

## Process Interlocking



## TRAINING

Quotation number	TBA
Inquiry number	TBA
Engineering company	TBA
End-user	TBA
Project	TBA
Date	TBA

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SECTION

## **Introduction over Mechanical Interlocking**



## Process Interlocking

# Process Interlocking Introduction

Process interlocking is a long-used and well-established principle to guide users safely through an operating sequence. Once the proper steps have been identified NETHERLOCKS will supply mechanical interlocks that can be operated by means of a linear key.

Many processes incorporate many valves, and NETHERLOCKS has several standard locking devices to lock all types and sizes of valve: e.g. ball valve, gate valve, globe valve, needle valve, plug valve, etc...

In addition to valve safety products, NETHERLOCKS also manufactures locks for switches, MOVs, closure doors, hatches etc...

Every safety procedure is unique; we will always provide a custom-made solution to guarantee a proper sequence of operation.

### Interlocking principle

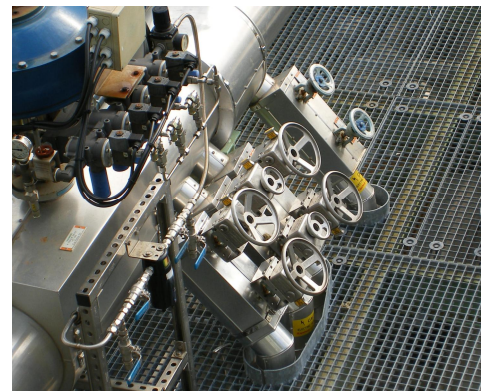
An interlock guides the operator through the sequence with unique keys for each step. It is only when a mistake is made that the operator will not be allowed to proceed; a key will not fit or a valve will be locked in position.

The principle of mechanical key interlocking is the transfer of keys. Each lock is executed with two keys: one for the locked open position and one for the locked closed position. When the valve is open the "open" key is released, can be removed ready to operate the next lock in the sequence, which will share the same code. All keys are unique and depending on the sequence

NETHERLOCKS will determine the codes to guarantee the required sequence.

### Linear Key

NETHERLOCKS uses a linear key system. The key is easy to use, robust and fully made out of Stainless Steel 316. Our linear key design is maintenance-free and very reliable, and it remains functional under severe circumstances. We have a proven track record with projects in a variety of locations both on and off-shore e.g. Alaska, Russia, Middle East, North Sea etc...







## Process Interlocking

# History of Interlocking

This article describes the history of Process Interlocking through the years, from the first introduction of bolt locks in the 1930's up to today's purpose-built locks for oil & gas industry.

## Bolt Locks

The Bolt Locks used initially were originally not designed for the process industry but to be able coupling switchgear in pre-determined sequences.

Interlocking of valves was first introduced by using these "rotating key" Bolt Locks and incorporating these into bracketing and tubing which could then be welded onto the host valve. The valve's spindle had to be drilled and machined to mount these locks. A difficulty was that once installed, these locks were permanently fixed and could not be adjusted to changes in the valve's open and closed position, that occurs over the years by wear of the seats, changes in temperature, pollution etc.

The number of variations to implement these bolt locks to a valve, represent the different problems experienced by operation through time.

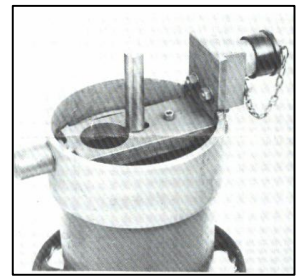
As more brand names entered over the years, designs were changed and purpose-built Interlocks emerged that required no modification to the valve. This evolution resulted in earlier designs to become less acceptable. Modifications to the valve were not preferred which resulted in purpose-built integral locks to be the new standard.

## Integral Locks

Valve Interlocks now could be mounted using specifically designed mounting sets, without the need to weld and modify the valve stem. These locks replaced the original lever / hand wheel and became an integral part of the valve.

The first integral locks were still equipped with the rotating key.

Keys were not released on the detection of stem height, but the locks were equipped with counting mechanisms that could be set to the number of rotations required to fully open or close the valve, and more important, could be re-set in time.





## Process Interlocking

### Linear Keys

In consultation with operators' experiences, Interlock manufacturers re-evaluated their design and introduced the linear key instead of rotary keys.

The first Integral locks still operated using the rotating key design. Over the years it became clear that rotating keys were not the ideal solution for use in the salty, dusty and sandy environment that oil & gas industry is usually located in. Key slots with dust caps filled up with dirt anyway and keys would not fit; rotating keys were small and easily dropped or lost even; operators were able to insert the wrong keys almost completely into the slot, and thus tried to rotate the wrong key which in its turn resulted in broken slots & keys.

Although the lock internals based on rotating components were generally kept the same, this linear key was a big step forward, both in terms of reliability and operability of the interlock. Linear keys are large and can easily be handled wearing working gloves, they require just one-hand operation, no need lifting up any covers.

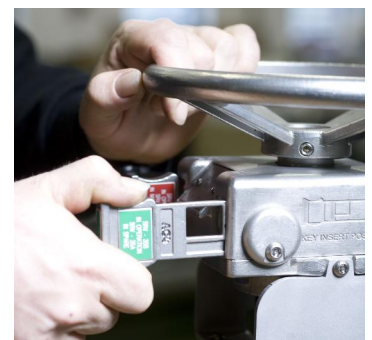
Nowadays, integral locks with linear keys are the standard for interlocking valves in oil & gas industry.

### Linear Movement

Eventually, NETHERLOCKS designed an integral lock with linear keys in which the advantages of linear movement (over rotating) were expanded to the fullest.

Linear design also makes huge improvements on the lock internals. All rotating parts on the inside that derived from the original rotating key designs were replaced, and a new lock was developed using as much linear movement as possible.

Apart from its simplicity, linear movement requires less grease and therefore has several advantages to make the whole lock invulnerable for ingress of dirt, dust and sand. This creates an operator-friendly and maintenance-free lock.



SECTION

## **Netherlocks Product Range Overviews**



## Process Interlocking

### Linear Key

The NETHERLOCKS key is a strong, easy to handle stainless steel 316 linear key.

The NETHERLOCKS' linear key requires push-in only; turning the key is not applicable. Right keys insert position is located along the sides of the lock and in the key design, the preferred grip is to hold the key automatically in the correct insert position.

Each key is unique; the key is executed with at least 4 grooves, which ensure that the applicable key can only fit in the corresponding lock key entry.

Consequently the NETHERLOCKS internals move linear resulting in the fact that the lock mechanism is not vulnerable for dirt, sand, moisture, etc.

The key entries do have automatically closing weather strips.

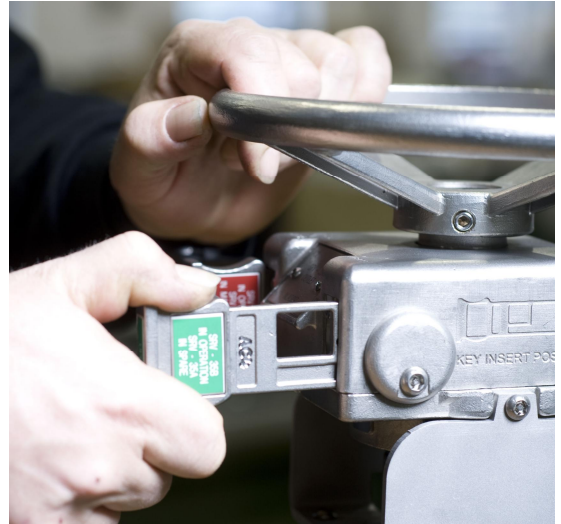
#### Colour tagging

The keys, the locks and the cabinet are provided with colour coded tags. The tag contains information provided by the clients regarding the corresponding system, location and status.

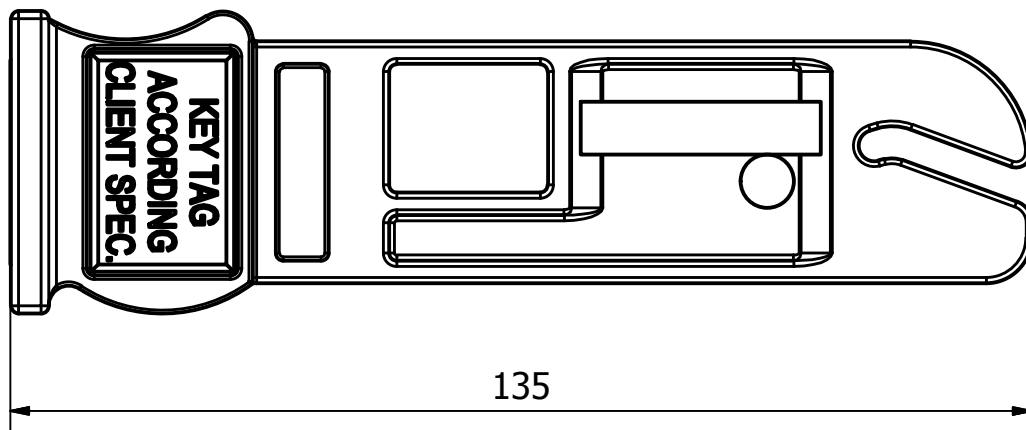
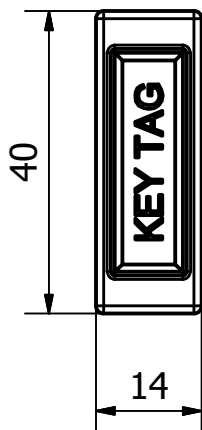
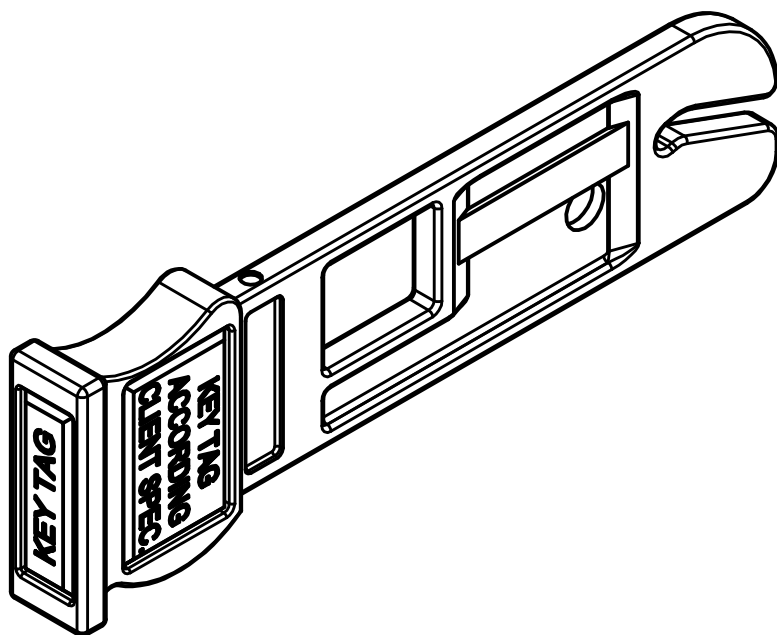
At the same time different colours can be used to indicate the status in case a key is returned to the control room. Together with the unique coded positions in the CKC this creates a clear overview for operation.

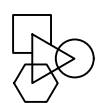
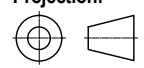
#### Features:

- Fully Stainless Steel 316
- Unique coding
- Easy to handle and robust
- Coloured tagging
- Key codes are hard dye stamped in the key handle.







Drawn: AKE	Date: 3-5-2012	Checked:
Key with Tags		
Drawing: NL-22	Units: mm	Projection:
		A4



## Process Interlocking

### Ninety Degree Lock (NDL)

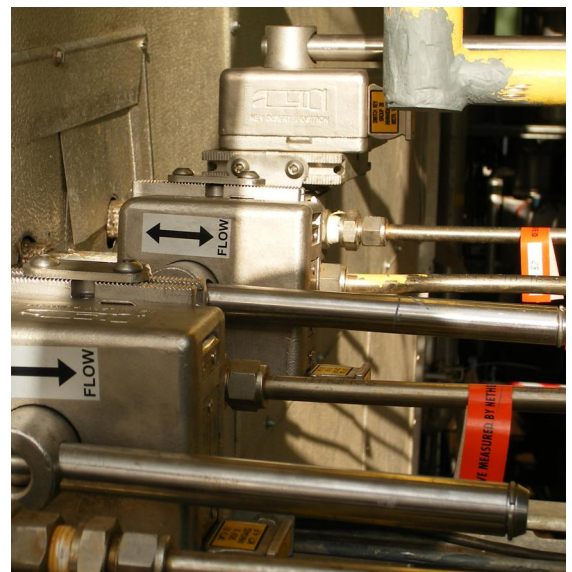
This type of lock can be installed on any type of valve that operates with a 90° rotation, like ball-, butterfly-, and plug valves.

The NDL can be mounted without any alteration to the host valve, and the characteristics of the valve remain unchanged. The lock is installed as an integral part of the valve, with the original valve lever removed and replaced by the NDL with a new, same-sized Stainless Steel sliding lever.

The principle of mechanical key interlocking is the transfer of keys. Each lock is executed with two keys: one for the locked open position and one for the locked closed position. When the valve is open the "open" key is released, can be removed ready to operate the next lock in the sequence, which will share the same code. All keys are unique and depending on the sequence NETHERLOCKS will determine the codes to guarantee the required sequence.

#### Technical Specifications:

- Fully made of stainless steel AISI 316
- SS AISI 316 lever is provided in the same size as the original
- Robust, reliable and simple design with a minimal amount of parts
- Maintenance free, No grease
- Tamperproof
- Mounting is very easy and can be done without shutting down the plant or making modifications to the valve
- Invulnerable for sand, dirt, snow, ice, etc.
- Thoroughly tested to withstand the most extreme operating environments
- Integrated second safety to prevent unlocking with an unauthorized object other than the designated linear key





## Process Interlocking

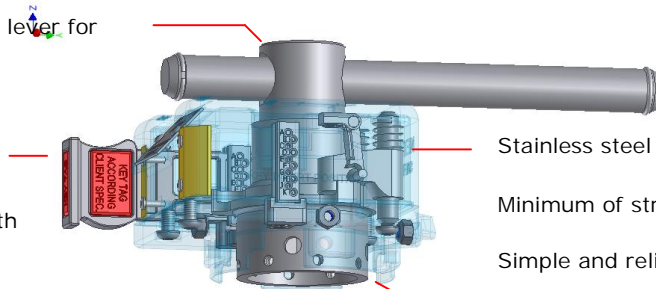
# Ninety Degree Lock (NDL)

## Features

Stainless steel 316 sliding lever for optimum flexibility.

Linear key for operator friendly use.

Key slots are protecting with self sealing weather strips.



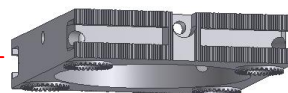
Stainless steel 316 body, 5mm thick.

Minimum of strong stainless steel 316 components

Simple and reliable anti manipulation clutch

8 screws to install the lock for a very strong fit

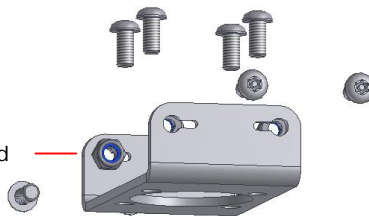
Mounting plate to connect the bracket to the lock.



Large diameter adapter – purpose machined - with 4 keyways. The large diameter assures that:

- the original nut will fit
- clamping the adapter from the sides is not necessary
- load on keys is minimized

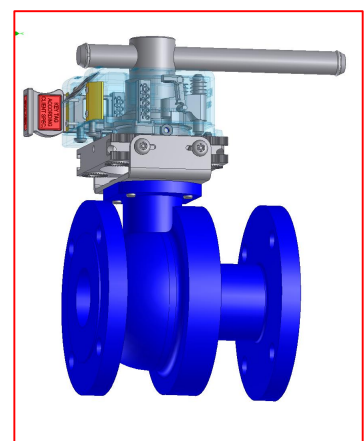
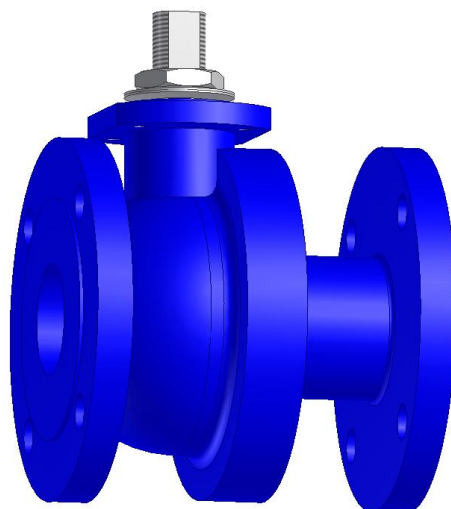
Stainless steel 316 purpose machined bracket.



### NETHERLOCKS:

- ISO 9001-2000 CERTIFIED
- SCC CERTIFIED

Locks are TUV & ATEX certified.





## Process Interlocking

### Multi Rotation Lock (MRL)

The Multi Rotation Lock (type MRL) is suitable for all hand wheel-operated valves like gate-, globe- and gearbox-operated valves.

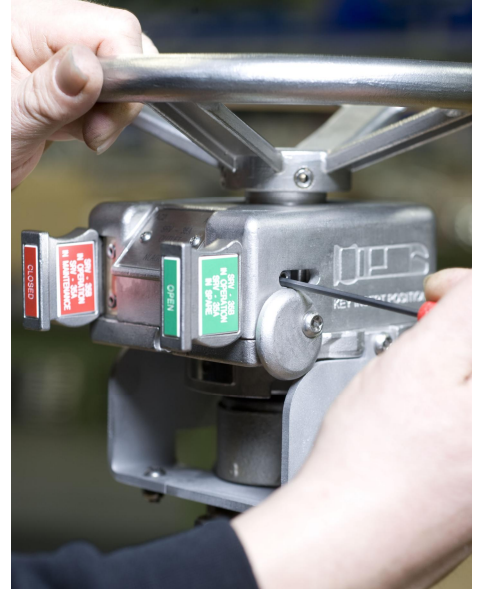
The MRL can be mounted without any alteration to the host valve, and the characteristics of the valve remain unchanged. The lock is installed as an integral part of the valve, with the original hand-wheel removed and replaced with a new, same-sized Stainless Steel hand wheel.

Since the number of rotations to open or close a valve is different for almost every valve, the MRL has a field adjustable, easy to set counting mechanism.

The principle of mechanical key interlocking is the transfer of keys. Each lock is executed with two keys: one for the locked open position and one for the locked closed position. When the valve is open the "open" key is released, can be removed ready to operate the next lock in the sequence, which will share the same code. All keys are unique and depending on the sequence NETHERLOCKS will determine the codes to guarantee the required sequence.

#### Technical specifications:

- Fully made of stainless steel AISI 316
- Stainless steel hand wheel is provided in the same size as the original
- Robust, reliable and simple design with a minimal amount of parts
- Maintenance free, no Grease
- Mounting can be done without shutting down the plant or making modifications to the valve
- Invulnerable for sand, dirt, snow, ice, etc.
- Thoroughly tested to withstand the most extreme operating environments
- Tamperproof; integrated second safety to prevent unlocking with an unauthorized object other than the designated linear key



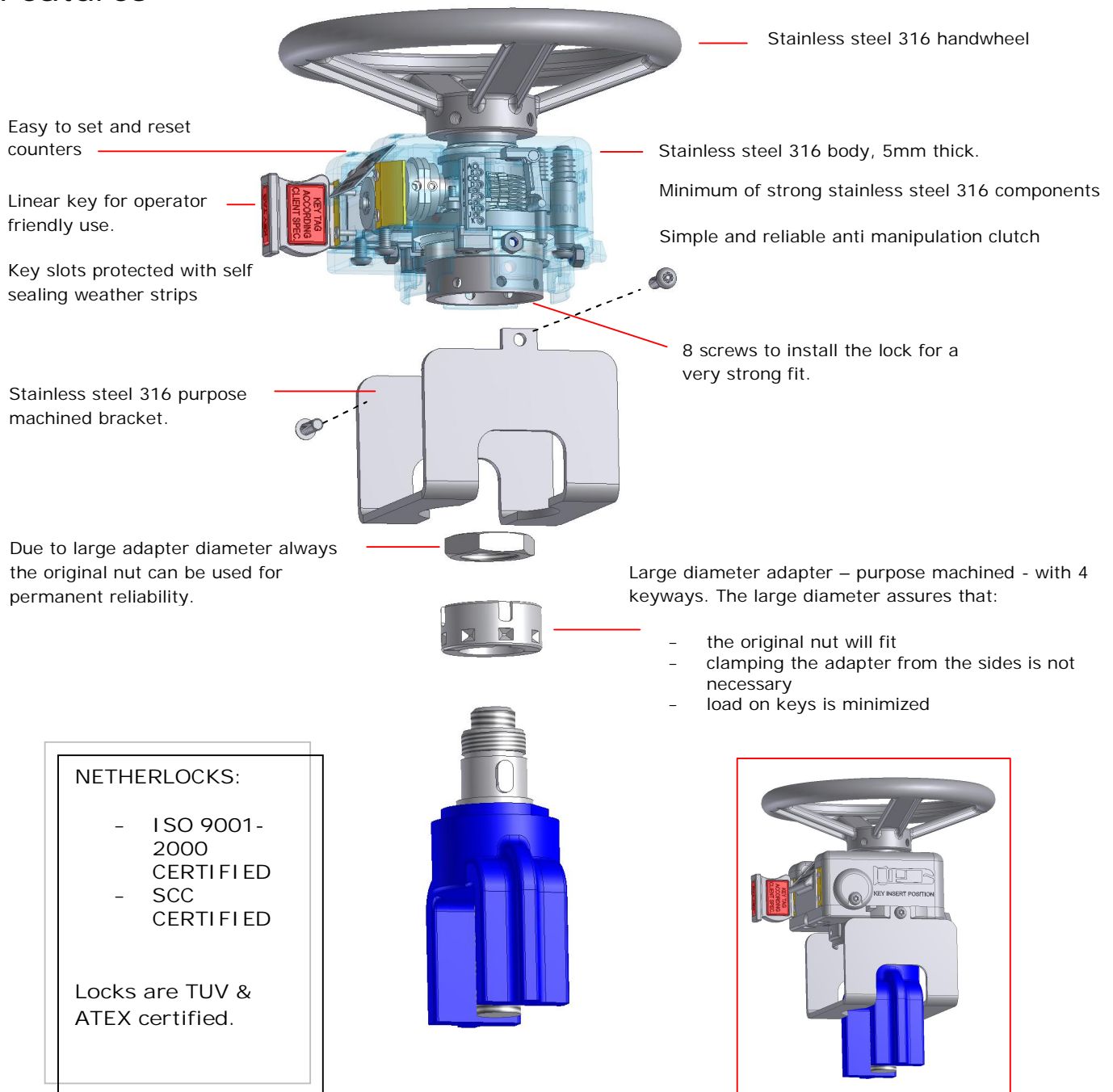




## Process Interlocking

# Multi Rotation Lock (MRL)

## Features





## Process Interlocking

### Multi Rotation Lock - X Counter (MRL- X counter)

The Multi Rotation Lock – X counter (type MRL X counter) is similar to the Standard MRL lock but equipped with a special counter. The X counter is suitable for all hand wheel-operated valves with high rotations due to a gearbox or valves that have large variation of the end position. (Often the close position)

The MRL X counter can be mounted without any alteration to the host valve, and the characteristics of the valve remain unchanged. The lock is installed as an integral part of the valve, with the original hand-wheel removed and replaced with a new, same-sized Stainless Steel hand wheel.

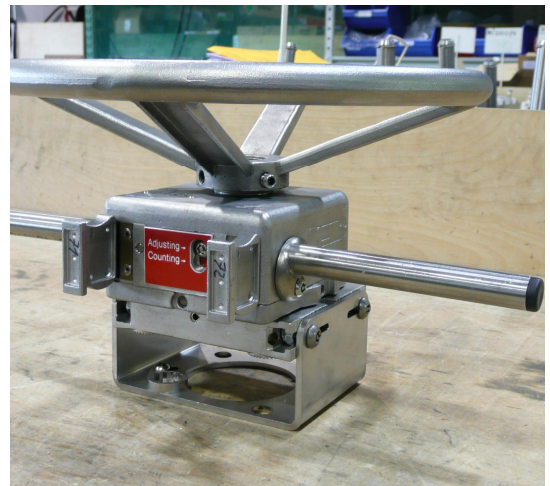
For our standard counter the key can be released within a fixed margin before and after the set point to release the key. This is sufficient for 95% of the valves.

When valves are operated with a high ratio gearbox, the original amount of rotation is multiplied as a result and the standard margin might not be sufficient anymore.

The X counter allows you to set the open and closed position but instead of a fixed margin the X counter has the possibility to set the margin before the set point to any required amount of rotations. Beside that the x counter will not trap the key at all if the set point is passed so no margin after the original set point.

#### Technical specifications:

- o Fully made of stainless steel AISI 316
- o Stainless steel hand wheel is provided in the same size as the original
- o Robust, reliable and simple design with a minimal amount of parts
- o Mounting can be done without shutting down the plant or making modifications to the valve
- o Invulnerable for sand, dirt, snow, ice, etc.
- o Thoroughly tested to withstand the most extreme operating environments
- o Tamperproof; integrated second safety to prevent unlocking with an unauthorized object other than the designated linear key





## Process Interlocking

### Locks for small valves / needle valves

For needle valves, manifold blocks and valves below 1" NETHERLOCKS will design a custom made low weight lock.

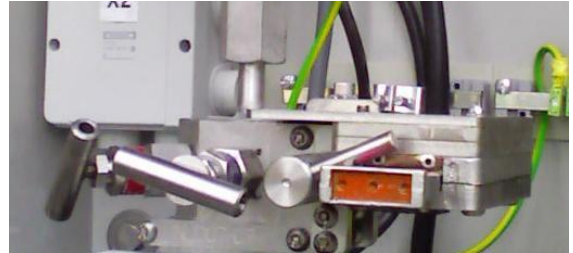
Different options are available depending on the valve; often the original hand wheel or lever remains to reduce the amount of added weight and, if required, additional bracketing to support the valve will be supplied.

Alternative materials like plastics are also available to further reduce weight.

The basis component is the NETHERLOCKS Linear bolt lock.

#### Features:

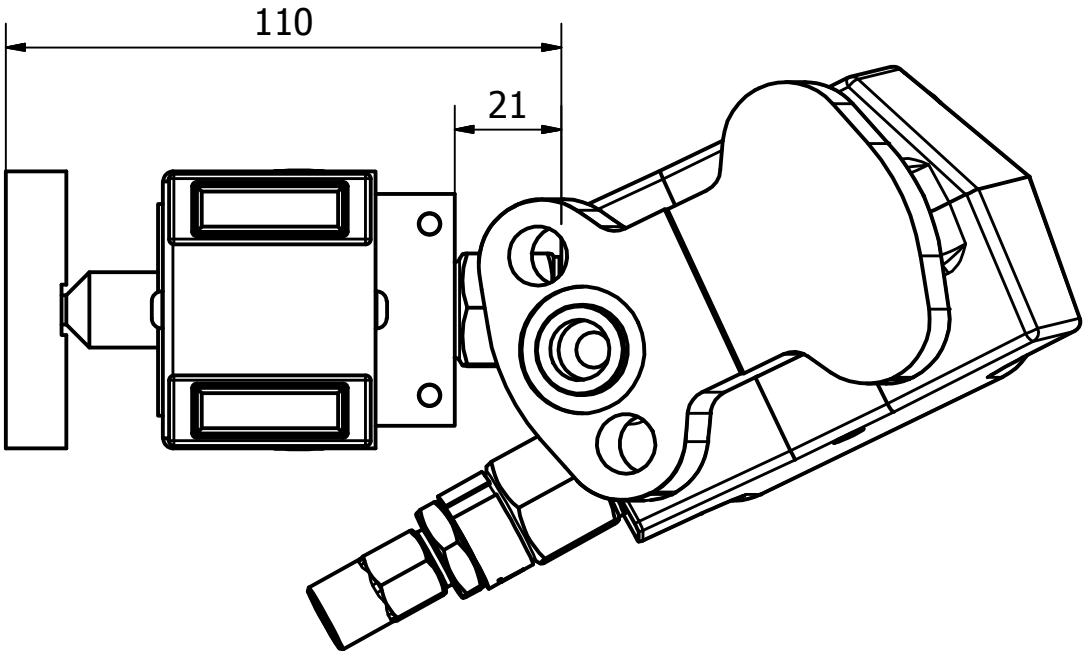
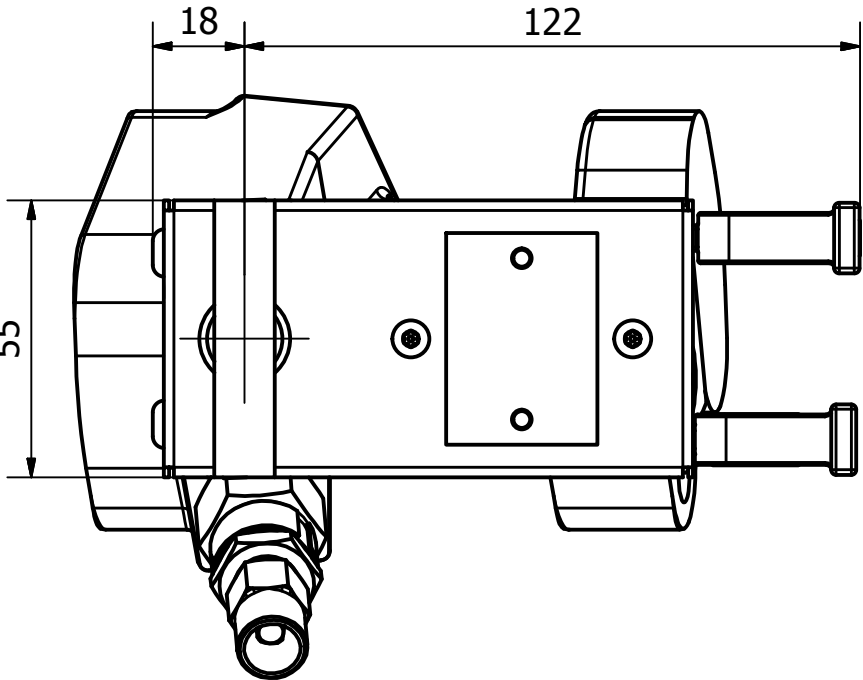
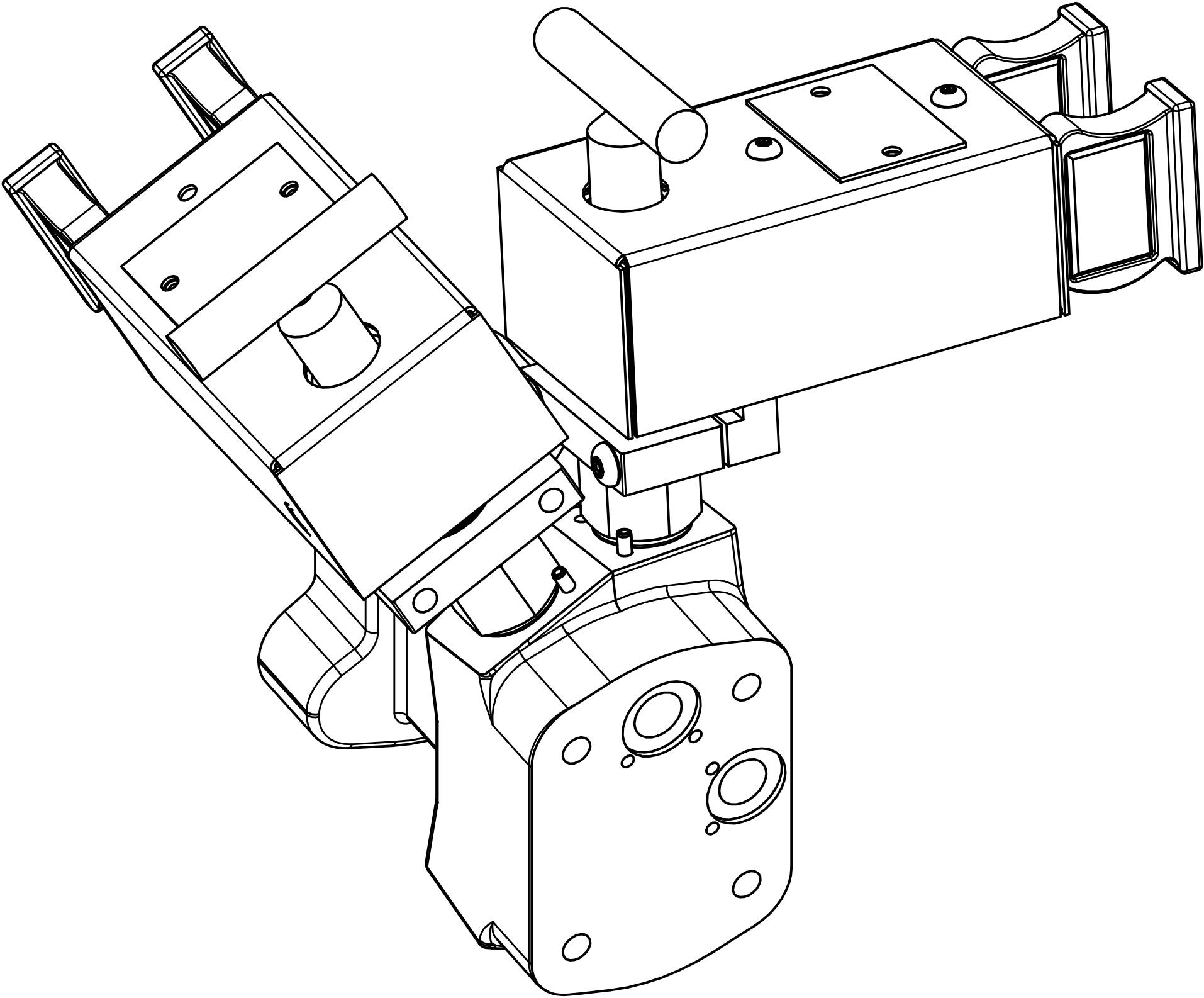
- Standard fully stainless Steel 316
- Linear key operated
- Alternative materials available upon request
- Available in lock open, locked closed or both.







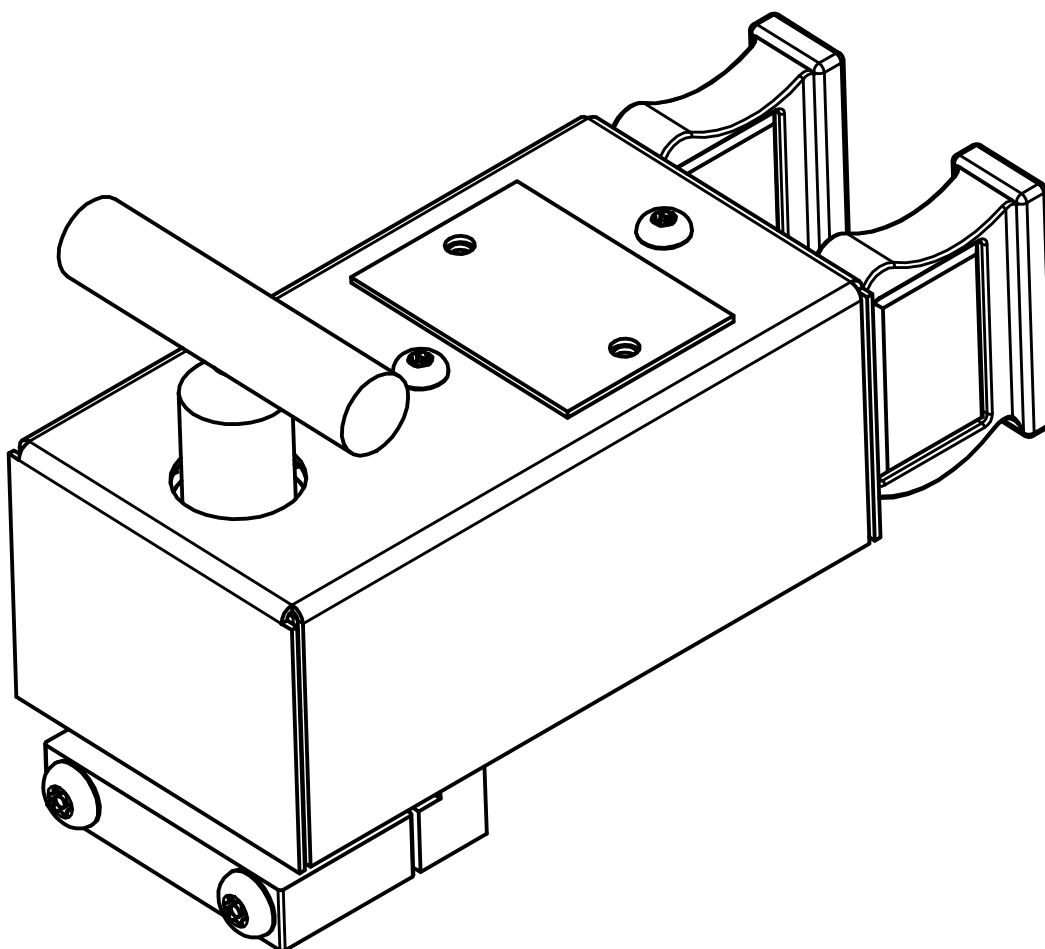
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	NLD12-067_20	Needle Valve Lock
2	1	SBB-DC0-SG00U	Schneider Manifold



Drawn: AKE	Date: 3-5-2012	Checked:
Needle Valve Lock		
Drawing: NLD12-067_00	Units: mm Projection: 	A3

# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-067_01	Assembly Lock Unit
2	1	NLD12-067_13	CLAMP
3	1	NLD12-067_14	Assembly Adaptor
4	1	NLD12-067_17	Bottom Cover
5	1	NLD12-067_18	Top Cover
6	4	Resistorx - M4 x 8	Resistorx - Metric
7	2	Resistorx - M5 x 30	Resistorx - Metric
8	1	ORIGINAL HANDWHEEL	
9	1	Tagplate - rvs	



Drawn: AKE

Date: 3-5-2012

Checked:

Needle Valve Lock



Units: mm

Drawing:

NLD12-067\_20

Projection:



A4



## Process Interlocking

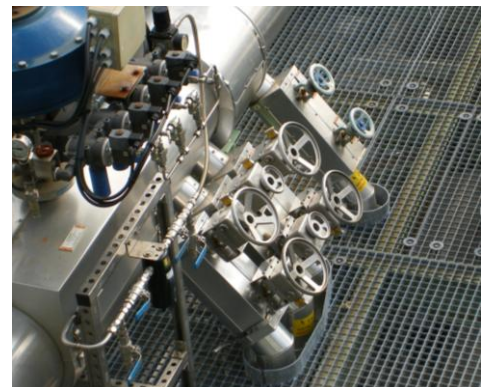
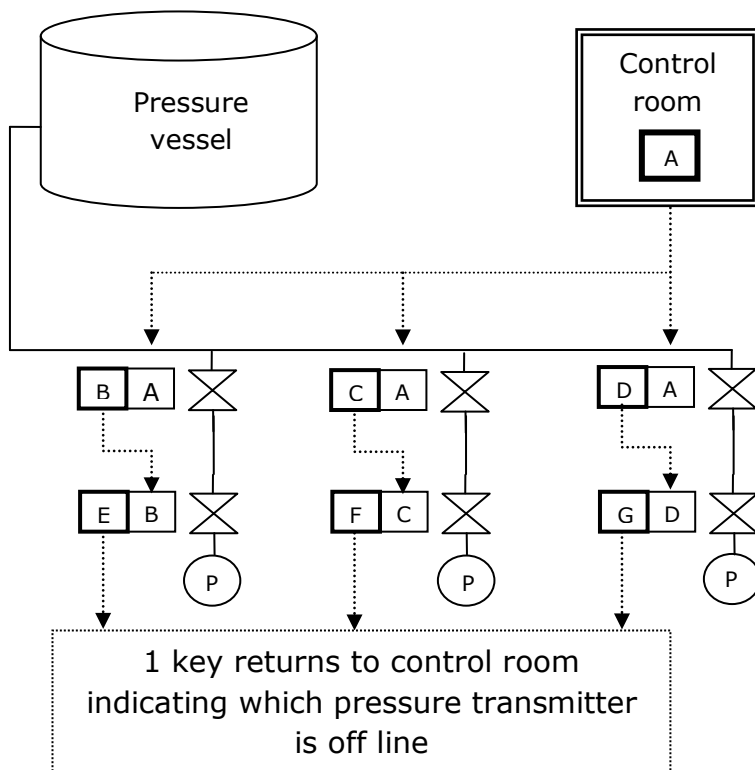
### 2 out of 3 interlocking application

Process interlocking is a long-used and well-established principle to guide users safely through an operating sequence. Once the proper steps have been identified **NETHERLOCKS** will supply mechanical interlocks that can be operated by means of a linear key.

A typical application is 2 out of three, when using pressure gauges or level sensors "2 out of 3" is common. Typically 3 gauges are installed parallel and 2 out of 3 gauges or sensors need to be online at all times to get redundancy.

Since manifold blocks are often used we have designed a specific interlock to lock the needle valve handles, see picture.

By implementing mechanical interlocks on the block valves (often needle valves) we guarantee only 1 line can be closed at a time to guarantee 2 out of 3 are always online. See below sequence diagram.





## Process Interlocking

### Electrical Switch Lock (ESL)

Operating procedures sometimes require switching off the electrical power. To integrate this action into an interlocking sequence, NETHERLOCKS developed their Electrical Switch lock.

The universal design of the ESL makes it suitable for all types of switches. The ESL makes use of a boltlock, operated by a linear key.

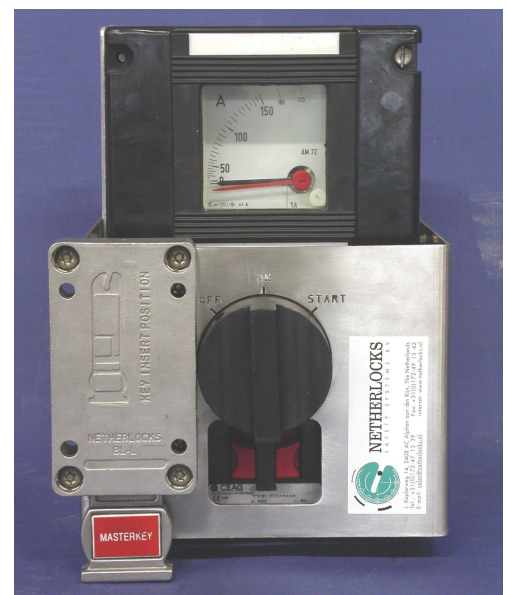
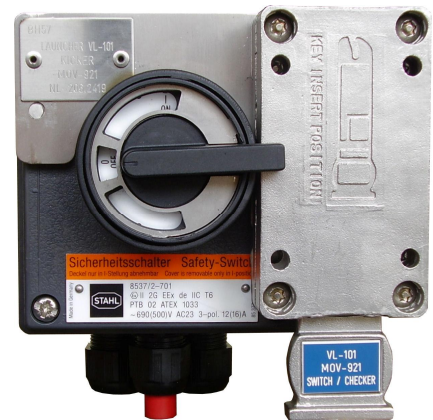
when the power is switched ON, the key is trapped. Once the power is switched OFF, the key can be released (or vice versa).

The ESL is also available as a complete assembly, including any type of switch, according to the required specifications.

The lock is mounted without modifying the switch so it will not interfere with any existing EX certification of the switch.

#### Features:

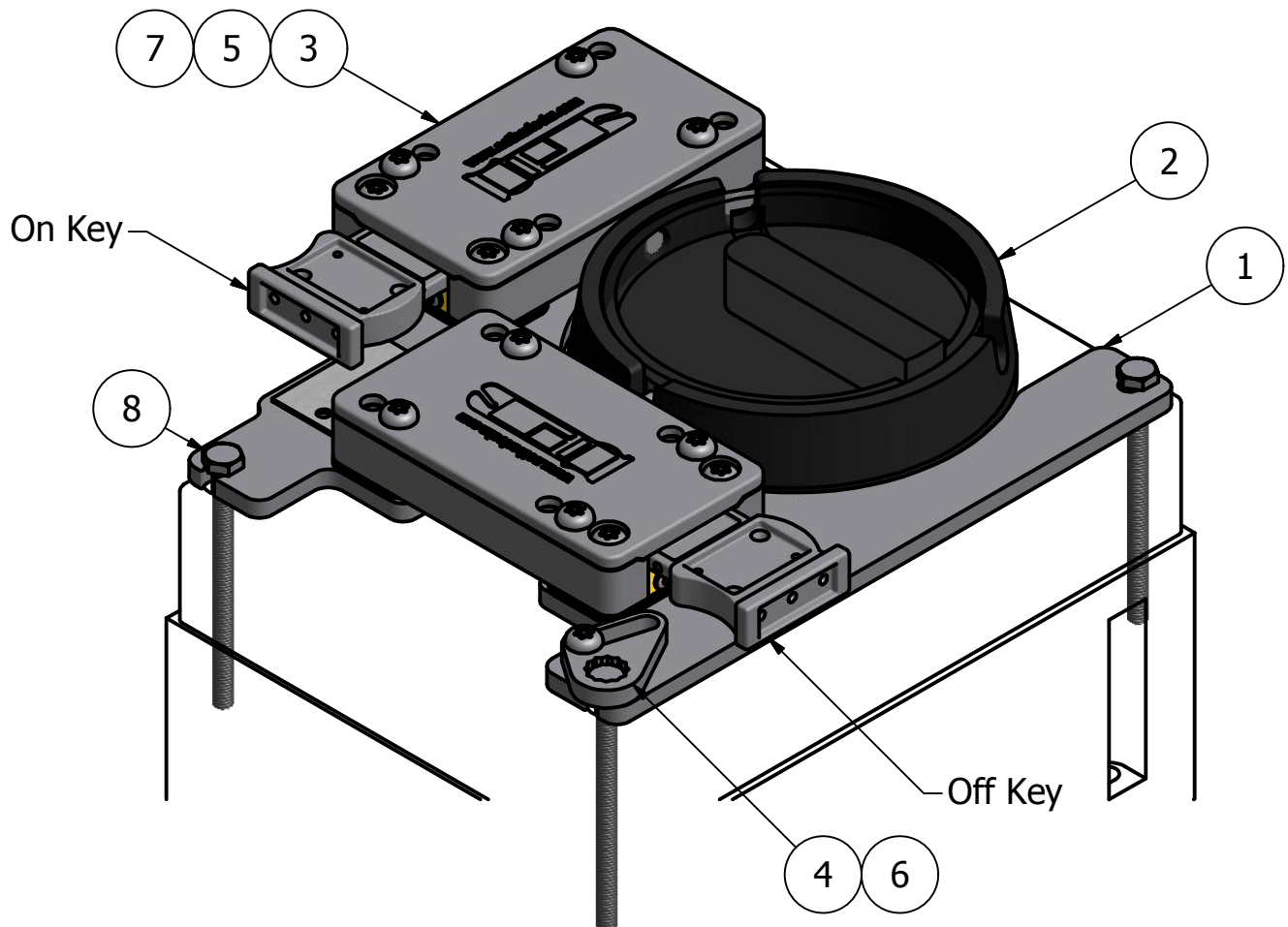
- o Fully Stainless Steel AISI 316
- o Robust, reliable and simple design with a minimal amount of parts
- o Will not interfere with any existing EX certification of the switch
- o Fully maintenance-free
- o Tamperproof
- o Mounting is very easy and can be done during production
- o Invulnerable for sand, dirt, snow, ice, moist, etc.
- o Thoroughly tested to withstand the most extreme operating environments





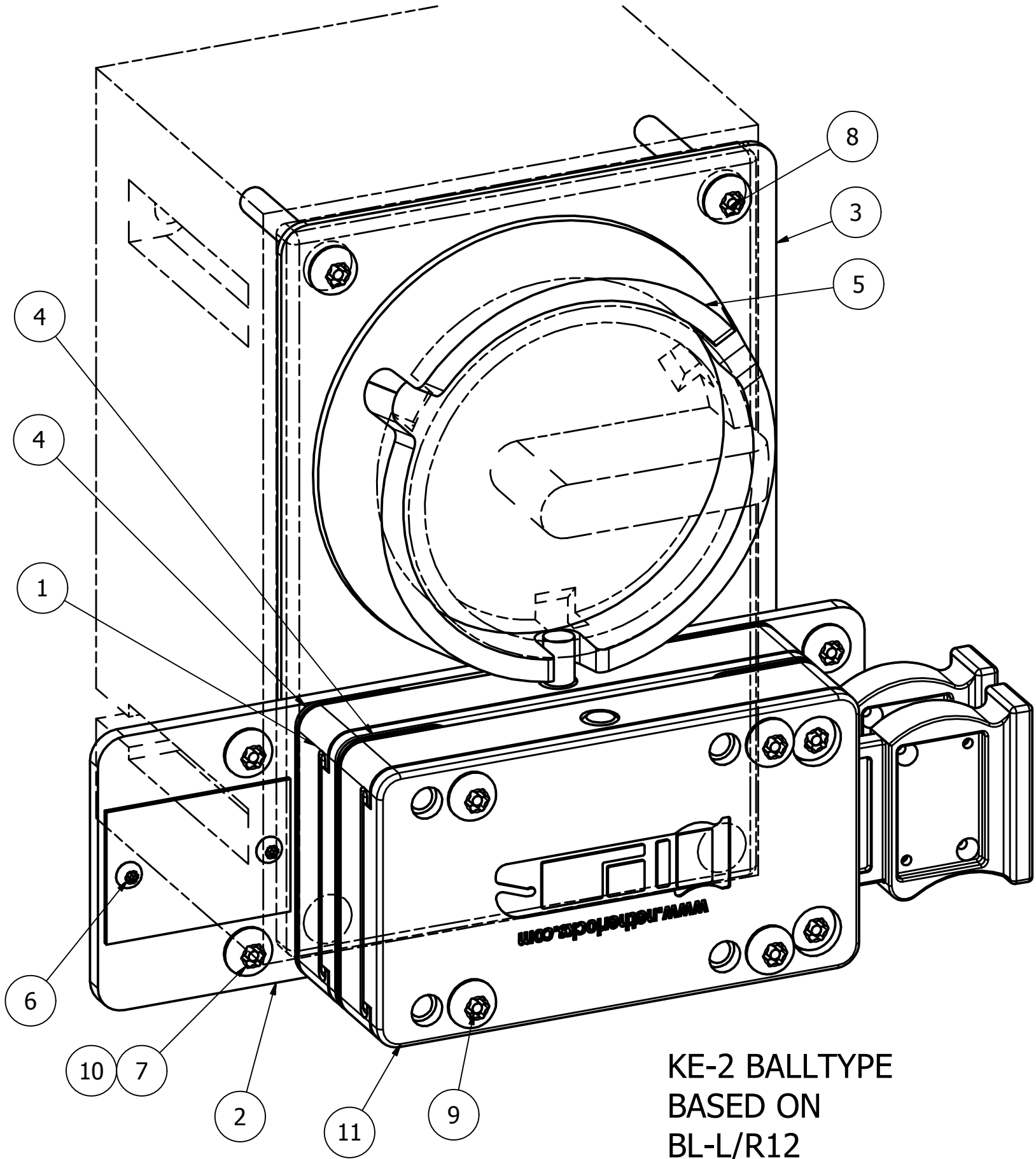
# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-024_01A	Bracket
2	1	NLD11-024_02	MOD to Stahl Switch
3	2	NLD11-024_10	MOD to NL-901 - BLL-R11
4	1	NL-117_R0	Boltcover M6 (Gearbox)
5	8	NL-129	Filler plate BLL-R10
6	1	Resistorx - M6 x 10	Resistorx - Metric
7	8	Resistorx - M6 x 25	Resistorx - Metric
8	3	DIN 933 - M6 x 80	Hex-Head Bolt



Drawn: AKE	Date: 17-3-2011	Checked:
STAHL SWITCH BL-L CO		
Units: mm	Projection:	A4
Drawing: NLD11-024_00A		

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-135_01	MOD to BLL-R12
2	1	NLD11-066_01	BRACKET1
3	1	NLD11-066_02	BRACKET2
4	4	NL-129	Filler plate BLL
5	1	Stahl Switch	8537/2-702-7000
6	2	Resistorx - M3 x 6	Resistorx - M3x6
7	4	Resistorx - M6 x 12	Resistorx - Metric
8	4	Resistorx - M6 x 40	Resistorx - Metric
9	4	Resistorx - M6 x 50 -> L=46.5	Resistorx - Metric
10	4	DIN 985 - M6	Selfretaining Nut
11	1	BLL-R12	BOLTLOCK

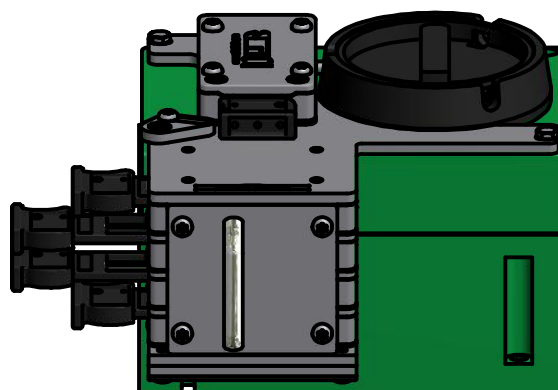
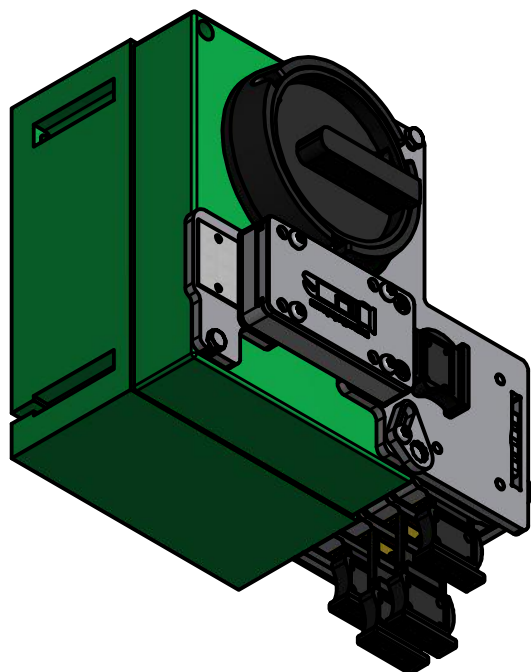


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STAHL SWITCH BL-L KE-2		
Drawing: NLD12-135_00	Units: mm	Projection:

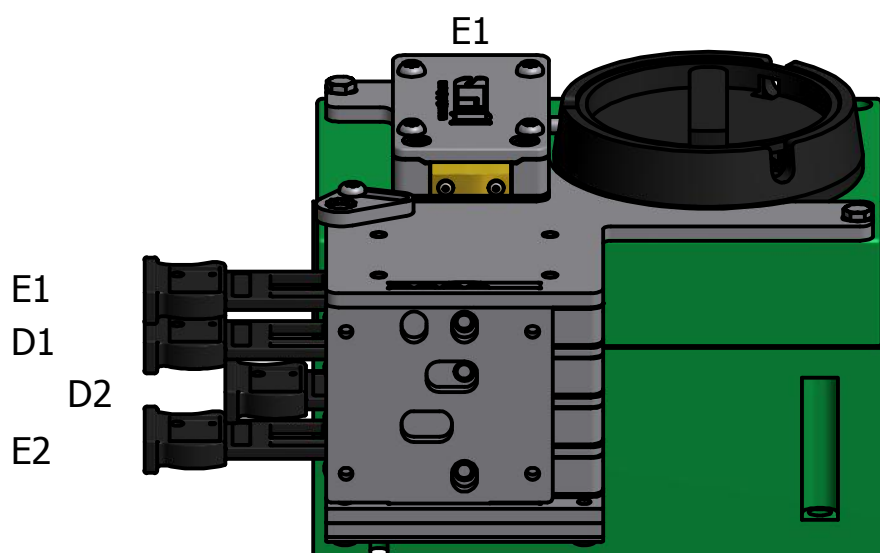
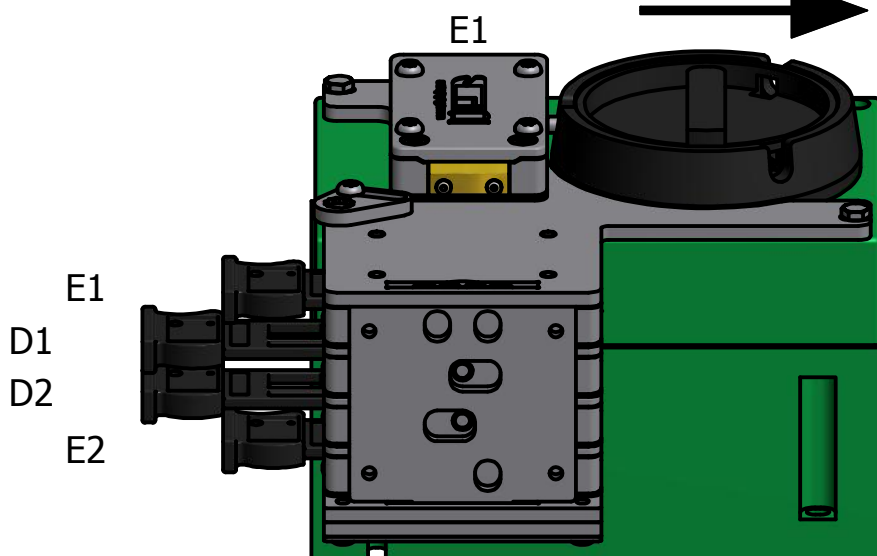
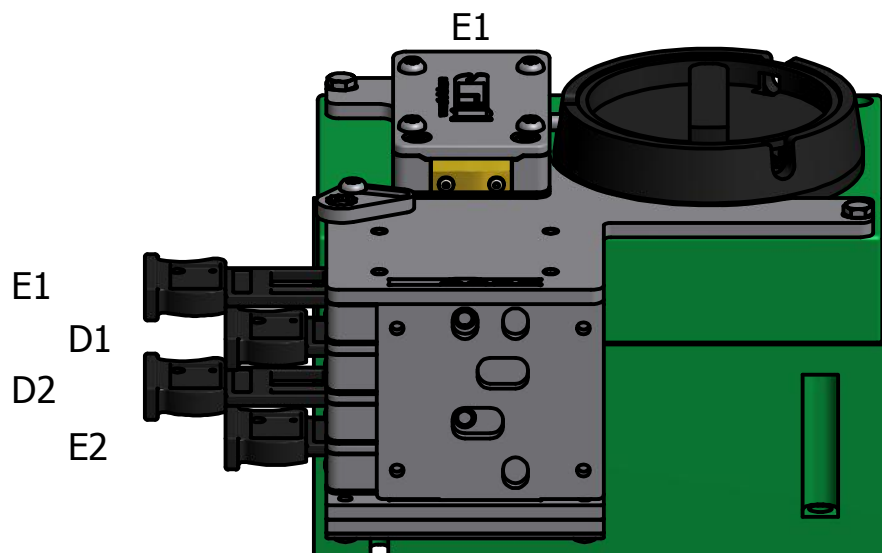
A3

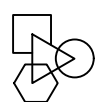

# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
2	1	NLD12-009_01	Bracket
4	1	NLD12-009_06	Selector Plate
5	1	NLD12-009_07	Selector Plate Cover
1	1	Stahl Switch 8537 2-705	Stahl Switch 8537/2-705
3	1	NLD11-024_10	MOD to NL-901 - BLL-R11
6	1	NLD11-039_01	Cover
7	1	NLD11-039_02	Plate
8	1	NLD11-039_19	Cover Top
9	4	THREAD-M6	Threaded Rod L= 103 mm
10	1	NL-117	Boltcover M6 (Gearbox)
11	14	NL-129	Filler plate BLL
12	1	NL-805	Lamp70
13	4	NL-901	BLL-R11
14	2	DIN 912 - M3 x 10	Cylinder Head Cap Screw
15	3	DIN 933 - M6 x 80	Hex-Head Bolt
16	4	DIN 985 - M6	Selfretaining Nut
17	1	Resistorx - M6 x 10	Resistorx - Metric
18	8	Resistorx - M6 x 12	Resistorx - Metric
19	4	Resistorx - M6 x 25	Resistorx - Metric
20	1	Druk stuk	5 mm



Drawn: RH	Date: 23-1-2012	Checked:
STAHL Switch with Key Exchange		
Drawing: NLD12-009_00	Sheet 1 of 2	Units: mm Projection:
		A4



Drawn: AKE	Date: 23-1-2012	Checked:
STAHL Switch with Key Exchange		
Units: mm		
Drawing: NLD12-009_00	Sheet 2 of 2	Projection: 
		A4





## Process Interlocking

### Closure Locks (CL)

During pig launching and receiving, written procedures must be followed carefully. When the vessel is not drained and vented or when the isolation valves are not fully closed before opening the closure, very dangerous situations can occur.

The NETHERLOCKS closure lock (CL), as part of an interlocking sequence, prevents these situations by guaranteeing that the isolation valves are closed and the vessel is vented and drained before opening the closure.

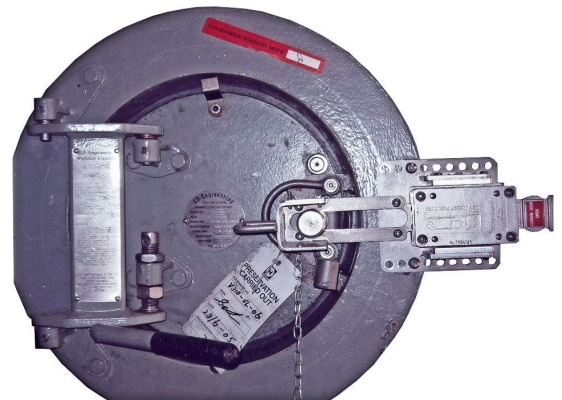
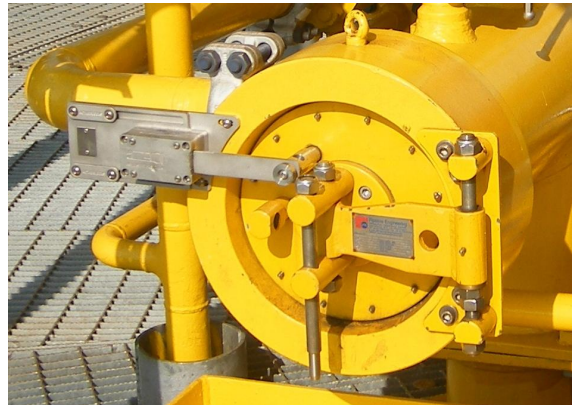
Because there are many closure types, each design is different, parts of our CL are custom designed for each type and size of closure.

However, the design philosophy behind the Netherlocks CL remains the same; in general, opening of a closure requires removal of a bleedbolt. The Netherlocks Closure Lock prevents the bleedbolt from being removed and thus the closure cannot be opened. Only insertion of a unique linear key releases the bleed bolt in order to open the closure. As long as the closure is open, the unique key is trapped. Only when the door is fully closed and the bleed bolt is in its original position, the key, necessary to continue the procedure, is released.

The NETHERLOCKS closure lock is suitable for every type and size of closure.

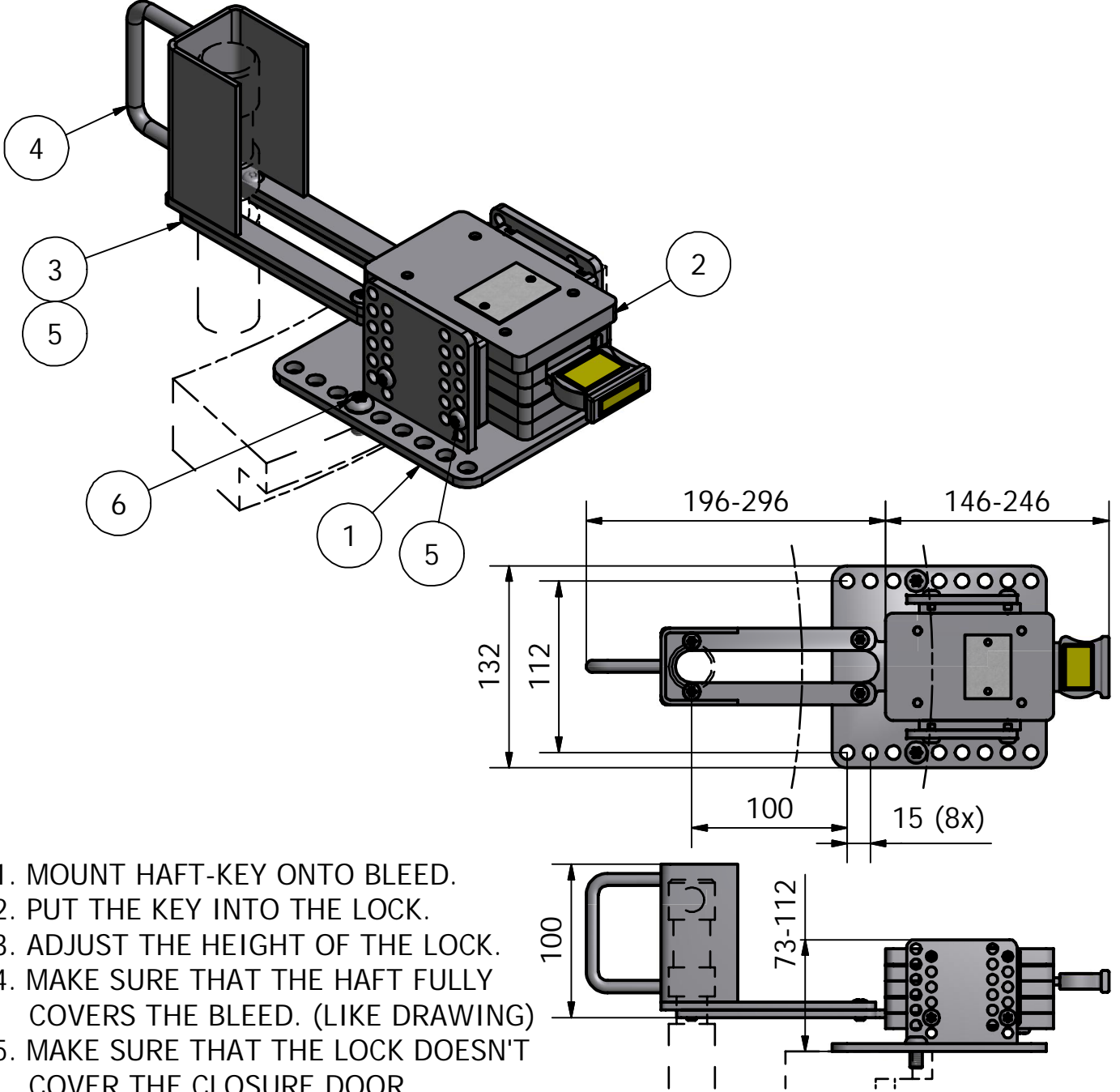
#### Features:

- Fully Stainless Steel AISI 316
- Robust, reliable and simple design
- Fully maintenance free
- Tamperproof
- Invulnerable for sand, dirt, snow, ice, etc...
- Thoroughly tested to withstand the most extreme operating environments
- Optionally, electronic components can be integrated to establish feedback to the control room



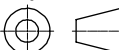




PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-013_01	Bracket
2	1	NLD11-013_04A	BLL KE-2 Ball
3	1	NLD11-013_08	Closure Key
4	1	NLD11-013_09	Key Haft
5	8	Resistorx - M6 x 10	Resistorx - Metric
6	2	Resistorx - M8 x 16	Resistorx - Metric



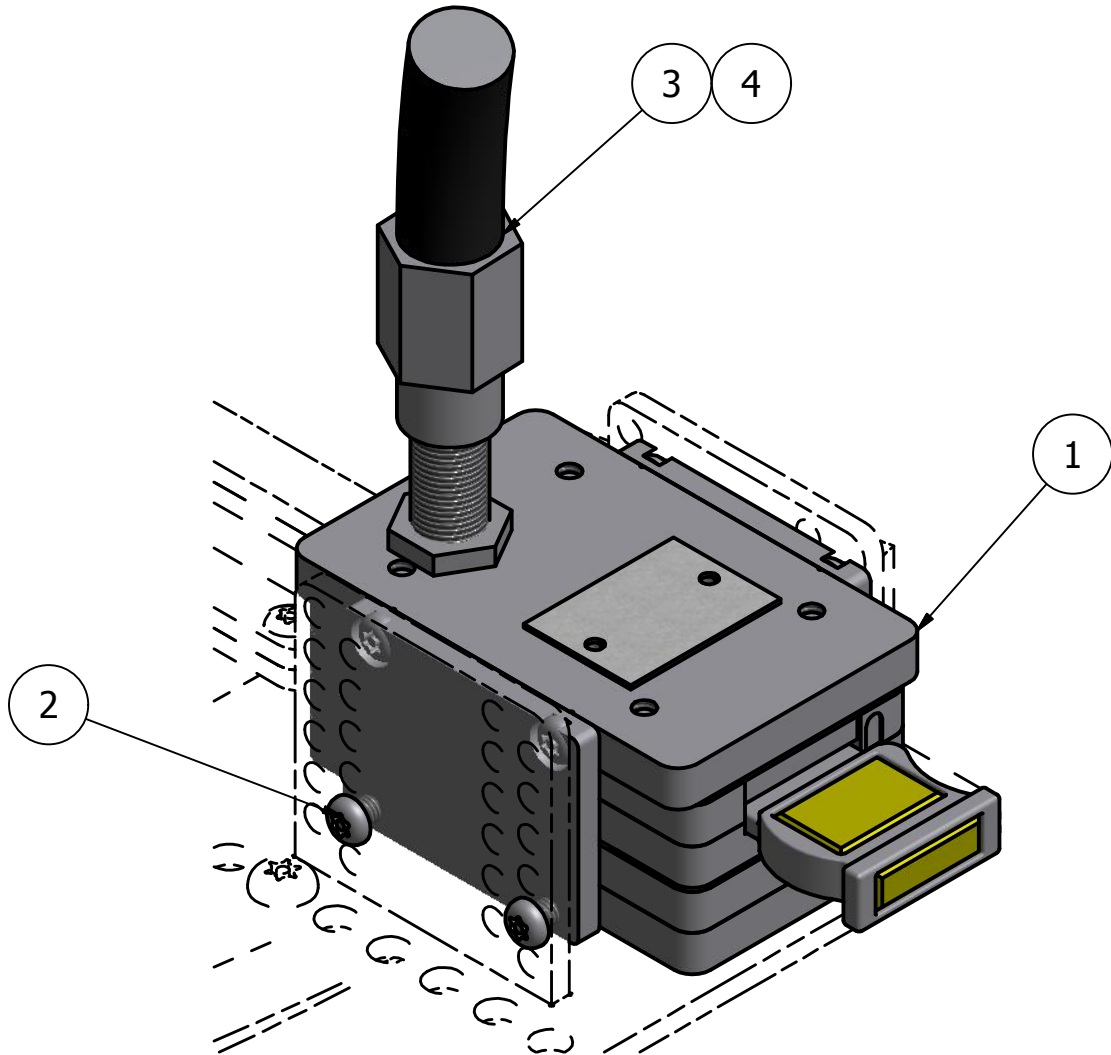
- 1. MOUNT HAFT-KEY ONTO BLEED.
- 2. PUT THE KEY INTO THE LOCK.
- 3. ADJUST THE HEIGHT OF THE LOCK.
- 4. MAKE SURE THAT THE HAFT FULLY COVERS THE BLEED. (LIKE DRAWING)
- 5. MAKE SURE THAT THE LOCK DOESN'T COVER THE CLOSURE DOOR.
- 6. MARK 2 SPOTS TO FIX THE LOCK ONTO THE FLANGE.
- 7. REMOVE THE LOCK.
- 8. DRILL THE MARKED SPOTS Ø6.8mm AND TAP M8 (16mm DEEP).
- 9. FIX THE LOCK WITH 2 BOLTS ONTO THE FLANGE.

Drawn: AKE	Date: 3-3-2011	Checked:
(Derived from NLD-17-11-05-34)		
GD Closure UNI		
Units: mm		
Drawing:	Projection:	
NLD11-013_00A		





PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-020_04	BLL KE-2 Ball
2	4	Resistorx - M6 x 10	Resistorx - Metric
3	1	GO SWITCH 7G	GO SWITCH 7G
4	1	GO SWITCH - NUT	

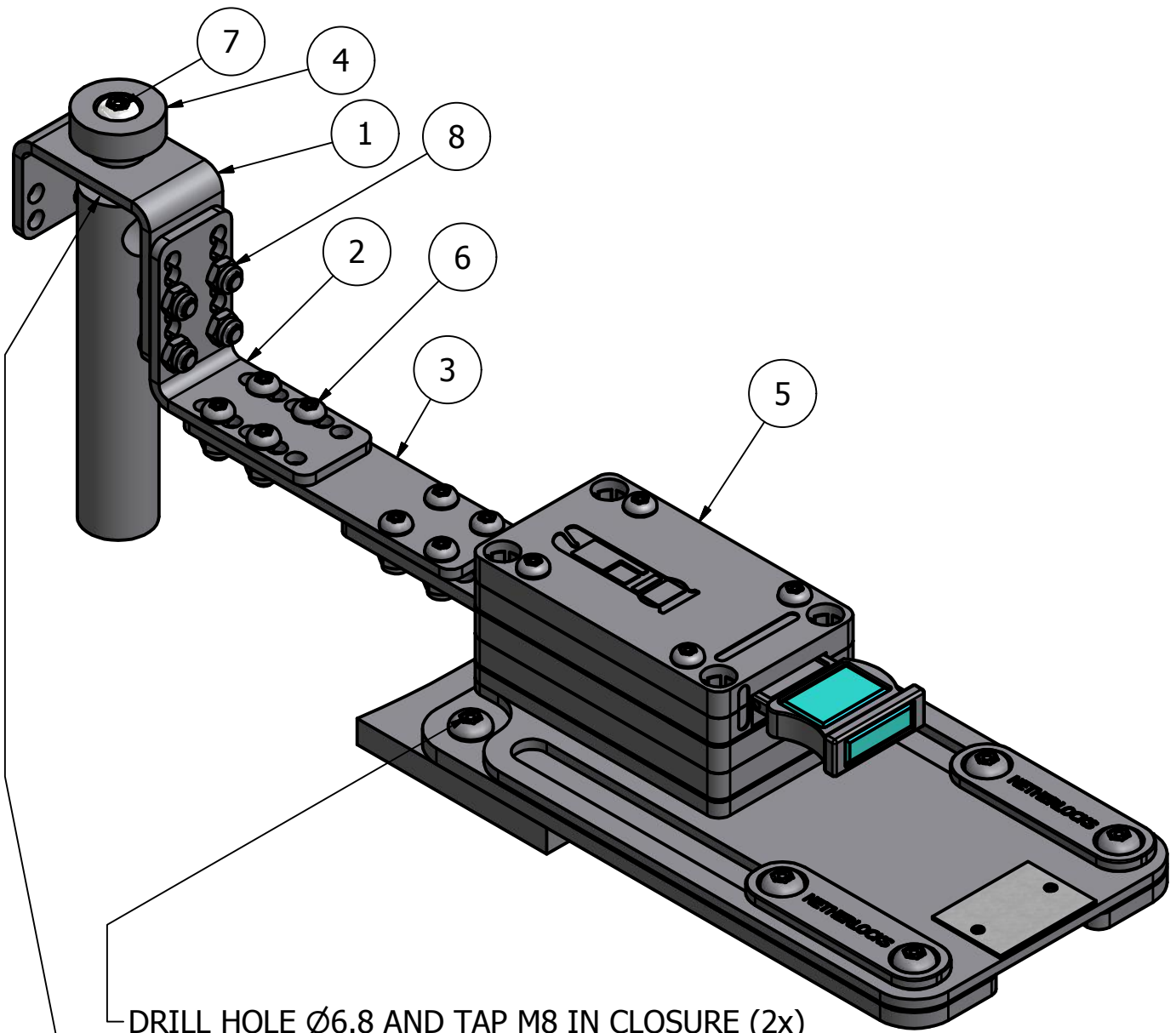


Drawn: AKE	Date: 14-2-2011	Checked:
GD Closure UNI GO Switch		
Drawing: NLD11-020_00	Units: mm	Projection:
		<b>A4</b>





PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-082_12	Key Closure
2	1	NLD12-082_13	Key Bracket
3	1	NLD12-082_14	Key Spacer
4	1	NLD12-082_20	Bush M8
5	1	NLD12-082_30	Sliding Lock
6	12	Resistorx - M6 x 16	Resistorx - Metric
7	1	Resistorx - M8 x 30	Resistorx - Metric
8	12	DIN 985 - M6	Selfretaining Nut



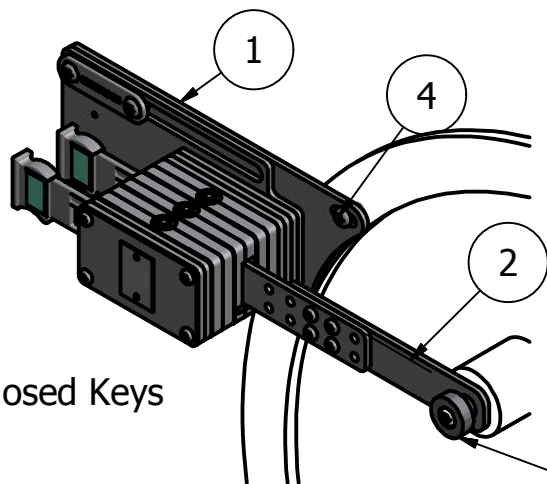
— DRILL HOLE Ø6.8 AND TAP M8 IN CLOSURE (2x)  
— DRILL HOLE Ø6.8 AND TAP M8 IN BLEED BOLT (1x)

Drawn: AKE	Date: 23-5-2012	Checked:
SYPRIS CLOSURE UNI		
Drawing: NLD12-167_00	Units: mm	Projection:
		A4

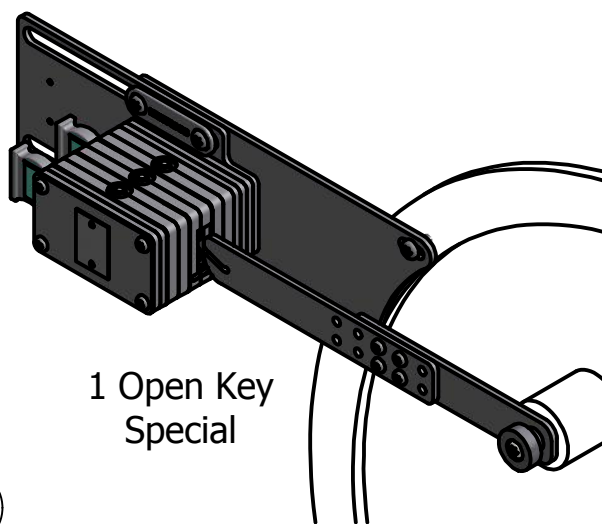




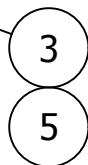
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-040_02	Assembly BLL
2	1	NLD11-040_04	Assembly Key
3	1	NL-139	Bush M8
4	2	Resistorx - M8 x 16	Resistorx - Metric
5	1	Resistorx - M8 x 30	Resistorx - Metric



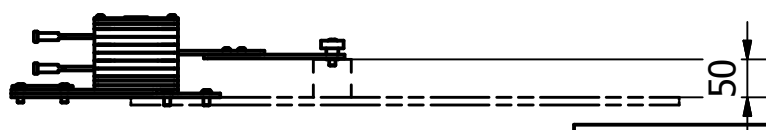
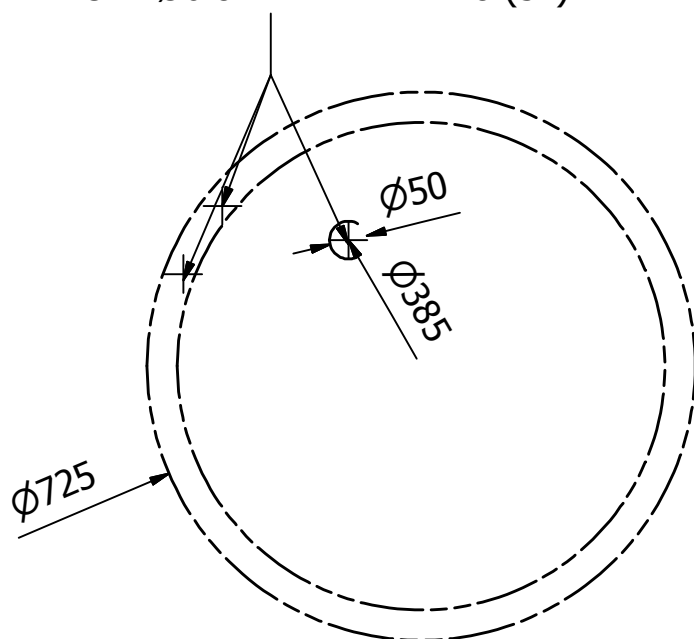
2 Closed Keys



1 Open Key  
Special



DRILL HOLE Ø6.8 AND TAPER M8 (3x)



Drawn: AKE	Date: 28-3-2011	Checked:
Closure Lock Pipeline Engineering 20" 1500#		
Drawing: NLD11-040_00	Projection: 	A4





## Process Interlocking

### Key Exchange (KE)

With a key exchange unit you can release keys only at a time when other keys are inserted

Both the input key as the output key can be one, or more

The key exchange can be designed for releasing any number of keys in any combination.

There is no maximum of number of keys or combinations.

Example of KE with 7 keys and 2 options (6 in, 1 out)

#### Features:

- All KE-components made of stainless steel AISI 316
- Clear tagging to indicate procedure
- Maintenance-free
- Tamperproof
- Invulnerable for sand, dirt, snow, ice, moist, etc.
- Thoroughly tested to withstand the most extreme operating environments

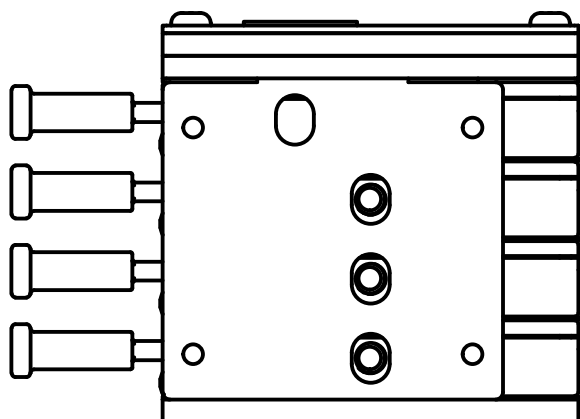
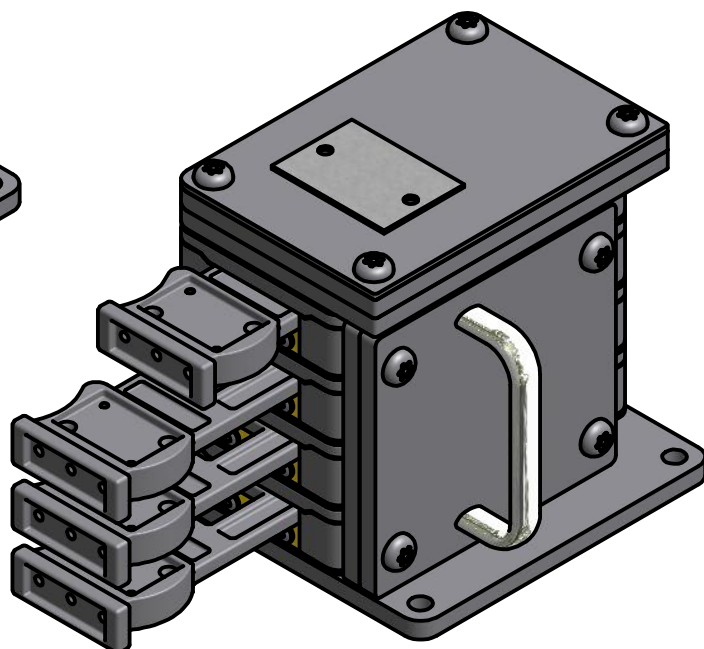
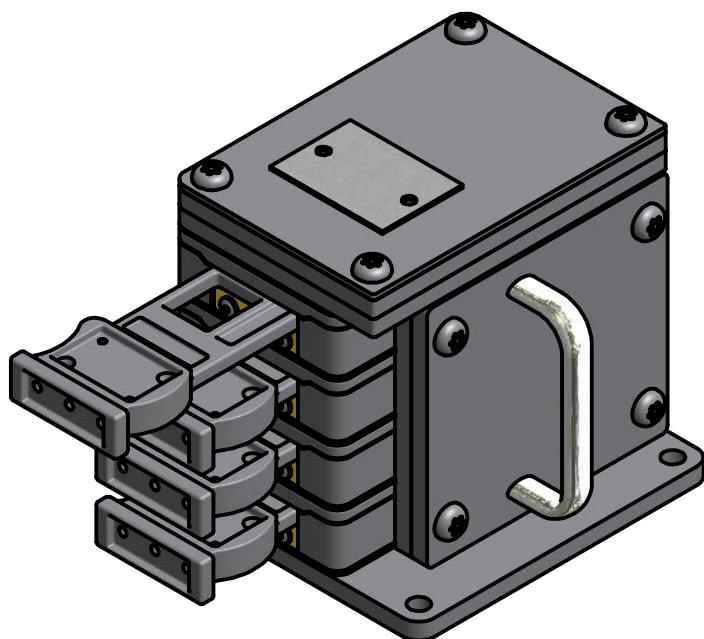
#### Optional:

- Integration of electronics like limit- and proximity switches, solenoids, etc...
- Mounting inside a lockable cabinet (epoxy-coated steel plate or stainless steel)

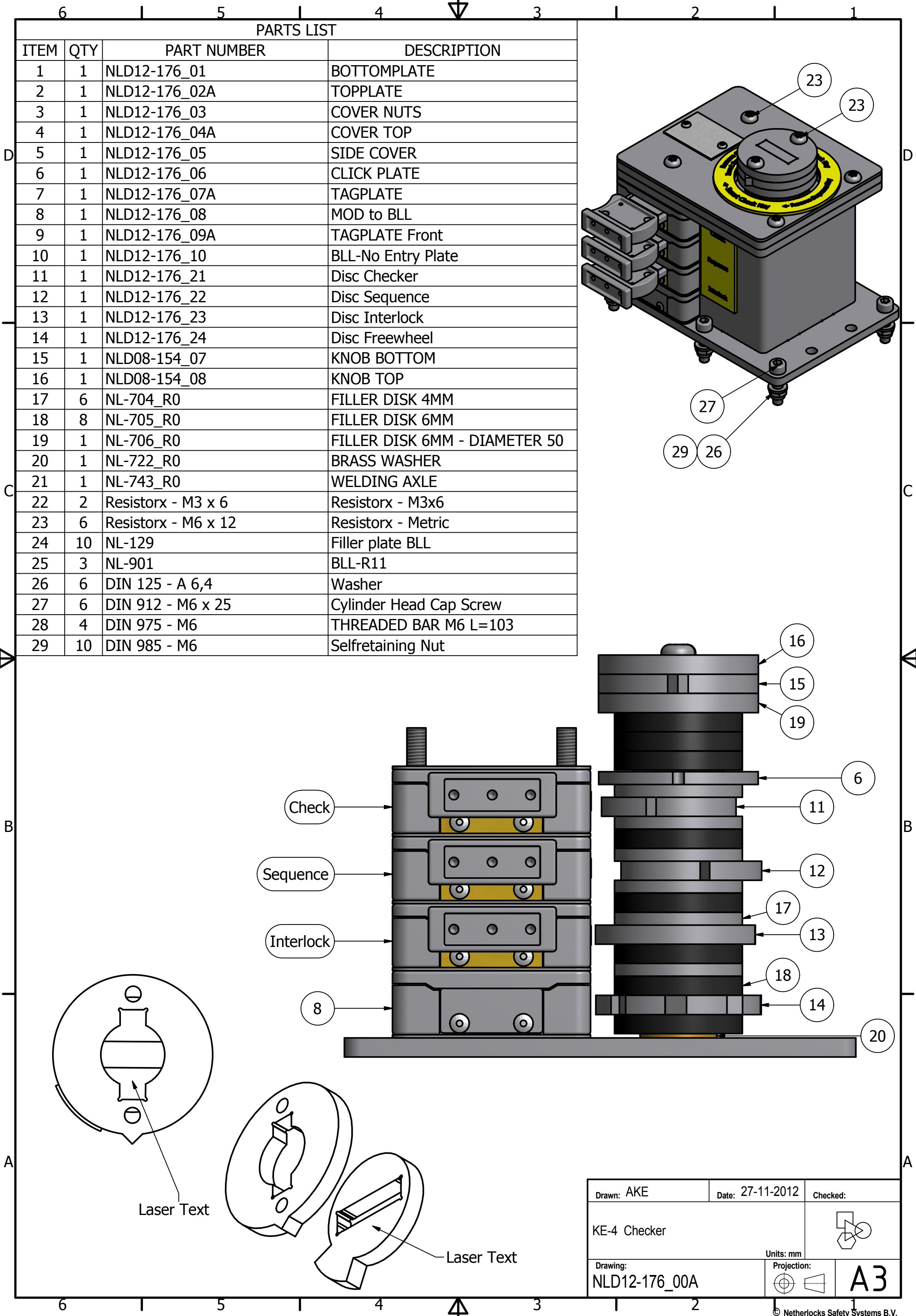


# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-037_06	Selector Plate
2	1	NLD12-037_07	Selector Plate Cover
3	1	NLD11-039_01	Cover
4	1	NLD11-039_02	Plate
5	1	NLD11-039_03	Bottom Plate
6	1	NLD11-039_19	Cover Top
7	10	NL-129	Filler plate BLL
8	1	NL-805	Lamp70
9	4	NL-901	BLL-R11
10	8	Resistorx - M6 x 12	Resistorx - Metric
11	2	DIN 912 - M3 x 10	Cylinder Head Cap Screw
12	4	DIN 975 - M6	Threaded Rod L= 103 mm
13	4	DIN 985 - M6	Selfretaining Nut



Drawn: AKE	Date: 5-3-2012	Checked:
Derived from NLD06-058 KE-4 1+3		
Drawing: NLD12-037_00	Units: mm Projection:	 <b>A4</b>



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-176_01	BOTTOMPLATE
2	1	NLD12-176_02A	TOPPLATE
3	1	NLD12-176_03	COVER NUTS
4	1	NLD12-176_04A	COVER TOP
5	1	NLD12-176_05	SIDE COVER
6	1	NLD12-176_06	CLICK PLATE
7	1	NLD12-176_07A	TAGPLATE
8	1	NLD12-176_08	MOD to BLL
9	1	NLD12-176_09A	TAGPLATE Front
10	1	NLD12-176_10	BLL-No Entry Plate
11	1	NLD12-176_21	Disc Checker
12	1	NLD12-176_22	Disc Sequence
13	1	NLD12-176_23	Disc Interlock
14	1	NLD12-176_24	Disc Freewheel
15	1	NLD08-154_07	KNOB BOTTOM
16	1	NLD08-154_08	KNOB TOP
17	6	NL-704_R0	FILLER DISK 4MM
18	8	NL-705_R0	FILLER DISK 6MM
19	1	NL-706_R0	FILLER DISK 6MM - DIAMETER 50
20	1	NL-722_R0	BRASS WASHER
21	1	NL-743_R0	WELDING AXLE
22	2	Resistorx - M3 x 6	Resistorx - M3x6
23	6	Resistorx - M6 x 12	Resistorx - Metric
24	10	NL-129	Filler plate BLL
25	3	NL-901	BLL-R11
26	6	DIN 125 - A 6,4	Washer
27	6	DIN 912 - M6 x 25	Cylinder Head Cap Screw
28	4	DIN 975 - M6	THREADED BAR M6 L=103
29	10	DIN 985 - M6	Selfretaining Nut

Drawn: AKE	Date: 27-11-2012	Checked:
KE-4 Checker		
Drawing: NLD12-176_00A	Units: mm	Projection:
		A3





## Process Interlocking

# Mechanical Process Control Unit (MPCU)

The MPCU is a mechanically-programmed key exchange system that controls complicated procedures, such as pig launching & receiving, and filter regeneration units.

The MPCU is like a mechanical PLC, fully Stainless Steel 316 and can be installed out in the field.

For some applications or complicated procedures like for example pig- launching & receiving we need to program every step to ensure a 100% safe situation, for example when a step has to be repeated at different stages of the process. With the MPCU the operator cannot make any error, since one step has to be taken before another step can be done, even in a non-linear progression.

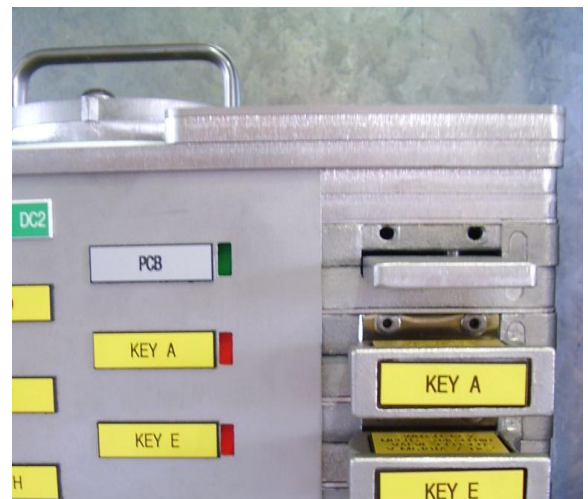
Optional electronic accessories can also be integrated to link parts of the sequence to the DCS.

### Features:

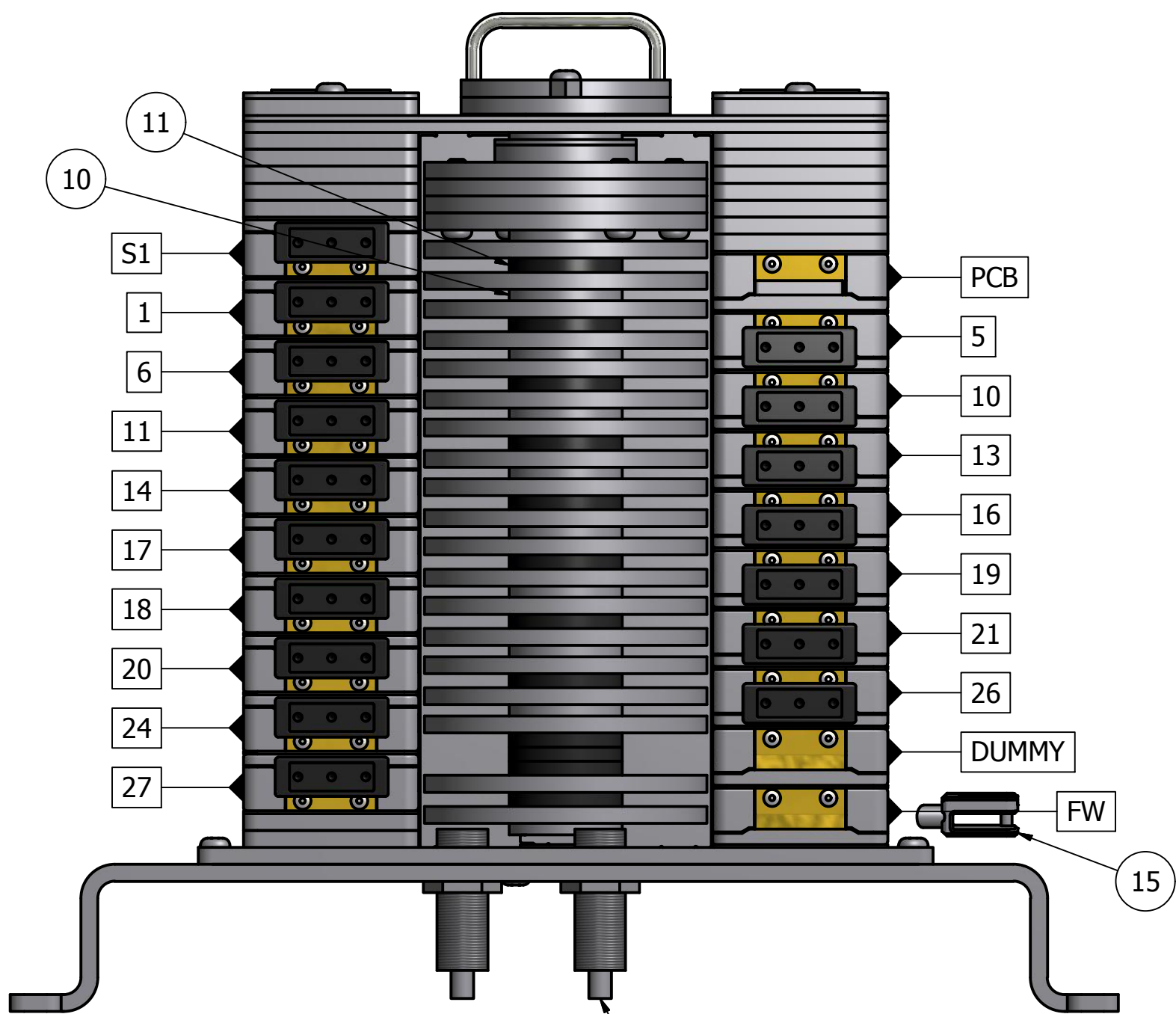
- All MPCU-components made of stainless steel AISI 316
- Visual identification for releasing and returning key positions
- Complete with step by step written procedures
- Maintenance-free
- Tamperproof
- Invulnerable for sand, dirt, snow, ice, moist, etc.
- Thoroughly tested to withstand the most extreme operating environments

### Optional:

- Integration of electronics like limit- and proximity switches, solenoids, etc...
- Mounting inside a lockable cabinet (epoxy-coated steel plate or stainless steel)



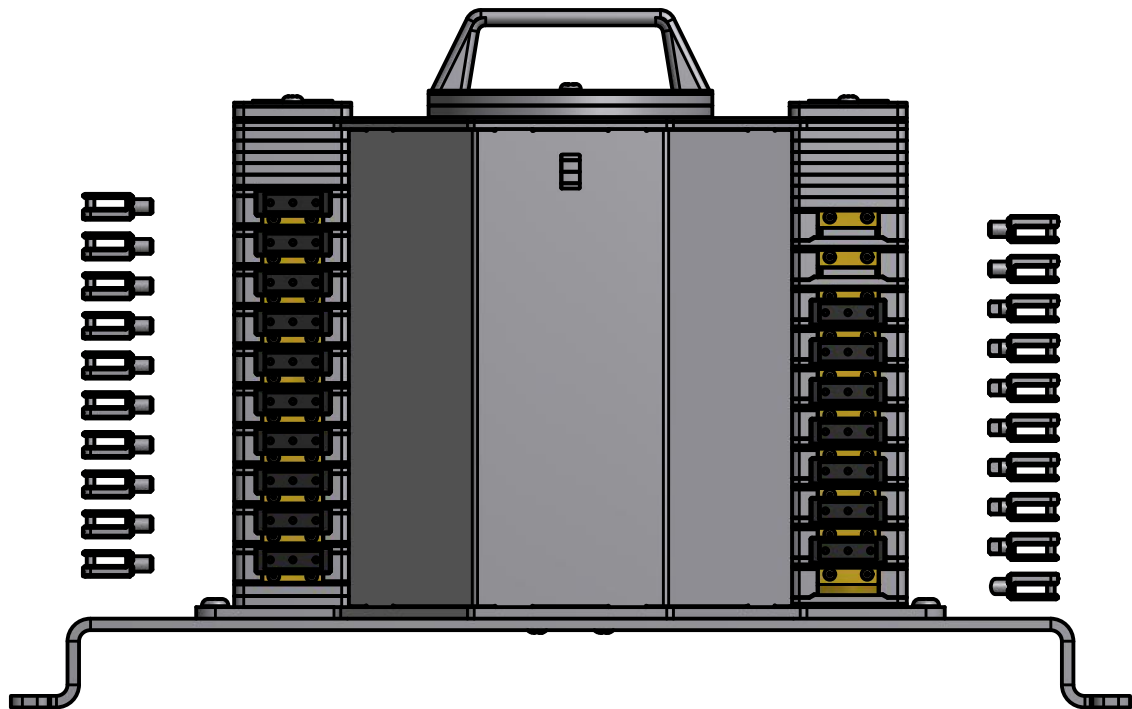




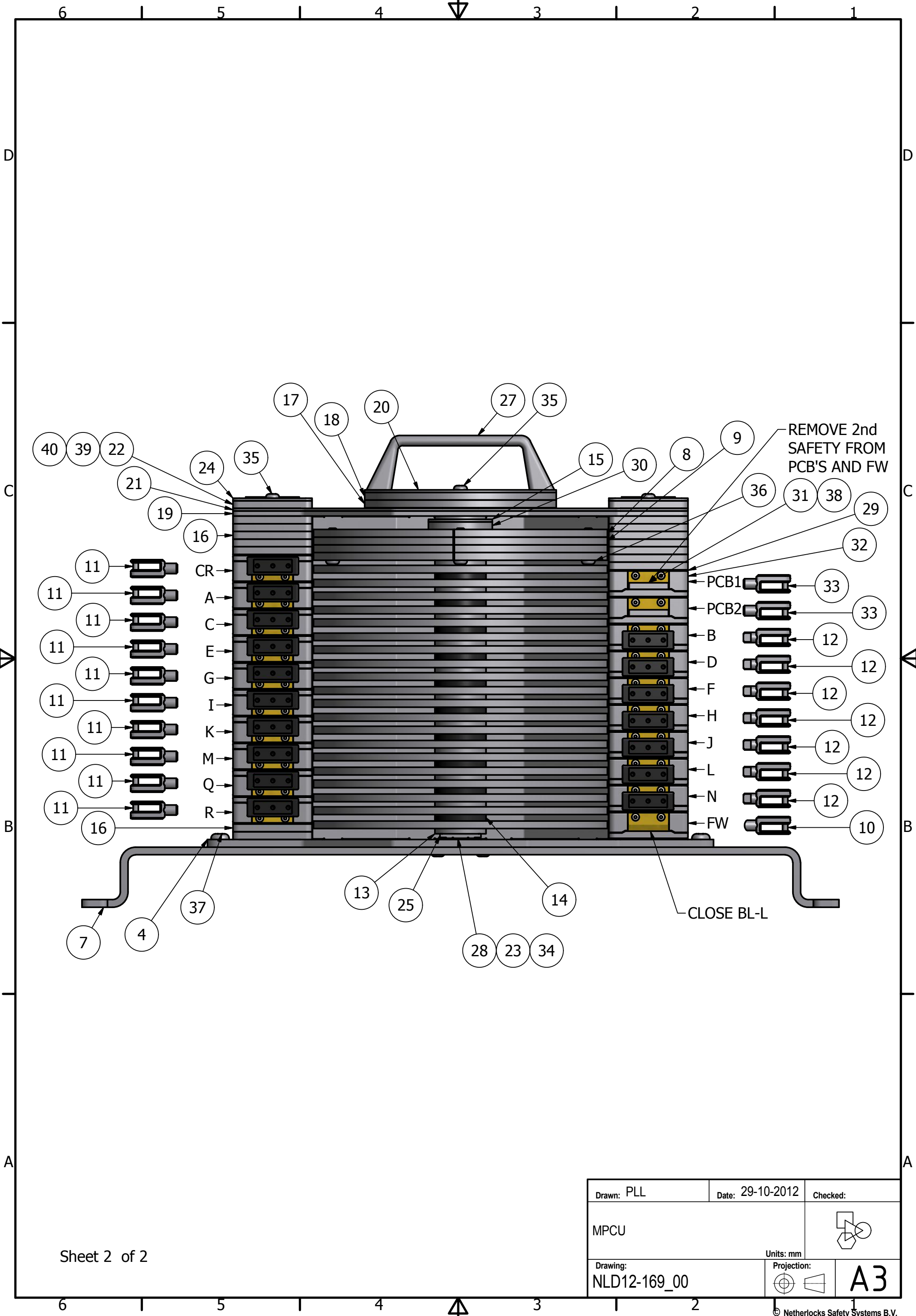
INSTALL SWITCHES AFTER MOUNTING  
THE MPCU IN THE CABINET

Drawn: PLL	Date: 8-1-2012	Checked:
MPCU LAUNCHER		
Drawing: NLD12-001_00	Units: mm Projection:	A3

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-169_01	SELECTOR PLATES
2	1	NLD12-169_02	MPCU SEQUENCE
3	1	NLD12-169_03	TAGPLATES
4	1	NLD12-169_04	BOTTOMPLATE
5	1	NLD12-169_05	COVER FRONT
6	1	NLD12-169_06	COVER BACK
7	1	NLD12-169_07	MOUNTINGPLATE MPCU-CKC
8	1	NLD12-169_08	INDICATOR1
9	3	NLD12-169_09	INDICATOR2
10	1	NLD10-078_04	MOD. TO NL-905 - BLL-R11 Lock Bolt
11	10	NLD10-080_05	MOD. TO NL-905 (LEFT)
12	7	NLD10-080_06	MOD. TO NL-905 (RIGHT)
13	13	NLD11-075_09	FILLER-4MM
14	10	NLD11-075_10	FILLER-5MM
15	1	NLD11-075_11	FILLER DISK 2MM - DIAMETER 50
16	14	NLD11-075_12	FILLPLATE BOLTLOCK
17	1	NLD11-075_15	KNOB BOTTOM
18	1	NLD11-075_16	KNOB TOP
19	1	NLD11-075_18	TOPPLATE
20	1	NLD11-075_19	KNOB TOP COVER
21	1	NLD11-075_20	TOPPLATE COVER
22	2	NLD11-075_21	COVER NUTS
23	1	NLD11-131_06	BEARING COVER
24	2	NLD11-131_12	COVER NUTS TOP
25	1	NLD12-001_07	AXLE WELDING
26	1	NSYS3D6630T	CABINET 600x600x300 GLAZED DOOR
27	1	GN728-5-120-A	HANDLE
28	1	SKF-61804-2RS1	BEARING
29	44	NL-129	Filler plate BLL
30	1	NL-706_R0	FILLER DISK 6MM - DIAMETER 50
31	2	NL-806_R1	PCB KNOB
32	20	NL-901	BLL-R11
33	2	NL-905 - BLL-R11 Lock Bolt	Locking Bolt
34	4	Resistorx - M6 x 10	Resistorx - Metric
35	8	Resistorx - M6 x 12	Resistorx - Metric
36	4	Resistorx - M6 x 25	Resistorx - Metric
37	4	Resistorx - M8 x 12	Resistorx - Metric
38	2	DIN 912 - M3 x 6	Cylinder Head Cap Screw
39	8	DIN 934 - M6	Hex Nut
40	8	DIN 975 - M6	L=271



Drawn: PLL	Date: 29-10-2012	Checked:
MPCU		
Drawing: NLD12-169_00	Units: mm Projection:	A3



Drawn: PLL	Date: 29-10-2012	Checked:
MPCU		
Drawing: NLD12-169_00	Units: mm	Projection:
		A3





## Process Interlocking

# Actuator Locking System (ALS)

## Electrical actuator

NETHERLOCKS offers the ALS, an actuator locking device to suit all sizes and types of actuators – linear and rotating, electric and Pneumatic / hydraulic.

To lock an actuator the philosophy is always the same: lock the power supply and guarantee the position. In case of an actuator you need to control the power source.

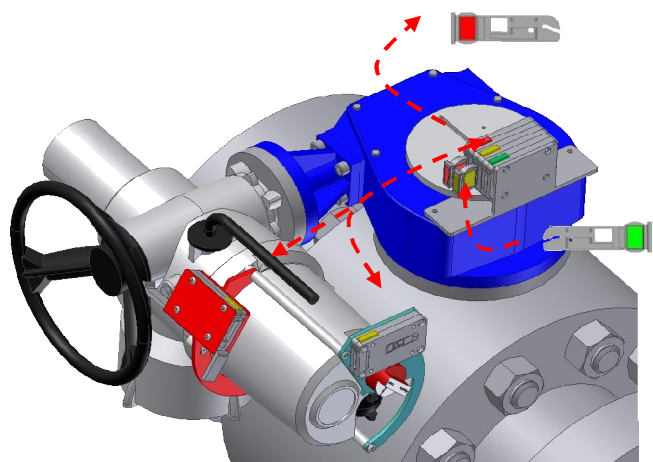
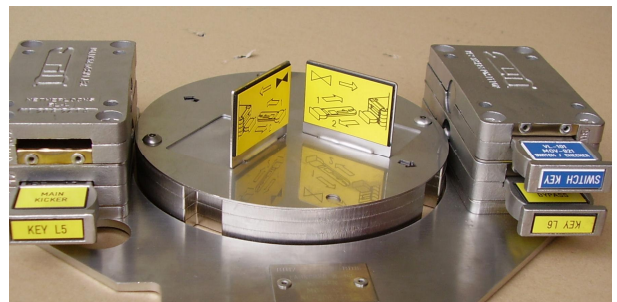
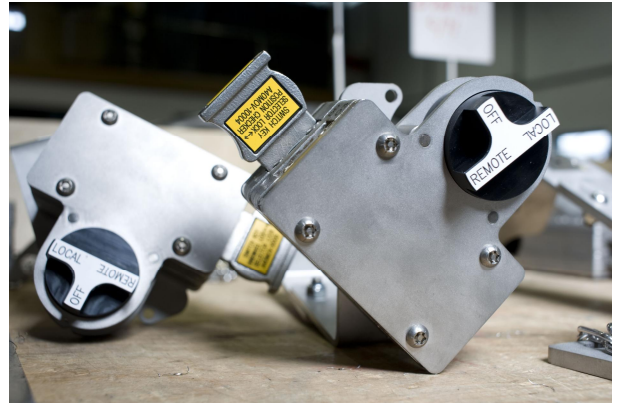
This could be air, oil or electric power.

A combination of NETHERLOCKS products can be used to create a locking procedure to lock a MOV e.g. a switch lock, a manual override lock, an air supply lock and a position checker.

The below sample shows you how to switch-over an electrical actuator from open to close.

Sequence:

1. Valve is open, power is OFF, open key is released
2. Insert open key (green) into A.P.C.
3. Releasing a switch key (yellow)
4. Insert switch key into Switch Lock to unlock the power
5. Activate the power, the switch key is no trapped
6. Operate actuator to CLOSE,
7. Deactivate power, the switch key is no released
8. Insert switch key into A.P.C.
9. Release close key (red), only possible in case the actuator is FULLY close and switch key is present.

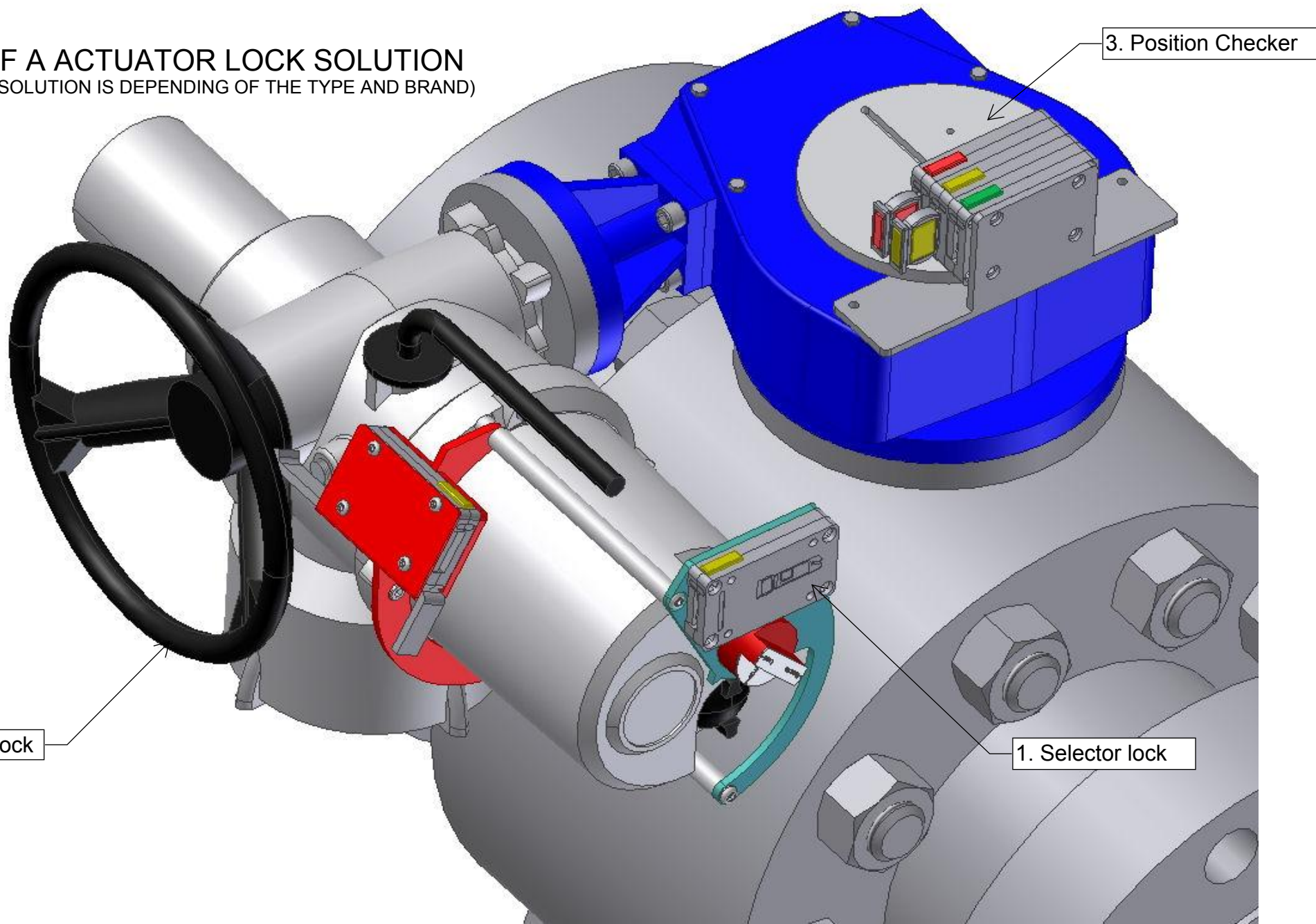


The ALS lock consist of three parts:

1. Selector lock (This device is to operate the actuator electric to his open or closed;
2. Handwheel lock (Mount the handwheel lock on the handwheel with the delivered brackets);
3. Position Checker (Mount the round shaped plates on top of the position indicator of the gearbox/actuator).

## EXAMPLE OF A ACTUATOR LOCK SOLUTION

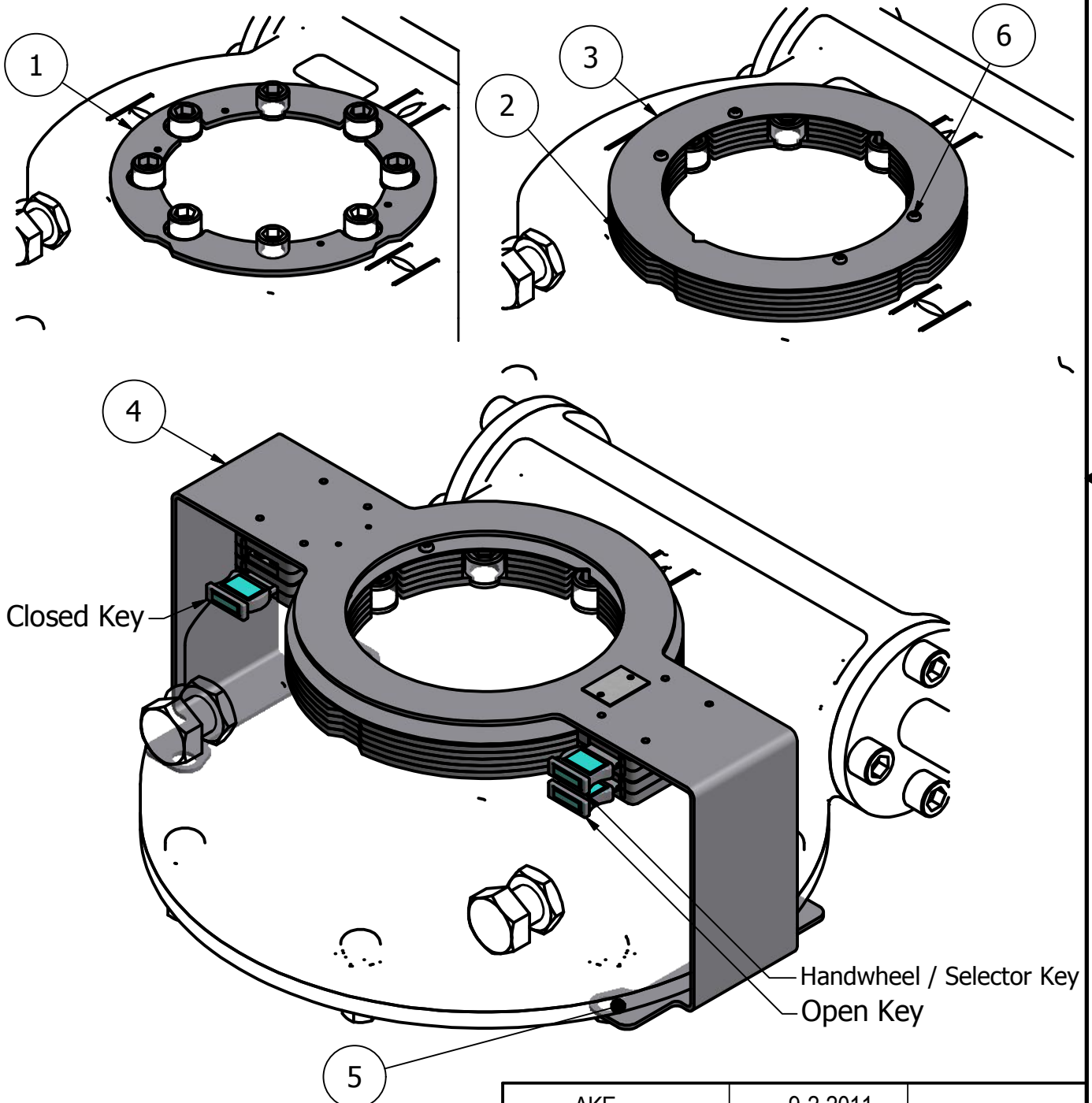
(DESIGN OF LOCK SOLUTION IS DEPENDING OF THE TYPE AND BRAND)





## PARTS LIST

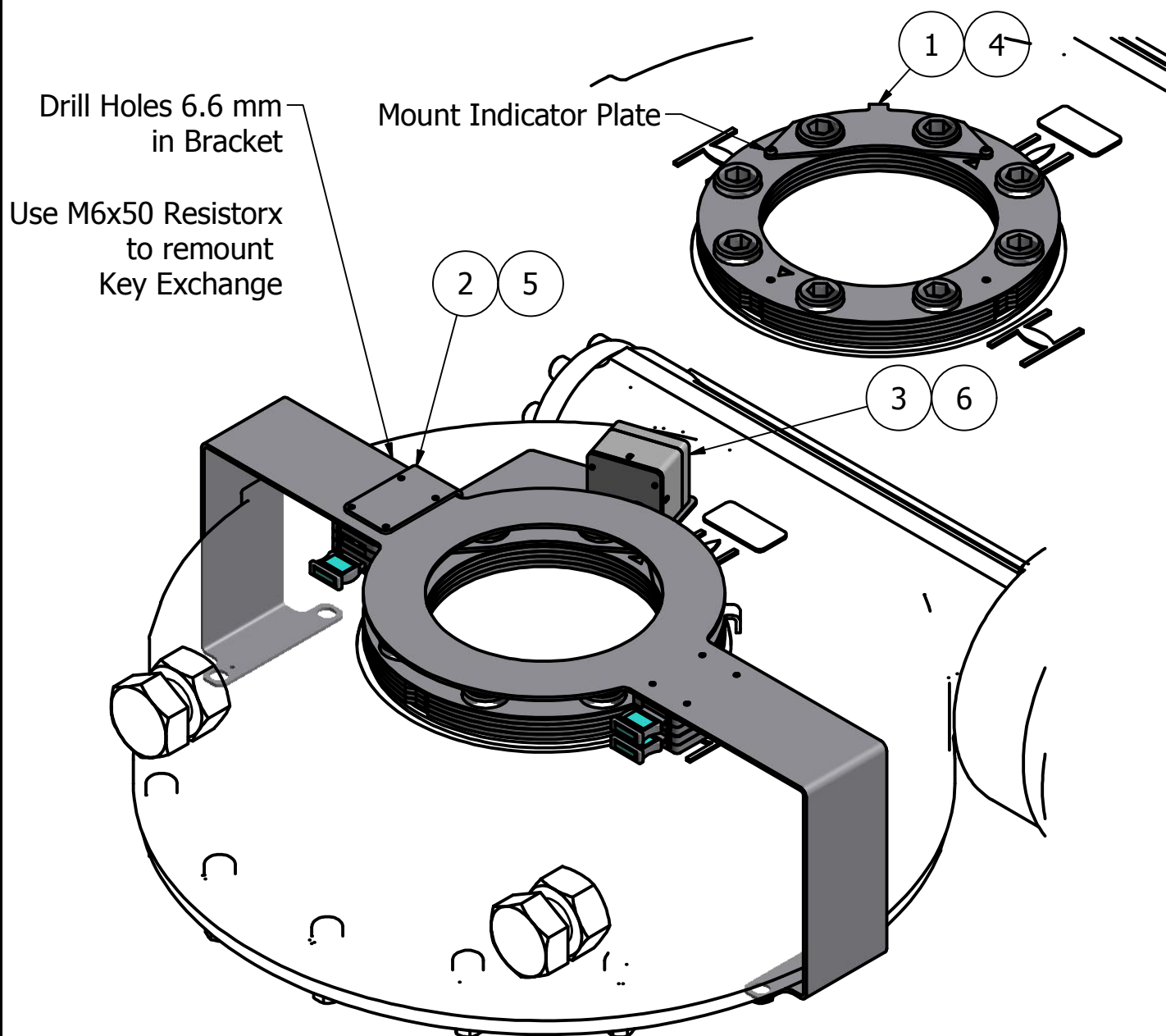
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD10-120_01A	Indicator Bottom
2	4	NLD10-120_02A	Indicator Center
3	1	NLD10-120_03A	Indicator Top
4	1	NLD10-120_10	Assembly Bracket
5	1	Resistorx - M6 x 10	Resistorx - Metric
6	4	Resistorx - M6 x 30	Resistorx - Metric



Drawn: AKE	Date: 9-2-2011	Checked:
CHECKER IW8 CO		
Drawing: NLD10-120_00A	Units: mm	Projection:
		<b>A4</b>

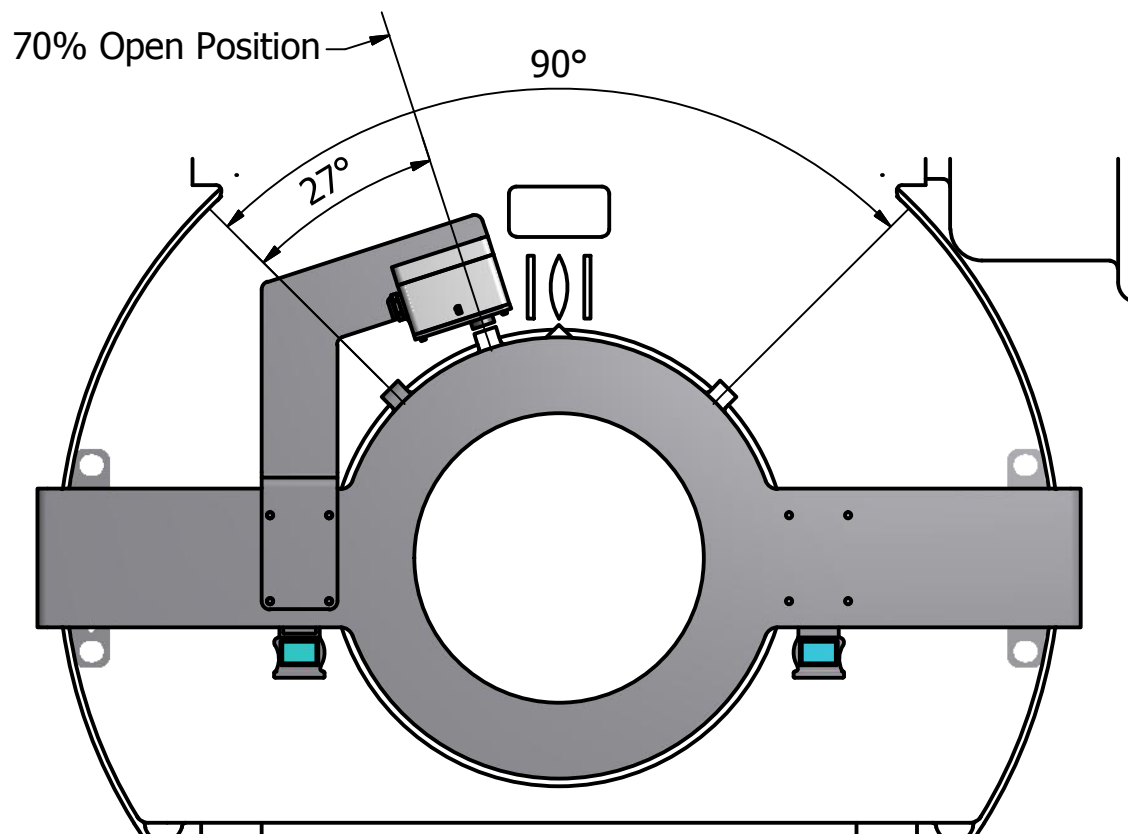
# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD10-119_05	Indicator Plate
2	1	NLD10-119_06	Bracket
3	1	NLD10-119_07	MOD to ROSE 80x80x60
4	2	Resistorx - M6 x 30	Resistorx - Metric
5	4	Resistorx - M6 x 50	Resistorx - Metric
6	1	PF-M18-NJ5-18GKn39	
7	1	Gland-M16x1.5	M16 Gland
8	1	KE Ball, NL-129	Spare Parts Key Exchange



Drawn: AKE	Date: 19-1-2012	Checked:
MOD to CHECKER IW11 CO		
Units: mm	Projection:	A4
Drawing: NLD10-119_00A		

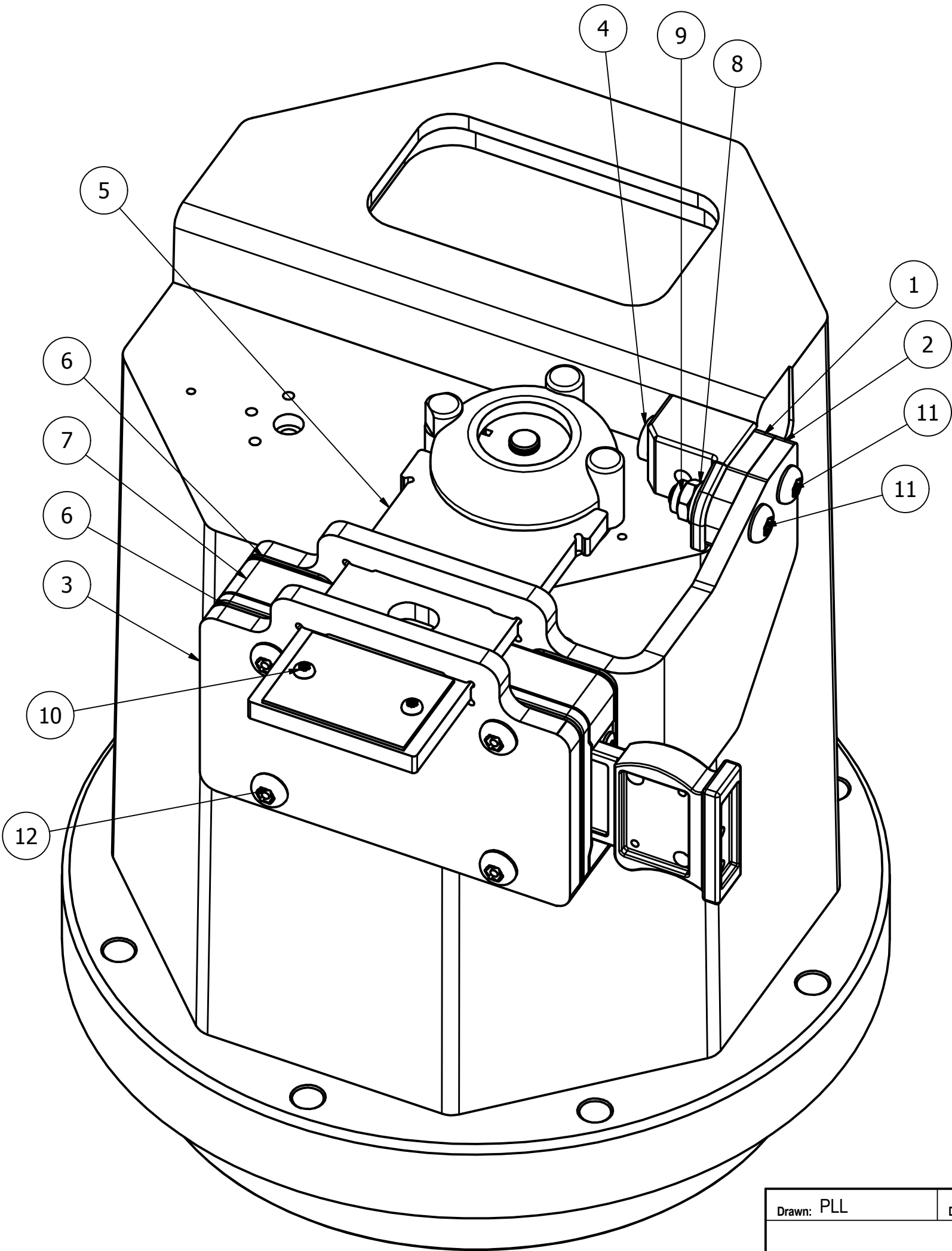



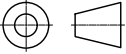


Drawn: AKE	Date: 19-1-2012	Checked:
MOD to CHECKER IW11 CO		
Drawing: NLD10-119_00A	Units: mm	Projection:
		<b>A4</b>



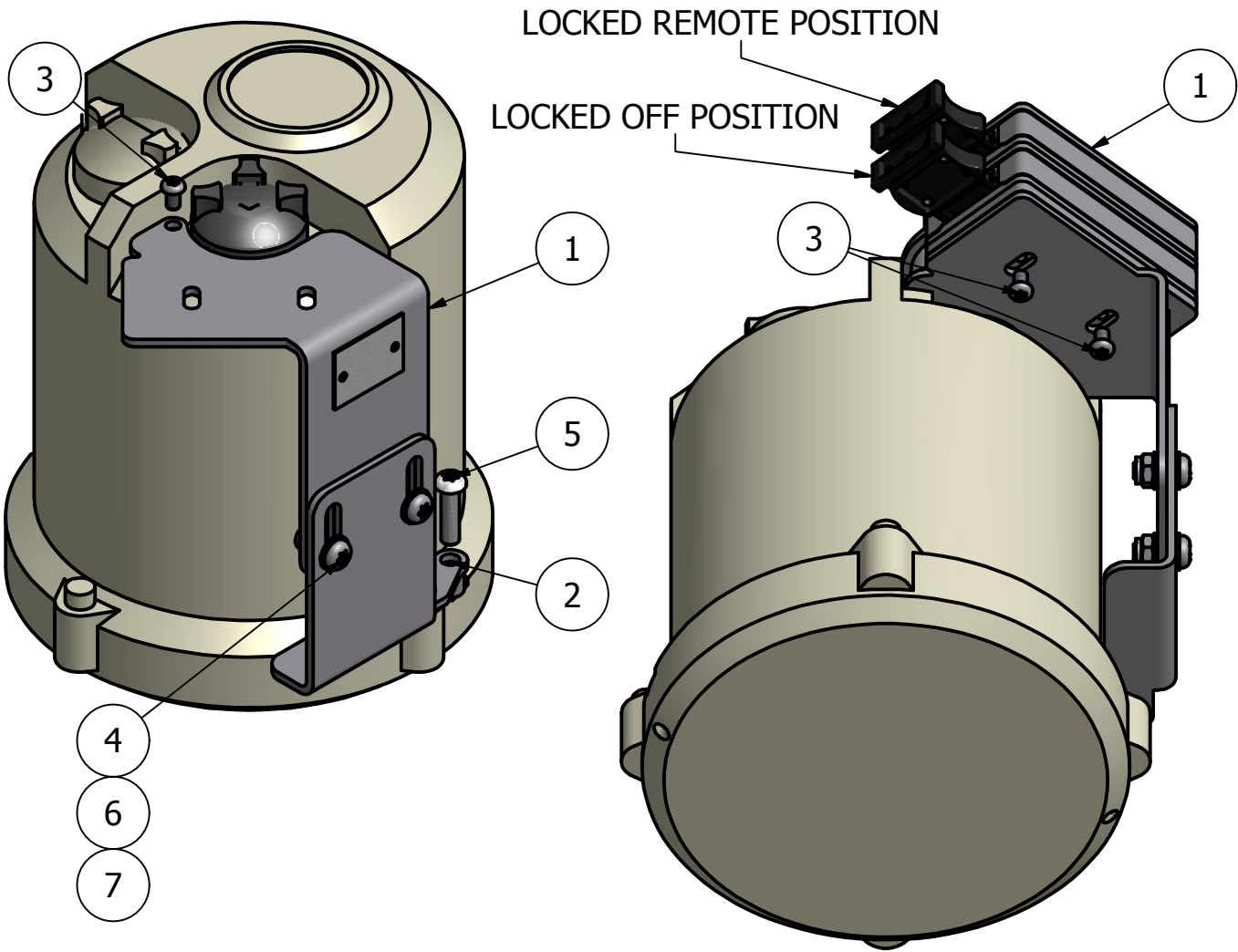
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD13-154_01	FILLER
2	1	NLD13-154_02	BRACKET1
3	1	NLD13-154_03	BRACKET2
4	1	NLD13-154_04	BUSH
5	1	NLD13-154_05	LOCKPLATE
6	4	NL-129	Filler plate BLL
7	1	NL-920	BL-L/R12
8	1	DIN 125 - A 6,4	Washer
9	1	DIN 985 - M6	Selfretaining Nut
10	2	Resistorx - M3 x 6	Resistorx - M3x6
11	2	Resistorx - M6 x 25	Resistorx - Metric
12	4	Resistorx - M6 x 40	Resistorx - Metric

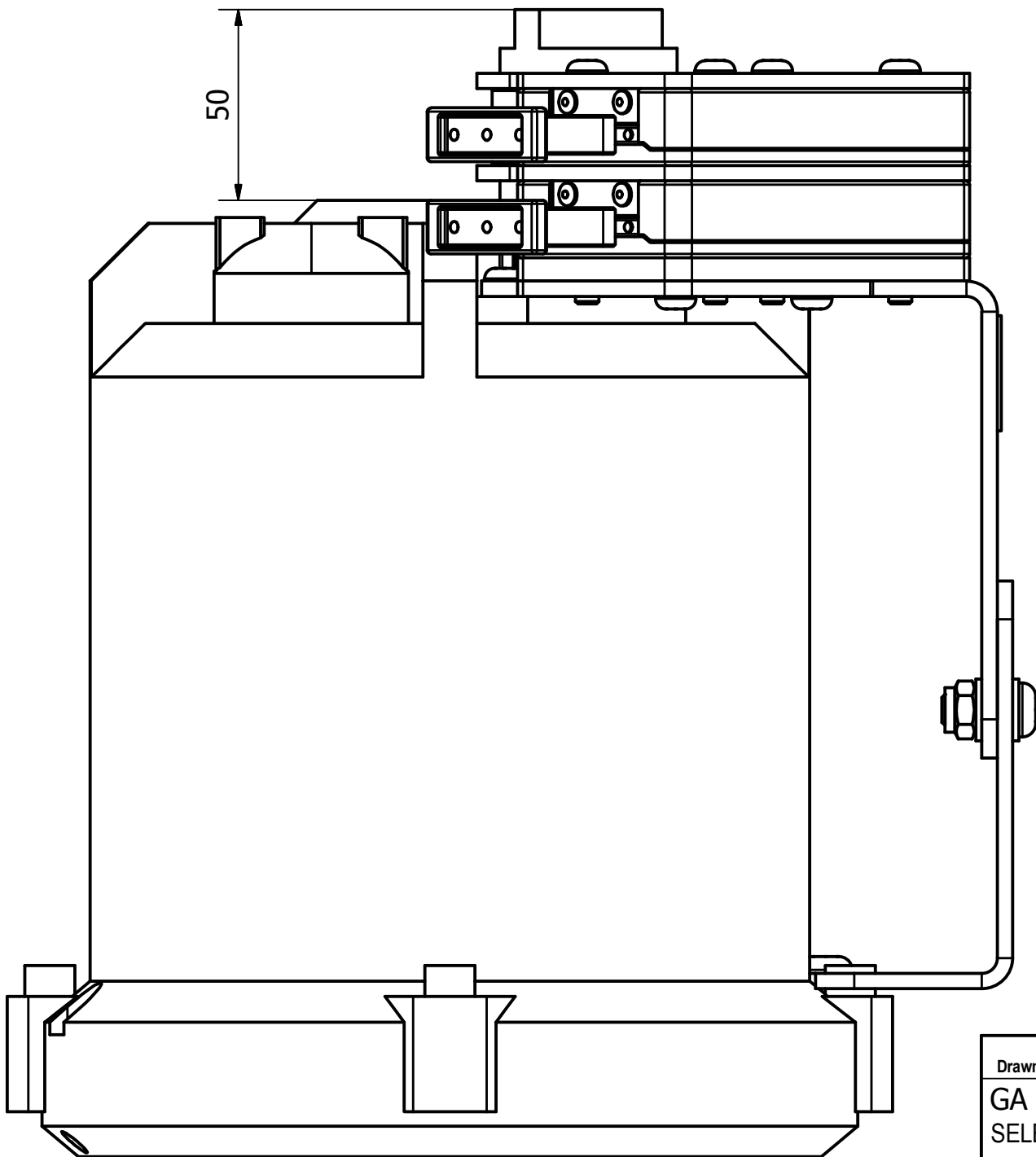
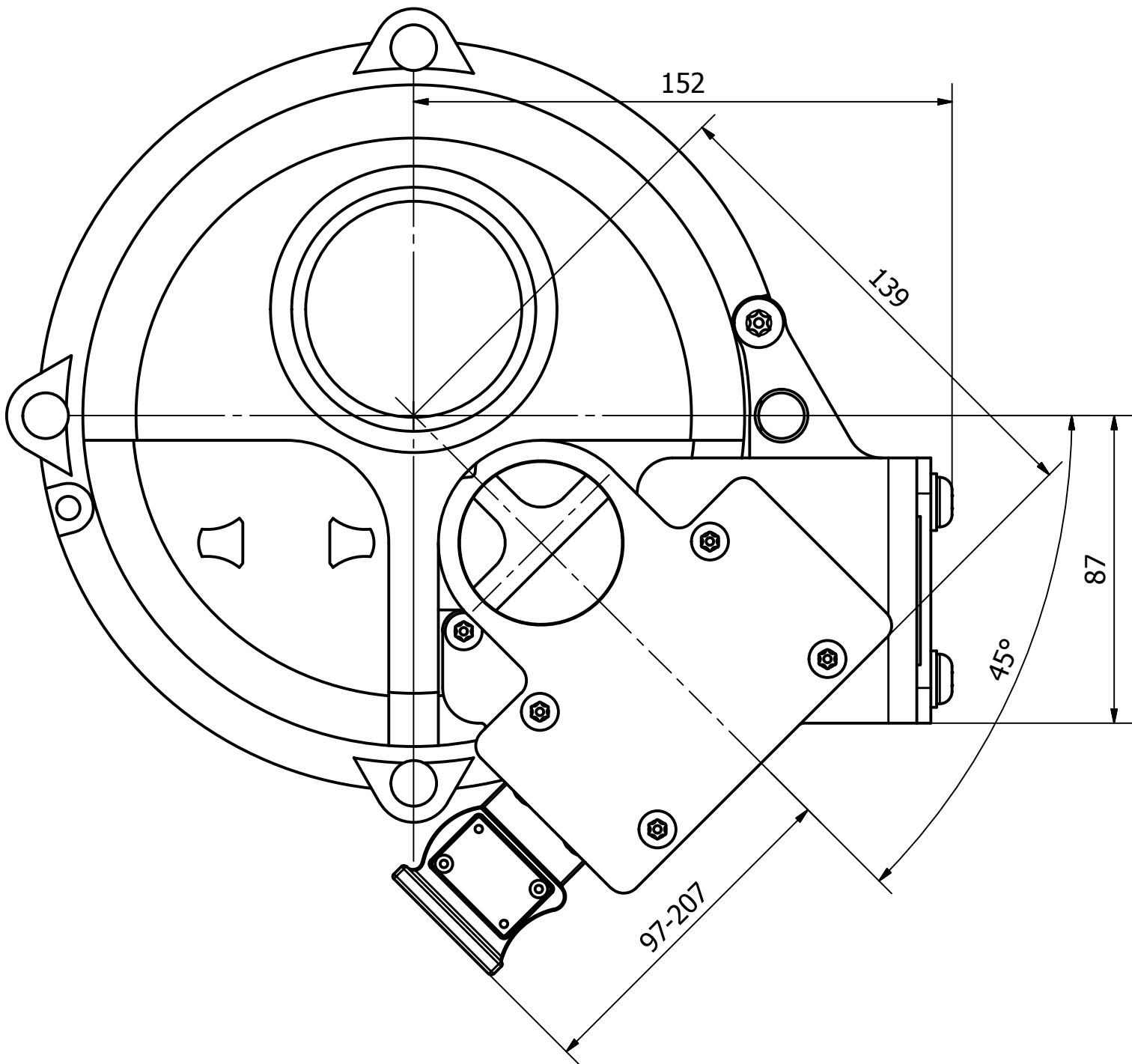


Drawn: PLL	Date: 30-9-2013	Checked:
SELECTORLOCK VALVITALIA ELA		
Drawing: NLD13-154_00	Units: mm	Projection: 
		A3



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD09-183_00B	SELECTORLOCK ROTORK IQ
2	1	NLD09-183_05	FILLER BUSH
3	3	Resistorx - M6 x 10	Resistorx - Metric
4	2	Resistorx - M8 x 20	Resistorx - Metric
5	1	Resistorx - M8 x 30	Resistorx - Metric
6	4	DIN 125 - A 8,4	Washer
7	2	DIN 985 - M8	Selfretaining Nut

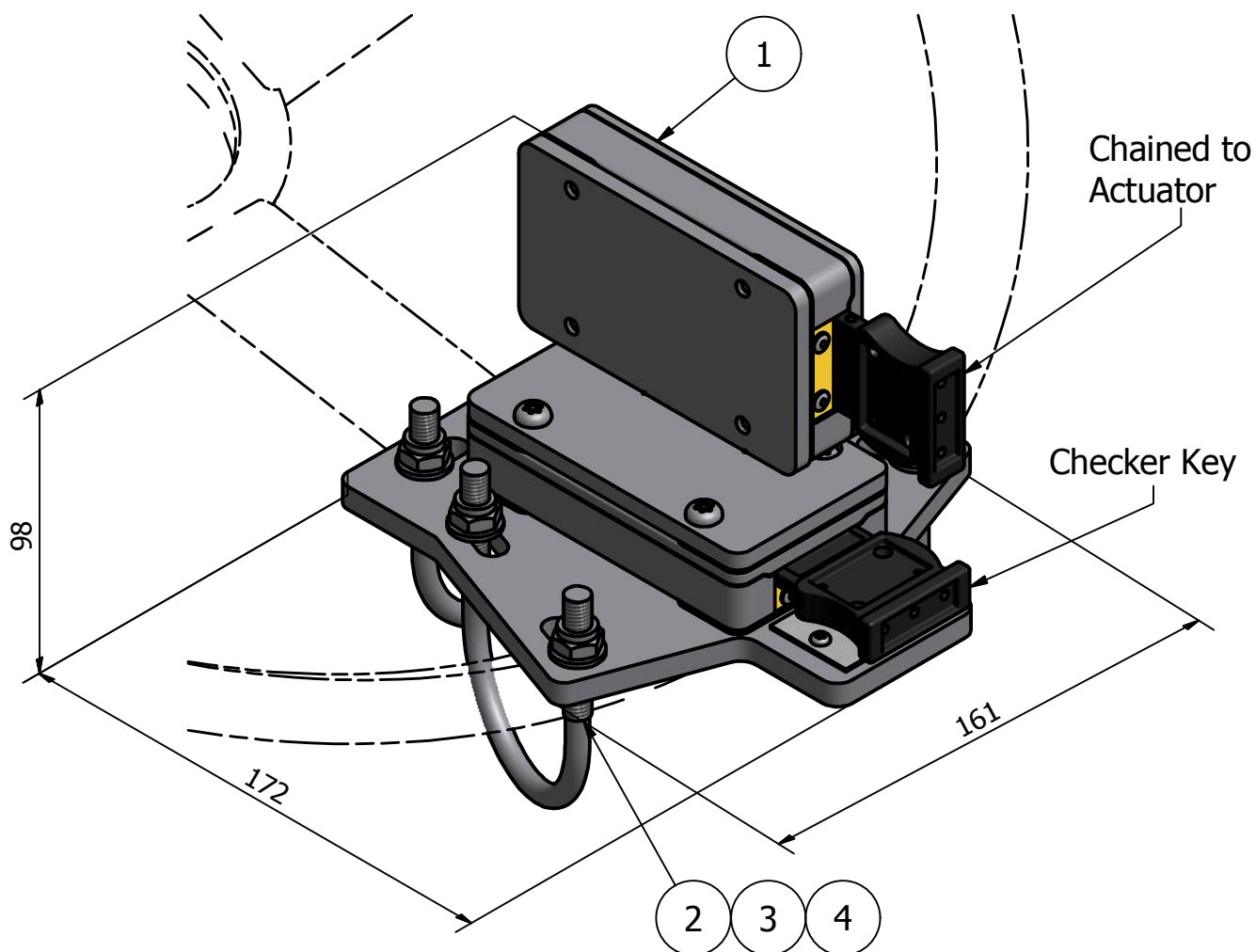




Drawn: PLL	Date: 9-7-2010	Checked:
GA DRAWING SELECTORLOCK ROTORK IQ		
Drawing: NLD09-183_00A	Projection: 	A3

# PARTS LIST

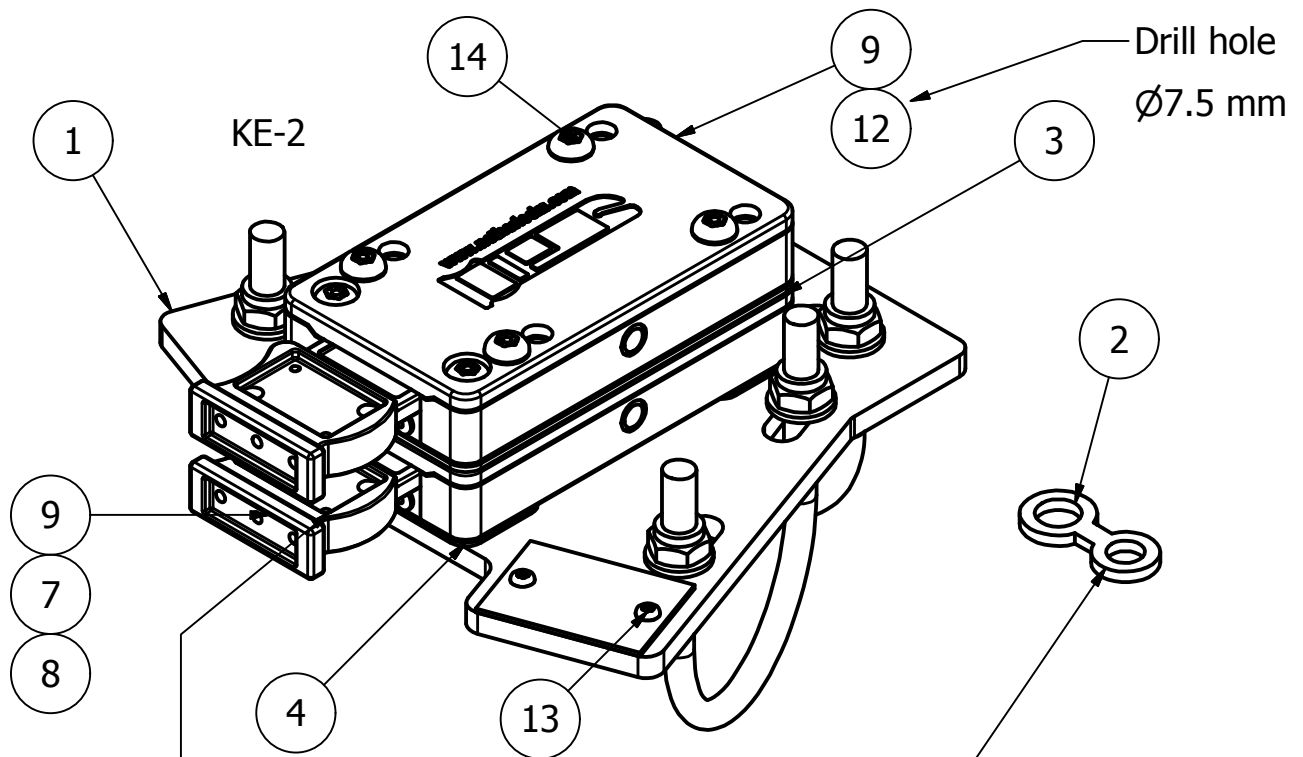
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD10-135_00	HANDWHEEL LOCK ACTUATOR
2	3	NL-174 - U-BOLTS-2911-57MM	U-BOLTS - 2911 - 57mm
3	6	DIN 125 - A 8,4	Washer
4	6	DIN 985 - M8	Selfretaining Nut



Drawn: AKE	Date: 1-2-2011	Checked:
HANDWHEEL LOCK ACTUATOR		
Units: mm		
Drawing: NLD10-135_00-GA	Projection:	A4

# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD14-004_01	Bracket
2	1	NLD14-004_04	Cable Connection
3	1	NLD12-176_30	BLL-KE-Ball-Filler
4	2	NL-129	Filler plate BLL
5	3	NL-171	U-BOLTS - 2911 - 34 mm
6	3	NL-174	U-BOLTS - 2911 - 57mm
7	1	NL-523	Cable AISI316 - Constr. 7x7 Diam 2mm x 1 m
8	2	NL-524	Nicopress Clamp 1.5 - 2mm
9	2	NL-920 - BLL-R12_SUB	Boltlocks
10	6	125-M8-A2	Plain Washer M8
11	6	985-M8-A2	Selfretaining Nut M8
12	1	5401-7-A4	Hardened Steanless Steel Ball
13	2	7380-M3x6-A2	Tamperproof Bolt - M3x6
14	4	7380-M6x50-A2	Tamperproof Bolt - M6x50



Attach cable (NL-524)  
on key with clamp (NL-523)

Sheet 1 of 3

Drawn: NST

Date: 1/8/2014

Checked:

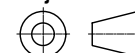
Universal ALS Handwheel Lock

Units: mm

Drawing:

NLD14-004\_00

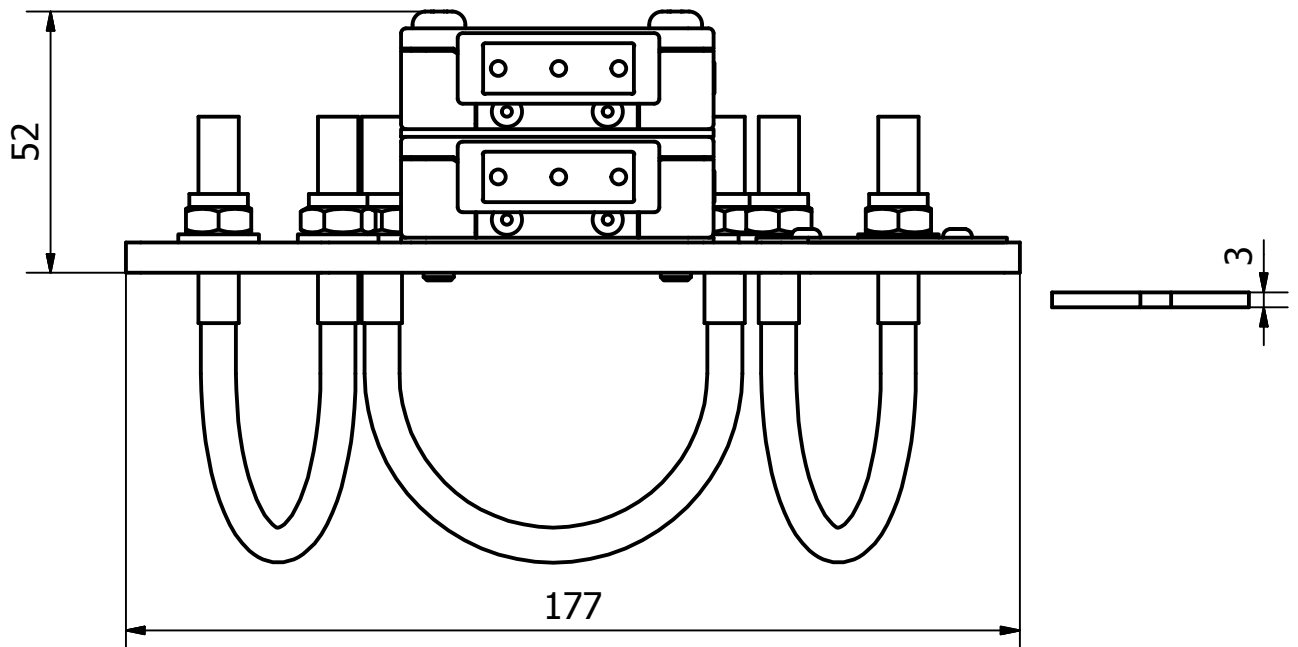
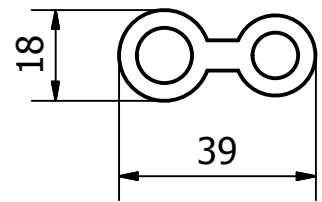
Projection:



A4



181-281 (KeyOut)



Sheet 2 of 3

Drawn: NST

Date: 1/8/2014

Checked:

Universal ALS Handwheel Lock

Units: mm

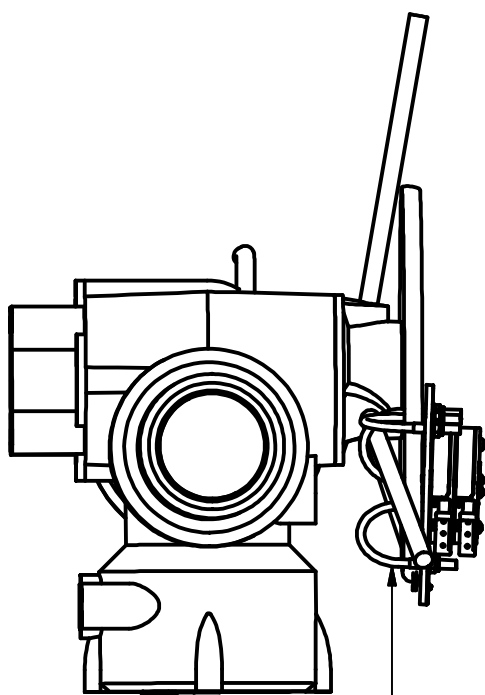
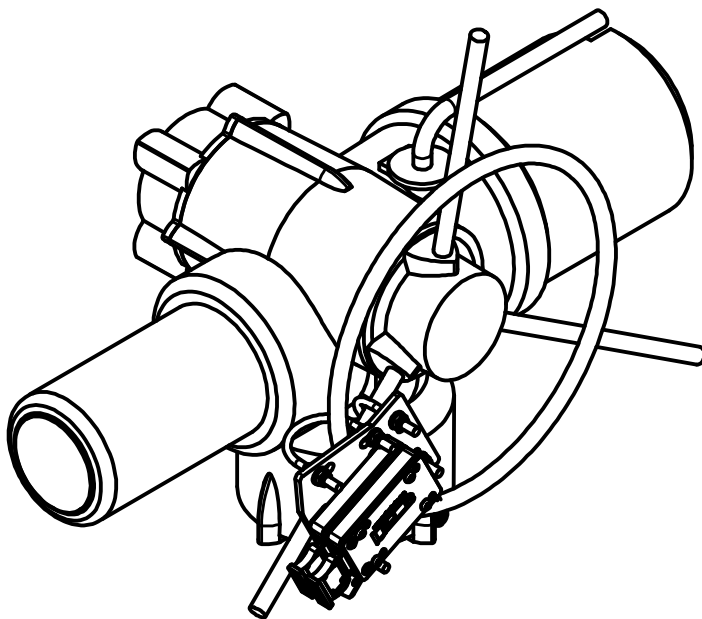
Drawing:

NLD14-004\_00

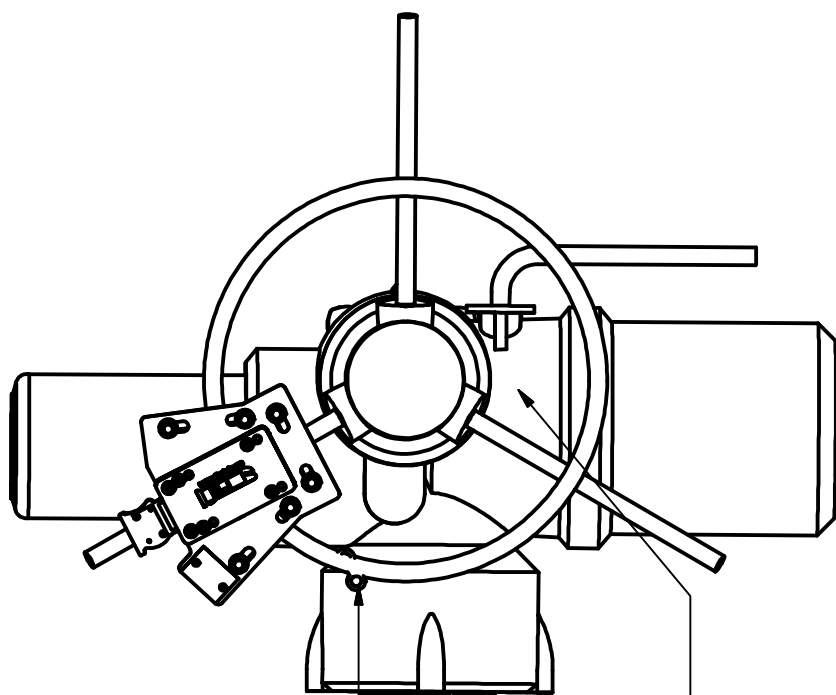
Projection:



A4



Attach lock on handwheel  
with U-Bolt and selfretaining nut



Attach cable on  
cable connection with clamp

Attach cable connection  
on the actuator

Sheet 3 of 3

Drawn: NST	Date: 1/8/2014	Checked:
Universal ALS Handwheel Lock		
Units: mm		
Drawing: NLD14-004_00	Projection: 	<b>A4</b>



## Process Interlocking

# Actuator Locking System (ALS)

## Pneumatic actuator

NETHERLOCKS offers the ALS, an actuator locking device to suit all sizes and types of actuators – linear and rotating, electric and Pneumatic / hydraulic.

To lock an actuator the philosophy is always the same: lock the power supply and guarantee the position. In case of an actuator you need to control the power source.

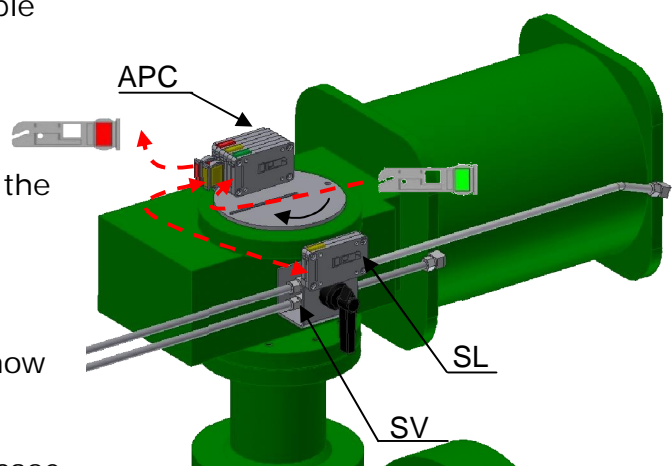
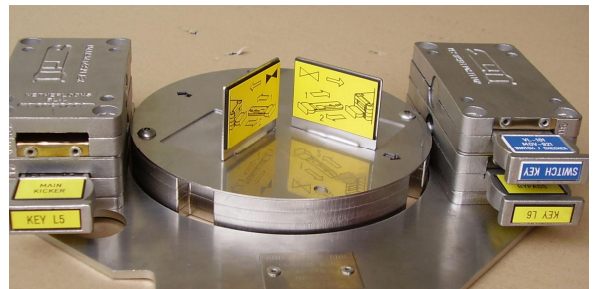
This could be air, oil or electric power.

A combination of NETHERLOCKS products can be used to create a locking procedure to lock a MOV e.g. a switch lock, a manual override lock, an air supply lock and a position checker.

The below sample shows you how to switch-over a pneumatic actuator from open to close.

### Sequence:

1. Valve is open, Air / gas supply is closed, open key (green) is Available, only possible in case the actuator is FULLY open and switch key is present.
2. Insert open key (green) into A.P.C.
3. Releasing a switch key (yellow)
4. Insert switch key into Valve lock to open the air/gas supply
5. OPEN air/gas valve, the switch key is no trapped
6. Operate actuator to CLOSE,
7. CLOSE the Valve lock, the switch key is now released
8. Insert switch key into A.P.C.
9. Release close key (red), only possible in case the actuator is FULLY close and switch key is present.





## Process Interlocking

### Compact Key Cabinet (CKC)

To store the starting keys in the control room, NETHERLOCKS offers a lockable key cabinet (type CKC).

Each position is hard-coded meaning the CKC codes are identical to the corresponding key codes, so there is no possibility that an operator inserts a key in the wrong position.

Due to the horizontal insertion of the keys the CKC is compact, the tag plate on the key is always clearly visible when the key is inserted in the cabinet, and the tag plate on the CKC is only visible once the key is removed.

Together with the non-combustible transparent door, this offers an immediate visual indication of the status of the valves and/or systems.

The compact key cabinet is available in different sizes and can hold up to 500 keys. Optionally the cabinet can contain switches to give feedback to the control room or solenoids to release keys only when authorized by the control room.

#### Technical Specifications:

- Made of epoxy-coated steel plate
- Non-combustible door with maximum transparent area
- Unique coded key slots
- Lockable door
- Colored key tags

#### Optionally available:

- Stainless steel AISI 304 or 316
- Electronic switches or solenoids integrated
- Sequence diagrams added





## Process Interlocking

# Compact Key Cabinet (CKC)

Standard sizes:

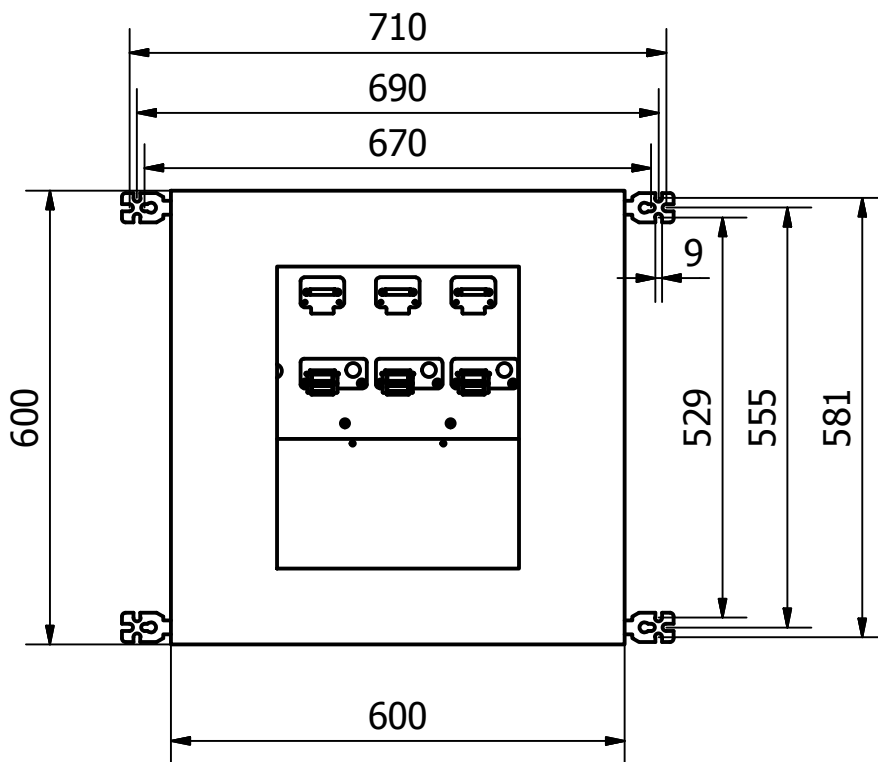
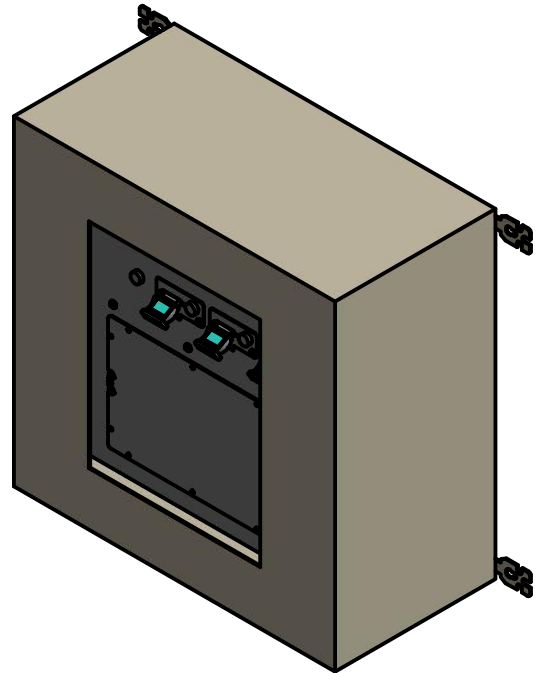
CKC	Size plate (mm)	Size Cabinet (mm)
12	250x250	300x300x200
20	350x250	400x300x200
24	350x350	400x400x200
30	350x350	400x400x200
40	450x350	500x400x200
50	550x350	600x400x200
70	550x550	600x600x200
80	550x550	600x600x200
112	750x550	800x600x200
140	750x750	800x800x300
216	950x750	1000x800x250
252	950x950	1000x1000x300
Others	Please contact NETHERLOCKS for custom made cabinets	







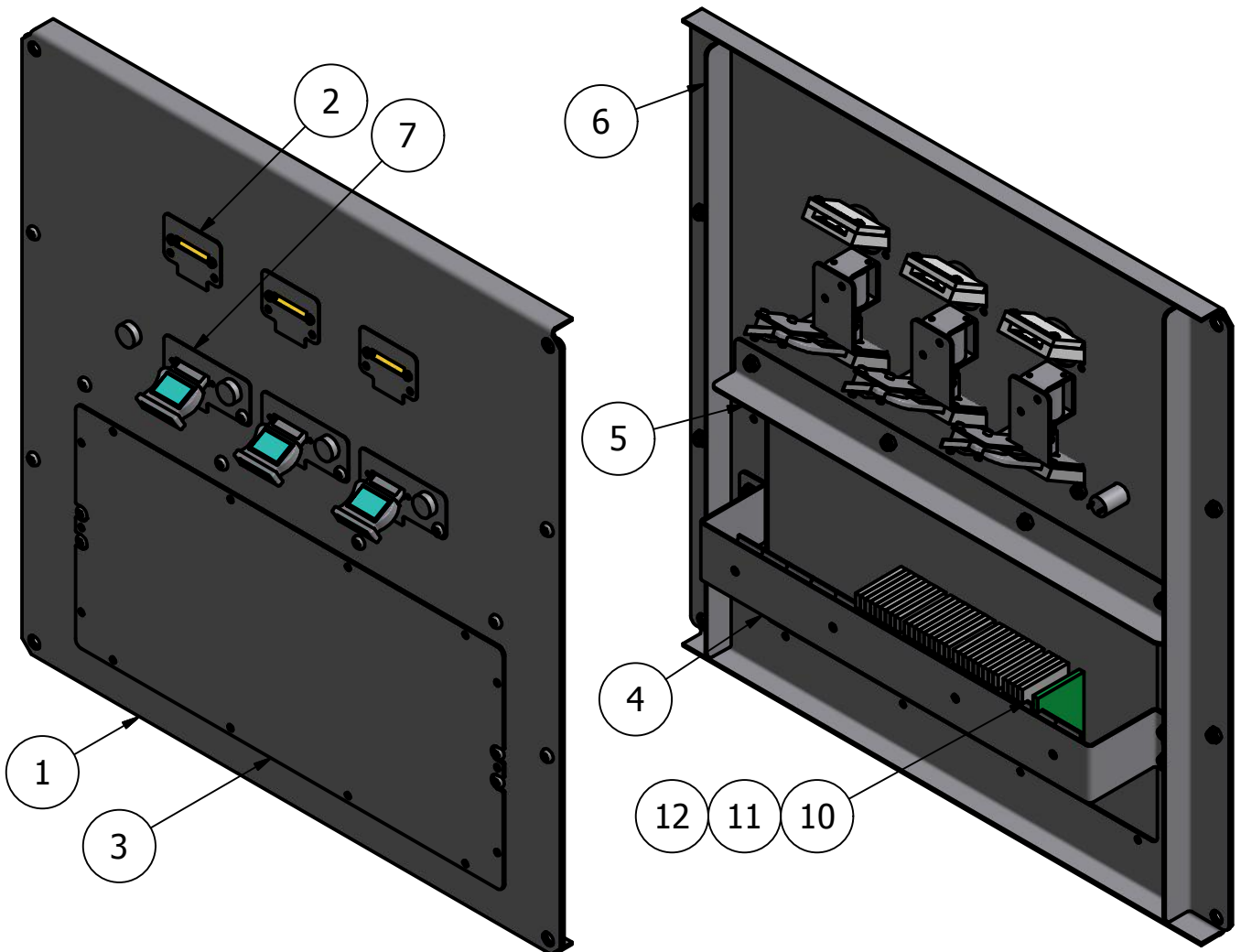
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-082_01	CKC-8 SPECIAL
2	1	NLD11-082_60	Electric Diagram
3	1	CKC-600x600x300	



Drawn: AKE	Date: 8-7-2011	Checked:
CKC-8 POS-SWITCH LAMP SOLENOID		
Drawing: NLD11-082_00	Projection:	Units: mm
		<b>A4</b>

# PARTS LIST

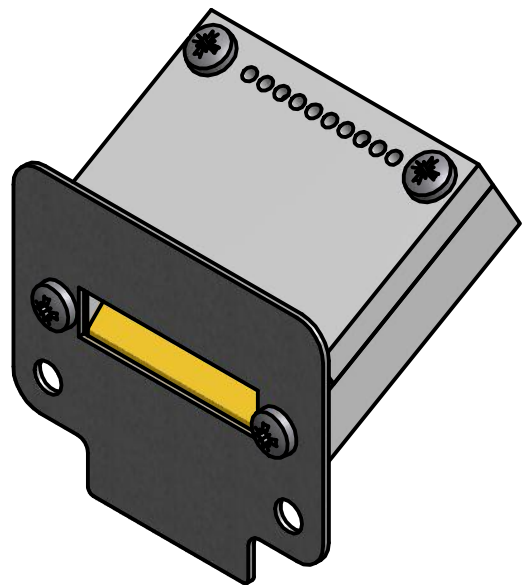
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-082_02	CKC Plate
2	3	NLD11-082_10	CKC Key Position
3	1	NLD11-057_03	Cover
4	1	NLD11-057_04	Bracket DINRail
5	1	NLD10-110_05	SUPPORT-HOR
6	2	NLD10-110_06	SUPPORT-VERT
7	3	NLD11-057_07	KeyPos Switch Lamp Solenoid
8	18	Resistorx - M6 x 10	Resistorx - Metric
9	18	DIN 985 - M6	Selfretaining Nut
10	14	DinRail-35	
11	1	TERMINAL EARTH	WEIDMULLER 101000 WPE2.5
12	31	TERMINAL	WEIDMULLER 102000 WDU2.5
13	1	TH-706210-89	Pushbutton 31-131



Drawn: AKE	Date: 8-7-2011	Checked:
CKC-8 SPECIAL		
Units: mm		
Drawing: NLD11-082_01	Projection:	A4



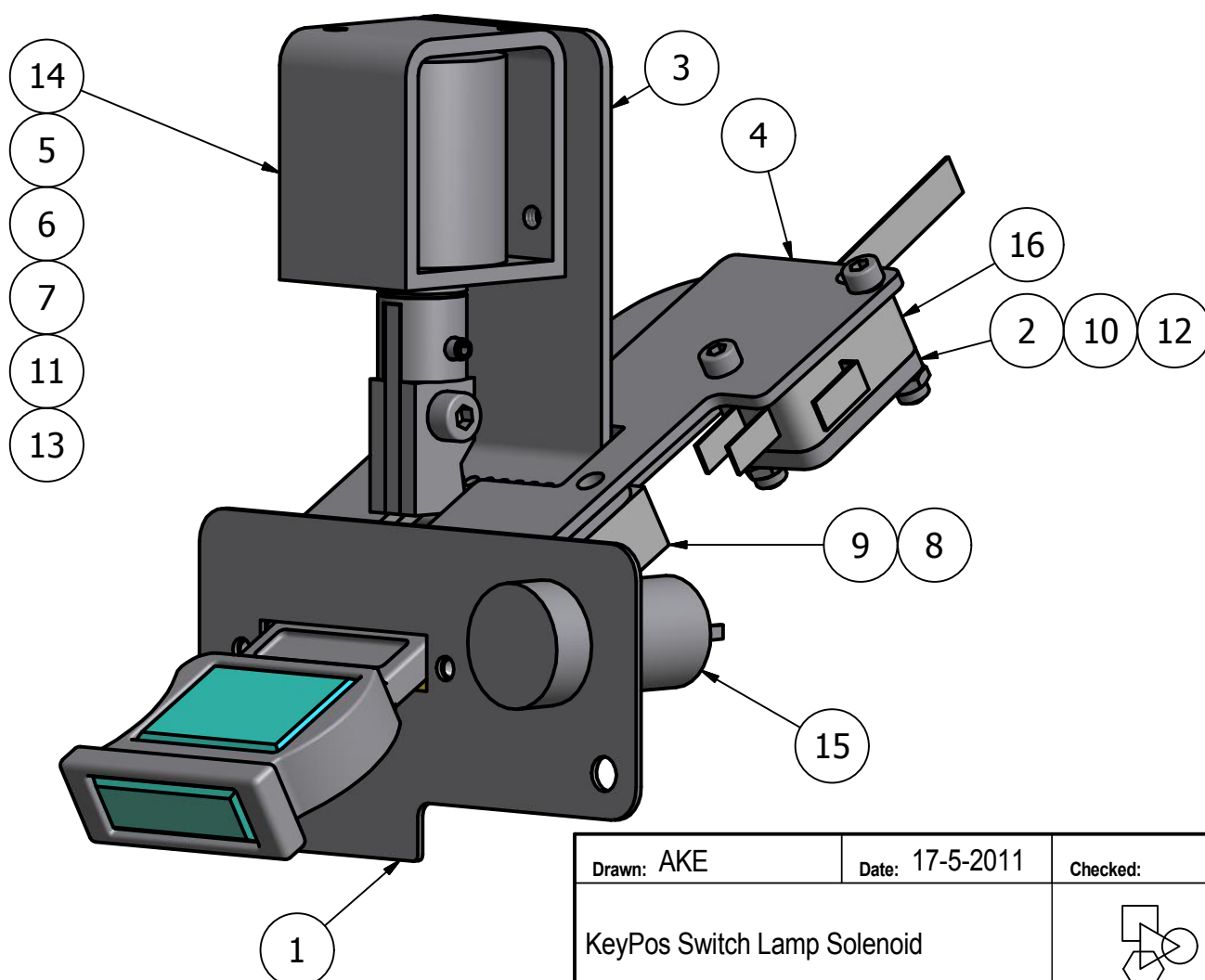
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NL-38	Weatherstrip
2	4	NL-65	Rivet 2.5 x 3.2
3	1	NL-109_R3	CKC-Position Bottom
4	1	NL-110_R3	CKC-Position Top
5	1	NL-111_R3	CKC-Position Frontplate
6	2	NL-130	Rokut Rivet 5,0x1,5-7,0 Nylon
7	2	7981-3.5x9.5	Cross Recessed Pan Head Tapping Screw - Type AB - Type IA
8	2	7981-3.5x16	Cross Recessed Pan Head Tapping Screw - Type AB - Type IA



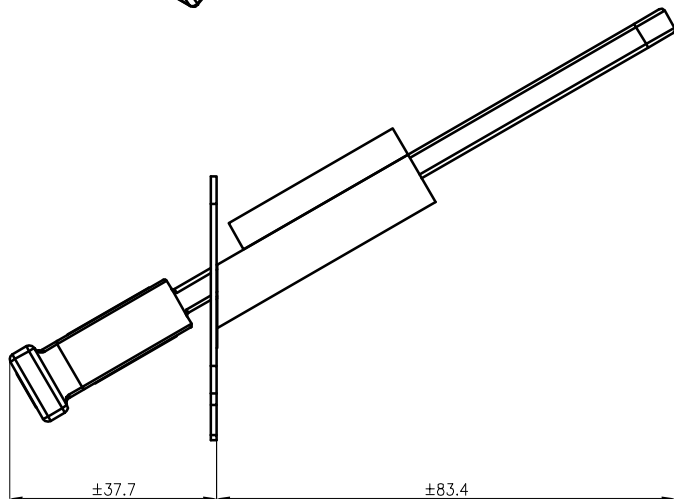
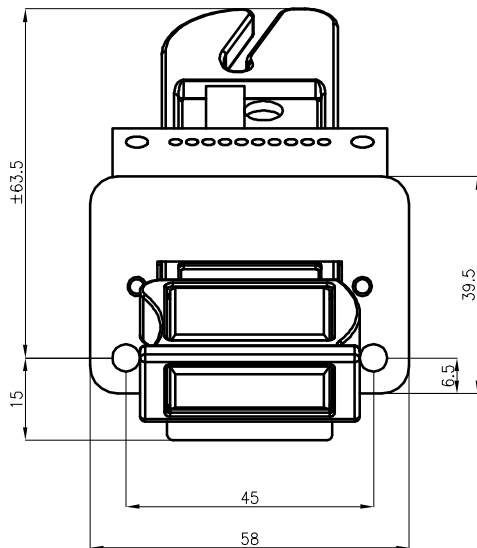
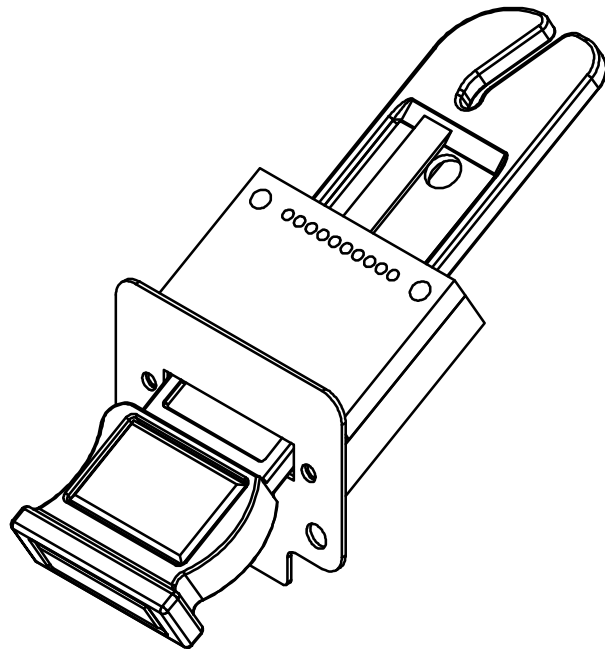
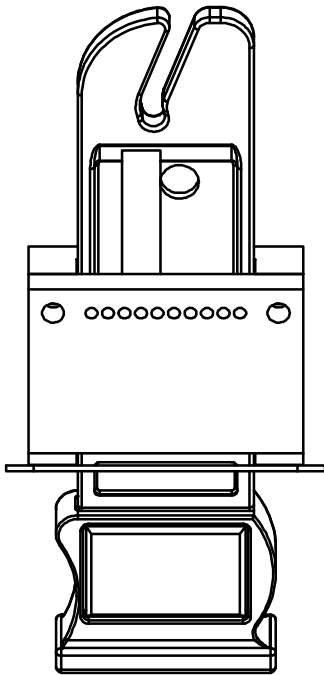
Drawn: AKE	Date: 11-7-2011	Checked:
CKC Key Position		
Drawing: NLD11-082_10	Units: mm Projection: 	A4


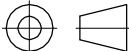
# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-057_06	Front Plate
2	1	NLD11-057_12	Filler Switch
3	1	NLD06-109_07A	
4	1	NLD06-109_08A	
5	1	NLD06-109_09A	
6	1	NLD06-109_10A	
7	1	NLD06-109_11A	
8	1	NL-38	Weatherstrip
9	1	NL-109	CKC-Position Bottom
10	3	DIN 912 - M3 x 20	Cylinder Head Cap Screw
11	1	DIN 912 - M4 x 10	Cylinder Head Cap Screw
12	2	DIN 985 - M3	Selfretaining Nut
13	1	ISO 8752 - 3 x 16 A	Spring-type straight pins - Slotted, heavy duty
14	1	BLP-41 24V	SOLENOID
15	1	TH-706210-89	Pushbutton 31-131
16	1	VX-53-1A3	Switch



Drawn: AKE	Date: 17-5-2011	Checked:
KeyPos Switch Lamp Solenoid		
Units: mm		
Drawing: NLD11-057_07	Projection:	A4

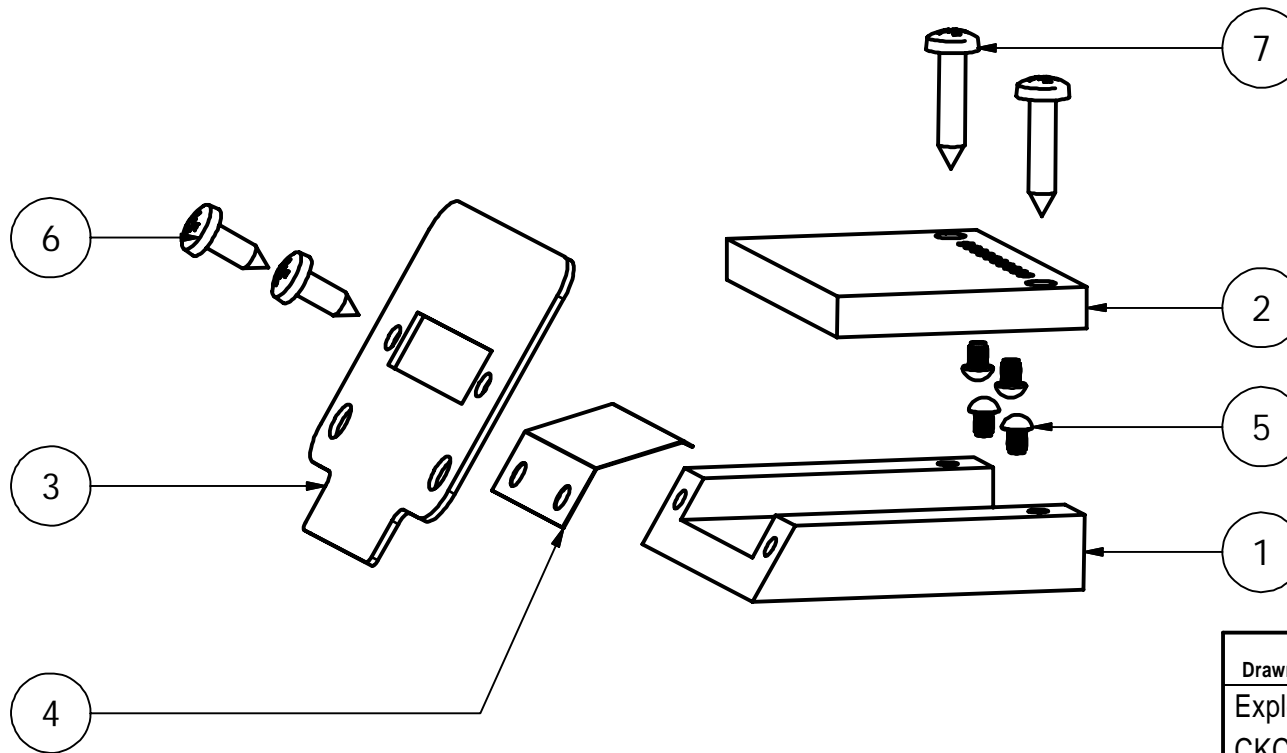


	<b>NETHERLOCKS</b> SAFETY SYSTEMS AND VALVECONTROL WWW.NETHERLOCKS.COM TEL.0031(0)172-471339 FAX.0031(0)172-427858			
	Revision	Drawn	Date	Checked
Drawn: PLL	Date: 08-08-08		Checked:	
CKC/R3				
Drawing:		Projection:		
CKC-R3.dwg				A3



# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NL-109_R3	CKC-Position Bottom
2	1	NL-110_R3	CKC-Position Top
3	1	NL-111_R3	CKC-Position Frontplate
4	1	NL-38	Weatherstrip
5	4	NL-65	Rivet 2.5 x 3.2
6	2	7981-3.5x9.5	Cross Recessed Pan Head Tapping Screw - Type AB - Type IA
7	2	7981-3.5x16	Cross Recessed Pan Head Tapping Screw - Type AB - Type IA

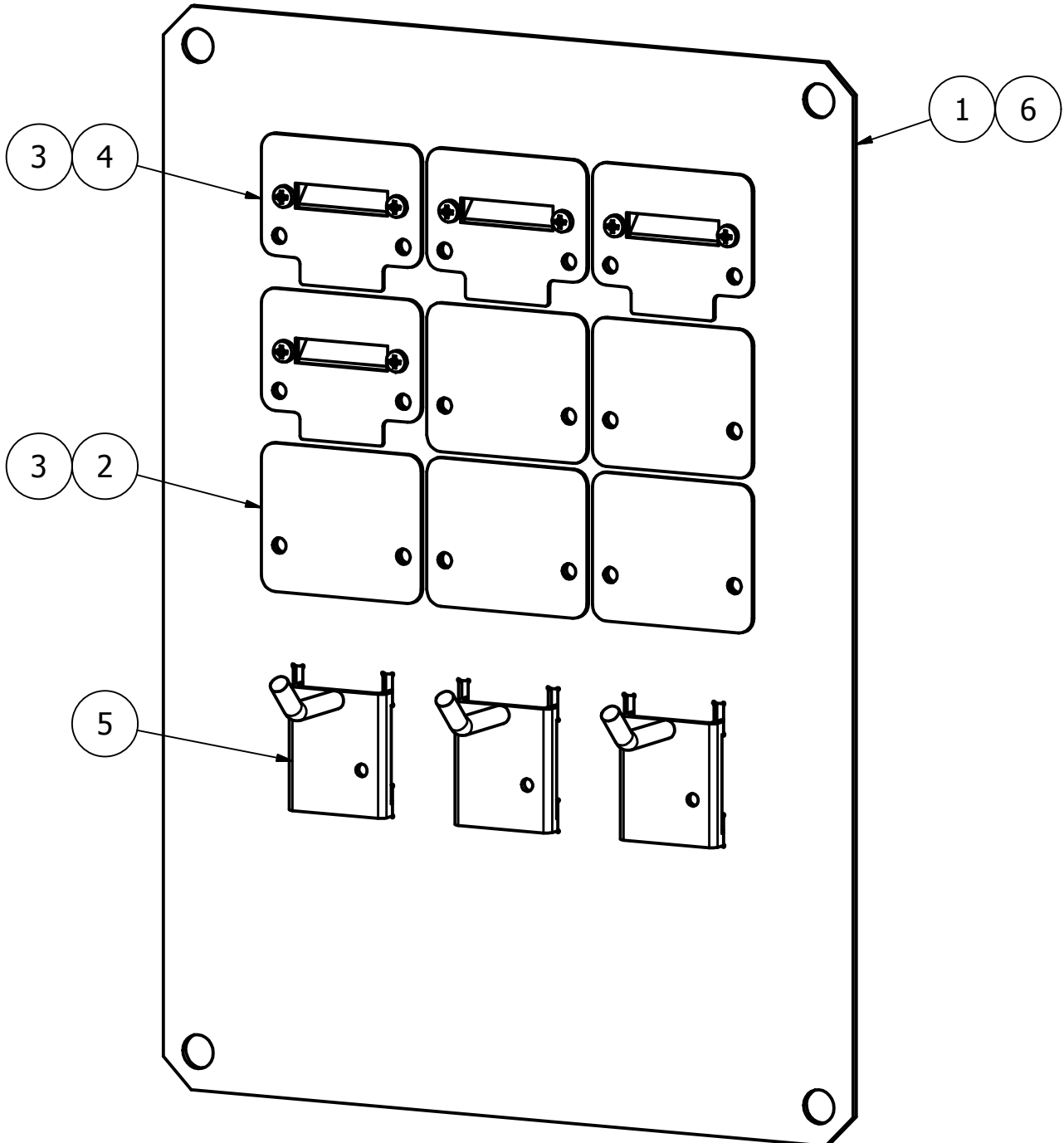


Drawn: RH	Date: 25-2-2010	Checked:
Exploded View CKC position CKC Key PositionR3		
Drawing: CKC-BLOCK/R3	Projection: 	<b>A4</b>

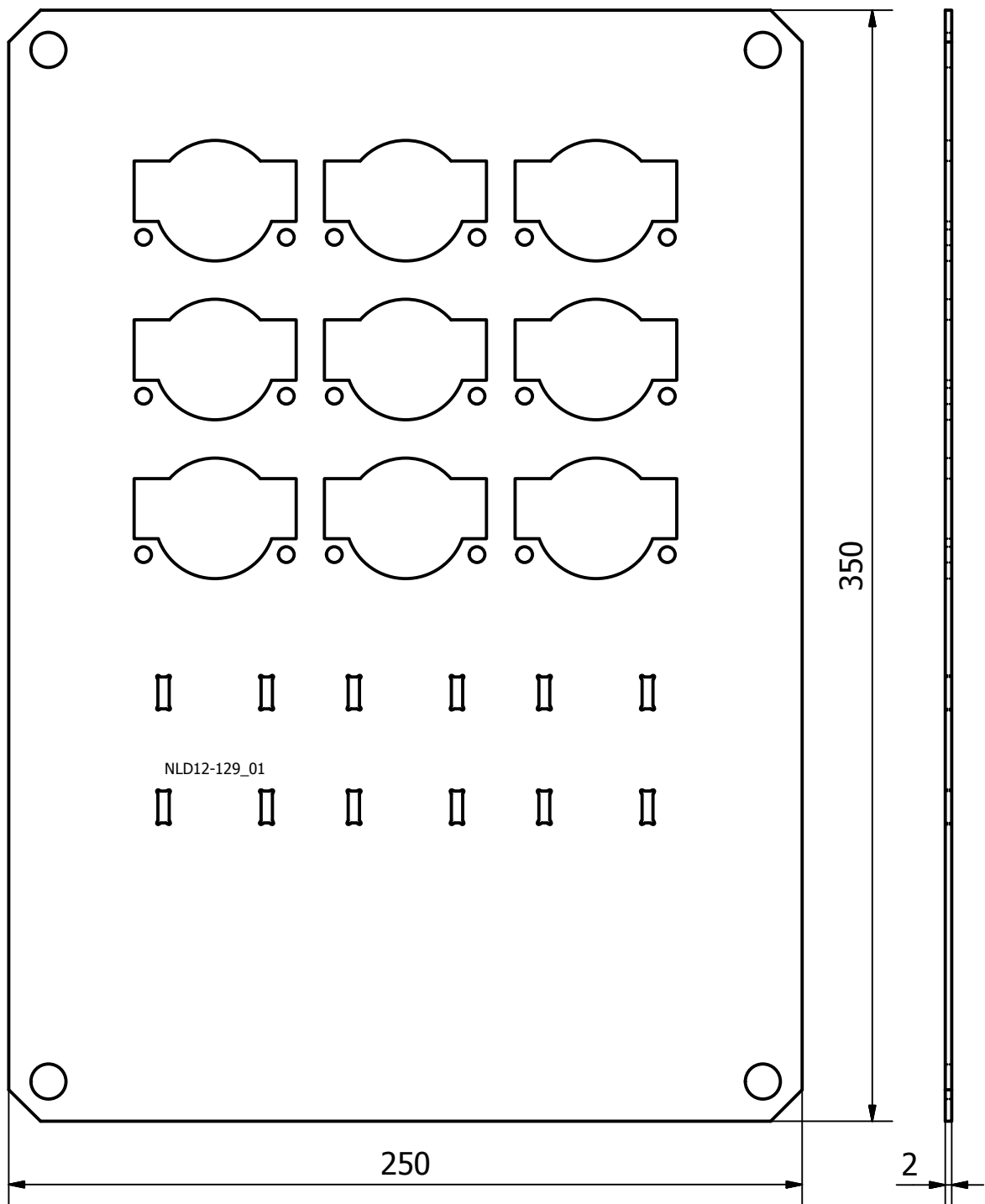


# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-129_01	CKC PLATE
2	5	NL-112_R3	CKC-Position Sparepos Cover
3	18	NL-130	ROKUT RIVET
4	4	CKC-BLOCK/R3	CKC Key Position
5	3	961330-38x5	Holder for Tools
6	1	CABINET400300200	NSYS3D4320T



Drawn: PLL	Date: 14-8-2012	Checked:
CKC		
Units: mm		
Drawing: NLD12-129_00	Projection:	A4




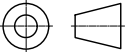
**Material: AISI 304 BRUSHED**

<b>STANDARD TOLERANCES</b> (unless mentioned otherwise)		
BASIC	SIZE (mm)	TOLERANCE (mm)
	> 0	± 0.2
	> 10	± 0.5
	> 100	± 1
	> 1000	± 2
	> 0.0	± 0.1
	> 10.0	± 0.2
	> 100.0	± 0.5
	> 1000.0	± 1
<div>  0.25          <math>\varnothing</math>0.25       </div>		

Drawn: PLL	Date: 14-8-2012	Checked:
CKC PLATE		
Drawing: <b>NLD12-129_01</b>	Projection: 	<b>A4</b>

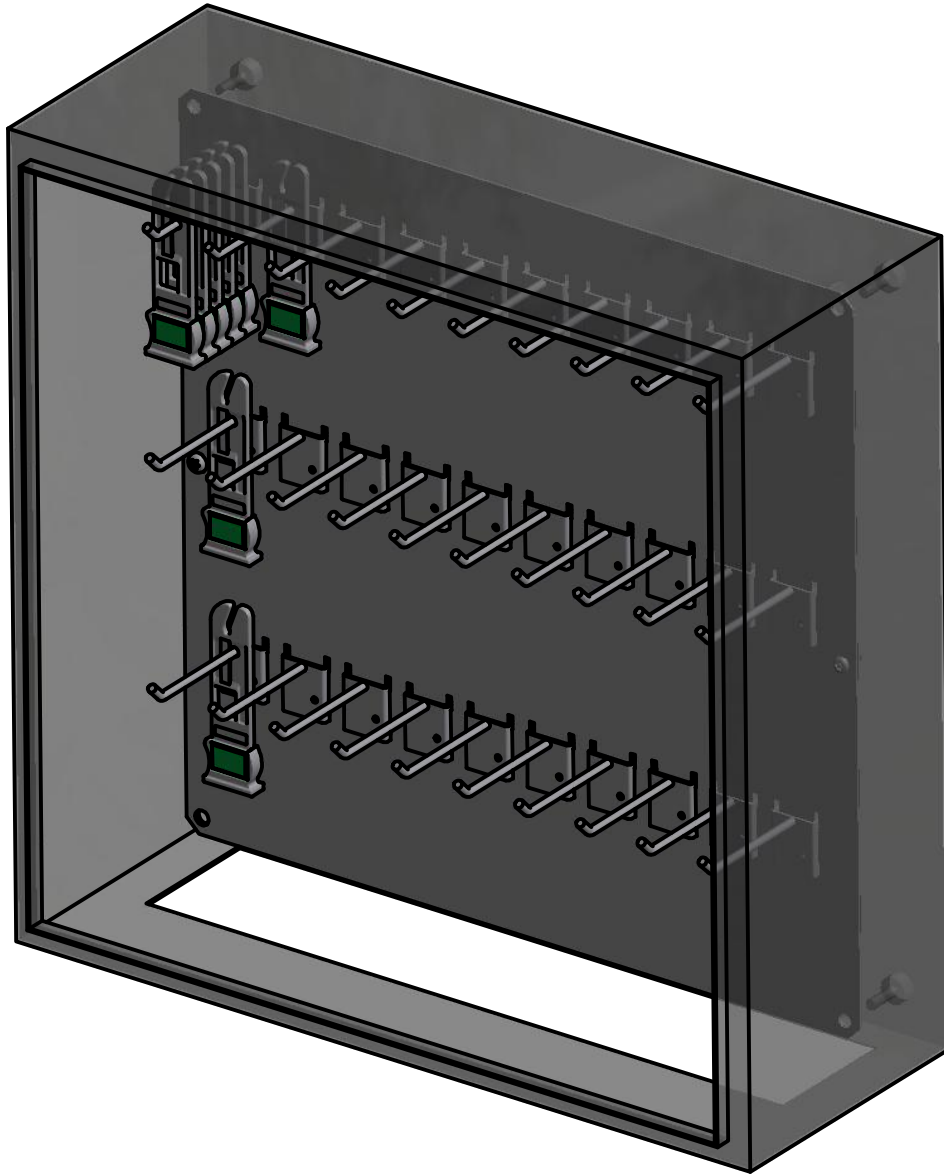
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-051_10	CKC Special
2	5	CKC-BLOCK/R3	CKC Key Position
3	1	CABINET600600200	CKC 600x600x200
4	1	TagPlate	H157.5 x W222.75
5	27	961330-38x5	Holder for Tools



Drawn: AKE	Date: 20-3-2012	Checked:
CKC 5-KEYS 27-HOOKS for Keys		
Drawing: NLD12-051_00	Units: mm	Projection: 
		A3



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-044_01	CKC PLATE
2	2	NLD09-036_02	SUPPORT
3	30	961330-100	Hook 100x6
4	2	DIN 985 - M8	Selfretaining Nut
5	2	Resistorx - M8 x 16	Resistorx - Metric
6	1	CKC-600x600x250	



Drawn: AKE	Date: 9-3-2012	Checked:
CKC-600x600x250 30x HOOK-GEBO		
Drawing: NLD12-044_00	Units: mm Projection:	 <b>A4</b>





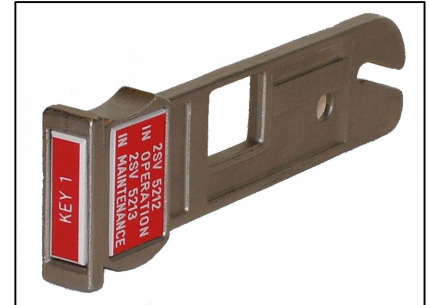


## Process Interlocking

### Master Key

The master key is fully stainless steel AISI 316 and can be used on all Nether-locks but a master key can also be supplied per area, process, division, etc...

A master key should always be kept under supervision and A master key should be stored properly. *e.g. Master Key Cabinet*



### Master Key Cabinet

To store the master key we have a red lockable key cabinet available.

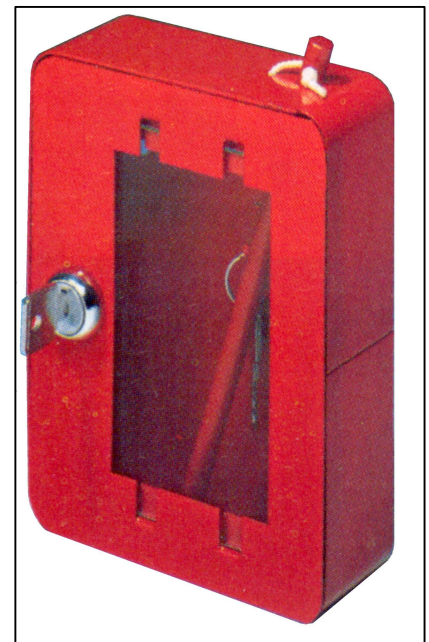
The cabinet is lockable and only the responsible people have access to this cabinet.

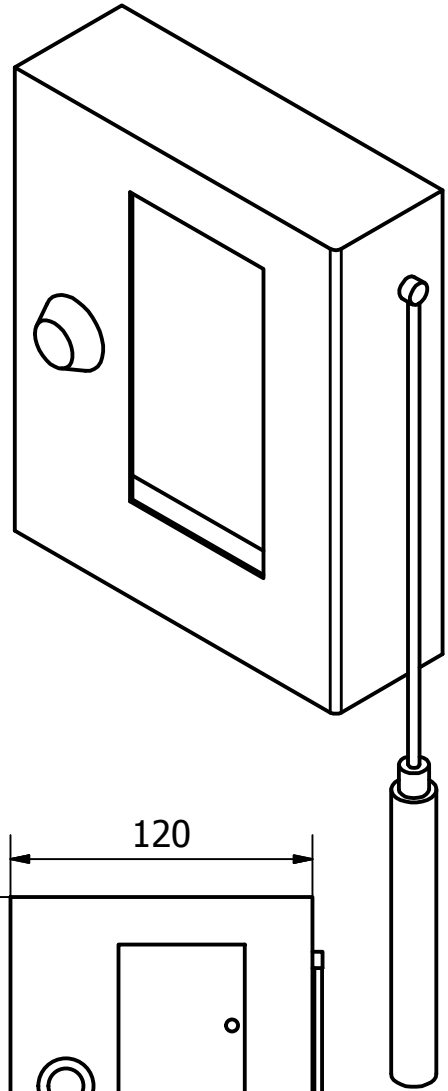
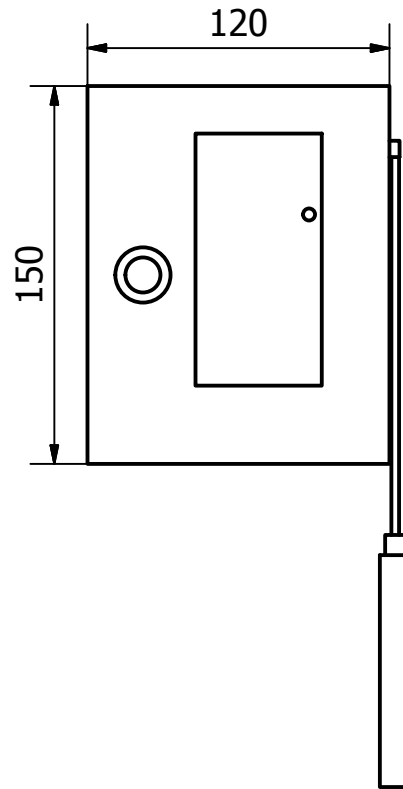
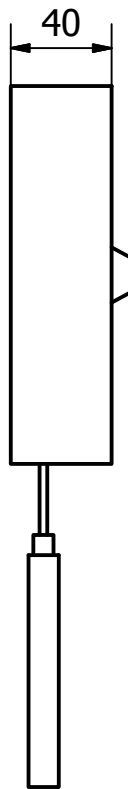
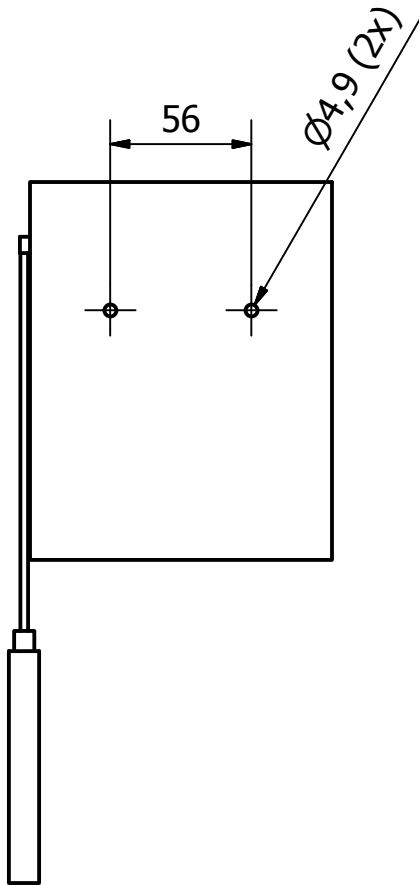
In case of emergencies the glass can be broken and the key released!


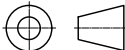
It is preferable to hang the cabinet in or next to the control room. The red colour makes it eye-catching.

#### Features

- Lockable door
- Breakable glass
- Including hammer to break glass
- Red colour for easy notice
- Powder coated steel





Drawn: AKE	Date: 25-4-2012	Checked:
NLD09-154_00 Compact Key Cabinet (Master Key) RED		
Units: mm		
Drawing: NL-143	Projection: 	A4



## Process Interlocking

### Q-card

NETHERLOCKS designed a Q-card to make the installation process go more smoothly and without interruption.

Interlocks guarantee a predetermined sequence in accordance to client's specification. This sequence could give "problems" during transport and hydrostatic pressure testing of piping systems.

After locks are installed on the valves they cannot always be operated freely due to the sequence. When the plant is not yet in operation or valves are not yet installed (transport), valves that are locked in position can become a limitation.

For example during pressure testing all valves need to be closed, however a PSV sequence allows only one valve to be closed at a time as a sequential safety requirement. In such an instance, the interlocks could only be installed after pressure testing, which could cause logistical problems.

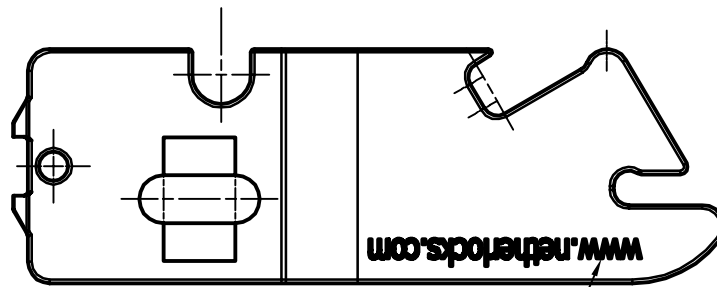
So to make it easier we designed the Q-card, a special type of key that can only be fitted in the lock in our factory during assembling. This special key allows the locks to be opened or closed regardless of the sequence.

For safety reasons the *Q-Card* cannot be re-used and 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 commission.

There is no need for master keys or spares, since these could jeopardise the plant safety. A master key is re-usable, which means that it will fit any time any place and collecting all spare or master keys afterwards is very unlikely.

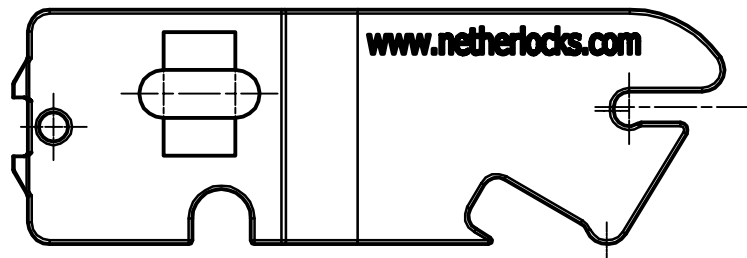
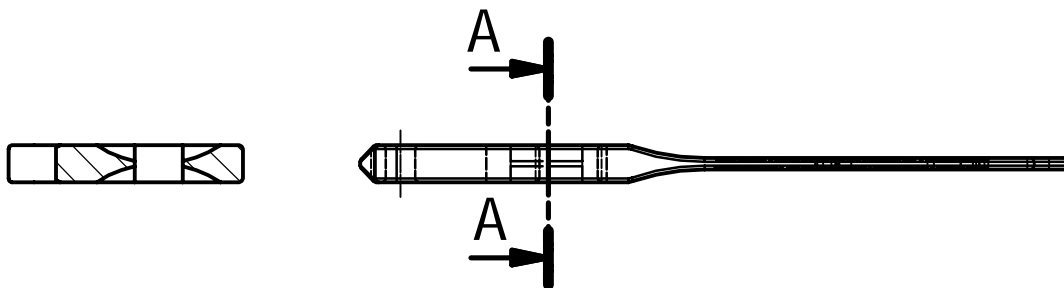
The *Q-card* saves time, money and prevents irritation, without reducing safety.





TEXT ON BOTH SIDES 0.25 DEEP MAX


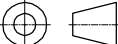
A-A



R4

**Material: AISI 316**

<b>STANDARD TOLERANCES</b> (unless mentioned otherwise)	
BASIC SIZE (mm)	TOLERANCE (mm)
> 0	$\pm 0.2$
> 10	$\pm 0.5$
> 100	$\pm 1$
> 1000	$\pm 2$
> 0.0	$\pm 0.1$
> 10.0	$\pm 0.2$
> 100.0	$\pm 0.5$
> 1000.0	$\pm 1$
0.25	$\varnothing 0.25$

 <b>NETHERLOCKS</b> <b>SAFETY SYSTEMS BV</b>				
	R4	RH	28-04-09	
	R3	RH	18-04-07	
	R2	RH	03-04-07	
	<b>Revision</b>	<b>Drawn</b>	<b>Date</b>	<b>Checked</b>
<b>Drawn:</b> RH	<b>Date:</b> 7-11-2006		<b>Checked:</b>	
Q-Card				
NL-120_R4				
<b>Drawing:</b> NL-120 R4		<b>Projection:</b> 	A4	

Print Date:

© Netherlocks Safety Systems B.V.



## Process Interlocking

### Second safety device.

Sometimes the question is raised whether the Netherlocks locking devices are protected against false operation by means of something else than the properly coded key.

The answer is **NO**

Independent second safety unit.

Although locks are equipped with uniquely coded plates to avoid false key insert, it is unfortunately necessary to create a higher protection against manipulation.

For this reason a second components is integrated in the lock to make it anti tamper, the second safety.

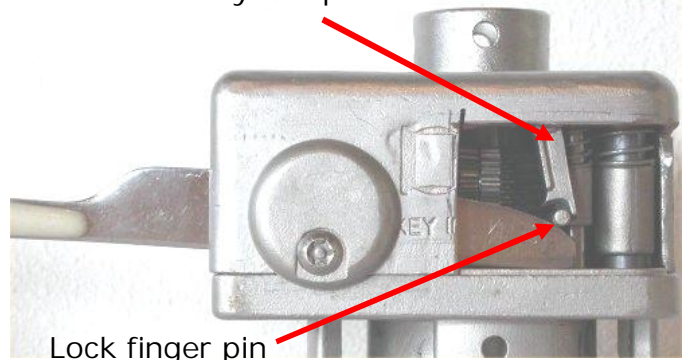
#### Anti tamper

The below picture shows a knife inserted into the lock, however, it is clear to see that it is not able to unlock the locking system. Only a properly coded key is able to operate the locking finger.

In order to unlock we need to lift up the lock finger pin.

The Netherlocks 2<sup>nd</sup> safety makes it impossible to lift up the lock finger with anything other than the Netherlocks key.

Second safety component



Lock finger pin





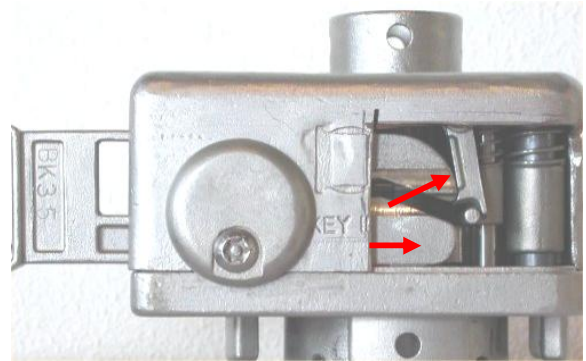


## Process Interlocking

### Working principle 2<sup>nd</sup> safety

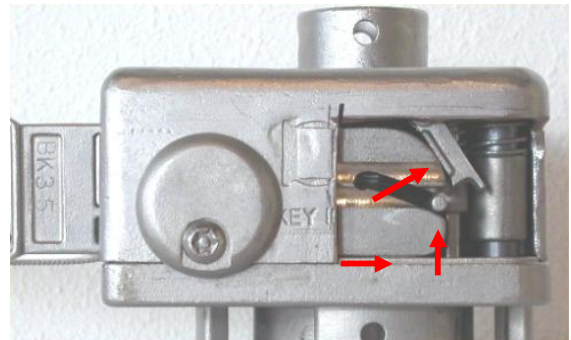
#### STEP 1

During the insert the top of the key pushes the 2<sup>nd</sup> safety forward to make way for the lock finger pin to go up.



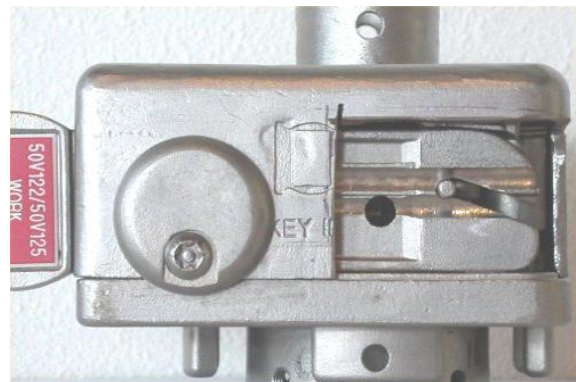
#### STEP 2

Once the key has pushed the 2<sup>nd</sup> safety forward, the lock finger will be lifted up by the key insertion.



#### STEP 3

When the lock finger is fully lifted the lock is in unlocked situation.





## Process Interlocking

Just a few questions for you to answer:

- Explaining people that something can be bypassed, even though it is not true, is very dangerous?
- Do you want people to discuss about bypassing a Lock?
- If a lock works without problems, why does an operator want to bypass it?
- Why do people spread around dirt about competition, is there nothing good to say about themselves.
- If the dirt that is spread around is false, does it implicate that there eventually is NO dirt to spread around?

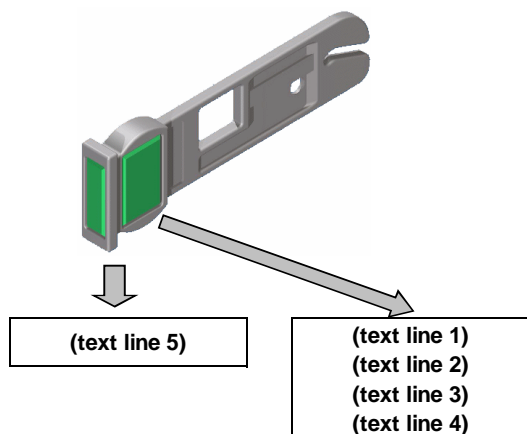
We trust you chose NETHERLOCKS not only for the HIGH QUALITY but also for their INTEGRITY!





Customer:	
End user:	
Project:	
Customer PO:	
Netherlocks ref:	

## TAGGING OF SYSTEM



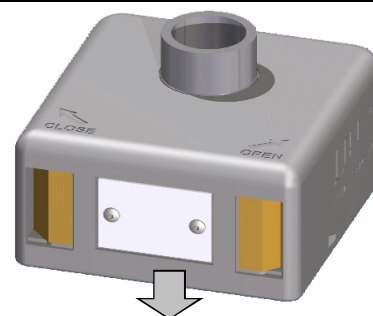
Text line 1: \_\_\_\_\_  
 Text line 2: \_\_\_\_\_  
 Text line 3: \_\_\_\_\_  
 Text line 4: \_\_\_\_\_  
 Text line 5: \_\_\_\_\_  
 Colour : \_\_\_\_\_  
 Max 20 characters per text line (block letters)

### KEY CABINET TAGPLATES (INVISIBLE WHEN KEY IS IN POSITION)

(text line 1)  
 (text line 2)  
 (text line 3)  
 (text line 4)

Text line 1: \_\_\_\_\_  
 Text line 2: \_\_\_\_\_  
 Text line 3: \_\_\_\_\_  
 Text line 4: \_\_\_\_\_  
 Colour : \_\_\_\_\_  
 Max 20 characters per text line (block letters)

### PLASTIC (RESOPAL) TAGPLATES



(text line 1)  
 (text line 2)  
 (text line 3)  
 serial no Netherlocks

(text line 1)  
 (text line 2)  
 (text line 3)  
 serial no Netherlocks

Text line 1: \_\_\_\_\_  
 \* Text line 2: \_\_\_\_\_  
 Text line 3: \_\_\_\_\_  
 Colour : \_\_\_\_\_  
 Max 20 characters per text line (block letters)  
 \* Max 15 characters

### STAINLESS STEEL TAGPLATES

Tagplate colours available: WHITE, GREEN, YELLOW, RED, BLUE



## Position Indication

# Valve Position Indicator for Gate / Gear (VPI)

As is well known, it is very difficult to create a reliable feedback signal from handwheel operated gate valves, since it has traditionally been very difficult to create a strong and robust mounting facility around the hand wheel and adequate protection for the switches themselves.

The VPI will be custom made to fit a gate valve or a gearbox operated gate valve with a specified switch.

The Netherlocks VPI makes it possible to create an extremely reliable remote signal to the control room. It converts the open and closed positions of the valve to an electronic signal via a mechanical counter, which operates an electronic switch. Any switch can be selected by the client.

Both the mounting method and the counter are proven designs, used successfully in our mechanical interlocks for over 15 years.

Our VPI can be mounted on both new valves and existing valves. This system is customized for each valve and switches are enclosed without loose wiring.

### Features:

- o Robust and reliable
- o Fully Stainless steel
- o switches protected
- o Available for any type of switch
- o No loose wiring
- o NO fragile bracket around the hand wheel





## Postion Indication

Stainless steel 316 handwheel

Stainless steel 316 body,  
5mm thick.

8 screws to install the lock  
for a very strong fit.

Stainless steel 316 purpose machined  
bracket. (Please be aware that for  
brackets several solutions are  
available; one of them is the universal  
type)

Large diameter adapter – purpose  
machined - with 4 keyways. The large  
diameter assures that:

- the original nut will fit
- clamping the adapter from the  
sides is not necessary
- load on keys is minimized

Rose Junction box  
IP 66 EEx e

various types of switches can be  
used. Proximity / Limit and

No lose wiring

switches are protected by  
stainless steel housing

Open / closed position can be adjusted  
without removing the indicator







## Position Indication

### Valve Position Indicator specials (VPI – S)

Getting a reliable signal to the control room is often critical for production continuation and/or for safety reasons. In many situations a signal to the control room is required and switches are available to create this feedback.

There can often be a challenge however in creating a device that is robust, practical and custom made for your application.

Weak bracketing or vulnerable switches out in the open can create a malfunction in the proper indication of open or closed position.

NETHERLOCKS can design and manufacture a robust and reliable position indicator that will suit your specific requirements.

#### Actuators

We have designed a unique position checker for Rotorq: it detects the position of the valve spindle so it is a direct indication whether the valve is open or closed for critical applications. The position checker also has a window to see locally whether the valve is open or closed. It is fully stainless steel 316 with glass window!

#### Gearboxes

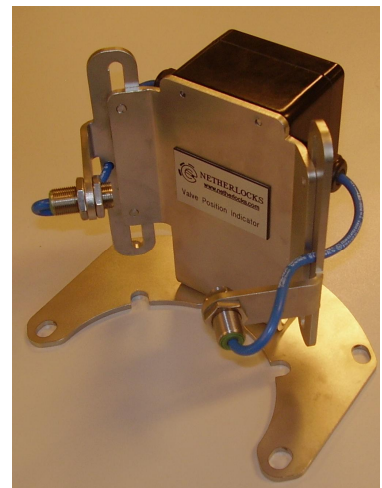
We have designed robust position checkers for both bevel and worm gearboxes.

#### 90 degree switch box

We can provide the mechanical connection between a standard 90 degree switch box and a ball valve, butterfly valve or a gearbox.

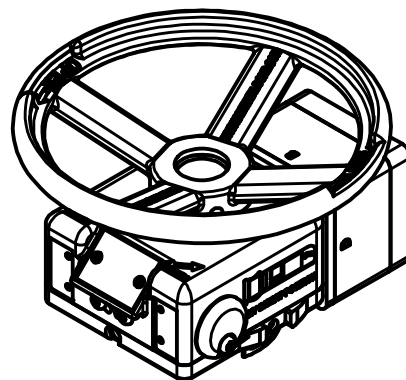
#### Rising stem ball valve

We designed a position checker for rising stem ball valves, the unit is universal for different types and sizes and the switches can be adjusted for the exact angle.



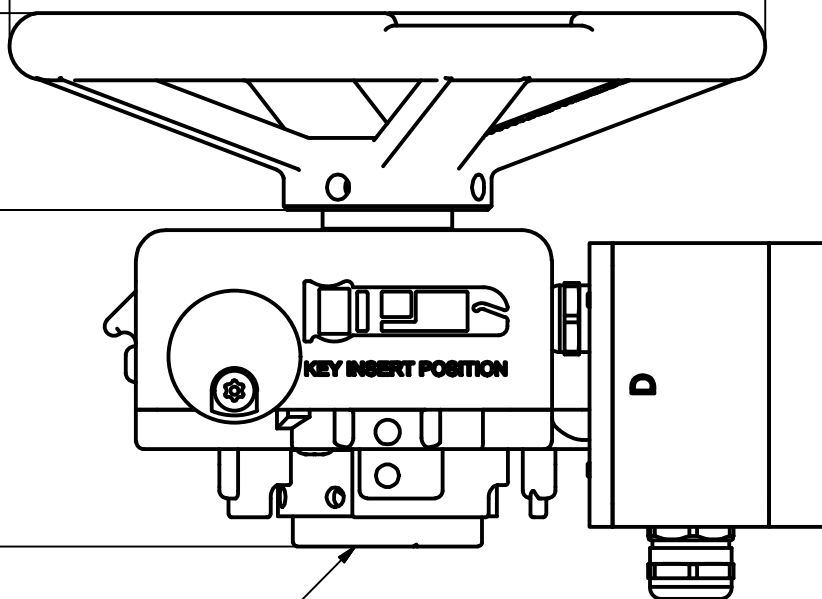


Approximate size of original handwheel



35 ~ 130

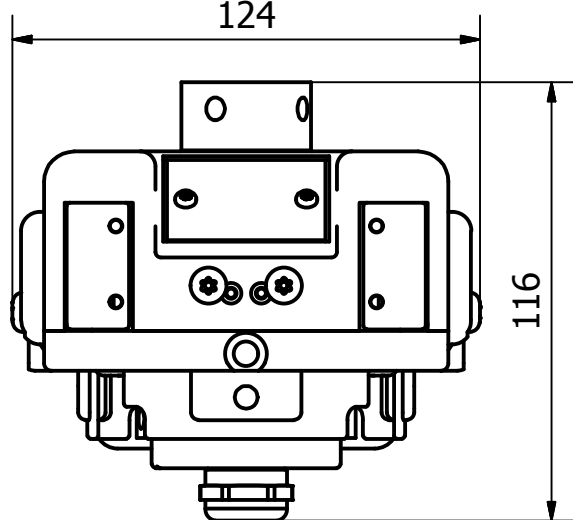
82 ~ 110



Lower Side of Original Handwheel

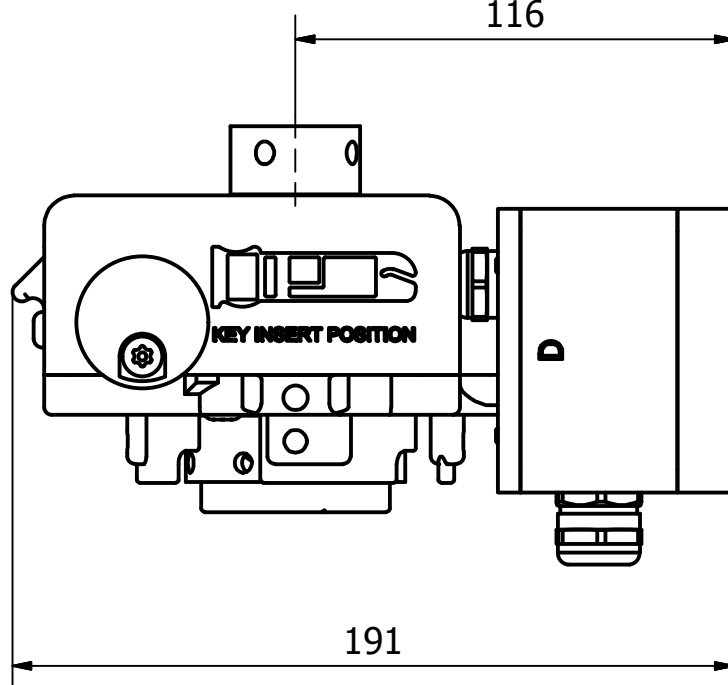
M20 Cable Entry to JunctionBox

124



116

116



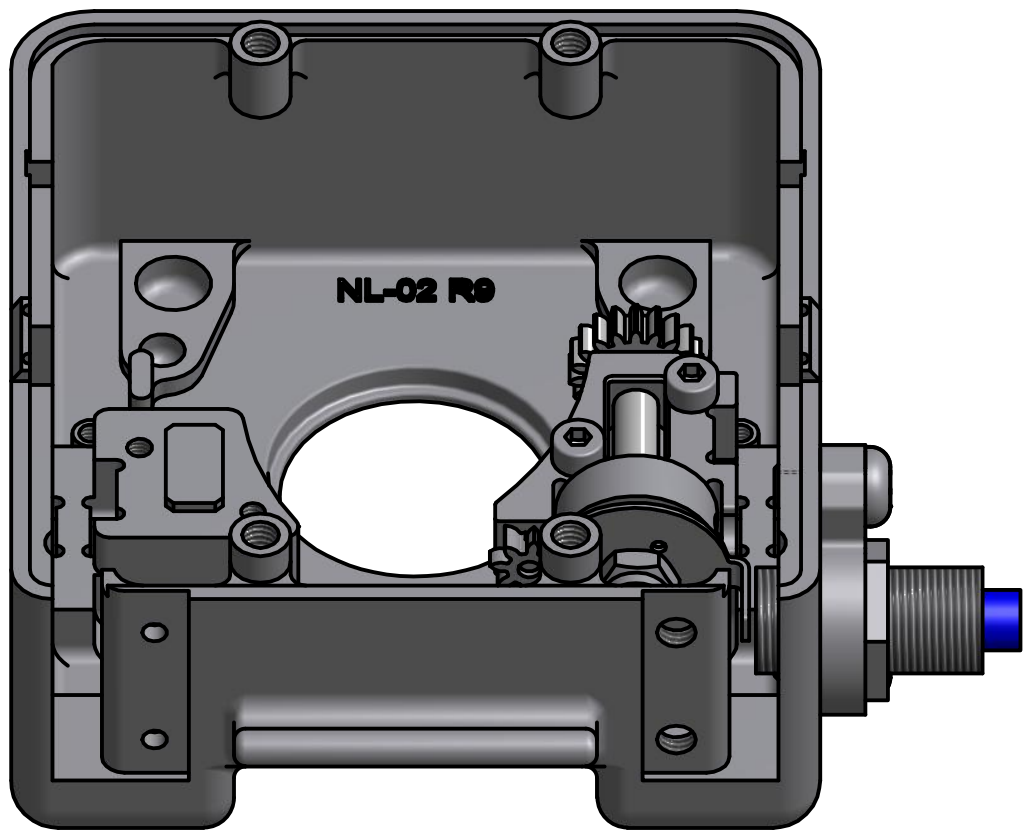
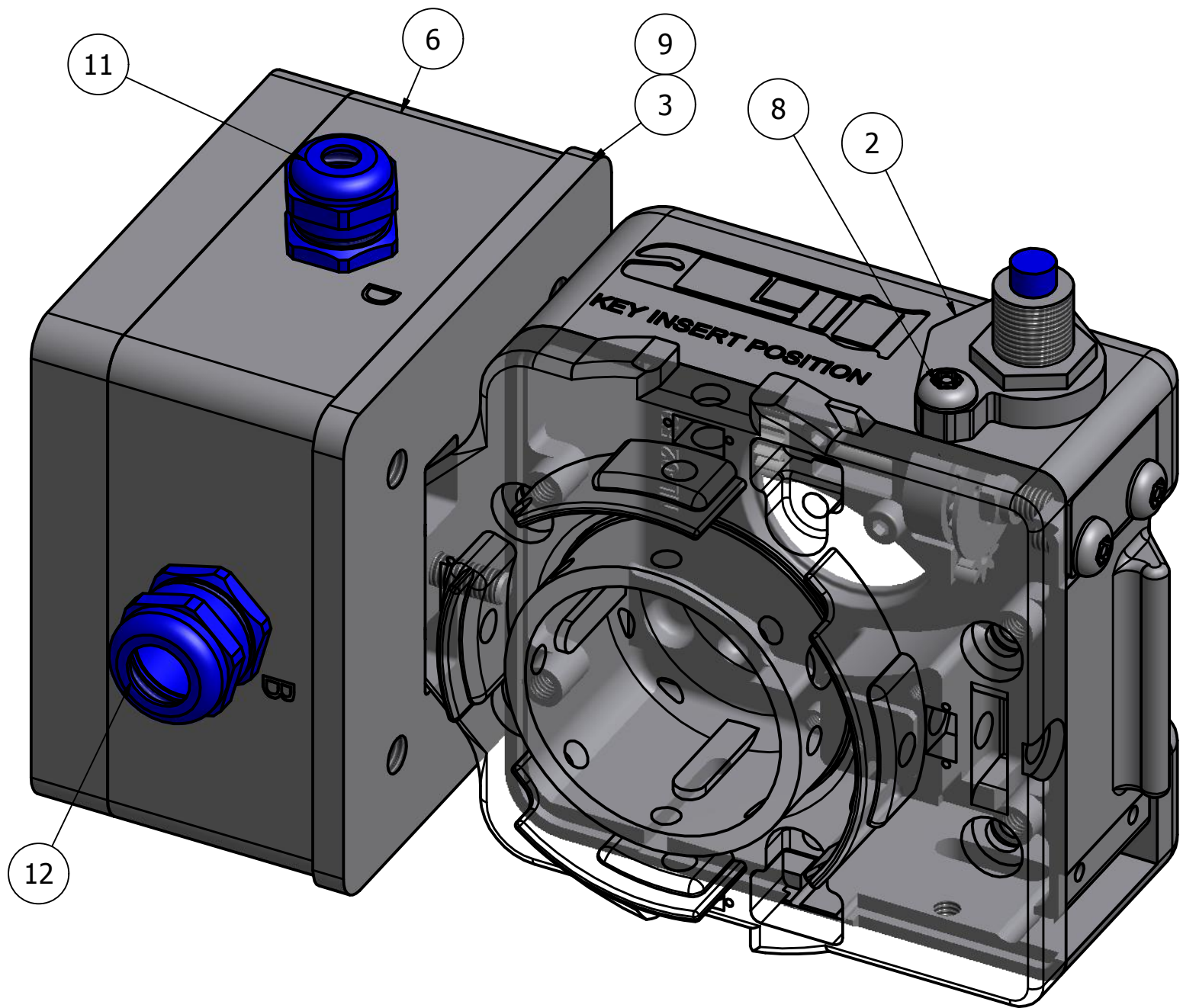
191

Drawn: AKE	Date: 19-6-2013	Checked:
VPI SMALL MR CO		
Drawing: NLD13-030_00-GA	Units: mm	Projection:
		A4





PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-120_01	MOD to NL-02_R8 (NL-02_R9) - MRL-S Body
2	1	NLD12-120_05	BRACKET SWITCH
3	1	NLD12-120_06	BRACKET JUNCTIONBOX
4	1	NLD12-120_07	Custom MRL-L Entry plate
5	1	NLD12-064_05	Counter Machined
6	1	JB100x100x61 RVS	B=M20x1.5 D=M16x1.5
7	2	Resistorx - M6 x 10	Resistorx - Metric
8	4	Resistorx - M6 x 12	Resistorx - Metric
9	1	Resistorx - M6 x 16	Resistorx - Metric
10	2	DIN 912 - M4 x 16	Cylinder Head Cap Screw
11	1	Gland-M16x1.5-Blue	M16 Gland Blue Atex ia
12	1	Gland-M20x1.5-Blue	M20 Gland Blue Atex ia
13	1	PF-M14-NJ2-11-N-G	Inductive Proximity Switch
14	1	PF-M14-Nut	PF NUT M14x1 (Supplied with Sensor)



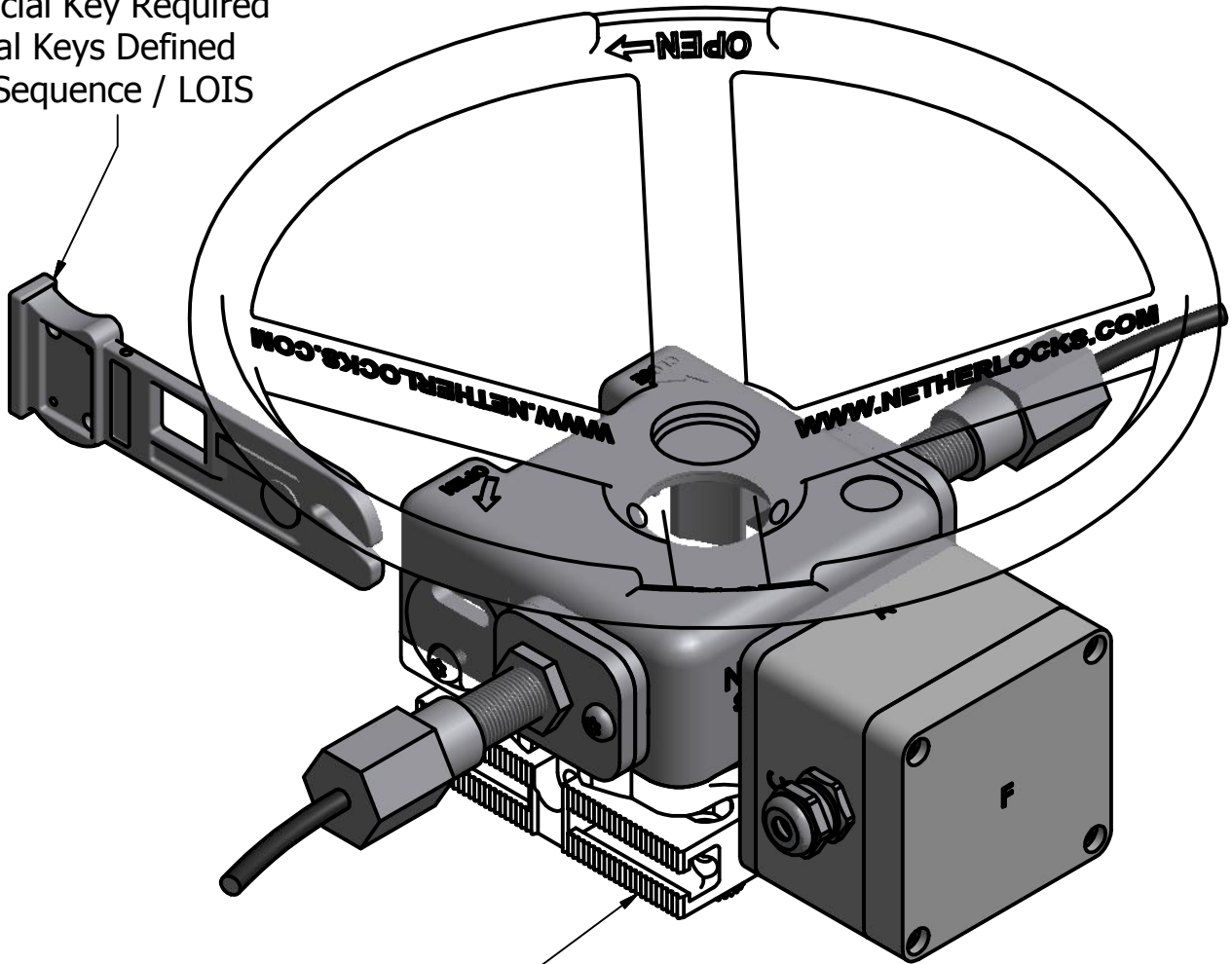
Drawn: AKE	Date: 19-7-2012	Checked:
VPI SMALL CLOSED NJ2-11-N-G		
Drawing: NLD12-120_00	Units: mm	Projection:
		A3



# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD13-076_01	MOD to NL-02_R8 - MRL-S Body
2	2	NLD13-076_02	Assembly Sensor
3	1	NLD13-076_60	Sticker Wiring
4	1	NLD11-087_02	Bracket Junction Box
5	1	NLD10-184_04	WELDING KEY
6	1	Resistorx - M6 x 16	Resistorx - Metric
7	1	ROSE 80x80x60	Holes Acc to Glands B=M20,C=M16,D=M16
8	2	Gland-M16x1.5	M16 Gland
9	1	Gland-M20x1.5	M20 Gland

Special Key Required  
Total Keys Defined  
by Sequence / LOIS



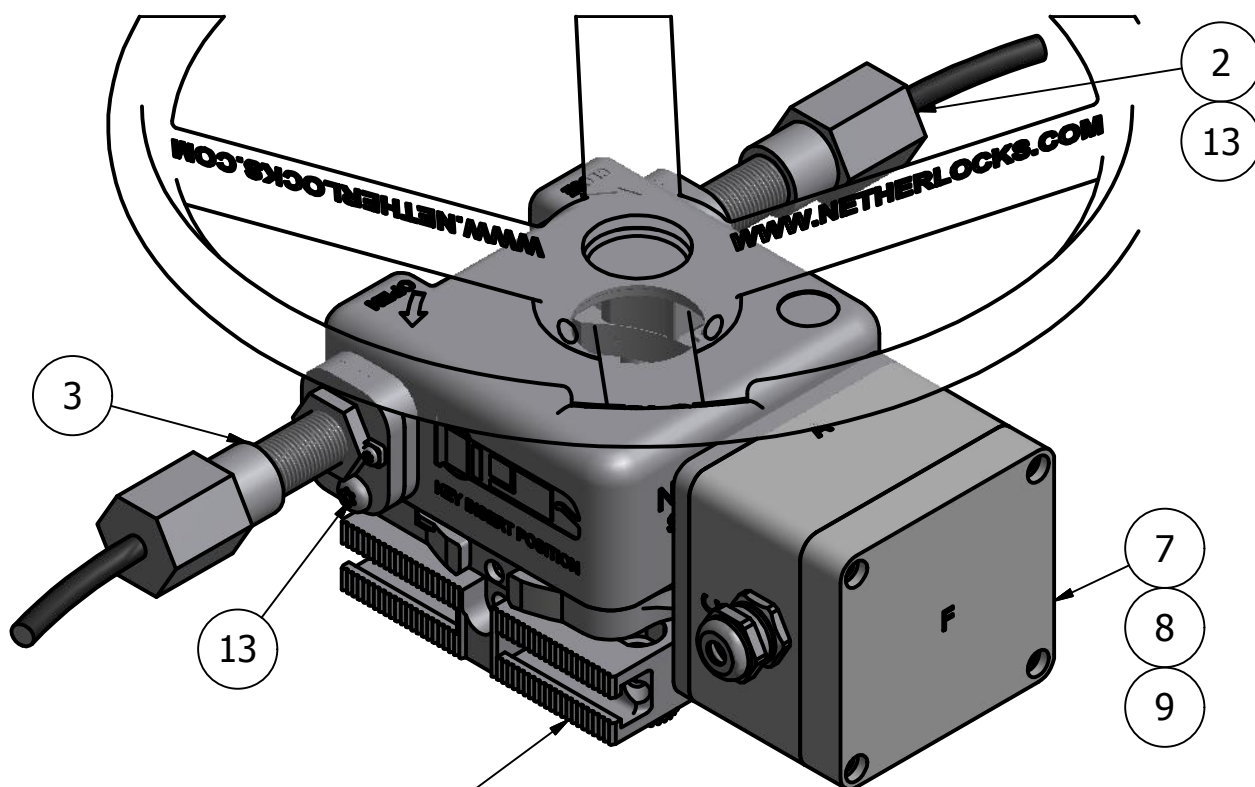
Mind V Drawings  
For Instruction 2.01, 2.02 and  
other UNI Solutions  
NL-200 U-Bracket Small  
must be mounted before  
mounting Junction Box Bracket

Drawn: AKE	Date: 10-4-2013	Checked:
VPI Ferro Sensor CO MRL Key Detection		
Units: mm		
Drawing: NLD13-076_00	Projection:	A4



# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD14-005_01	Bracket Junction Box
2	2	NLD14-005_02	Assembly Sensor
4	2	NLD14-005_10	VPI GO Counter Ferro
5	1	NLD14-005_31	MOD to VPI Counter to NL-02_R8 - MRL-S Body
6	1	NLD14-005_60	Sticker Wiring
7	1	Junction Box 80x80x60	Holes Acc to Glands B=M20,C=M16,D=M16
8	2	Gland-M16x1.5	M16 Gland
9	1	Gland-M20x1.5	M20 Gland
10	1	NL-01	Bottom plate small
11	2	NL-39	No Entry plate
12	1	NL-200	Uni-bracket small
13	3	Resistorx - M6 x 16	Resistorx - Metric
14	4	DIN 912 - M4 x 16	Cylinder Head Cap Screw

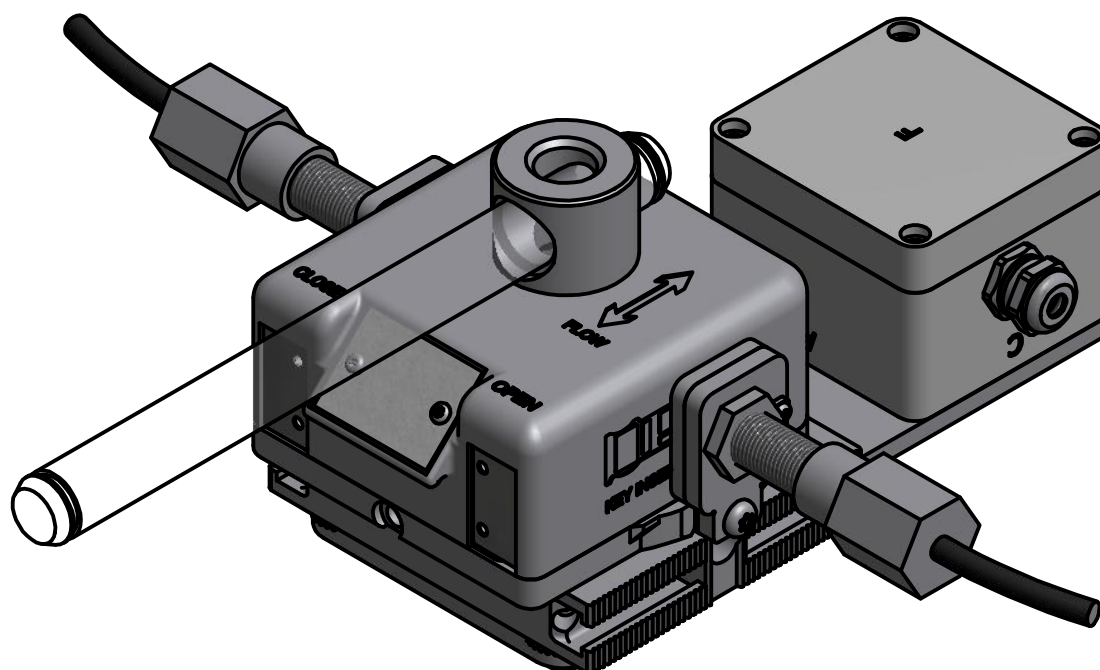


Mind V Drawings  
For Instruction 2.01, 2.02 and  
other UNI Solutions  
NL-200 U-Bracket Small  
must be mounted before  
mounting Junction Box Bracket

Drawn: AKE	Date: 8-1-2014	Checked:
VPI Ferro Sensor CO MRL Counter Detection		
Units: mm		
Drawing: NLD14-005_00	Projection:	
		A4

# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	NLD14-010_02	Assembly Sensor
2	2	NLD14-010_12	Detector 400
3	1	NLD14-010_31	MOD TO NL-82_R7 - NDL-S Body
4	1	NLD14-010_32	MOD TO NL-07_R10- Tube NDL-S
5	1	NLD14-005_60	Sticker Wiring
6	1	NLD12-070_09	BRACKET ROSE
7	1	NL-01	Bottom plate small
8	2	NL-39	No Entry plate
9	1	NL-200	Uni-bracket small
10	4	DIN 912 - M4 x 16	Cylinder Head Cap Screw
11	4	DIN 985 - M8	Selfretaining Nut
12	2	DIN 7991 - M4x10	Hexagon socket countersunk head cap screws
13	2	Resistorx - M3 x 6	Resistorx - M3x6
14	2	Resistorx - M6 x 20	Resistorx - Metric
15	4	Resistorx - M8 x 30	Resistorx - Metric
16	1	Junction Box 80x80x60	Holes Acc to Glands B=M20,C=M16,D=M16
17	2	Gland-M16x1.5	M16 Gland
18	1	Gland-M20x1.5	M20 Gland



Drawn: AKE

Date: 17-1-2014

Checked: SVD

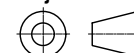
VPI NDL CO Small Ferro Sensing Proximity Switch

Units: mm

Drawing:

NLD14-010\_00

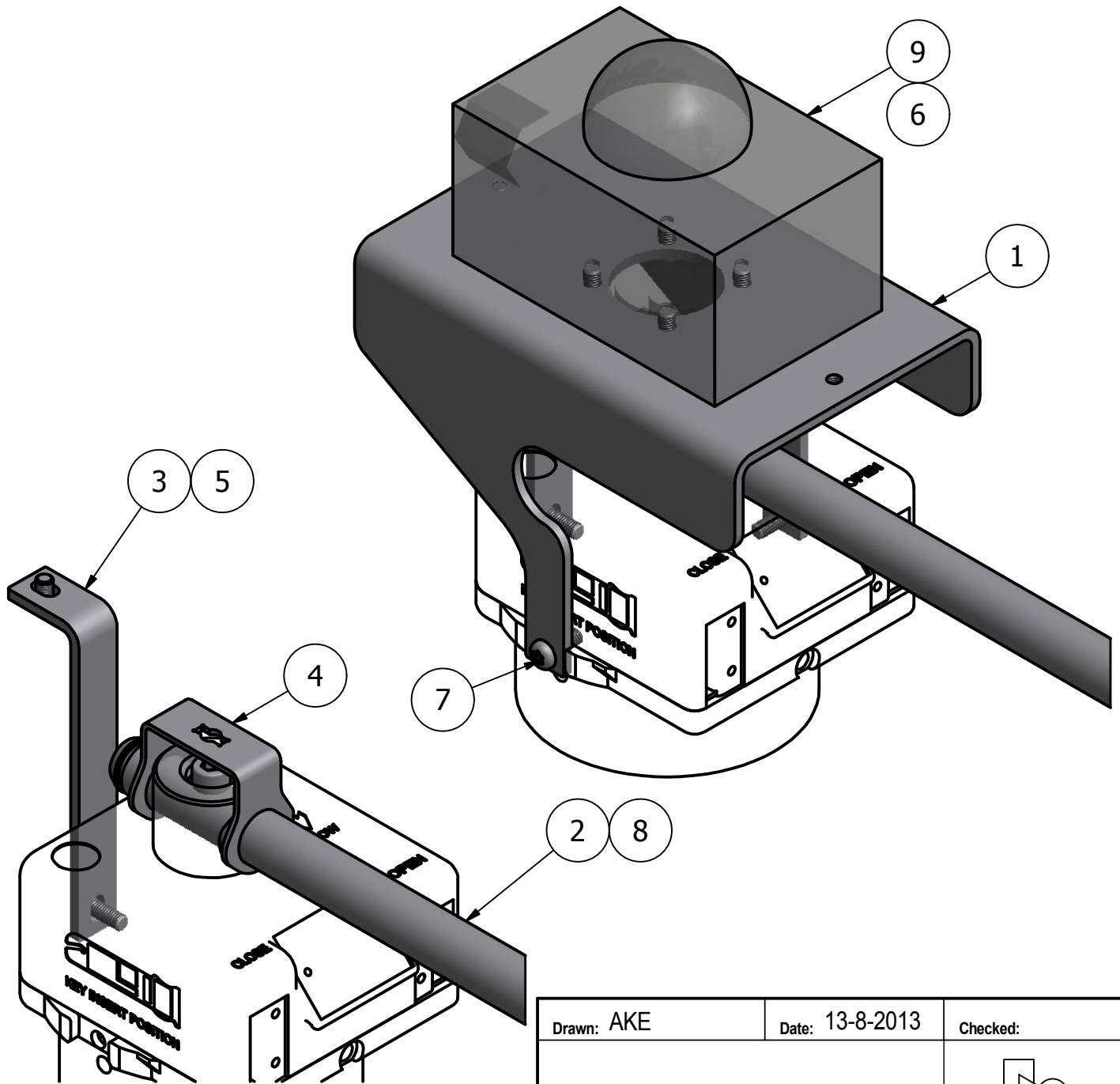
Projection:



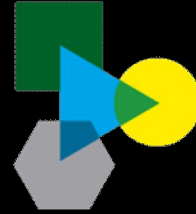
A4

# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-046_01	Bracket VPI
2	1	NLD12-046_02	MOD TO Lever (NL-125 430)
3	1	NLD12-046_06	Support
4	1	NLD10-086_02	MANIPULATOR
5	1	Resistorx M6 x 8	Resistorx - Metric
6	4	Resistorx - M6 x 10	Resistorx - Metric
7	3	Resistorx - M6 x 16	Resistorx - Metric
8	1	DIN 912 - M8 x 12	Cylinder Head Cap Screw
9	1	EVE21I01-73-IA-MS	SwitchBox



Drawn: AKE	Date: 13-8-2013	Checked:
Custom VPI EVE NDL		
Drawing: NLD13-139_00	Units: mm	Projection:
		A4



## Valve Control



Have FAITH in your partial stroke test!

**FAITH - pp**  
Partial stroke test system

Reliability matters



The NETHERLOCKS FAITH system is a good example of a simple and reliable solution to perform a partial stroke test. (FAITH: Fail Action Test Handling System)

The FAITH is integrated into the static and dynamic coupling and replaces the original coupling and spool piece. During a test, the FAITH is a mechanical blocking mechanism and ensures that the dynamic coupling can only turn a preset amount e.g. 20 degrees. Any degree of angle is possible.

The FAITH system is customised to fit; and electronics can be added to create feedback to the control room to monitor the test.

#### FMEDA

A FMEDA report by Exida is available. The FMEDA considers the FAITH System PP-Series as a component of the valve-actuator combination. The failure rates of the FAITH System PP-Series must be added to the failure rates of the valve-actuator combination when determining the PFD AVG and Safe Failure Fraction (SFF) for the final element.

The FMEDA done by Exida includes a 'Test Time PFD AVG' for increased probability of failure in case ESD demand occurs during testing.

We can conclude that the FAITH can be used within SIL3 applications despite the risk of an ESD occurring during testing. The chance of a false trip during testing - occurred by overshoot of the valve - must be counted as much more serious!

#### Why perform a PARTIAL STROKE TEST

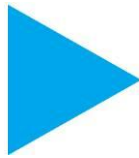
Partial stroke testing is of major importance to end users, as an important safety step to ensure that an ESD or HIPPS valve will operate as intended when needed. All valves can degrade and become worn or stuck over time, so something as vital as an ESD must be tested frequently. Therefore, the IEC61508 & IEC61511 highly recommends testing of all the ESD and HIPPS valves on a regular time schedule.

A partial stroke test enables testing without halting process flow, meaning tests can be carried out more easily and more often, which should both ensure proper operation and also reduce the deterioration of the valve.



**FAITH Guarantees no overshoot of test angle so no effect on the spurious trip rate (STR)**





## Why choose NETHERLOCKS "FAITH"

1. The danger in partial stroke testing is that the valve might overshoot the test angle. With the FAITH system we guarantee no overshoot of the test angle, and therefore no effect on the Spurious Trip Rate (STR).  
Therefore it enables safe testing in a live plant and guarantees no production interruption due to a wrong test.
2. NETHERLOCKS developed a simple and 100% reliable mechanical solution to do a partial stroke test. The FAITH is easy to understand. There is no complicated software, no fragile wiring and prevents process interruption due to the test.
3. The NETHERLOCKS FAITH allows you to test all final elements (solenoid, Quick exhaust, pilot and shuttle valves) and does a real life test instead of a manipulated test at low speed.
4. What do you do when a test indicates a potential problem? Having the actuator in its FAITH position (blocked at e.g. 20 degrees) makes it possible to replace critical components at any time without interrupting the process. Without FAITH, control system components could only be replaced if the actuator is in its fail position. The FAITH can be used as a maintenance tool and can be added to an ESD system with an existing diagnostic PST system or smart positioner.
5. According to the IEC 61508, a PST needs to be witnessed, to start a test the FAITH is unlocked by means of a unique key and therefor forces the operator to initiate the test locally.

## Lock principle

During normal operation the FAITH system is no more than a spool piece and adapter. In case of an actual emergency situation the valve will close normally.

A unique key is used to unlock the FAITH and activate the test position. In the test position mechanical block pins are inserted into the adapter stopping it from rotating beyond a certain point. Any angle is possible, but for partial stroke testing typically an angle between 10-20 degrees is used to make sure the process flow is not interrupted. The test angle is specified by end user, and advice and recommendations are available from our specialist safety engineers.

This mechanical blocking system is custom made to the specifications of the actuator's break torque and a safety factor of 2.5 is used to stop the actuator.

## Types

We have different types available for both rotating and linear valves. For the rotating valve principle we can work with 1 or 2 pins depending on the size and torque of the actuator.



## Materials

All locking and blocking components are made out of Stainless steel 316. The adapter and bracket are made of steel, the bracket is powder coated as standard but can be coated to client specifications.

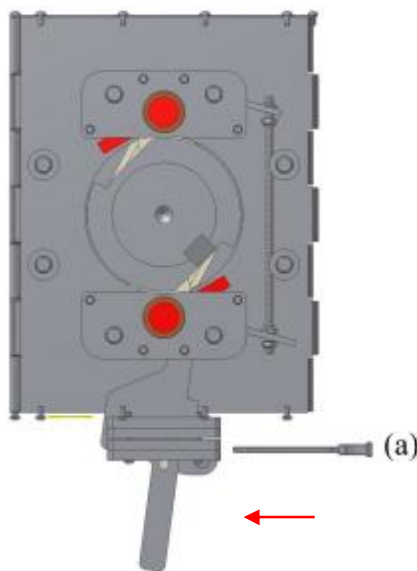
## Key operation

The test mechanism is initiated by inserting a key. You can choose to have one key for all systems or a unique key for every system. During testing the key is trapped and the key can only be removed when the system is in normal operation. Once the key is removed it is kept in the control room to guarantee the system is NOT in test and to lock the FAITH for unauthorized operations. A special key cabinet (CKC) is available to store the unique keys in an orderly manner.

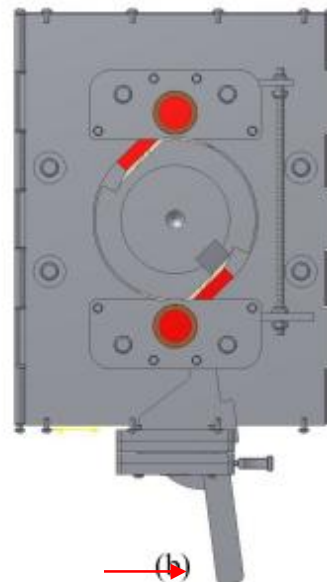


## Test procedure

During normal operation, the key is in the control room. The valve can be operated freely, so it can be opened or closed when necessary. When the valve needs to be tested, the following procedure must be followed:

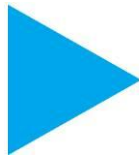


(a) Insert the linear key into the FAITH system to release the handle



(b) Turn the handle to move the blocking pins into place for testing. The key is now trapped.

The system is now ready for testing. The blocking pins will restrict the linear or rotating movement of the actuator to the requested percentage. After testing, when the actuator is back in its original position, turn the handle and release the key to lock the handle and return key to the control room.



### Available options

The system is fully custom made to fit, not only the sizing but also several options are available to customize the procedure or to create additional feedback for control systems.

### Limit switch

A limit switch can be integrated to identify that the FAITH is in test mode and that the actuator is physically blocked. The signal can be used as an integral part of the operating sequence but is not a critical part of the mechanism.

### Features:

- Testing without critical wiring & software,
- Test all final elements
- Components replacements at any time,
- Hardware testing, no electronic output checking,
- Test is done in accordance at real speed,
- Purposed designed, compact and strong,
- SIL 3,
- Lockable with the linear NETHERLOCKS key,
- Robust, maintenance-free, simple and reliable,
- Optional, an electric switch for remote test start,
- Can be used on either linear- or rotary actuators,



### Summary

A FAITH system makes it possible to increase the plant safety. Each actuator can whenever preferred been tested without stopping the production or starting complicated electronic protocols.

We keep it simple and reliable, a mechanical partial stroke device is the only 100% guarantee to get a full stop at the requested angle and so no chance to overshoot the test angle and create a plant shut down due to a failed test.

The FAITH system SIL 3 rated and is custom made to your equipment and test requirements.

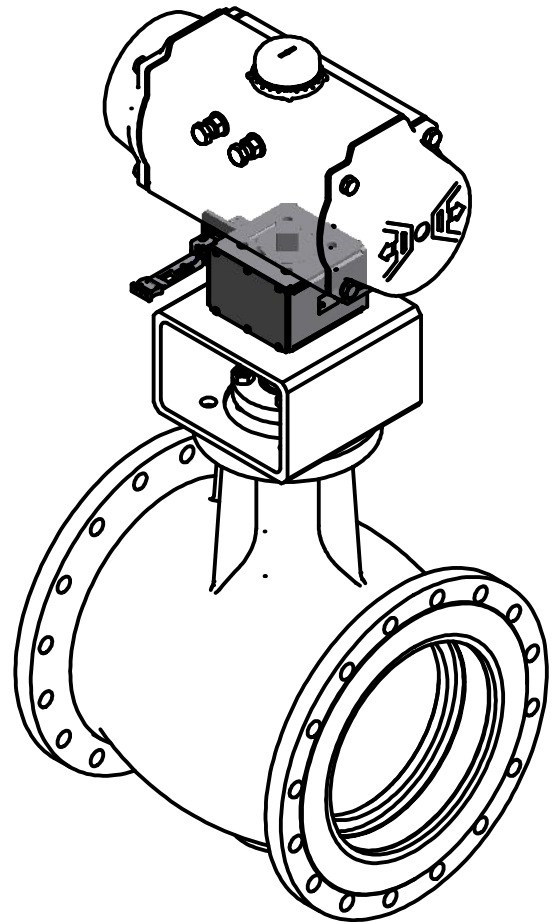
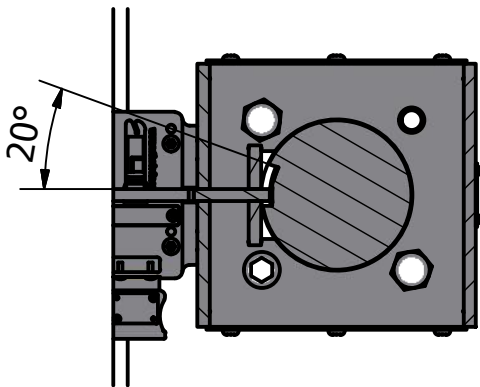
The FAITH can also be used as a maintenance tool by itself or in addition to existing diagnostic test equipment.

**FAITH is SIL 3 rated by Exida**

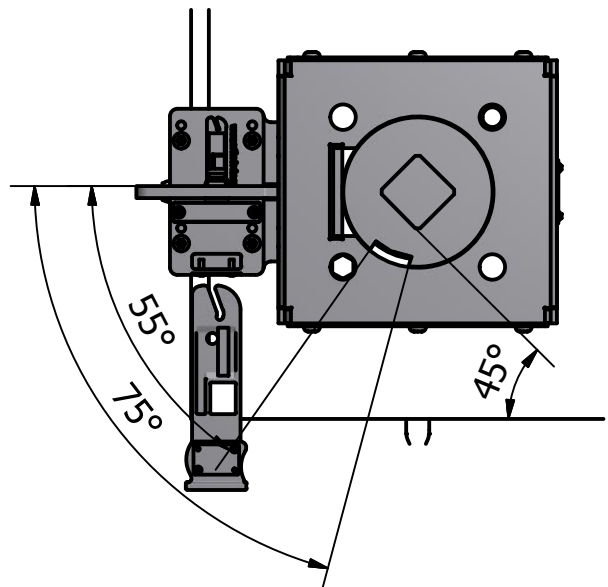
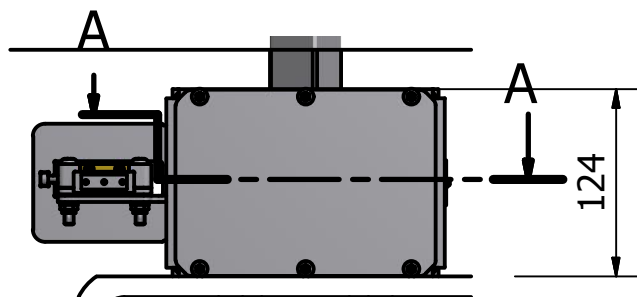
# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	F-0256_20	FAITH F14

Drawn in Open State  
 Closing CounterClockWise  
 Stopped at 20degrees  
 Insert Key for Partial Stroke Test

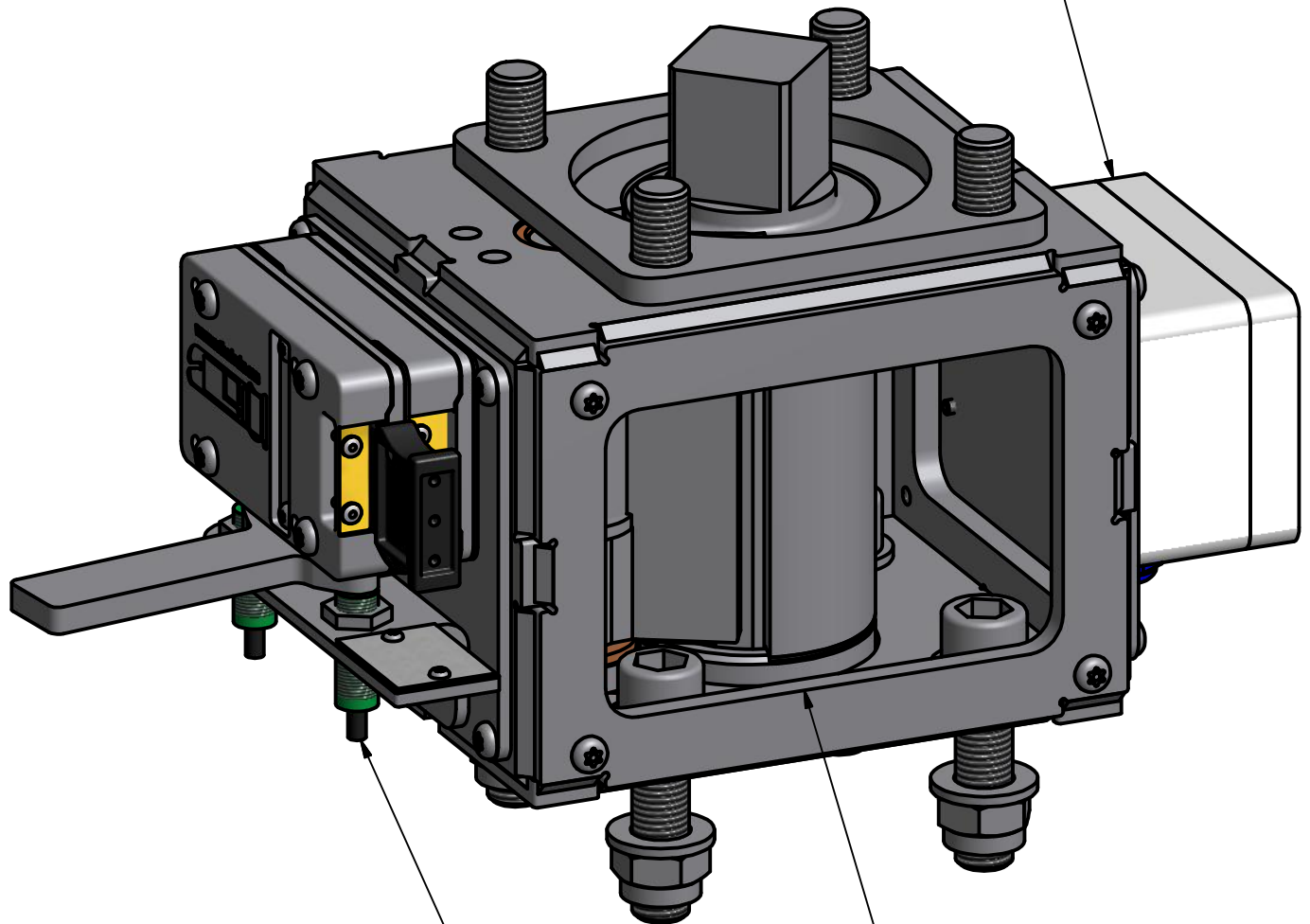


Drawn in Closed State  
 Top View



Drawn: AKE	Date: 29-1-2014	Checked:
VETEC FTC F14 1100Nm 20d of 75d		
Drawing: F-0256_00	Units: mm	Projection:
		A4

JUNCTIONBOX WITH  
M20 GLAND FOR  
CLIENT CONNECTION





PLEXIGLASS WINDOW

1X SENSOR FOR NORMAL OPERATION  
1X SENSOR FOR TEST POSITION

STAINLESS STEEL SYSTEM  
NOT COATED

Sheet 3 of 3

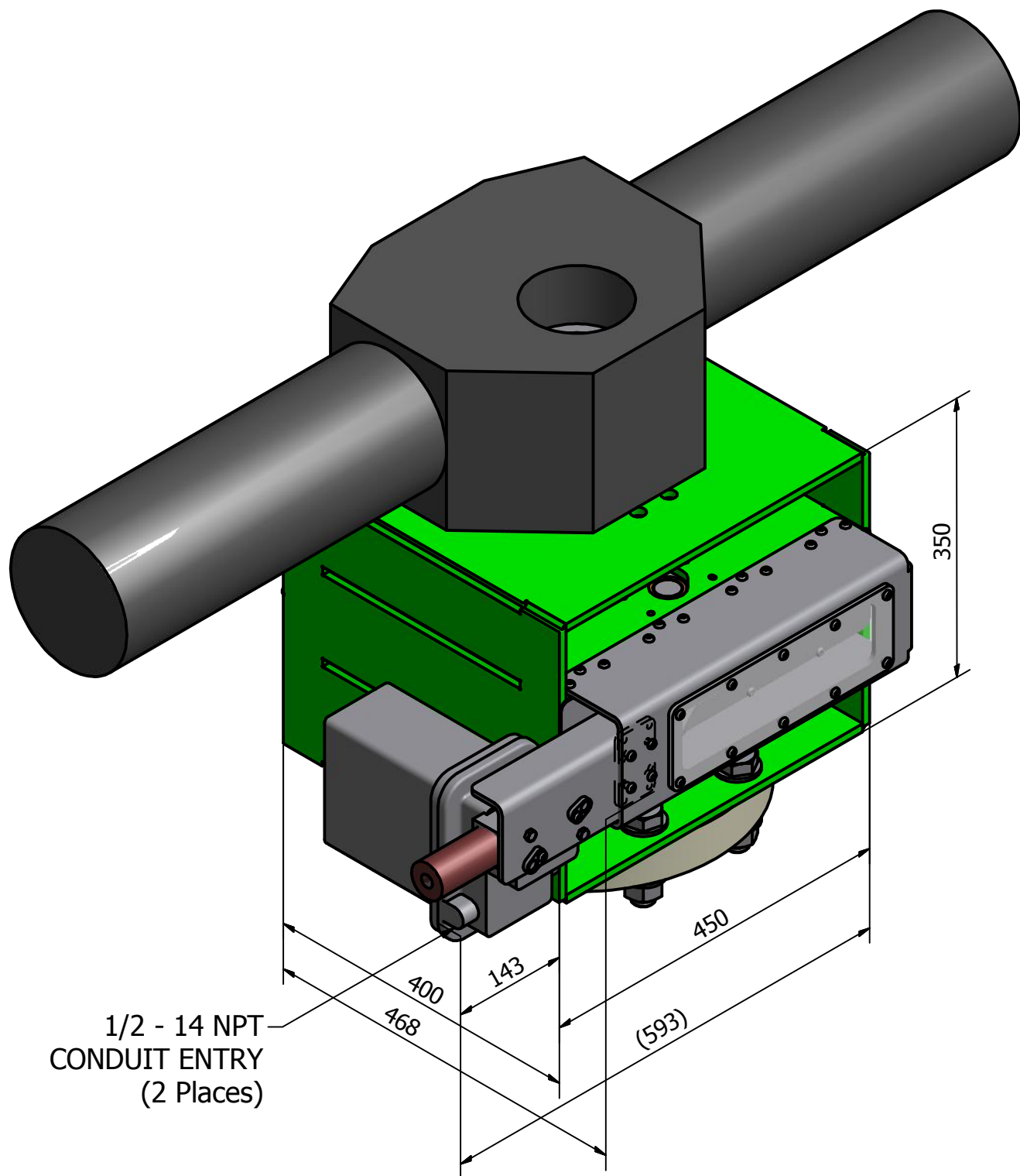
Drawn: PLL	Date: 26-11-2013	Checked:
FAITH 15-DEGREES FTC 1760Nm		
Units: mm	Projection:	A4
Drawing: F-0254_00		



	6	5	4	3	2	1
ITEM	QTY	PART NUMBER	DESCRIPTION			
1	1	F-0192_03	Bracket Weldment			
2	1	F-0192_09	COVER BACK SIDE			
3	1	F-0192_10A	COVER LOCK SIDE			
4	2	F-0192_11	LOCKPIN			
5	1	F-0192_15	Lever			
6	2	F-0192_16	MANIPULATOR			
7	1	F-0192_18A	ADAPTOR			
8	4	F-0192_19	KEY (KEY-STEEL)			
9	4	F-0192_21	Bearing Support			
10	1	F-0192_22	Faith Sticker			
11	1	F-0192_23	Faith State Sticker			
12	1	F-0192_30B	Actuator Mount			
13	1	F-0192_31	Actuator Bracket			
14	1	F-0192_32	Filler Part			
15	1	F-0192_33	Window			
16	4	F-0104_10	BEARING			
17	16	DIN 933 - M8 x 16	Hex-Head Bolt			
18	4	71802-CS13/M8				
19	2	NL-135	Boltcover 1_4"			
20	22	Resistorx - M6 x 10	Resistorx - Metric			
21	14	Resistorx - M6 x 12	Resistorx - Metric			
22	25	Resistorx - M6 x 16	Resistorx - Metric			
23	1	Resistorx - M6 x 25	Resistorx - Metric			
24	2	DIN 912 - M8 x 16	Cylinder Head Cap Screw			
25	2	DIN 912 - M8 x 20	Cylinder Head Cap Screw			
26	1	DIN 975 - M12	THREADED BAR M12-240			
27	1	DIN 985 - M6	Selfretaining Nut			
28	1	PBV BALLVALVE 18"	PBV BALLVALVE 18"			
29	1	BETTIS 43HD				
30	1	LA-1000 [0.75-3 A12.38]	Actuator + Options (D042 & D043)			
31	4	ANSI/ASME B18.2.1 - 1/4-20 UNC - 1	Hex Bolt - UNC (Regular Thread - Inch)			
32	1	----- Not In Scope of Supply	Parts Below			
33	8	ANSI B18.2.1 - 1-8 UNC - 4	Hex Cap Screw			
34	8	ANSI/ASME B18.2.1 - 5/8-11 UNC - 1,5	Hex Bolt - UNC (Regular Thread - Inch)			
35	8	ANSI B18.2.2 - 1 - 8	Hex Nuts (Inch Series) Hex Nut			
36	2	ISO 7089 - 24 - 140 HV	Plain washers - Normal series - Product grade A			
37	16	ISO 7089 - 27 - 140 HV	Plain washers - Normal series - Product grade A			
38	8	ASTM F436 - 5/8	Washer A			

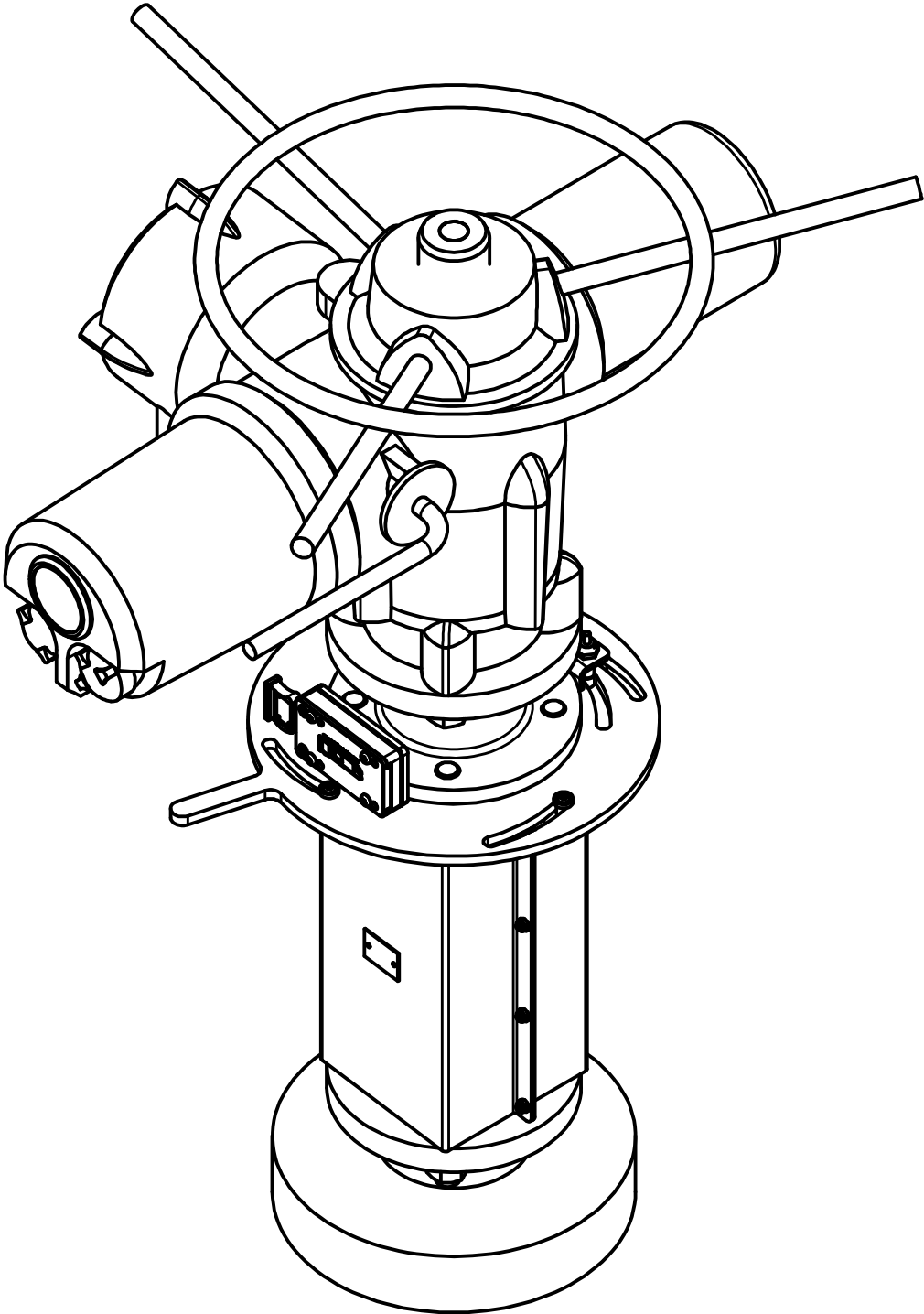
Drawn: AKE	Date: 19-10-2011	Checked:
Bettis 43DH 17000Nm on PBV 18"		
Drawing: F-0192_00B	Sheet 1 of 3	Projection: <b>A3</b>

© Netherlocks Safety Systems B.V.

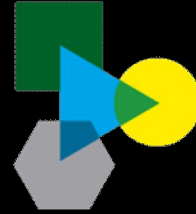


Drawn: AKE	Date: 19-10-2011	Checked:
Bettis 43DH 17000Nm on PBV 18"		
Drawing: F-0192_00B	Sheet 2 of 3	Units: mm Projection:
		<b>A4</b>

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD12-013_01	Spindle Connection Lower Part
2	1	NLD12-013_02	Spindle Connection Upper part
3	1	NLD12-013_03	Spindle Tr48x12(P6) LH
4	1	NLD12-013_04	Actuator Coupler
5	1	NLD12-013_05	Locking Base
6	4	NLD12-013_06	Lock Bolt
7	1	NLD12-013_07	Lock Bolt Operating Disc
8	1	NLD12-013_08	BL-L Mounting Plate
9	4	NLD12-013_09	Operating Roller
10	4	NLD12-013_10	Operating Pin
11	4	NLD12-013_11	Mounting Stud
12	2	NLD12-013_12	Protection Cover
13	1	NLD12-013_13	Plastic Guide L=645mm
14	1	NLD12-013_14	Sensor Bracket
15	2	NL-129	Filler plate BLL
16	1	NL-901	BLL-R11
17	1	UNKNOWN GATE-10	
18	1	UNKNOWN GATE-10 - ENDSTOP	
19	1	IQ35_THW+AZ-1	
20	1	PF-NJ2-12GK-N	PF SENSOR
21	2	PF-M12-Nut	PF NUT M12x1 (Supplied with Sensor)
22	14	Resistorx - M6 x 12	Resistorx - Metric
23	8	Resistorx - M6 x 25	Resistorx - Metric
24	8	DIN 125 - A 21	Washer
25	8	DIN 912 - M6 x 35	Cylinder Head Cap Screw
26	6	DIN 912 - M12 x 25	Cylinder Head Cap Screw
27	6	DIN 916 - M8 x 8	Hexagon Socket Set Screw
28	4	DIN 933 - M20 x 55	Hex-Head Bolt
29	4	DIN 934 - M20	Hex Nut
30	8	DIN 985 - M6	Selfretaining Nut



Drawn: RH	Date: 2-2-2012	Checked:
LINEAIR FAITH HV1110		
Drawing: NLD12-013_00	Units: mm Projection:	A3

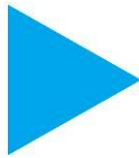


## Valve Control



## KMS Power Tool

Reliability matters

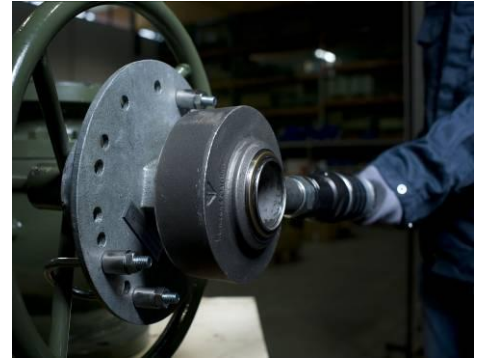


## General:

The NETHERLOCKS power tool (KMS) is a pneumatic handheld actuator that can be used to operate hand wheel operated valves. The KMS removes the strain from the operator and saves a significant amount of time.

The tool is connected to the valve through a universal coupling that is easy to install with U-bolts. Multiple couplings can be used, and one tool can be used for multiple valves.

Just install the coupling with U-bolts, connect the tool to an air supply and operate the valve 40 times faster!



One actuator can be used on multiple valves and not each valve has to be mounted with an individual drive unit.

## Reduce strain

When operating large sized hand wheel-operated valves that require many rotations to fully open or close, the NETHERLOCKS KMS can offer great advantages, especially when these valves require great forces to operate them.

The KMS will save you both time and money. Large valves that would normally take up to 2-3 hours of hand wheel turning to go from fully closed to fully open, can now be operated in under 10 minutes.



Because of the KMS' gearing ratio, stress on the operator will be reduced significantly which will help reduce injuries. A single person can easily operate larger valves by himself.

## Mounting parts:

The Universal adaptor that couples the valve's original hand wheel with the KMS handheld actuator can be bolted on without any modifications while your hand wheel remains intact.

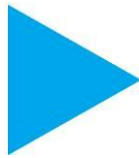
U-braces are supplied to mount the adaptors straight onto the hand wheels; a special hole-pattern is applied to fit hand wheels with various numbers of spokes.

The adaptors are equipped with a hexagonal shape that matches the female hexagon in the KMS' gearing.

Adaptors can be mounted as permanent or just temporarily.







## Operation:

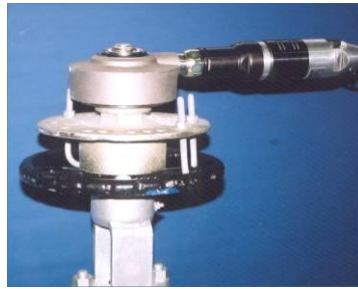
The KMS drive has a variable speed control that can easily be controlled by means of a 'throttle' at the back of the handle.

It is also equipped with an additional emergency button so that 2 hand operation is mandatory. A knob is used to easily change the KMS rotation from clockwise to counter-clockwise.

NETHERLOCKS KMS is air driven and can be used in any possible environment.



Valve is closed, KMS is placed on top of adaptor



Operate; press emergency button and twist-turn 'throttle'



Valve is open, remove KMS handheld actuator

## Maintenance

We highly recommend the use of a lubricator and air filter to assure proper working. We have a protection box available which includes a lubricator and air filter.

If the protection box is not used, 2.5 cc of oil should be poured into the air inlet bushing before use.

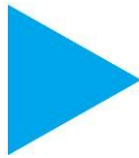
Recommended oil is Ingersol – rand pneu- lube light oil nr. 10

## Safety

- o The tool requires 2-hand operation and incorporates an EMERGENCY LEVER
- o Releasing one of the two hands will stop the KMS immediately
- o The operator should position themselves in such way that the KMS moves away from their body
- o The gas throttle allows a controlled build-up of torque and speed.

## Technical data:

Type	Length mm	Air Need <i>l/min</i>	Speed without load <i>rev/min</i>	Safe operating pressure <i>bar</i>	Recommend ed pressure <i>bar</i>	Torque at recommended pressure <i>Nm</i>
KMS	1182	1860	75	4-7	6,2	480



## Maintenance:

Like any other air-driven tool, NETHERLOCKS' KMS needs to be lubricated. This is done automatically if below mentioned storage box or protection unit is used. Should this not be the case, then it is advised to add some lubricant every 2 months through the air inlet of the KMS tool.

## Features:

- o One actuator can be used on multiple valves
- o Adaptors can be mounted as permanent or just temporarily
- o Operate the valve 40 times faster
- o Throttle allows a controlled build-up of torque and speed
- o Tool requires 2-hand operation and incorporates an emergency lever
- o Hole for rising spindle

## Optional:



### Storage box (type 103 000):

To safely store the KMS handheld actuator, together with its hose, a storage box is available that includes an air filter, pressure gauge, a lubricator and 20 meter hose reel.

Material box: Aluminum



### Protection unit (type 103 200):

This unit consists of an air filter, Pressure gauge and lubricator



### Hose reel (type 103 008):

20 meter air hose on reel.

## KMS:

To work more efficiently and to assist your plant operators further with the operation of the larger valves or high rotation valves, which can often be found located around a pig launcher/receiver. Netherlocks have the KMS, a hand held portable actuator.

### – PORTABLE AIR DRIVEN VALVE ACTUATOR –

The KMS is a time- and cost saving device. For valves taking Up to 4 man hours to open and close, the KMS actuator will Perform the same work in 10 minutes with only one operator.

Since it's an air driven actuator, it can be used throughout a process plant and even in an offsite location, where a process air supply is available.



The universal mountable drive plate assures that the actuator can be used on all types of valves. The actuator has an adjustable air-in twisting handle/valve. It is reversible also (a dead man's handle for HSE).

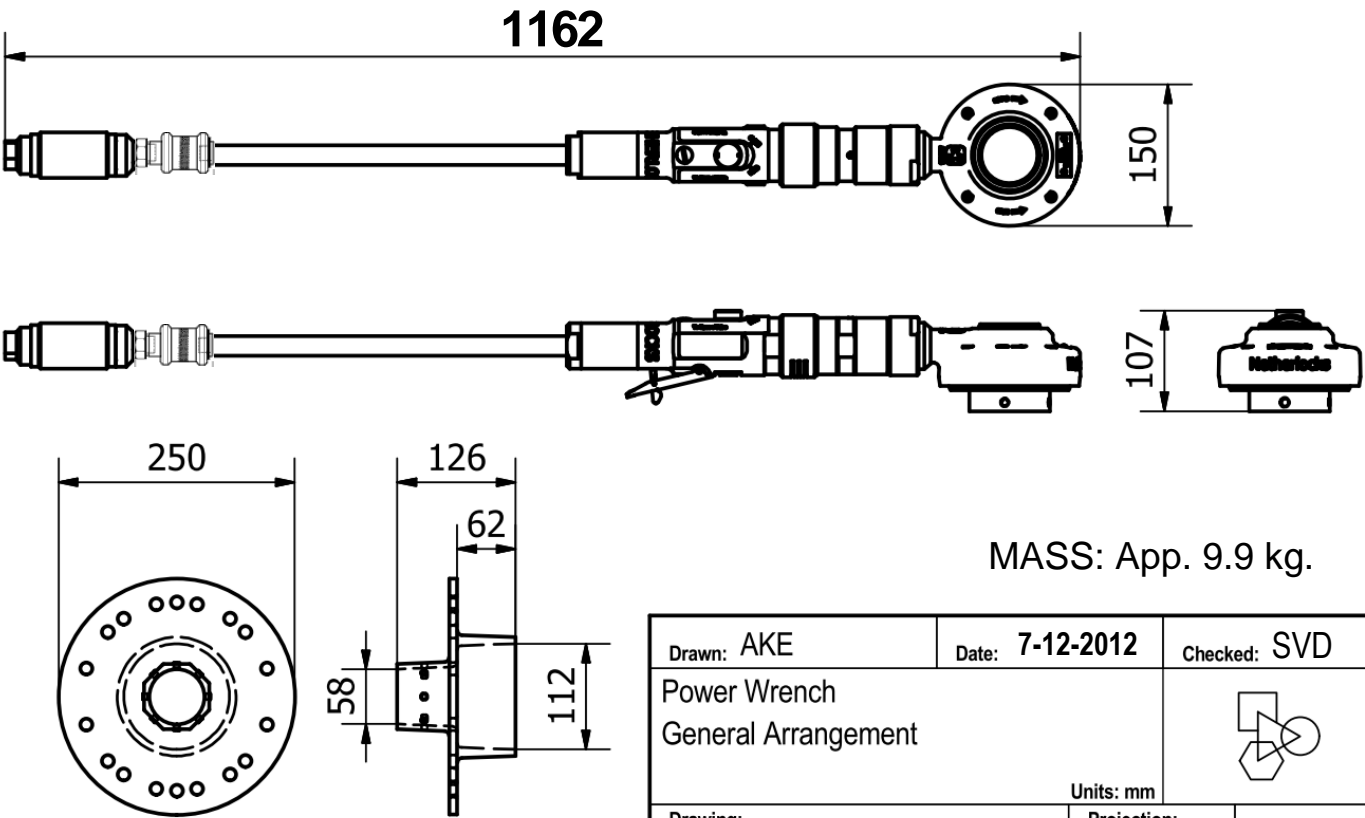
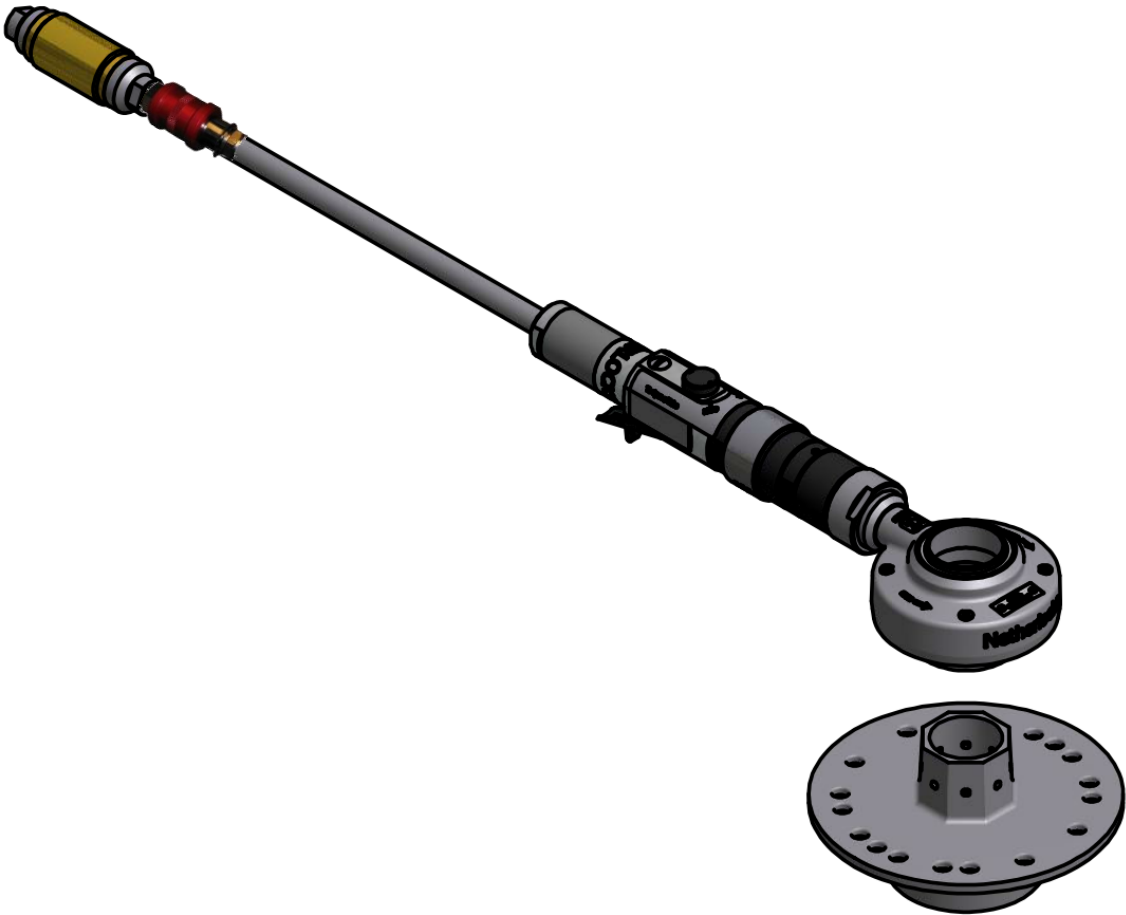
For a proper storage we can provide a special box with an integrated air filter, lubrication device, automatic hose reel and reduction valve to adjust speed and torque. It is to be stationary stored by the air outlet.



### Technical details

Type	Air consumption (l/min)	Speed without load (turns/min)	Safe operating pressure (Bar)	Recomm Pressure (Bar)	Torque at recom pressure (Nm)
101 100	1860	75	4-7	6,2	480
102 000	780	136	4-7	6,2	120

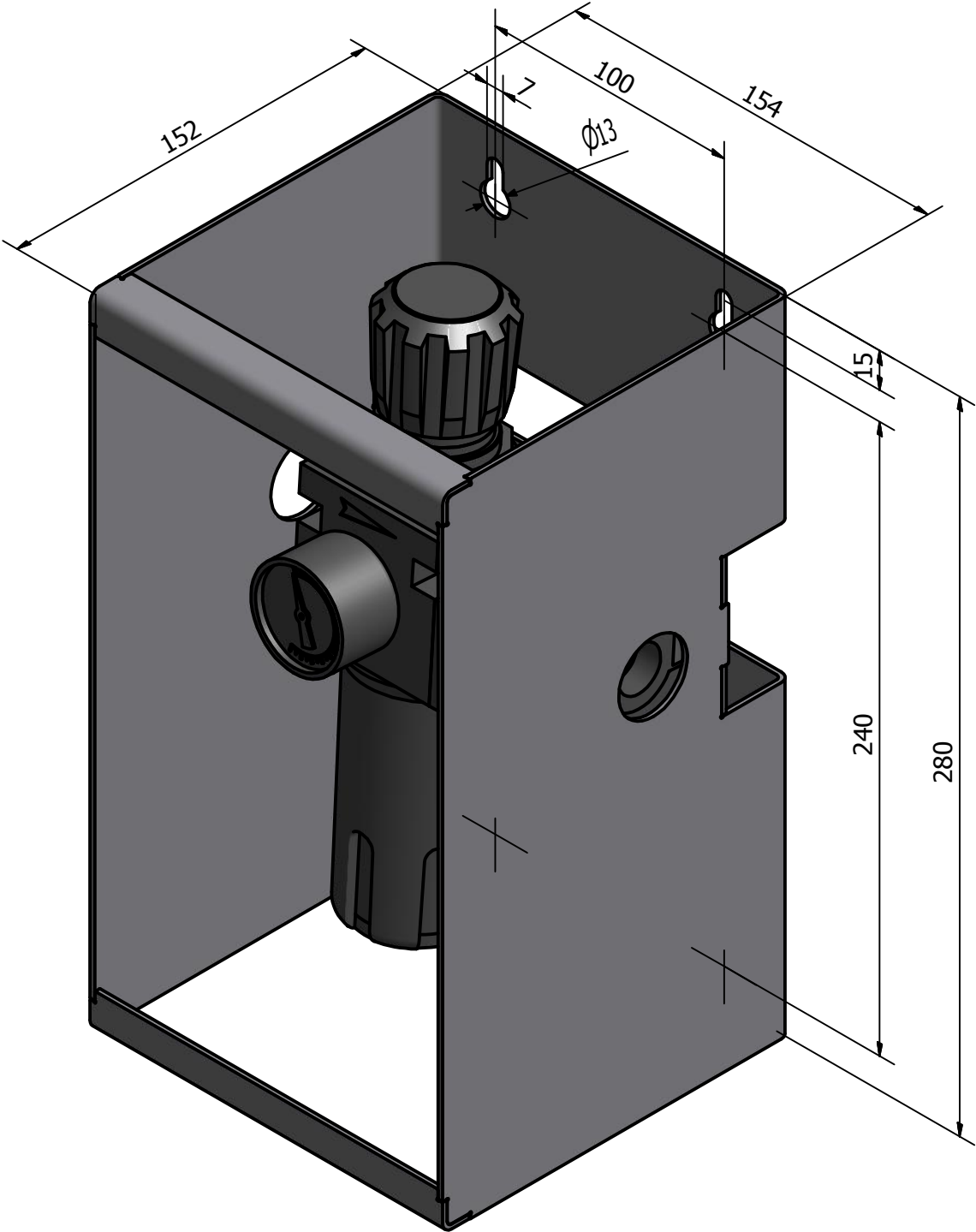
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-102_00-R3	Power Wrench
2	1	NL-351-R2	DrivePlate 50 (Default)




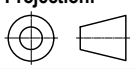
MASS: App. 9.9 kg.

Drawn: AKE	Date: 7-12-2012	Checked: SVD
Power Wrench General Arrangement		
Units: mm	Projection:	A4
Drawing: NLD11-102_00-R3-GA		

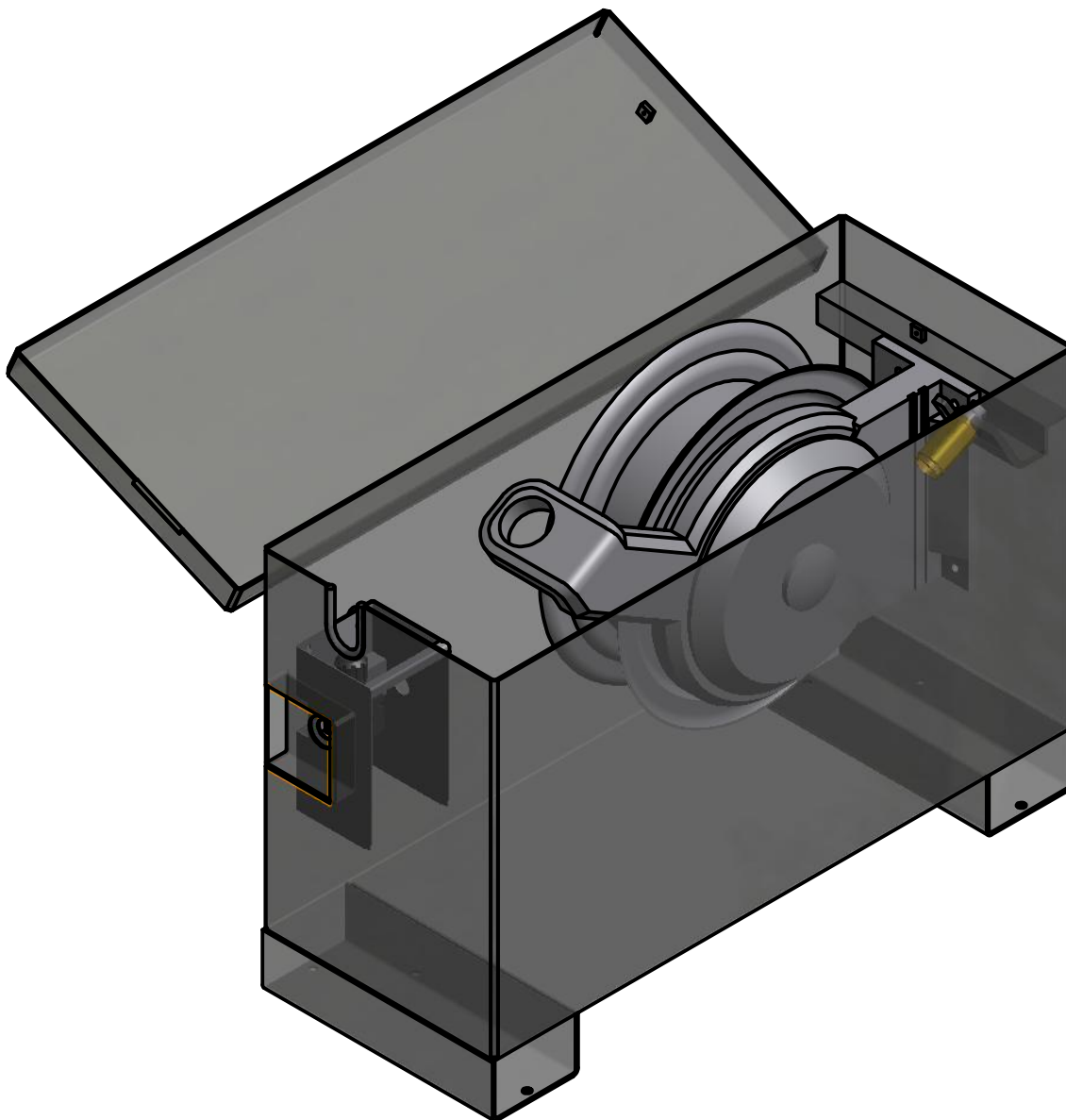
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD13-084_10	Lubrication Shell
2	1	PW-FilterLub	Lubricator PowerWrench





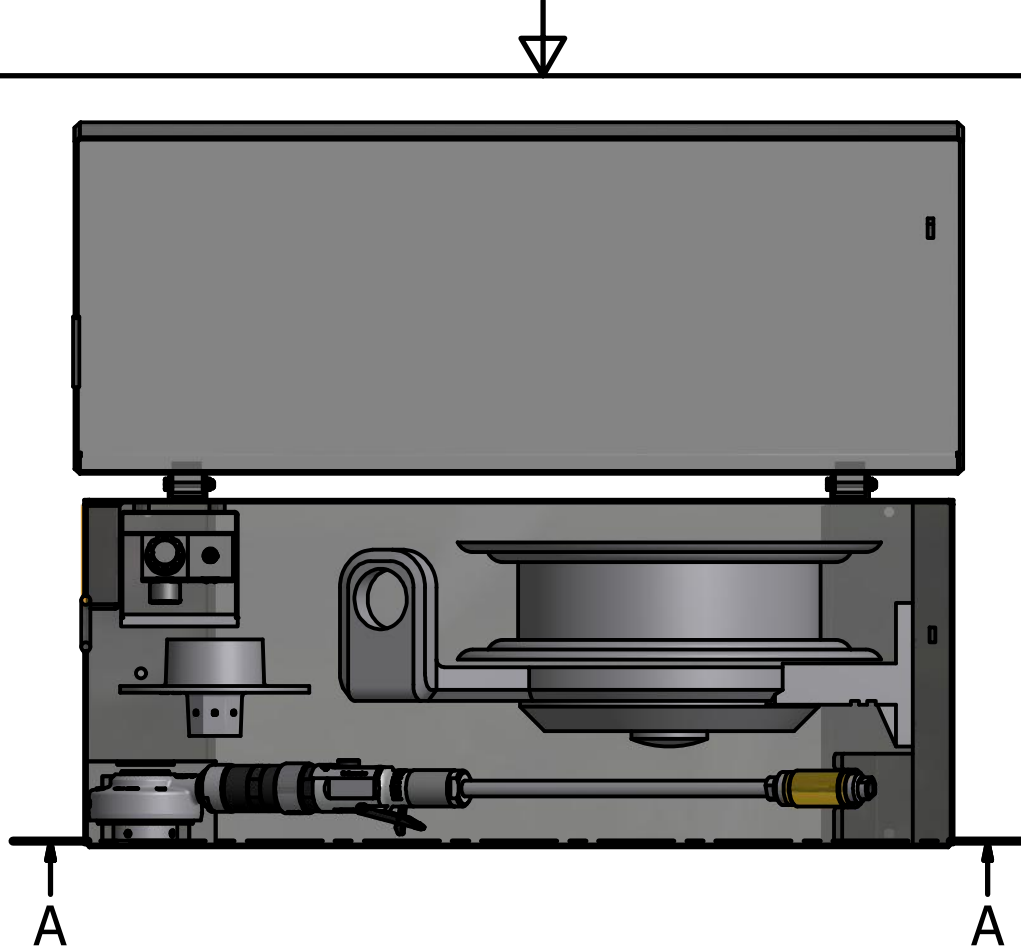
1/2" NPT Male Connections  
on both Sides

Drawn: AKE	Date: 16-8-2013	Checked:
Derived from DEV12-01 NL-PW Lubricator		
Drawing: NL-581	Units: mm Projection:	 <b>A4</b>

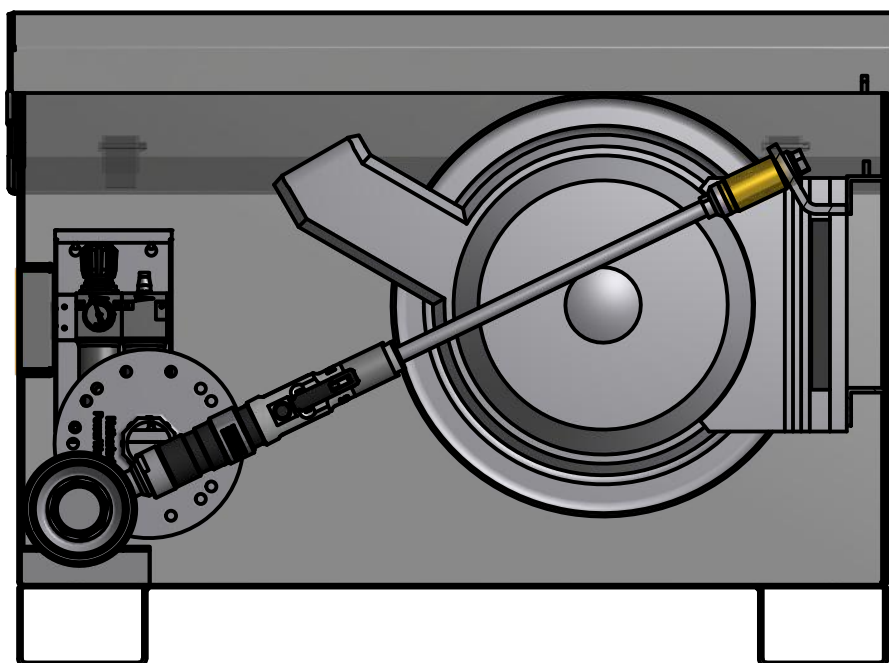






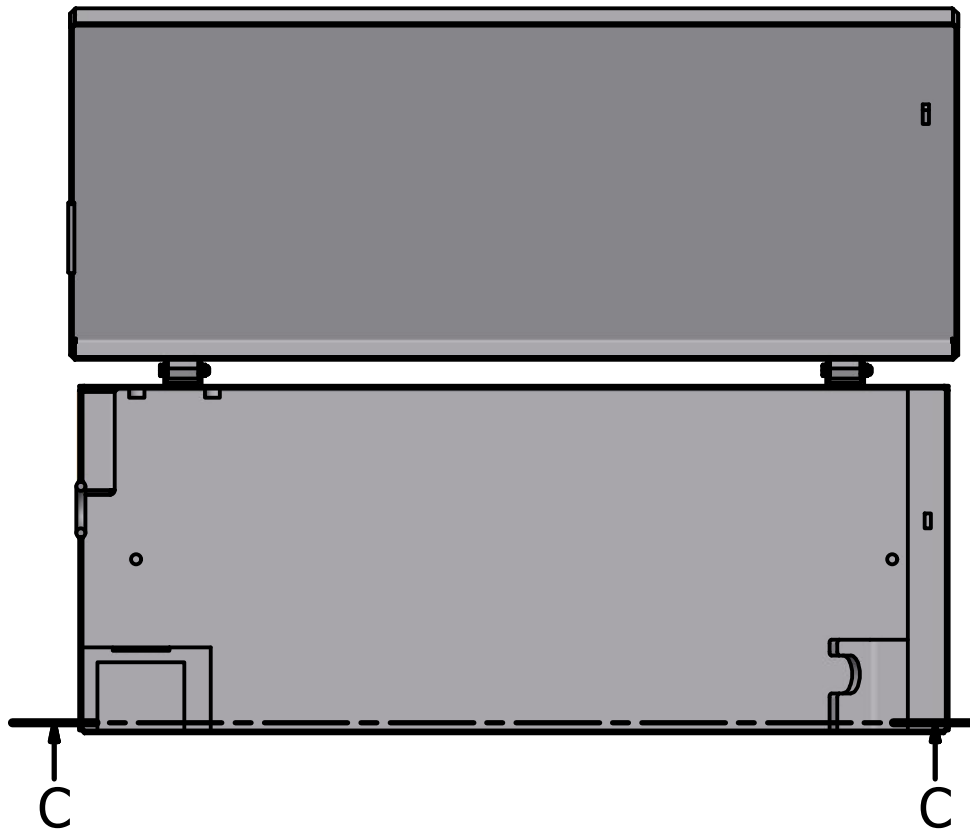
Drawn: AKE	Date: 18-6-2012	Checked:
NLD12-103 (NL-KMS StorageBox)		
Units: mm		
Drawing: NLD12-103_00	Sheet 2 of 4	Projection: 
		A4



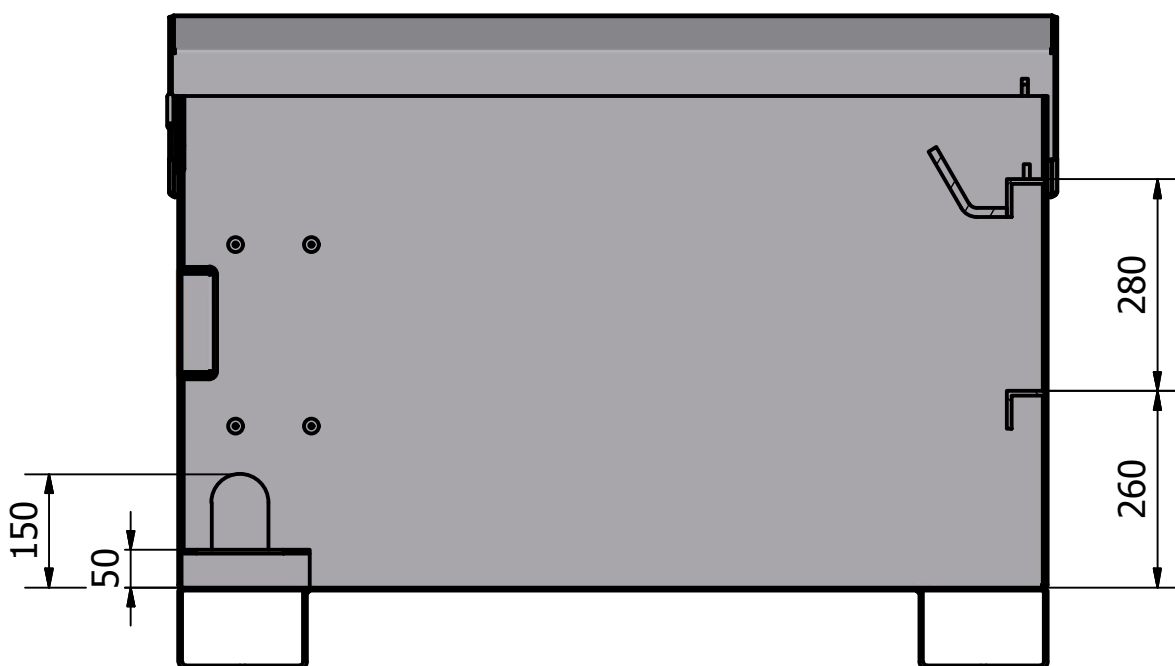
A-A ( 1 : 10 )

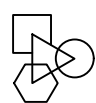



Drawn: AKE	Date: 18-6-2012	Checked:
NLD12-103 (NL-KMS StorageBox)		
Drawing: NLD12-103_00	Sheet 3 of 4	Units: mm Projection: 
		<b>A4</b>



C-C ( 1 : 10 )



Drawn: AKE	Date: 18-6-2012	Checked:
NLD12-103 (NL-KMS StorageBox)		
Drawing: NLD12-103_00	Sheet 4 of 4	Units: mm Projection: 
		<b>A4</b>



## SPRING RETURN DEVICES

### Spring Return Device

A **NETHERLOCKS** spring return device provides a solution where others manufacturers stop.

The device makes the valve closing when the lever of hand wheel is released.

Manual operated devices with higher torques are possible (up to 200 Nm).

These devices will have a custom made design.  
On request a mounting set to install the device direct onto your valve can be included.

Devices with a torque up to max 105Nm are lever operated.  
For torques from 90 - 105Nm the lever is equipped with a speed reducer for the closing stroke.

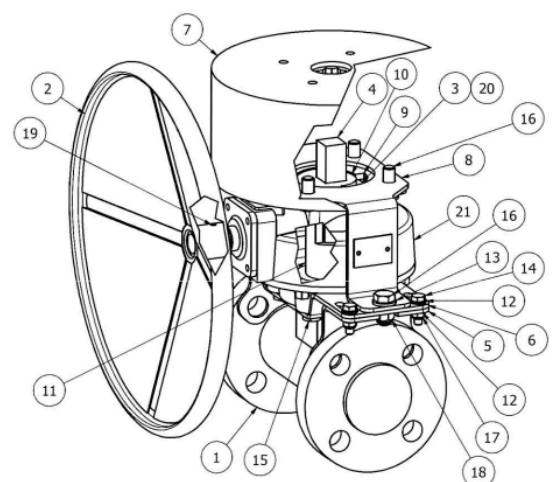
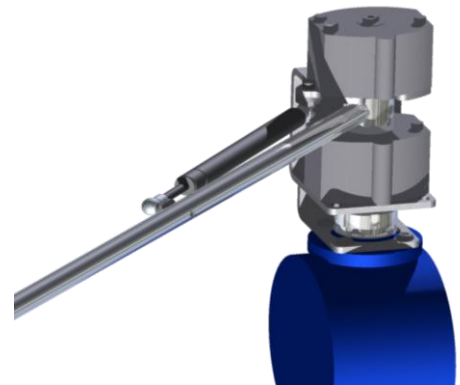
Spring material: 1.4310 stainless st.  
Housing material: stainless steel 316  
Coupling set: stainless steel 316

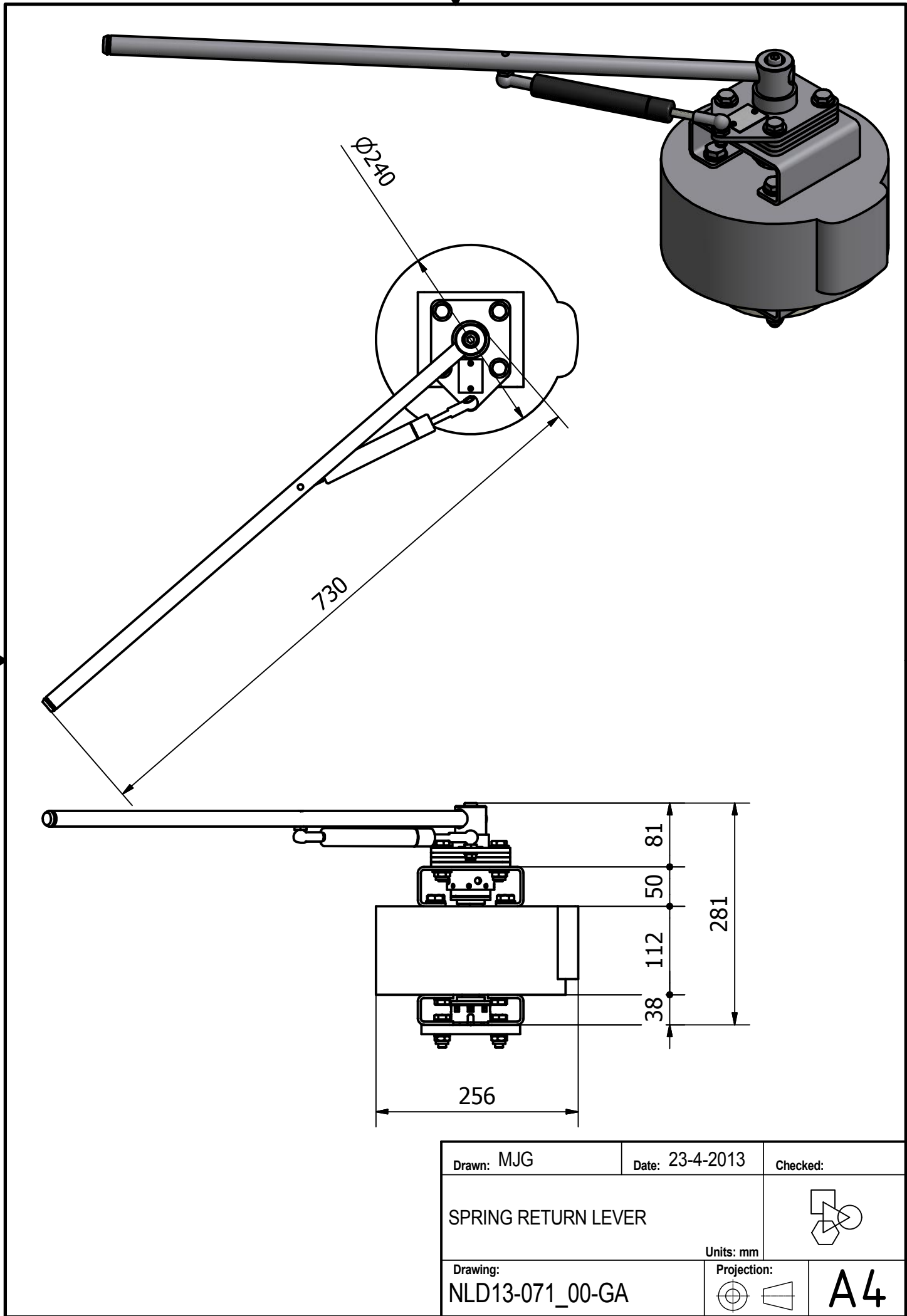
Devices with a torque 115-200Nm will be designed with a hand wheel operated gear to reduce the manual operating torque.

Gear operator: heavy coated steel  
Housing of the spring box: composite, fully enclosed

#### Features:

- Operating without critical wiring & software.
- No production loss.
- Purposed designed, compact and strong.
- Robust, maintenance-free, simple and reliable.
- To be used on either rotary valves.
- Is suitable torque up to 200 Nm.
- Optional: lockable with the linear **NETHERLOCKS** key.



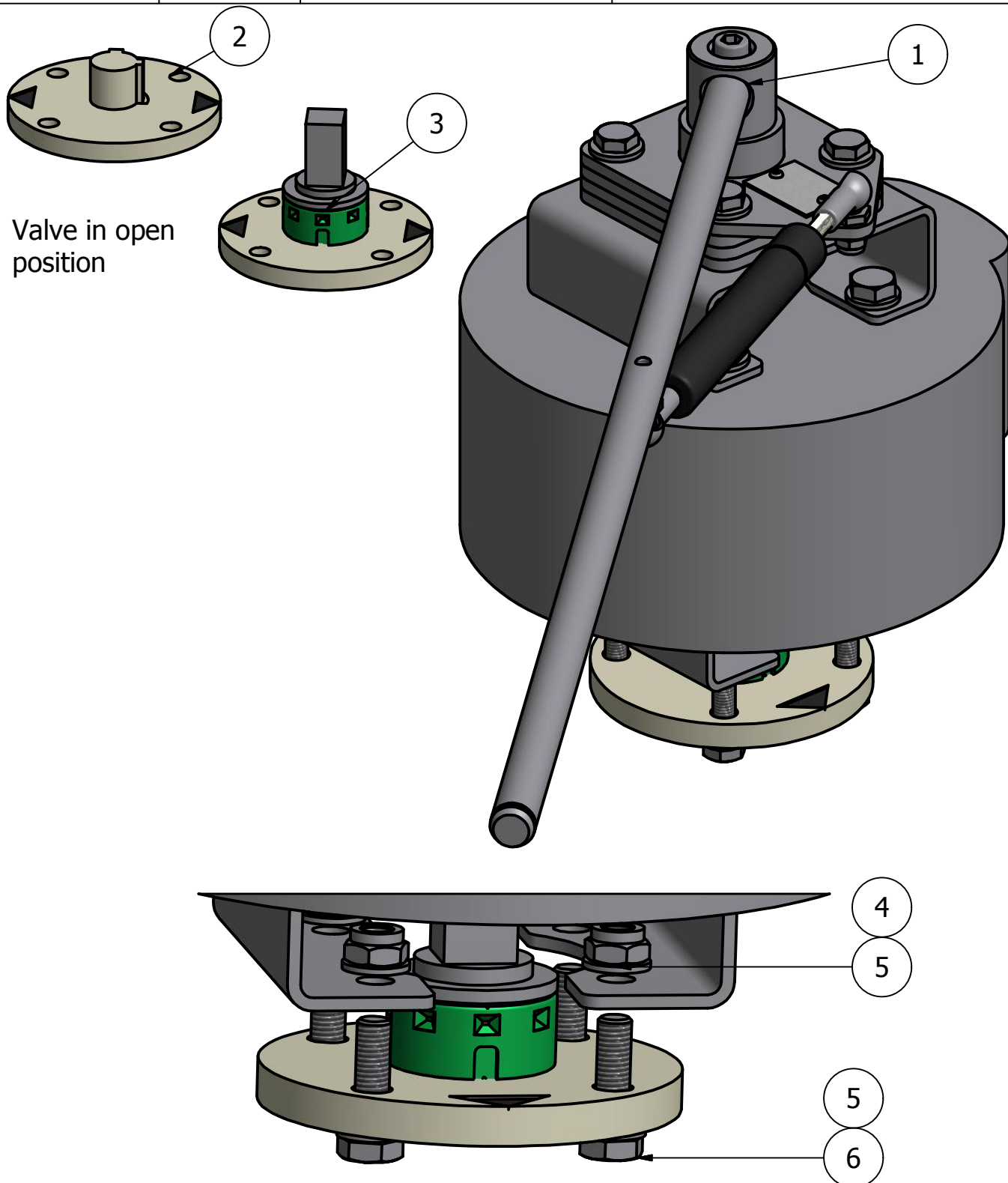


Drawn: MJG	Date: 23-4-2013	Checked:
SPRING RETURN LEVER		
Drawing: NLD13-071_00-GA	Units: mm	Projection:
		A4

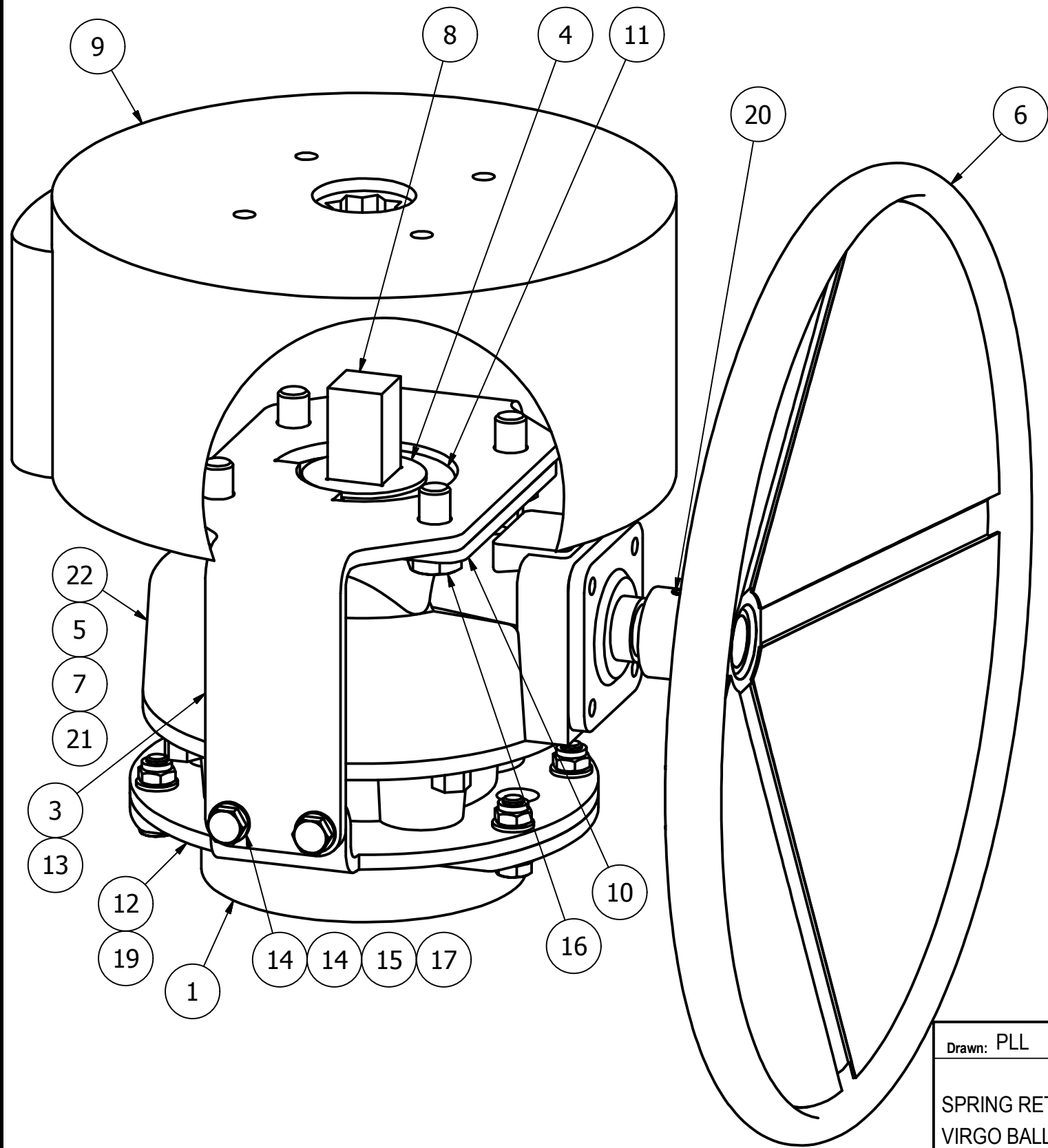


# PARTS LIST

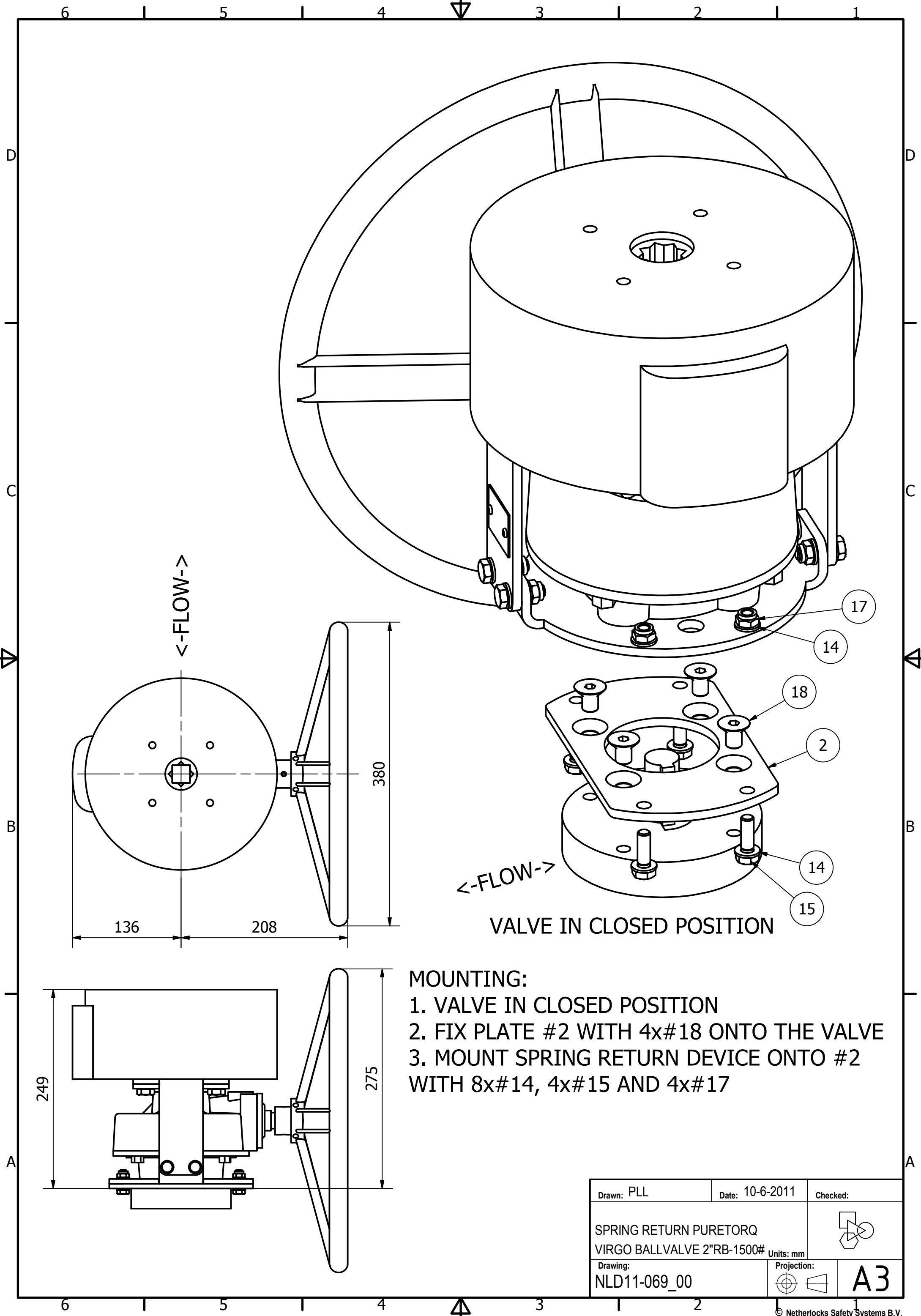
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD13-071_00	SPRING RETURN LEVER
2	1	NLD13-071_01	LCM BALLVALVE 2" RB-300#
3	1	NLD13-071_02	ADAPTOR WELDING
4	8	DIN 985 - M10	Selfretaining Nut
5	12	DIN 125 - A 10,5	Washer
6	4	DIN 933 - M10 x 35	Hex-Head Bolt



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD11-069_01	VIRGO BALLVALVE 2"RB-1500#
2	1	NLD11-069_02	BRACKET BALLVALVE
3	1	NLD11-069_03	BRACKET SPRING PURETORQ
4	1	NLD11-069_04	FILLER
5	1	NLD11-069_05	MOD. TO DriveBush K300
6	1	NLD09-116_02	WELDING HANDWHEEL
7	1	NLD09-116_05	GEARBOX COVER K300
8	1	NLD09-116_06	ADAPTOR
9	1	NLD09-116_09	PURETORQ VSR1000
10	1	NLD09-116_11	ENDSTOP
11	1	NLD09-116_12	ENDSTOP PLATE
12	1	NLD10-105_08	BRACKET GEARBOX K300
13	2	Resistorx - M3 x 6	Resistorx - M3x6
14	16	DIN 125 - A 8,4	Washer
15	8	DIN 933 - M8 x 25	Hex-Head Bolt
16	4	DIN 933 - M12 x 25	Hex-Head Bolt
17	8	DIN 985 - M8	Selfretaining Nut
18	4	DIN 7991 - M10x16	Hexagon socket countersunk head cap screws
19	4	DIN 7991 - M10x25	Hexagon socket countersunk head cap screws
20	1	ISO 8752 - 6 x 35 A	Spring-type straight pins - Slotted, heavy duty
21	1	RADIAL SHAFT SEAL 32x47x10	OK NBR E-MST 32x47x10
22	1	PROGEAR K-300	K300 STANDARD - F10



Drawn: PLL	Date: 10-6-2011	Checked:
SPRING RETURN PURETORQ VIRGO BALLVALVE 2"RB-1500#		
Drawing: NLD11-069_00	Projection: 	A3



- MOUNTING:**
- 1. VALVE IN CLOSED POSITION
  - 2. FIX PLATE #2 WITH 4x#18 ONTO THE VALVE
  - 3. MOUNT SPRING RETURN DEVICE ONTO #2 WITH 8x#14, 4x#15 AND 4x#17

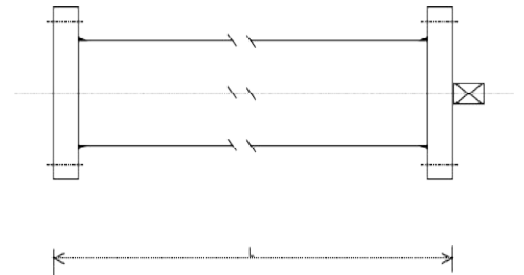
Drawn: PLL	Date: 10-6-2011	Checked:
SPRING RETURN PURETORQ VIRGO BALLVALVE 2"RB-1500#		
Drawing: NLD11-069_00	Projection: 	<b>A3</b>



## Valve Control, SPINDLE EXTENSIONS

### Spindle Extensions

As a supplier of add-on products for valves, spindle extensions do fit in the NETHERLOCKS range too.



Technical information:

- o Flanges: F05, F07, F10, F12, F14, F16
- o Length: on clients specification
- o Material: carbon steel
- o Flanges + tube: powder coating
- o Spindle:
  - o no coating
  - o male-female connection. All common standards are possible.
  - o bearing on top side of the extension

#### Options

- o Support on top of the extension available as an option.
- o Stainless steel version available as an option



#### Special items

Special models, custom made on clients request are possible.

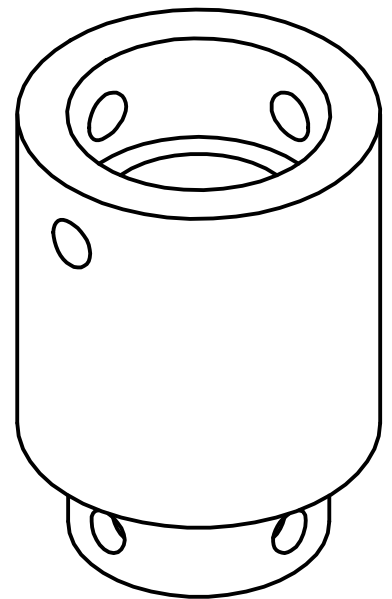
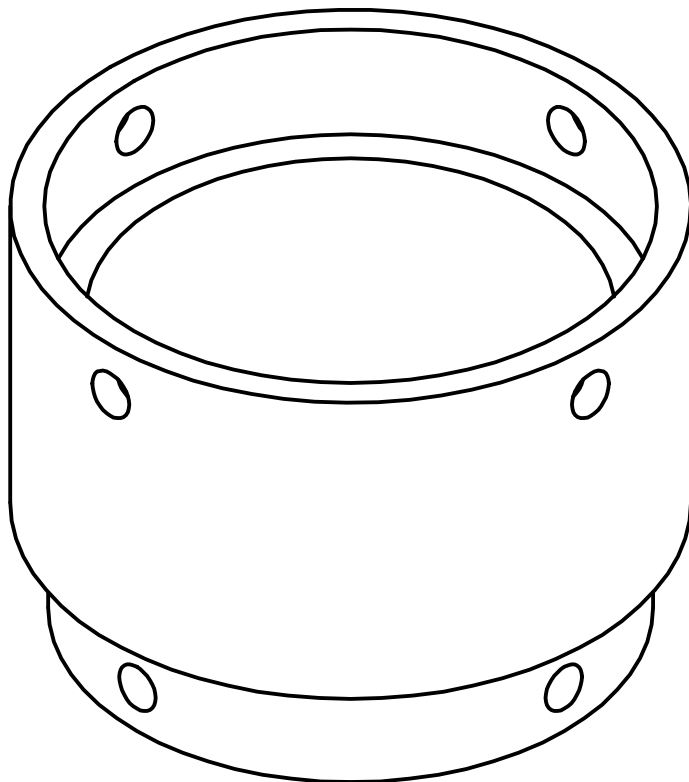
NETHERLOCKS spindle extensions can be equipped with valve interlocking devices.





# PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD13-058_01	HW Extension Large 50mm
2	1	NLD13-058_02	HW Extension Small 50mm



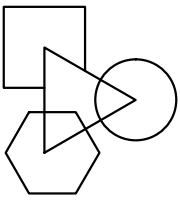
Drawn: FVB	Date: 14-3-2013	Checked:
NLD13-058 (Handwheel Extension)		
Drawing: NLD13-058_00	Units: mm Projection: 	A4





SECTION

# **Mechanical Rotation Interlock (MRL) Installation Guide**

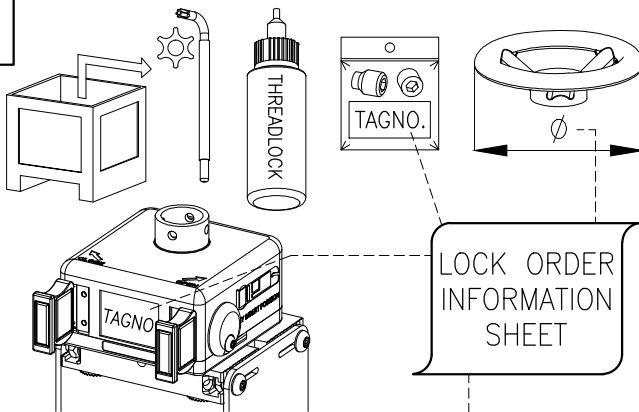


# NETHERLOCKS INSTALLATION INSTRUCTION MULTI ROTATION LOCK ON GATE - / GLOBE VALVE

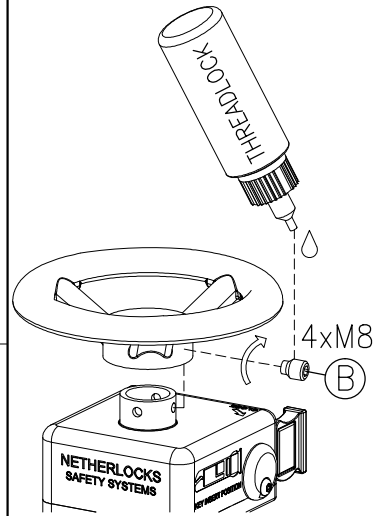
Tel: +31 (0) 172 471 339 - Fax: +31 (0) 172427858 - [www.netherlocks.com](http://www.netherlocks.com)

## 2.01

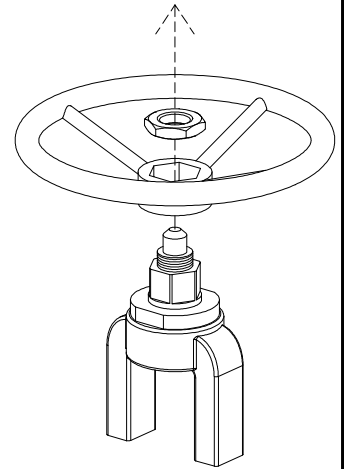
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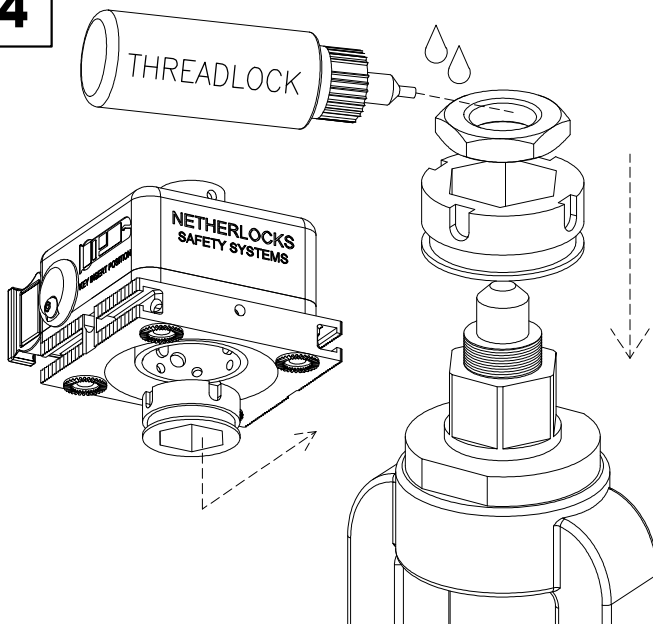
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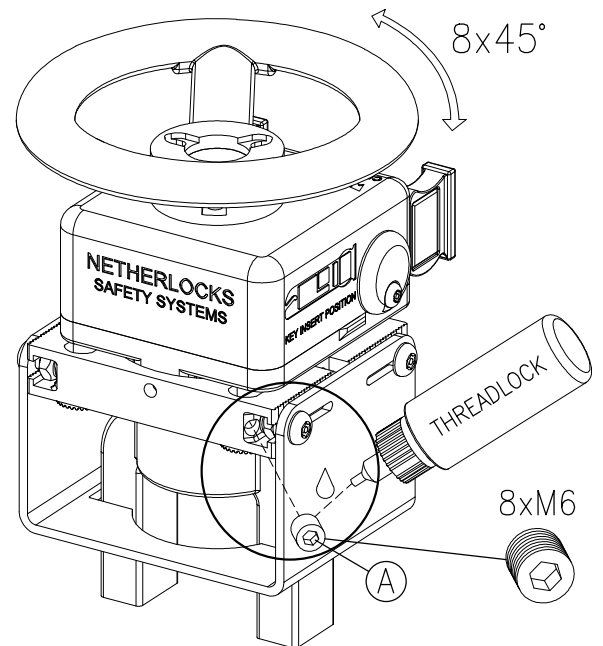
**3**



**4**

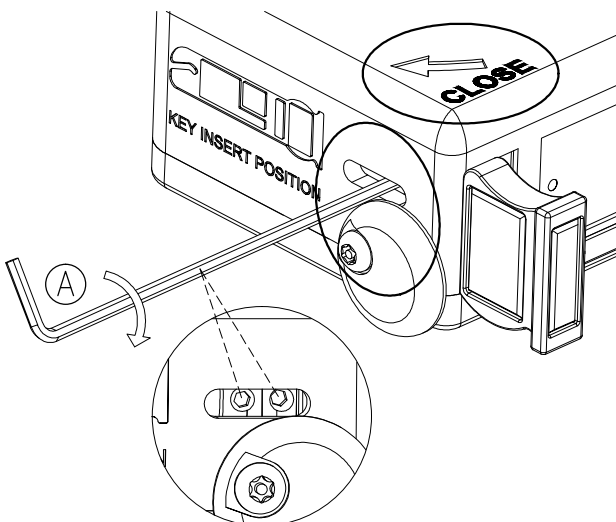


**5**



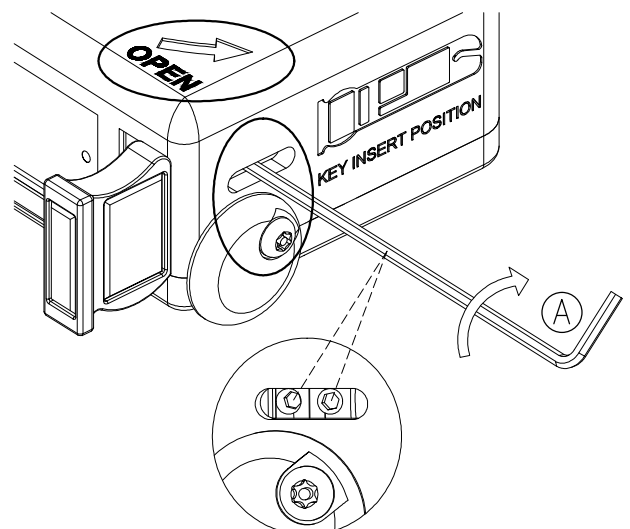
**6**

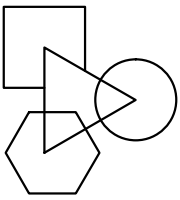
—  — **VALVE CLOSED**



**7**

—  — **VALVE OPEN**



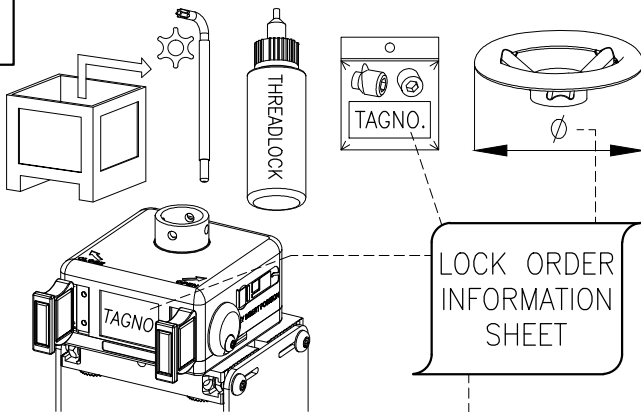


# NETHERLOCKS INSTALLATION INSTRUCTION MULTI ROTATION LOCK ON GATE - / GLOBE VALVE

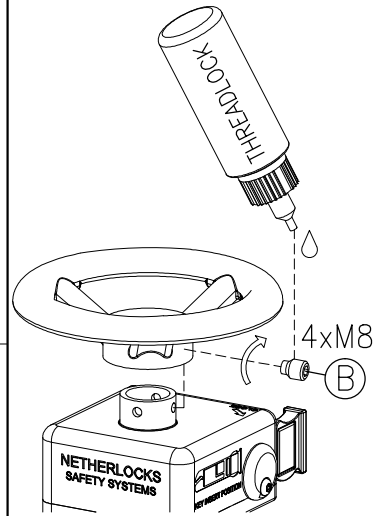
Tel: +31 (0) 172 471 339 - Fax: +31 (0) 172427858 - [www.netherlocks.com](http://www.netherlocks.com)

## 2.02

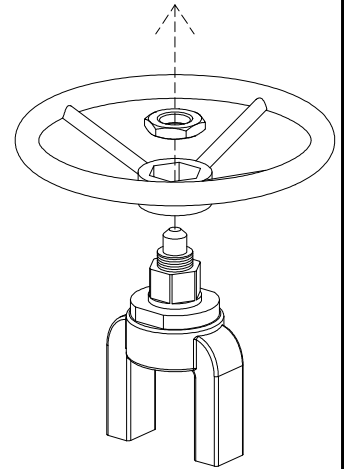
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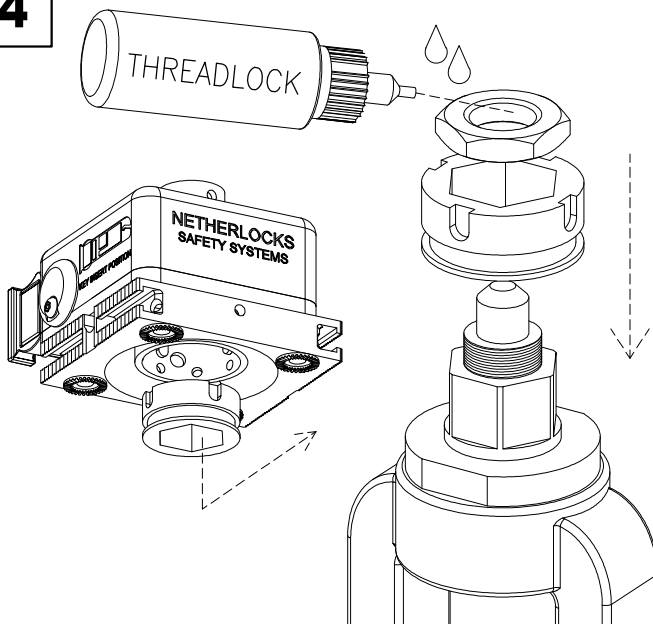
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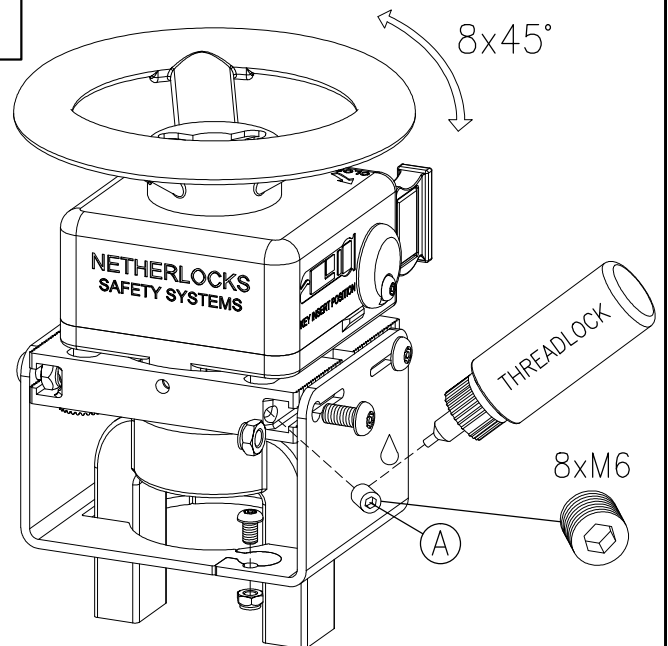
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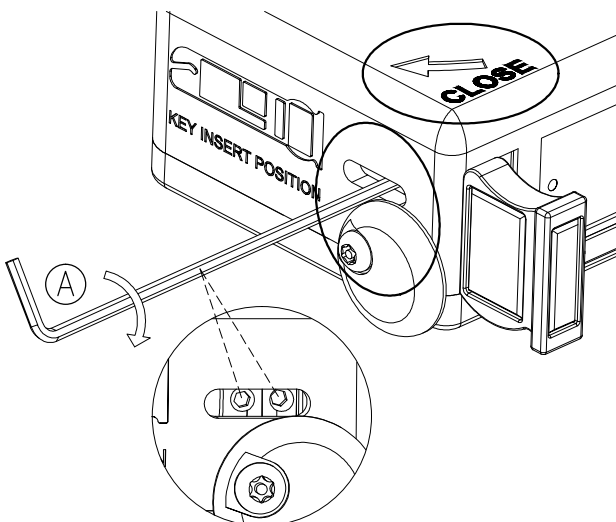


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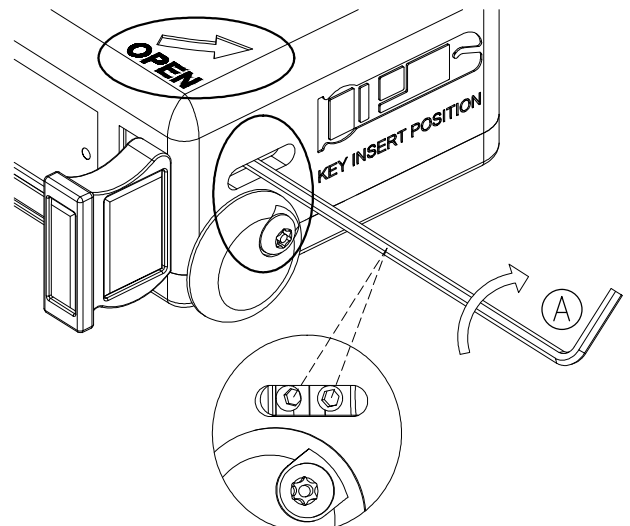
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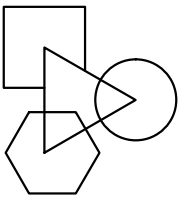
—  — **VALVE CLOSED**



**7**

—  — **VALVE OPEN**



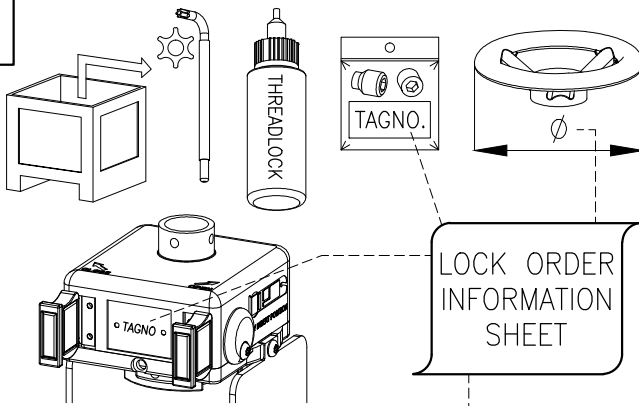


# NETHERLOCKS INSTALLATION INSTRUCTION MULTI ROTATION LOCK ON GATE - / GLOBE VALVE

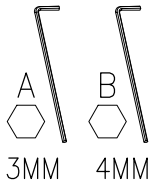
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## 2.06

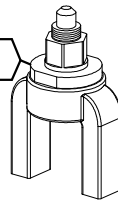
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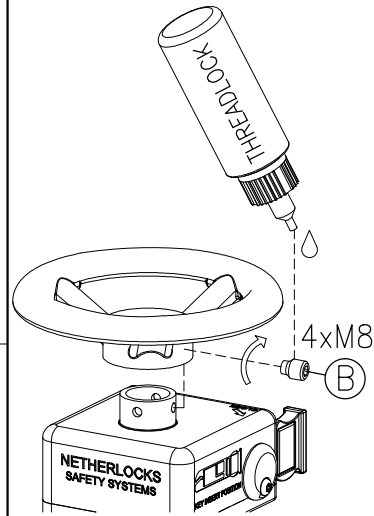
PERMIT  
OK?



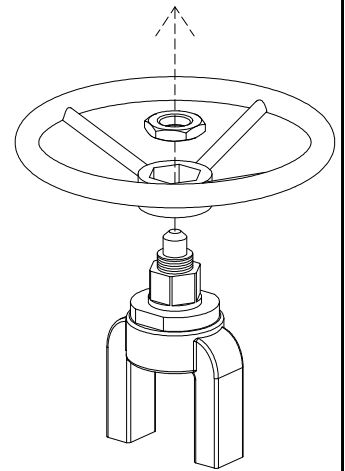
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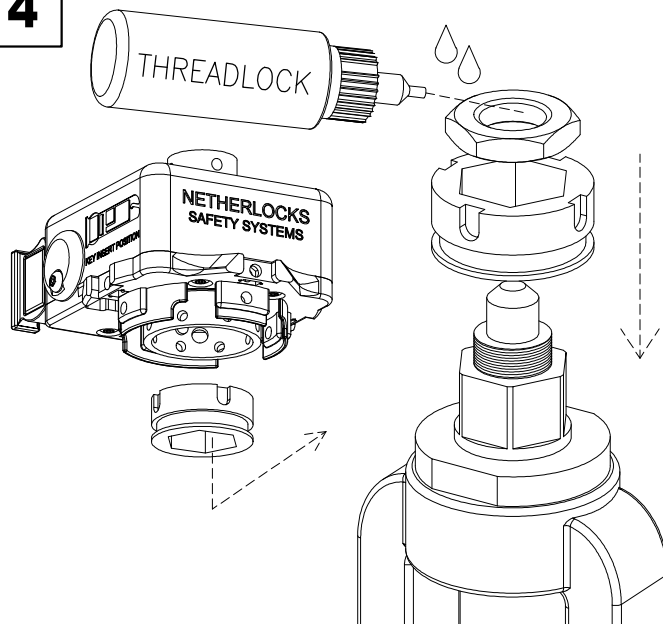
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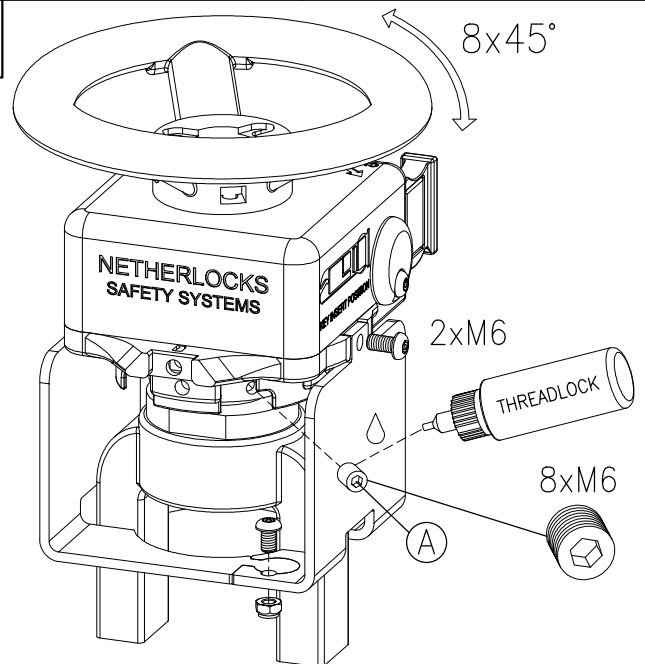
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**4**



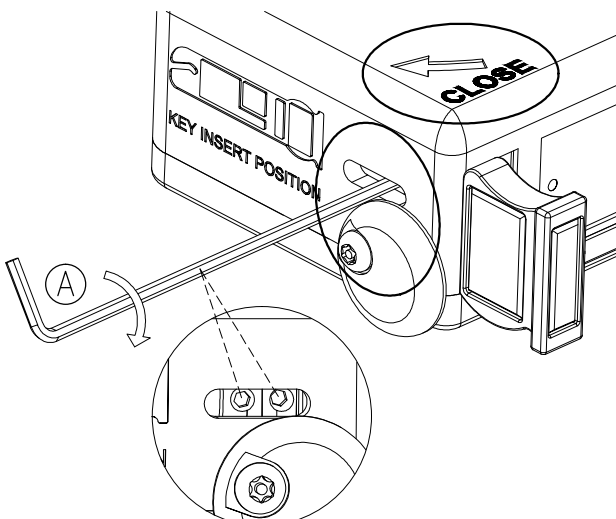
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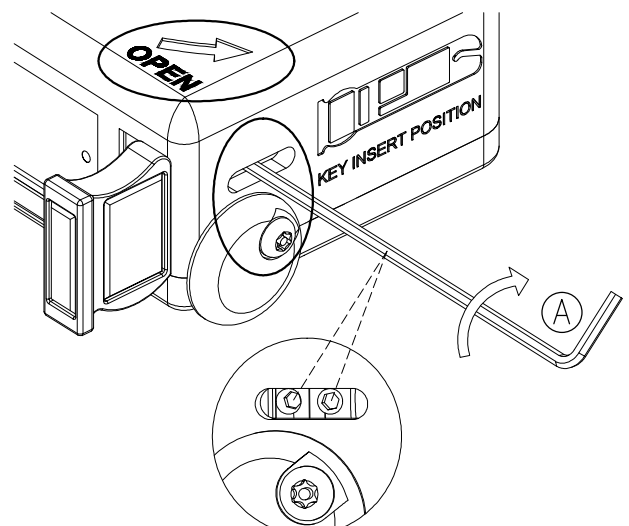
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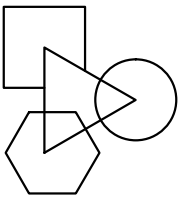


**7**



VALVE OPEN



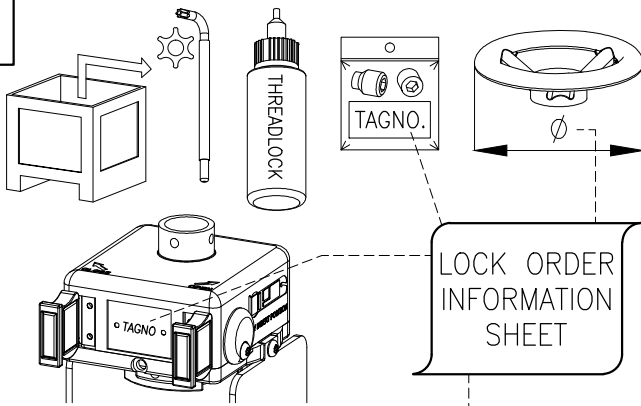


# NETHERLOCKS INSTALLATION INSTRUCTION MULTI ROTATION LOCK ON GATE - / GLOBE VALVE

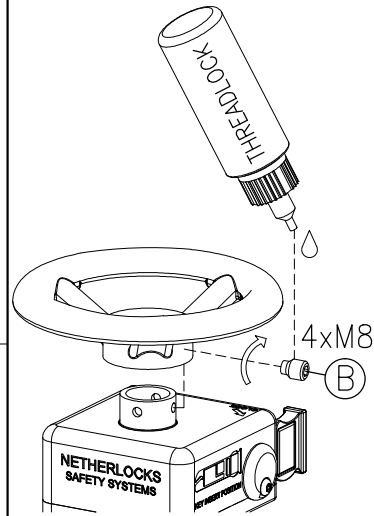
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## 2.07

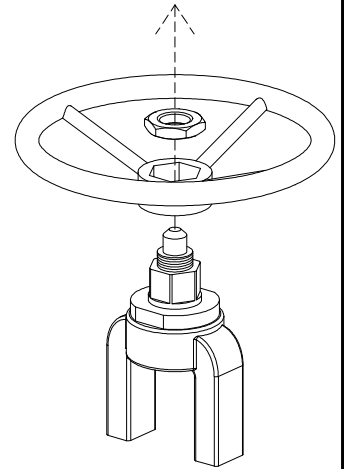
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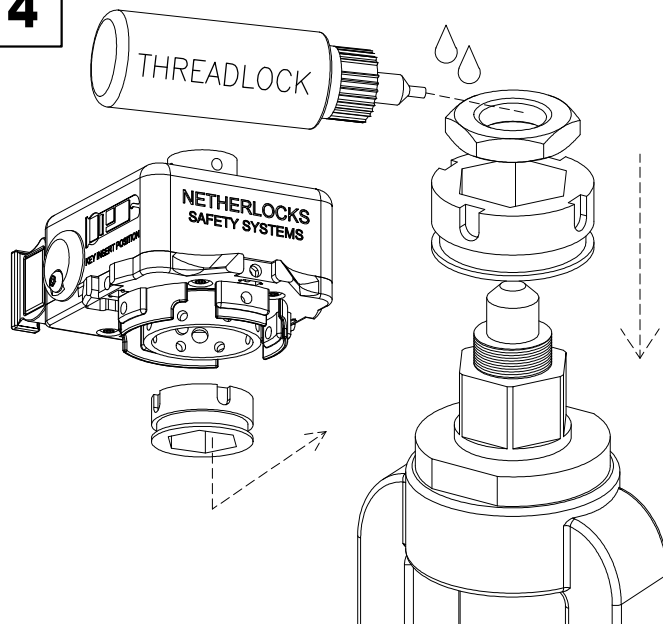
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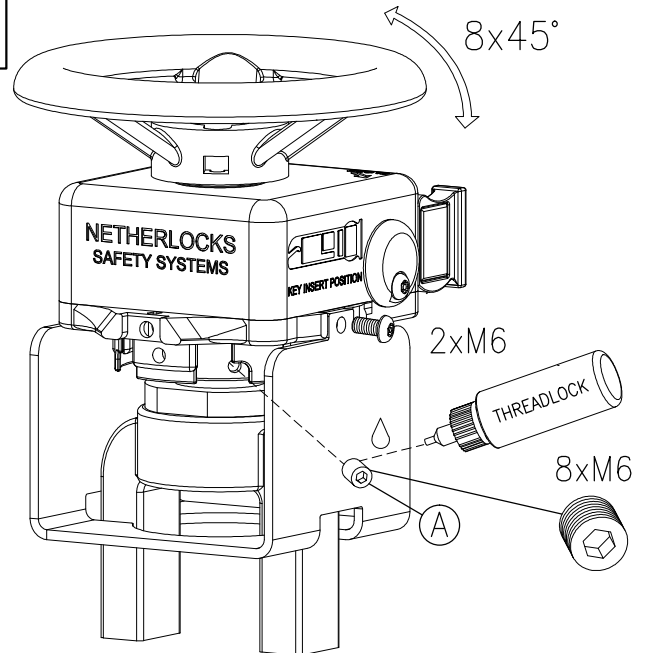
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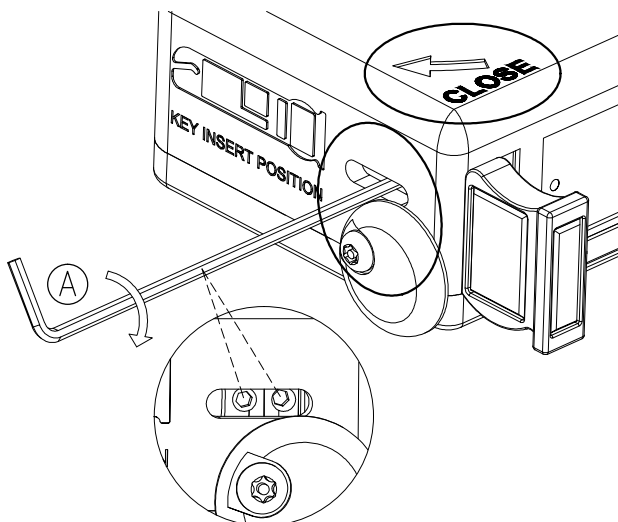


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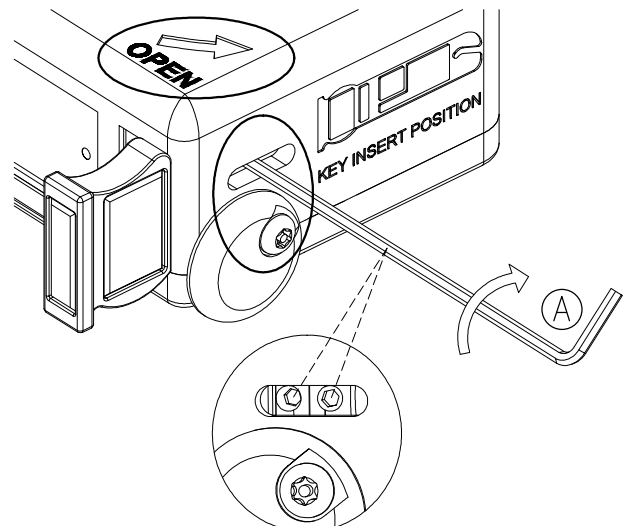
**6**

—  — **VALVE CLOSED**

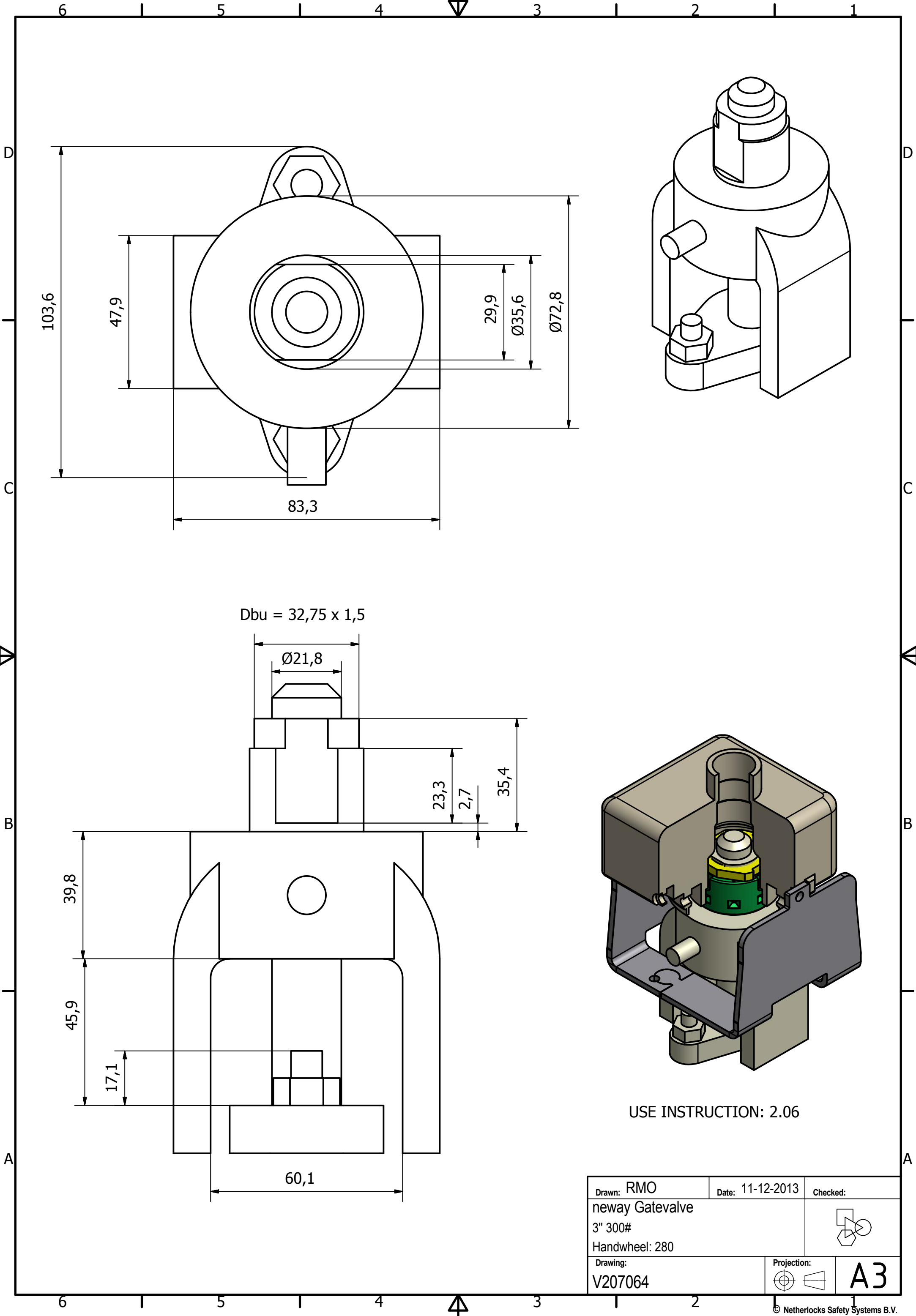




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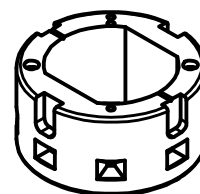
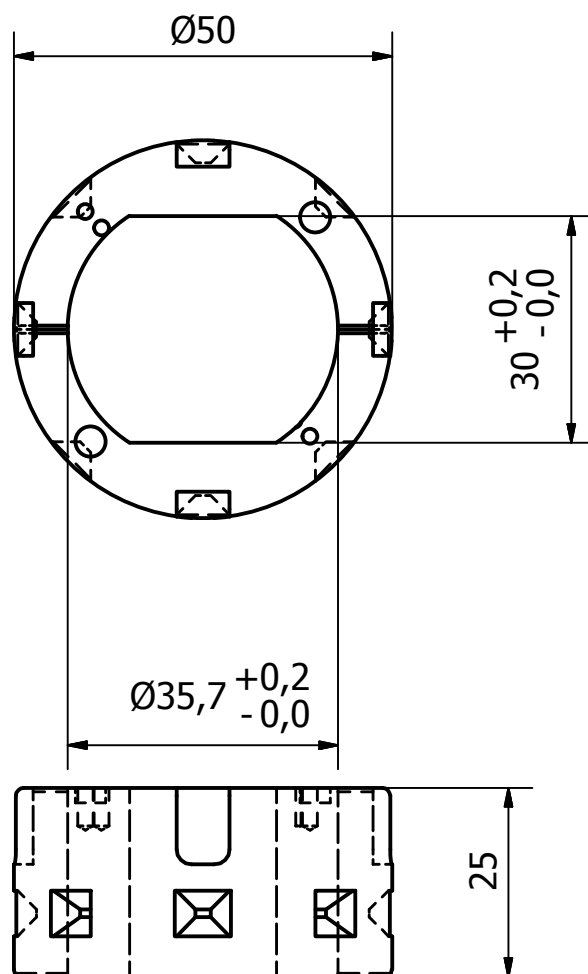
—  — **VALVE OPEN**









Drawn: RMO	Date: 11-12-2013	Checked:
neway Gatevalve 3" 300# Handwheel: 280		
Drawing: V207064	Projection: 	A3

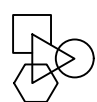



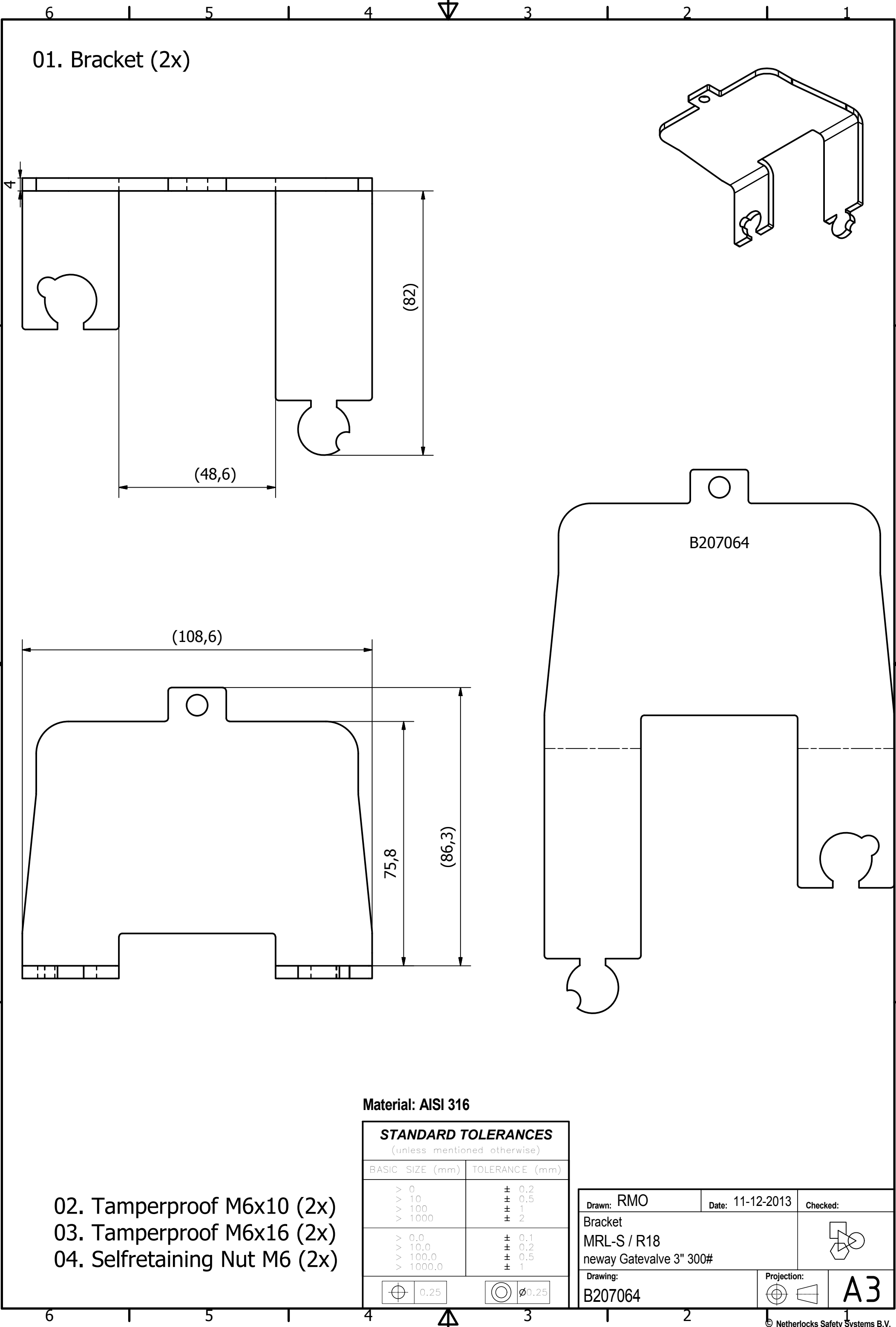
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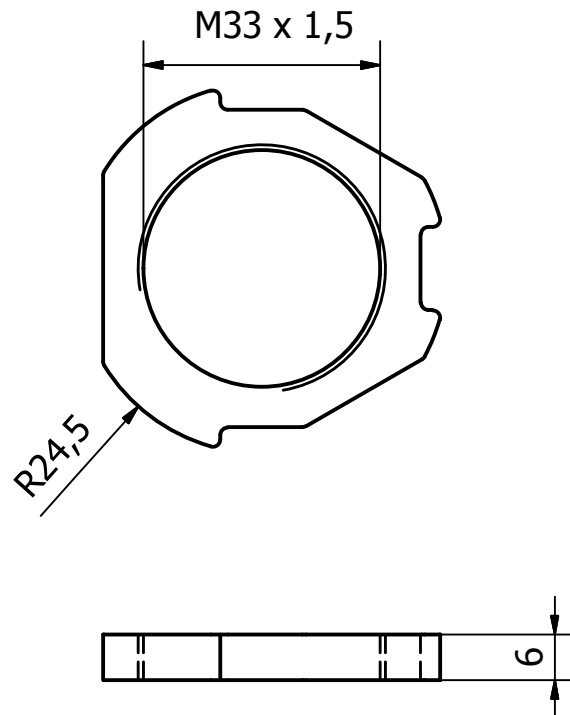
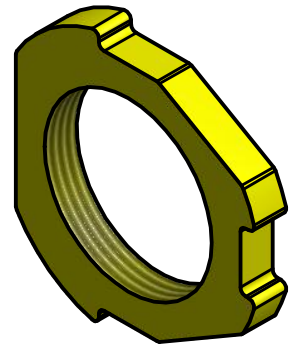
Use Nut from Nut Drawing

**Material: AISI 316**



<b>STANDARD TOLERANCES</b> (unless mentioned otherwise)		
BASIC	SIZE (mm)	TOLERANCE (mm)
> 0		± 0.2
> 10		± 0.5
> 100		± 1
> 1000		± 2
> 0.0		± 0.1
> 10.0		± 0.2
> 100.0		± 0.5
> 1000.0		± 1
	0.25	 Ø0.25



Drawn: RMO	Date: 11-12-2013	Checked:
Adaptor MRL-S / R18 neway Gatevalve 3" 300#		
Drawing: A207064	Projection: 	<b>A4</b>

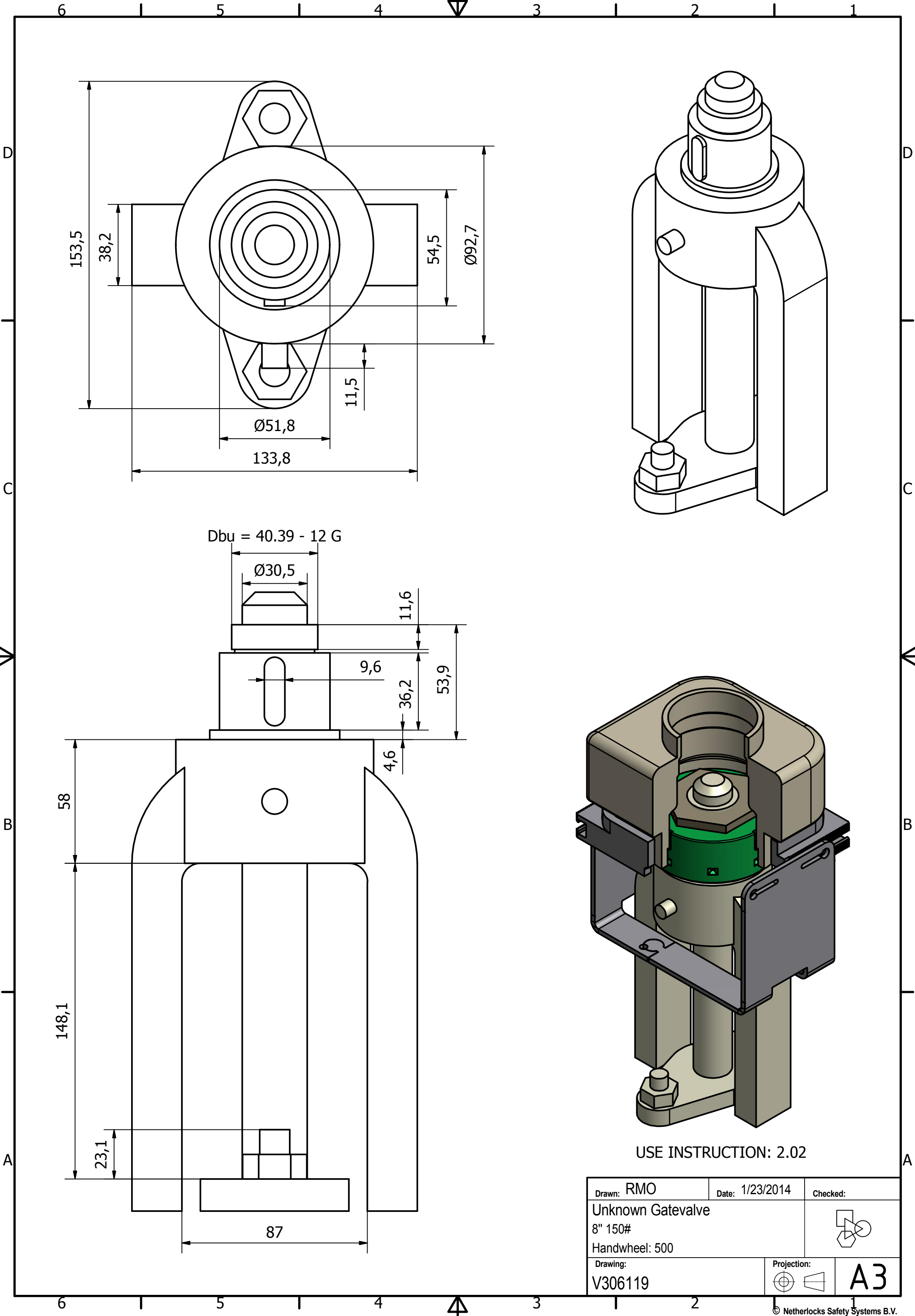


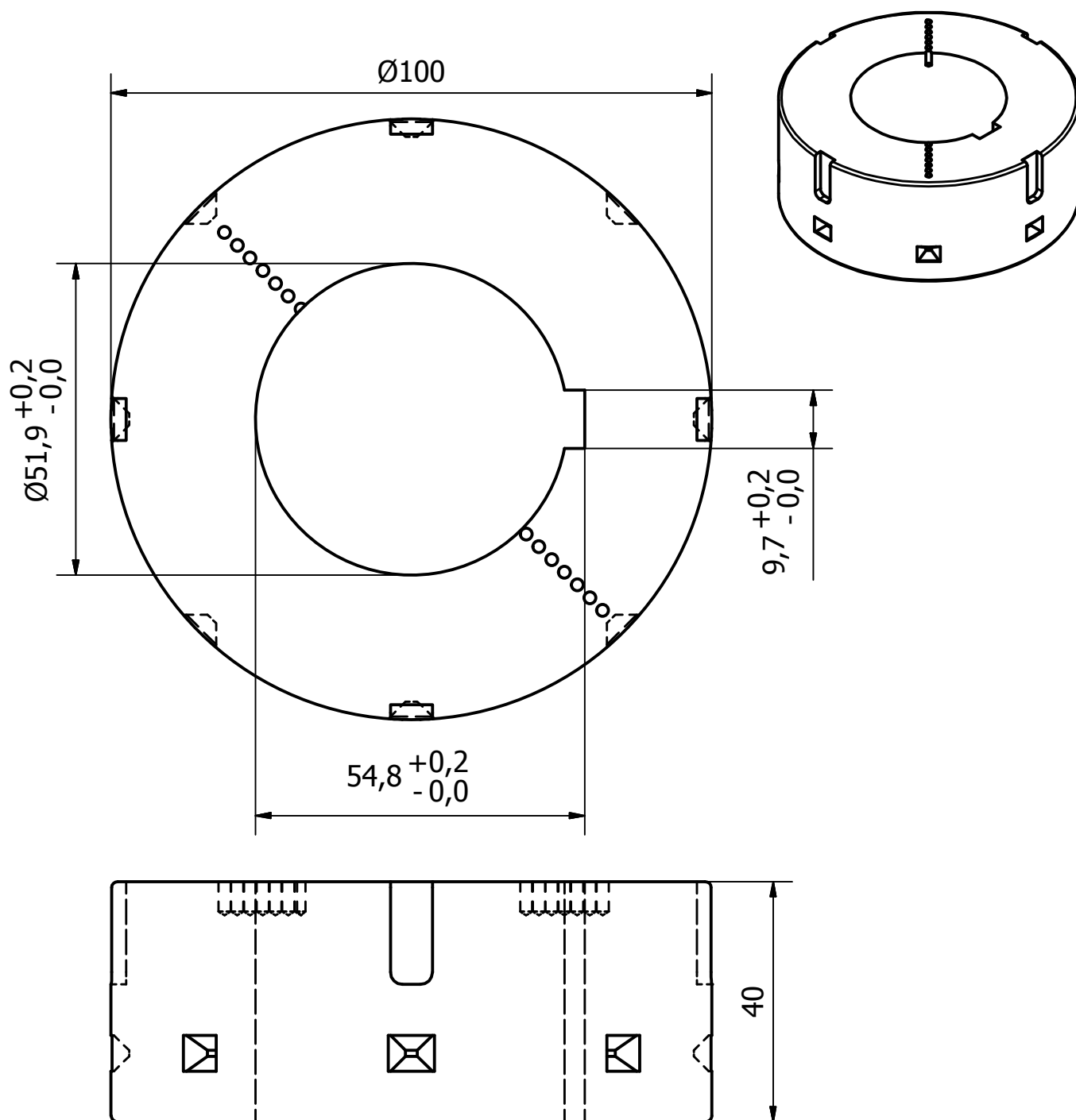


**Material: AISI 316**

<b>STANDARD TOLERANCES</b> (unless mentioned otherwise)	
BASIC SIZE (mm)	TOLERANCE (mm)
> 0	$\pm 0.2$
> 10	$\pm 0.5$
> 100	$\pm 1$
> 1000	$\pm 2$
> 0.0	$\pm 0.1$
> 10.0	$\pm 0.2$
> 100.0	$\pm 0.5$
> 1000.0	$\pm 1$
 0.25	 $\phi 0.25$

Drawn: RMO	Date: 11-12-2013	Checked:
Nut MRL-S / R18 neway Gatevalve 3" 300#		
Drawing: N207064	Projection: 	<b>A4</b>







Use Original Nut

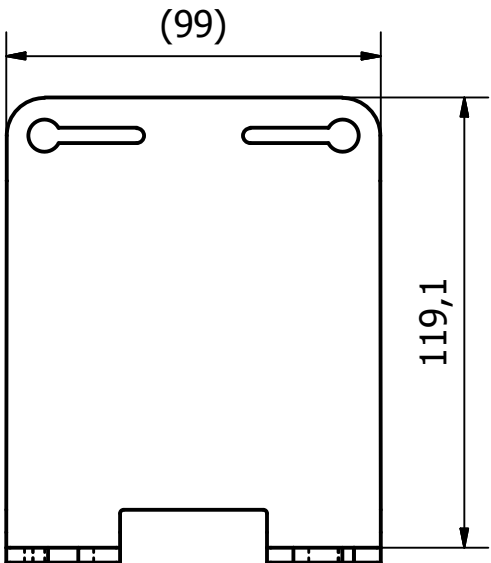
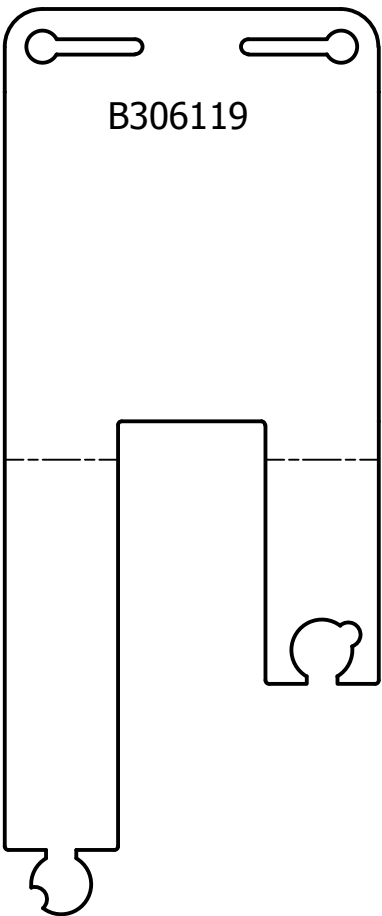
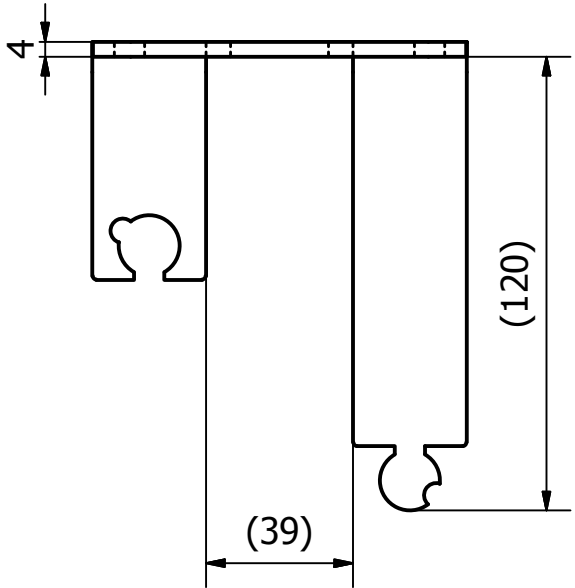
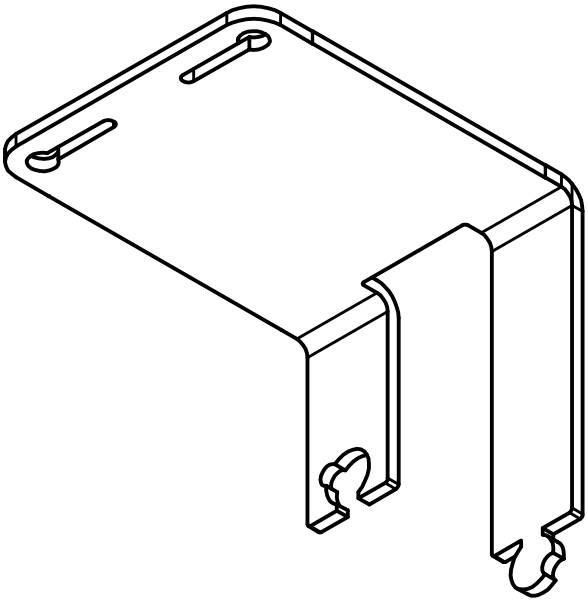
Material: AISI 316

STANDARD TOLERANCES		
(unless mentioned otherwise)		
BASIC	SIZE (mm)	TOLERANCE (mm)
> 0		$\pm 0.2$
> 10		$\pm 0.5$
> 100		$\pm 1$
> 1000		$\pm 2$
> 0.0		$\pm 0.1$
> 10.0		$\pm 0.2$
> 100.0		$\pm 0.5$
> 1000.0		$\pm 1$
	0.25	
	$\text{Ø}0.25$	



Drawn: RMO	Date: 1/23/2014	Checked:
Adaptor MRL-L / R17 Unknown Gatevalve 8" 150#		
Drawing: A306119	Projection: 	A4




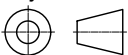
01. Bracket (2x)



Material: AISI 316

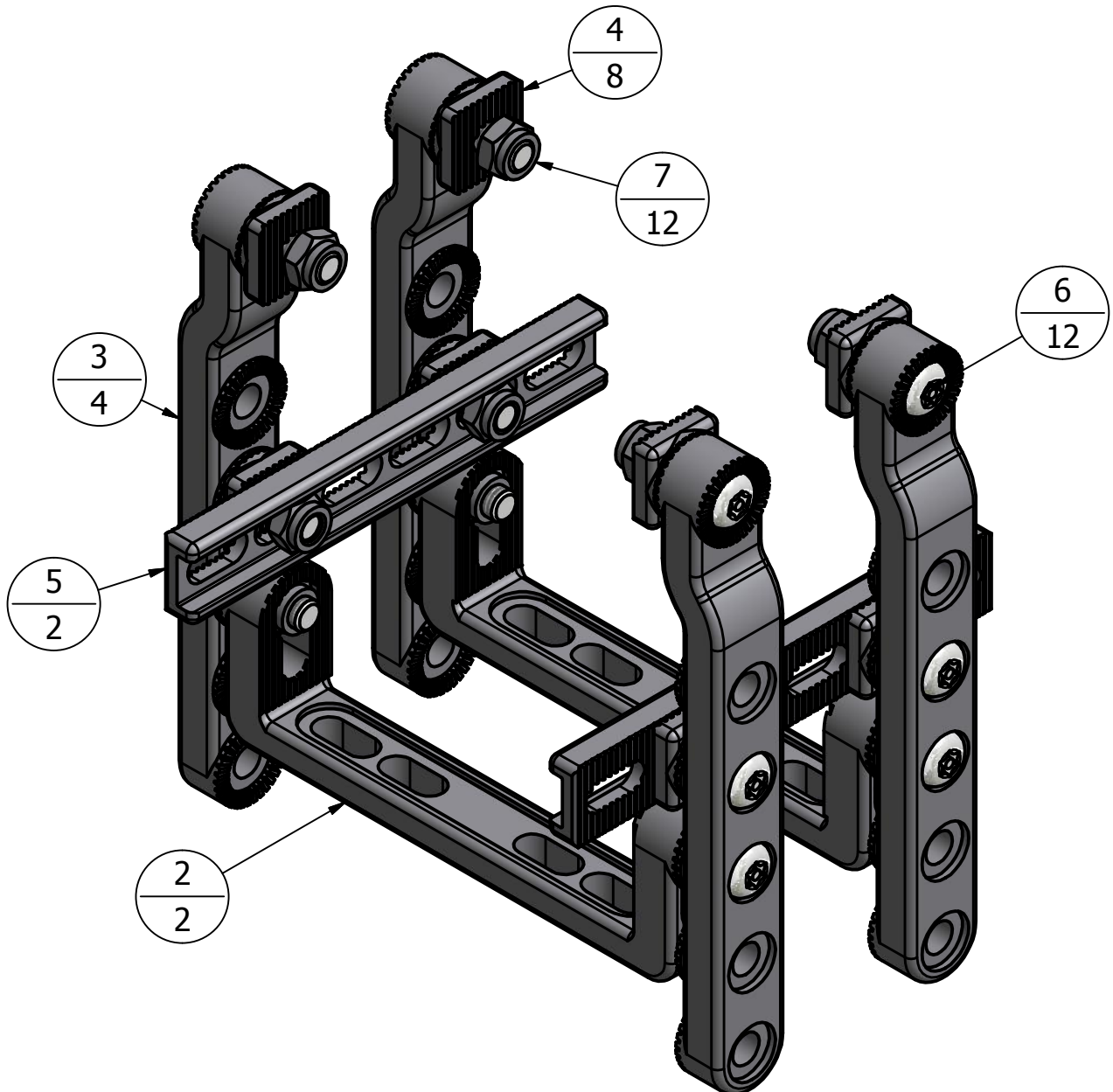
STANDARD TOLERANCES	
(unless mentioned otherwise)	
BASIC SIZE (mm)	TOLERANCE (mm)
> 0	± 0.2
> 10	± 0.5
> 100	± 1
> 1000	± 2
> 0.0	± 0.1
> 10.0	± 0.2
> 100.0	± 0.5
> 1000.0	± 1
 0.25	 0.25

02. Tamperproof M6x10 (2x)  
03. Tamperproof M8x16 (4x)  
04. Selfretaining Nut M6 (2x)  
05. Selfretaining Nut M8 (4x)

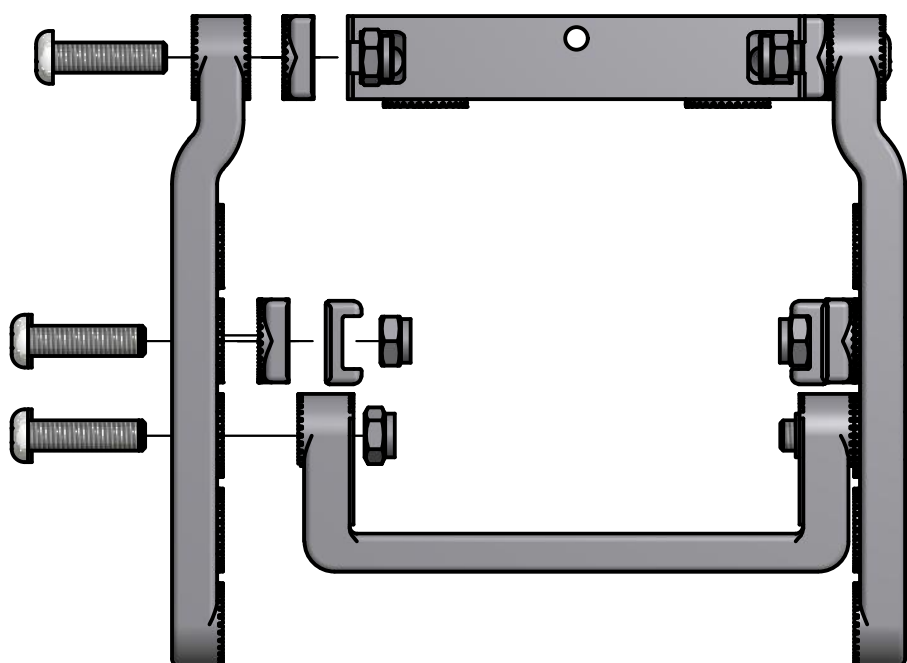
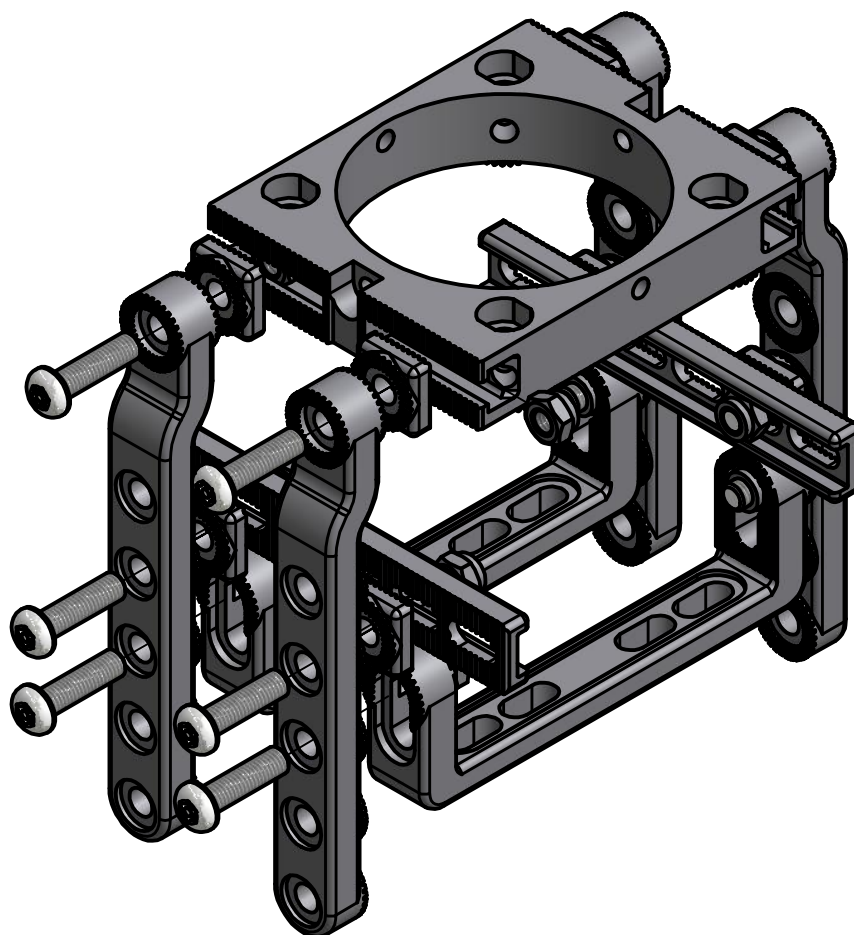
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Bracket MRL-L / R17 Unknown Gatevalve 8" 150#		
Drawing: B306119	Projection: 	A3

# PARTS LIST

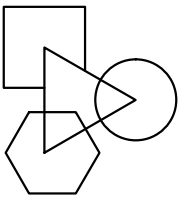
ITEM	QTY	PART NUMBER	DESCRIPTION	Large
1	1	NL-200	Uni-Bracket Small	NL-202 Uni-Bracket Large
2	2	NL-201	U-Brace Small	NL-203 U-Brace Large
3	4	NL-204	SwingArm-150	NL-210 SwingArm-200
4	8	NL-205	Adjustment Plate	
5	2	NL-209	Adjustment connection bar L-6	
6	12	Resistorx - M8 x 30	Resistorx - Metric	
7	12	DIN 985 - M8	Selfretaining Nut	



Drawn: AKE	Date: 5-10-2011	Checked:
Universal Bracket Small / Large		
Drawing: Universal Bracket	Projection: 	A4



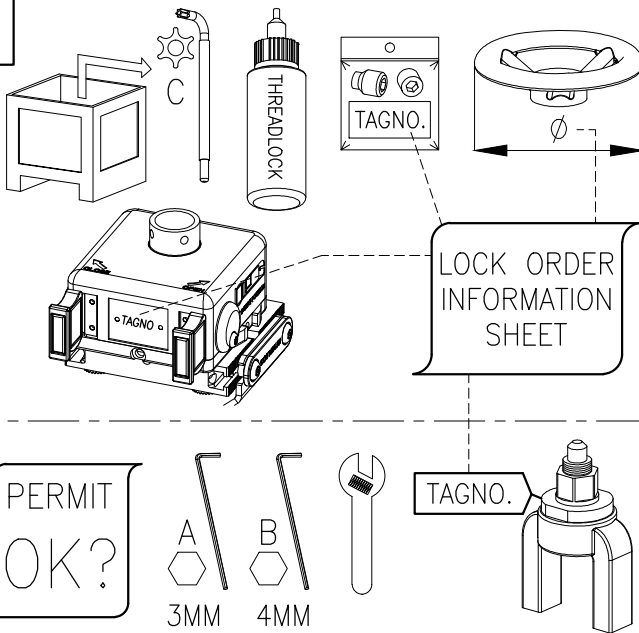
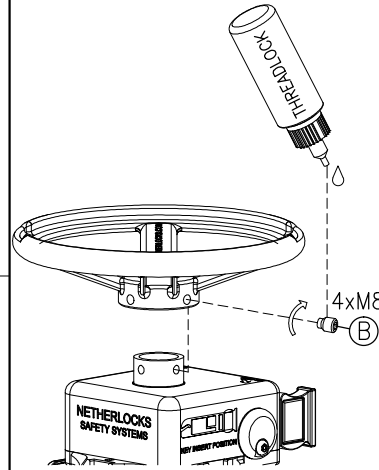
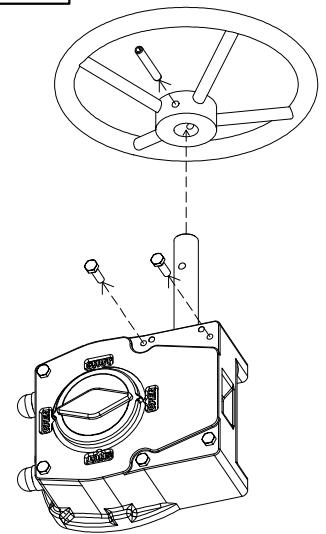
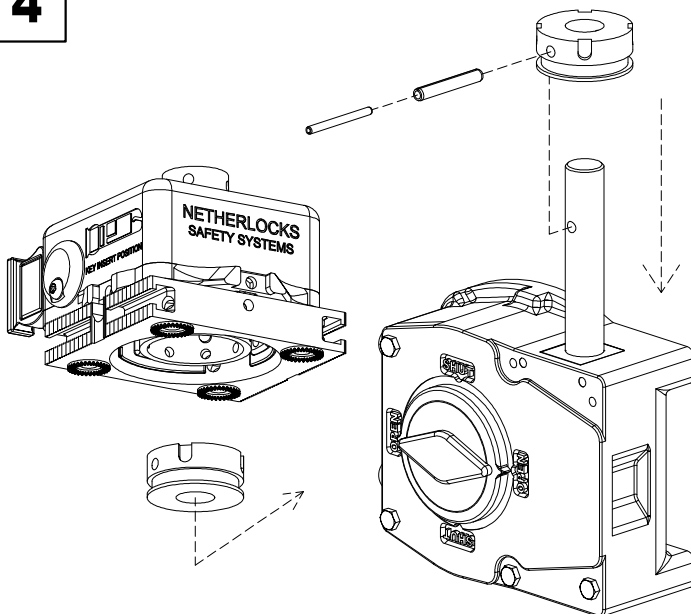
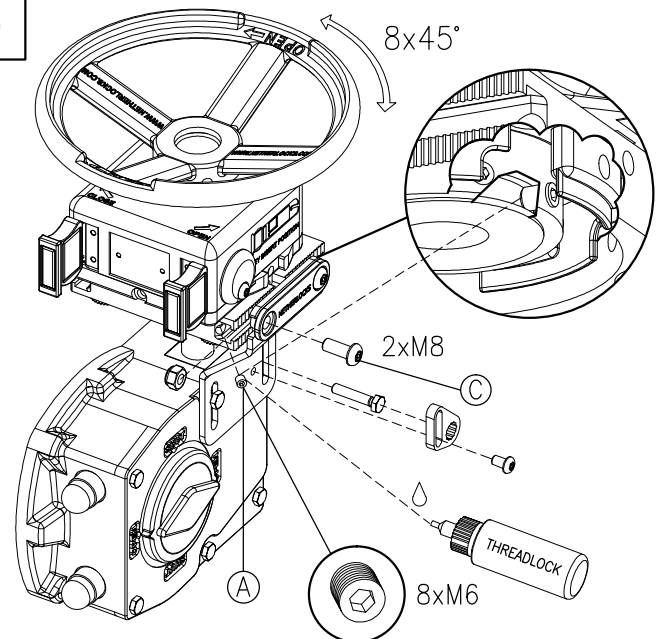
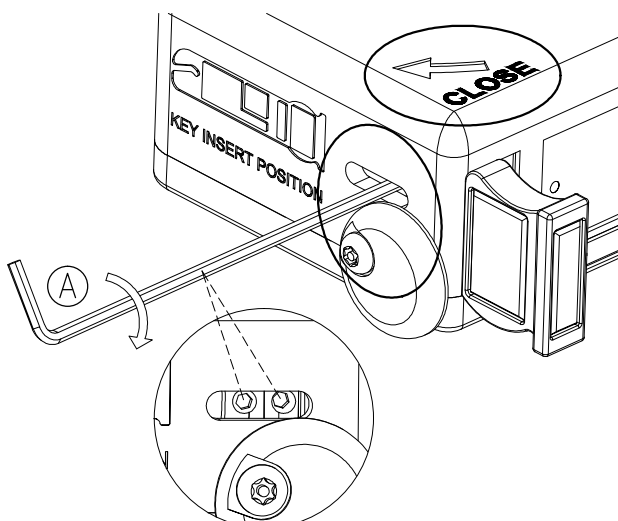
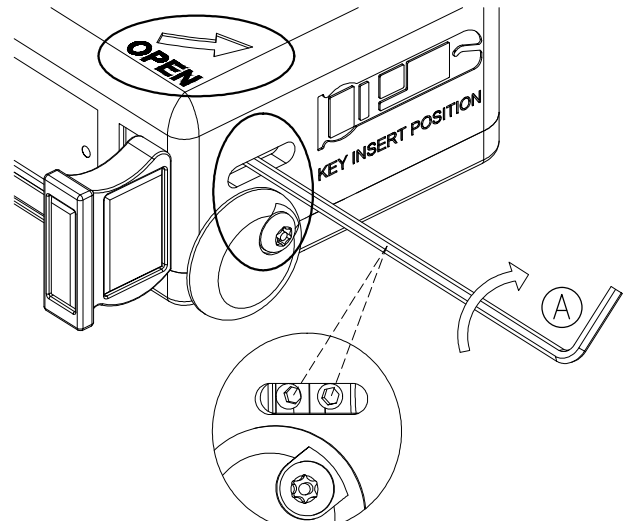
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Universal Bracket Small / Large		
Drawing: Universal Bracket	Projection: 	<b>A4</b>

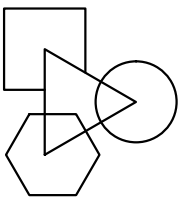


# NETHERLOCKS INSTALLATION INSTRUCTION MULTI ROTATION LOCK ON GEARBOX

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## 2.08

**1****2****3****4****5****6****VALVE CLOSED****7****VALVE OPEN**

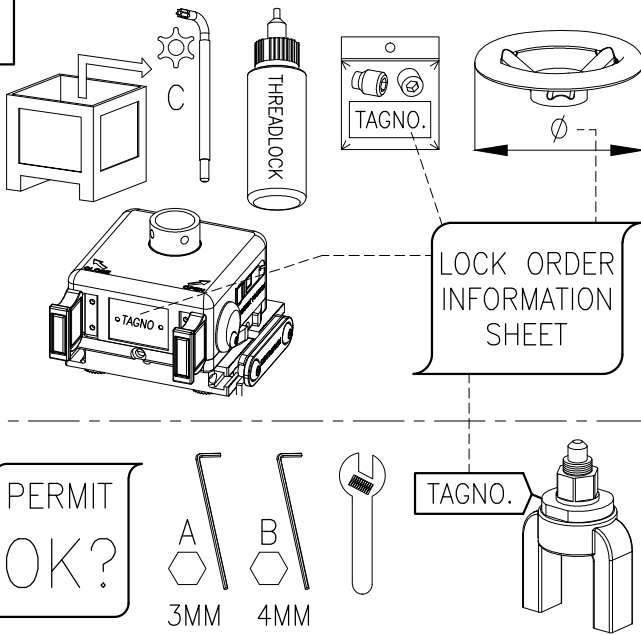
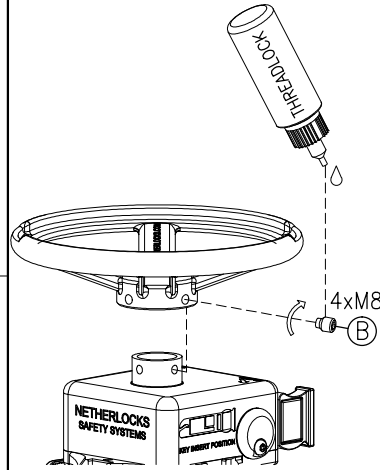
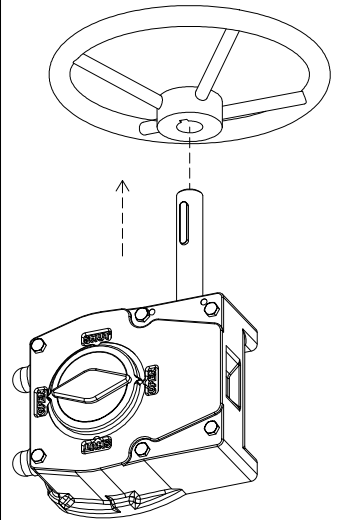
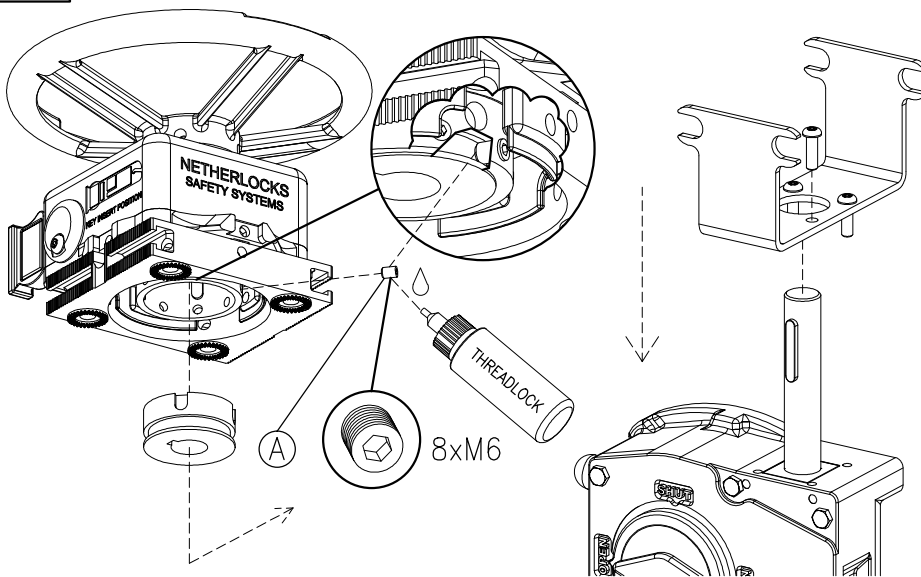
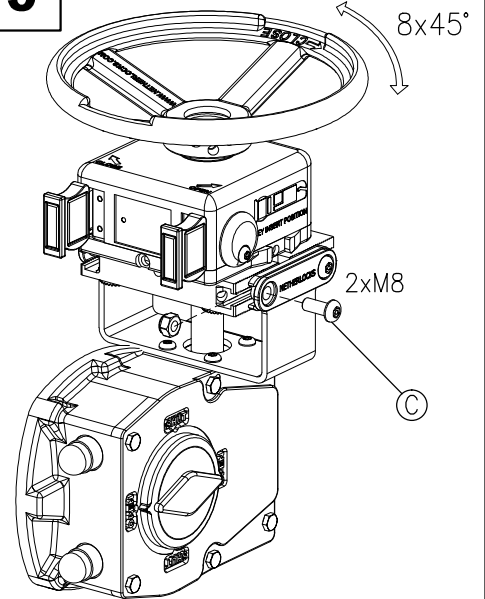
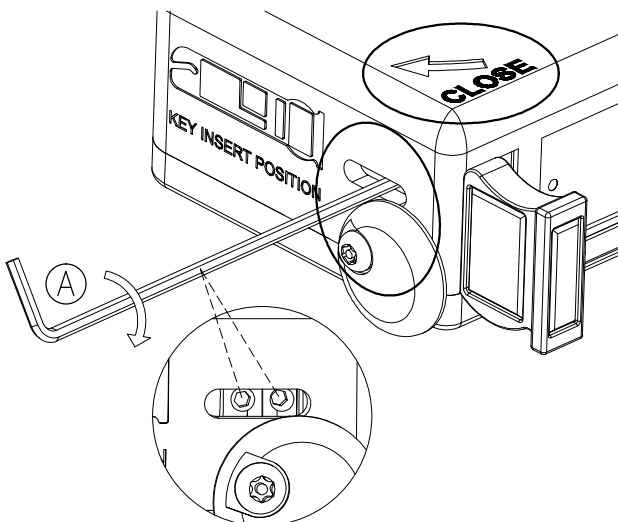
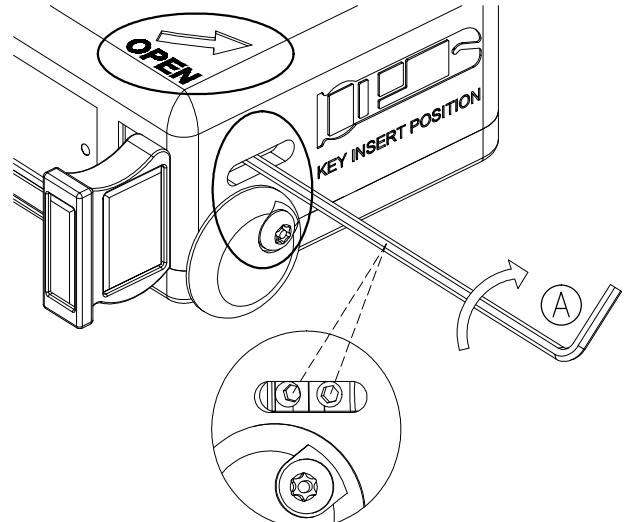


# NETHERLOCKS INSTALLATION INSTRUCTION

## MULTI ROTATION LOCK ON GEARBOX

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# 2.10

**1****2****3****4****5****6****VALVE CLOSED****7****VALVE OPEN**

# *Installation Manual*

*MRL-S*

*Special Counter*

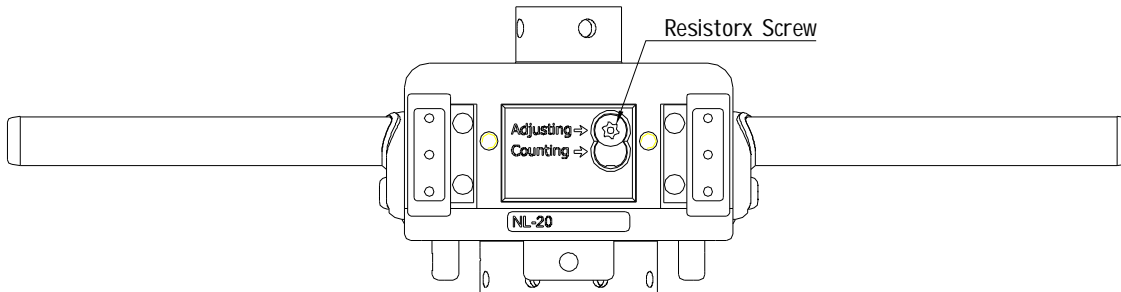
**Rev 3**

**February 2008**



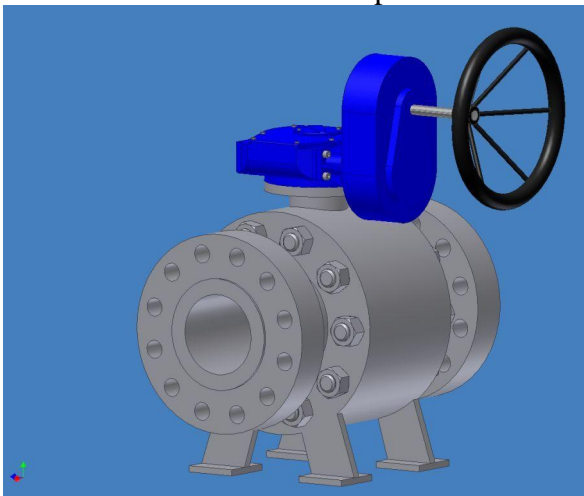


1. Prior to installation of the locking device, operate the valve to full open or full closed position. (In this manual we assume that you have fully closed the valve.)
2. The Locking device will be supplied with the counter setting device in adjusting mode, see Picture 1. In case the setting device is in counting mode, loosen the Resistorex screw 6 turns. Move the setting device to the adjusting mode and tighten the screw.

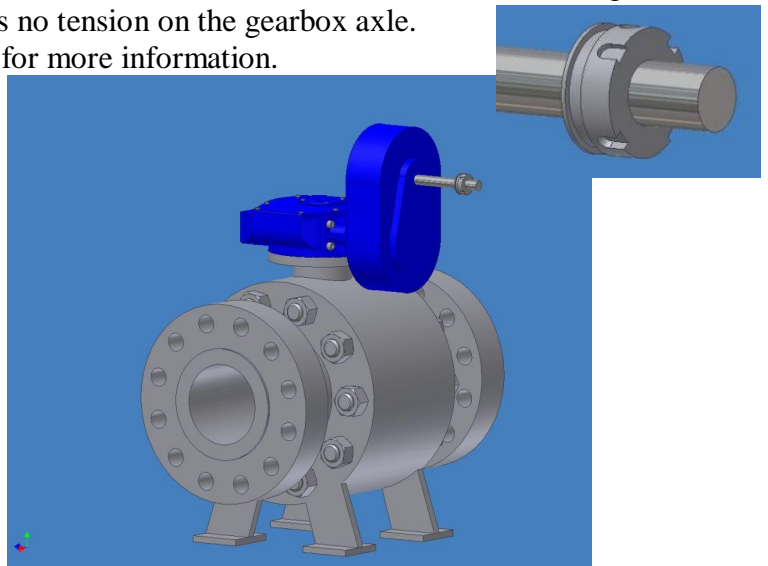


Picture 1

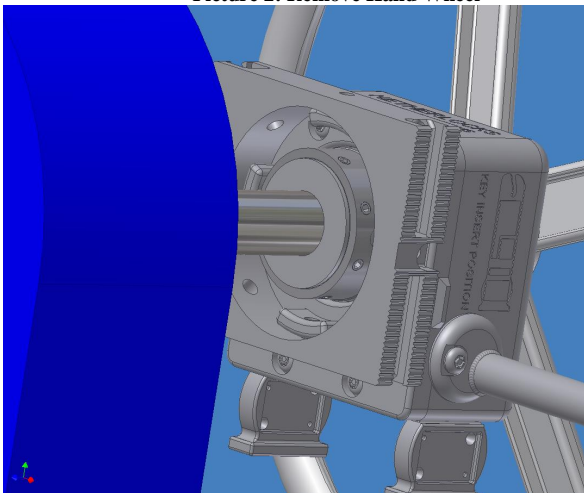
3. Mount the supplied hand wheel onto the locking device. Make sure to use a thread lock adhesive on the screws.
4. Mount the locking device on the valve with the supplied bracket and adapter. See Picture2-5 When installing the lock on the adapter (Picture 4) make sure to use the 8 supplied set screws. Also use a thread lock adhesive on the set screws. When installing the supplied bracket make sure there is no tension on the gearbox axle. See Installation and operation manual for more information.



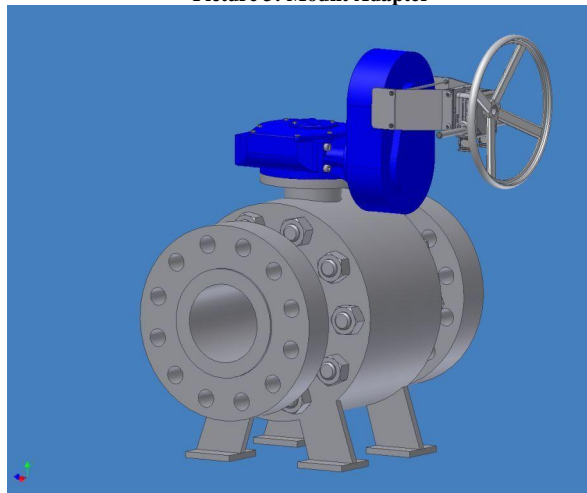
Picture 2: Remove Hand Wheel



Picture 3: Mount Adapter

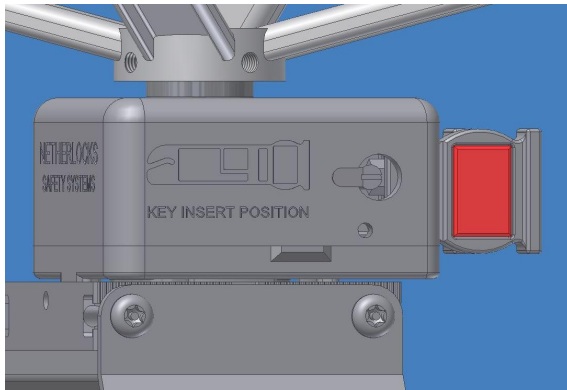


Picture 4: Mount Lock on Adapter

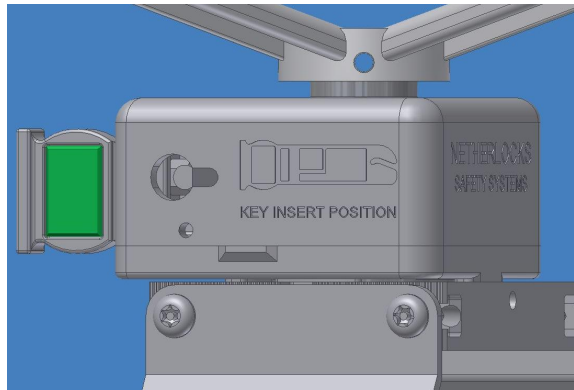


Picture 5: Mount Bracket

5. Remove the covers, see picture 6 and 7, from the locking device.

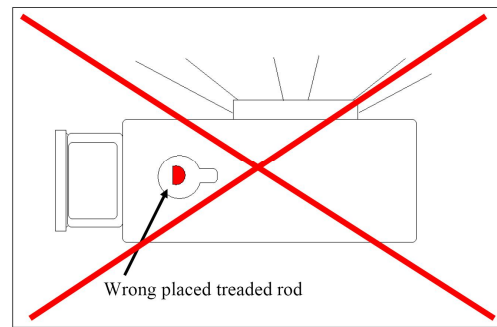
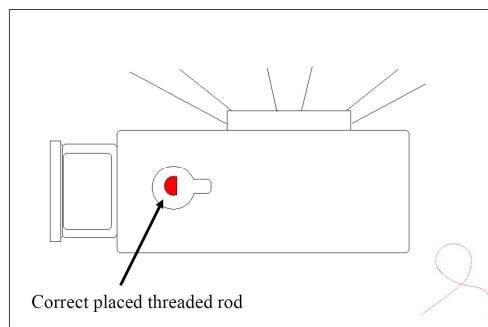


Picture 6: Closed position, side view

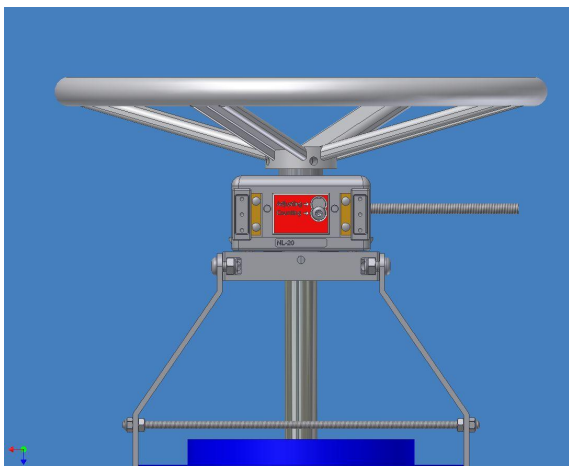


Picture 7: Open position, side view

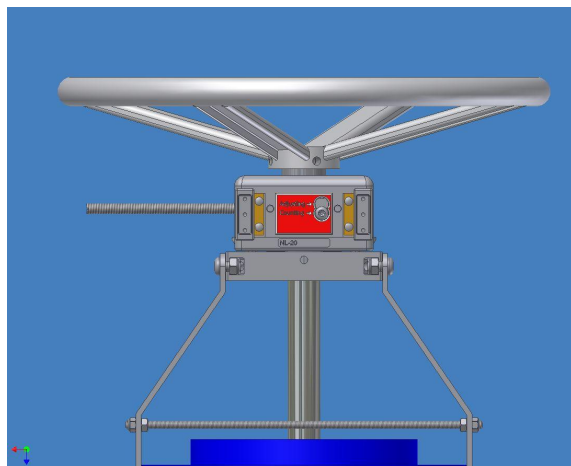
Because the lock is in adjusting mode, you can turn the threaded rod by hand. Turn the threaded rod until you can release the closed-key (key on the left). Make sure the flat side of the threaded rod is facing towards the back of the locking device. See picture 8.



Picture 8. Correct position of the threaded rod



Picture 9: Closed position



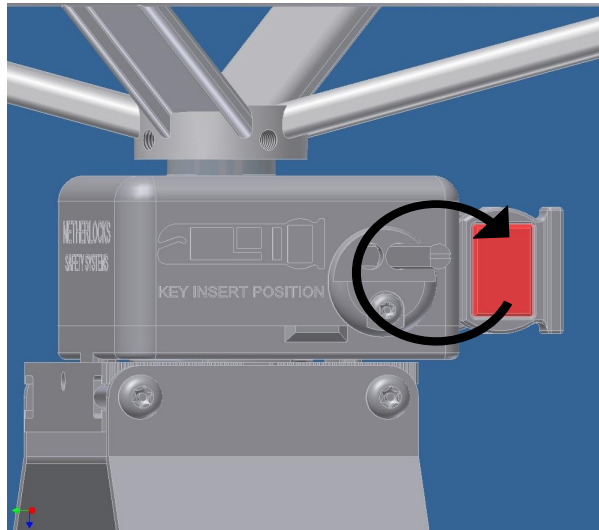
Picture 10: Open position

6. Loosen the Resistorx screw of the setting device 6 turns. Move the setting device to the counting mode and tighten the screw. (reverse of step 2)
7. Check if the keys are inserted in the locking device. If not, insert the missing key. Both keys should be in the lock to proceed with the manual.

8. The valve is in closed position. Open the valve 20 turns. The closed-key (on the left) is now trapped. If not, the adjustment made by step 5 is false. Recheck if necessary.

If the closed-key is trapped after 20 turns, operate the valve to full open position. After opening install the cutting disk onto the open side (right side) of the locking device.

Set the lock into adjusting mode (step 2). Turn the threaded rod, on the closed side (left side), clockwise 12 turns (See picture 10). Set the lock back into counting mode (step 6).



**Picture 10: Closed side, turning clockwise**

#### **Cutting the threaded rod:**

The cutting disk helps you to cut the rod. Place the saw blade against the flat side of the cutting disk. Use a file to make sure the threaded rod doesn't stick out of the cutting disk.

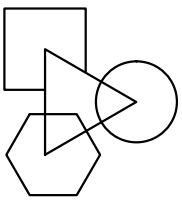
Set the lock into adjusting mode (step 2). Turn the threaded rod, on the closed side (left side), counter clockwise 12 turns. Set the lock back into counting mode (6).

Check if the open-key (on the right) will come out of the locking device. If not, short the threaded rod just a little bit more as written above. Continue at step 9.

9. Remove the cutting disk and install the covers back onto the locking device. Check if both keys are in the locking device. Operate the valve to the original position and lock the valve by releasing one key.

SECTION

## **Mechanical Ninety Degree Interlock (NDL) Installation Guide**



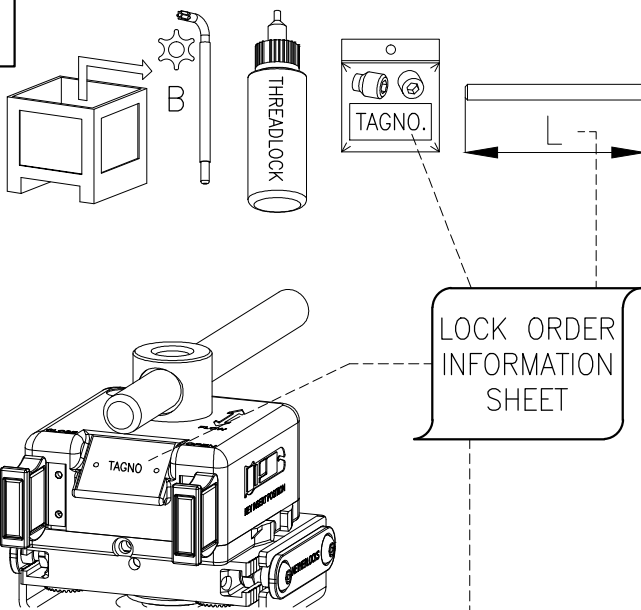
# NETHERLOCKS INSTALLATION INSTRUCTION

## NINETY DEGREE LOCK ON BALL VALVE

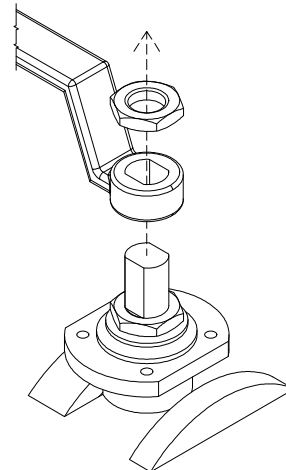
Tel: +31 (0) 172 471 339 - Fax: +31 (0) 172427858 - [www.netherlocks.com](http://www.netherlocks.com)

# 0.05

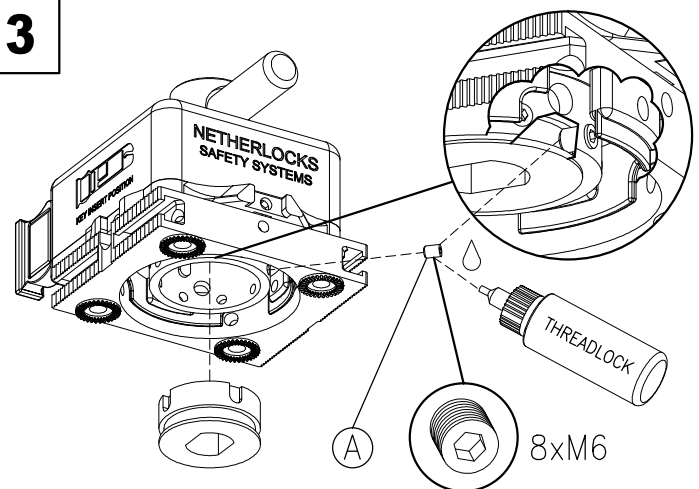
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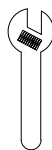
**2**



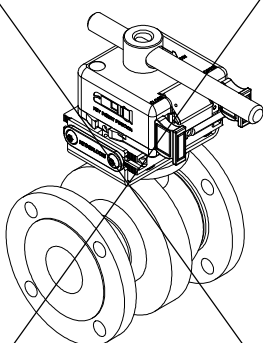
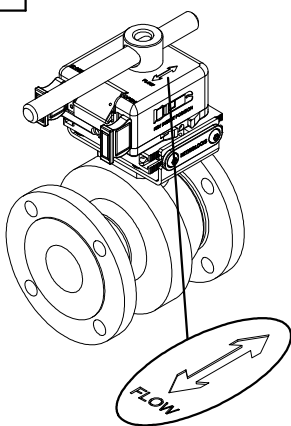
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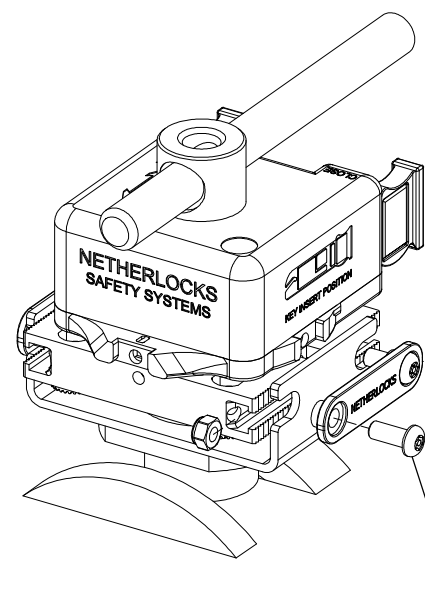
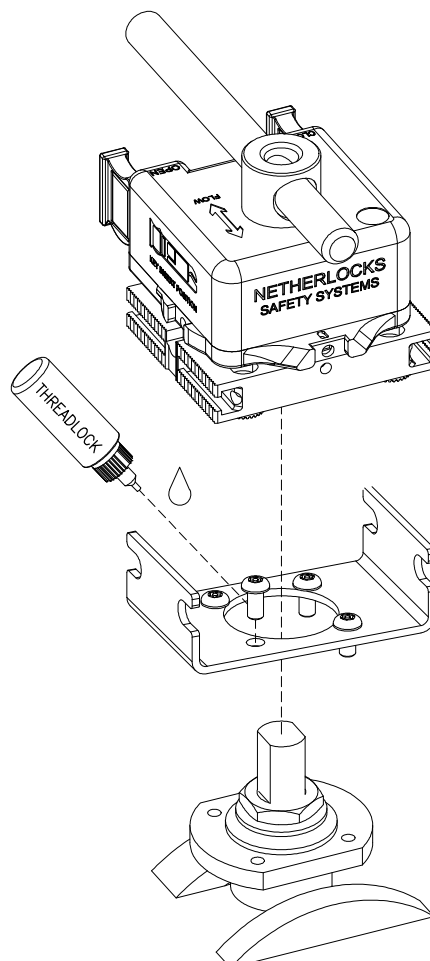
PERMIT  
OK?

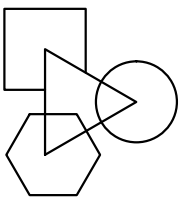


**4**



**5**





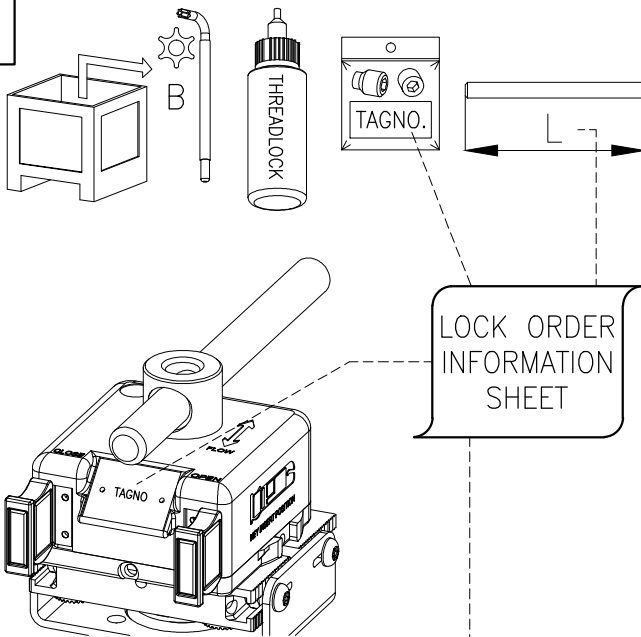
# NETHERLOCKS INSTALLATION INSTRUCTION

## NINETY DEGREE LOCK ON BALL VALVE

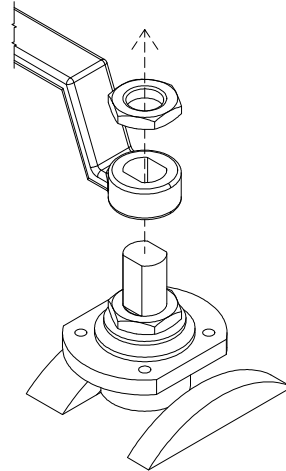
Tel: +31 (0) 172 471 339 - Fax: +31 (0) 172427858 - [www.netherlocks.com](http://www.netherlocks.com)

# 0.07

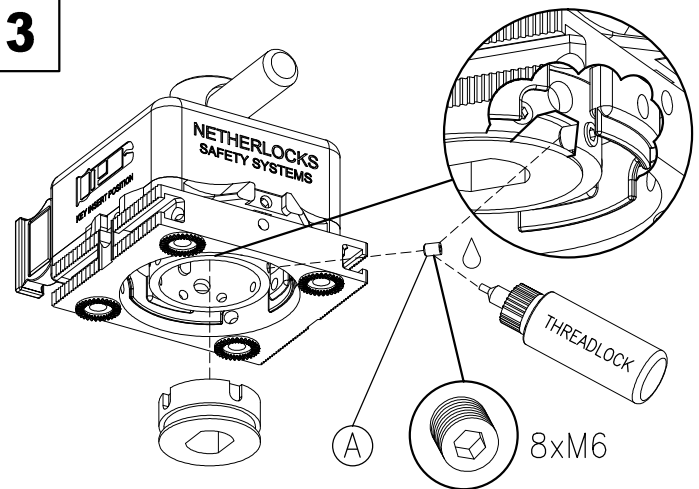
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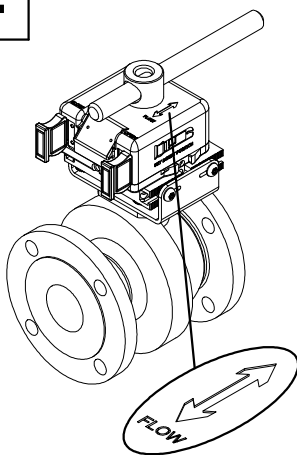
**2**



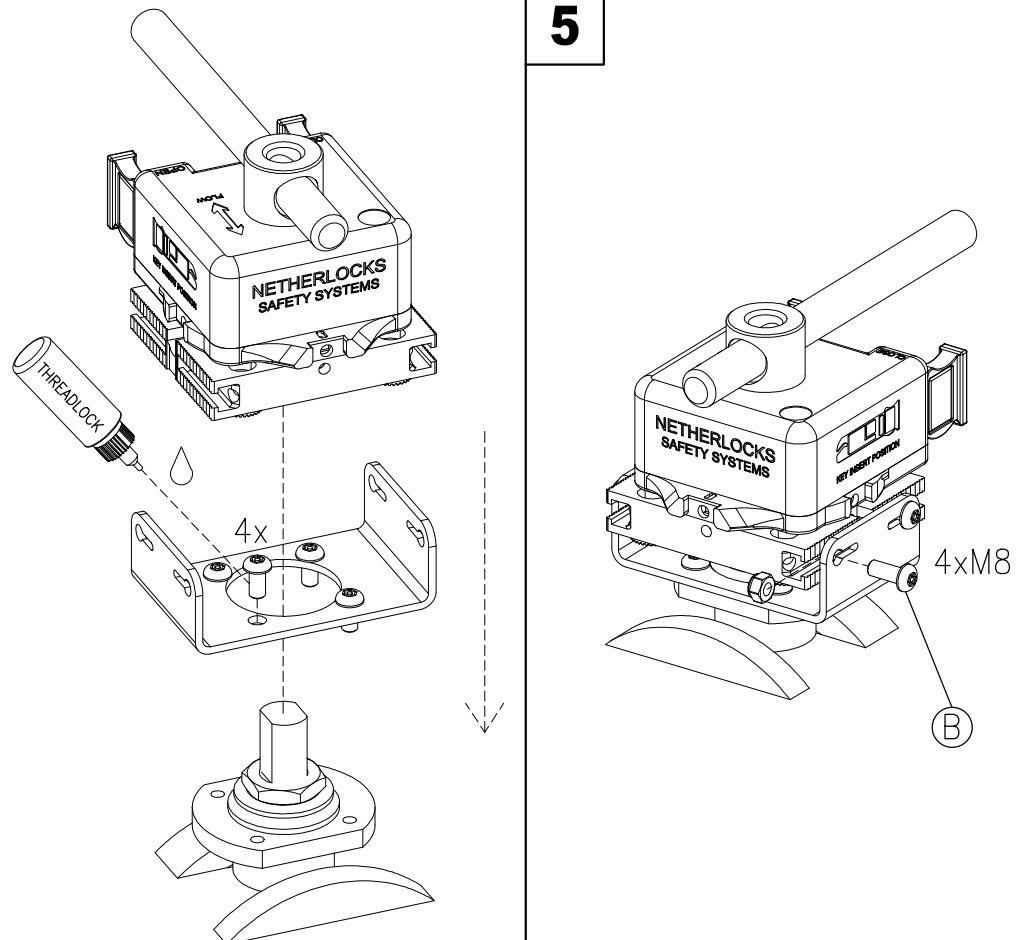
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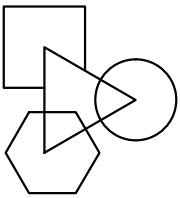
**4**



**5**





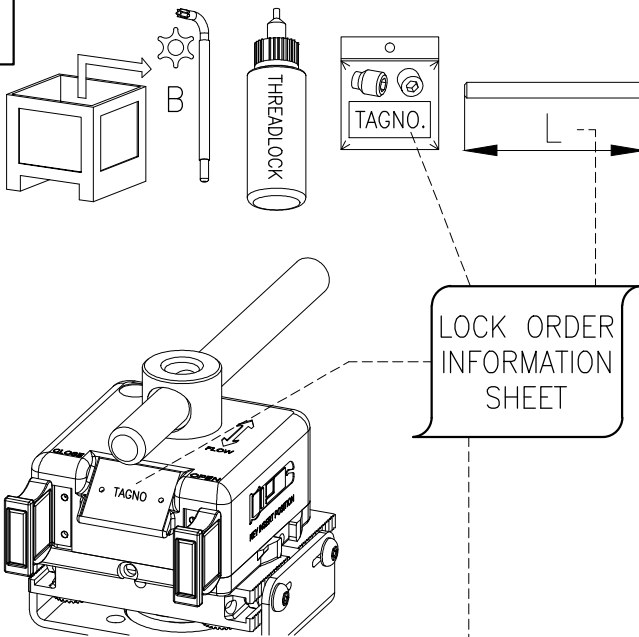
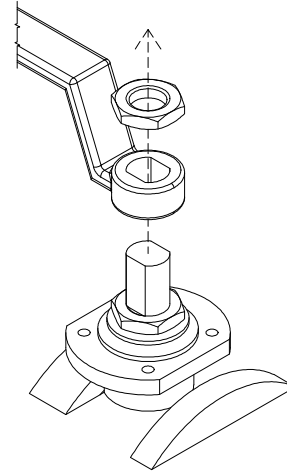
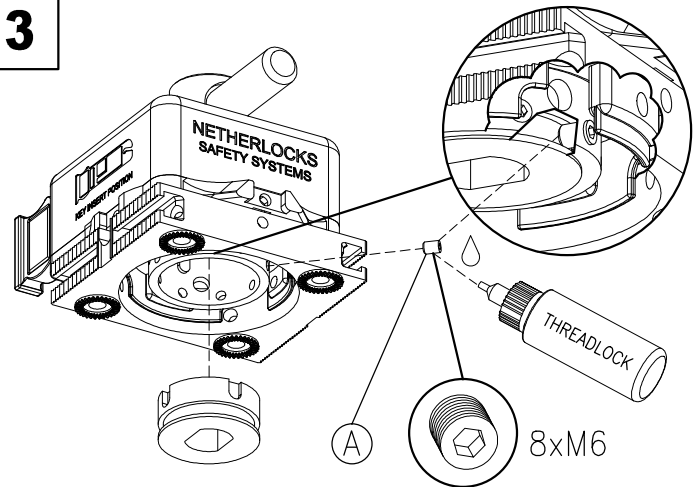
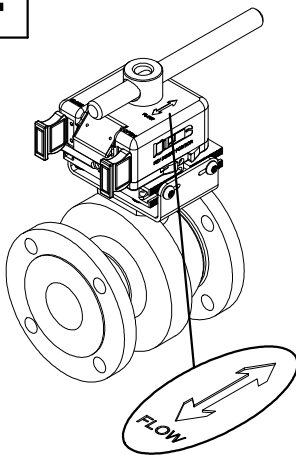
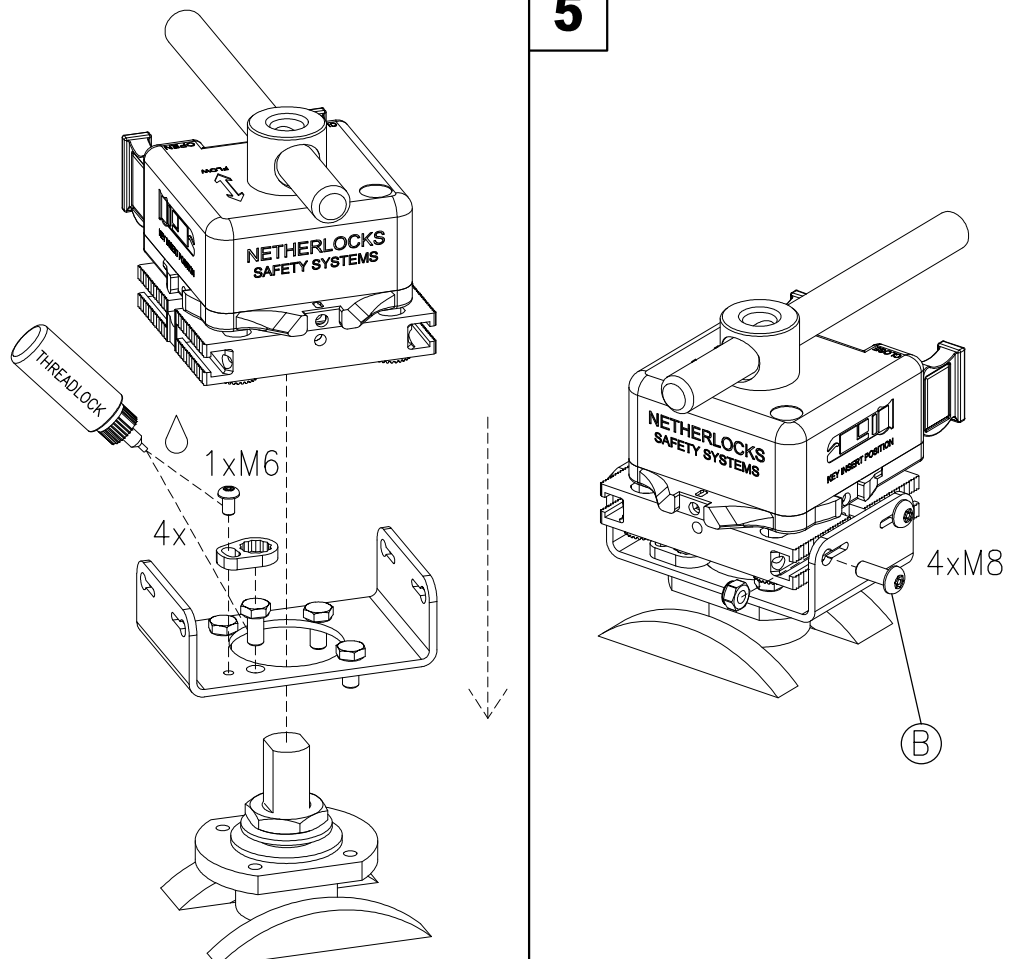


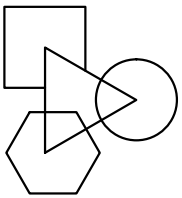
# NETHERLOCKS INSTALLATION INSTRUCTION

## NINETY DEGREE LOCK ON BALL VALVE

Tel: +31 (0) 172 471 339 - Fax: +31 (0) 172427858 - [www.netherlocks.com](http://www.netherlocks.com)

# 0.08

**1****2****3****4****5**



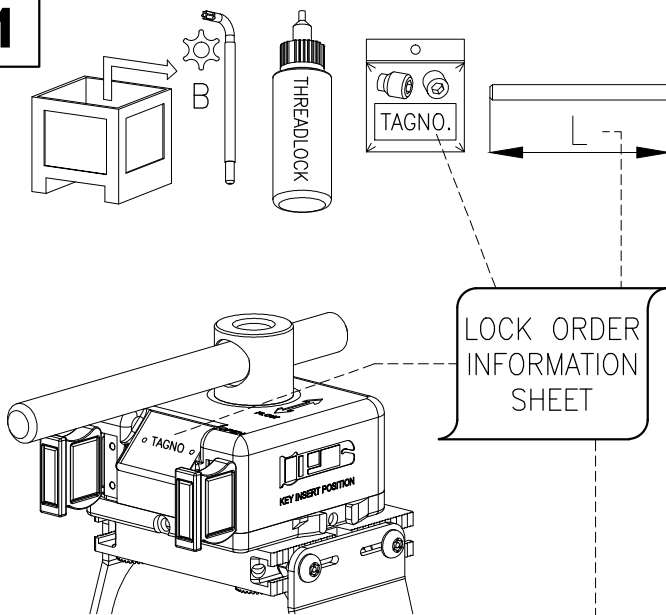
# NETHERLOCKS INSTALLATION INSTRUCTION

## NINETY DEGREE LOCK ON BALL VALVE

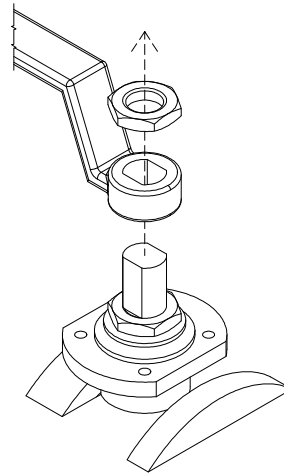
Tel: +31 (0) 172 471 339 - Fax: +31 (0) 172427858 - [www.netherlocks.com](http://www.netherlocks.com)

0.09

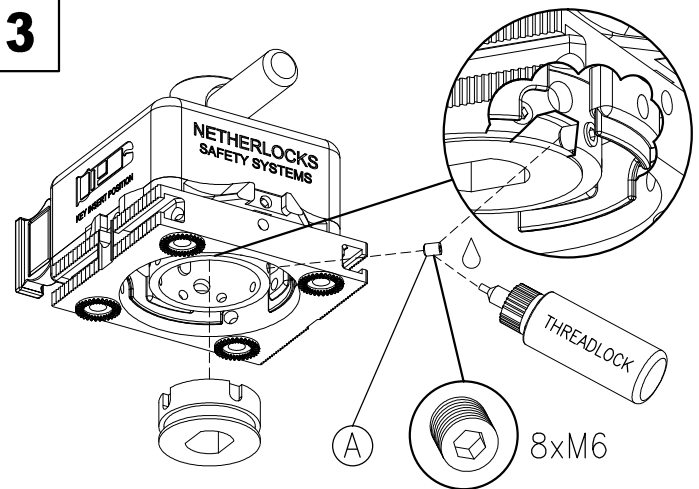
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2



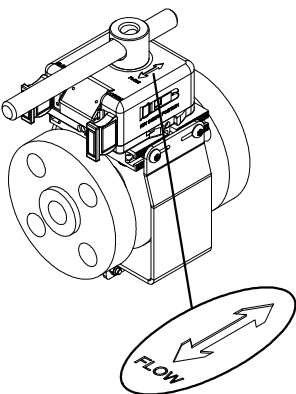
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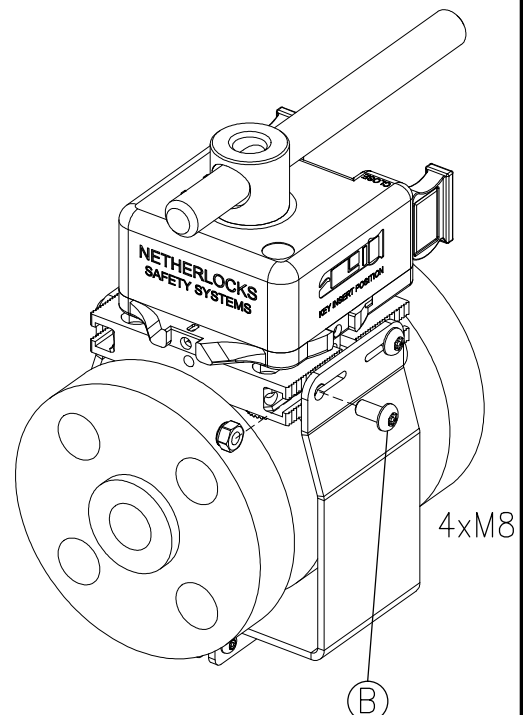
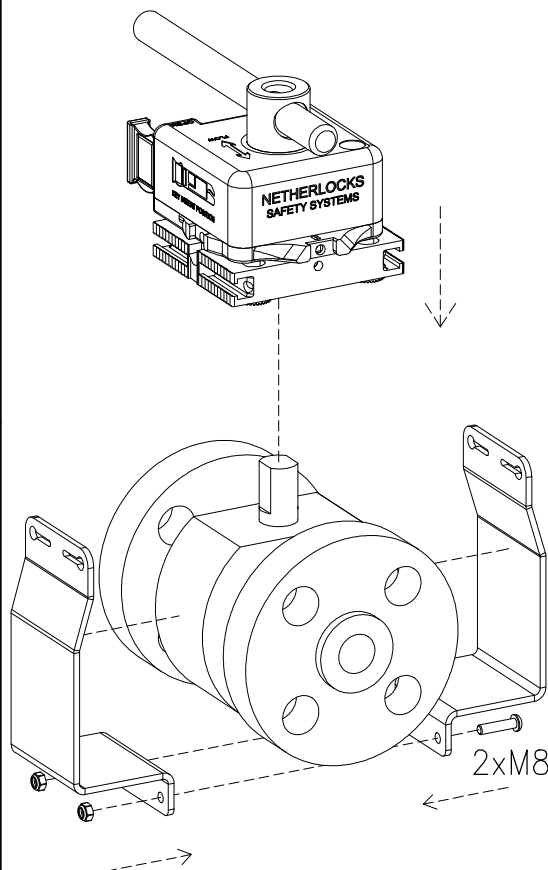
PERMIT  
OK?



4

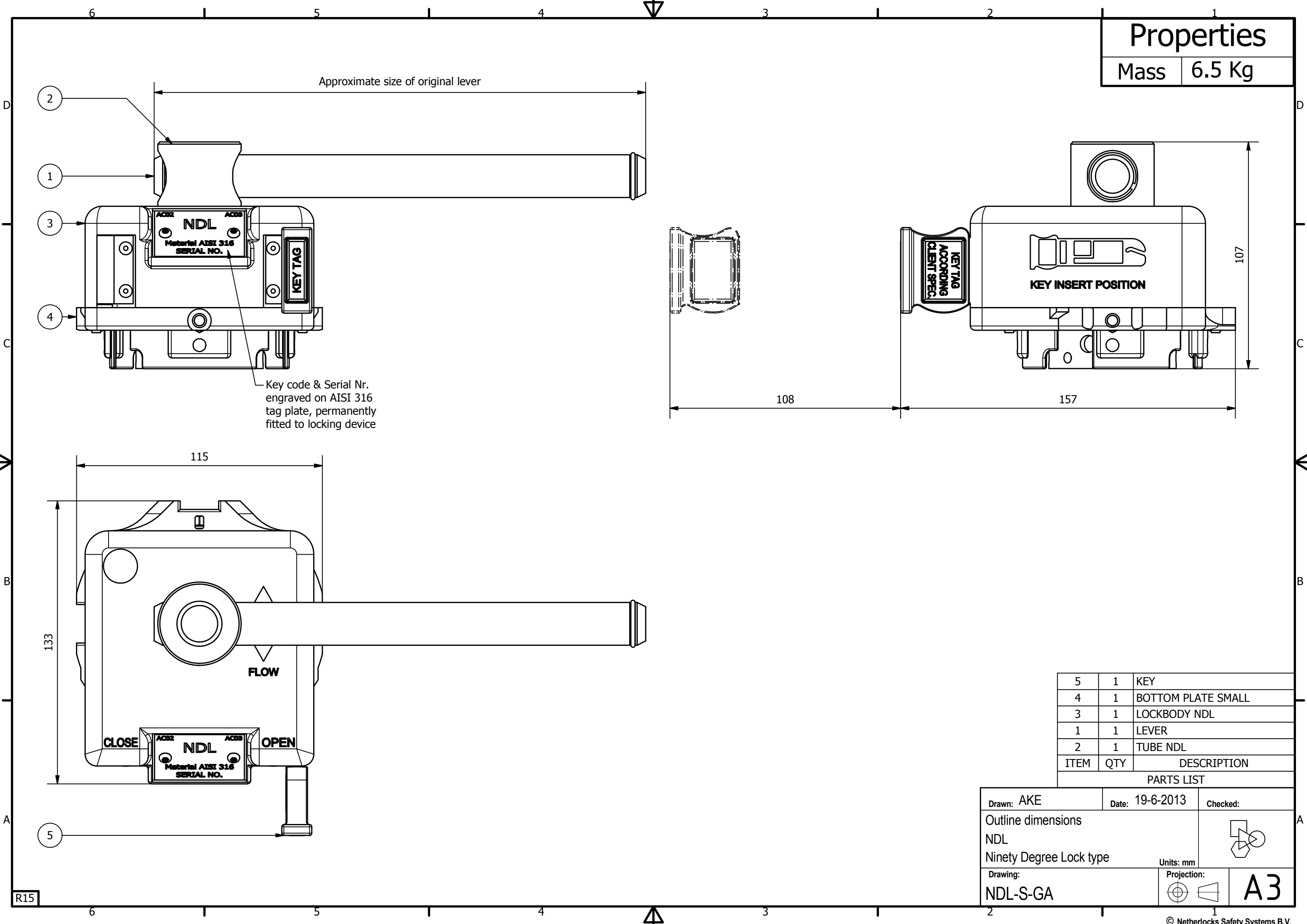


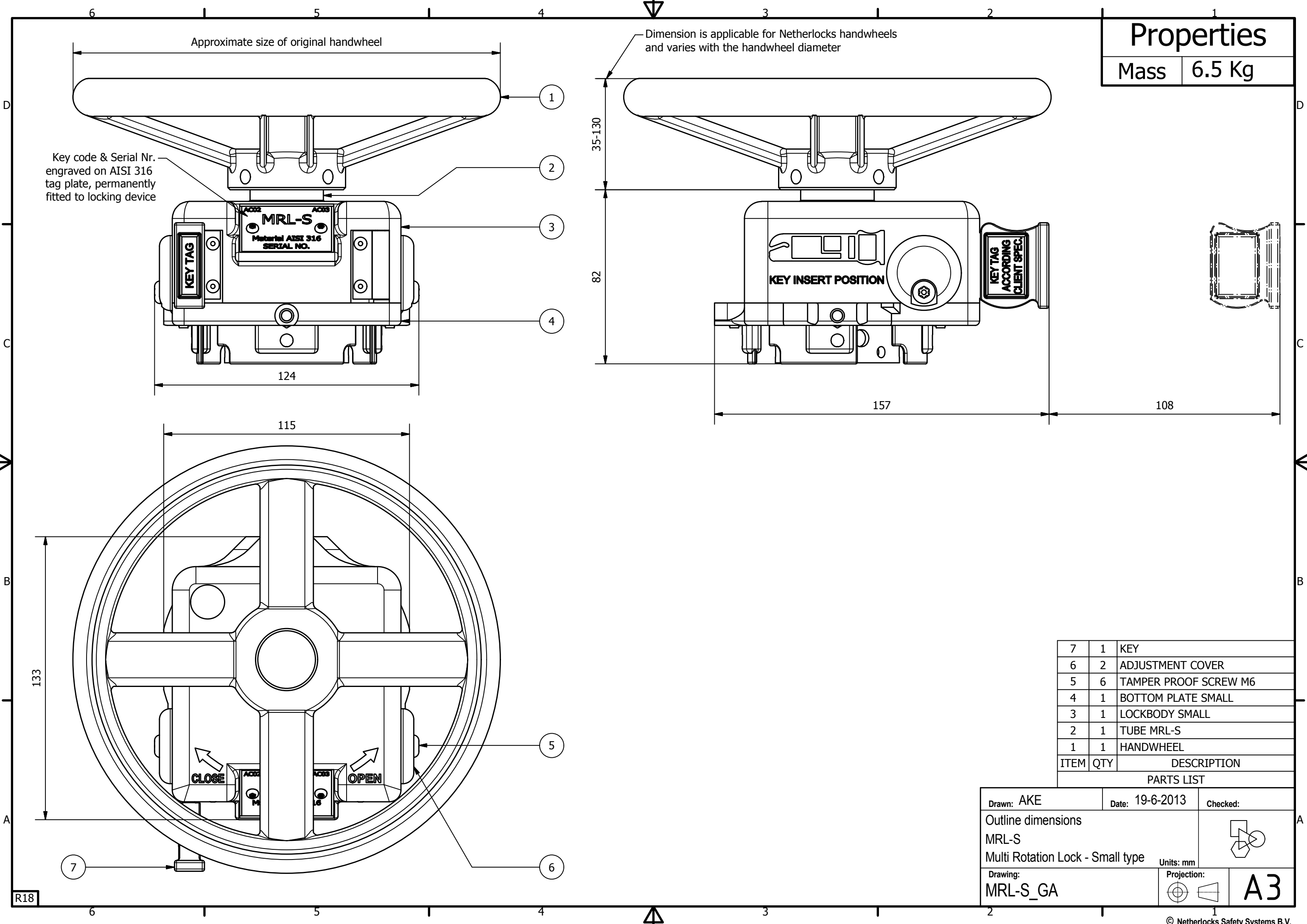
5



SECTION

## **GA Drawings for Standard Mechanical Interlocking**

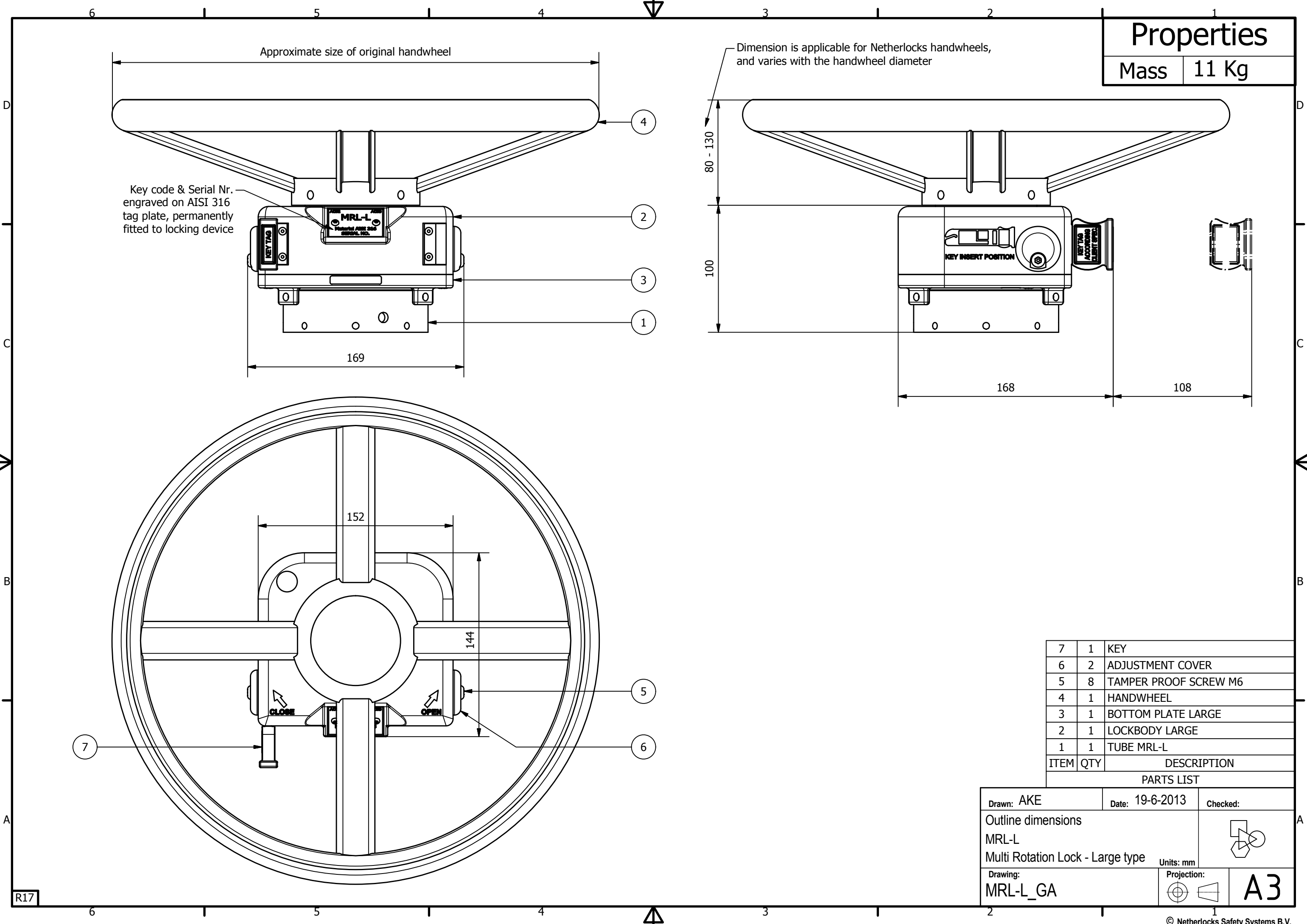




Properties	
Mass	6.5 Kg

7	1	KEY
6	2	ADJUSTMENT COVER
5	6	TAMPER PROOF SCREW M6
4	1	BOTTOM PLATE SMALL
3	1	LOCKBODY SMALL
2	1	TUBE MRL-S
1	1	HANDWHEEL
ITEM	QTY	DESCRIPTION
PARTS LIST		

Drawn: AKE	Date: 19-6-2013	Checked:
Outline dimensions MRL-S Multi Rotation Lock - Small type		
Drawing: MRL-S_GA	Units: mm Projection:	A3



# Properties

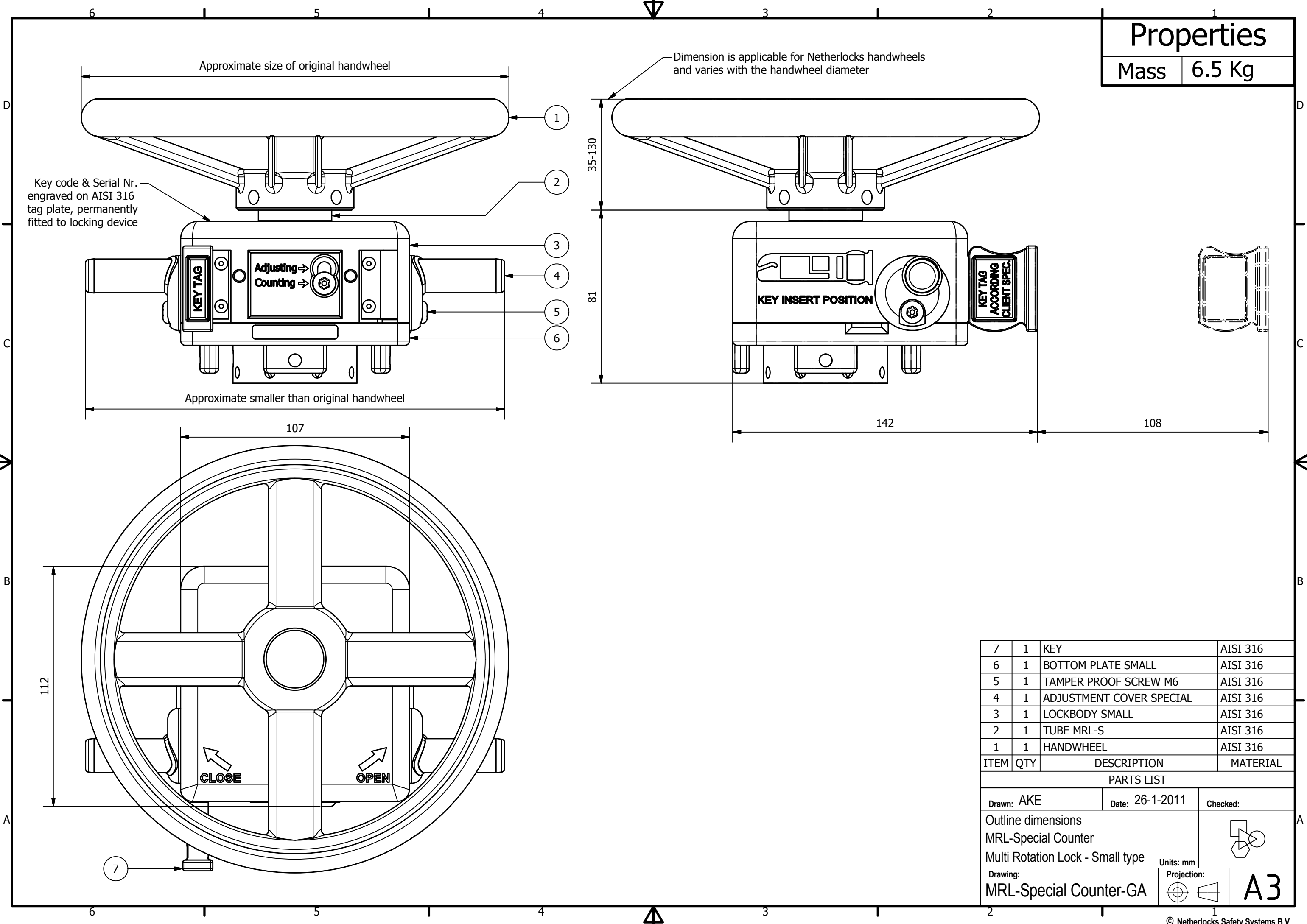
Mass 11 Kg

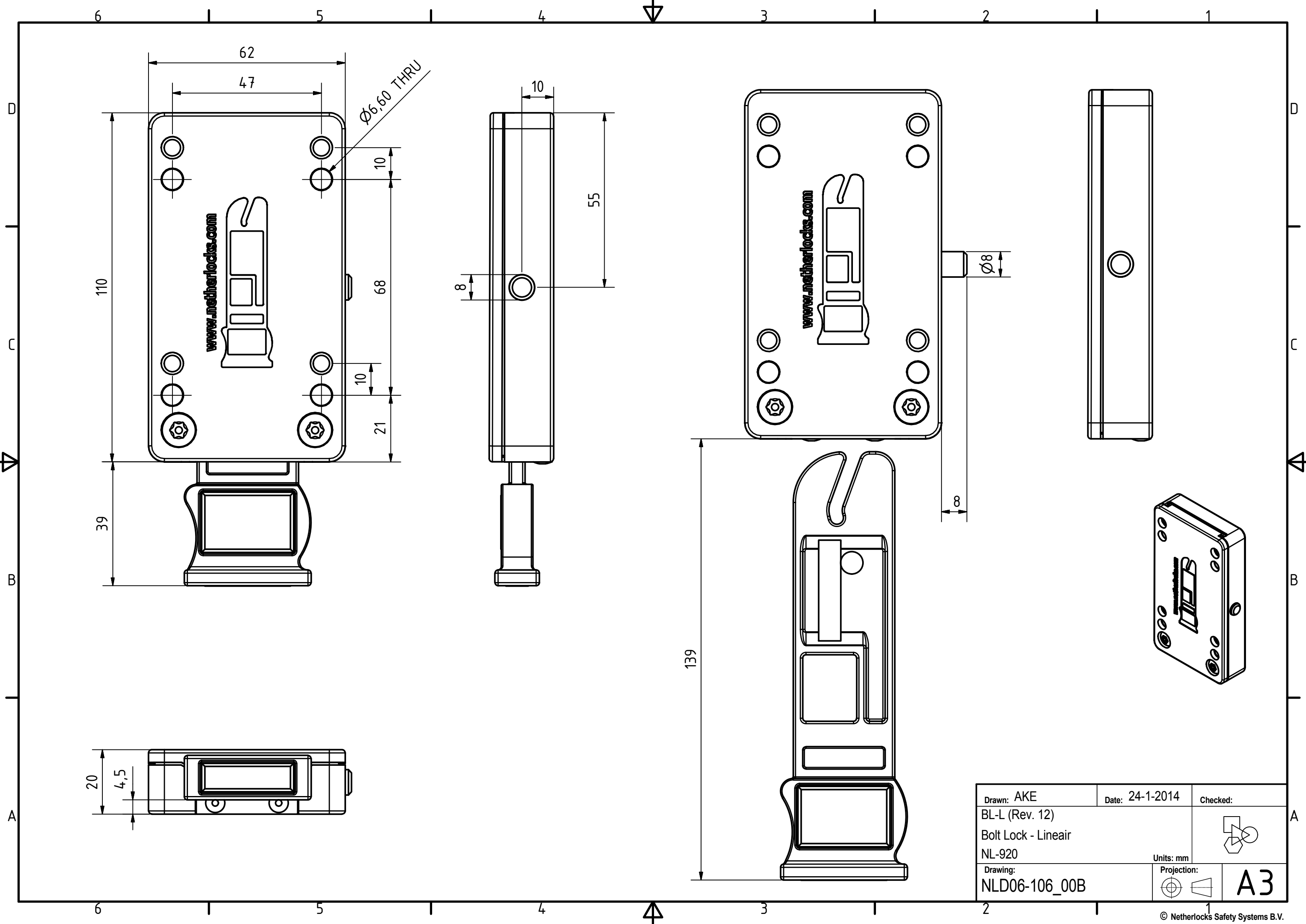
7	1	KEY
6	2	ADJUSTMENT COVER
5	8	TAMPER PROOF SCREW M6
4	1	HANDWHEEL
3	1	BOTTOM PLATE LARGE
2	1	LOCKBODY LARGE
1	1	TUBE MRL-L
ITEM	QTY	DESCRIPTION
PARTS LIST		


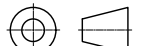
Drawn: AKE	Date: 19-6-2013	Checked:
Outline dimensions MRL-L Multi Rotation Lock - Large type		
Drawing: MRL-L_GA	Units: mm	
Projection:		A3



Properties	
Mass	6.5 Kg



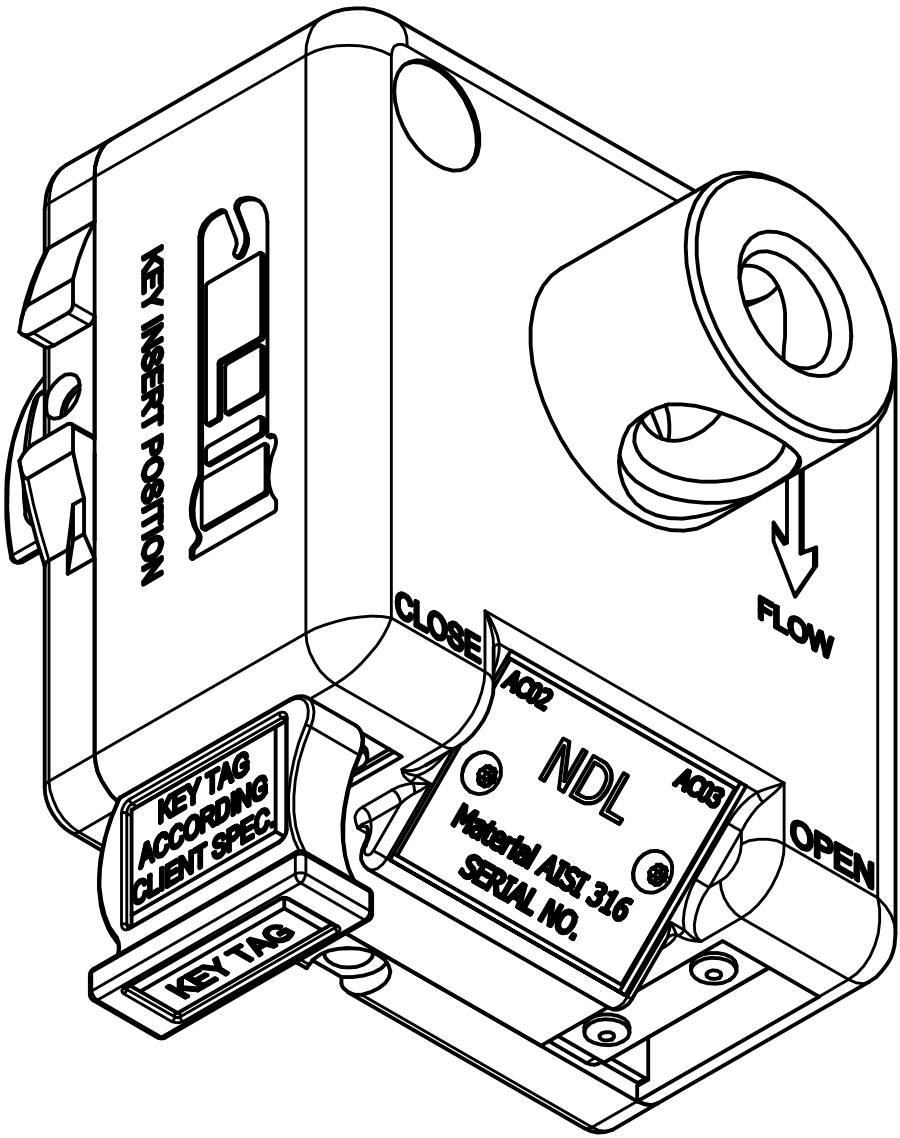
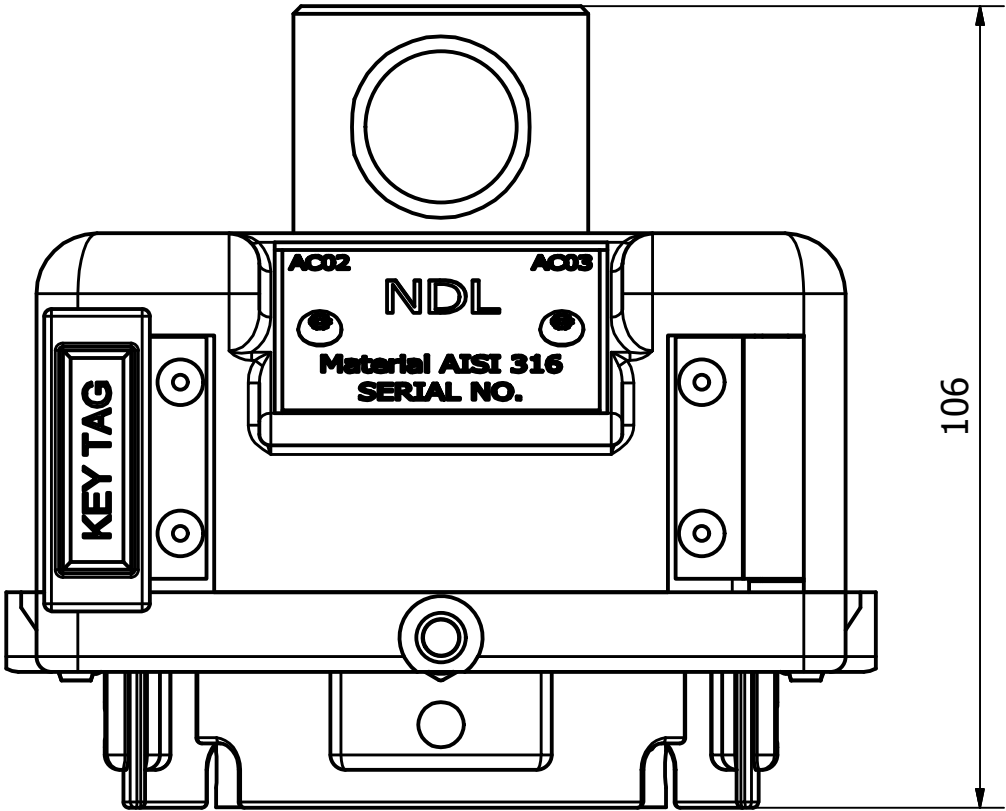
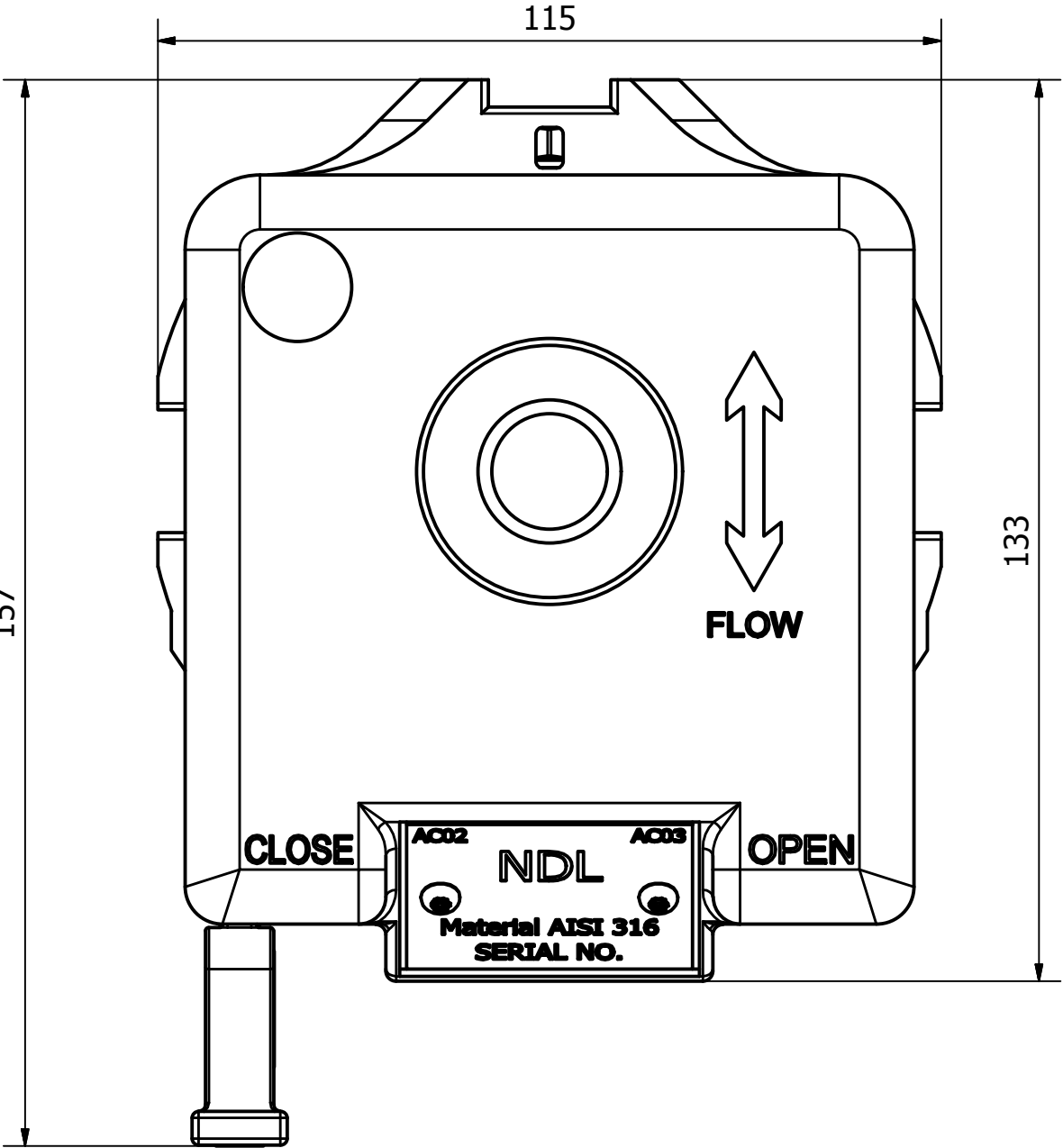


Drawn: AKE	Date: 24-1-2014	Checked:
BL-L (Rev. 12)		
Bolt Lock - Linear		
NL-920		
Units: mm		
Drawing:	Projection:	
NLD06-106_00B		
		A3

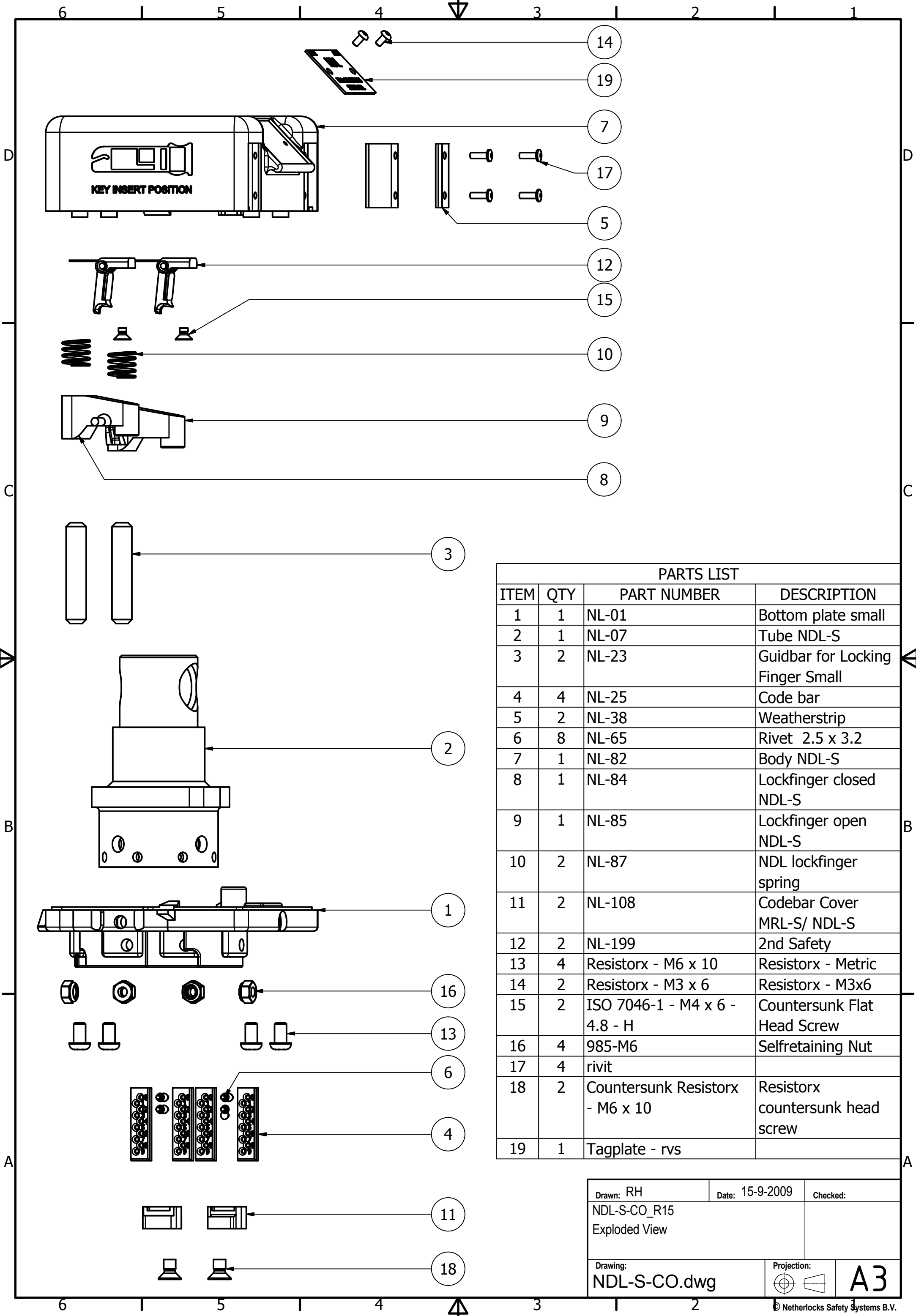
SECTION

## **Standard Mechanical Interlocking Exploded Views**

Properties	
Volume	N/A
Mass	N/A



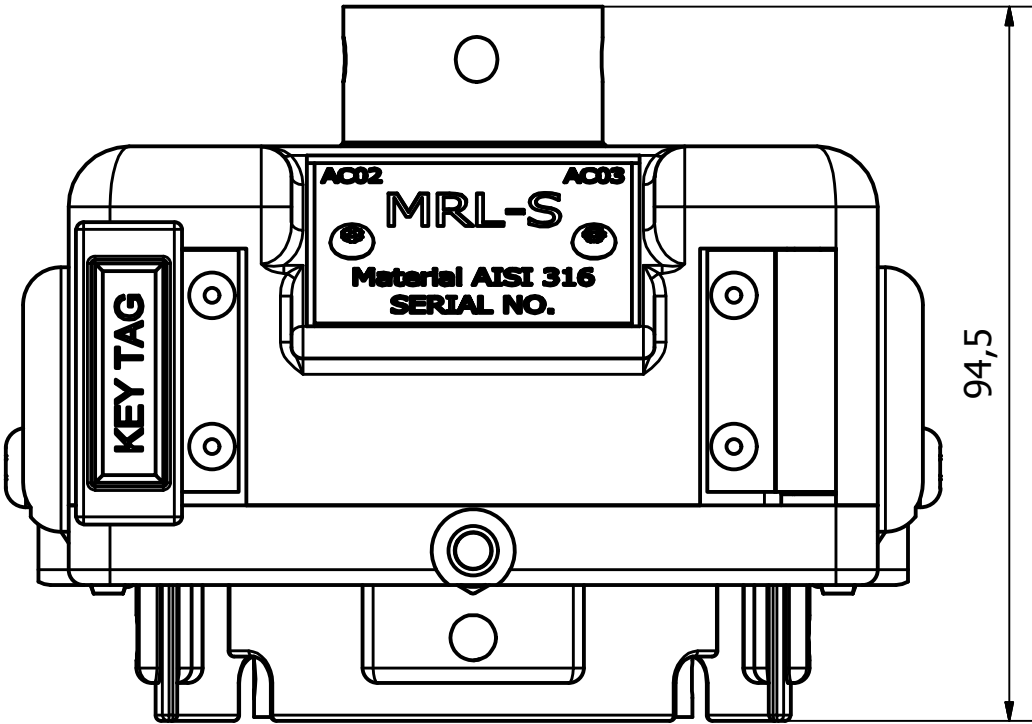
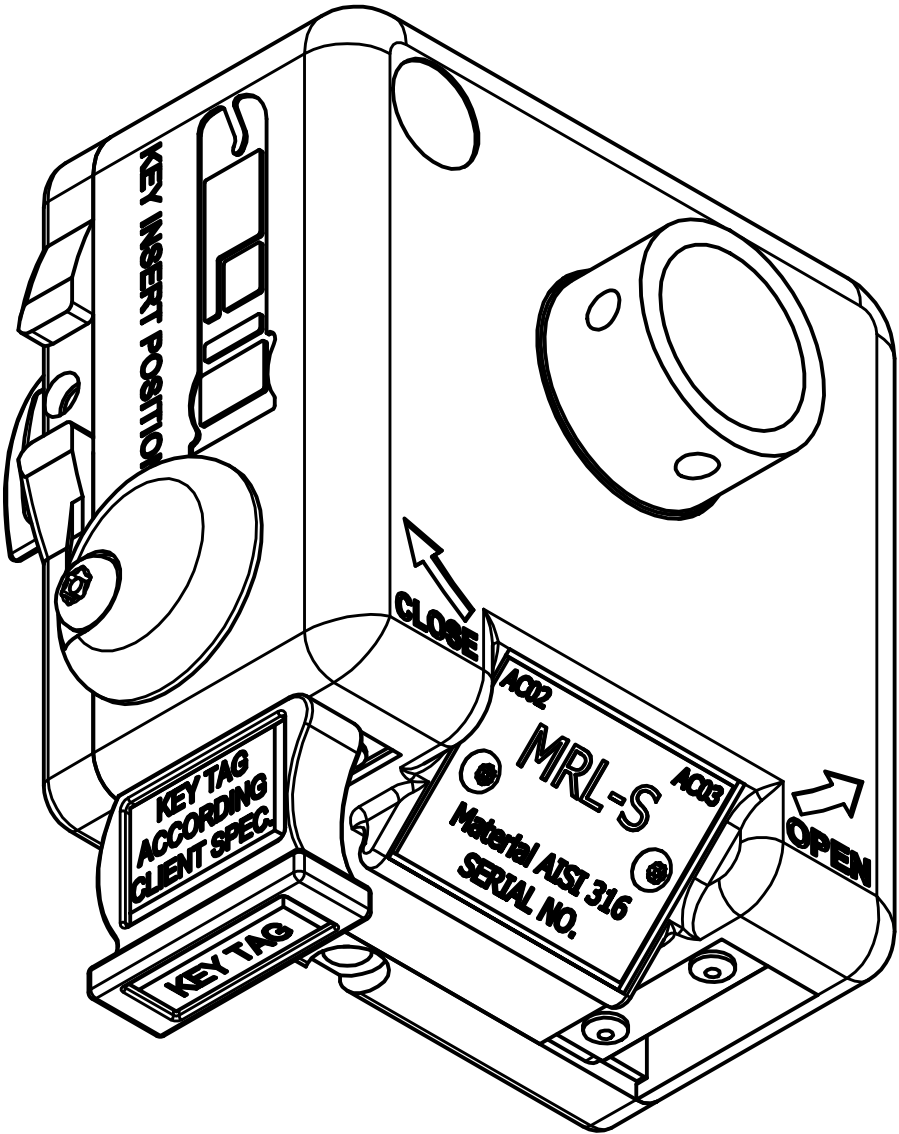
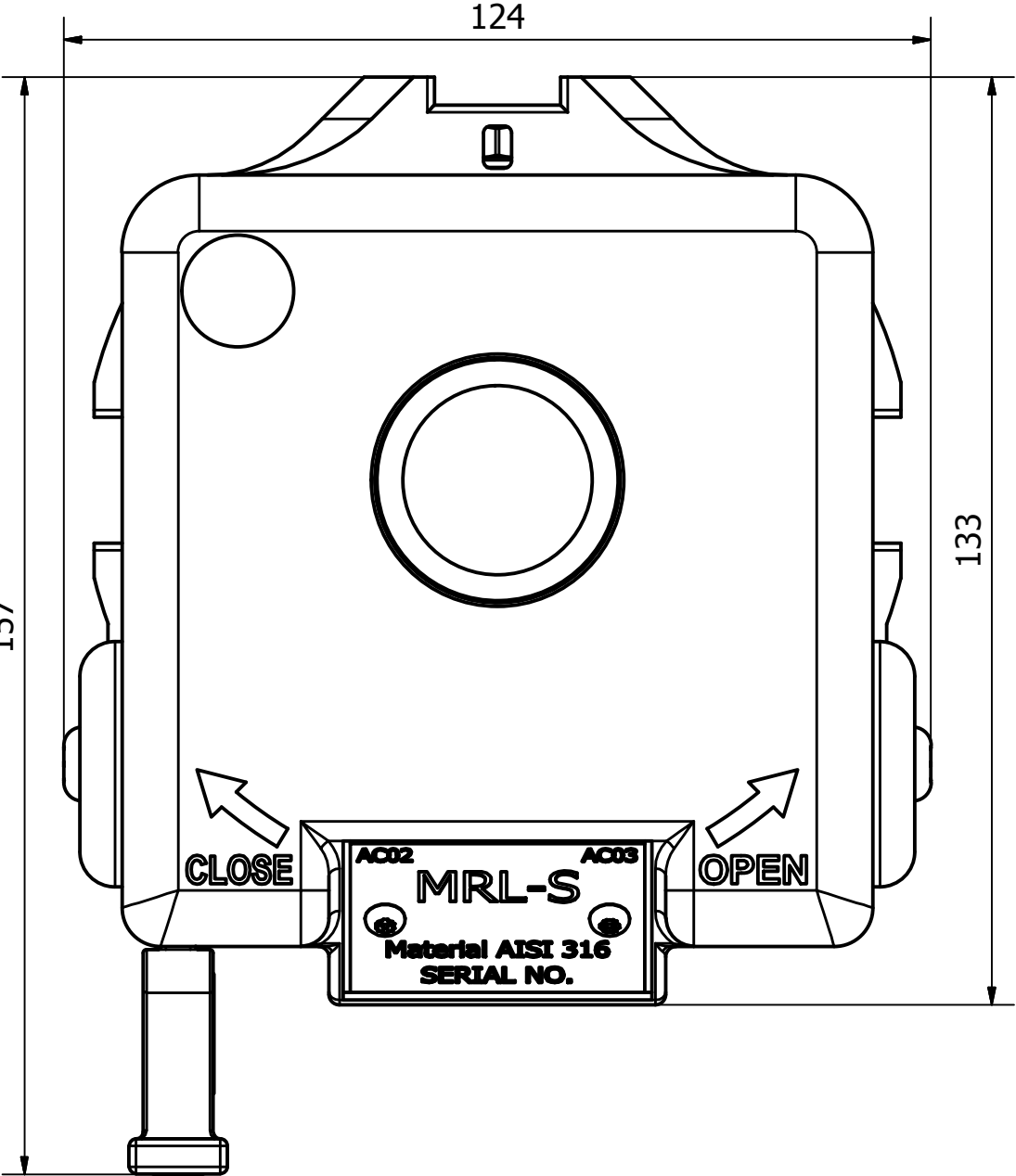
Drawn: RH	Date: 15-9-2009	Checked:
NDL-S-CO_R15 Outline Dimensions		
Drawing: NDL-S-CO.dwg	Projection: 	A3



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NL-01	Bottom plate small
2	1	NL-07	Tube NDL-S
3	2	NL-23	Guidbar for Locking Finger Small
4	4	NL-25	Code bar
5	2	NL-38	Weatherstrip
6	8	NL-65	Rivet 2.5 x 3.2
7	1	NL-82	Body NDL-S
8	1	NL-84	Lockfinger closed NDL-S
9	1	NL-85	Lockfinger open NDL-S
10	2	NL-87	NDL lockfinger spring
11	2	NL-108	Codebar Cover MRL-S/ NDL-S
12	2	NL-199	2nd Safety
13	4	Resistorx - M6 x 10	Resistorx - Metric
14	2	Resistorx - M3 x 6	Resistorx - M3x6
15	2	ISO 7046-1 - M4 x 6 - 4.8 - H	Countersunk Flat Head Screw
16	4	985-M6	Selfretaining Nut
17	4	rivit	
18	2	Countersunk Resistorx - M6 x 10	Resistorx countersunk head screw
19	1	Tagplate - rvs	

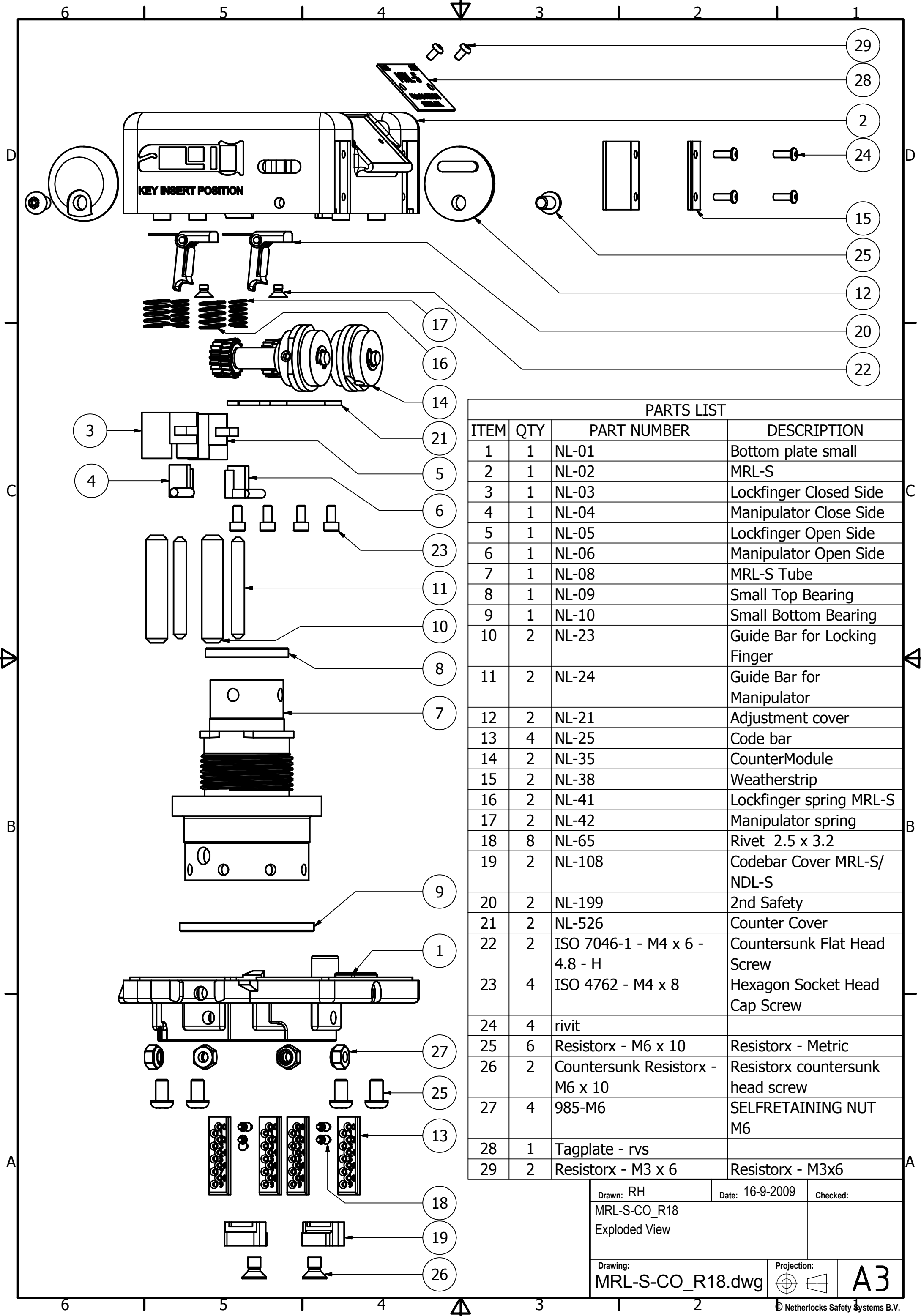
Drawn: RH	Date: 15-9-2009	Checked:
NDL-S-CO_R15		
Exploded View		
Drawing: NDL-S-CO.dwg	Projection:	A3

Properties	
Volume	N/A
Mass	N/A



Drawn: RH	Date: 16-9-2009	Checked:
MRL-S-CO_R18		
Outline Dimensions		
Drawing: MRL-S-CO_R18.dwg	Projection: 	A3

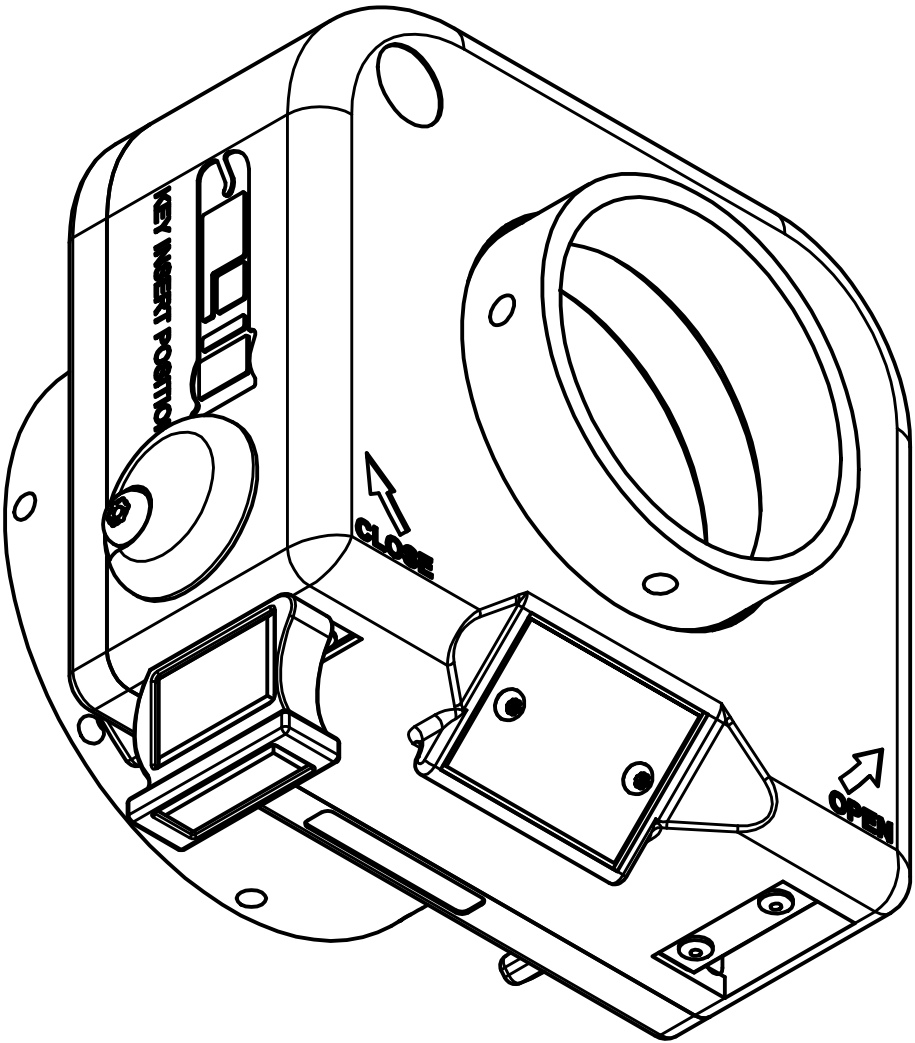
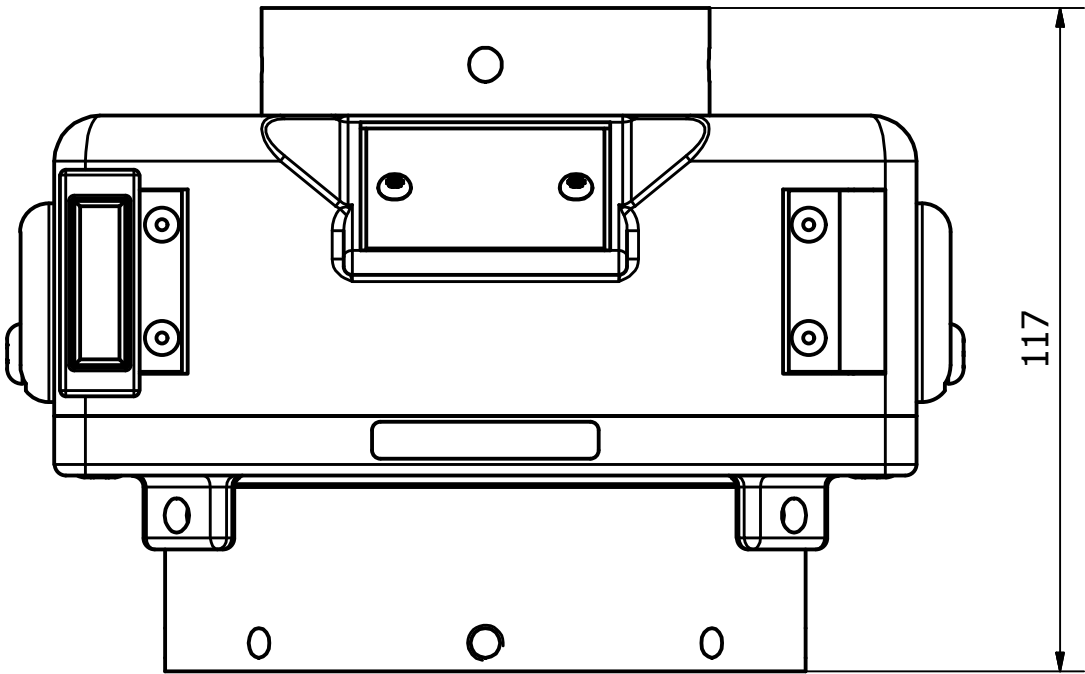
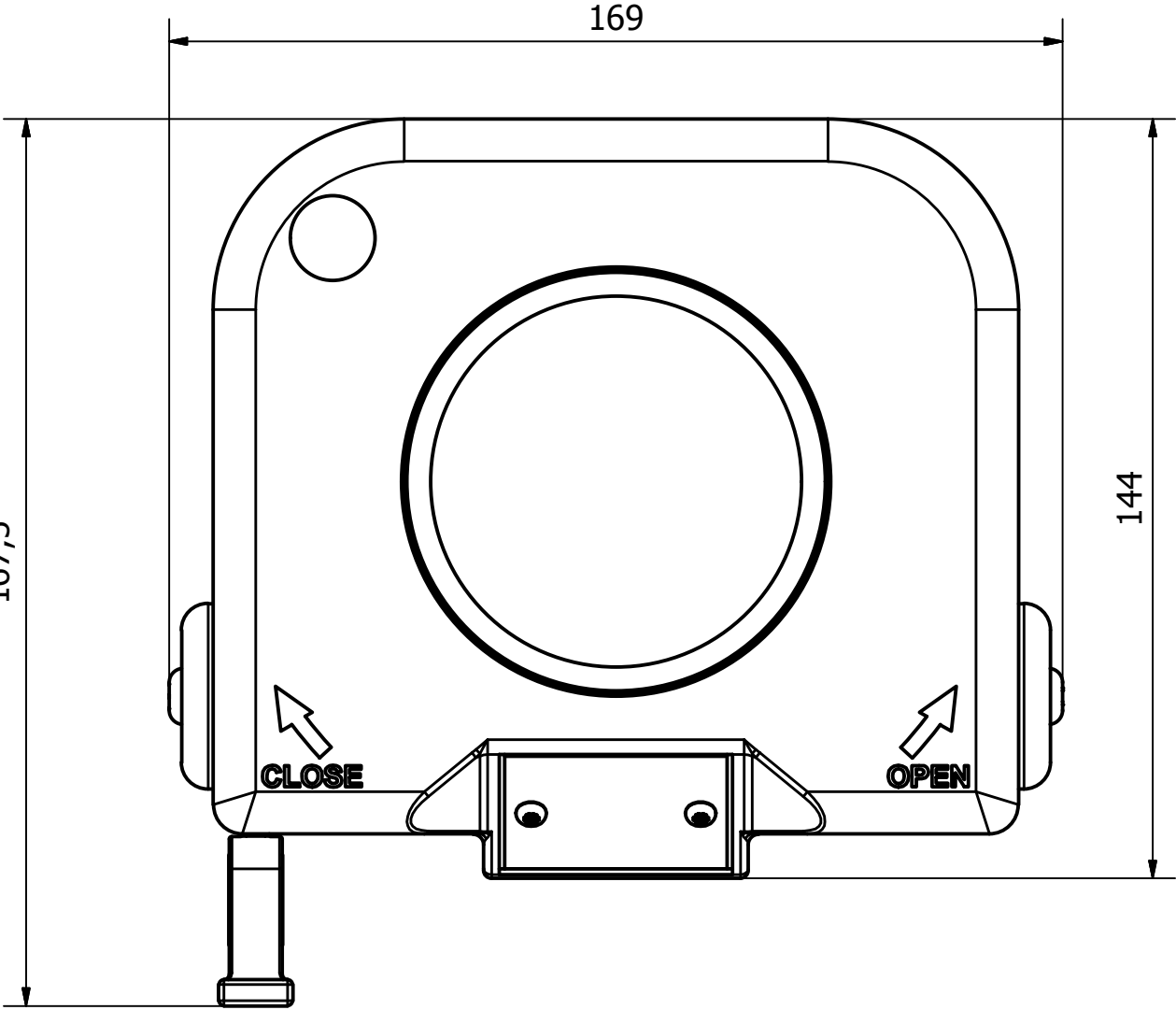




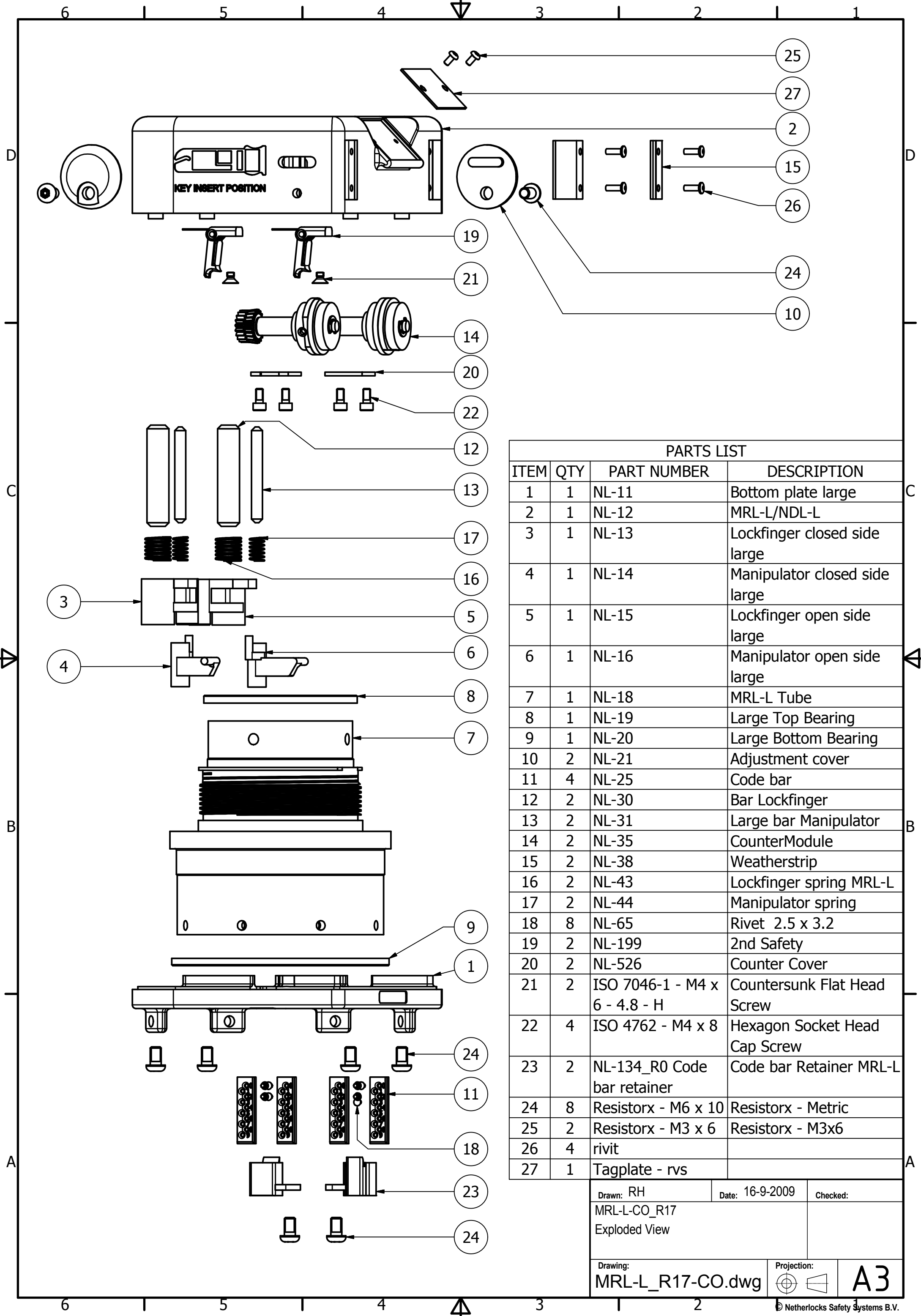
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NL-01	Bottom plate small
2	1	NL-02	MRL-S
3	1	NL-03	Lockfinger Closed Side
4	1	NL-04	Manipulator Close Side
5	1	NL-05	Lockfinger Open Side
6	1	NL-06	Manipulator Open Side
7	1	NL-08	MRL-S Tube
8	1	NL-09	Small Top Bearing
9	1	NL-10	Small Bottom Bearing
10	2	NL-23	Guide Bar for Locking Finger
11	2	NL-24	Guide Bar for Manipulator
12	2	NL-21	Adjustment cover
13	4	NL-25	Code bar
14	2	NL-35	CounterModule
15	2	NL-38	Weatherstrip
16	2	NL-41	Lockfinger spring MRL-S
17	2	NL-42	Manipulator spring
18	8	NL-65	Rivet 2.5 x 3.2
19	2	NL-108	Codebar Cover MRL-S/NDL-S
20	2	NL-199	2nd Safety
21	2	NL-526	Counter Cover
22	2	ISO 7046-1 - M4 x 6 - 4.8 - H	Countersunk Flat Head Screw
23	4	ISO 4762 - M4 x 8	Hexagon Socket Head Cap Screw
24	4	rivit	
25	6	Resistorx - M6 x 10	Resistorx - Metric
26	2	Countersunk Resistorx - M6 x 10	Resistorx countersunk head screw
27	4	985-M6	SELFRETAINING NUT M6
28	1	Tagplate - rvs	
29	2	Resistorx - M3 x 6	Resistorx - M3x6

Drawn: RH	Date: 16-9-2009	Checked:
MRL-S-CO_R18 Exploded View		
Drawing: MRL-S-CO_R18.dwg	Projection: 	<b>A3</b>

Properties	
Volume	N/A
Mass	N/A



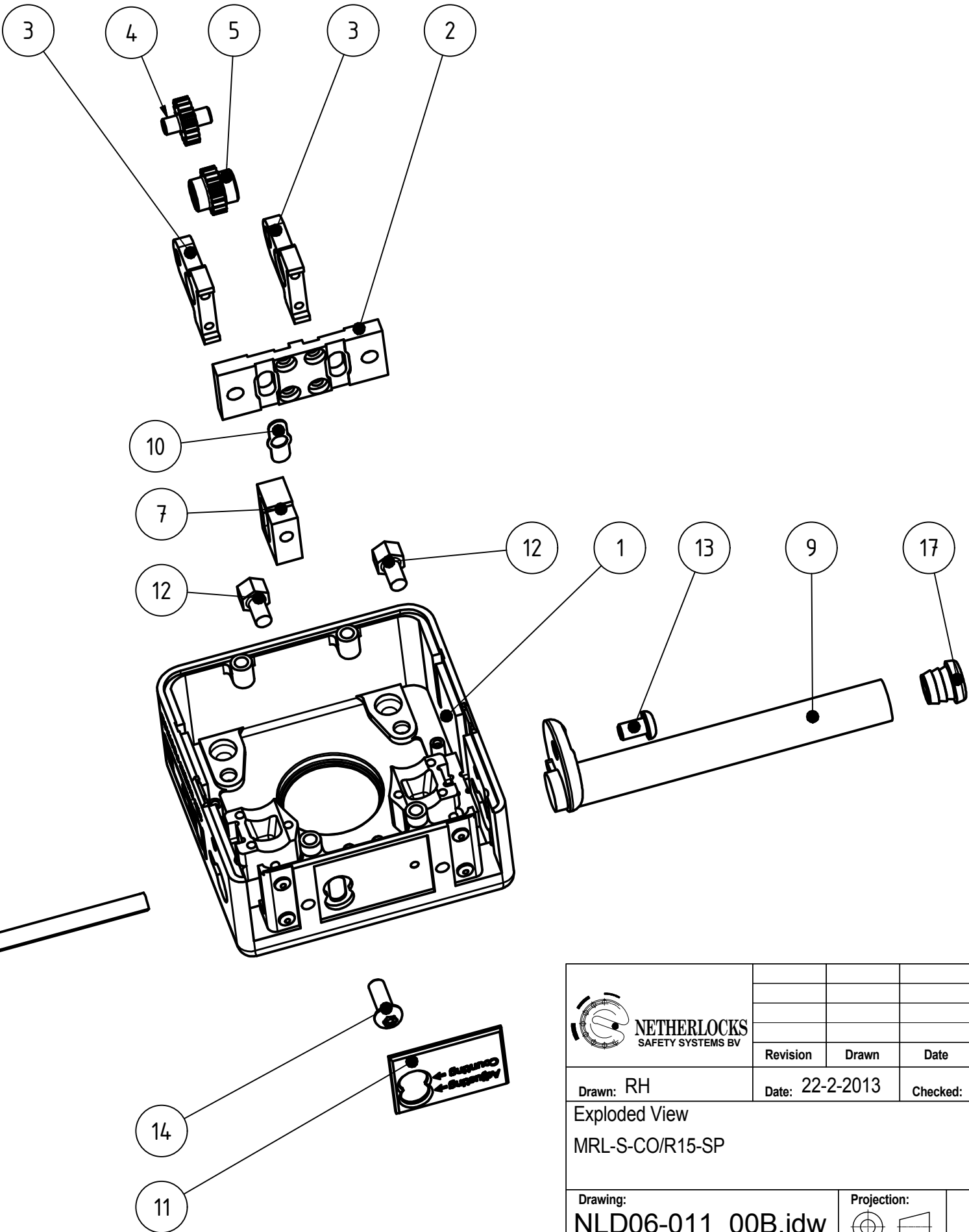
Drawn: RH	Date: 16-9-2009	Checked:
MRL-L-CO_R17 Outline Dimensions		
Drawing: MRL-L_R17-CO.dwg	Projection: 	A3




PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NL-11	Bottom plate large
2	1	NL-12	MRL-L/NDL-L
3	1	NL-13	Lockfinger closed side large
4	1	NL-14	Manipulator closed side large
5	1	NL-15	Lockfinger open side large
6	1	NL-16	Manipulator open side large
7	1	NL-18	MRL-L Tube
8	1	NL-19	Large Top Bearing
9	1	NL-20	Large Bottom Bearing
10	2	NL-21	Adjustment cover
11	4	NL-25	Code bar
12	2	NL-30	Bar Lockfinger
13	2	NL-31	Large bar Manipulator
14	2	NL-35	CounterModule
15	2	NL-38	Weatherstrip
16	2	NL-43	Lockfinger spring MRL-L
17	2	NL-44	Manipulator spring
18	8	NL-65	Rivet 2.5 x 3.2
19	2	NL-199	2nd Safety
20	2	NL-526	Counter Cover
21	2	ISO 7046-1 - M4 x 6 - 4.8 - H	Countersunk Flat Head Screw
22	4	ISO 4762 - M4 x 8	Hexagon Socket Head Cap Screw
23	2	NL-134_R0 Code bar retainer	Code bar Retainer MRL-L
24	8	Resistorx - M6 x 10	Resistorx - Metric
25	2	Resistorx - M3 x 6	Resistorx - M3x6
26	4	rivit	
27	1	Tagplate - rvs	

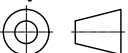
Drawn: RH	Date: 16-9-2009	Checked:
MRL-L-CO_R17 Exploded View		
Drawing: MRL-L_R17-CO.dwg	Projection: 	<b>A3</b>

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD06-011_02	
2	1	NLD06-011_03E	
3	2	NLD06-011_06C	
4	1	NLD06-011_04	
5	1	NLD06-011_05	
6	1	NLD06-011_07	
7	1	NLD06-011_08E	
8	1	NLD06-011_09	
9	1	NLD06-011_12	
10	1	NLD06-011_14B	
11	1	NLD06-011_15	
12	2	NLD06-011_16B	
13	2	Resistorx - M6 x 10	Resistorx - Metric
14	1	Resistorx - M6 x 16	Resistorx - Metric
15	4	ISO 7046-1 - M4 x 10 - 4.8 - Z	Countersunk Flat Head Screw
16	4	rivit	
17	2	THOVIP-403000 16x10x4.0	

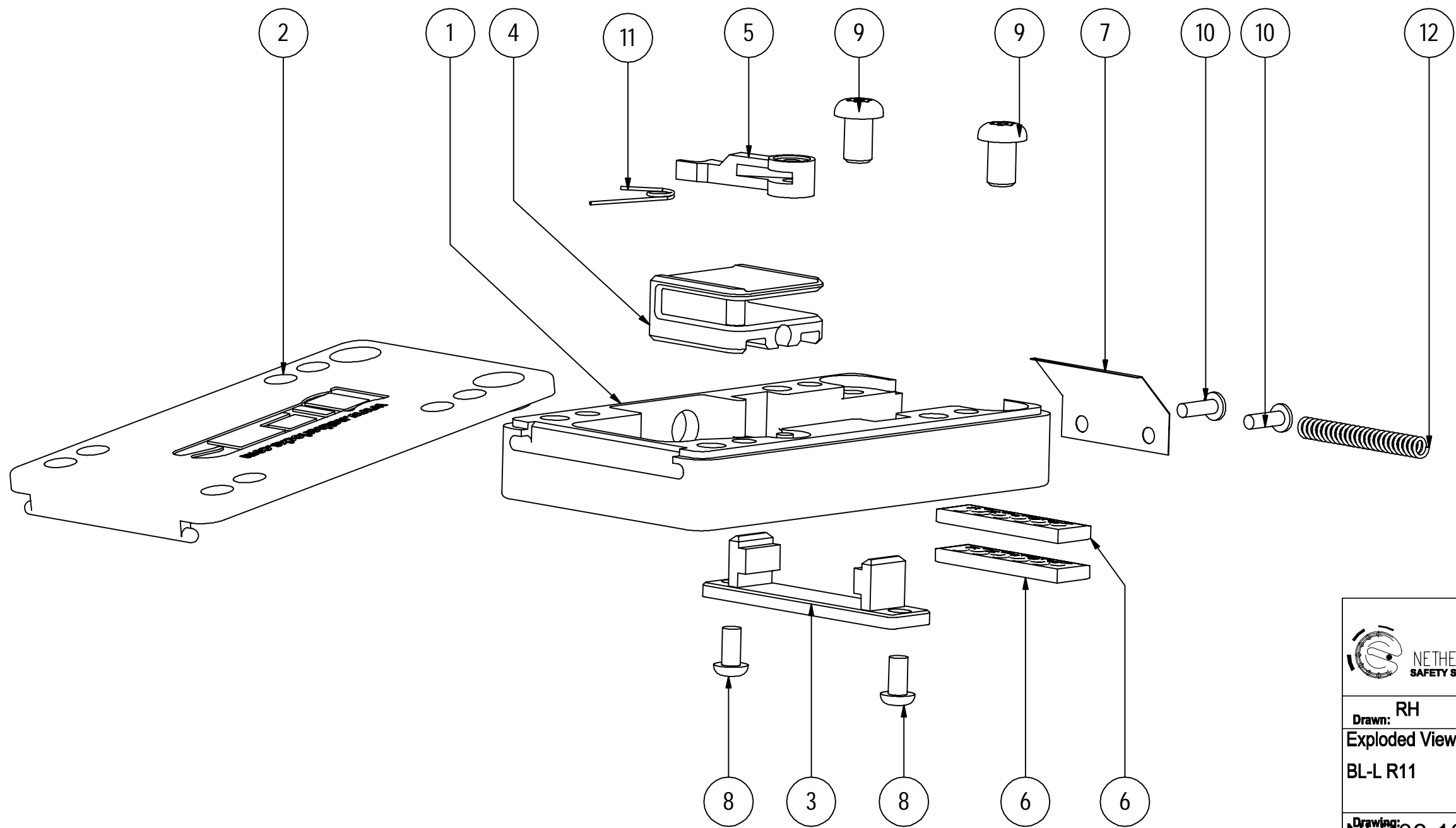





**NETHERLOCKS**  
SAFETY SYSTEMS BV

Revision	Drawn	Date	Checked
Drawn: RH		Date: 22-2-2013	Checked:
Exploded View MRL-S-CO/R15-SP			
Drawing: NLD06-011_00B.idw		Projection: 	<b>A3</b>

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	NLD06-106_02	Bottom Side Lock Housing
2	1	NLD06-106_03	Upper Side Lock Housing
3	1	NLD06-106_04	Codebar Retainer
4	1	NLD06-106_05	Locking Bolt
5	1	NLD06-106_06	2nd Safety
6	2	NL-25	Code bar
7	1	weatherstrip	
8	2	Resistorx - M4 x 10	Resistorx - Metric
9	2	Resistorx - M6 x 10	Resistorx - Metric
10	2	rivit	
11	1	T025-090-140	Torsion Spring
12	1	C0180-029-1500S	Compresion Spring





NETHERLOCKS  
SAFETY SYSTEMS BV

Revision	Drawn	Date	Checked
Drawn: RH	Date: 6-11-2007	Checked:	
Exploded View			
BL-L R11			
Drawing: NLD06-106_01.dwg		Projection:	A3

SECTION

## Technical Drawing Fill-in Sheets





## Process Interlocking

# Measuring Instructions

## QUALITY

NETHERLOCKS products are renowned for their high quality. To maintain this high standard, it is important the locks are mounted correctly. Mounting of our locks requires an adapter and a bracket. To design these, we need the exact top work dimensions of the valve/gearbox on which the lock will be mounted.

## FILL-IN SHEETS

In order to assist you in measuring the topwork correctly we have developed fill-in sheets for all types of valves and gearboxes. These sheets give a general idea of the shape of the valve/gearbox and the dimensions we require.

## HANDDRAWN SKETCH

When the actual valve/gearbox has a significantly different shape than the fill-in sheets, a hand-drawn sketch including dimensions is necessary to give our engineers a better idea of the shape of the valve.

## DELIVERY TIME

After we have received and approved all the required dimensions we can start engineering. This means our x weeks delivery time starts then.

If you have any questions regarding the measurements please contact us at [engineering@netherlocks.com](mailto:engineering@netherlocks.com)

Thank you in advance,

**NETHERLOCKS**

Symbols:

PCD = pitch circle diameter

Ø = circle diameter

▣ = square

X = Dimension is not applicable



Specify shape and size of Drive Bush

Dimension [mm]

phi A	
phi B	
C	
D	
E	
F	
G	
phi H	
I	
J	
K	
L	
M	
N	
O	
P	
Q	
phi R	
S	
pitch	

phi 1	
2	
3	
4	
phi 5	
6	
7	
HEX	
OCT	
phi 10	
11	
HEX2	

Drivebush  
(remove handwheel  
before measuring)

NETHERLOCKS

safety systems

Tel: +31 (0) 172 471 339 - Fax: +31 (0) 172427858

www.netherlocks.com

Brand/Make:

Size/Pressure class:

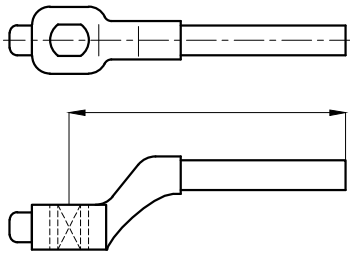
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Date:

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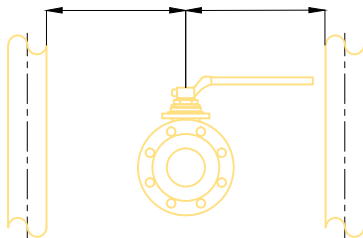
# BALLVALVE FILL-IN SHEET

FORM. NF9M004  
REV. 2013-08-14

LEVER (or WRENCH)



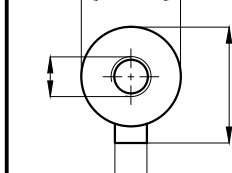
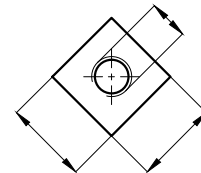
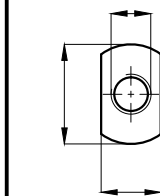
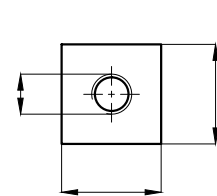
J AVAILABLE SPACING BETWEEN VALVE AND PIPING H



ONLY IF SPACING  $\leq$  LEVER + 50 mm

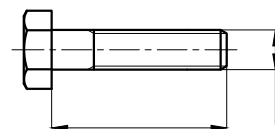
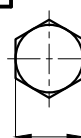
SPECIFY SHAPE AND  
SIZE OF STEM  
IN CLOSED STATE

DIRECTION OF FLOW

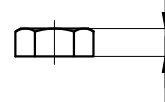


Other Shape:

SPECIFY SORT AND  
SIZE OF LEVER FASTENING

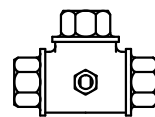
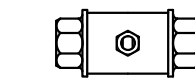


OR



INDICATE APPLICABLE TYPE

☐ 90° -Turn ☐ 180° -Turn



☐ STRAIGHT-WAY

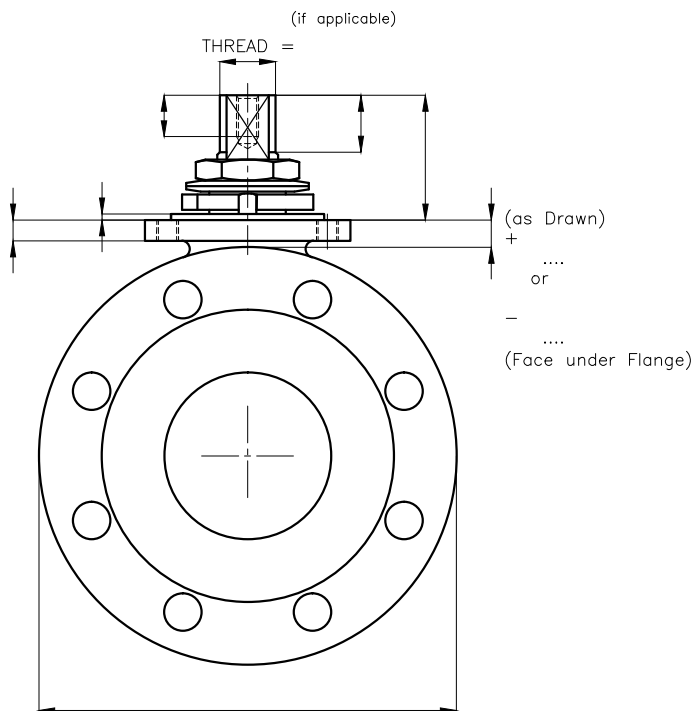
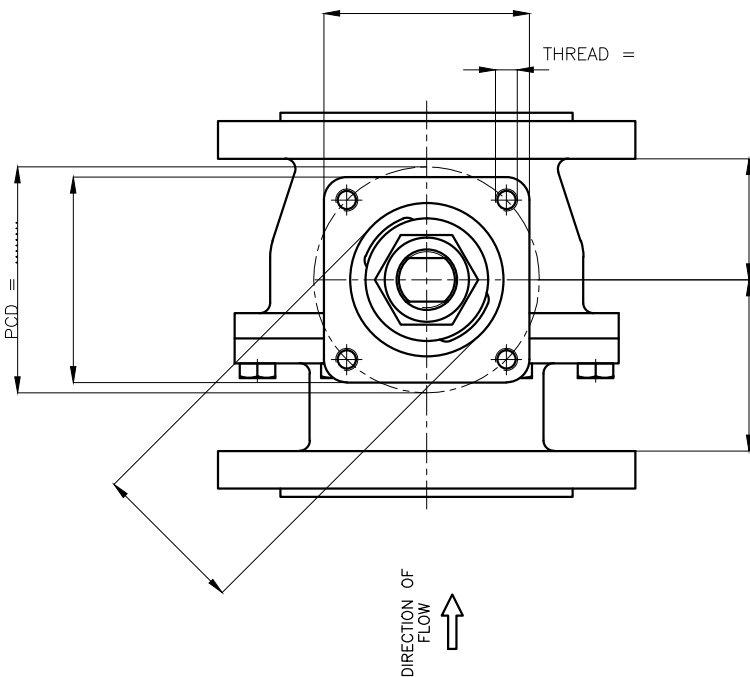
☐ THREE-WAY

CLIENT:

PROJECT:

P.O. No:

Valve / Tagno.



Brand / Make:

Size:

Class:

A Measured by:

Date:

Sketchnr.

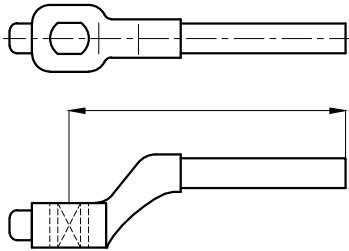
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FORM. NF9M004-Empty  
REV. 2013-08-14

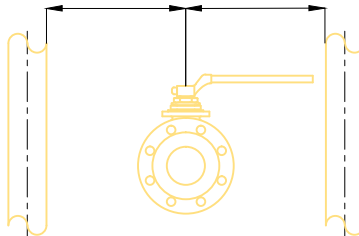
SPECIFY SHAPE AND  
SIZE OF STEM  
IN CLOSED STATE

DIRECTION OF FLOW →

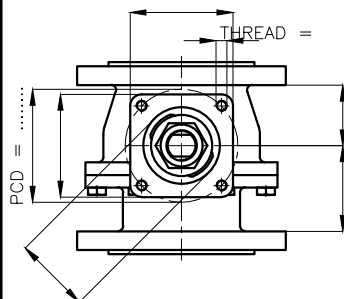
LEVER (or WRENCH)



AVAILABLE SPACING BETWEEN VALVE AND PIPING

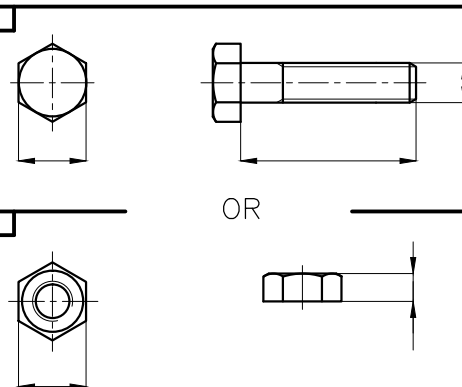


ONLY IF SPACING  $\leq$  LEVER + 50 mm



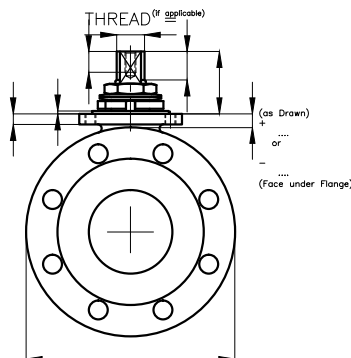
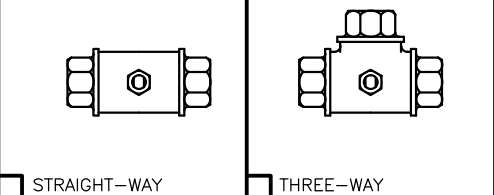
Other Shape:

SPECIFY SORT AND  
SIZE OF LEVER FASTENING



INDICATE APPLICABLE TYPE

90° -Turn 180° -Turn



CLIENT:

PROJECT:

P.O. No:

**NETHERLOCKS**  
safety systems

**Brand / Make:**

**Size:**

**Class:**

**A** Measured by:

Date:

Sketchnr.

**B** Valve / Tagno.

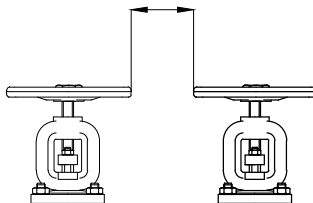
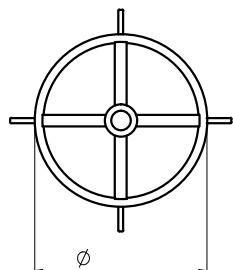
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FORM. NF9M002  
REV. 2013-05-10

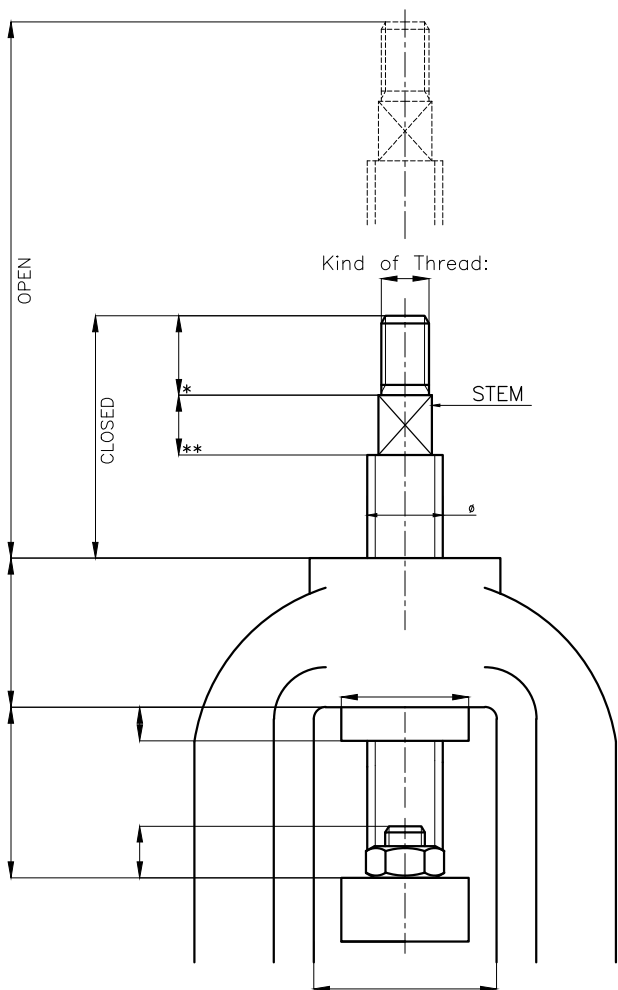
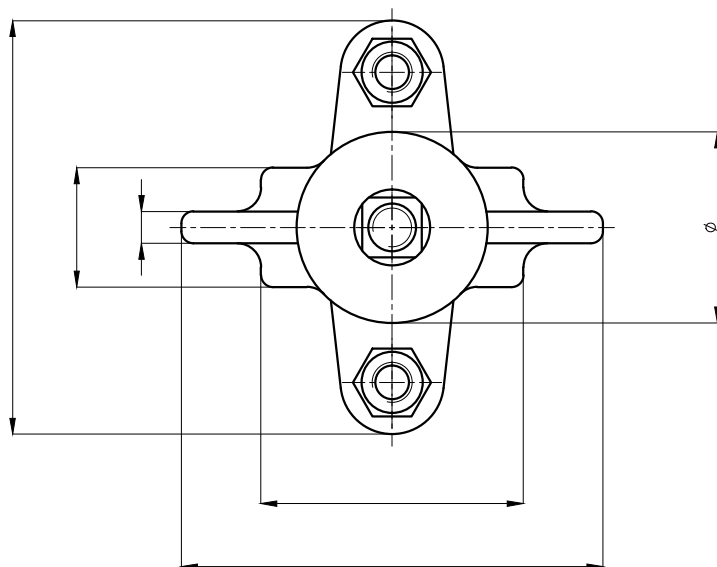
SPECIFY SHAPE AND  
SIZE OF STEM

HANDWHEEL

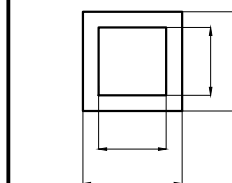
G AVAILABLE SPACING BETWEEN HANDWHEELS F



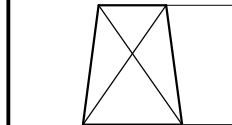
ONLY IF SPACING  $\leq$  50 mm



Conical:



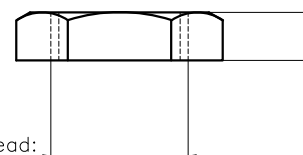
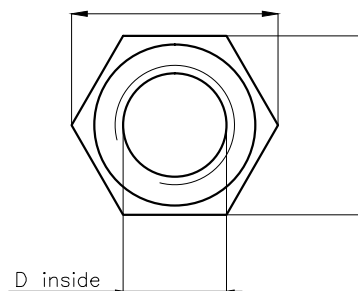
\*STEM TOP



\*\*STEM BOTTOM

Other Shape:

HANDWHEEL-NUT



Kind of Thread:  
Pitch =

CLIENT:

PROJECT:

P.O. No:

Valve / Tagno.

**NETHERLOCKS**  
safety systems

Brand / Make:

Size:

Class:

A Measured by:

Date:

Sketchnr.

B

C

# GEARBOX FILL-IN SHEET

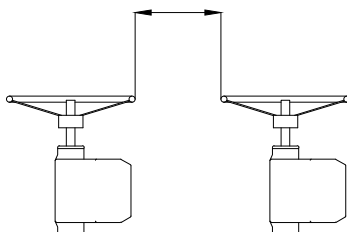
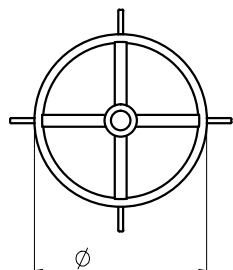
FORM. NF9M003-4

REV. 2013-05-10

SPECIFY SHAPE AND  
SIZE OF HANDWHEEL AXLE

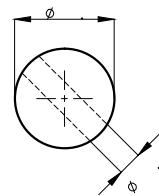
HANDWHEEL

J AVAILABLE SPACING BETWEEN HANDWHEELS H

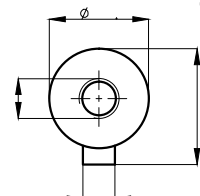


ONLY IF SPACING  $\leq 50$  mm

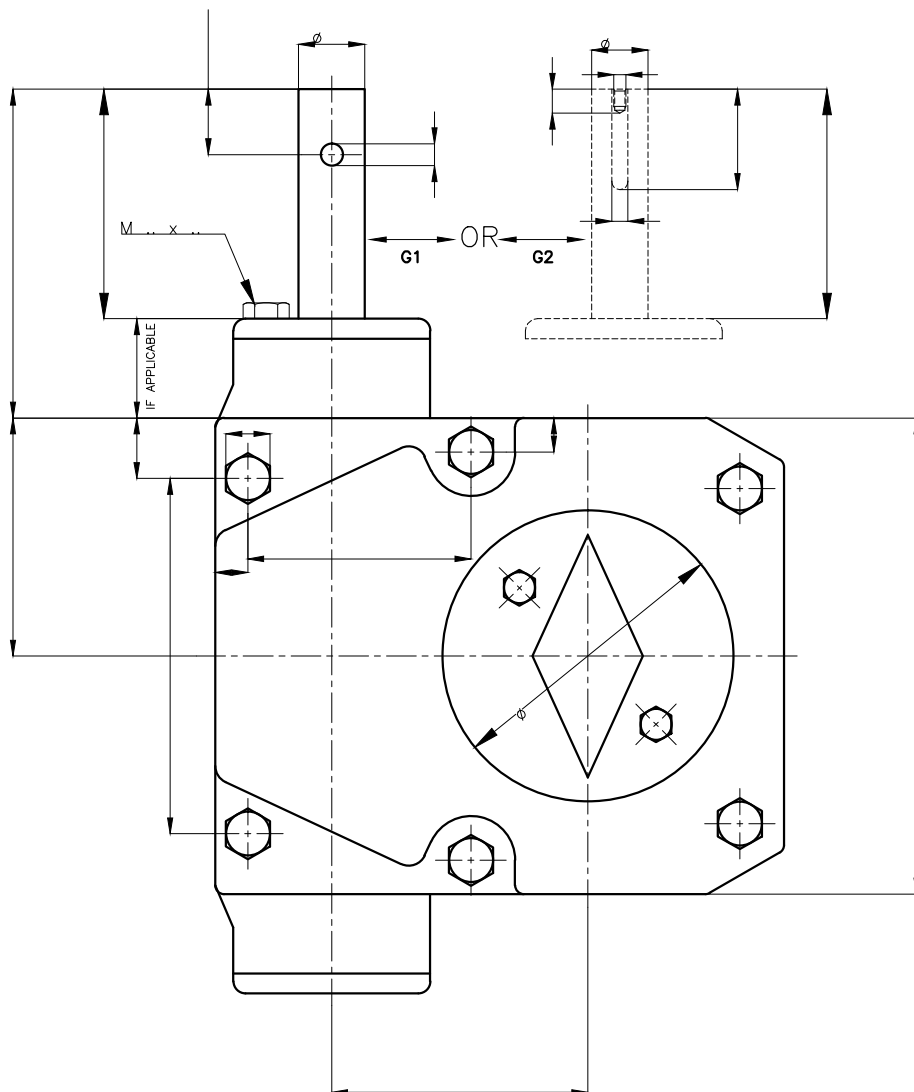
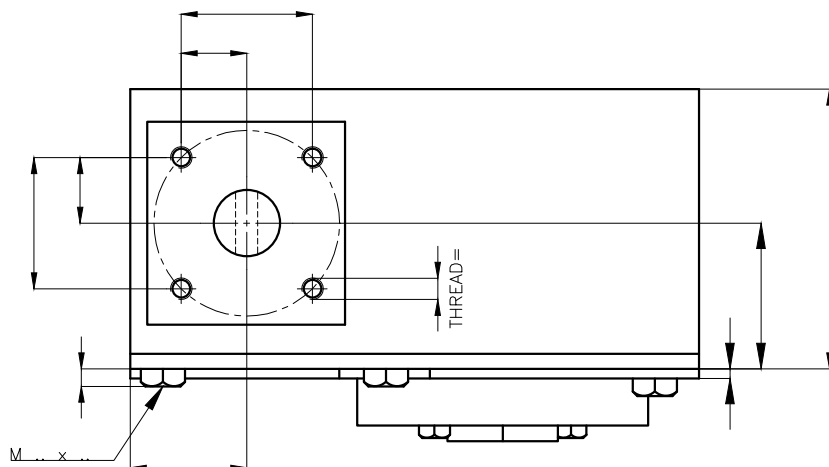
G1



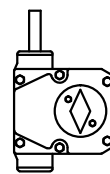
G2



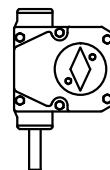
Other Shape:



INDICATE  
APPLICABLE  
VIEW



OR



CLIENT:

PROJECT:

P.O. No:

Brand / Make:

Model:

Number of Turns:

Measured by:

Date:

Sketchnr.

Valve / Tagno.



SECTION

## **Mechanical Interlocking For Pig Launching**

# NETHERLOCKS

safety systems



## Process Interlocking



**Safe pigging operations,  
The full story.**

Reliability matters

### Pigging Systems:

Pigging operations have been recognized in the industry as a highly dangerous procedure. A slight mistake or lack in concentration could result in a disastrous consequence.

A few examples of incidents which could occur and unfortunately do are listed below.

- Closure door is opened, while pressure still possibly remains inside the vessel.
- Main process valve is opened, while the closure door is still not yet fully or properly closed.
- Closure door is opened, while a high concentration level of H<sub>2</sub>S or other toxins still remain inside the vessel.
- Vent valve remains open, while the vessel is being pressurized with its medium.



The operation of the various valves and closure door involved in achieving this looks simple, but they're often tied to a complex non-linear process sequence. Plus as stated early, there is always the added danger of high pressure and the various mediums containing high levels of H<sub>2</sub>S or other toxins.

These dangers are acknowledged; therefore the "BS 8010 Code of Practice for Pipelines Recommendations" recommends the use of mechanical interlocking systems on all critical items around the vessel (Part 2 1992 – section 2.8 & Part 3 1993 – section 6.6). Furthermore, ASME VIII – Division 1 mentions the effective safety solution with the use of interlocks.

### Mechanical Interlocks

An interlock guides the operator through the sequence with unique keys for each step. It is only when a mistake is made that the operator will not be allowed to proceed – a key will not fit or a valve will be locked in position.

The principle of mechanical key interlocking is the transfer of keys. Each lock is executed with two keys: one for the locked open position and one for the locked closed position. When the valve is open the "open" key is released, can be removed ready to operate the next lock in the sequence, which will share the same code. All keys are unique and depending on the sequence **NETHERLOCKS** will determine the codes to guarantee the required sequence.



### NO interference in procedure:

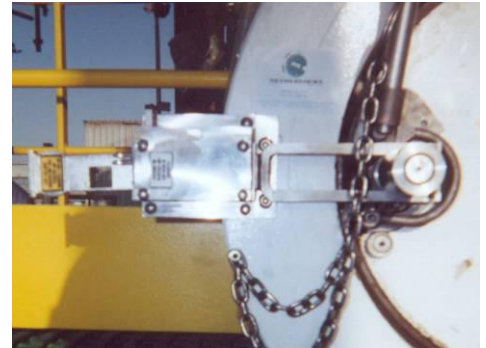
Often there is a misconception that mechanical interlocking interferes with the standard switch over procedures of systems, please note; **THIS IS NOT TRUE.**

Key interlocking switch over procedures are based on a "one free key" principle. The key which you have in your hand is released and fits only in its dedicated valve interlock or closure door at its correct time in its procedure.

### Closure doors and bleed bolts:

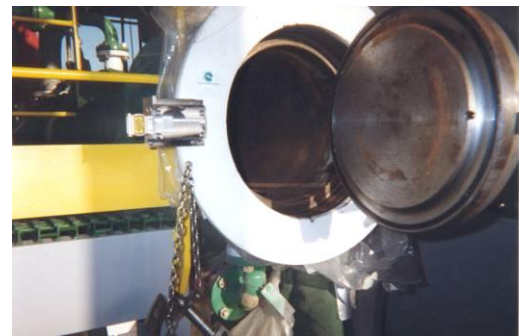
People have the impression that a bleed bolt on a closure door is a more than adequate safety precaution, to avoid any incidents. However, what function does the bleed bolt have if the door is already open?

It cannot stop anybody from opening the main, kicker or a drain valve now by mistake at this point.



Key can only be freed when  
the door is fully closed

With an interlocking system installed, it is not possible to operate any process valve while the closure door is still open or not in its fully locked closed position. This is because the start key to start the sequence in unlocking these various valves is currently trapped in the closure door lock.



Key is trapped while the door  
is open

### Vent and Drain:

To ensure the safety of the operators while opening a closure door, the vessel involved needs to be vented, drained, purged and isolated from the main process line. As different vessels and also clients have different procedures, it is therefore a good HSE practice to have mechanical interlocking mounted onto all these critical valves.

Now all valves involved shall only be operated according to its written procedure, thus giving the assurance before any breaking of confinement that the vessel is clear of any pressure and possible toxins. We should realize that 0.1 of a bar (equal to 10.000 N/m<sup>2</sup>) could kill an operator.

**Note:** Operators should still always check the pressure gauge which is installed on the vessel or attach a temporary gauge; this is to confirm no pressure remains. If there is a sign of pressure re-building back up, it means that a valve somewhere in the sequence is passing.



### Sequence Procedures:

It goes without saying, H<sub>2</sub>S is extremely dangerous. When H<sub>2</sub>S is trapped inside a vessel, you need to purge in order to remove it. The volume of the vessel and the H<sub>2</sub>S content determines how many times purging should take place. Very often, you will need to vent and purge at least 7 times before it's safe to open the closure door.

### How can we guarantee that a written procedure is followed?

The answer to this question is simply by using a MPCU, a Mechanical Process Key Exchange Unit.

Netherlocks have designed the MPCU (mechanical process control unit – a mechanical PLC) to assist the operator in the field, but to also assure that the operator is following the correct procedure and not taking any short cut's. For example if you have to purge a system 7 times, we program into the MPCU that this has to be done, so you cannot skip these steps.

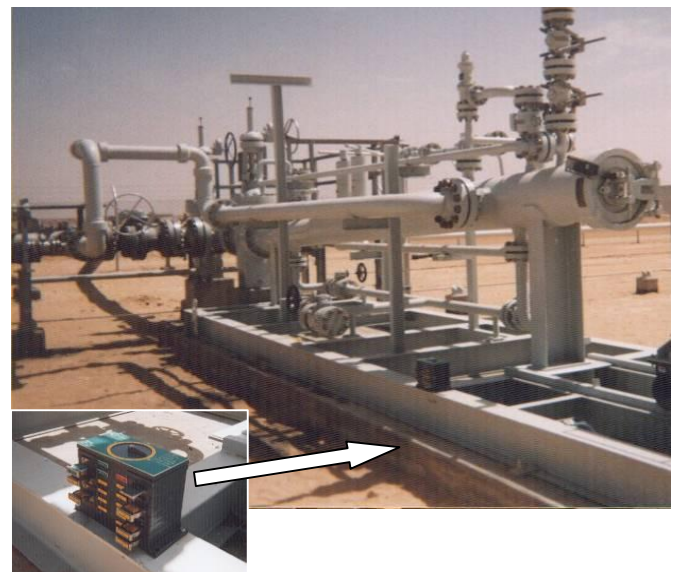
Procedures are written for a reason, one being the safe operation and working environment of a plant, but sometimes these written procedures can lead to the work taking longer. As we're all human, it is within our nature to try and take a short cut in which we could cut down on the work and time involved.

But when using an MPCU, each step in a written procedure **must** be followed. This then keeps the integrity of the plant and the safety of the operator priority.

Shown above, are mechanical interlocks with a MPCU as an intergraded part of a launcher or receiver skid.



Ball valve with an Interlock installed



A pig launcher with interlocking installed and a MPCU

### So how do we achieve this?

The mechanical process control unit (MPCU) is a step-by-step key exchange system which guides the operator through the complicated procedures involved. For example on pig-launchers & receivers or non-linear heat exchange units.

In order to achieve this, Netherlocks mechanically programs the written procedure of the applicable vessel into our MPCU design. So now only at the correct time in a particular sequence, shall the correct key be freed to make the necessary next step.

### A Mechanical Process Control Unit

There is **No extra work** involved for the operator when using this system, just the confirmation that the correct step has been made.

The knob on the top of the MPCU can only be rotated when the appropriate key has been inserted. 100% error free, even an operator with less field experience can follow these steps quickly and easily.

Therefore, a seven step cycle purge-vent operation must be followed, as the MPCU does not allow you to skip these.

If sometimes more purging cycles are required. We've incorporated into our design, an option where it is possible to repeat further extra purge-vent operations, but not less.



### Features:

- All MPCU- components are made of stainless steel AISI 316
- Maintenance-free design
- Tamperproof
- Tested to work in the most extreme operating environments

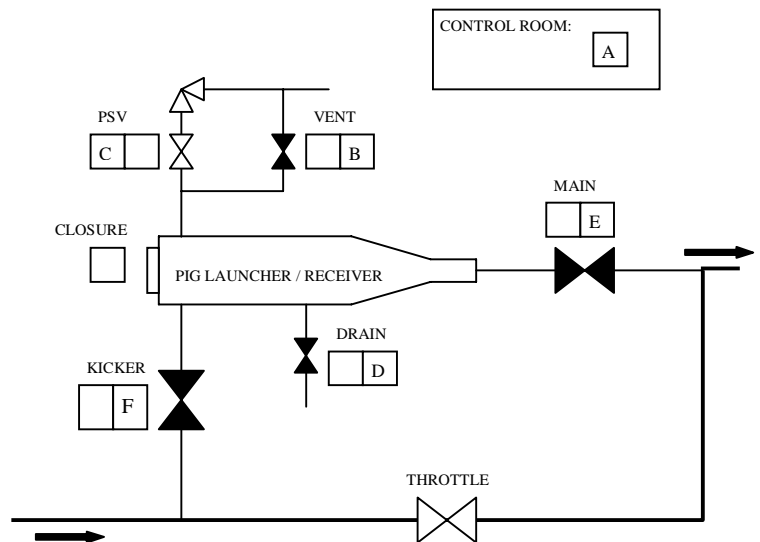
### Optional:

- The Integration of electronics like limit & proximity switches, solenoids etc..
- The mounting of the MPCU into a lockable cabinet for further security and protection. (Stainless steel or epoxy-coated steel available)

## A simple Pig launcher & Receiver sequence

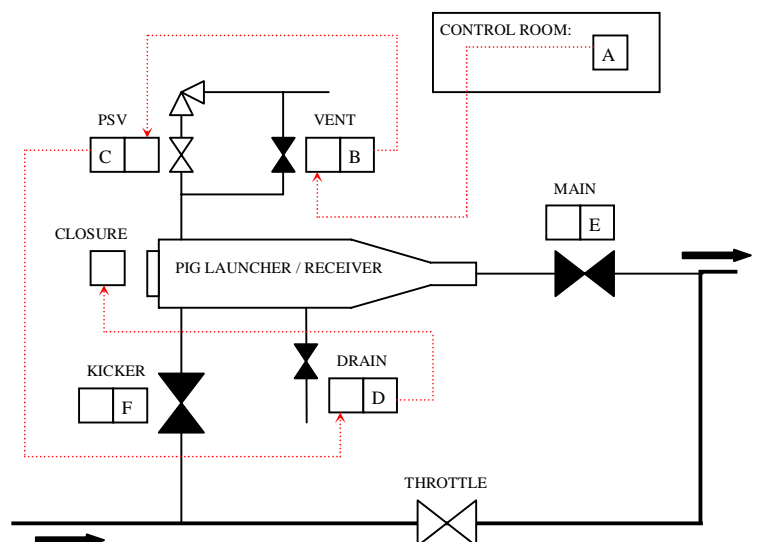
### NORMAL OPERATION

The pig trap is isolated from the main flow line. **Key A**, which starts the sequence is in its key cabinet located in the control room, stating normal operation.



### STEP 1: loading the pig

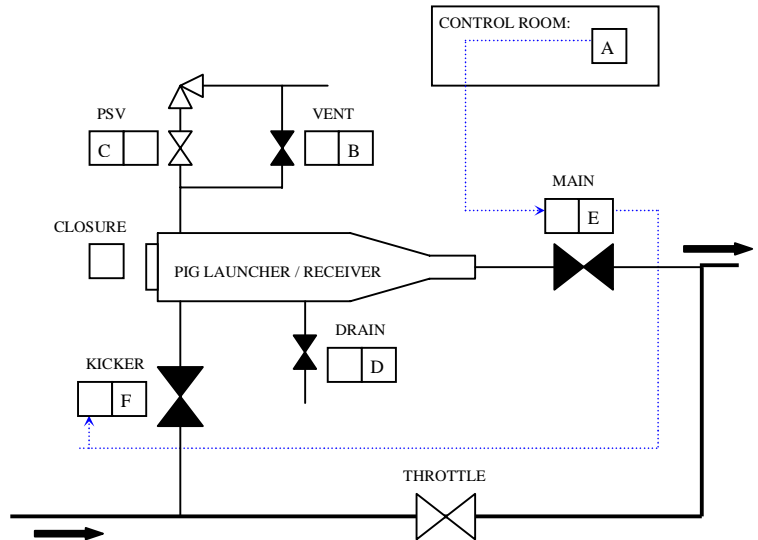
To begin the launch sequence, **key A** must be issued from the control room. With this key, the vent can be opened, releasing **key B**. This key is used to close the PSV, which releases **key C**. This key is used to open the drain to clear the vessel from any liquids. At this point the door can be opened with **key D** and the pig can be loaded. Closing the door releases **key D** again, then the sequence must be repeated backwards to make sure the drain is closed, the PSV is open and the vent is closed. **Key A** is necessary to continue.





## STEP 2: Launching the pig

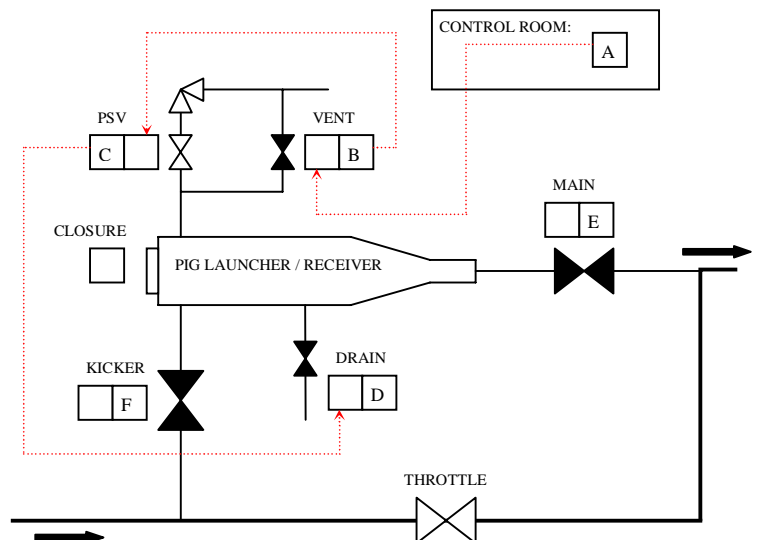
To launch the pig, **key A** is used to open the main valve. This releases **key E**, which is used to pressurize the pig launcher by opening the kicker line. After the kicker line is opened, the throttle valve is used to restrict the flow in the mainline, by slowly closing it. This causes the pressure behind the pig to rise until the pig is launched into the mainline. After opening the throttle again, the kicker line and the main valve are closed, releasing **key A**, which will be used again to depressurize the vessel?



## STEP 3: depressurizing the vessel

After the pig is launched, the vessel must be depressurized again to avoid hazardous situations. This sequence is mostly the same as **step 1**, except that it's not necessary to open the door.

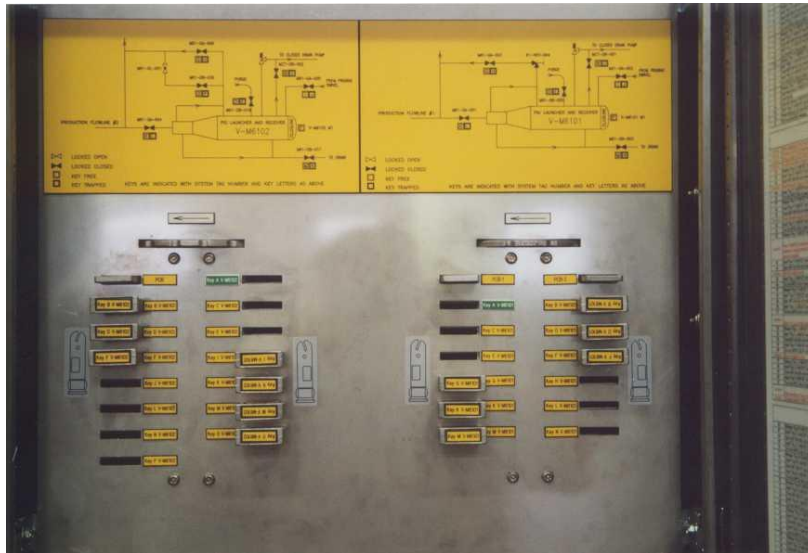
After the drain is opened and closed again, the PSV must be opened and the vent must be closed to release **key A**, which is returned to the control room as an indication that the pig is launched and the system is back on normal operation.



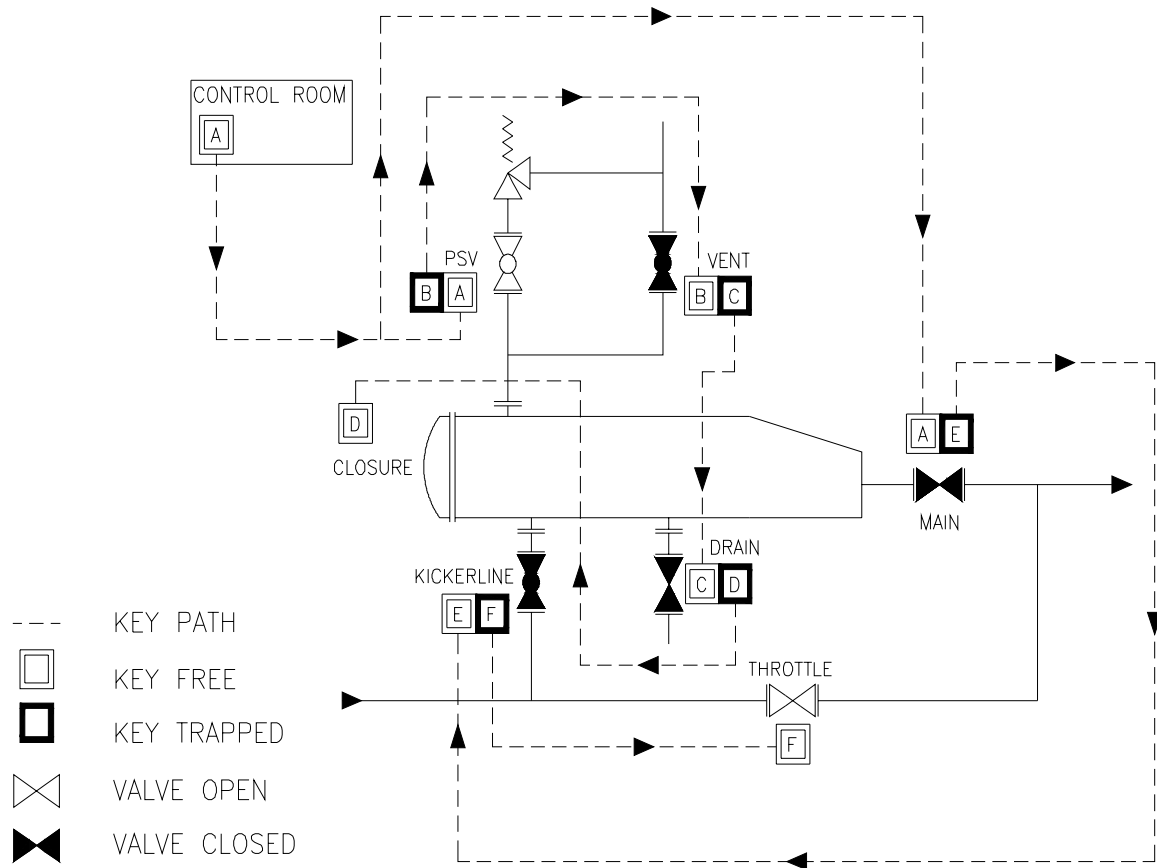
**Please Note:** It is also possible to interlock the throttle valve, into the above sequence. An MPCU device would be used in the above sequences to guide and check that the correct sequence of events is or has taken place.



## Various Examples of MPCU's Mechanical Process Control Units



**A further sequence schematic example:**



**Procedure:**

**Preparing the vessel and loading the pig**

Collect key A from the control room

Insert key A in the PSV block valve, close and release key B

Insert key B in the vent valve, open and release key C

Insert key C in the drain valve, open and release key D

Vessel is now depressurized and free of residual fluids

Insert key D into the closure, open and load pig

After loading the pig, close the closure and release key D

Insert key D in the drain valve, close and release key C

Insert key C in the vent valve, close and release key B

Insert key B in the PSV block valve, open and release key A

Procedure Continuation:

### **Launching the pig**

Insert key A in the main isolation valve, open and release key E  
Insert key E in the kicker line valve, open and release key F

Vessel is now pressurized and ready for launching

Insert key F in the throttle valve, slowly close until the pig is launched  
After the pig is launched, open the throttle valve and release key F

### **Isolation and depressurizing of the vessel**

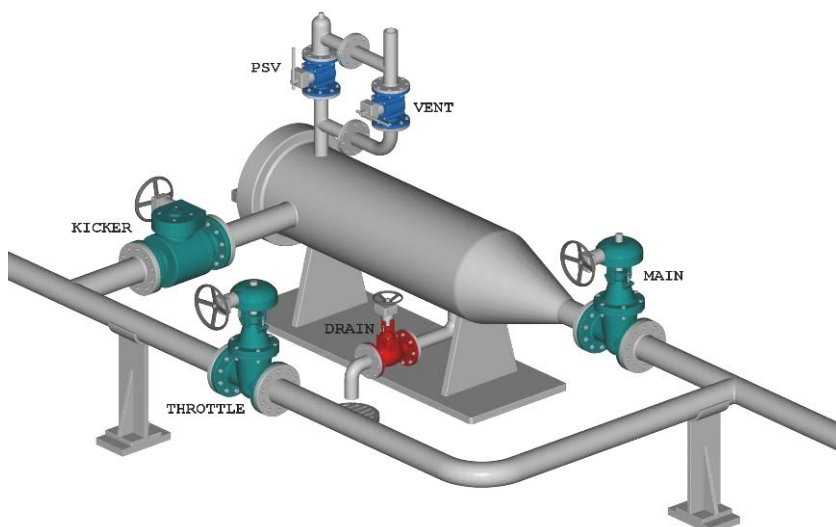
Insert key F in the kicker line valve, close and release key E  
Insert key E in the main isolation valve, close and release key A  
Insert key A in the PSV block valve, close and release key B  
Insert key B in the vent valve, open and release key C  
Insert key C in the drain valve and open  
After draining all residual fluids, close the valve and release key C  
Insert key C in the vent valve, close and release key B  
Insert key B in the PSV block valve, open and release key A

Return key A to the control room

### **Locks for electric or pneumatic actuators**

Above we discussed hand operated valves, however locks are applicable for any type of valve, irrespective the operation; manually, pneumatic, hydraulically or electrically actuated.

In all circumstances locks guarantee that a certain position of a valve or door is reached before the next step can be made. Furthermore, it can be adapted to control the power source. Therefore, when a key is released; the power supply is cut off.



## Notes