

## **Risk assessment on the use of roller- and leaf chains** **according to Directive 2006/42/EC**

In lifting applications, the chains used according to the above directive are classed as safety components. It is assumed that the chain delivered by the manufacturer is free from defects and matches the requirements. The hazards referred to in Annex I of the Directive 2006/42/EC concern the breaking of lifting chains, causing sudden falling of goods which may result in material or personal harm.

In general, the intended use of chains is required. The following table provides an overview of potential risks and sources of error in the use of chains in lifting applications. It does not replace the assembly-, operating- and maintenance manuals. It is assumed that all the used chains are designed properly. Depending on the application, the risks listed below can be omitted, changed or added to.

**Risk during installation**

<b>Risk</b>	<b>Cause</b>
Crushing the fingers / hands	Incorrect assembly can entangle the chain links and injure the fingers.
	Injury can be caused by the hands / fingers being drawn into the chain drive, especially in the areas where the chains run around sheaves or sprockets.
Allergic reaction	The chains are initially lubricated. To avoid allergic reactions to the ingredients of the oil, protective gloves should be worn at work.
Crushing of the feet	Chains can sometimes be very heavy. To avoid serious injury from falling chains, safety shoes must be worn in the assembly area. When installing the chains in greater heights, we recommend the use of protective headgear.
Cuts from sharp edges	Although the chain plates are deburred, in some cases there can be sharp edges or pressed metal chips on the chain. To avoid injury, protective gloves should be worn.

**Risk from installation errors**

<b>Error</b>	<b>Risk</b>
The chain fittings and pulleys are not aligned.	Uneven load distribution within the chain links. The chain does not have the required tensile strength.
	It may cause grinding of parts in the guide or the pulley causing loss of material, thus leading to a reduction in tensile strength.
	Load increase by additional transverse forces.
Wrong chain selection. Interchanging chains.	Different chains are visually similar and so can be installed without noticing they are different. Material selection and specification hardness can differ so much that the operational safety can not be guaranteed.
Selecting the wrong connecting pin	Many chains are attached with pins which are not delivered by the chain manufacturer. If using these pins, there may be an incorrect material, heat treatment or dimension (tolerance).

External damage	When there is damage to the chain by external applications (shock, media, twist, etc.) the operational safety is no longer guaranteed.
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**Risk in operation**

<b>Error</b>	<b>Risk</b>
Lack of inspection	If the chain is not inspected regularly, there is a risk that the following hazards will not be noticed at an early stage.
The chains corrode.	Removal of material and reduction of breaking load
	Loss of material and loosening of press fits. The chain pins can come loose from the plates
	Stiff joints, thereby increasing the frictional forces.
The chain vibrates or shakes	Non-uniform velocities may cause the lifted load to fall.
Insufficient lubrication	Corrosion (see Error: The chains corrode)
	Increased chain wear which gives a change in the load distribution and/or a reduction of the material cross sections. The result would be a reduction in tensile strength.
Stiff joints	Proper positioning not possible. The lift can drop at the bent location at any time.
Twisted or loose pins	May be an indication of overload or insufficient lubrication. The load capability of the chain is no longer guaranteed.
External damage	In various applications, it is possible that other items hit the chain. If there are impact marks or deformation, the reliability is no longer given.
Fatigue cracks	Fatigue cracks could arise due to overload. If individual plates within the packed plates are cracked without the chain failing, the breaking load is reduced accordingly.
Dirt	For heavily soiled chains, the joint can not be adequately lubricated.

Wear	The chain is worn if it has lengthened by more than 3% of nominal length, and must be replaced.
Pinching or crushing in articulation location	The articulating area of the chain must be shielded against accidental contact by users.
Wrong temperature range	Depending on the manufacturer, different materials, heat treatments and lubricants are provided. Application at high or low temperature conditions may lead to brittleness and/or loss of strength of the components.
Welding, soldering	Due to the influence of temperature and subsequent reduced reliability, welding and soldering of chains is prohibited.