Technical Information TI-KRM-001

Safety Catcher KRM

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

Contents

A detailed description of the control, assembly and operational test of the Safety catchers KRM can be found in the *„Operating Manual BA-KRM-001“* .

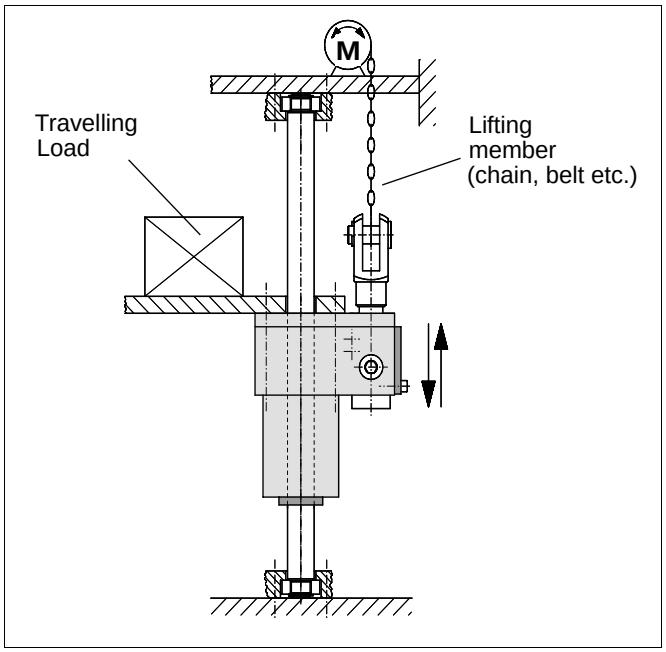

Fig. 1: Setup, schematically

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 menber. 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 massses is used to intensify the clamping action in an ingenious manor.

2 Function

2.1 Overview

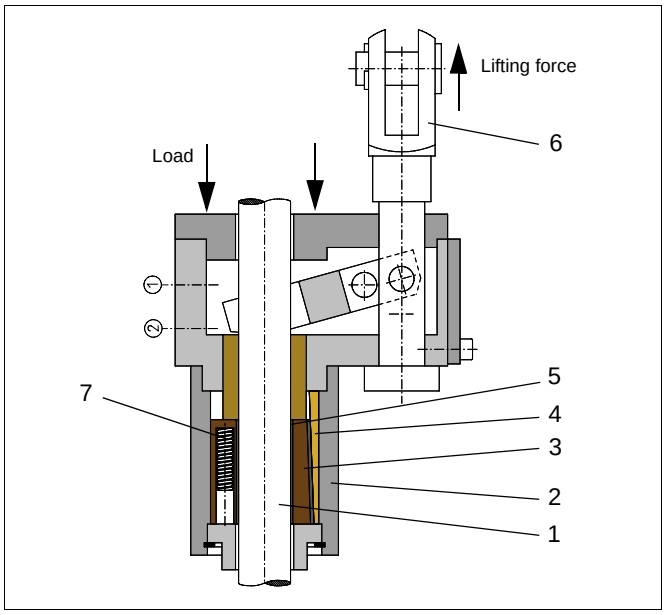

Fig. 2: Safety Catcher KRM (clamping released)

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

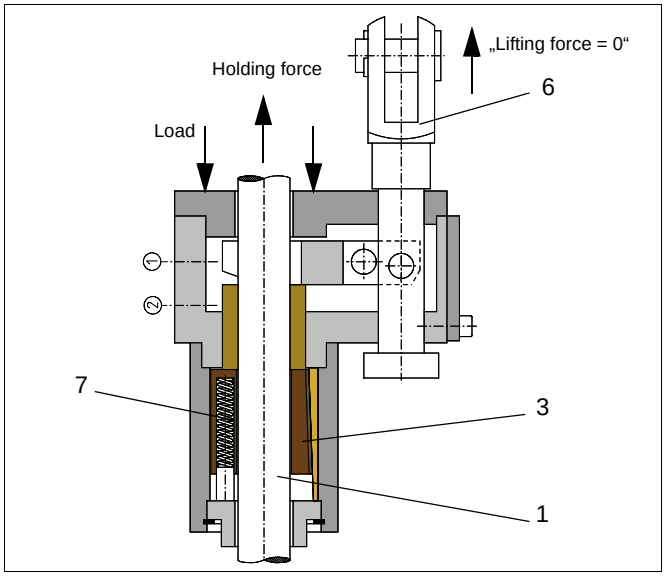

Fig. 3: Safety Catcher KRM having catched the load

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.

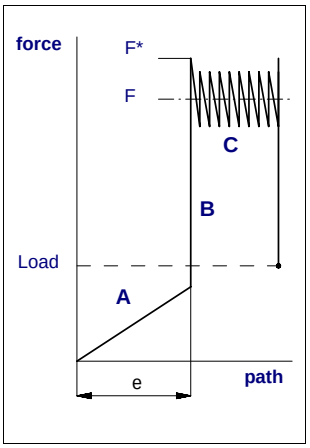

Fig. 4: Force-path diagram, schematic

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 Monitoring by proximity switches

The proximity switch 1 „Load secured“ signals the secure 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.

4 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. The fixing elements which accept the load (e.g. linking the rod to the machine framel etc.) must therefore be dimensioned for a 3.5 x M force. This maximum force can occur with emergency braking.

It must be ensured that the dimensions and arrangement of Safety Catchers in safety-relevant applications meet the requirements of the risk evaluation (EN 1050) 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.

5 Rod requirements

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

- ISO tolerance field f7 or h6
- Surface roughness: Rz = 1 to 4 µm or Ra= 0,1 bis 0,4 µm.
- Hardchrome plated surface recommended
- Lead-in chamfer 3x20°, rounded.

As the maximum load can be as high as 3,5 times the nominal force M (for M see data sheets or dimensional drawing), care must be taken to ensure that the strength of the rod material is adequate. In the case of compression-loaded rods, sufficient buckling resistance must be assured.

In practice, suitable and commercially available rods are:

Piston rods with,

Rod diameter toleranz: ISO f7
Basic material: 42CrMo4V
Hard chrome plating: 800-1100 HV min. 13 µm deep
Surface finish: RA 0,15 - 0,25

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.

On the other hand it should be mentioned, that from our experience particular circumstances could diminish the service life considerably, as there are

- Radial forces or side loads due to misalignmet
- a too rough finish of the rod surface
- penetration of corrosive substances into the housing

7 Attachment

It must be ensured, that no side load can be induced due to tolerances in dimensions or angular misalignment relative to other guiding means. In general it is recommended to install the rod using a floating bearing.

8 Operating conditions

The Safety Catcher KRM is designed to operate in usual clean and dry shop atmosphere.

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 Overall documentation and CE label

The Safety Catcher KRM 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 Catcher KRM with the overall documentation and if applicable ensure that the machine or system is CE-certified.

10 Regular functional checks

The Safety Catcher KRM 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.

It must be ensured, that no side load can be induced due to tolerances in dimensions or angular misalignment relative to other guiding means. In general it is recommended to install the rod using a floating bearing.

(*Please see „Operating Manual BA-KRM-001“ for further details*).

11 Maintenance

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