

## Operating Manual BA-S12

# Safety Locks series KRGP

- high holding forces through self-reinforcing clamping
- for static loads
- compact design



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## 1 General

### 1.1 About this manual

This manual enables safe handling of the Safety Lock. The manual is an integral part of the Safety Lock, and must be kept readily available to personnel close by.



Personnel must have thoroughly read and understood this manual before starting any work procedures. Compliance with the safety notices and other instructions set out in this manual is essential to safe working. National accident prevention regulations and occupational health and safety requirements apply in addition to the instructions set out in this manual.

Illustrations in this manual are intended to provide a basic understanding, and may differ from the actual implementation.

### 1.2 Associated documents

You have received the following documents together with this manual:

- technical data sheet (see annex)
- EC Declaration of Conformity
- for standard designs (for special designs where appropriate): adjustment instructions for proximity switch holders
- a dimensional drawing, where appropriate
- for modified standard designs: supplementary information
- for included proximity switches: proximity switch data sheet

Be sure to comply with the instructions and notices contained in those documents.

### 1.3 Explanation of symbols

Safety notices in this manual are flagged by symbols. Safety notices start with a signal word indicating the severity of the hazard.

Symbol	Signal word	Meaning
	<b>DANGER!</b>	Indicates an immediate danger which will result in death or serious injury if not avoided.
	<b>WARNING!</b>	Indicates a potential danger which may result in death or serious injury if not avoided.
	<b>CAUTION!</b>	Indicates a potential danger which may result in moderate or slight injury if not avoided.
	<b>NOTICE!</b>	Indicates a potential danger which may result in damage to assets or harm to the environment if not avoided.

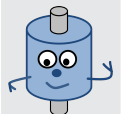
Symbol	Signal word	Meaning
		The figurative clamping head flags up useful tips and recommendations for safe, trouble-free functionality.

Table 1: Explanation of symbols

## 1.4 Warranty

SITEMA provides a 24-month warranty on the **standard design version** of the Safety Lock from date of delivery. The warranty on special designs is 12 months.

Shipped items which are found to be defective will be repaired free of charge at our factory or replaced. The possibility of reimbursing any costs beyond this warranty cover is excluded.

The actual scope of delivery may differ from the wording and illustrations shown here where special designs are supplied, additional components are ordered, or technical modifications are made.

Wearing parts and corrosion damage are excluded from warranty cover, as is any damage resulting from use other than for the intended purpose. No liability will be accepted for consequential damage or loss.

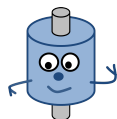
## 2 Safety

This chapter provides an overview of all key safety aspects for the protection of personnel and to ensure safe, trouble-free operation. The sections covering the individual life phases contain additional task-specific safety notices.

### 2.1 Intended use

The Safety Lock holds static loads.

Use in accordance with the intended purpose also means complying with all the stipulations set out in this manual and in the associated documents. Any use beyond or at variance to the intended use shall be considered as misuse.



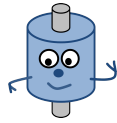
The Safety Lock is designed to hold the **admissible load (M)** stipulated on the name plate and in the data sheet (or dimensional drawing). The static weight acting on the rod must not exceed the admissible load in any operating state.



#### CAUTION Danger of damage

The rod does not slip if there is an overload. Loads that exceed twice the admissible load M can lead to damage on the rod and Safety Lock.

- ➔ Do not overload the Safety Lock.



The Safety Lock has the advantage that it does not release **under load**. The Safety Lock can normally be released in this case only if release pressure is applied and the load is simultaneously lifted, i.e. if the load has already been transferred safely elsewhere. To ensure this **safety advantage**, the **load** must have a **minimum value** during operation. See minimum value F6 in "Technical data sheet TI-S12".



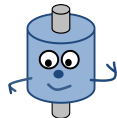
### WARNING

#### Danger in case of misuse!

Misuse of the Safety Lock can lead to dangerous situations.

- ➔ Use the Safety Lock only to hold loads that do not exceed the admissible load. The static weight acting on the rod must never exceed the admissible load.
- ➔ Use the Safety Lock only in explosion-proof areas.
- ➔ Use the Safety Lock only for securing static loads, not for braking dynamic loads.
- ➔ Do not use the Safety Lock as a positioning device.
- ➔ Always leave the rod inserted during operation.
- ➔ Leave the Safety Lock assembled. Do not open the Safety Lock.
- ➔ Maintain the Safety Lock in its delivered condition. Do not manipulate the Safety Lock.

## 2.2 Regular performance testing



Regular performance testing ensures safe functioning of the Safety Lock. Use the performance test to verify safe functioning of the Safety Lock also after unforeseen events occur.

A performance test must be carried out in the following cases:

- after installation
- after any use at variance from the intended use

In safety applications, the functioning of the Safety Lock must be checked **at least every 6 months**. Much more frequent testing may also be required depending on the application parameters (degree of contamination, cycle frequency, control system). In some cases even daily fully automated testing is necessary. This detects any trouble at an early stage.

See also *Chapter 8 Performance test* [▶ 20].

If the test finds that the Safety Lock no longer conforms to the specified properties, the stipulated safety for working on plant and other machinery is no longer assured. The Safety Lock must be returned to SITEMA without delay for professional servicing and acceptance testing.

## 2.3 Responsibility of the machinery manufacturer

Where a machinery manufacturer integrates the Safety Lock into a machine or plant as a safety component, the machinery manufacturer must fulfill the following obligations:

- Select and integrate the Safety Lock according to DIN EN ISO 12100:2011 and the standards and regulations applying to the specific application case.
- Inform the operating company that the Safety Lock has been integrated into the overall machine.
- Instruct the operating company on how to install, put into service, performance test, disassemble and dispose of the unit in the specific application case.

## 2.4 Personnel requirements

The tasks set out in this manual may only be carried out by authorized specialist personnel.

A **specialist** is a person who possesses the appropriate skills and knowledge of the relevant standards and regulations based on his or her professional training. A specialist may fulfill the following requirements:

- assess scheduled work procedures
- identify potential hazards
- take necessary measures to eliminate hazards
- apply accepted technical standards, rules and directives
- carry out necessary repair and assembly work

## 2.5 Personal protective equipment

Personal protective equipment preserves the health and safety of personnel when carrying out their work. Use the personal protective equipment stipulated in the various sections of this manual.



### Industrial helmet

An industrial helmet protects the head against injury from falling objects, swinging loads and bumping against fixed obstacles.



### Goggles

Goggles protect the eyes against flying parts and splashing liquids.



### Protective gloves

Protective gloves protect the hands against friction burns, scrapes, cuts or deeper injuries, and against touch contact with hot surfaces.



### Safety boots

Safety boots protect the feet against crushing, falling items and falling on slippery floors.



### Ear defenders

Ear defenders protect the ears against excessively loud noise and prevent acoustic trauma.

## 2.6 Labeling

These symbols and notices may be found on the Safety Lock:

- notice warning of the risk of injury by moving parts inside the housing
- notice to remove the transport protection
- notice to install the proximity switches

## 3 Technical data

You will find the technical data for your particular model at the following locations:

- on the name plate
- in the technical data sheet
- in the accompanying supplementary information (if provided)
- or:
- in the accompanying dimensional drawing (if provided)

You will find the type designation on the name plate.

### 3.1 Name plate

The name plate is fixed on the housing and contains the following data:

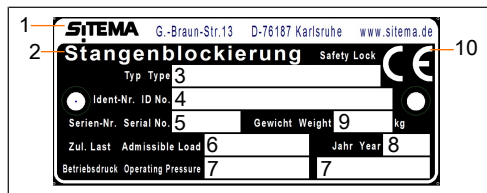


Fig. 1: Name plate

1	Manufacturer	6	Admissible load
2	Product designation	7	Operating pressure (min. / max.)
3	Type (e.g. KRG 45, KRGP 22)	8	Year of manufacture
4	ID number	9	Weight
5	Serial number	10	CE marking

Make sure the name plate is not damaged, removed or rendered unreadable. Quote the data on the name plate when submitting technical queries to SITEMA.

### 3.2 Pressure fluid

The following data apply to **standard designs**. Other pressure fluids may only be used in consultation with SITEMA.

Parameter	Value	Unit
Compressed air, dried and filtered recommendation: compressed air according to ISO 8573-1:2010 [7:4:4]	-	-
Min. operating pressure	3.5	bar
Min. operating pressure when using a spring base	4.5	bar
Max. operating pressure	10	bar



For types not listed in the data sheet you will find type-specific data on the accompanying dimensional drawing.

For modified standard designs you will find design-specific data in the accompanying supplementary information.

### 3.3 Operating conditions

The immediate vicinity of the Safety Lock must be dry and clean. If the unit is heavily dirt contaminated, special protective measures must be taken - see *Chapter 6.1 Location requirements* [▶ 14].

Parameter	Value	Unit
Admissible surface temperature	0 – 60	°C
Max. humidity (no condensation)	60	%

Comply with the type or design specific data in the accompanying dimensional drawing or supplement information (if provided).

### 3.4 Emissions

The Safety Lock creates no significant emissions. There are no electronic components built into the Safety Lock. Consult the manufacturer as to the electromagnetic compatibility of the proximity switches (not supplied in scope of delivery; available as options).

### 3.5 Service life

When estimating service life, a distinction is made between the following categories of stress:

#### 1. Stress when securing the load

When securing a stationary load, the occurring material stresses are negligible and can be withstood millions of times over.

#### 2. Stress when taking up the load

When taking up the load the Safety Lock may reach the maximum holding force. During operation this occurs, for example, when the drive is switched off and in the event of leakage or a line break. The design forces and material stresses then occur. The rod does not slip when this happens.

To ensure longer service life, the following operating modes should be avoided:

- misoperation of the (press cylinder) drive with the clamp closed
- motion opposing the load direction without simultaneous pressurization

You can additionally take the following measures to extend service life:

- Make sure the rod is not subjected to any transverse forces.
- Do not use excessively rough rod surfaces.
- Protect the interior of the housing against penetration of corrosive media and dirt.
- Clamp the rod preferably only once it has come to a complete standstill.

## 4 Design and function

KRG-series Safety Locks are pressure versions. When a load is applied, it pushes the Safety Lock onto the machine component. The load is transmitted into the machine via the mounting surface of the Safety Lock.

Attention must be paid to how the load acts on the rod and to the Safety Lock particularly when configuring the layout. For more information see chapter *Layout*.

### 4.1 KRGP (pressure version) design

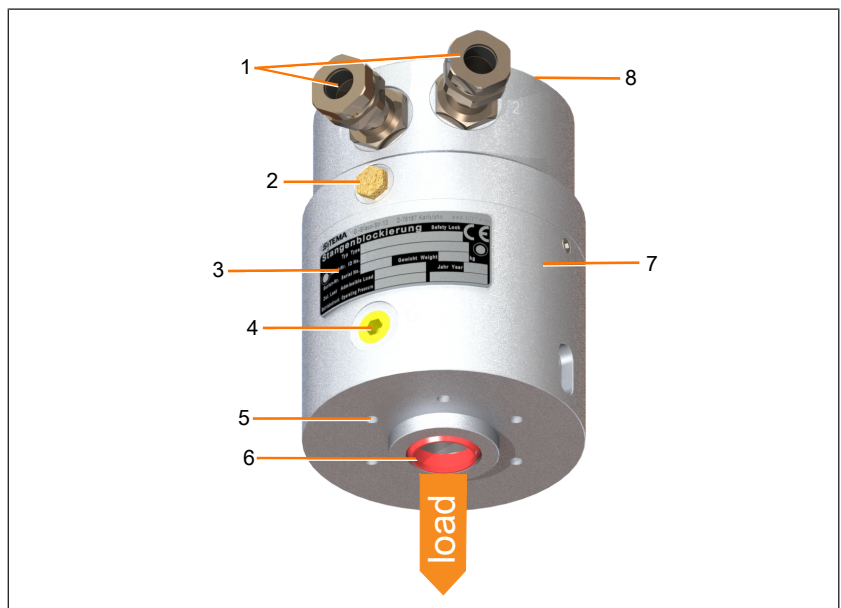


Fig. 2: Overview of series KRGP (example design)

- 1 Holder\* for proximity switch\*\* 1, signal "load secured"
- Holder\* for proximity switch\*\* 2, signal "clamping released"
- 2 Port T "pressure compensation"
- 3 Name plate
- 4 Pressure port L "release"
- 5 Mounting side (contact surface)**
- 6 Rod opening with wiper
- 7 Housing
- 8 Free face side with threads for attached components

\* Optional equipment in special designs

\*\* Proximity switches not supplied in scope of delivery; available as options

The ports are identified by steel punch numbers and letters. The positions of the ports may vary depending on the design.

### 4.2 Function

The Safety Lock holds static loads.

#### "Secure load" operating state

There is a clamping sleeve in the interior of the Safety Lock, which, in case of pressure drop at pressure port L, clamps the clamping rod and secures the load. The Safety Lock has not yet taken up the load when this happens. The clamping action can be released by increasing the pressure at pressure port L.

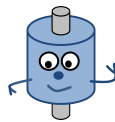
### “Take up load” operating state

The holding force intensifies if the load moves further in the direction in which it is to be secured. In doing so, the self-reinforcing clamping sleeve and housing brace themselves. The relative motion between rod and Safety Lock is very low and does not amount to more than a maximum of 2 mm, even on large sizes, with the admissible load M. The rod **does not** slip if there is an overload. Loads must not exceed twice the admissible load M. To release clamping after taking up the load, the rod is moved by the drive in the direction opposite to the load direction and pressure is applied to pressure port L.

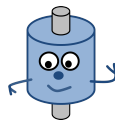
## 4.3 Layout

The Safety Lock may be integrated into the machine as a **stationary** component or as a movable component **moving with the load**:

- If the Safety Lock is integrated into the machine as a stationary component, the load (e.g. the slide) is normally movable.
- If the Safety Lock moves with the load (e.g. with the slide), the rod is normally stationary.



To avoid constraint forces on the rod, attach either the Safety Lock or the rod **loosely (radially floating)**.



When configuring the layout, pay attention to the load direction, so as to ensure the Safety Lock is installed correctly!

In the pressure version, the load pushes the Safety Lock onto the machine part. The load is transmitted into the machine part via the mounting side of the Safety Lock.

### 1. Series KRG is stationary:

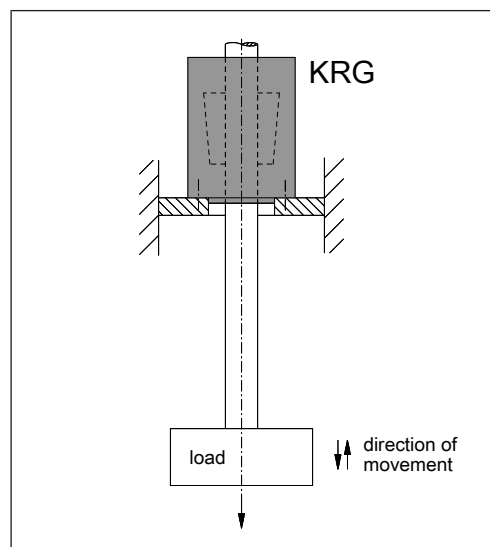


Fig. 3: Series KRG stationary

## 2. Series KRG moves along with the load:

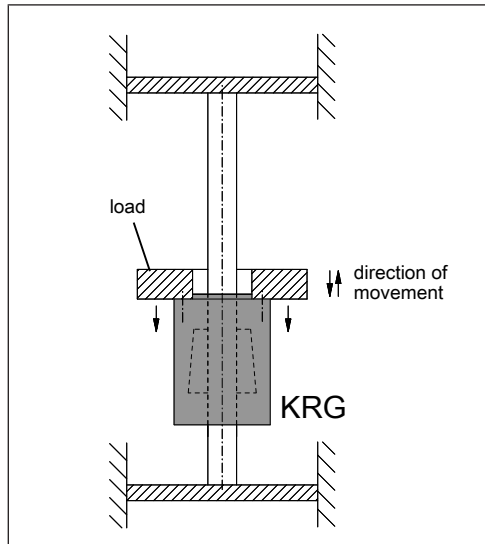


Fig. 4: Series KRG movable

## 4.4 Ports

All ports are uniquely identified by steel punch numbers and letters. You will find an overview of the locations and dimensioning of all ports in the following documents:

- in the technical data sheet
- or:
- in the accompanying dimensional drawing (if provided)

### 4.4.1 Proximity switch holder (optional equipment in special designs)

The proximity switches (not supplied in scope of delivery; available as options) monitor the position (operating state) of the Safety Lock. The proximity switches are mounted in the holders 1 and 2. They transmit the following signals to the machine controller:

- proximity switch in holder 1: "load secured"
- proximity switch in holder 2: "clamping released"

When proximity switch 1 signals "load secured" and there is no more residual pressure at port L, the load is secured. The signal is used to allow access to the danger zone.

When proximity switch 2 signals "clamping released", movement is allowed in both directions. The signal is used to enable movement of the drive in the load direction.

A safe state is only assured when signal 1, "load secured", is being received. This signal must be processed and displayed by the machine controller.

## 5 Transport, packaging and storage

### 5.1 Safety notices for transport



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**WARNING****Risk of injury by falling or toppling packs!**

Packs might be off center of gravity. Packs might topple and fall if improperly fixed. Falling or toppling packs might cause serious injury.

- Pay attention to center of gravity markings and indicators on packs. If you are unclear about anything, contact SITEMA.
  - Lift packs with care, and observe whether they topple. Modify handling attachments if necessary.
- 



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**WARNING****Danger from suspended loads!**

The load might swing and drop during lifting. This might cause serious injury, or even death.

- Always keep out of the swing range of suspended loads.
  - Always keep loads under observation when moving them.
  - Use only approved lifting gear and handling attachments with adequate load-bearing capacity.
  - Use only intact, undamaged handling attachments, such as ropes and straps.
  - Attach handling attachments, such as ropes and straps, only at rounded edges and corners. Do not knot or twist the handling attachments.
  - Place the load down when leaving the workplace.
- 

### 5.2 Packaging

To protect against dirt contamination, corrosion and other damage, the Safety Lock is packed in plastic sheeting. Leave the sheeting on until just before installing the unit. Dispose of the sheeting appropriately.

### 5.3 Transport

Depending on its size and weight, and the quantity ordered, the Safety Lock is packed in a cardboard or wooden box, in a crate, or on a pallet.

Packs can be transported using a **forklift** or **crane**, among other options.

Packs can be transported **using a forklift** under the following conditions:

- The forklift must be capable of holding the weight of the pack.
- The forklift operator must be licensed to operate materials handling vehicles equipped with a driver's seat or cab.

Packs can be transported **using a crane** under the following conditions:

- The crane and handling attachments must be capable of holding the weight of the packs.
- The operator must be licensed to operate the crane.

Starting from a weight of 15 kg or above, the Safety Lock is equipped with threads on both face sides to fix eye bolts. Use the supplied eye bolts or larger ones to attach lifting gear.

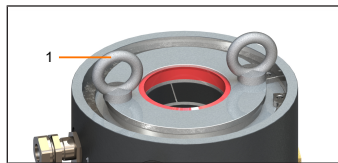


Fig. 5: Lifting points

1 Eye bolt

## 5.4 Storage

Store packs under the following conditions:

- in original packaging
- only indoors
- in a location inaccessible to unauthorized personnel
- dry and dust-free
- protected against aggressive media
- protected against direct sunlight
- protected against mechanical shaking
- storage temperature:  $-10$  to  $+60$  °C
- max. humidity: 60 %, no condensation

If the unit is kept in stock for more than 2 years, please consult SITEMA before installing it.

## 6 Preconditions for use

### 6.1 Location requirements

The immediate vicinity of the Safety Lock must be dry and clean. If the unit is heavily dirt contaminated, special protective measures must be taken. The admissible surface temperature is  $0 - 60$  °C. For more information on operating conditions see *Chapter 3.3 Operating conditions* [► 9].

**WARNING****Danger in the event of severe dirt contamination, and when lubricants or releasing agents are present at the operating location!**

Penetration of foreign bodies (grinding dust, swarf), lubricants or liquids (especially coolants, preservatives and releasing agents) into the housing might result in loss of holding force.

- Connect a depressurized line to port T, routed to a clean environment (such as a clean, depressurized vessel).
- Protect the rod against contact with foreign bodies, lubricants or liquids, such as by installing a bellows.

If in doubt, please contact SITEMA. We will be glad to help.

## 6.2 Requirements for the clamping rod

**WARNING****Danger if an incorrect clamping rod is used!**

Selection of the wrong clamping rod might result in danger.

- Select the clamping rod in accordance with the specification.
- Provide protection against corrosion without use of high-viscosity lubricants (grease).
- Make sure the base material is of adequate strength.
- Make sure the rod will not bend under pressure.
- Configure the mounting elements to handle the maximum holding force.

The clamping rod must have the following properties:

- ISO tolerance zone: f7 or h6
- induction hardened min. HRC 56,  
surface hardening depth: up to  $\varnothing$  30 mm: min. 1 mm,  
 $\varnothing$  over 30 mm: min. 1.5 mm
- surface roughness: Rz = 1 to 4  $\mu$ m
- protection against corrosion, e.g. hard chromium plating: 20  $\pm$ 10  $\mu$ m,  
800 – 1000 HV
- lead-in chamfer, rounded: min. 4 x 30°

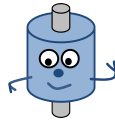
For example, standard rods with this specification can be used:

### 1. Piston rods (ISO tolerance field f7), hard chrome plated

- base material: yield strength min. 580 N/mm<sup>2</sup>
- induction hardened HRC 56 – 64,  
surface hardening depth min. 1 mm or 1.5 mm
- hard chrome plating: 800 – 1100 HV, min. depth 13  $\mu$ m
- surface roughness: Ra 0.15 – 0.25  $\mu$ m

### 2. Rods for linear ball bearings (ISO tolerance field h6)

- induction hardened min. HRC 60,  
surface hardening depth min. 1 mm or 1.5 mm
- surface roughness: Ra 0.15 – 0.25  $\mu$ m



The Safety Lock withstands overloading up to 2 x admissible load (M). The mounting elements which take up the load (such as the rod and its linkage, etc.) must therefore be dimensioned to a loading of at least 2 x M. If the rod is overloaded it will not slip, resulting in damage to the rod and the Safety Lock.

## 7 Installation

### Personnel:

- safety engineer
- pneumatics specialist
- electrician

### Personal protective equipment:



- goggles
- protective gloves
- safety boots
- industrial helmet
- ear defenders



### WARNING

#### Danger if installation is carried out improperly!

Improper installation and initial putting into service might result in serious injury and major damage to assets.

- ⇒ Secure the danger zone.
- ⇒ Secure all switchable machine elements and power connections against unintentionally being turned on.
- ⇒ Secure moving machine parts against dropping while carrying out work procedures.
- ⇒ Leave the Safety Lock assembled. Do not open the Safety Lock.
- ⇒ Secure all moving parts (especially the rod and Safety Lock) separately so that they do not drop down or topple over.
- ⇒ Make sure mounting screws have the required tightening torques.

### 7.1 Feeding in clamping rod

#### Before inserting the rod:

- Check visually:
  - The interior must be free of foreign bodies and dirt.
  - The wipers must not be damaged.
- Use only rods conforming to the specification.
- If there is a thread on the end of the rod, cover it.
- Provide a temporary pressure supply through a clean connection line.
- Use only a dry, ungreased rod.



**CAUTION****Risk of injury by moving parts in the interior of the housing!**

- ➔ Do not reach through the openings in the housing.

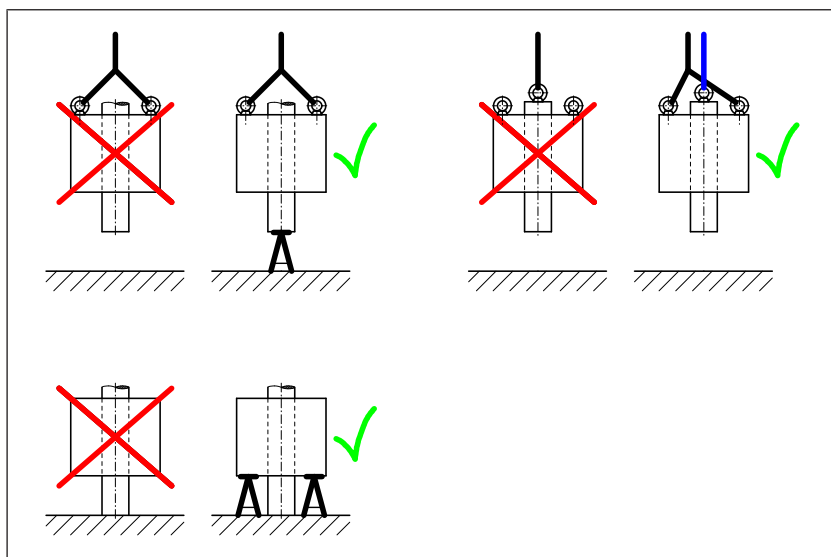
**Follow this procedure:**

1. Remove the cap from pressure port L.
2. Connect a temporary pressure supply to pressure port L.
3. Apply the operating pressure to pressure port L (see name plate).
4. Insert the clamping rod with care, so that the wipers in the rod openings are not damaged.

**7.2 Attach Safety Lock****WARNING****Risk of injury by dropping!**

Clamping the rod by the Safety Lock is not a safe method of transport, and might cause danger possibly resulting in serious injury and damage to assets.

- ➔ Secure the Safety Lock and clamping rod separately.
- ➔ Secure the Safety Lock and clamping rod by suitable means before and during mounting.



If the **rod is rigidly** attached, mount the Safety Lock with a radially loose spring base. You can find SITEMA spring bases in "Technical data sheet TI-B20."

If the **rod is loosely** attached (such as by suspension of the rod as a radial loose bearing), fix the Safety Lock rigidly (screw directly).

To fix the Safety Lock use only the threads or holes on the mounting side - see *Chapter 4 Design and function* [▶ 10].

The thread dimensions are specified in the following documents:

- in the technical data sheet  
or:
- in the accompanying dimensional drawing (if provided)

For mounting on a steel (e.g. 1.0553 / 1.0570) part, the following guide values are recommended for the tightening torques of the mounting screws:

Thread	Strength class	Tightening torques
M 6	10.9	11 Nm
M 8	10.9	30 Nm
M 10	10.9	55 Nm
M 12	10.9	85 Nm
M 16	10.9	200 Nm
M 20	10.9	400 Nm
M 24	10.9	750 Nm
M 30	10.9	1 400 Nm
M 36	10.9	2 600 Nm
M 42	10.9	4 000 Nm

These specifications do not absolve the machinery manufacturer of its responsibility to check the screw fittings for the specific application in a professional manner.

1. Move the Safety Lock to the mounting position.
2. Align the Safety Lock.
3. Make sure there are no constraint forces occurring transverse to the rod.
4. Fix the Safety Lock to the machine part with the required tightening torque.

### 7.3 Making pressure connection



#### WARNING

##### Danger if the pressure fluid discharge is slowed!

Slowing of the pressure fluid discharge might cause danger, as the clamp will then only close after a delay.

- ➔ Do not integrate any components which impair discharge of the fluid from pressure port L.
- ➔ Lay all connection lines without kinking.
- ➔ If there is a risk of kinking, take precautions (protective tubing, thicker tube walling, etc.).

If a **fast response time** of the Safety Lock is stipulated, comply with the following requirements:

- suitable controller
- short lines
- fast valve response times
- installation of a dump valve directly on L.

**Check the preconditions:**

- The Safety Lock is attached to the machine part.
- The rod has been inserted. No constraint forces are acting on the rod.
- A temporary pressure supply has been connected.
- The connection lines are clean.

The pressure supply is connected to L.

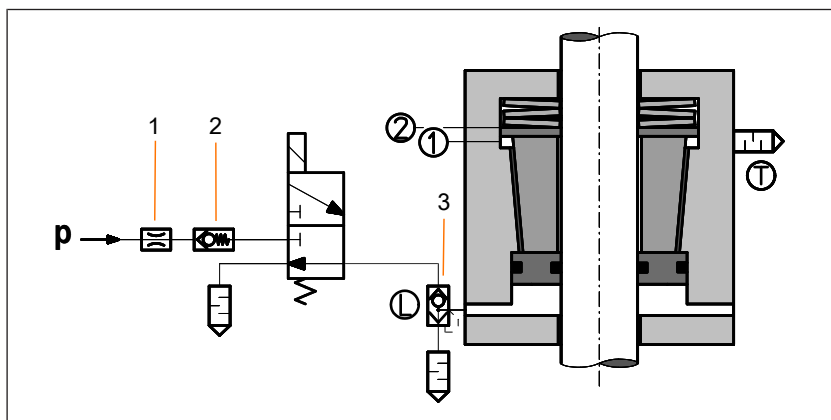


Fig. 6: Actuation (schematic view)

- 1 Throttle
- 2 Check valve
- 3 Dump valve

**Follow this procedure:**

1. Relieve the pressure and disconnect the temporary pressure port from L.
2. Connect the stationary compressed air supply to L.

If **tapping** is heard while pressure is being applied:

- ▶ Fit a throttle (1) in the p line **upstream** of the switching valve.

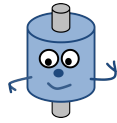
If the pressure is able to fall **below the minimum**:

- ▶ Fit a check valve (2) in the p line **upstream** of the switching valve.

## 7.4 Checking port T

Internal changes in volume during switching are equalized via port T. For this “breathing” process, the port is fitted with an air filter which provides adequate protection against dirt contamination in a dry, clean environment.

- ▶ Check whether the air filter is fitted on port T.



If moisture or aggressive media can be drawn in, in place of the filter install a **depressurized line** routed directly into a clean environment, such as a clean, depressurized vessel.

## 7.5 Connect proximity switch (optional equipment in special designs)

In standard designs the proximity switch holders NHT are installed. The NHT holders are **preset** to the correct depth. Do not change the setting of the holders before installing the proximity switches. Install the proximity switches as described in the accompanying adjustment instructions.

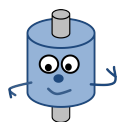
In the case of special designs, refer to the accompanying proximity switch holder adjustment instructions for details of the proximity switch holder type and all further installation and adjustment information.

## 7.6 Checking installation

### Follow this procedure:

1. Check the lines and fittings for leaks.
2. Check that the pressure fluid is able to discharge from pressure port L unhindered.
3. Check the free movement of the rod when pressure is applied to pressure port L.
4. Check the (electrical) connection to the proximity switches.
5. Before putting the unit into service, carry out a **performance test** - see *Chapter 8 Performance test* [▶ 20].

## 8 Performance test



Regular performance testing ensures safe functioning of the Safety Lock. Use the performance test to verify safe functioning of the Safety Lock also after unforeseen events occur.

The performance test consists of the following parts:

- testing the **holding force**
- Testing the **proximity switch function** (optional equipment in special designs)

A performance test must be carried out in the following cases:

- after installation
- after any use at variance from the intended use

In safety applications, the functioning of the Safety Lock must be checked **at least every 6 months**. Much more frequent testing may also be required depending on the application parameters (degree of contamination, cycle frequency, control system). In some cases even daily fully automated testing is necessary. This detects any trouble at an early stage.

## 8.1 Testing holding force



### WARNING

#### Danger if performance test is carried out incorrectly!

If the performance test is carried out incorrectly, safe functioning of the Safety Lock is not assured.

Malfunctions during checking might result in risk to personnel and damage to machinery.

- Carry out testing at the specified time intervals.
- Carry out testing with adequate test force.
- Cordon off the danger zone.
- Attach suitable damping and cushioning devices to cushion the load in the event of malfunctions.
- Wear your personal protective equipment.

The **main aim** of the test is to verify that an adequate **holding force reserve** is available to withstand the load being secured. The Safety Lock is loaded with a test force for this purpose.

The rod must not slip under this test force.

Depending on type, the tapering distance is a maximum of 2 mm. This drop is admissible as a relative movement between the Safety Lock and rod.

When using a **spring base**, the stroke  $h$  of the spring base is added to this tapering distance, resulting in a total drop – depending on type – of 7 to 8 mm.

### 8.1.1 Safety-related application

For a safety-related application, SITEMA recommends a maximum test force of **1.5 x the maximum load** during operation:

	Max. load in operation ( $\leq$ admissible load (M))
+	50 % max. load in operation
=	Test force

Practical example:

Admissible load (M) = 10 kN

Max. load in operation = 8 kN

	8 kN (max. load in operation)
+	4 kN (50 % max. load in operation)
=	12 kN (test force)

**Follow this procedure:**

1. Secure the maximum load which can occur in operation with the Safety Lock - see *Chapter 9.2 Securing the load* [► 24].
  2. Actuate the drive so that its power (in load direction) corresponds to half the maximum load.
    - ⇒ Depending on type, the clamping rod moves a maximum of 2 mm (with spring base: 7 to 8 mm) relative to the Safety Lock (tapering distance).
    - ⇒ The clamping rod must not slip (further) under this load.
- ⇒ If this is the case, a holding force reserve of 50 % has been verified and the test is passed.

**8.1.2 Non-safety-related application**

For a non-safety-related application, SITEMA recommends a test force that is calculated from the **maximum occurring force during operation + safety margin**. The safety margin is to be determined by the customer (machinery manufacturer, operator) for the respective application.

The maximum test force amounts to 2 x the admissible load M. Higher loads can lead to damage to the Safety Lock and machine.

	Max. load in operation ( $\leq$ admissible load (M))
+	Safety margin
=	Test force

Practical example:

Admissible load (M) = 12 kN

Max. load in operation = 10 kN

Customer-specific safety margin = 30 % maximum load = 3 kN

	10 kN (max. load in operation)
+	3 kN (30 % max. load in operation)
=	13 kN (test force)

**Follow this procedure:**

1. Secure the maximum load that can occur during operation with the Safety Lock, see *Chapter 9.2 Securing the load* [► 24]
  2. Actuate the drive so that its force (in load direction) corresponds to the safety margin.
    - ⇒ Depending on type, the clamping rod moves by the a maximum of 2 mm (with spring base: 7 to 8 mm) relative to the Safety Lock (tapering distance).
    - ⇒ The clamping rod must not slip (further) under this load.
- ⇒ If this is the case, a holding force reserve of 50 % has been verified and the test is passed.

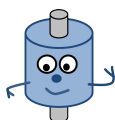
**8.2 Testing proximity switch functionality**

The proximity switches send two signals:

- signal 1 "load secured"
- signal 2 "clamping released"

**Follow this procedure:**

1. Remove load from the Safety Lock: Run the drive opposite to the load direction. The drive's power must correspond to the weight of the load.
2. Apply the operating pressure to pressure port L.
  - ⇒ Signal 1 "load secured" is no longer active.
  - ⇒ Signal 2 "clamping released" is displayed.
3. Relieve the pressure at pressure port L.
  - ⇒ Signal 2 "clamping released" is no longer active.
  - ⇒ Signal 1 "load secured" is displayed.



Cross-check the two signals! The signals must not occur simultaneously. Brief overlap times during switching are admissible. Check the correct processing of signals in the machine controller too.

If the signals from the proximity switches are not unambiguous, the reason might be an incorrect depth setting, see accompanying adjustment instructions for proximity switches. They also contain details of the proximity switch holder type as well as all further information on assembly and adjustment.

If malfunctions occur, contact SITEMA. We will be glad to help.

## 9 Putting into service

This chapter sets out instructions on how to activate and set the various operating states of the Safety Lock.

**WARNING****Danger if the unit is put into service improperly!**

Improper initial putting into service might result in serious injury and major damage to assets.

- Make sure all installation work has been completed as stipulated in this manual.
- Make sure there is no one in the danger zone.

**Check the preconditions:**

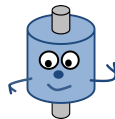
- The clamping rod conforms to the specification.
- Correct mounting of the Safety Lock, attending to the load direction and tightening torques.
- Pressure supply has been connected.
- The holding force has been successfully tested.
- The proximity switch functionality has been successfully tested.

### 9.1 Releasing the clamp

The clamp can only be released with an intact drive. No increased force is required for release.

**Follow this procedure:**

1. Apply the operating pressure to pressure port L.
  2. Run the drive opposite to the load direction. The drive's power must correspond to the weight of the load.
  3. Maintain the operating pressure to keep the clamp permanently open.
- ⇒ Proximity switch 2 signals "clamping released".



If the **clamp is not released**, it is often the case that the necessary **counter-movement of the rod** has not taken place, or the counter-movement is insufficient.

To **release** the clamp **after securing the load** (see *Chapter 9.2 Securing the load* [▶ 24]), it is sufficient to apply the operating pressure to pressure port L, provided the load had not previously dropped.

To **release** the clamp **after taking up the load** (see *Chapter 9.3 Taking up the load* [▶ 24]) applying the operating pressure to L is not sufficient. The rod must additionally be moved opposite to the load direction.

## 9.2 Securing the load

**Follow this procedure:**

1. Stop the rod completely.
  2. Disconnect the pressure from pressure port L.
- ⇒ The clamp closes.
- ⇒ The load has been secured.
- ⇒ Proximity switch 1 signals "load secured".

## 9.3 Taking up the load

Pressure port L is depressurized. The holding force is built up only when the load continues moving in the direction in which it is to be secured.

- ▶ Apply the load to the Safety Lock (such as by releasing the service brake).
- ⇒ The Safety Lock takes up the load.

# 10 Inspection, maintenance and cleaning

## 10.1 Inspection

Always inspect the Safety Lock when carrying out machine servicing. When doing so, check that the following components are in good working condition:

Component	Good condition
Wiper (rod openings)	The sealing lip shows no signs of wear. (Damaged wipers might let dirt into the clamping system. Worn or damaged wipers must be replaced by original SITEMA parts.)



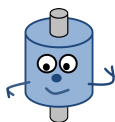
Component	Good condition
Rod	The rod has no scoring or deposits on it. (Scoring indicates transverse forces, defective wipers or damaged clamp elements.)
Mounting	All mounting screws of the Safety Lock and the attached components are properly secured, with the necessary tightening torque.
Proximity switches (optional equipment)	The proximity switches correctly signal the operating states. The ports are in good working condition.
Pressure port L	The pressure port is leak-tight. The connection line is leak-tight and not kinked. Outflow of the pressure fluid is not impaired by additional components. The circuit's response time is sufficiently fast.
Port T (pressure compensation)	The air filter is clean and permeable. If heavily contaminated by the environment: A line is connected and is routed into a clean area. The line is leak-tight and depressurized.

The following components are available from SITEMA as spares:

- air filters (for port T)
- proximity switch holders
- proximity switches

## 10.2 Maintenance

No maintenance procedures are required other than the routine performance tests - see *Chapter 8 Performance test* [► 20]. Do not apply high-viscosity lubricants (grease) to the rod during maintenance.



SITEMA recommends having a **general overhaul** of the Safety Lock carried out at SITEMA's factory after 5 – 6 years in service (preventive maintenance). Integrate the general overhaul into your plant's maintenance schedule.

## 10.3 Cleaning



### NOTICE

#### Risk of malfunction due to improper cleaning!

The functioning of the Safety Lock might be impaired by penetration of dirt and liquid, or by improper attempts at cleaning.

- ➔ Clean only the outside.
- ➔ Use only equipment which cleans without high pressure.
- ➔ Clean only using a soft cloth and cleaning products which are not harmful to the materials.
- ➔ Do not apply any lubricants (grease) to the rod.

## 11 Troubleshooting



### WARNING

#### Risk of injury if unauthorized troubleshooting is carried out!

Unauthorized troubleshooting might result in injury and damage to property.

- ➔ Leave the Safety Lock assembled. Do not open the Safety Lock.
- ➔ Do not reach through the openings in the housing.

Notify SITEMA whenever you suspect that the clamping system is malfunctioning. We will provide you with the necessary prompt advice and support.

Please describe the problem in as much detail as possible, e.g.:

- type and serial number on name plate
- clamp not closing
- clamp not opening despite ... bar pressure and despite .... mm upward movement
- irregular dropping
- rod slipping under ... kN load
- leakage from ...
- response time ... ms too long

## 12 Repairs

The Safety Lock is a safety component. Repairs may only be carried out by SITEMA. If unauthorized repairs are carried out, there is a resultant risk of injury and of malfunction. SITEMA accepts no responsibility for this.

## 13 Disassembly and disposal

### Personnel:

- **safety engineer**
- **pneumatics specialist**
- **electrician**

### Personal protective equipment:

- goggles
- protective gloves
- safety boots
- industrial helmet
- ear defenders



**WARNING****Risk of injury if improper disassembly and disposal procedures are followed!**

Accumulated residual pressures, the heavy intrinsic weight of components (rod, Safety Lock) and spring forces can cause serious injury.

- ⇒ Secure the danger zone.
- ⇒ Leave the Safety Lock assembled. Do not open the Safety Lock.
- ⇒ Secure the Safety Lock and rod separately, even if the Safety Lock is fixed to the rod.
- ⇒ Do not reach through the openings in the housing and the rod.

## 13.1 Disassembly

**Check the preconditions:**

- The load (e.g. moving machine parts) secured by the Safety Lock is supported by other means or has already been disassembled.
- The Safety Lock and clamping rod are secured separately to prevent them from dropping down.

Depending on the method of integration into the local plant, the Safety Lock might be disassembled separately from the clamping rod or only together with it. The following describes both cases.

### Combined disassembly of clamping rod and Safety Lock

**Follow this procedure:**

1. Discharge accumulated residual pressures.
2. Disconnect the complete pressure supply from the Safety Lock.
3. Secure the Safety Lock and clamping rod separately.
4. Loosen the mounting screws of the Safety Lock and the rod.
5. Remove the Safety Lock from the machine together with the rod.
6. Connect a temporary pressure supply to pressure port L.
7. Apply pressure to pressure port L.
  - ⇒ The clamping system opens.
8. Pull the rod out of the Safety Lock.
9. Disconnect the temporary pressure supply from the Safety Lock.

## Separate disassembly of clamping rod and Safety Lock

### Follow this procedure:

1. Make sure the Safety Lock is under no load.
2. Apply pressure to pressure port L.  
⇒ The clamping system opens.
3. Disassemble the rod and pull it out of the Safety Lock.
4. Discharge accumulated residual pressures.
5. Disconnect the complete pressure supply from the Safety Lock.
6. Loosen the mounting screws and remove the Safety Lock from the machine.

## 13.2 Disposal

There are no electronic components built into the Safety Lock. The only electronic components are the externally mounted proximity switches (optional equipment).

### Follow this procedure:

1. Remove the proximity switches and dispose of them in accordance with environmental regulations.
2. Scrap the Safety Lock in its entirety.

## 14 Technical data sheet

The data is accurate at the time of printing this manual. The latest version is available at [www.sitema.com](http://www.sitema.com) at any time.

### Documents about this

 (Resources/pdf/66505867.pdf)