Technical Data Sheet TI-S10
Safety Locks

- ☑ High holding force by self-intensifying clamping
- ☑ Hydraulic respectively pneumatic actuation
- ☑ suitable for holding static loads

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A detailed description of the control, assembly and operational test of the Safety Locks can be found in the *„Operating Manual BA-S11 and BA-S12“ .*

1 Purpose

The SITEMA Safety Lock type KRG is able to block a weight (static load) in one direction on a cylinder rod or a separate shaft.

For example, these devices are used as a mechanical fixation of:

- suspension-cylinders at cranes and other heavy vehicles
- lifting equipment
- machine tool components
- lifting tables in production machinery

2 Function

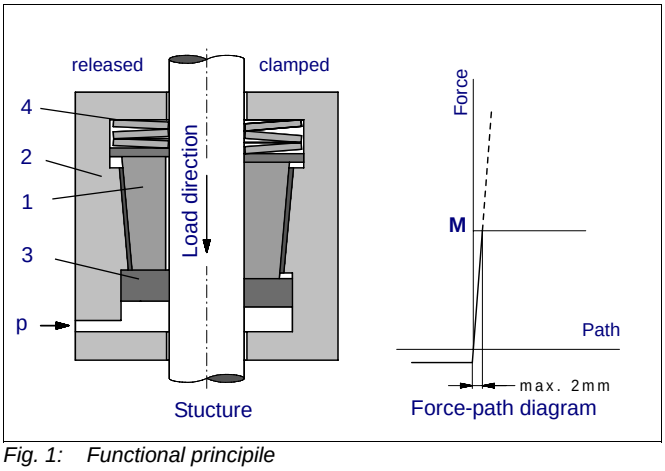

Fig. 1: Functional principile

As shown in *Fig. 1*, the clamping system consists of a conical clamping sleeve (1) movable within the conical housing (2).

In released condition, the annular piston (3) keeps the clamping sleeve pushed against the set of disc springs (4) by hydraulic or pneumatic pressure, so that the shaft can move freely, with help of a well designed radial clearance.

On zero pressure the clamping sleeve is pushed into the cone of the housing by a set of disc springs. So a situation of initial friction contact between rod and clamping sleeve is achieved. If an a load is now acting on the rod, the clamping sleeve is drawn further into the housing, leading to a self-intensifying clamping process. During this process, the movement of the rod is very small. Even at larger sizes the movement does not exceed 2 mm when the admissible load M is applied.

⚠ **ATTENTION: As indicated in the diagram, in case of an overload there is no slipping to dissipate the energy. For this reason an overload exceeding twice the admissible load M may lead to a damage of the device.**

If the rod is moved against the direction of load at zero pressure, a braking force at the level of roughly 10% of the admissible load is achieved. Under certain circumstances, this feature can be used to perform a reversing stop. Please contact SITEMA for details. To release the clamping, an upward movement of the rod is normally necessary additionally to the release pres-

sure at port L. This leads to the advantage, that the clamping is automatically not releasable unless the lifting drive is working properly.

However, this advantage may not be valid, if there are only small loads in combination with simultaneously high release pressure (for details please see minimal load F6 and F100 in *„Technical Data Sheets TI-S11 and TI-S12“*)

A standard proximity switch has to be used to signal 2 the situation „clamping released“. Only in case this signal is active, a downward movement is possible.

3 Types

Type KRG
For hydraulic actuation

Type KRGP
For pneumatic actuation

Except the actuation both types are identical regarding function and application.

4 Control

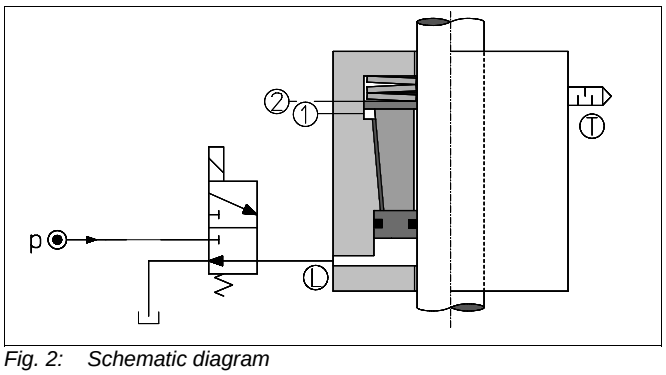

Fig. 2: Schematic diagram

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To actuate SITEMA Safety Locks hydraulic pressure is most common. For smaller sizes and smaller holding capacity pneumatic actuation is also frequently used.

For hydraulic version:

Hydraulic oil (HLP) in accordance with DIN 51524-2 must be used as pressure medium. Please consult us before using any other media.

For pneumatic version:

The compressed air must be dried and filtered

Actuation using 3/2-way valve
In most cases, the activation indicated in *Fig. 2* will be used.

During every operational cycle, the 3/2-way valve is actuated electrically and releases the Safety Lock .

When the valve is switched off, as well as in case of power failure, emergency stop etc., the Safety Lock becomes effective and clamps the rod. Also, if the pressure source or pipe should fail, the load is secured in the same way.

Monitoring by proximity switches
The proximity switch 1 „Load secured“ signals the secured state and is used to authorise entrance to the danger area. Switch 2 „released“ is used to activate the downward movement of the drive.

For automatic detection of failures both signals are compared. In case both switches indicate the same state - apart from minor overlapping periods - there is a defect present.

5 Choosing the right size
The admissible load M is stated for all types in the *„Technical Data Sheets TI-S11 and TI-S12“*. During usual conditions (vertical move ment), the criteria as below is to be maintained..

$$M \geq \frac{\textit{Moving weight}}{\textit{Number of safety locks}}$$

Against forces in load direction (see *Fig. 1*) the rod will be totally blocked, the higher the force the stronger the grip. Therefore forces exceeding 2xM may cause damages of the device.

6 Rod requirements
The Safety Lock is designed for operation on smooth round rods.

Fig. 3: Rod end with lead-in chamfer

Rod design requirements:

- The rod end is fitted with a lead-in chamfer (mind. 3×20°, rounded) as a mounting aid.
- The rod surface is hardened (at least HRC 52), burnished and within ISO tolerance f7 or h6 and a surface finish Rz= 1 to 4 µm or R_a 0.15 - 0.25 µm
- The material has a yield strength sufficient to withstand the maximum posible load (up to 2 x F). In the case of compression-loaded rods buckling resistance must be assured.

Most recommended are:

Piston rods, hard chrome-plated (ISO-tolerance f7 or h6)
basic material: yield strength min 580 N/mm²
induction-hardened HRC 52 - 64 / min. 1 mm deep
hard chrome plating: 800-1100 HV min 13 µm thickness
surface finish: R_a 0.15 - 0.25 µm

7 Service life
The Safety Lock is designed for at least 1 mio. times holding full load, which was also verified in a number of cycling tests. In usual applications however the rod will be secured in every cycle, but without transferring the load from the lifting gear to the Safety Lock . Such kind of cycling will not stress the device substantially and can be carried out for millions of cycles.

Based on these facts it can be guaranteed that for several years in normal use, the holding force will not drop below the nominal value.

On the other hand it should be mentioned, that from our experience certain undesired operational conditions could diminish the service life considerably. Most of all following operating conditions must be avoided:

- Radial forces to the retaining rod
- Finish of the rod too rough
- Penetration of corrosive substances (including humid compressed air) into the housing
- Lowering of the load due to control with every stroke while the device is „load secured" status.

8 Operating conditions

The Safety Lock is designed to operate in usual clean and dry shop atmosphere. In case of other environments at least the port T for breathing purposes is to be connected to a clen and dry volume (tank). Should heavy soiling conditions (grinding dust, chips, other liquids, etc.) exist, please contact SITEMA. Grease on the rod may reduce the holding force.

The permissible ambient temperature is 0 - 60°C.

9 Required risk assessment

It must be ensured that the dimensions and arrangement of SITEMA - Safety Brakes in safety-relevant applications meet the requirements of the risk evaluation DIN EN ISO 14121-1 and also comply with any further standards and regulations applying to the intended use. This is the duty of the system manufacturer and the user.

10 Overall documentation and CE label

The Safety Lock is designed as a component to be integrated into a machine or system and as such can never be CE-certified itself. The seller of the machine or system must provide information on the Safety Lock with the overall documentation and if applicable ensure that the machine or system is CE-certified.

11 Regular functional checks

The Safety Lock must be functionally checked at regular intervals. Regular checking is the only way to ensure that the unit will operate safely in the long run.

See *„Operating Manual BA-S11 and BA-S12"* for further details.

12 Maintenance

The maintenance of the SITEMA Safety Locks is limited to the prescribed regular functional check.

Should the Safety Locks cease to comply with the required characteristics, the aforementioned safety of working with the machine or system is no longer given. In this case the Safety Locks must be removed immediately and professionally repaired by SITEMA.

Any repair or refurbishing must be carried out by SITEMA. SITEMA cannot take any responsibility for repairs by another party.