

## **1 Foreword**

### **1.1 General Instructions**

This guide will help you to use RUD chain ends safely, properly and profitably. When you follow the instructions in this guide, you will

- Increase the reliability and service life of the RUD chain ends and the system
- Avoid dangers
- Reduce repairs and down times

**This guide must**

- **Be available at all times at the place of use**
- **Be read and followed by everyone who works on RUD chain ends**

The RUD chain ends have been manufactured according to the state-of-the-art and in compliance with the recognized safety rules. However, improper handling or use for other than intended purpose may endanger the life and limb of the user or third parties and/or damage the conveyor system and other tangible assets.

Spare parts must fulfil the technical requirements specified by RUD Ketten. This is guaranteed in the case of original spare parts, as they are subjected to continuous quality control by a quality management system certified under ISO 9001. Third party spare parts may, under certain circumstances, change the specified design characteristics of the system, and lead to serious defects which, in such a case, would not be the responsibility of RUD Ketten.

Use a suitably equipped workshop for performing maintenance work. Only the manufacturer can guarantee to carry out a professional overhaul or repair.

This guide has been drawn up with the greatest possible care. However, if you would like further information, please contact:

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### **1.2 Intended Usage**

- The RUD chain ends serve as a means of traction for the conveyance of bulk materials and unit loads.
- In stationary operation, the permitted power transfer through the RUD chain ends when conveying a specific material at a specific speed and with an appropriate distance between axes is specified in the order placed with RUD and in the confirmation of order by RUD. Any other use or use going beyond the intended use – for example higher conveying capacities or speeds, conveying other materials, or use under unapproved operating conditions – shall be regarded as use for other than the intended purpose.
- Use for the intended purpose also includes complying with this fitting and operating guide.
- RUD chain ends for conveyors are hardened and must not be used as load lifting tackle, hitching gear or as a means of support as defined by DIN 15 003.


**The manufacturer shall not be liable for damage resulting from usage for other than the intended purpose. The user shall bear the risk alone.**

## 2 Safety Instructions

### 2.1 Explanation of Symbols and Notices

 <p><b>Warning!</b></p>	<p><b>Danger to life and limb, or substantial material damage can occur if the appropriate safety instructions are not followed.</b></p>
 <p><b>Attention!</b></p>	<p><b>Undesirable consequences or working conditions can arise if the appropriate safety instructions are not followed.</b></p>

### 2.2 General

 <p><b>Warning!</b></p>	<p><b>Follow the safety instructions. Otherwise there is danger to the life and limb of the user and third parties, and of damage to the machine and other tangible assets.</b></p>
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- Mounting, dismounting, repairs, overhauls, and wear measurement may only be performed by competent persons who are familiar with the operating manuals and trained people.
- Inform the operating personnel and appoint supervisors before starting maintenance work.
- Secure machines and equipment against being started unintentionally.
- Switch off the main control systems, remove keys, and attach warning notices.
- Before mounting/dismounting work, secure the chain strand against movement. When mounting/dismounting chain equipment, a one-sided load can set the chain in motion and cause injuries which may prove to be fatal.
- Protect the working area against falling materials and components.
- When mounting and replacing individual parts or larger modules, attach and secure them carefully to the lifting equipment so that they cannot become a source of danger. Only use suitable and technically faultless lifting equipment and load hitching tackle.
- Do not stand or walk under suspended loads.
- As a rule, all components must be mounted and dismantled in an electrically dead state, unless otherwise stated. Risk of crushing!
- All parts of the plant must have cooled down to the extent that they can be touched without causing burns.

- Appoint only operating personnel with valid certificates of entitlement to hitch loads and instruct crane drivers. The spotter must remain in view of the operator or be in voice contact with him.
- The platforms provided and climbing aids complying with safety regulations must be used for assembly work above head height. Do not use machine parts as climbing aids. Wear protection against falling when performing maintenance work at great heights.
- Operating and process materials must be disposed of safely and in a way that does not harm the environment.
- As a matter of principle, no welding work is permitted to be done on round steel chains, chain couplings or case-hardened module components. The chain must not be used as a ground connection to the steel structure for electric welding.
- Welding, burning and grinding work may only be performed on the plant when this has been expressly authorized. Before starting welding, burning or grinding work, clean the plant and its surroundings of dust and combustible materials, and ensure adequate ventilation. There could, for example, be a risk of fire or explosion.
- Ensure that screw connections are tightened with the defined torque. Always check these connections with a torque wrench.
- Persons are not allowed to ride on the conveyor.
- For safety reasons, it is forbidden to make any modifications or alterations to the components without the manufacturer's authorization.
- All methods of working which are of questionable safety are forbidden.
- In addition to the operating instructions, comply with and implement the generally applicable, legal and other binding accident prevention and environmental protection regulations. For example, the handling of hazardous substances and the provision and wearing of personal protective clothing and equipment.

### **2.3 Care and Maintenance**

- Wherever necessary, cordon off the maintenance area, allowing a wide safety margin.
- Before starting maintenance work, cordon off the working area of the machine/equipment to prevent the access of unauthorized persons. Attach or put up suitable notices advising of the maintenance work.
- Any material adhering to or remaining in the buckets can come loose and fall out. Switch off the material feed, and empty the bucket elevator before opening the inspection flaps. Wear a safety helmet while working.

### 3 Description

The chain ends are made of standard steel with RUD special deep hardening, their surface hardness gradient is optimized to match the conditions of use.

Standard equipment:

Matching pairs of chains according to DIN 764-2 with 3, 5, 7, 9 and longer lengths of chain, tied together by wire.

The main parts (figure 1) are:

- Chain end 10

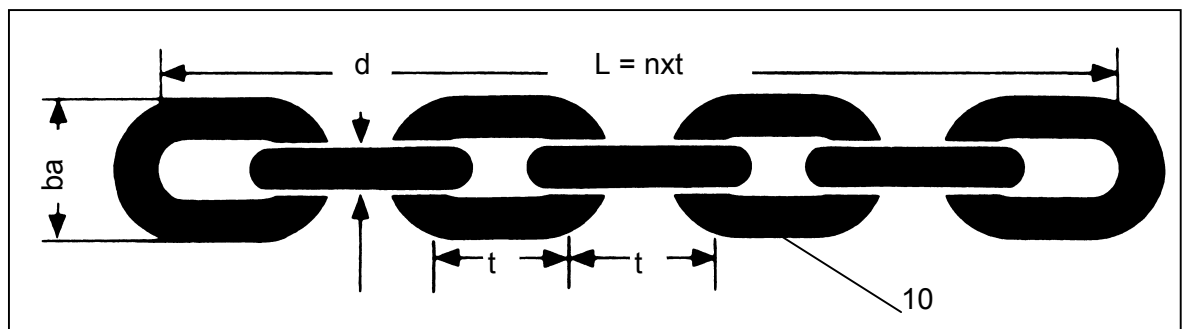


Fig. 1

#### 3.1 Dimensions and qualities

##### Technical Specifications

DIN 764						
Nom. thick.	Pitch	Dimens.	Min. breaking force kN	Weight	Assoc. chain shackle acc. to DIN for wheels	
(d)	(t)	ba (max.)	Grade 25	[kg/m]	plain Pitch	*toothed Pitch
10	35	36	39	2	45	35
13	45	47	66	3,5	56	45
16	56	58	100	5,2	63	56
18	63	65	127	6,5	70	63
20	70	72	157	8,2	80	70
23	80	83	207	11	91	80
26	91	94	265	14	105	91
28	98	101	308	16,5	105	-
30	105	108	353	19	126	105
33	115	119	427	22,5	126	-
36	126	130	508	26,5	147	126
39	136	140	597	31	147	136
42	147	151	692	36	147	147

##### With RUD special deep hardening

	Grade 25 Standard steel *1)
Proof stress	125 N/mm <sup>2</sup>
Breaking stress	250 N/mm <sup>2</sup>
Min. surface hardness	800 HV 30
Hardness depth HTÄ	0.1 x +0.01 / -0.02 (Ø 10 – 28 mm)  0.1 x +0.01 / -0.02 (Ø 30 – 42 mm)

\*1) ≥ 30mm Ø = Toleranz 20%

\* Applies only to DIN 764 chains. tolerance class A: accurate to gauge, for toothed wheels. tolerance class B: not accurate to gauge ( same length stretched) for plain wheels.

### 3.2 Chain markings (fig. 2)

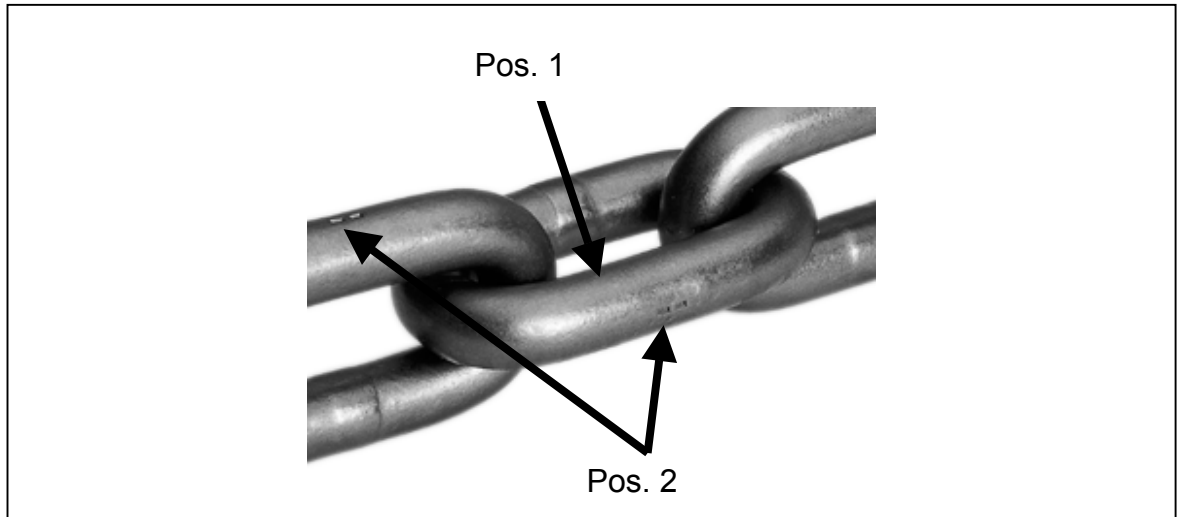


Fig. 2

<b>Position 1</b>	Front: R2
<b>Position 2</b>	Back: Month and year, example " 304 " (= March, 04 ) Mark on back: „ – – “

### 3.3 Strand lengths, manufacturing tolerance

According to DIN 764, tolerance class A

## 4 Fitting

### 4.1 Join the ends of the individual chain strands with chain shackles and buckets.

Follow the general operating instructions for the corresponding chain shackles according to DIN 5699 or DIN 745 (F80527 / WV1).

1. Please note that the welds in the vertically arranged chain links must face the centre of the wheel during the further course of fitting.
2. The weld seams of the horizontal links can face in either direction.

## 4.2 General guidelines

**Attention!**

Comply with the following general guidelines.

1. Protect round steel chains against overloading or blocking by foreign bodies by suitable measures, such as safety clutches or shearing pins on the drive.
2. Clean off material adhering to the round steel chain upstream of the chain wheel inlet by means of scrapers, compressed air or water jets. If a lot of material is adhering to the chain running into the drive wheel or guide stations, then suitably robust chain scrapers and chain guides may have to be fitted at these points.
3. If, for example, as a result of the accumulation of material the chain is in danger of lifting off the chain wheel, then a chain depressor or chain cross must be fitted before, after or over the whole range of the chain wrap.
4. Comply exactly with the assembly dimensions and tolerances stated in the assembly drawings when:
  - Fitting the chain wheels
  - Manufacturing scraper bars, buckets and bucket attachments
6. Define a usable takeup distance, taking into account the length of the loop and the aggressive stress acting on the chain.
7. Maintain a continuous takeup tension by means of springs or weights in the adjustable tensioning device. The magnitude of the chain takeup tension must be matched to the requirements of the elevator. The chains must be maintained under the correct takeup tension throughout their entire service lives. Slack chains cause problems.

## 5 Disassembly

### 5.1 Shortening the chain loop

The chain loop is shortened by removing a complete chain end including a bucket and the associated chain shackles.

## 6 Care and Maintenance

### 6.1 Lubrication

Under normal circumstances, RUD conveyor chains do not require any lubrication. The chains may only be lubricated with standard engine oil. Grease must not be used. Dirty chains should be cleaned before being lubricated.

### 6.2 Takeup tension

Check the tension in the chains regularly, especially during the running-in phase of new chains and/or where the loop lengths are long. The takeup tension must not be greater than that required for the chains and attachments to run faultlessly under normal operating conditions. The takeup tension must be the same in all the chain loops of multistranded conveyors.

#### Attention!

**Excessive tension shortens the service life of the chain.**

### 6.3 Monitoring

Examine the chains every six months, or at least annually, for damage, corrosion and points of unusual wear. Pay particular attention to the condition of the connecting links. Measure the lengthening caused by wear with the aid of the wear measuring sheet. Rectify all defects found without delay.

## 7 Wear and Replacement State of Wear

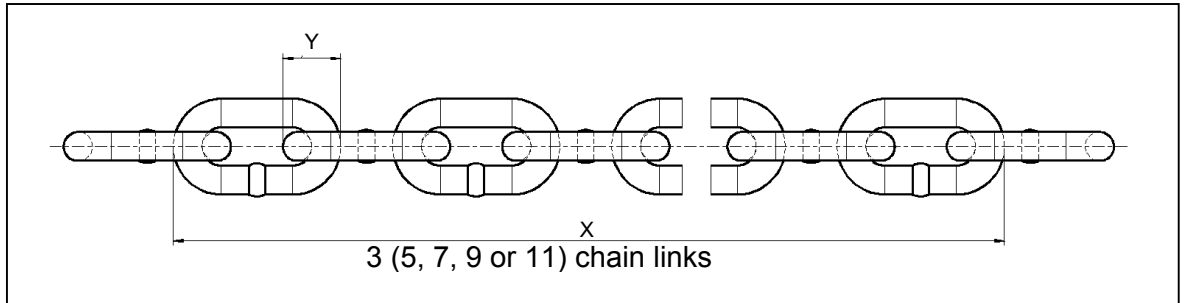
Once the case-hardened zone of the links has completely worn away, the rate of wear increases significantly and is no longer predictable. A chain must be replaced before the hardened zones have completely worn away. Measure the wear across the diameters of two links at their interlink points.

For example: a 20 mm chain with a 10% case hardening depth has a 2 mm case-hardened layer. Twice the diameter is 40mm, so the chain must be replaced before the measurement falls below  $40\text{mm} - 2 \times 2\text{ mm} = 36\text{ mm}$ .

#### Note!

- **Round steel chains on which the average thickness of the link has fallen by more than 10% of the nominal thickness must be taken out of service. (Averaged thickness of the link = average measurement of two measurements made at a right angle to one another at the link cross-section showing the most wear).**
- **The chains must always be replaced when damage occurs which directly or indirectly endangers the safety or operation of the plant.**

7.1 Wear measuring sheet



**Determination of the increase in pitch as a result of wear**

1. Measurement of the external chain length, dimension X across 3 (5, 7, 9 or 11) chain links, with the chain straight and under tension
2. Measurements of dimension y

3. Taken from the measurements of x:  $X_{min} =$  mm  
 Calculate the average value of the measurements x:

$$\frac{\text{Sum } x}{\text{Number}} = X_{average} = \text{ mm}$$

- Taken from the measurements of x:  $X_{max} =$  mm

4. Calculate the average value of the measurements y:

$$\frac{\text{Sum } y}{\text{Number}} = Y_{average} = \text{ mm}$$

5. Calculation of the inside nominal length of 3 (5, 7, 9 or 11) chain pitches.

$$L_{nom} = 3(5,7,9 \text{ or } 11) \cdot t_{nom}$$

6. Calculation of the min., average and max. pitch increases through wear in %

$$\text{Wear} = \left[ \frac{(x_{...} - y_{average})}{L_{nom}} - 1 \right] \cdot 100\% = \dots\%$$

To 1. and 2.: At least 3 measurements per chain strand for loop lengths up to about 4 strands.

At least 1-2 measurements per strand for longer lengths.

On multiple strand conveyors, each loop must be measured and evaluated.



Example:  $x_{\min} = 417.8$   $x_{\text{average}} = 418.3$   
Round steel chain 19 x 75  
 $x_{\max} = 419.2$

Measurements over 5 links  $y_{\text{average}} = 36.8 \text{ mm}$

$$L_{\text{nom}} = 5 \cdot t_{\text{nom}} = 5 \cdot 75 = 375 \text{ mm}$$

$$\text{Wear} = \left[ \frac{(x_{\dots} - y_{\text{ave}})}{L_{\text{nom}}} - 1 \right] \cdot 100\% =$$

$$\text{Wear} = \left[ \frac{(418.3 - 36.8)}{375} - 1 \right] \cdot 100\% = \begin{array}{l} \text{min} = 1.60\% \\ \text{ave} = 1.73\% \\ \text{max} = 1.95\% \end{array}$$

**RUD Chain Ends acc. to DIN 764-2**  
**GENERAL OPERATING INSTRUCTIONS**  
**F80552 / WV1**



Chain size:.....

Company:.....

Measurements across .....links

Elevator:.....

Date:.....

Left-hand chain loop				Right-hand chain loop			
Dimension				Dimension			
Code* no.	x (..t+2d)	y (2 d)		Code* no.	x (..t+2d)	y (2 d)	
1				1			
2				2			
3				3			
4				4			
5				5			
6				6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			
15				15			
16				16			
17				17			
18			% increase in pitch by wear	18			% increase in pitch by wear
19				19			
20				20			
x min.			min. %	x min.			min. %
x average		y average	average %	x average		y average	average %
x max.			max. %	x max.			max. %

\* Indicate measurements across chain couplings with "S", across attachments with "M".

At least 3 measurements per chain strand for loop lengths up to about 4 strands.

At least 1-2 measurements per strand for longer lengths.

**Please see pages 8 and 9 for chain measurement and evaluation instructions**