Operating Instructions for Bucket Elevator Chains

EN

Contents

Validity

These operating instructions apply to Rexnord bucket elevator chains that are in accordance with standard plant specifications.
Chains that are a component of lifting equipment or load handling devices are covered by EC Machinery Directive 2006/42/EC.
These operating instructions apply to the following Rexnord chains:

ER102B, ER110, ER111, ER833, ER856, SJM/ER857, SJM/ER859, SJM/ER864, SJM/ER956, SJM/ER958, SJM/ER984, ER1084, R4251/R4011, R4004, R4035, R4037, R4010, R4065

General Safety Instructions

All mounting and maintenance work must be performed on systems or drives that are completely disconnected from power sources, and may only be performed by persons with the requisite technical skills. Only proper professional tools, devices and auxiliary equipment may be used.
The required protective clothing must be worn at all times. General regulations regarding safety and accident prevention must also be heeded, along with the directions in this manual.
After work is completed, all covers and protective devices must be fully attached and functional.

Proper Use

Rexnord bucket elevator chains may only be used as a means of lifting loads. They are suitable for use in bucket conveyors and similar elevators. Bucket elevator chains are constructed as bush chains and, because of their type of construction, work by means of a friction wheel or chain wheel. Bucket elevator chains may only be subjected to tensile stress. Lateral forces, caused by misalignment for example, must be avoided.

Storage

New Rexnord chains should be stored in their packaging. If the storage period is longer than 12 months, then the chain must also be coated with protective oil. In order to protect the chain from soiling, it is advisable to cover it in an air-permeable manner, using oil-impregnated paper. The chain is initially lubricated ex works. If lubricants end up on the floor, contaminated surfaces must be immediately cleaned.

Warning Instructions with Regard to Misuse

(Removal of the chains from the packaging, handling and transport)
When removing chains from the packaging and when handling them, take care that no forces arise that are transverse to the chain's direction of movement/load axis. The chain can be damaged by such forces.
Wear gloves when handling the chain.
Use suitable lifting equipment to lift, handle and secure the chain.

Handling the Chains in their Delivered Condition (Delivery Length)

For easier handling, the chains are delivered, coiled, in 10-foot (3.048 m) lengths.
The rolled up pieces of chain are secured with a wire for transport. The chain segments are usually packed on a pallet and shrink-wrapped in foil. The chains are not supposed to be unpacked until shortly before they are mounted.
Pallets must always be transported with a pallet truck or forklift.

The rolled-up lengths of chain are stored edgewise on the pallet. When the chains are lifted up and then set down, the entire reel must be lifted in order to prevent damage to the chain. See Figure 1.

STOP	Never position the crane hook at the end or in the middle of the chain in order to lift it. Twisting the chain can result in angular momentum.

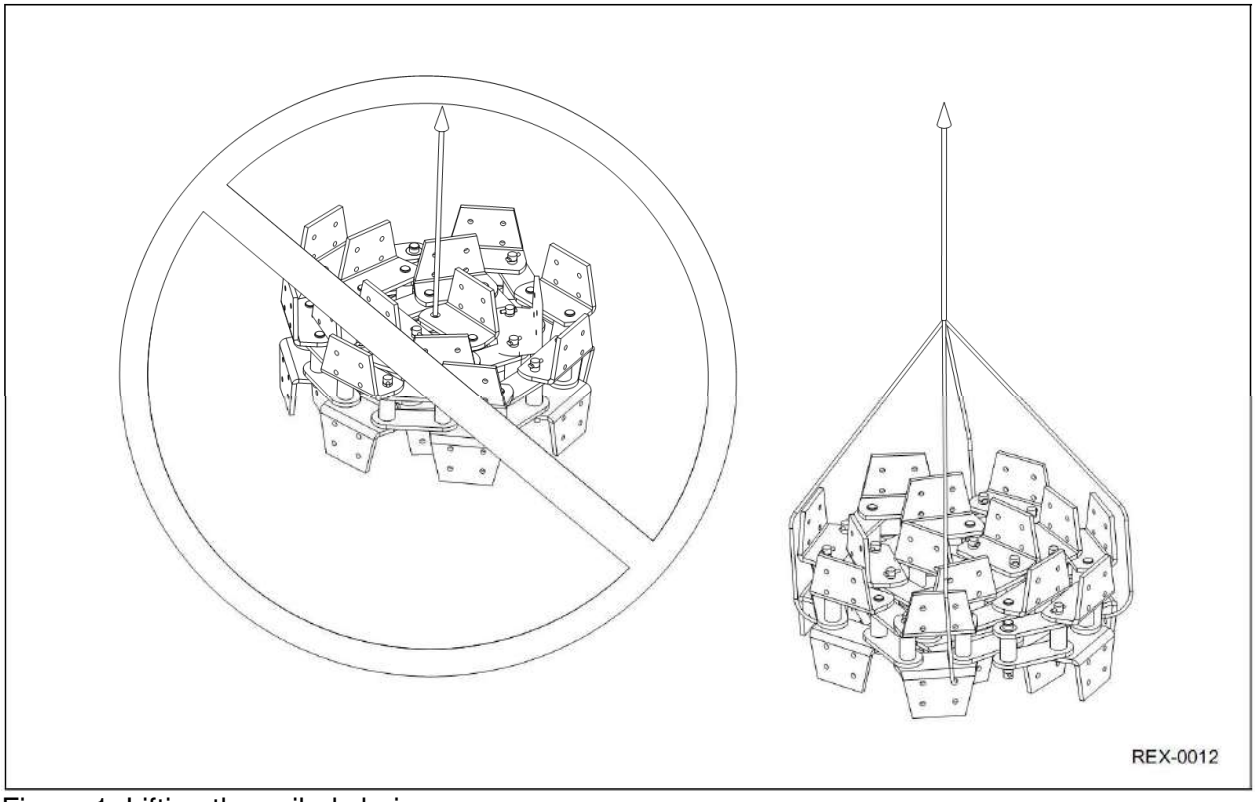


Figure 1 Lifting the coiled chain

The reeled chains must be unrolled before they are installed in the bucket elevator. The chains must be unrolled in such a way that the chain links are lying parallel to the ground and can then be unrolled in a straight line. In this way, the chain is now in a position to be installed in the bucket elevator or to be added to the next chain segment to lengthen it.

Fastening and Lifting the Chain

Before you install the chains, determine the total weight of the entire chain so that you use the appropriate lifting device.
Use only suitable, tested lifting equipment for lifting the chains.
Information about the total weight of the chain can be found in the manufacturer's assembly drawing, among other places. For mounting purposes, always lift the chain at the first bushing. See Figure 2

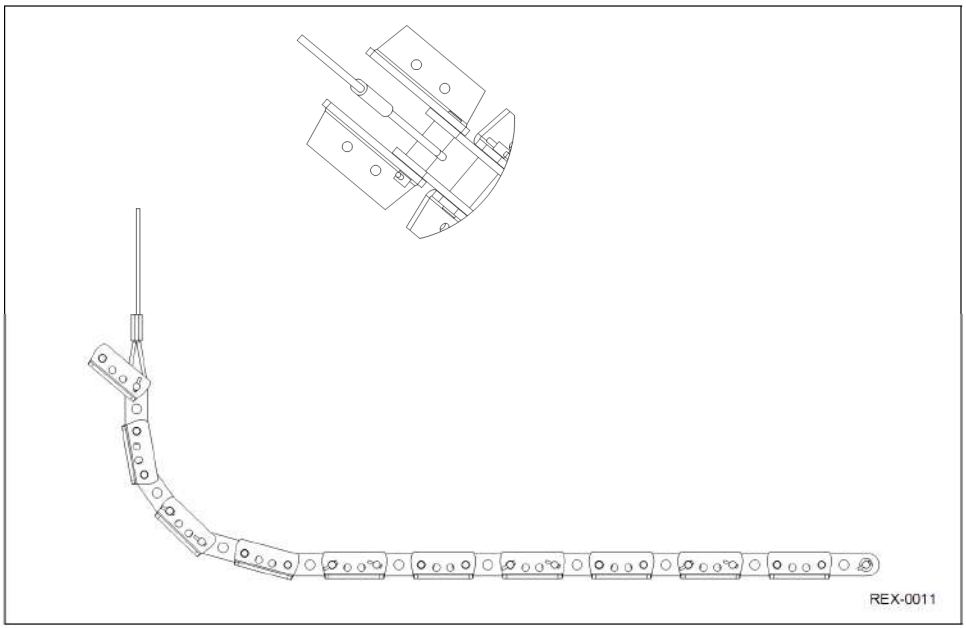


Figure 2 Fastening and lifting the chain

STOP	Fastening the chains through the link plate hole or onto the chain pins can result in damage and is therefore not allowed.
STOP	Always lift chains with the chain link parallel to the supporting surface. See Figure 2
STOP	Never lift a chain that is lying on its side, since the chain can be damaged by lateral torsion. See Figure 3

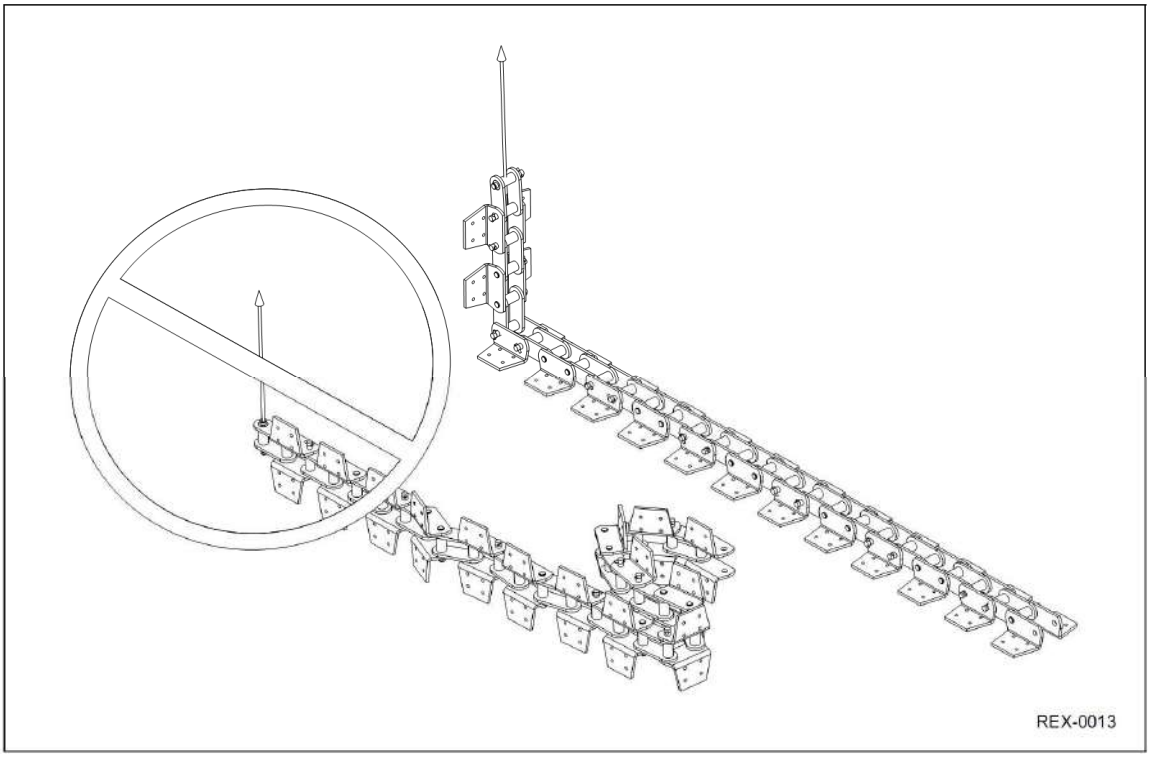


Figure 3 Lifting the chain

STOP	The pins may not be warmed or ground and the plate boreholes may not be enlarged by drilling or sanding. These measures directly affect the strength of the chain. In the event of non-compliance, the warranty will expire.

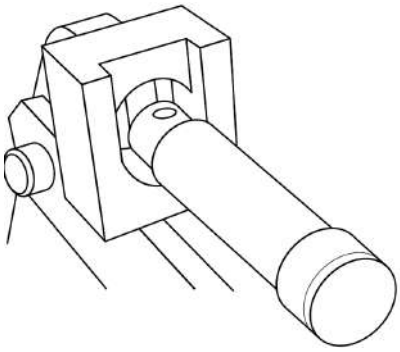
Lengthening the chain/pushing in the chain pin

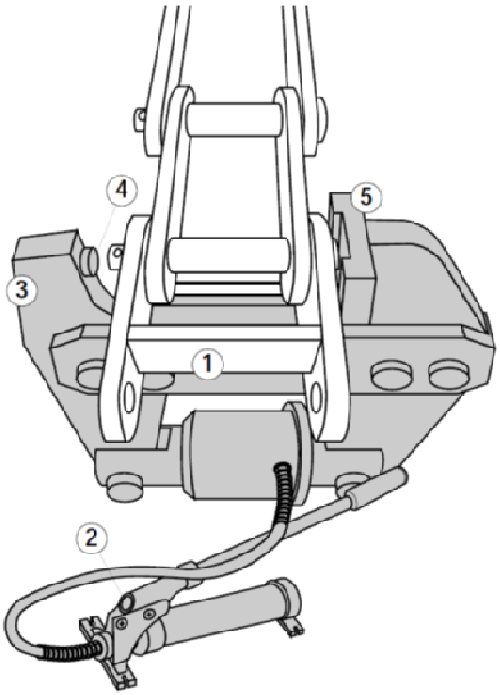
The chain can be lengthened and locked by inserting a chain pin. There is a press fit between the outer link and the chain pin.
Damaged or severely worn chain components may not be reused.
Correct mounting of the chain is the key to safe, smooth running during operation.
Pins and boreholes are manufactured with a narrow range of tolerance. They can be directly or repeatedly removed and flattened. The manner of inserting and removing, as well as the orientation, are predetermined by this design. That is to say, the pin matches the flattened side, and does not fit through the cotter pin side of the chain.
For correct assembly, the link plate on the pinhead side is labeled “head”.

!	Improper lengthening or shortening of the chain will invalidate the warranty. The warranty will also be invalidated for all components that malfunction because of improper installation of the chain in the bucket elevator.

A suitable device that conforms to the regulations of EC Machinery Directive 2006/42/EC must be used for inserting or removing the pin.
We recommend using the Rexnord Linkmaster or something comparable.

Inserting the Chain Pins





1 Spacer plate
2 Manually operated pump
3 Lever arm
4 Pressure piece
5 Support plate

Figure 4 Use of Linkmaster during insertion

1. Stick the pin of the chain link that is to be connected as far as possible into the outer link. When doing this, be mindful of the correct position of the cotter pin hole (Fig. 4). A light film of oil on the pin and in the plate borehole makes the installation easier.
2. Center the pin in the plate borehole with a slight tap of a hammer. This prevents the hole from being damaged by a pin that is not in straight. Please be sure that a spacer plate is inserted in the width between the outer link plates. This prevents the outer link from being compressed too far.
3. Now use a suitable lifting device to position the Linkmaster over the chain link that is to be joined and take care that the end of the pin is correctly positioned in the recess of the support plate.
4. Activate the arm of the hand lever pump until the head of the pin is in contact with the outer link plate.
5. During this process, ensure that the Linkmaster does not slip off the head of the pin.
6. Now open the pressure release screw on the hand pump to release the pressure.
7. Remove the Linkmaster and the spacer plate.
8. Now put the cotter pin into the hole at the end of the chain pin. Then bend the cotter so that it cannot come out of the drilled hole.
9. Check the link for mobility. If necessary, hit the end of the chain pin back until mobility of the link is ensured. Fig. 5

STOP	Chain pins that were damaged during insertion or removal must be replaced with new pins. Damaged pins are not reliable; using them invalidates the warranty.

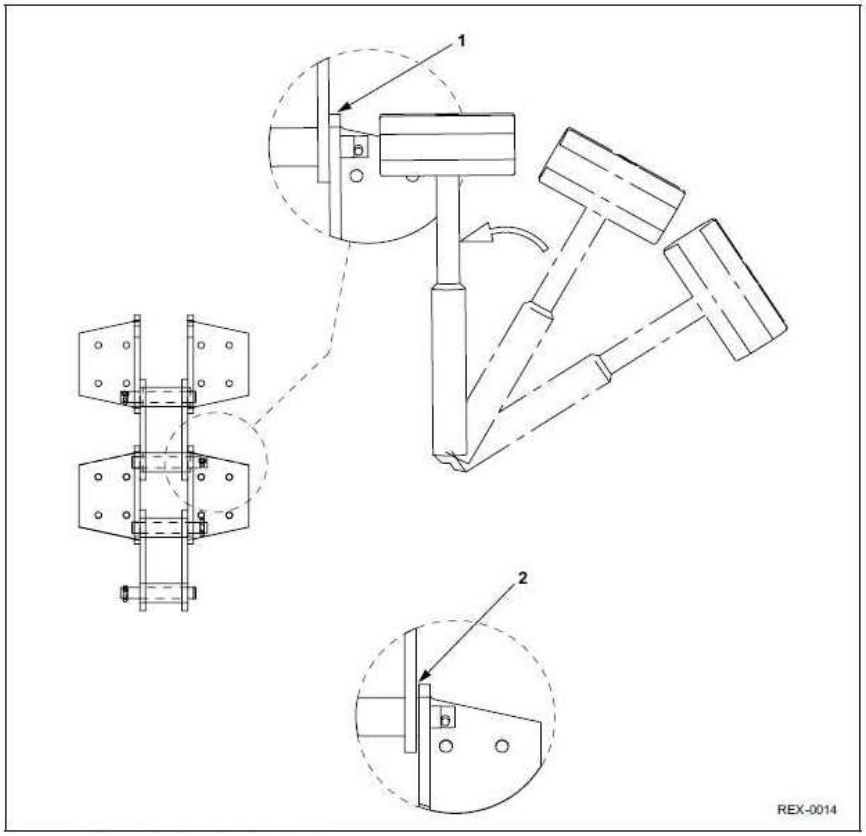


Figure 5

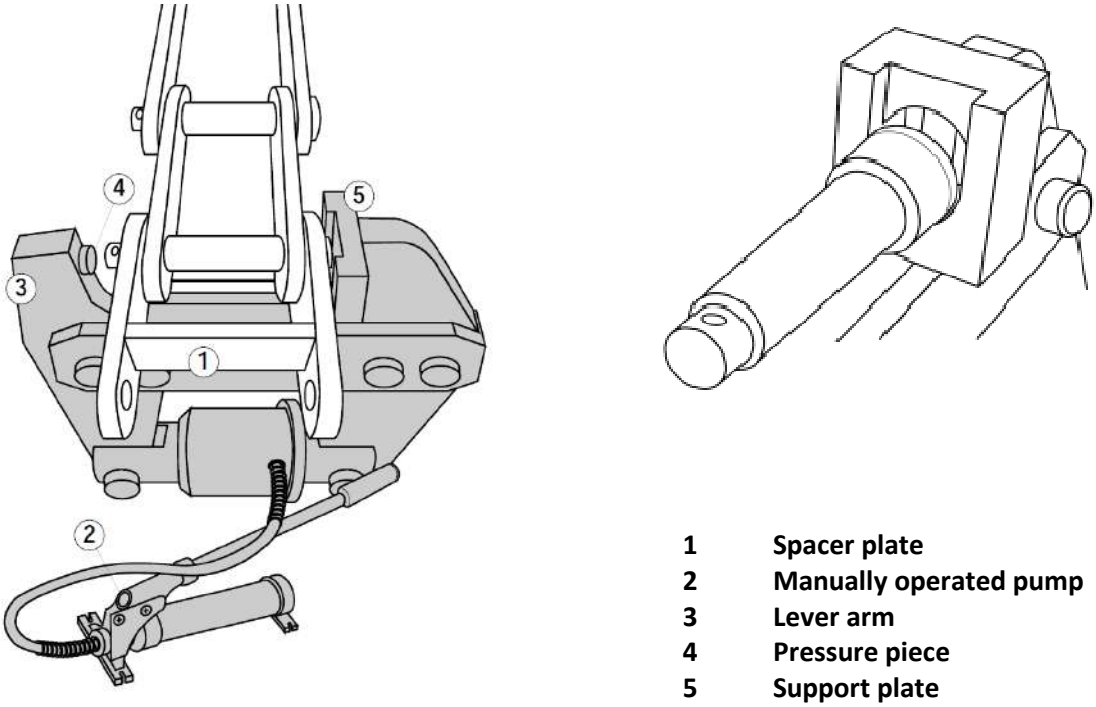
1 Too little lateral play
2 Sufficient lateral play

Shortening the Chain / Removing the Chain Pin

The chain can be shortened by removing the chain pin. There is a press fit between the outer link and the chain pin. This press fit needs to be overcome when the pin is extracted. To this end, it may be necessary to remove the rivet head beforehand.
If the rivet head is removed by grinding, care must be taken that the link plates are not damaged in the process. The outer link plates of the detached link may not be reused.

Damaged chain components may also not be repaired or reworked.
During grinding there is a risk of fire and injury as the result of flying sparks. Appropriate occupational safety measures of the generally applicable safety and accident prevention regulations must be taken.

Removal of the Chain Pin



1	**Spacer plate**
2	**Manually operated pump**
3	**Lever arm**
4	**Pressure piece**
5	**Support plate**

Figure 6 Use of the Linkmaster during removal

1. If necessary, remove the cotter pin so that the chain is not damaged during the removal.
2. Use a suitable lifting device to position the Linkmaster over the chain link.
3. Activate the pump lever until the head end of the pin is pushed completely out of the link plate. During this process, make sure that the head of the pin is correctly positioned in the recess of the spacer plate; otherwise the manually operated pump could be damaged. Loosen the pressure release screw.
4. To remove the Linkmaster, push the lever arm toward the outside.

Commissioning / Use / Operation of the Chains

The safety factors specified in EC Machinery Directive 2006/42/EC must be heeded in regard to selection and use of the chain.
Only chains with an identical type of construction may be used.

Inspection / Cleaning / Relubrication

The equipment manufacturer's maintenance intervals and maintenance instructions must be heeded.

At intervals stipulated by the equipment manufacturer, the chain must be checked for stiff joints and damage. The link plates, bushings and pins must also be checked for external damage.

The bucket elevator chain should be visually inspected once a month.

1. Check the cotter pins in the chain pins. Missing cotter pins must be replaced.
2. Check the inner link plates for traces of tarnish from the chain wheel or chain return wheel. Prominent traces of tarnish on the inner link plates are an indication of misalignment.
3. Check the outside diameter of the bushings for irregular wear, marked traces of wear and plastic deformation on the contact points of the pin. Compressed material and heavy wear on the bushings can be the cause of a worn chain wheel or return chain wheel. This pattern of wear also frequently shows up when new chains are installed in combination with worn chain wheels. This kind of wear also arises when only a small area of the friction wheel has had contact with the chain bushing.
4. Visually inspect the lateral play between the inner and outer link. Excessive lateral play can be an indication of a broken pin. Pins must be inspected in these places. Broken pins must be replaced. If there are more than two broken pins in the chain, these must be replaced as soon as possible.
5. The equipment may only be returned to service after all identified defects have been repaired.
6. Inspect all individual parts for fatigue fractures:
   a. Pins: Broken pins can be identified with the hammer test.
      There is a distinct difference between the sound arising from a broken pin and the sound arising from an intact pin.
   b. Link plates: Visually inspect all drilled holes for cracks and fractures. Broken link plates must be immediately replaced. If more than three link plates are broken, the chain must be replaced as soon as possible. Check the link plates for enlarged drill holes.

Figure 7 Damaged link plates

   c. Hinged fittings: Visually inspect for cracking in the bend radius. Broken link plates must be replaced.

Measurement of wear:
Linear measurements of wear must be conducted at intervals set by the equipment manufacturer.

A chain becomes longer as a consequence of wear between pins and bushings. Lengthening occurs as the result of link-joint motion during engagement with, and disengagement from, the chain wheel. Rexnord pins and bushings are case-hardened for this reason, in order to extend the wear life of the chains. If the case-hardened layer is worn, then progressive wear ensues, which can result in a chain failure in the near term. Because of the great hardness of the surface of individual components, the wear on the chain is consistent, and therefore the service life is predictable. The expected service life can be determined by appropriate measurements of the wear. Permissible wear limits can be found in the table below (Figure 8). The exact service life and thus the time the chains will be due for replacement can be determined by regular measuring and documentation of the results. In this way it is possible to schedule replacement of a chain before the chain fails as the result of wear. Measurement of wear should be performed at least once a year. Shorter time intervals allow more precise documentation and therefore optimal utilization of the expected wear life.

ELONGATION TABLE - MILLIMETERS

Chain	Pitch	Links to Measure	Measurement when New	Measurement when Near Replacement	Recommended Max.% Elongation - Check Pin & Bushings	Pin Diameter New	Pin Diameter Worn	Bushing ID New	Bushing ID Worn
ER102B	101,6	30	3048,0	3124,2	2,50%	15,88	13,84	16,33	17,35
ER110	152,4	20	3048,0	3109,0	2,00%	15,88	13,84	16,33	17,35
ER111	120,9	26	3144,4	3207,3	2,00%	19,05	16,69	19,56	20,47
ER833	152,4	20	3048,0	3124,2	2,50%	19,05	16,69	19,56	20,47
ER856	152,4	20	3048,0	3124,2	2,50%	25,40	21,91	26,04	28,22
SJM / ER857	152,4	20	3048,0	3124,2	2,50%	25,40	21,91	26,04	28,22
SJM / ER859	152,4	20	3048,0	3124,2	2,50%	31,75	27,81	32,26	35,56
SJM / ER864	177,8	18	3200,4	3270,8	2,20%	31,75	27,81	32,26	35,56
SJM / ER956	152,4	20	3048,0	3124,2	2,50%	25,40	21,91	26,04	28,22
SJM / ER958	152,4	20	3048,0	3124,2	2,50%	28,27	25,02	29,16	31,39
SJM / ER984	177,8	18	3200,4	3270,8	2,20%	34,92	30,86	35,48	38,74
ER1084	177,8	12	2133,6	2180,5	2,20%	41,28	35,94	41,91	45,09
R4251 / R4011	304,8	10	3048,0	3063,2	0,50%	22,23	21,11	22,86	23,62
R4004	228,6	14	3200,4	3248,4	1,50%	25,40	21,97	26,84	27,15
R4035	228,6	14	3200,4	3248,4	1,50%	28,57	24,89	29,21	30,33
R4037	228,6	14	3200,4	3248,4	1,50%	38,10	33,40	38,86	40,44
R4010	304,8	10	3048,0	3078,5	1,00%	38,10	33,40	38,86	40,44
R4065	228,6	14	3200,4	3248,4	1,50%	31,75	27,81	32,39	33,96

Figure 8 Permissible wear limits as indicated by chain length

The wear of the outside diameter of the bushings must also be monitored in the same time intervals. Wear occurs here as well, because of the friction between the bushing and the chain return wheel. The maximum allowable wear can be found in the table in Figure 8.

Cleaning:
Only paraffin derivatives such as diesel fuel, petroleum or white gas (naphtha) can be used for cleaning the chain.
Cleaning the chain with steam jets, cold cleaners or corrosive or acidic agents is not allowed.
Relubrication after commissioning is not allowed.

Disposal

Dispose of packaging material in an environmentally sound manner or reuse it.
Unusable chains and components are to be recycled.

Manufacturer's Declaration

REXNORD

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EC Declaration of Conformity for Machinery

EN

(EC Directive 2006/42/EC)

Chains that are used as a component of lifting equipment or load handling devices for lifting purposes fall within the scope of EC Machinery Directive 2006/42/EC. The Machinery Directive's requirements for "machines" must be used for such chains.

Rexnord Kette GmbH, Industriestr. 1 in D-57518 Betzdorf, Germany, hereby declares that **Rexnord bucket elevator chains** are in compliant according to the EC Directive.

Chain type	Minimum Ultimate Strength [kN]
ER102B	160
ER110	160
ER111	213,5
ER833	213,5
ER856	365
SJM/ER857	430
SJM/ER859	150
SJM/ER864	690
SJM/ER956	430
SJM/ER958	430
SJM/ER984	690
ER1084	1437
R4251/R4011	454
R4004	378
R4035	480
R4037	1002
R4010	805
R4065	756

The following harmonized standards are applied:

EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 618	Continuous handling equipment and systems - Safety and EMC requirements for equipment for mechanical handling of bulk materials except fixed belt conveyors

Betzdorf, 01.04.2019

Responsible for documentation
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