Technical Information TI-KRM10
Safety Catcher KRM

- ☑ high holding force by self-intensifying clamping
- ☑ mechanical triggering and releasing

Contents

A detailed description control, assembly and performance test of the Safety catchers KRM can be found in the *"Operating Manual BA-KRM"*.

1 Purpose

Safety Catcher KRM are used where protection of personnel and accident prevention must be achieved in connection with loads or tools lifted by a chain, belt, rope etc. in case of rupture of a lifting element. Safety Catcher KRM catch falling masses infinitely variable at any position of the stroke, in a mechanically secure and absolutely reliable manner. The design principle of the self-intensifying clamping ensures an extremely high safety level.

The Safety Catcher KRM is mechanically kept released by the lifting force of the chain etc. and engages immediately in case of breakdown of the force. Afterwards the energy of the falling masses is used to intensify the clamping action in an ingenious manor.

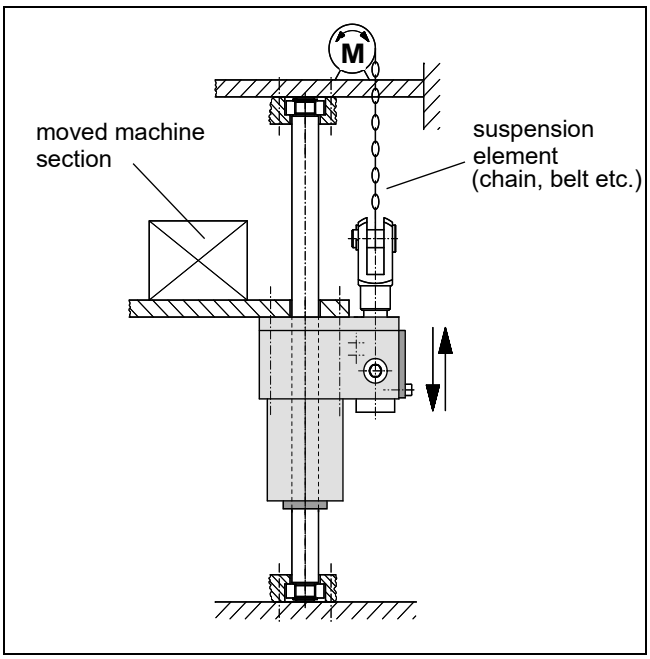

Fig. 1: Schematic view

2 Function

2.1 Overview

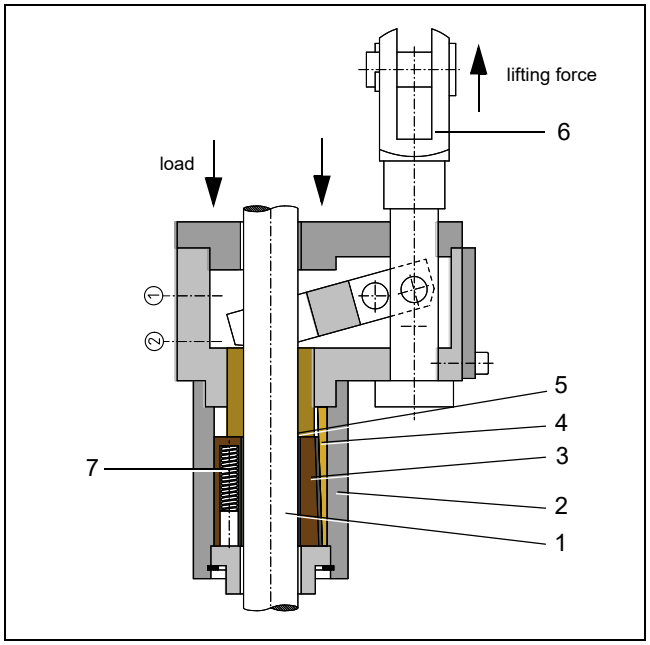

Fig. 2: Safety Catcher KRM (clamping released)

The piston shaft (1), *Fig. 2* is surrounded by the housing (2), *Fig. 2* in which several wedged clamping jaws (3), *Fig. 2*, each with one slide lining (4), *Fig. 2* and one brake lining (5), *Fig. 2* are assembled. The tensile force of the lifting member acting on the anchor bolt (6), *Fig. 2* via a lever keeps the clamping jaws released. The springs (7), *Fig. 2* are compressed in this position.

2.2 Rod clamping

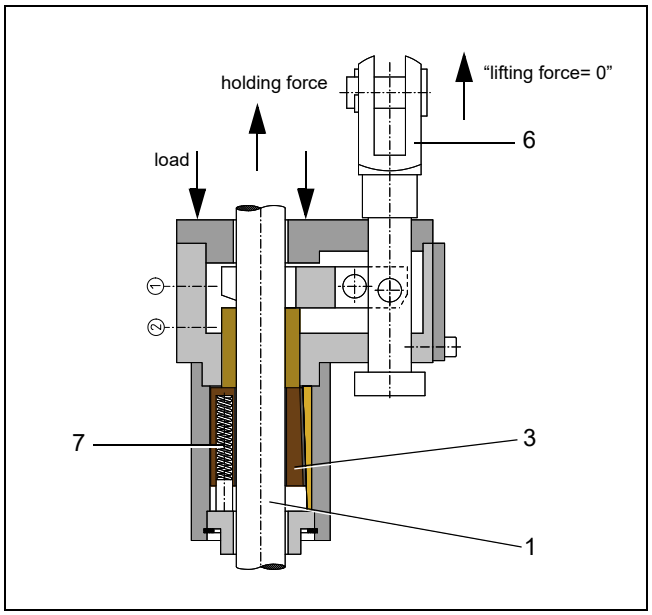

Fig. 3: Safety Catcher KRM having catched the load

The Safety Catcher KRM becomes effective as soon as the lifting force drops below a critical limit due to any failure.

The action of the springs then causes the clamping jaws (3), *Fig. 3* to clamp the shaft (1), *Fig. 3* firmly, thus securing the load.

The full clamping force is built up by as the Safety Catcher KRM together with the falling load is moving along the shaft. Due to the self-intensifying static friction at the shaft, the clamping jaws (3), *Fig. 3* are drawn into the clamping position at their stops (7), *Fig. 3* after having moved the distance "e" (approx. 5 to 15 mm, depending on the design). This movement is illustrated as phase **A** in the force-path diagram.

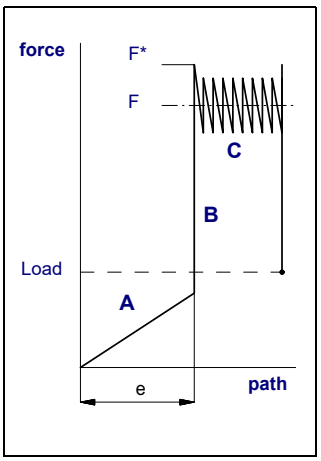

Fig. 4: Force-path diagram, schematic

Afterwards the clamping device in phase (**C**) generates a mean dynamic braking force F – the braking – force and thus dissipates the kinetic energy of the falling masses.

To release the clamping (after having fixed the failure) the load must just be for a path equal to "e" by the lifting drive. The necessary force normally is according to the load, excess force is not necessary.

3 Choosing the right size

The admissible load M is stated for any type in the respective drawing. During usual conditions (vertical movement), the criteria as below is to be maintained..

$$M \geq \frac{\textit{Moved weight}}{\textit{Number of Safety Catchers}}$$

The holding (braking) force for dry running or mineral-oil wetted shafts is not less than 2 x M, but will not exceed 3,5 x M (see *Kapitel 5 „Requirements for the clamping rod and the fastening elements" auf Seite 3*).

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4 Monitoring by proximity switches

Proximity switch 1 “load secured” signals the secure state and is used to authorize entrance to the danger zone.

Proximity switch 2 “clamping released” is used to activate the movement of the drive in the load direction.

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.

4.1 Proposal for a logical integration of the Safety Catcher into the machine control system

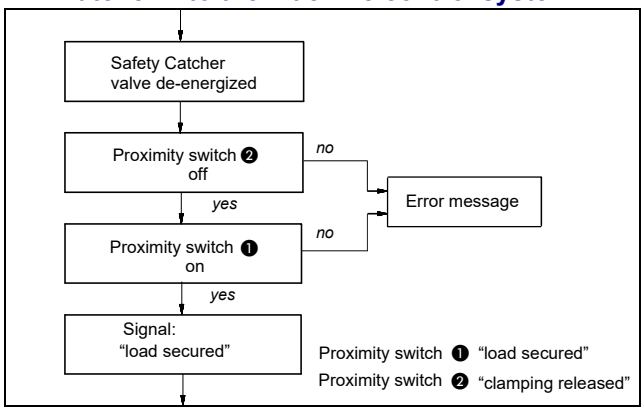

Fig. 5: Secure load

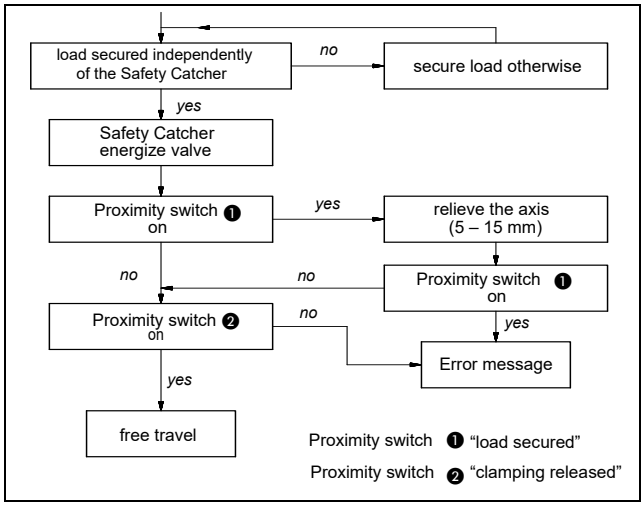

Fig. 6: Release clamping

5 Requirements for the clamping rod and the fastening elements

The Safety Catcher KRM will operate correctly only if the rod has a suitable surface:

- ISO tolerance field f7 or h6
- surface roughness: Rz = 1 to 4 µm (Ra 0.15 - 0.3 µm)
- protection against corrosion, e.g. hard chromium plating: 20 ±10 µm, 800 – 1 000 HV
- base material: yield strength min. 580 N/mm²
- lead-in chamfer, rounded:
  ø 18 mm up to ø 80 mm: min. 4 x 30 °
  ø over 80 mm up to ø 180 mm: min. 5 x 30 °
  ø over 180 mm up to ø 380 mm: min. 7 x 30 °

Often, the following standard rods fulfill the above mentioned requirements and can then be used:

- piston rods, ISO tolerance field f7

The rod may not be lubricated with grease.

For safety reasons, the maximum holding force may be as much as 3.5 times greater than the admissible load (M). The maximum holding force can occur at rupture of the suspension element.The mounting elements that take up the load (e.g. the rod and its linkage, etc.) must therefore be dimensioned for a load of least 3.5 x M. In case of overload the rod slips, causing no damage to rod and Safety Catcher KRM.

6 Service life

Based on the results of fatigue tests, it can be guaranteed that for several years in normal use, the holding force will not drop below the nominal value, and that even after lots of clamping cycles, no relevant changes in the diameter or surface quality will be observed on the clamping shaft.

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.

7 Attachment

To avoid constraint forces due to dimensional or angle tolerances, the rod must be attached loosely to the load handling attachment or machine frame (e.g. by mounting the rod as a radial loose bearing).

8Operating conditions

SITEMA Safety catchers KRM are designed to operate in normal clean and dry workshop atmosphere.

Heavy soiling conditions like grinding dust, chips, other liquids, etc. may require special protective measures. In such cases, please contact SITEMA.

The surface of the housing parts is primed black, the front sides are treated with corrosion protection wax and the aluminium parts are anodized.

The permissible surface temperature is 0°C to +60°C.

9 Required risk assessment

It must be ensured that the dimensions and arrangement of a SITEMA Safety Catcher KRM used in safety-relevant applications meet the requirements of the risk evaluation EN ISO 12100:2010 and also comply with any further standards and regulations applicable for the intended use. The Safety Catcher KRM alone principally cannot form a complete safety solution. It is however suitable to be part of such a solution. Furthermore, all attachments and fixations have to be dimensioned correspondingly. This is generally the duty of the system manufacturer and the user.

10 Regular performance testing

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

Please check the operating manual *"Operating Manual BA-KRM"* for further details.

11 Maintenance

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

Should the Safety catchers KRM 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 catchers KRM must be removed immediately and professionally repaired by SITEMA.

Safety catchers KRM are safety devices. Any repair or refurbishing must be carried out by SITEMA.
SITEMA cannot take any responsibility for repairs by another party.

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