1 Foreword

1.1 General Instructions

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

- Increase the reliability and service life of the RUD round steel chain 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 the RUD round steel chain**

The RUD round steel chain has 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 or other tangible assets.
Spare parts must fulfill 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 Use for the Intended Purpose

- The RUD round steel chain serves as a traction mechanism for conveying bulk materials and unit loads.
- In stationary operation, the permitted power transfer through the RUD round steel chain 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 round steel chains 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. This also applies to DIN 22 252 and DIN 22 255 chains.

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

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

2.2 General

Warning!	**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.**

- 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 dismounted 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 round steel chains are made of high-grade constructional steels with a high degree of purity, fine grain and insusceptibility to aging, and Cr, CrNi or CrNiMo alloyed. Their surface hardness gradient has been optimally matched to their specific conditions of use.

Single strand conveyors
Chains are supplied grouped.

Multistranded conveyors
Chains are supplied grouped.
Each chain group contains a pair of chain strands marked with the same color.

3 and 4 stranded conveyors
Chains are supplied marked and grouped in the corresponding numbers.

Scope of supply: Chain groups of the corresponding number.

The main parts (figure 1) are:

- Chain **10**

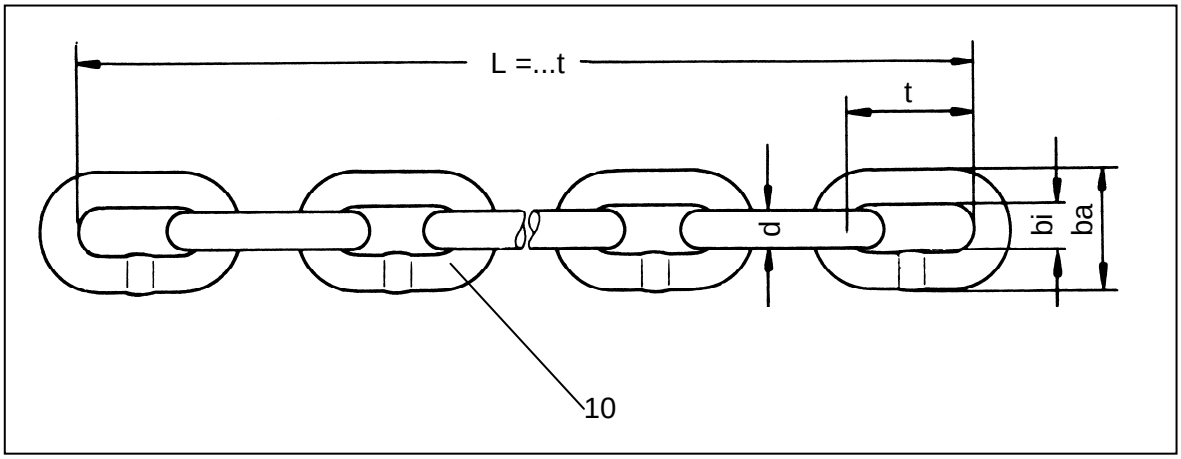

Fig. 1

3.1 Dimensions

Round steel link chains in special grades – highly wear-resistant					
Chain d x t in mm	Chain width bi (min.) mm	Chain width ba (max.) mm	Weight kg/m	Strand length [m / link] *1)	Attachmend distance [links]
8 x 31	10.3	28	1.3	50.0 / 1613	variable
				Fitting strand	
				24.893 / 803	
				Fitting strand	
10 x 38	12.5	34	2.1	50.0/1315	variable
				Fitting strand	
				20.026/527	
				Fitting strand	
14 x 50	16.3	47	4.0	Fitting strand	variable
				Fitting strand	
				Fitting strand	
14 x 64	16.3	47	3.7	10.176/159	
				Fitting strand	
16 x 64	20	55	5.1	19,9/311	variable
				Fitting strand	
18 x 64	21	60	6.9	15.296/239	variable
				Fitting strand	
19 x 75	22	63	7.7	10.725/143	variable
				Fitting strand	
19 x 120	23	65	6.3	3.0/25	2
				5.16/43	
				Fitting strand	
22 x 86 *5)	26	74 (73)	9.7 (9.5)	10.234/119	variable
				Fitting strand	
25 x 95	34	90	12.5	8.265/87	4
				Fitting strand	
26 x 92	30	85	13.7	14.444/157	variable
				Fitting strand	
26 x 100	31	87	13.3	7.9/79	4/8/10/16
				8.3/83	4/6/12/14
				Fitting strand	–
30 x 108	34	97	18.0	10.692/99	variable
				Fitting strand	
30 x 120	36	102	17.5	5.640/47	4/6/8/12/16
				5.88/49	10
				Fitting strand	–
34 x 126	38	109	22.7	8.694/69	variable
				Fitting strand	
34 x 136	39	113	23.8	4.760/35	4/6/12/18
				5.304/39	4/8/10
				Fitting strand	–
38 x 144	44	127	30.0	3.312/23	8/12
				4.176/29	4/6/10
				Fitting strand	-

3.2 Chain grades and part numbers

Round steel link chains in special grades – highly wear-resistant *3)

R2		R2B		R80		R100		R140		R160		Chain d x t in mm
Breaking force [kN]	RUD part number	Breaking force [kN]	RUD part number	Breaking force [kN]	RUD part number	Breaking force [kN]	RUD part number	Breaking force [kN]	RUD part number	Breaking force [kN]	RUD part number	
80	**51697** 7983021											8 x 31
						50	**7905630** 7905631					
125	**7987062** 7983022											10 x 38
						75	**7905633** 7905634					
250	8504309*2)											14 x 50
						140	**7905636** 7905638					
						128 *4)	**7900548** 7982305					14 x 64
		240	**7988920** 7989510			180	**7905640** 7905641					16 x 64
						225	**7905643** 7905644					18 x 64
		340	**7904795** 7904540			260	**7905646** 7905648	230	7905862 7905863			19 x 75
						260	**7905650** **7905651** 7905652					19 x 120
		450	**7101775** 7101774	260	**7905474** 7905475	350	**7905654** 7905655			310	**7905719** 7905720	22 x 86 *5)
610	8504310*2)											
						400	**7905657** 7905658					25 x 95
				370	**7905480** 7905477							26 x 92
850	8504311*2)											
				370	**7905491** **7905492** 7905493	425	**7905660** **7905661** 7905662			430	**7905722** **7905723** 7905724	26 x 100
				440	**7905497** 7905496							30 x 108
1130	8504312*2)											
				440	**7905498** **7905499** 7905500	640	**7905664** **7905666** 7905667			580	**7905727** **7905728** 7905729	30 x 120
				460	**7905502** 7905503	720	**7905670** 7905672					34 x 126
1450	8504313*2)											
				460	**7905521** **7905522** 7905506	720	**7905675** **7905676** 7905678	630	**7905865** **7905866** 7905868			34 x 136
						920	**7905680** **7905681** 7905683					38 x 144

*1) maximal variable length: no longer than the standard belt length (in bold print)
*2) length in compliance with ordering specifications
*3) allowed tolerance of breaking tension +/- 10%
*4) Rud grade R40c-G/s3
*5) bracketed values for chain grade R2

3.3 Chain Markings (Fig. 2)

Position of marking	Vertical	Vertical	Vertical	Vertical	Vertical
Side of chain	Front side	Front side	Back side	Back side	flank
Distance between each marking	approx. 800 mm	approx. 800 mm	every 4. Link	every 4. Link	every link
Marking	Manufacturing number	Batch number	Chain quality	Manufacturing date	Manufacturer's label
Marking example	Y 3 9	0 0 2	R 1 0 0	0 7 1 5	R U D

Explanation:

Manufacturing number:
The manufacturing number is composed of one letter and two numbers. As in the example above (Y39).

Batch number:
The batch number is composed of three numbers, as in the example above (002).

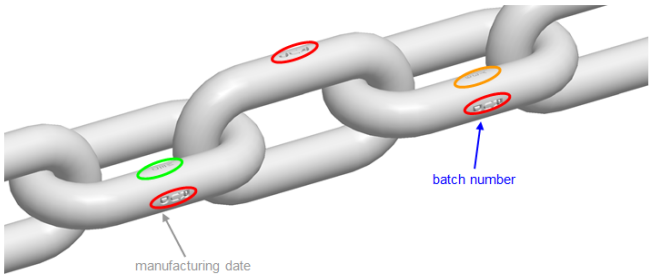

Fig 2

3.4 Strand Lengths, Manufacturing Tolerance

+0.4%
-0.15% =0.55% max.,

That is a maximum difference of 55 mm over a length of 10 m.

3.5 Length Tolerance DX of Paired Chain Strands (Fig. 5)

(Multistranded conveyors)
ΔX = 0.05% max., that is a maximum difference of 5.0 mm between 10m strands.
For strands of less than 8 m, the greatest pairing tolerance is 4mm.

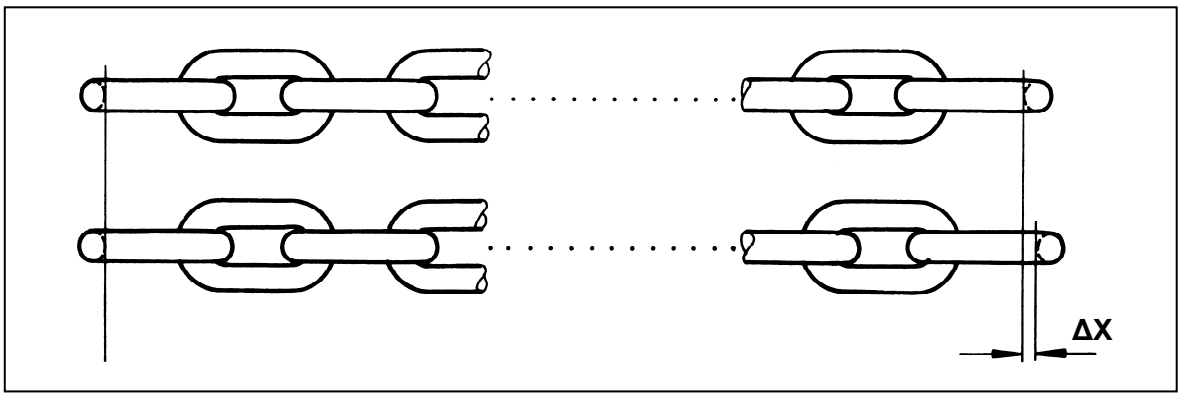

Fig. 5

4 Assembly

4.1 Join the ends of the individual chain strands with chain couplings.

Please follow the general operating instructions for the RUD chain couplings designed for the particular system (F20537 / WV1), (F20538 / WV1), (F20539 / WV1) or (F20540 / WV1).

Single strand conveyors
Single strands can be fitted in any order.

Multistranded conveyors

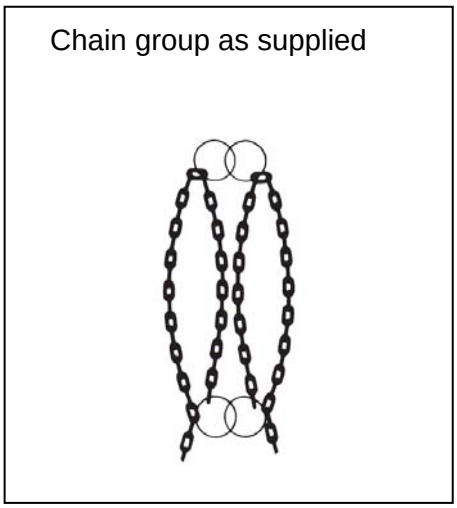

Fig. 6

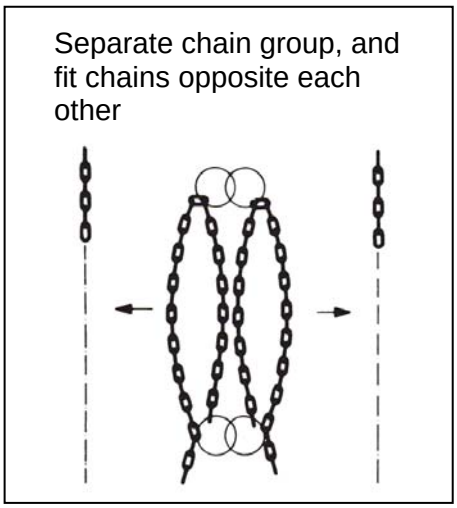

Fig. 7

1. Do not remove the wires tying the chains together until shortly before assembly. Otherwise the pairs of chains could get mixed up (figs 6 & 7).
2. Fit the strands of each pair alongside each other. This prevents chain alignment errors occurring.

Attention **Fit the marked or grouped chain strands parallel alongside each other. This is the only way to ensure that the chain loops are the same length.**

If the wire rings are removed prematurely or the chain strands get mixed up:

a. Call RUD and state the order number, they will then tell you the numbers of the chain strands which belong to each other. The number of each chain strand is stamped into the last color-coded link (does not apply to chain dimensions 8 x 31 and 10 x 38).

b. In exceptional cases, chain strands with the same color coding (or color combination) can be fitted alongside each other. In such a case, the length tolerance between the two parallel strands could be a maximum of 4mm.

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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 chains upstream of sprocket and wheel inlets 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 a sprocket or wheel, then a chain depressor or chain cross must be fitted before, after or over the whole range of the chain wrap.

4. Support the chain when too long a length of freely hanging chain requires an excessive chain take-up tension.

5. Comply exactly with the assembly dimensions and tolerances stated in the mounting drawings when:
   - Mounting sprocket wheels/pocket chain wheels and guide wheels
   - Manufacturing buckets and bucket suspensions
   - Attaching guide rails to the guide station

6. Define a usable tensioning range 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.

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5 Disassembly

5.1 Shortening a Chain (Fig. 8)

Chain links must be cut out carefully and without damaging the adjacent links. For example by tempering caused by thermal cutting.

Attention!

- **Cover adjacent chain links.**
  This prevents fire damage to chain links.
- **Do not heat adjacent chain links.**
- **Always cut the 2nd, 4th, 6th etc. link from the chain strand.**
- **Cut the same number of links out of both chain loops.**

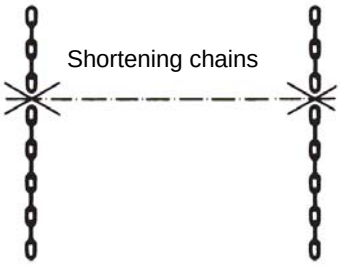

Fig. 8

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 wear in unusual places. 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.

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7 Wear and Replacement State of Wear

Under normal conditions, wheel teeth and round steel chains reach a replacement state of wear at the same time.

In the case of sprocket wheels (internally toothed wheels) this is reached when the measured pitch of the chain resulting from wear has increased by 1.5% – 2.5% (or more), and at the same time under normal chain take-up tension the chain links engage jerkily with the drive wheel under compulsion and disengage with difficulty or suddenly, that is they are taken past the normal disengagement point. In such cases, it may be possible to use teeth with higher link rests in order to ensure that the chain runs smoothly.

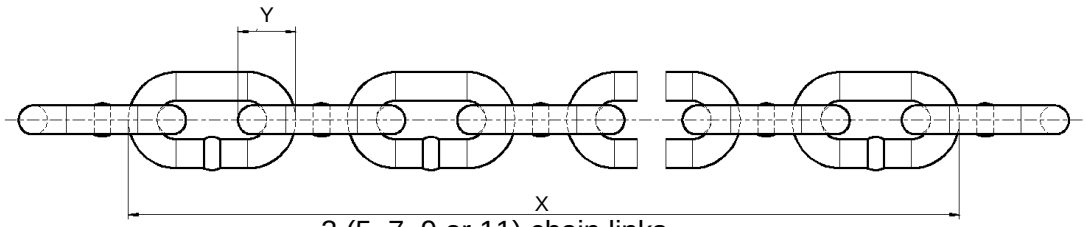
In the case of pocket wheels (externally toothed drive wheels) a pitch increase resulting from wear of up to 4% may acceptable under certain circumstances.

With long distances between axles and when conveying very abrasive or corroding material, at high conveyor speeds, and/or under the effects of heat and similar conditions, the chain may engage and disengage jerkily with the drive wheel although the measured pitch increase resulting from wear is still less than 1.5%.

Attention!

- **In such a case, change the wheel teeth on all the drive wheels at the same time.**
- **On principle, new round steel chains may only be used with new wheel teeth.**
- **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



3 (5, 7, 9 or 11) chain links

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, <u>with the chain straight and under tension</u>

2. Measurements of dimension y

3. Taken from the measurements of x: x_{min} = mm
   Calculate the average value of the measurements x:
   $$\frac{Sum\ x}{Number} =$$ $x_{average}$ = mm
   Taken from the measurements of x: x_{max} = mm

4. Calculate the average value of the measurements y:
   $$\frac{Sum\ y}{Number} =$$ $y_{average}$ = mm
5. Calculation of the inside nominal length of 3 (5, 7, 9 or 11) chain pitches.

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

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

$$Wear = \left[\frac{\left(x... - y_{average}\right)}{L_{Nom}} - 1 \right] \cdot 100\% = ...\%$$

Re. 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 multistranded conveyors, each loop must be measured and evaluated.

<u>Example:</u>

x_{min} = 417.8
Round steel chain 19 x 75
x_{max} = 419.2

$x_{average}$ = 418.3

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

$$L_{Nom} = 5 \cdot t_{Nom} = 5 \cdot 75 = 375\,mm$$

$$Wear = \left[\frac{\left(x... - y_{average}\right)}{L_{Nom}} - 1 \right] \cdot 100\% =$$

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

Chain size:.....

Measurements across .....links

Company:.....

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				Pitch increase through wear in %	17				Pitch increase through wear in %
18					18				
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 section 7.1 for chain measurement and evaluation instructions