Rexnord

... MOVING AHEAD

Chain Drive Design

A guideline
to calculating and designing
chain drives
with a view to
application-related criteria

Think like partners – act like partners.

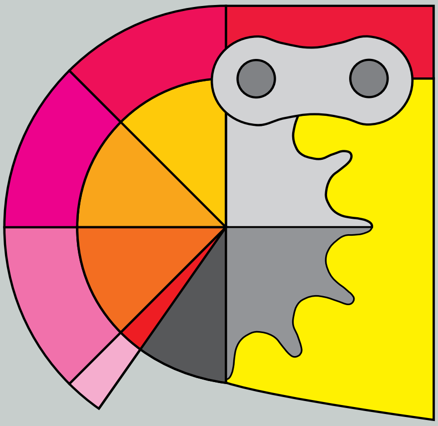
Speed

The speed with which modern technologies change our world is breathtaking.

For us two aims are certain:

We are determined, with our products for our customers, to occupy a leading position as regards technology.

We want, together with our customers, to achieve quality and sales growth.



Consulting

Our application engineers concentrate on the customer’s interests.

We concentrate on the individual wishes and needs of the customer when calculating and identifying the correct chain drive.

Together with our customers, we find solutions, which optimize the factors of safety, service life and price.

Partnership

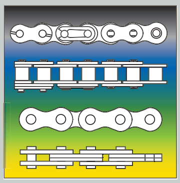
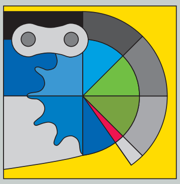
We know what the customer needs in his market for his product in the future.

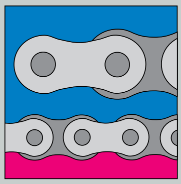
We listen to you and observe driving and conveying world-wide. We carry out analyses on the customer's premises and apply practicable solutions. So that you remain competitive.

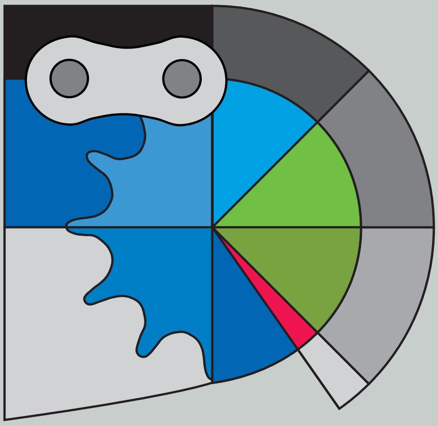
Service

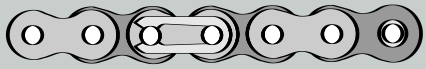
We are only satisfied when you are.

We have created the conditions for this by means of intensive consulting, partnership and our own sales activities. Thus there is a combination of our market know-how, technical competence, customer service and the satisfaction of our customers.

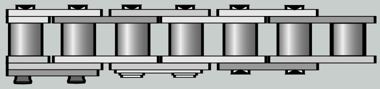





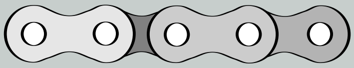




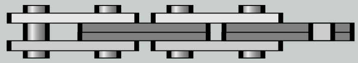
Roller chains



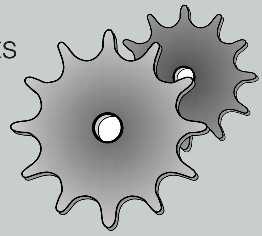
Product range



Leaf chains



Sprockets



Competence

As the manufacturer of one of the most extensive chain ranges for drives and conveying we are an established partner of leading companies. Our 5,000 chain variants provide an impressively large number of solutions and flexibility.

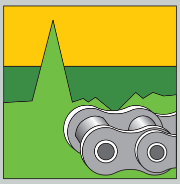
Innovation

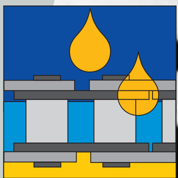
The secret lies in the production methods and the material.

Several thousand tools developed by ourselves rotate in the flow of production.
650 special tools were constructed by us for the manufacture of special chains.
30 special steels, alloyed, stainless, patented, are processed.
Moreover, we offer many different lubrications.
Through our customers we have become a specialist in surface refinement and the heat treatment of steel.

Quality

For Rexnord means that the customer comes back and not the chain.





Foreword

This technical paper on chain drives is intended for illustrating the background and factors that affect the design of a chain drive in a comprehensive manner and for explaining the criteria that often go unnoticed.

The systematic approach - or as we would put it – a guide-line for your deliberations in calculating chain drives takes up the forefield of this paper.

Moreover, we are attempting to encourage you to seek a dialogue whenever you hit upon a sensitive point in chain design, or when a special application gives rise to extra-ordinary demands on the chain drive.

Contents by: Abteilung Entwicklung und Technische Beratung, Rexnord-Kette, Betzdorf.

Layout by: Rexnord-Kette, Betzdorf – Publicity Department.

1. The step-by-step approach to a chain drive design

1.1 Determining the number of teeth for the driver sprocket

Choose the suitable number of teeth in accordance with the recommendations regarding sprocket selection criteria (cf. page 8).

Determination of chain speed on grounds of the sprocket revolution is based on the formula:

chain speed: $v = \frac{do \cdot n}{19{,}100} \left(\frac{m}{s}\right)$

wherein:

do = sprocket reference diameter in mm
n = sprocket revolution (r.p.m.)
v = chain velocity (m/s)
19,100 = constant

The sprocket revolution can also be derived from chain speed and the reference diameter by simply rearranging the above formula:

Sprocket revolution: $n = \frac{v \cdot 19{,}100}{do}$ (r.p.m.)

Finally, the required sprocket reference diameter can be derived from the shaft revolution and chain velocity:

$do = \frac{v \cdot 19{,}100}{n}$ (mm)

1.2 Determining the driven sprocket's number of teeth

The table on page 9 allows for determining the driven sprocket's number of teeth on the basis of the desired gear ratio.
The following relations apply here:

Gear ratio: $i = \frac{Z_2}{Z_1}$ or $\frac{n_1}{n_2}$

Drive revolution: $n_1 = n_2 \cdot i$

Output revolution: $n_2 = \frac{n_1}{i}$

wherein:

Z_1 = driver sprocket's number of teeth
Z_2 = driven sprocket's number of teeth
n_1 = driver sprocket revolution
n_2 = revolution of driven sprocket.

1.3 Allowance for correction value y

Determine the impact load by applying the table on page 12; then apply correction value y shown in the table on page 11 and multiply the output to be transmitted with this correction value. The corrected output value so determined is decisive for the selection of the chain.

1.4 Chain selection

Determine the suitable chain pitch by the chain pitch diagram to be chosen according pages 21 – 23 and the tables on pages 24 to 36 showing the transmittable output's.

The economic and technically superior approach consists in choosing a single chain of the smallest feasible pitch on the basis of the corrected output values to be transmitted and the revolution of the small sprocket selected.

1.5 Selecting multiple chains

If, for reasons of space availability, the sprocket diameters of a chosen single chain cannot be accommodated, or if, considering the safe revolution range, the output to be transmitted not be warranted, then multiple chains, or several single chains (adjusted in pairs and/or groups) should be chosen. In this case, the multiple-strand factor must be applied, if multiple-strand chains are to be used.

Application of several single chains allows for a linear increase of the transmission of output.

1.6 Lubrication

Lubrication must be made in accordance with the details given in the output tables.

2. The methodical approach to designing a roller chain drive

2.1 Required drive datas

1. Drive output (kW) to be transmitted
2. Driving sprocket revolution (r.p.m.)
3. Desired gear ratio, or driven sprocket revolution.
4. Type of impact load (correction value y).

2.2 General considerations

With chain drives, the sprockets'number of teeth influences the wear and running conditions to a considerable extent. If the number of teeth is too small, it is not only the interference by the polygon effect that counts, but, far more also, the greater number of link-joint motions will produce an increased wear.

2.3 The polygon effect

As is shown on the diagram, a sprocket is subjected to an acceleration and a decelation effect when the chain enters and runs off the sprocket. Moreover, in this instance, the chain performs a ride-up and ride-down motion. And, with a smaller number of teeth, uneven running increases on a progressive scale.

Furthermore, sprockets with a small number of teeth will generate additional dynamic forces in the chain seeing the tractive forces to be transmitted will permanently be accelerated and decelerated at intervals with the result of an increased bearing on the chain's fatigue strength.

The uneven load transmission in conjunction with the repeated ride-up and ride-down motions give rise to a jerky chain running.

As is shown on the diagram, the chain will suffer a 4 percent change of speed when applied on an 11-tooth sprocket. If, however, a 21-tooth sprocket is used, this imbalance will not exceed 1 percent and, with 30 teeth it will be a mere 0.5 percent.

This therefore shows the running performance of a 30-tooth sprocket to be 8 times better than that of an 11-tooth sprocket. And, the improvement obtained with a 21-tooth sprocket still is approximately four times that

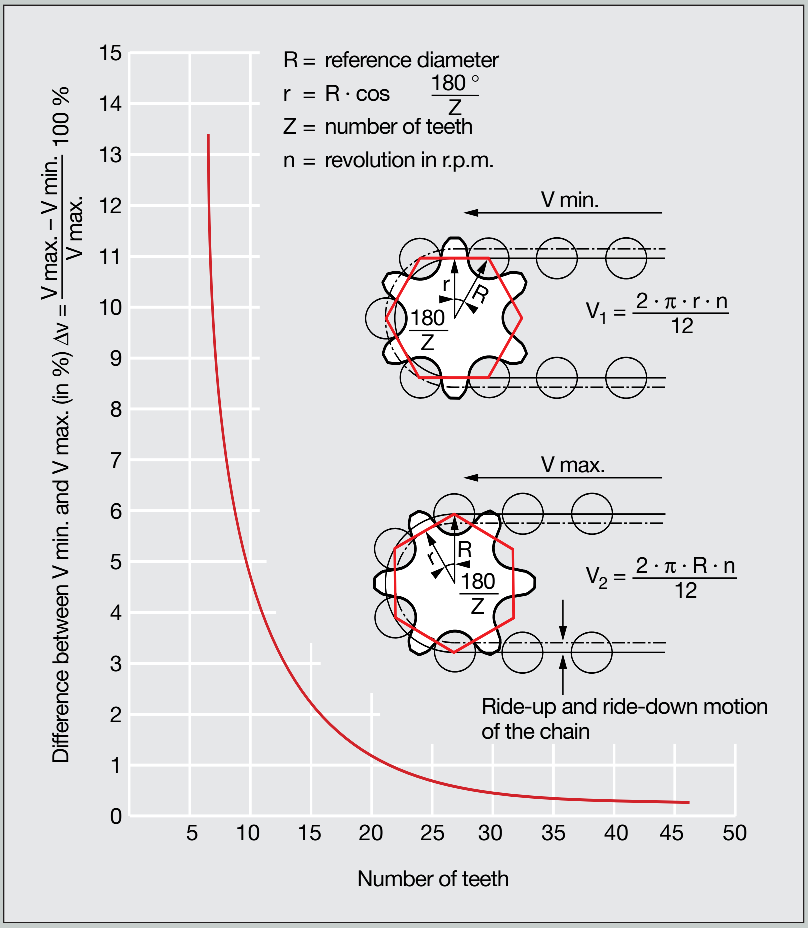


***Fig. 1:* The polygon effect.**

of a chain with 11 teeth sprocket.

The following recommendations should hence, be borne in mind:

1. Even with low speeds (up to 3 m/s) and low loading, no sprockets with less than 13 teeth should be used.
2. In the case of moderate speeds (up to 6 m/s), the chosen sprockets should have at least 17 teeth.
3. If a good running performance at mean speeds (up to 15 m/s) is specified, and the loading to be expected is moderate, then sprockets with 21 to 25 teeth should be chosen.
4. With exacting demands on the chain running and with a transmission of high tractive forces at speeds of 10 m/s and higher, we recommend a sprocket with 30 to 40-teeth.

2.4 The size of joint motion

The link-joint motion of a chain occurring at the run-in and run-off point of a sprocket is equated as follows:

$$\text{Link-joint motion } 2\,\alpha = \frac{360}{\text{number of teeth}}$$

Hence, on entering an 18-tooth sprocket, a link-joint performs a 20 deg. link-joint motion, whereas, with a 36-tooth sprocket, this motion amounts to a mere 10 deg. This signifies that a 36-tooth sprocket will enhance a chain's resistance to wear by approx. 100 percent compared with an 18-tooth sprocket.

2.5 Criteria governing the choice of the number of teeth

2.5.1 9 to 10 teeth

These numbers of teeth should, on principle, be avoided. The imbalance they produce is excessive. They are suitable merely for adjusting drives with low chain speeds (< 1 m/s). No call for an even and smooth running can be made.

2.5.2 11 to 12 teeth

Suitable only for max. 2m/s chain speeds. The specific chain load should be small. No call for a smooth and even chain running can be made.

2.5.3 13 to 14 teeth

Suitable for chain speeds of less than 3 m/s, provided the chain load is low and no call for a smooth and quiet running is made.

2.5.4 15 to 17 teeth

Suitable for max. 6 m/s chain speed drives, provided no special requirements exist for a quiet and vibration-free running.

2.5.5 18 to 21 teeth

Up to max. 10 m/s, this number of teeth will produce a satisfactory running performance and, under appropriate conditions, smooth running can be achieved.

2.5.6 22 to 25 teeth

A fair number of teeth for drive sprockets. Smooth and even running may be expected. Suitability extends to a chain speed of up to 15 m/s.

2.5.7 26 to 40 teeth

The most appropriate number of teeth for highly stressed high-revolution drive sprockets. The polygon effect is negligible, in this case. Vibration and noise features meet the highest demands. Field of application up to approx. 30 m/s.

2.5.8 45 to 120 teeth

The most appropriate numbers of teeth for driven wheels. They meet all demands for a good running performance. However, due to the reduced take-up capacity of the gearing, the admissible wear elongation is reduced to the following values:

Z = 70 – 2.8%
Z = 80 – 2.3%
Z = 90 – 2.0%
Z = 100 – 1.7%
Z = 120 – 1.2%.

2.5.9 125 to 200 teeth

These numbers of teeth should be avoided. As to their running performance, they offer no improvement compared to the range of 45 to 120 teeth, however, with 200 teeth, for instance, admissible chain wear is reduced to 1 %. This stands for a considerable reduction of allowed wear elongation compared with the generally admissible wear index.

2.6 Determining the gear ratio and the number of teeth of the big sprocket

2.6.1 Table of sprocket ratios

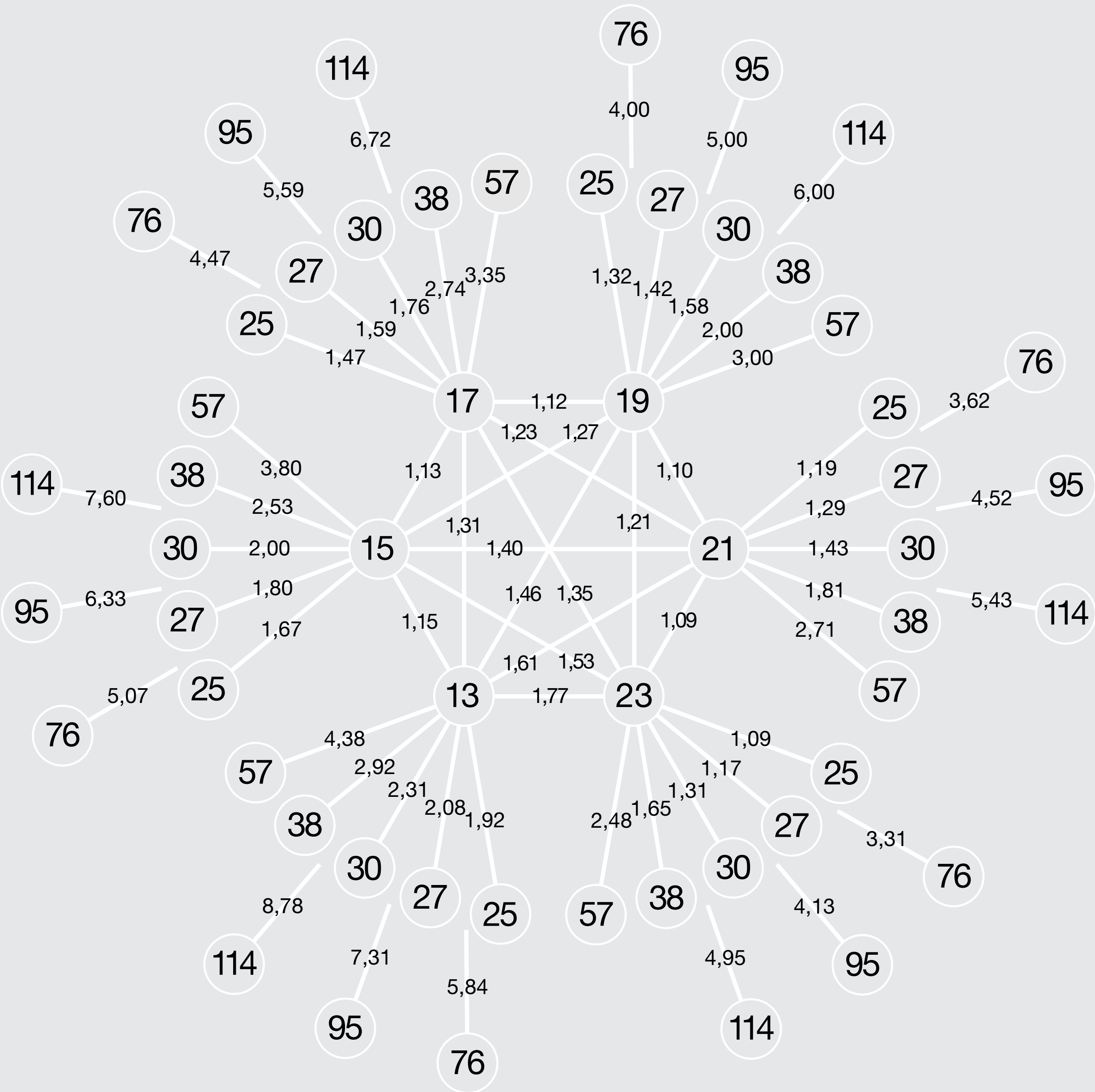
The big sprocket's number of teeth can be determined by means or the table hereunder. And, the gear ratios matching the cosen number of teeth can be determined directly.

Please also note the "ratio star" (2.6.2) on the page to follow.

Driven sprocket no. of teeth	Driving sprocket number of teeth												
	13	14	15	16	17	18	19	20	21	22	23	24	25
13	1.00												
14	1.08	1.00											
15	1.15	1.07	1.00										
16	1.23	1.14	1.07	1.00									
17	1.31	1.21	1.13	1.06	1.00								
18	1.38	1.29	1.20	1.13	1.06	1.00							
19	1.46	1.36	1.27	1.19	1.12	1.06	1.00						
20	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00					
21	1.61	1.50	1.40	1.31	1.23	1.17	1.10	1.05	1.00				
22	1.69	1.57	1.47	1.38	1.29	1.22	1.16	1.10	1.05	1.00			
23	1.77	1.64	1.53	1.44	1.35	1.28	1.21	1.15	1.09	1.04	1.00		
24	1.85	1.71	1.60	1.50	1.41	1.33	1.26	1.20	1.14	1.09	1.04	1.00	
25	1.92	1.79	1.67	1.56	1.47	1.39	1.32	1.25	1.19	1.14	1.09	1.04	1.00
26	2.00	1.86	1.73	1.63	1.53	1.45	1.37	1.30	1.24	1.18	1.13	1.08	1.04
27	2.08	1.93	1.80	1.69	1.59	1.50	1.42	1.35	1.29	1.23	1.17	1.12	1.08
28	2.15	2.00	1.87	1.75	1.65	1.56	1.47	1.40	1.33	1.27	1.22	1.17	1.12
30	2.31	2.14	2.00	1.88	1.76	1.67	1.58	1.50	1.43	1.36	1.31	1.25	1.20
32	2.46	2.28	2.13	2.00	1.88	1.78	1.68	1.60	1.52	1.45	1.39	1.33	1.28
35	2.69	2.50	2.33	2.19	2.06	1.95	1.84	1.75	1.67	1.59	1.52	1.46	1.40
36	2.77	2.57	2.40	2.25	2.12	2.00	1.89	1.80	1.71	1.63	1.57	1.50	1.44
38	2.92	2.72	2.53	2.48	2.24	2.11	2.00	1.90	1.81	1.73	1.65	1.58	1.52
40	3.08	2.86	2.67	2.50	2.35	2.22	2.10	2.00	1.90	1.82	1.74	1.67	1.60
42	3.23	3.00	2.80	2.63	2.47	2.34	2.21	2.10	2.00	1.91	1.83	1.75	1.68
45	3.46	3.21	3.00	2.81	2.65	2.50	2.37	2.25	2.14	2.04	1.96	1.88	1.80
48	3.69	3.43	3.20	3.00	2.82	2.67	2.52	2.40	2.28	2.18	2.09	2.00	1.92
52	4.00	3.71	3.47	3.25	3.06	2.89	2.74	2.60	2.48	2.36	2.26	2.17	2.08
54	4.15	3.86	3.60	3.38	3.18	3.00	2.84	2.70	2.57	2.45	2.35	2.25	2.16
57	4.38	4.07	3.80	3.56	3.35	3.16	3.00	2.85	2.71	2.59	2.48	2.38	2.28
60	4.61	4.28	4.00	3.75	3.53	3.34	3.16	3.00	2.86	2.72	2.61	2.50	2.40
68	5.23	4.86	4.54	4.25	4.00	3.78	3.58	3.40	3.24	3.09	2.96	2.84	2.72
70	5.38	5.00	4.67	4.38	4.12	3.89	3.68	3.50	3.33	3.18	3.05	2.92	2.80
72	5.54	5.14	4.80	4.50	4.24	4.00	3.79	3.60	3.43	3.27	3.13	3.00	2.88
76	5.84	5.43	5.07	4.75	4.47	4.23	4.00	3.80	3.62	3.45	3.31	3.17	3.04
80	6.15	5.71	5.34	5.00	4.70	4.45	4.21	4.00	3.81	3.63	3.48	3.34	3.20
84	6.46	6.00	5.60	5.25	4.94	4.67	4.42	4.20	4.00	3.81	3.65	3.50	3.36
95	7.31	6.78	6.33	5.94	5.59	5.28	5.00	4.75	4.52	4.32	4.13	3.96	3.80
114	8.78	8.15	7.60	7.13	6.72	6.35	6.00	5.70	5.43	5.18	4.95	4.75	4.56

2.6.2 The ratio star

All ratios that can be achieved with standard sprockets are shown in this star.



3. Correction values y for the output to be transmitted

3.1 The impact coefficient

The output to be transmitted requires correcting, depending on the types of the driving and driven machines.

If, for example, a centrifugal pump is driven by an electric motor, then the chain drive will suffer no impacts either by the drive motor, or by the driven machine. In this case, the correction value to be applied is y = 1.0, i. e. the value of the output to be transmitted need not be corrected for choosing the relevant chain in the output tables.

If, however, a press be driven by an electric motor, the press will cause severe impacts to act on the chain. In this case the output to be transmitted must be increased by factor y = 1.5, this being 50 %. This corrected value must then be applied when selecting the right chain in the output tables.

This correction will lead up to selection of a stronger chain for ensuring that, on the basis of an unchanged life expectancy, it will meet the increased impact load.

3.2 Correction value y

	Driving machine		
Driven machine	Combustion engine with a hydrostatic transmission	Electric motor	Combustion engine with a mechanical transmission
Impact-free operation	1.0	1.0	1.2
Average impact load	1.2	1.3	1.4
Severe impact load	1.4	1.5	1.7

Determination of the different kinds of impact load is made according to the table on the page to follow.

With an high impact load reflecting correction value y = 1.4 to 1.7, we recommend using heavy roller chains, or marine diesel roller chains for the 2-½ " to 4-½ " pitch.

The roller chains to factory standard R 38 SH and R 44 SH are also recommended for these applications.

3.3 Types of impact load

Impact-free operation	Medium impact load	Heavy impact load
Machines with uniform power draw and without reversing operation	Machines with an uneven power draw and with reversing operation	Machines with a high uneven power draw with reversing operation
Continuous mechanical handling equipment; Fans; Centrifugal pumps; Stirring devices	Machine tools; Reciprocating pumps; Textile machines; Wood working machines	Road construction machines; Asphalt cutters; Pulvimixers; Excavator drives
Drum drives with a constant power draw and with reversing operation	Elevators, storage and retrieval units for high-bay warehouses; Drum drives with reversing operation	Presses, blanking presses; Drum drives with reversing impacts

4. The correct chain selection

4.1 Selecting the appropriate chain pitch
(refer to chapter Design Tables page 21)

4.1.1 Revolution ranges

Each chain pitch has

a) a normal revolution range;

b) a ceiling revolution range;

c) a maximum power transmission range.

With increasing revolution and a bigger chain pitch, the centrifugal forces generated while the chain is running on the sprocket will also increase. The increase of these forces of gravity in the range above maximum output is of a magnitude that will reduce the chain capacity.

4.1.2 Normal revolution range

It is recommended for technical and economical reasons to choose the chain pitch such that it will remain within the normal revolution range.

4.1.3 Ceiling revolution range

We recommend to contact us, if it should prove necessary to choose a chain pitch in the ceiling revolution range for reasons of the available space. This will allow us to contribute our Rexnord experience towards achieving an optimal solution of the drive problems. In this revolution range, the following factors should be afforded particular attention:

a) attenuation of oscillations and vibrations;

b) noise abatement;

c) chain roller fatigue strength;

d) lubrication.

4.2 General rules for choosing the chain pitch

1. With medium tractive forces and a low chain speed, a single chain of a bigger pitch should be chosen.
2. With a high tractive force and low chain speed, a multiple chain of a bigger pitch, or even better, the relevant number of single chains adjusted in a pair and/or a group should be chosen. Fatigue strength and accordingly, operational safety, is so optimized.
3. In the existence of medium tractive forces and a high chain speed, a single chain of small chain pitch would be recommended.
4. If a high tractive force at low speed is to be transmitted, then it will prove necessary to resort to a multiple chains of a small chain pitch, as is the rule with chain drives applied in oil fields.

Several strands of adjusted single chains offer adavantages as to their fatigue strength also in this instance.

4.3 The preliminary selection diagrams
(refer to chapter design tables)

Both the Speed Bar Chart (page 21) and the Chain-type Performance Diagrams on pages 22 & 23 offer an important aid and indication for finding the appropriate output table.

4.4 Performance tables

4.4.1 The capacity of single-strand roller chains

The performance-numbers listed in the performance tables relate to the capacity of Rexnord single-strand roller chains. They apply to a theoretical lifetime of 15,000 working hours at a 3 % wear elongation.

4.4.2 Basic conditions underlying the performance-numbers

In determining the performance-numbers shown in the performance tables, the following values were taken as a basis:

1. A chain drive consisting of 2 sprockets and including a tension sprocket in the return strand.
2. A distance between centres of 30...50 times the chain pitch.
3. A zero impact operation.
4. Chain lubrication as specified in the performance table.
5. Numbers of teeth as specified.

4.5 Choosing multiple-strand chains

4.5.1 Reasons for the application of multiple-strand chains

Multiple-strand chains may become necessary for the following reasons:

a) Space availability.

b) Speed: In the event that high speed calls for a smaller pitch, then a multiple-strand version will have to be resorted to.

c) General: If extremely high demands are made on the fatigue strength, then it is advisable to apply several single strands - matched as a group - instead of a multiple-strand chain. Please consult us in any such case.

4.5.2 Multiple-strand chains

As the distribution of load within a chain is impaired by an increasing number of strands, the output to be transmitted will hence, not increase on a linear scale with the number of strands.

Please gather the multiple-strand factors from the table hereunder. Multiplying the performance-numbers given in the performance tables on pages 24 to 36 by these multiple-strand factors will then produce the transmittable output of a multiple chain:

Number of chain strands	Multiple-strand factor
2	1.7
3	2.5
4	3.0
5	3.5
6	4.0
8	4.5

The decreasing multiple-strand factors in relation to the increasing number of chain strands results from the decrease in fatigue strength that coincides with the increase in strands.

If, on the other hand, matched single chains are applied instead of multiple-strand chains, then the transmittable output will rise on a linear scale with the number of single strands used.

4.6 The allowed wear elongation

4.6.1 The allowed extension in length

Rexnord chains possess an allowed 3 % wear elongation corresponding to a 30 mm/metre extension in chain length.

The chain will gradually ride up in the teeth on account of the extension in length. If, now, the application of a chain (that shows considerable wear) on the sprockets is continued, then this will cause a progressive wear of the tooth profiles. In the final stage, the sprocket teeth will show pitting and hooking.

This natural gradual ride-up of the chain in the teeth that corresponds to its increasing length, cannot be ameliorated by applying an increased tension on the return strand. Excessive tension will, on the contrary, merely impair smooth chain running.

It is a well-known fact that link-joint wear occurring between the chain link pin and the bush produces an elongation of the chain. Neither the chain rollers, nor the link plates are coactive in this process.

It is, however, remarkable that link-joint wear only produces an elongation of the distance between every second chain roller. It therefore stands to reason that only sprockets with an odd number of teeth should be used.

With each sprocket rotation, sprockets having an odd number of teeth will change the respective rollers with and/or without a bigger pitch. Sprocket wear is so reduced.

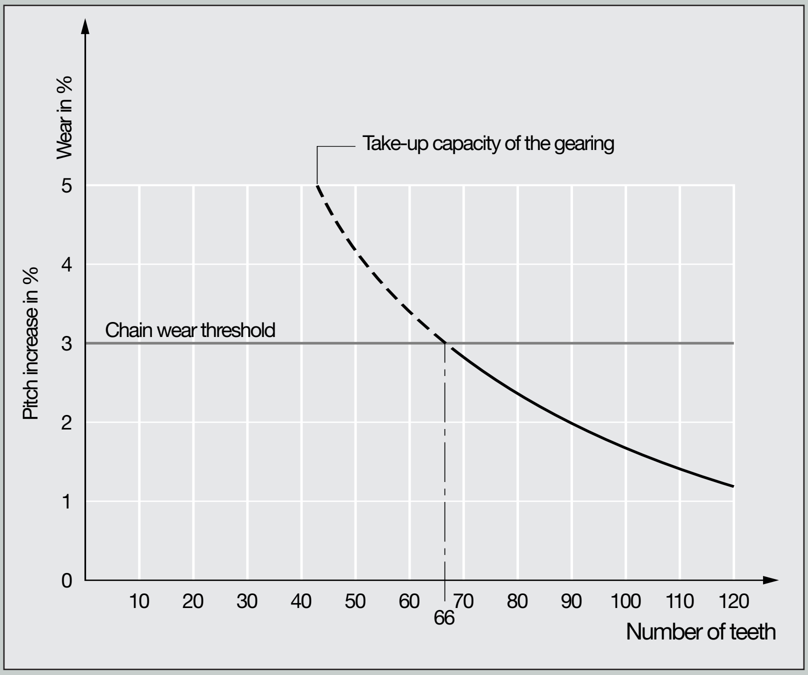
Moreover, sprocket wear can be minimized considerably by replacing the chains, as soon as, wear elongation arrives at 1.5...2.0 %.

4.6.2 Interdependence of allowed wear elongation on the number of sprocket teeth

Whereas the capacity of the chain itself that is subject to wear amounts to max. 3%, a higher number of teeth exceeding 66 will limit the allowed chain wear elongation, seeing that, with a rising number of teeth, the take-up capacity in the sprocket gearing of an elongated chain is reduced.

The ratio of the take-up capacity of elongated chains to the number of sprocket teeth is reflected on the diagram hereunder.

Fig. 2: The allowed wear elongation.



The decreasing take-up capacity of the gearing in context with a rising number of teeth is accountable for the fact that, with 120 teeth, the allowed wear elongation will amount to no more than 1.2 percent.
And, even with 90 teeth, a drop to 2 percent allowed wear elongation is noticeable.

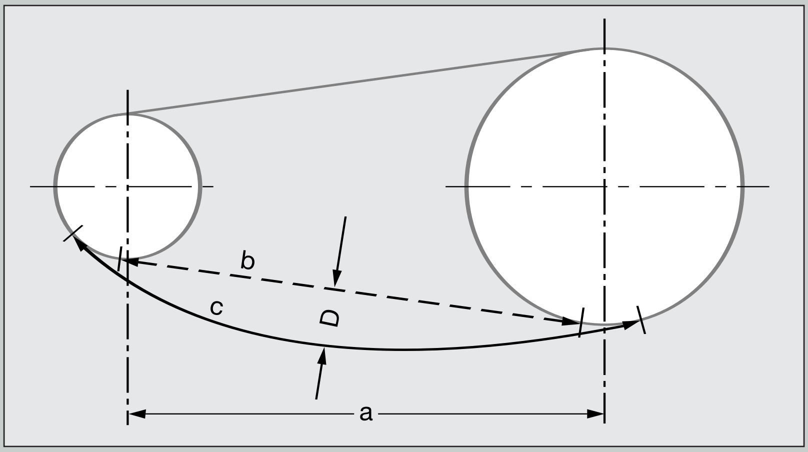


Fig. 3 :
Chain sag.

4.6.3 Calculation of chain sag D

With a taut chain strand, the direct distance b between the gearing points of the chain in the sprocket corresponds to the approximate distance between centres a.

According to the drawing,
c = b + chain elongation.

Setting b = a, results in:
c = a + chain elongation.

Hence, sag D can be calculated by the following formula:

$$D = \frac{\sqrt{3 \cdot c^2 - 3 \cdot a^2}}{4}$$

Example:

A maximum 2 % wear elongation is allowed for a 25.4 mm pitch chain drive with a = 1000 mm distance between centres and an 118-link chain length. What will be the sag with a 2 % wear elongation?

Chain length of the new chain:
pitch · number of links
= 25.4 · 118 = **2,997 mm**

chain length with 2 % wear elongation:
2 % of 2,997 mm = ***59.94 mm***

c = a + chain length:
c = 1000 + 59.94 = **1,059.94 mm**

The above values substituted by cm:

$$\text{Sag} \quad D = \frac{\sqrt{3 \cdot 105.99^2 - 3 \cdot 100^2}}{4}$$

$$= \frac{\sqrt{3 \cdot 11,236 - 3 \cdot 10,000}}{4}$$

$$D = \frac{\sqrt{33,708 - 30,000}}{4}$$

$$= \frac{\sqrt{3,708}}{4}$$

$$= \frac{\sqrt{60.9}}{4} = 15.2 \text{ cm}$$

The sag hence, amounts to 152 mm.

4.7 Design criteria for standard roller chains at low and high temperatures

The methods indicated on pages 24 to 36 for computing the transmittable output and/or tractive forces apply to temperatures ranging from – 20 to + 150 C. A certain drop in the transmittable forces must be allowed for with temperatures below, or above these ranges.

In the high temperature range, the lower capacity is attributable to a reduced surface hardness of the link units. In the low temperature range, the drop is attributable to a reduced notch value.

On the other hand, by the application of special steels, Rexnord chains still possess a relatively good notch value even with “very low temperatures“.

In the case of temperatures exceeding 150C, Rexnord HE roller chains offer more favourable performance values.

	Transmittable output in %	
Temperature range in C	Standard roller chains	HE-roller chains
– 21 to – 40	95	95
– 20 to + 150	100	100
+ 151 to + 200	70	80
+ 201 to + 280	40	50

The performance data shown in percentages in the above schedule relate to the basic values of Rexnord performance tables.

For meeting the relevant temperature ranges, a suitable lubrication must be applied.

With extreme temperature ranges (– 21 ... – 40 C and + 201 ... 280 C) low chain speeds (max 1 m/s) only should be allowed for.

4.8 Chain lubrication

An effective chain lubrication will considerably enhance wear resistance and, hence, chain life.

This lubrication is specified in the performance tables. On principle, all available motor, machine and gear luboils may be used in standard application.

The viscosity should range between 50 and max. 300 cStmm^2/s (measured at a temperature of 40 C).

On the other hand, particular operating conditions may require the application of specifically suitable lubricants, so for instance, in the food range and with high and/or low temperatures. It is advisable to consult Rexnord in the case of an application in special ranges so as to make sure to schedule the best possible product for the initial equipment.

4.9 The influence of lubrication on service life

Aachen Technical University (RWTH) engaged on comprehensive studies for determining the influence of lubrication on service life. The results were remarkable.

As becomes evident from fig. 4 on page 18, in a comparative test, a roller chain that is adequately lubricated will suffer a wear elongation of merely 0.5 mm, when a non-lubricated chain having the severest wear elongation will simultaneously have already reached its permissble limits of 3 % (30 mm in this case).

With temporary dry-running, however, under similar conditions in all other respects, wear elongation will amount to 6 mm, i. e. 12 times this value.

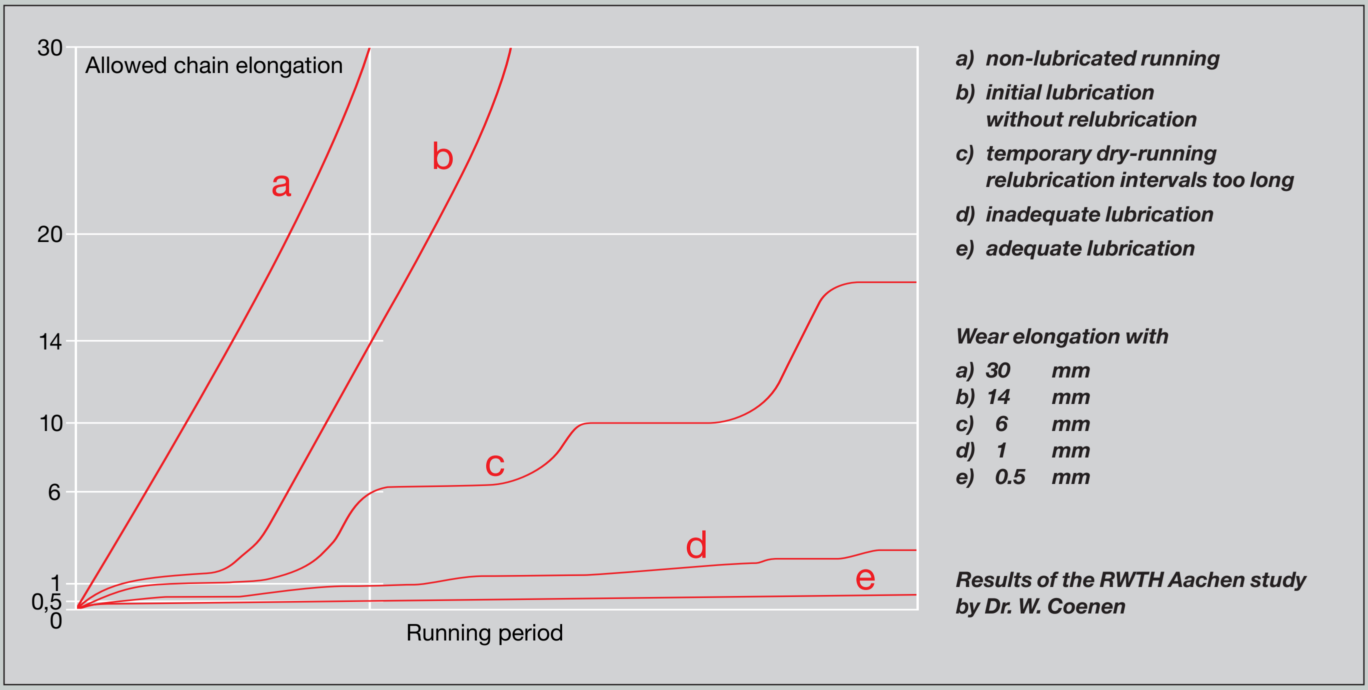


***Fig. 4:* Wear elongation depending on lubrication and running period.**

The service life of chain drives largely depends on the user. It remains with his attitude to lubrication whether a chain drive will achieve a twelvefold, sixtyfold, or only an inadequate service life.

4.10 Appropriate and inappropriate lubrication of roller chains

As simple and unproblematic as the lubrication of drive chains may appear, nonetheless, considering the high proportion of failures due to inappropriate lubricating, many mistakes are made in this respect. The following passages contain a review of the most frequent errors made, their causes and consequences and finally also an instruction on how to lubricate a chain correctly.

4.10.1 Faulty lubricating

The wear resistance of a chain and hence, its service life depend on correct lubrication. Inappropriate lubricating methods and inappropriate lubricating products produce an “anti-lubrication” and hence, severe wear and premature chain failure.

Statistical investigations have proved that approx. 60 % of all chain defects can be attributed to incorrect greasing. The number of chain lubricants in spray bottles currently proposed on the market has vastly increased. Many of these lubricants contain a solvent that will evaporate leaving a viscous grease film behind. These products are also offered in other types of containers and used for lubricating the chains.

4.10.2 Lubricating practice

In practice, these lubricants tend to solidify and loose their free-flowing properties with the effect of allowing a grease film to form in the chain links only on the initial lubricating operation seeing the admission of the lubricant into the openings between the shackles will then still be free. Subsequent lubricating will, as a rule, only produce a deposit of thick layers of grease settling on the shackle and roller surfaces that may partly even thicken and form a crust by taking up dust. No lubricant can then penetrate into the links, as such.

The outside appearance of the chain (and the spray bottle suppliers' publicity) suggest an optimal chain lubrication. The contrary, however, is true.

4.11 Guidelines for chain lubrication

4.11.1 Requirements made on the lubricants

For achieving an effective lubrication, an adequate quantity of a fluid lubricating product must be introduced into the bearing areas with each lubricating process. The cross-section of a bearing area (in fig. 5) clearly shows that the lubricant must pass through a narrow passage between the link plates for entering into the bearing area that is formed by the hinge pin and the bush.

The amount of lubricant required for the chain roller is relatively moderate. The luboil should be applied to the edges of the plate link.

4.12 Lubricating methods

4.12.1 Lubricating specification

The specification contained in the performance tables should be adhered to.

Lubricating by hand

With chain drives having a speed of approx. 0.5 m/s, lubricating by hand may be resorted to. In this case, the luboil is applied either with a brush, or an oil can, or a spray bottle (which must, however, contain a free-flowing lubricant).

Solidifying lubricants are disallowed.
The lubricant should have a viscosity of 50 to max. 300 cStmm^2/s.

Drip lubrication

The lubricant should be applied to the plate link top surfaces as shown in fig. 8.

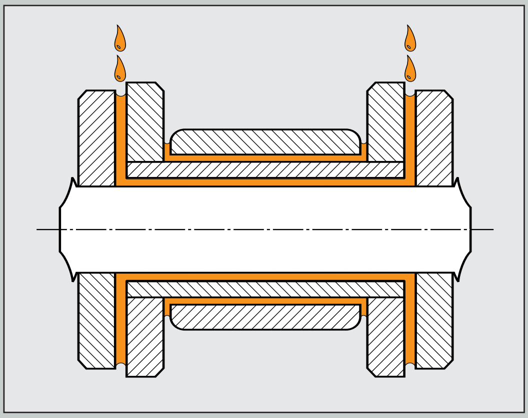


Fig. 5: Cross-section of a bearing area.

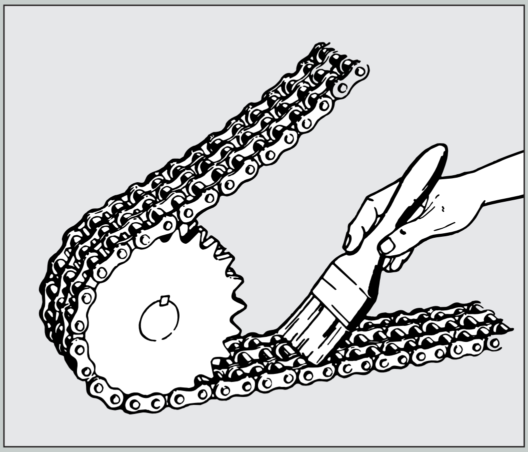


Fig. 6: Lubrication by means of a brush.

Fig. 7: Lubrication by means of a spray bottle.

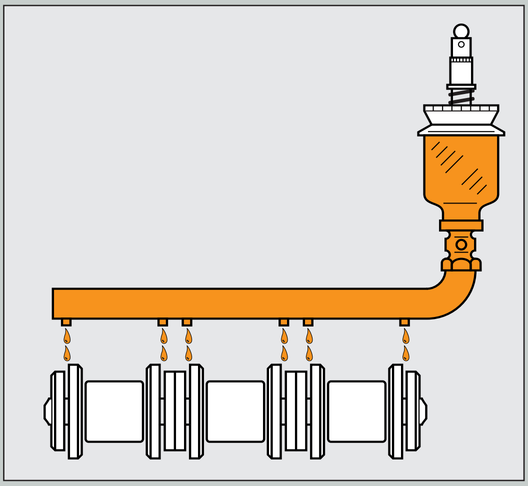


Fig. 8:
Drip lubrication.

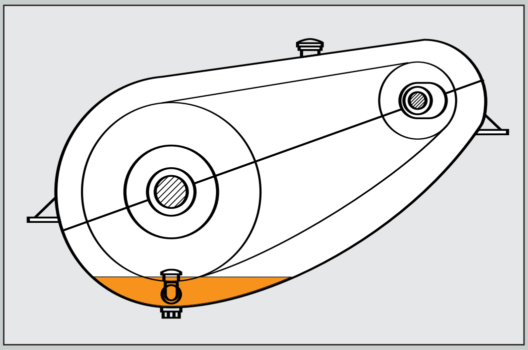


Fig. 9:
Oil-bath lubrication.

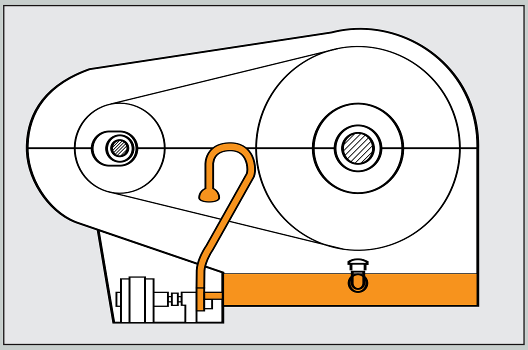


Fig. 10:
Forced feed lubrication.

Oil bath lubrication

With chain speeds up to 4 m/s, the chain may itself dip into the oil. However, a too deep immersion should be avoided as the oil might then foam and this would prejudice the effects of lubrication. With higher speeds, an oil splasher disc should be accommodated next to the sprocket. Merely this disc may then be allowed to dip into the oil.

Forced feed lubrication

With forced feed lubrication, the luboil is sprayed on the high shackle edges (not, however, on the chain rollers) by means of spray nozzles.

The circulated oil volume is to be rated such that the oil temperature will not exceed 100 ... 150 C.

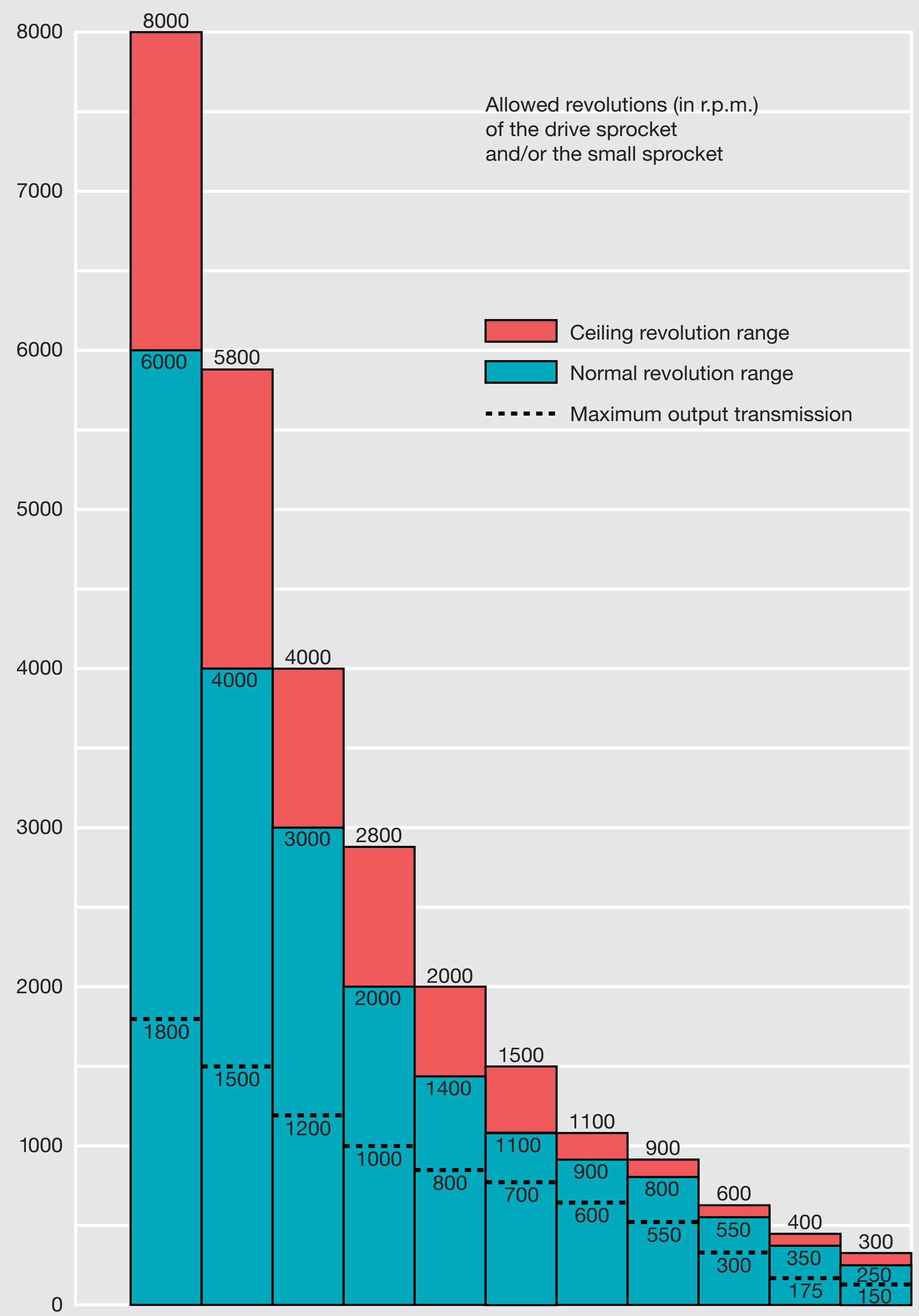
4.13 Summary

For concluding it wants to be repeated once again that the essential requirement in chain lubrication is the presence of an at all times adequate supply of lubricant in the chain link joint. An adequate supply can be ensured only by a thin-bodied oil.

Chains of a bigger dimension (approx. 1-½" pitch and bigger) have a lubricant requirement that will, as a rule, exceed the normal volume of a spray bottle.

Solidifying lubricants should never be applied. The lubricants supplied by Rexnord for lubricating chains will retain their free-flowing properties even after application and, they possess special lubricating qualities. They offer an optimal solution for all lubricating problems that may occurr with manual lubrication. The “Rexnord Heavy Duty Spray” warrants a clean application and superior lubricating effects. It possesses good flow properties, a high resistance to pressure and a reliable protection against corrosion.

5. The design tables



DIN	08 B	10 B	12 B	16 B	20 B	24 B	28 B	32 B	40 B	48 B	56 B
ANSI	40	50	60	80	100	120	140	160	200	240	–
	08 A	10 A	12 A	16 A	20 A	24 A	28 A	32 A	40 A	48 A	–
Pitch inch	1/2	5/8	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/2	3	3 1/2
Pitch mm	12.7	15.88	19.05	25.4	31.75	38.1	44.45	50.8	63.5	76.2	88.9

***Fig. 11:* Revolution bar chart for selecting the chain pitch depending on the drive sprocket revolution.**

Diagram for Roller Chains
(European Version).

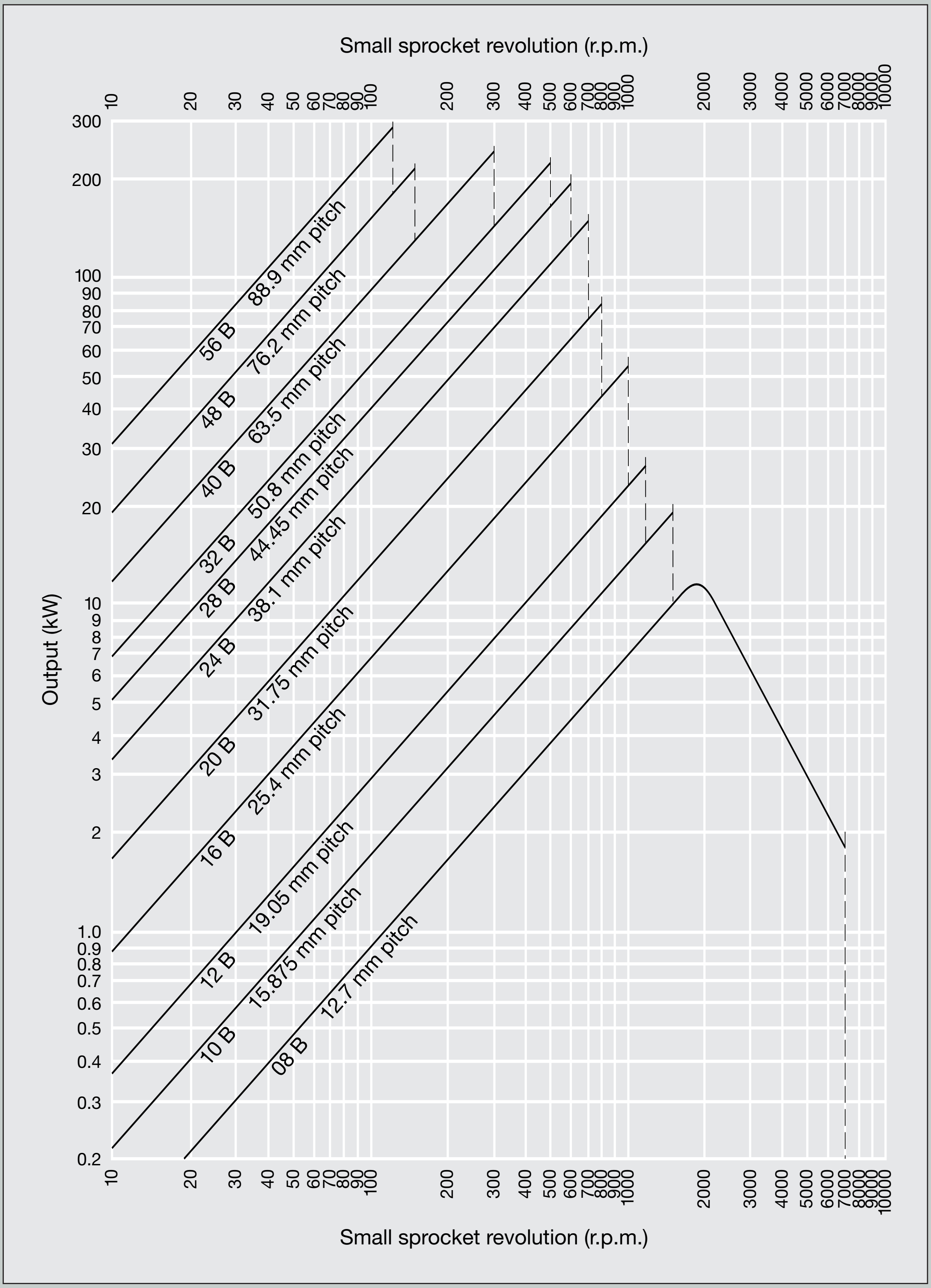


Fig. 12:
Performance diagram for roller chains (European version).

Diagram for Roller Chains (American Version).

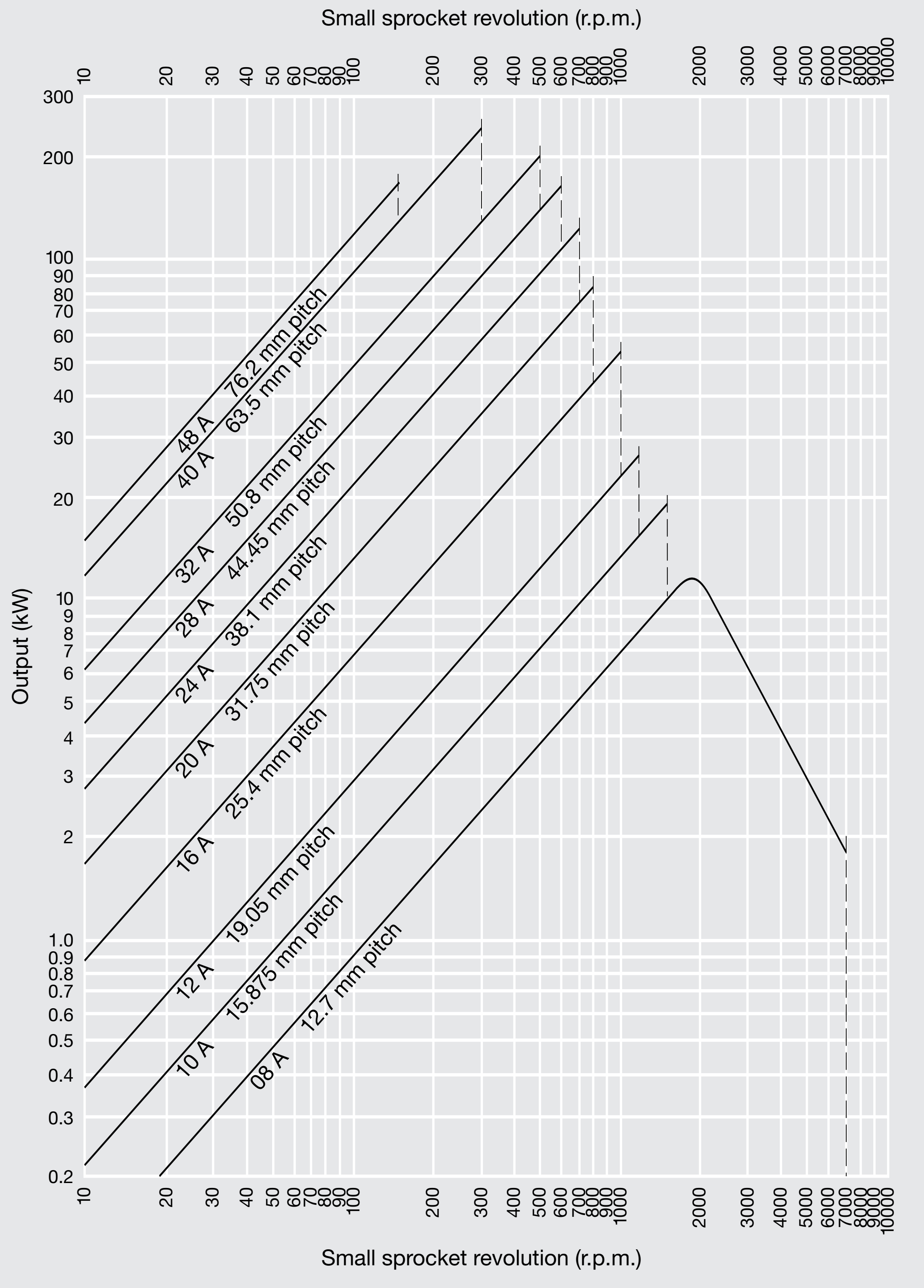
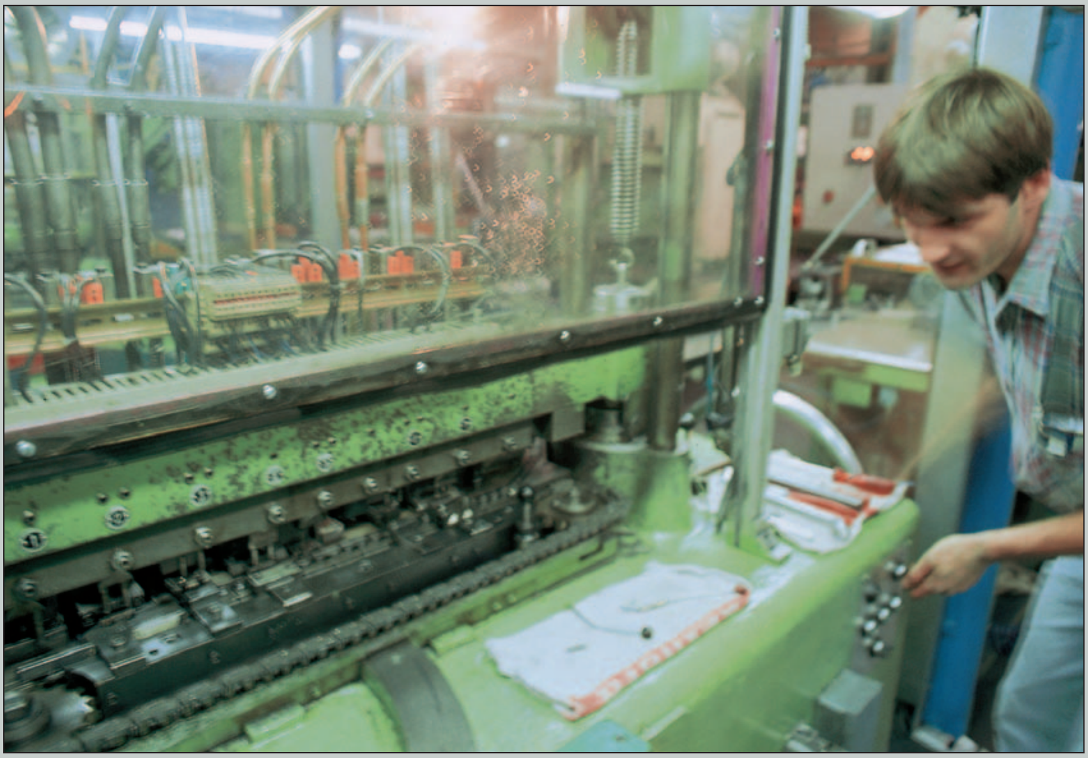


Fig. 13: Performance diagram for roller chains (American version).



5.1 Transmittable output's (kW)
for Rex-High-Capacity-Roller Chains 08 B – 1
12.7 mm pitch, European version

DIN 8187

Number of teeth	Reference ∅ mm	Small sprocket revolution																			
		50	200	400	600	900	1200	1800	2400	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	9000
		Hand lubrication		Drip lubrication				Oil bath lubrication				Forced feed lubrication									
13	53.10	0.23	0.80	1.50	2.16	3.11	4.02	4.99	3.24	2.32	1.84	1.51	1.27	1.07	0.93	0.82	0.72	0.65	0.58	0.53	–
14	57.10	0.25	0.87	1.62	2.33	3.37	4.36	5.58	3.62	2.59	2.06	1.68	1.41	1.21	1.04	0.92	0.82	0.72	0.66	0.59	–
15	61.10	0.27	0.93	1.75	2.52	3.62	4.70	6.19	4.02	2.88	2.28	1.87	1.57	1.33	1.16	1.02	0.90	0.81	0.72	.–	–
16	65.10	0.29	1.00	1.87	2.70	3.88	5.03	6.82	4.42	3.17	2.52	2.06	1.72	1.47	1.27	1.12	0.99	0.89	0.80	.–	–
17	69.10	0.31	1.07	2.00	2.88	4.15	5.37	7.47	4.85	3.47	2.76	2.26	1.89	1.62	1.40	1.23	1.09	0.97	0.87	.–	–
18	73.10	0.32	1.14	2.12	3.07	4.42	5.72	8.13	5.28	3.78	3.00	2.46	2.06	1.76	1.52	1.33	1.18	1.06	0.96	.–	–
19	77.20	0.35	1.21	2.26	3.25	4.68	6.06	8.75	5.73	4.10	3.26	2.67	2.23	1.91	1.65	1.45	1.28	1.15	1.04	.–	–
20	81.20	0.37	1.27	2.38	3.43	4.95	6.41	9.25	6.19	4.42	3.52	2.88	2.41	2.06	1.78	1.57	1.39	1.24	1.12	.–	–
21	85.20	0.38	1.35	2.52	3.62	5.22	6.76	9.75	6.66	4.77	3.78	3.09	2.59	2.22	1.92	1.68	1.49	1.33	1.21	.–	–
22	89.20	0.41	1.42	2.64	3.81	5.48	7.10	10.25	7.14	5.11	4.06	3.32	2.78	2.37	2.06	1.81	1.60	1.43	.–	.–	–
23	93.30	0.42	1.48	2.77	3.99	5.75	7.45	10.75	7.63	5.46	4.33	3.55	2.97	2.54	2.20	1.93	1.72	1.53	.–	.–	–
24	97.30	0.45	1.56	2.90	4.18	6.02	7.80	11.25	8.13	5.82	4.62	3.78	3.17	2.71	2.34	2.06	1.82	1.63	.–	.–	–
25	101.30	0.47	1.62	3.03	4.37	6.29	8.15	11.75	8.67	6.19	4.91	4.02	3.37	2.88	2.49	2.19	1.94	.–	.–	.–	–
28	113.40	0.52	1.83	3.42	4.94	7.12	9.25	13.25	10.25	7.33	5.82	4.77	3.99	3.41	2.96	2.59	2.30	.–	.–	.–	–
30	121.50	0.57	1.98	3.69	5.32	7.67	9.92	14.33	11.33	8.13	6.46	5.28	4.42	3.78	3.27	2.88	.–	.–	.–	.–	–
32	129.60	0.61	2.12	3.96	5.71	8.22	10.67	15.33	12.50	9.00	7.12	5.82	4.88	4.17	3.61	3.17	.–	.–	.–	.–	–
35	141.70	0.67	2.33	4.37	6.28	9.08	11.75	16.92	14.33	10.25	8.13	6.66	5.58	4.77	4.13	.–	.–	.–	.–	.–	–
40	161.90	0.77	2.70	5.04	7.26	10.42	13.58	19.50	17.50	12.50	9.92	8.13	6.82	5.82	.–	.–	.–	.–	.–	.–	–

5.2 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 10 B – 1 15.875 mm pitch, European version

DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution																			
		50	100	300	500	900	1200	1500	1800	2100	2400	2700	3000	3300	3500	4000	4500	5000	5400	5800	6200
		Hand lubrication		Drip lubrication			Oil bath lubrication					Forced feed lubrication									
13	66.30	0.42	0.80	2.13	3.38	5.75	7.46	7.58	5.67	4.49	3.68	3.08	2.63	2.28	2.10	1.71	1.43	1.23	1.08	0.98	–
14	71.30	0.46	0.87	2.31	3.64	6.22	8.08	8.50	6.34	5.02	4.12	3.45	2.94	2.56	2.34	1.91	1.60	1.37	1.21	.–	–
15	76.40	0.50	0.92	2.50	3.94	6.71	8.75	9.42	7.03	5.56	4.56	3.82	3.27	2.83	2.60	2.12	1.77	1.52	1.34	.–	–
16	81.40	0.53	1.00	2.67	4.22	7.18	9.33	10.42	7.75	6.12	5.03	4.22	3.59	3.12	2.87	2.33	1.96	1.67	1.49	.–	–
17	86.40	0.57	1.06	2.85	4.50	7.67	9.92	11.33	8.50	6.71	5.50	4.62	3.95	3.42	3.13	2.55	2.14	1.83	1.62	.–	–
18	91.40	0.61	1.13	3.03	4.79	8.17	10.58	12.33	9.25	7.31	6.00	5.03	4.29	3.72	3.41	2.78	2.33	2.00	.–	.–	–
19	96.50	0.64	1.19	3.22	5.08	8.67	11.25	13.42	10.08	7.92	6.50	5.45	4.66	4.04	3.71	3.02	2.53	2.17	.–	.–	–
20	101.50	0.68	1.27	3.40	5.37	9.17	11.92	14.42	10.83	8.58	7.03	5.88	5.03	4.37	4.00	3.26	2.73	2.34	.–	.–	–
21	106.50	0.72	1.34	3.58	5.67	9.67	12.50	15.33	11.67	9.17	7.56	6.36	5.40	4.69	4.31	3.52	2.93	2.52	.–	.–	–
22	111.60	0.75	1.40	3.78	5.96	10.17	13.17	16.08	12.50	9.92	8.08	6.79	5.81	5.04	4.61	3.77	3.15	2.71	.–	.–	–
23	116.60	0.79	1.47	3.96	6.23	11.00	13.75	16.83	13.42	10.50	8.67	7.27	6.20	5.37	4.93	4.02	3.38	.–	.–	.–	–
24	121.60	0.82	1.54	4.15	6.54	11.17	14.50	17.67	14.25	11.25	9.25	7.74	6.59	5.73	5.25	4.29	3.60	.–	.–	.–	–
25	126.70	0.87	1.62	4.33	6.83	11.67	15.17	18.42	15.17	12.00	9.83	8.25	7.03	6.10	5.58	4.57	3.83	.–	.–	.–	–
28	141.80	0.95	1.82	4.89	7.72	13.17	17.08	20.83	18.00	14.17	11.67	9.75	8.25	7.23	6.62	5.40	.–	.–	.–	.–	–
30	151.90	1.05	1.92	5.27	8.31	14.17	18.33	22.50	19.83	15.75	12.92	10.83	9.25	8.00	7.33	5.99	.–	.–	.–	.–	–
32	162.00	1.12	2.11	5.66	8.92	15.17	19.75	24.08	21.92	17.33	14.25	11.92	10.25	8.83	8.08	6.60	.–	.–	.–	.–	–
35	177.10	1.24	2.32	6.22	9.83	16.75	21.67	26.58	25.08	19.83	16.25	13.67	11.67	10.17	9.25	7.57	.–	.–	.–	.–	–
40	202.30	1.43	2.67	7.19	11.33	19.50	24.67	30.58	30.58	24.25	19.83	16.67	14.25	12.33	11.33	.–	.–	.–	.–	.–	–

5.3 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 12 B – 1 19.05 mm pitch, European version

DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution																			
		50	100	200	500	700	900	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3500	3800	4000	4600
		Hand lubrication		Drip lubrication			Oil bath lubrication						Forced feed lubrication								
13	79.60	0.62	1.15	2.15	4.89	6.57	8.33	10.17	8.07	6.58	5.56	4.72	4.09	3.59	3.18	2.85	2.57	2.04	1.80	1.67	–
14	85.60	0.67	1.25	2.32	5.30	7.20	9.08	11.42	9.08	7.40	6.21	5.27	4.57	4.02	3.56	3.18	2.87	2.28	2.01	1.87	–
15	91.60	0.72	1.33	2.51	5.71	7.73	9.75	12.58	10.00	8.20	6.87	5.85	5.07	4.45	3.95	3.53	3.18	2.52	2.22	2.07	–
16	97.60	0.77	1.44	2.68	6.12	8.33	10.50	13.50	11.08	9.00	7.60	6.44	5.58	4.91	4.36	3.89	3.50	2.77	2.45	2.28	–
17	103.70	0.82	1.53	2.88	6.54	8.92	11.17	14.50	12.17	9.92	8.33	7.06	6.12	5.37	4.77	4.27	3.90	3.05	2.68	2.49	–
18	109.70	0.88	1.63	3.05	6.93	9.42	11.92	15.33	13.25	10.75	9.08	7.67	6.67	5.85	5.19	4.64	4.18	3.32	2.93	2.72	–
19	115.70	0.93	1.73	3.24	7.40	10.00	12.58	16.25	14.33	11.67	9.83	8.33	7.27	6.34	5.63	5.04	4.53	3.60	3.17	2.94	–
20	121.80	0.98	1.83	3.42	7.79	10.58	13.33	17.17	15.50	12.58	10.58	9.00	7.79	6.87	6.08	5.44	4.89	3.88	3.43	.–	–
21	127.80	1.04	1.92	3.62	8.20	11.17	14.00	18.17	16.58	13.50	11.42	9.67	8.42	7.40	6.55	5.86	5.27	4.18	3.69	.–	–
22	133.90	1.09	2.02	3.79	8.67	11.75	14.75	19.08	17.83	14.58	12.25	10.42	9.00	7.93	7.00	6.28	5.65	4.48	3.95	.–	–
23	139.90	1.14	2.12	3.98	9.08	12.25	15.50	20.00	19.08	15.58	13.08	11.17	9.58	8.50	7.54	6.72	6.04	4.79	.–	.–	–
24	145.90	1.20	2.22	4.17	9.50	12.92	16.25	20.92	20.25	16.42	13.92	11.83	10.25	9.00	8.00	7.13	6.43	5.11	.–	.–	–
25	152.00	1.25	2.32	4.36	9.92	13.50	16.92	21.92	21.58	17.58	14.83	12.58	10.92	9.58	8.58	7.60	6.87	5.43	.–	.–	–
28	170.10	1.42	2.63	4.92	11.25	15.25	19.17	24.75	25.58	20.83	17.58	14.92	12.92	11.33	10.08	9.00	8.13	6.44	.–	.–	–
30	182.30	1.52	2.83	5.29	12.08	16.42	20.58	26.67	28.42	23.17	19.50	16.50	14.33	12.58	11.17	10.00	9.00	.–	.–	.–	–
32	194.40	1.63	3.04	5.68	12.92	17.50	22.08	28.58	31.25	25.50	21.50	18.17	15.83	13.83	12.33	11.00	9.92	.–	.–	.–	–
35	212.50	1.80	3.35	6.27	14.25	19.33	24.33	31.50	35.83	29.17	24.58	20.83	18.08	15.83	14.08	12.58	11.33	.–	.–	.–	–
40	242.80	2.08	3.88	7.27	16.50	22.33	28.08	36.50	41.83	35.58	30.00	25.50	22.00	19.42	17.17	15.42	.–	.–	.–	.–	–

5.4 Transmittable output's (kW)
for Rex-High-Capacity-Roller Chains 16 B – 1
25.4 mm pitch, European version

DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution 25	50	100	200	300	400	500	700	900	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000
		Hand lubrication		Drip lubrication				Oil bath lubrication				Forced feed lubrication									
13	106.10	0.97	1.80	3.36	6.26	9.00	11.67	14.25	19.33	24.25	21.00	16.00	12.67	10.42	8.67	7.42	6.43	5.65	5.01	4.48	–
14	114.10	1.04	1.95	3.63	6.78	9.75	12.67	15.50	20.92	26.25	23.50	17.83	14.17	11.58	9.75	8.30	7.19	6.31	5.60	5.01	–
15	122.20	1.12	2.10	3.92	7.31	10.50	13.67	16.67	22.58	28.33	26.00	19.83	15.75	12.83	10.75	9.17	7.97	7.00	6.21	0.35	–
16	130.20	1.21	2.25	4.20	7.83	11.25	14.58	17.83	24.17	30.33	28.67	21.83	17.33	14.17	11.83	10.17	8.75	7.71	6.84	.–	–
17	138.20	1.29	2.40	4.48	8.33	12.08	15.58	19.08	25.83	32.42	31.33	23.83	18.92	15.50	13.00	11.08	9.58	8.42	7.47	.–	–
18	146.30	1.37	2.56	4.77	8.92	12.83	16.58	20.33	27.50	34.42	34.17	26.00	20.67	16.92	14.17	12.08	10.50	9.17	8.16	.–	–
19	154.30	1.45	2.71	5.06	9.42	13.58	17.58	21.50	29.17	36.50	37.08	28.25	22.42	18.33	15.33	13.08	11.33	10.00	8.83	.–	–
20	162.40	1.53	2.87	5.35	10.00	14.33	18.58	22.75	30.83	38.67	40.08	30.50	24.17	19.83	16.58	14.17	12.25	10.75	0.79	.–	–
21	170.40	1.62	3.02	5.63	10.50	15.17	19.67	24.00	32.50	40.75	43.08	32.83	26.00	21.33	17.83	15.25	13.25	11.58	.–	.–	–
22	178.50	1.70	3.17	5.92	11.08	15.92	20.67	25.25	34.17	42.83	46.25	35.17	27.92	22.83	19.17	16.33	14.17	12.42	.–	.–	–
23	186.50	1.78	3.33	6.22	11.58	16.67	21.67	26.42	35.83	44.92	49.33	37.58	29.83	24.42	20.50	17.50	15.17	13.25	.–	.–	–
24	194.60	1.87	3.49	6.51	12.17	17.50	22.67	27.75	37.50	47.00	51.67	40.08	31.75	26.00	21.83	18.58	16.17	14.17	.–	.–	–
25	202.70	1.95	3.65	6.81	12.67	18.25	23.67	29.00	39.17	49.17	54.08	42.58	33.83	27.67	23.17	19.83	17.17	6.95	.–	.–	–
28	226.80	2.21	4.12	7.69	14.33	20.67	26.75	32.75	44.33	55.50	61.08	50.50	40.08	32.83	27.50	23.50	20.33	.–	.–	.–	–
30	243.00	2.37	4.44	8.28	15.42	22.25	28.83	35.25	47.75	59.83	65.75	56.00	44.42	36.33	30.50	26.00	20.42	.–	.–	.–	–
32	259.10	2.55	4.76	8.92	16.58	23.83	30.92	37.75	51.17	64.17	70.58	61.67	48.92	40.08	33.58	28.67	.–	.–	.–	.–	–
35	283.40	2.81	5.24	9.75	18.25	26.33	34.08	41.67	56.42	70.67	77.75	70.58	56.00	45.83	38.42	32.83	.–	.–	.–	.–	–
40	323.70	3.24	6.06	11.33	21.08	30.33	39.33	48.08	65.08	81.67	90.00	85.83	68.42	56.00	46.92	.–	.–	.–	.–	.–	–

5.5 Transmittable output's (kW)
for Rex-High-Capacity-Roller Chains 20 B – 1
31.75 mm pitch, European version

DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution 10	25	50	100	200	300	400	500	600	700	800	900	1000	1100	1200	1400	1600	1800	2000	2200
		Hand lubrication			Drip lubrication		Oil bath lubrication						Forced feed lubrication								
13	132.70	0.81	1.85	3.44	6.43	12.00	17.25	22.42	27.33	32.25	37.08	35.08	29.42	25.08	21.75	19.08	15.17	12.42	10.42	.–	–
14	142.70	0.87	2.00	3.73	6.96	13.00	18.75	24.25	29.67	34.92	40.08	39.17	32.83	28.00	24.33	21.33	16.92	13.83	11.58	.–	–
15	152.70	0.94	2.16	4.02	7.50	14.00	20.17	26.17	31.92	37.67	43.25	43.50	36.42	31.08	27.00	23.67	18.75	15.42	12.92	.–	–
16	162.70	1.02	2.31	4.31	8.04	15.00	21.58	28.00	34.25	40.33	46.33	47.92	40.08	34.25	29.67	26.08	20.67	16.92	14.17	.–	–
17	172.80	1.08	2.47	4.60	8.58	16.00	23.08	29.92	36.58	43.08	49.50	52.42	43.92	37.50	32.50	28.50	22.67	18.50	15.17	.–	–
18	182.80	1.15	2.62	4.89	9.17	17.00	24.58	31.83	38.92	45.83	52.67	57.17	47.92	40.92	35.42	31.08	24.67	20.25	13.83	.–	–
19	192.90	1.22	2.78	5.19	9.67	18.08	26.00	33.75	41.25	48.58	55.83	62.00	51.92	44.33	38.42	33.75	26.75	21.92	5.58	.–	–
20	202.90	1.29	2.94	5.48	10.25	19.08	27.50	35.67	43.58	51.33	59.00	66.50	56.08	47.92	41.50	36.42	28.92	23.67	.–	.–	–
21	213.00	1.36	3.10	5.78	10.75	20.17	29.00	37.58	45.92	54.08	62.17	70.08	60.33	51.50	44.67	39.17	31.08	25.42	.–	.–	–
22	223.10	1.42	3.26	6.08	11.33	21.17	30.50	39.50	48.33	56.92	65.42	73.75	64.75	55.25	47.92	42.00	33.33	27.33	.–	.–	–
23	233.20	1.50	3.42	6.38	11.92	22.17	32.00	41.42	50.67	59.75	68.58	77.33	69.17	59.08	51.17	44.92	35.67	29.17	.–	.–	–
24	243.20	1.57	3.58	6.68	12.50	23.25	33.50	43.42	53.08	62.50	71.83	81.00	73.67	62.92	54.58	47.83	38.00	31.08	.–	.–	–
25	253.30	1.64	3.74	6.97	13.00	24.33	35.00	45.33	55.42	65.33	75.08	85.00	78.42	66.92	58.00	50.92	40.42	30.25	.–	.–	–
28	283.60	1.85	4.22	7.89	14.75	27.50	39.58	51.25	62.67	73.83	85.00	95.83	92.50	79.33	68.75	60.33	47.92	4.12	.–	.–	–
30	303.80	2.00	4.56	8.50	15.83	29.58	42.67	55.25	67.50	79.58	91.67	103.33	103.33	88.33	76.25	66.92	53.08	.–	.–	.–	–
32	323.90	2.14	4.88	9.08	17.00	31.75	45.67	59.25	72.42	85.00	98.33	110.83	113.33	96.67	84.17	73.75	58.50	.–	.–	.–	–
35	354.20	2.36	5.38	10.00	18.75	34.92	50.33	65.25	79.75	94.17	108.33	121.67	130.00	110.83	95.83	84.17	40.33	.–	.–	.–	–
40	404.70	2.72	6.22	11.58	21.67	40.33	58.17	75.33	92.50	108.33	125.00	140.83	156.67	135.83	117.50	103.33	.–	.–	.–	.–	–

5.6 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 24 B – 1 38.1 mm pitch, European version

DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution 10	25	50	100	150	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
		Hand lubrication		Drip lubrication			Oil bath lubrication					Forced feed lubrication									
13	159.20	1.64	3.74	6.97	13.00	18.67	24.33	35.00	45.42	55.42	65.42	59.42	47.83	40.67	34.83	30.08	26.50	23.50	21.00	18.92	–
14	171.20	1.77	4.05	7.54	14.08	20.33	26.33	37.92	49.17	60.00	70.75	66.42	54.33	45.50	38.92	34.58	29.67	26.17	23.50	12.58	–
15	183.30	1.91	4.36	8.14	15.25	21.92	28.33	40.83	52.83	64.58	76.08	69.50	60.33	50.50	43.17	37.42	32.83	29.17	26.00	4.50	–
16	195.30	2.05	4.67	8.75	16.33	23.42	30.42	43.83	56.67	69.42	81.67	81.08	66.33	55.67	47.50	41.17	36.17	32.00	28.75	.–	–
17	207.30	2.19	4.99	9.33	17.42	25.00	32.42	46.67	60.58	74.08	87.50	89.17	72.67	60.83	52.00	45.17	39.58	35.17	31.42	.–	–
18	219.40	2.33	5.32	9.92	18.50	26.58	34.50	49.17	64.33	78.58	92.50	96.67	79.17	66.42	56.67	49.17	43.17	38.33	28.58	.–	–
19	231.50	2.47	5.62	10.50	19.58	28.25	36.50	52.75	68.25	83.33	98.33	105.00	85.83	72.08	61.42	53.33	46.67	41.50	20.75	.–	–
20	243.50	2.62	5.96	11.08	20.67	29.83	38.67	55.67	72.17	88.33	104.17	113.33	92.50	77.75	66.33	57.50	50.50	44.83	11.08	.–	–
21	255.60	2.75	6.27	11.67	21.83	31.42	40.75	58.75	76.08	93.33	110.00	121.67	100.00	83.33	71.42	61.83	54.33	48.25	.–	.–	–
22	267.70	2.89	6.58	12.33	23.00	33.17	42.83	61.67	79.92	97.50	115.00	130.83	106.67	90.00	76.67	49.67	58.17	50.25	.–	.–	–
23	279.80	3.03	6.92	12.92	24.08	34.67	45.00	64.83	84.17	103.33	120.83	139.17	114.17	95.83	81.83	70.83	62.42	42.33	.–	.–	–
24	291.90	3.18	7.25	13.50	25.25	36.42	47.17	67.83	88.33	106.67	126.67	145.00	121.67	101.67	87.50	75.50	66.33	32.58	.–	.–	–
25	304.00	3.32	7.58	14.08	26.42	38.00	49.17	70.83	91.67	112.50	131.67	152.50	130.00	109.17	92.50	80.42	70.42	.–	.–	.–	–
28	340.30	3.75	8.58	16.00	29.83	42.92	55.67	80.00	104.17	126.67	149.17	171.67	154.17	129.17	110.00	95.00	.–	.–	.–	.–	–
30	364.50	4.04	9.25	17.17	32.17	46.33	59.92	86.67	111.67	137.50	160.83	185.00	170.00	143.33	121.67	105.83	.–	.–	.–	.–	–
32	388.70	4.33	9.92	18.42	34.42	49.58	64.17	92.50	120.00	145.83	171.67	198.33	188.33	156.67	134.17	101.67	.–	.–	.–	.–	–
35	425.00	4.77	10.92	20.33	37.92	54.58	70.67	102.50	131.67	160.83	190.00	218.33	215.00	180.00	154.17	68.33	.–	.–	.–	.–	–
40	485.60	5.52	12.58	23.50	43.92	63.08	81.67	118.33	153.33	185.83	220.00	251.67	255.00	204.17	103.33	.–	.–	.–	.–	.–	–

5.7 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 28 B – 1 44.45 mm pitch, European version

DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution 10	25	50	100	150	200	250	300	350	400	450	500	550	600	700	800	900	1000	1100	1200
		Hand lubrication		Drip lubrication		Oil bath lubrication								Forced feed lubrication							
13	185.80	2.55	5.82	10.92	20.33	29.17	37.83	46.25	54.33	62.50	70.42	78.33	86.67	94.17	85.00	67.08	54.83	46.00	39.33	34.17	–
14	199.80	2.76	6.32	11.83	22.00	31.58	41.08	50.17	59.00	67.83	76.50	85.00	93.33	100.83	94.17	75.00	61.42	51.42	43.92	38.00	–
15	213.80	2.97	6.80	12.67	23.75	34.08	44.17	54.00	63.58	73.17	82.50	91.67	100.83	110.00	105.00	83.33	68.25	57.17	48.75	40.00	–
16	227.90	3.19	7.28	13.58	25.42	36.50	47.42	57.92	68.33	78.33	88.33	98.33	108.33	118.33	115.00	91.67	75.00	62.92	53.75	34.67	–
17	241.90	3.42	7.77	14.50	27.08	39.00	50.50	61.67	72.92	84.17	94.17	105.00	115.00	125.83	125.83	100.00	82.25	68.75	58.92	29.83	–
18	256.00	3.62	8.27	15.42	28.83	41.42	53.75	65.67	77.33	89.17	100.00	110.83	122.50	133.33	137.50	109.17	90.00	75.00	64.00	22.75	–
19	270.10	3.84	8.75	16.00	30.50	44.00	57.08	70.00	81.75	94.17	105.83	118.33	130.00	141.67	149.17	119.17	97.50	81.25	69.42	13.00	–
20	284.10	4.06	9.25	17.33	32.17	46.33	60.17	73.50	86.67	100.00	112.50	125.00	137.50	150.00	160.83	128.33	105.00	87.50	73.08	5.21	–
21	298.30	4.28	9.83	18.17	34.00	49.00	63.33	77.50	91.67	105.00	118.33	131.67	145.00	159.17	170.83	138.33	113.33	94.17	69.08	.–	–
22	312.30	4.50	10.33	19.17	35.83	51.50	66.67	81.67	96.67	110.83	125.00	139.17	152.50	165.00	180.00	148.33	120.83	100.83	62.08	.–	–
23	326.40	4.73	10.83	20.08	37.50	54.17	70.00	85.83	100.83	115.00	130.83	145.00	160.00	174.17	188.33	158.33	129.17	108.33	56.00	.–	–
24	340.50	4.95	11.25	21.17	39.33	56.67	73.33	90.00	105.83	120.83	137.50	152.50	166.67	181.67	196.67	168.33	138.33	115.00	46.50	.–	–
25	354.70	5.17	11.83	22.00	41.17	59.17	76.67	94.17	110.00	126.67	143.33	159.17	175.00	198.33	205.83	179.17	147.50	120.00	37.83	.–	–
28	397.00	5.83	13.33	24.92	46.42	66.83	86.67	105.83	125.00	143.33	162.50	180.00	196.67	215.00	233.33	211.67	174.17	98.33	.–	.–	–
30	425.30	6.29	14.42	26.83	50.00	72.00	93.33	114.17	134.17	154.17	174.17	194.17	213.33	232.50	251.67	235.00	175.00	82.92	.–	.–	–
32	453.50	6.74	15.42	28.75	53.58	77.33	100.00	122.50	144.17	165.00	186.67	207.50	228.33	248.33	268.33	251.67	168.33	64.83	.–	.–	–
35	495.90	7.44	17.00	31.58	59.17	85.00	110.00	135.00	159.17	181.67	205.83	229.17	250.83	274.17	295.83	241.67	143.33	28.83	.–	.–	–
40	566.60	8.58	19.58	36.67	68.25	98.33	126.67	155.83	183.33	210.83	238.33	264.17	290.00	315.83	310.00	208.33	85.83	.–	.–	.–	–

Rexnord

5.8 Transmittable output’s (kW) for Rex-High-Capacity-Roller Chains 32 B – 1 50.8 mm pitch, European version

DIN 8187

Number of teeth	Reference ∅ mm	Small sprocket revolution 10	25	50	100	150	200	250	300	350	400	500	550	600	700	750	800	850	900	950	1000
		Hand lubric.	Drip lubrication			Oil bath lubrication					Forced feed lubrication										
13	212.30	3.37	7.80	14.42	26.75	38.92	49.83	61.00	71.83	82.67	93.33	113.33	99.17	86.67	68.75	61.92	56.25	33.75	16.50	.–	–
14	228.30	3.65	8.33	15.58	29.00	41.67	54.08	66.17	77.75	90.00	100.83	124.17	110.00	95.83	76.83	69.08	62.92	31.33	12.42	.–	–
15	244.30	3.92	9.08	16.75	31.25	44.92	58.17	71.25	84.17	96.67	109.17	133.33	122.50	107.50	85.00	76.67	60.83	29.00	8.25	.–	–
16	260.40	4.21	9.67	18.00	33.50	48.08	62.50	76.42	90.00	103.33	116.67	143.33	135.00	118.33	93.33	78.75	58.75	26.58	4.58	.–	–
17	276.50	4.50	10.25	19.17	35.75	51.42	66.67	81.50	96.67	110.00	125.00	152.50	147.50	129.17	102.50	80.83	56.58	24.17	.–	.–	–
18	292.60	4.78	11.00	20.50	38.00	54.58	70.83	86.67	101.67	117.50	131.67	162.50	161.67	141.67	111.67	82.83	54.42	21.83	..–	.–	–
19	308.70	5.07	11.67	21.67	40.33	57.92	75.17	91.67	108.33	125.00	140.83	172.50	174.17	152.50	121.67	85.00	52.25	19.42	.–	.–	–
20	324.70	5.36	12.25	22.92	42.58	61.25	79.58	97.50	115.00	132.50	148.33	181.67	194.17	165.00	124.17	87.50	49.50	16.50	.–	.–	–
21	340.90	5.64	12.92	24.08	45.00	64.58	84.17	102.50	120.83	138.33	156.67	191.67	195.83	176.67	117.50	80.00	44.58	14.08	.–	.–	–
22	357.00	5.94	13.67	25.42	47.33	67.92	88.33	107.50	126.67	145.83	164.17	201.67	198.33	190.00	110.83	73.08	39.58	.–	.–	.–	–
23	373.10	6.23	14.33	26.58	49.58	71.25	92.50	112.50	133.33	153.33	172.50	211.67	200.00	188.33	104.17	65.83	34.67	.–	.–	.–	–
24	389.20	6.53	15.00	27.83	51.83	74.58	97.50	118.33	139.17	160.83	180.00	220.00	201.67	186.67	98.33	58.92	29.67	.–	.–	.–	–
25	405.30	6.82	15.67	29.17	54.25	78.00	100.83	124.17	145.83	167.50	188.33	228.33	203.33	184.17	91.67	51.75	17.42	.–	.–	.–	–
28	453.70	7.71	17.67	32.92	61.25	88.33	115.00	139.17	164.17	190.00	213.33	238.33	207.50	178.33	72.50	30.75	.–	.–	.–	.–	–
30	486.00	8.31	19.00	35.42	66.17	95.00	122.50	150.00	176.67	203.33	230.00	247.50	210.83	174.17	59.58	16.50	.–	.–	.–	.–	–
32	518.30	8.92	20.50	38.00	70.83	101.67	131.67	154.17	190.00	219.17	246.67	244.17	203.33	164.17	47.67	.–	.–	.–	.–	.–	–
35	566.70	9.83	22.50	41.92	78.00	111.67	145.83	178.33	209.17	241.67	271.67	240.83	197.50	150.00	27.50	.–	.–	.–	.–	.–	–
40	647.50	11.42	26.00	48.42	90.00	129.17	167.50	205.00	241.67	279.17	313.33	238.33	183.33	123.33	.–	.–	.–	.–	.–	.–	–

5.9 Transmittable output’s (kW) for Rex-High-Capacity-Roller Chains 40 B – 1 63.5 mm pitch, European version

DIN 8187

Number of teeth	Reference ∅ mm	Small sprocket revolution 5	10	15	20	30	40	50	60	80	100	150	200	250	300	350	400	450	550	600	650
		Hand lubrication				Drip lubrication					Oil bath lubrication				Forced feed lubrication						
13	265.40	3.17	5.89	8.50	11.00	15.83	20.58	25.17	29.58	38.33	47.00	67.67	87.50	106.67	125.83	135.00	120.00	100.83	52.50	23.58	–
14	285.40	3.42	6.40	9.17	11.92	17.17	22.33	27.25	32.00	41.67	50.83	73.33	94.17	115.83	136.67	142.50	125.83	105.00	52.33	20.83	–
15	305.40	3.70	6.89	9.92	12.92	18.58	24.00	29.33	34.58	44.83	54.67	78.75	102.50	125.00	150.00	150.83	132.50	109.17	51.67	17.58	–
16	325.50	3.96	7.38	10.67	13.75	19.92	25.75	31.42	37.08	47.92	58.75	85.00	109.17	134.17	157.50	157.50	137.50	113.33	50.42	13.58	–
17	345.60	4.23	7.88	11.42	14.75	21.17	27.50	33.67	39.58	51.25	62.58	90.00	117.50	142.50	165.00	163.33	142.50	115.83	48.33	8.83	–
18	365.70	4.50	8.42	12.08	15.67	22.58	29.17	35.75	42.08	54.58	66.67	96.67	124.17	152.50	170.83	170.00	147.50	118.33	46.00	3.60	–
19	385.80	4.75	8.92	12.75	16.67	23.92	31.00	37.75	44.58	57.75	70.67	101.67	132.50	160.83	178.33	175.83	150.83	120.00	42.75	.–	–
20	405.90	5.04	9.42	13.58	17.50	25.33	32.75	40.00	47.08	61.17	74.58	107.50	139.17	170.83	201.67	181.67	155.00	121.67	39.08	.–	–
21	426.10	5.32	9.92	14.25	18.50	26.58	34.50	42.17	49.67	64.42	78.75	114.17	146.67	180.00	207.50	186.67	157.50	122.50	34.67	.–	–
22	446.20	5.58	10.42	15.00	19.42	28.00	36.33	44.42	52.25	67.67	82.92	119.17	154.17	189.17	215.00	190.83	160.00	122.50	29.83	.–	–
23	466.30	5.87	10.92	15.75	20.42	29.42	38.08	46.67	54.92	71.17	86.67	125.00	161.67	197.50	220.00	195.00	162.50	122.50	24.25	.–	–
24	486.50	6.14	11.50	16.50	21.33	30.83	40.00	48.75	57.50	74.42	90.83	131.67	170.00	207.50	225.83	200.00	165.00	122.50	18.33	.–	–
25	506.70	6.42	12.00	17.25	22.33	32.08	41.67	50.83	60.00	77.75	95.83	136.67	177.50	216.67	231.67	203.33	166.67	120.83	11.75	.–	–
28	567.10	7.25	13.50	19.42	25.17	36.25	47.08	57.67	67.75	87.50	107.50	155.00	200.00	245.00	245.00	211.67	168.33	115.00	.–	.–	–
30	607.50	7.81	14.50	21.00	27.08	39.17	50.83	62.00	72.92	95.00	115.83	166.67	215.83	263.33	253.33	215.00	166.67	109.17	.–	.–	–
32	647.80	8.33	15.58	22.50	29.17	42.00	54.33	66.67	78.33	101.67	124.17	178.33	230.83	283.33	260.00	216.67	163.33	100.83	.–	.–	–
35	708.40	9.17	17.25	24.75	32.17	46.25	60.00	73.33	86.67	112.50	136.67	196.67	255.00	300.83	267.50	218.33	156.67	84.17	.–	.–	–
40	809.40	10.67	19.83	28.67	37.08	53.33	69.17	85.00	100.00	129.17	157.50	227.50	294.17	317.50	272.50	211.67	135.83	47.50	.–	.–	–

5.10 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 48 B – 1 76.2 mm pitch, European version

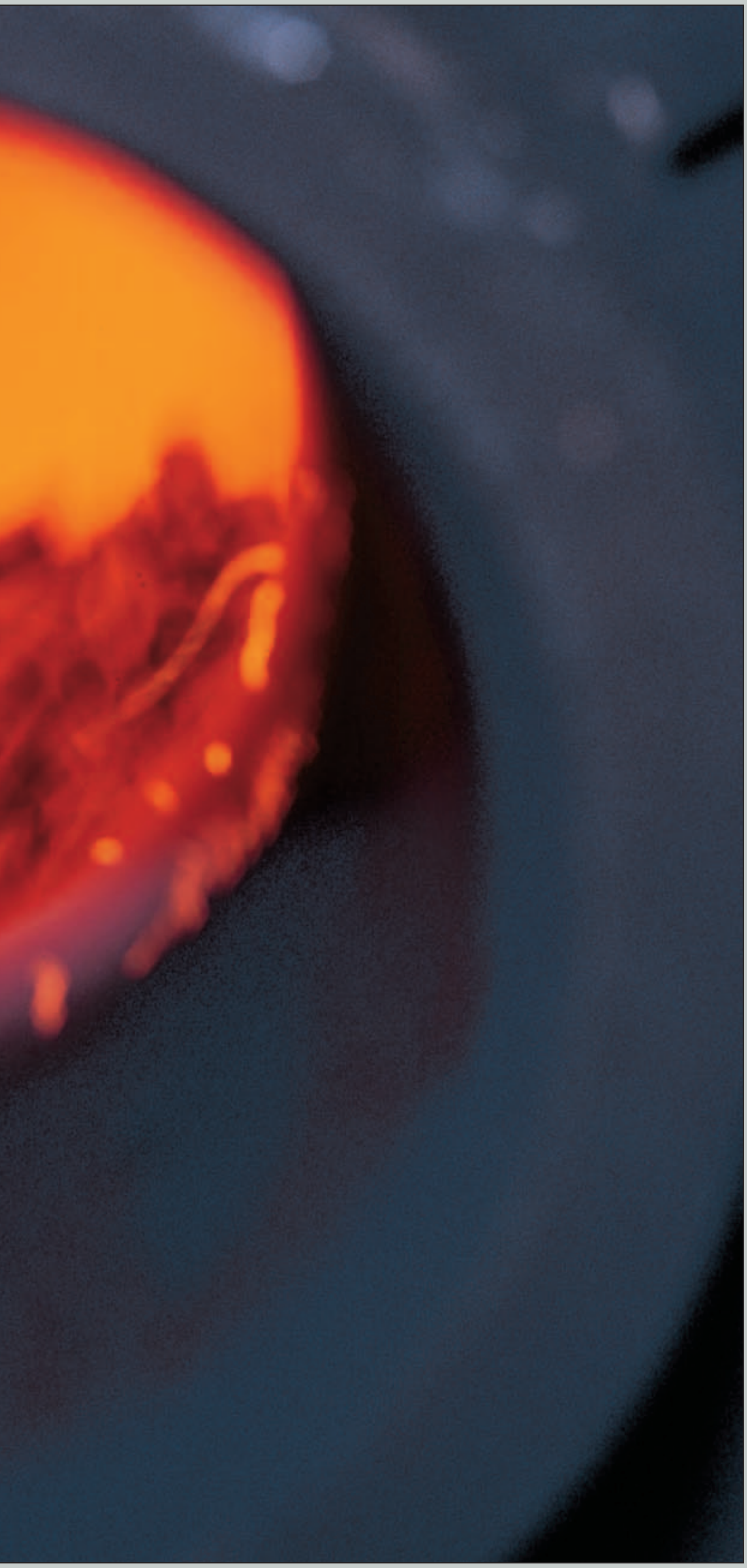
DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution 5	10	15	20	25	30	40	50	60	80	100	125	150	175	200	250	300	350	400	450
		Hand lubrication			Drip lubrication					Oil bath lubrication						Forced feed lubrication					
13	318.40	4.87	9.08	13.08	16.92	20.75	24.42	31.67	38.67	45.58	59.00	72.17	88.33	104.17	119.17	121.67	109.17	88.33	61.58	29.17	–
14	342.40	5.27	9.83	14.17	18.33	22.42	26.42	34.25	41.92	49.33	64.00	78.17	95.83	112.50	129.17	129.17	115.00	92.50	63.33	27.92	–
15	366.50	5.68	10.58	15.25	19.83	24.17	28.50	36.92	45.17	53.17	68.92	84.17	103.33	121.67	140.00	136.67	120.83	96.67	64.58	26.17	–
16	390.60	6.09	11.33	16.33	21.25	25.92	30.58	39.58	48.42	57.00	73.83	90.00	110.00	130.00	147.50	143.33	126.67	100.00	65.33	24.00	–
17	414.70	6.51	12.17	17.50	22.67	27.67	32.58	42.25	51.67	60.83	78.83	96.67	117.50	139.17	155.00	150.83	131.67	103.33	65.83	21.33	–
18	438.80	6.92	12.92	18.58	24.08	29.42	34.67	44.92	54.92	64.75	84.17	102.50	125.00	147.50	162.50	157.50	136.67	105.83	65.75	18.08	–
19	463.00	7.33	13.67	19.75	25.58	31.25	36.75	47.67	58.25	68.67	89.17	108.33	132.50	156.67	169.17	163.33	141.67	108.33	65.25	14.33	–
20	487.10	7.76	14.50	20.83	27.00	33.00	38.92	50.42	61.58	72.58	94.17	115.00	140.83	165.83	175.83	170.00	145.83	110.00	64.42	10.17	–
21	511.30	8.18	15.25	22.00	28.50	34.75	41.00	53.08	64.92	76.50	99.17	120.83	148.33	174.17	182.50	175.83	150.00	111.67	63.08	5.42	–
22	535.50	8.58	16.00	23.08	29.92	36.58	43.08	55.83	68.25	80.42	104.17	127.50	155.83	183.33	189.17	181.67	153.33	113.33	61.42	0.40	–
23	559.60	9.00	16.83	24.25	31.42	38.42	45.25	58.58	71.67	84.17	109.17	133.33	163.33	192.50	195.00	186.67	157.50	114.17	59.17	.–	–
24	583.80	9.42	17.58	25.33	32.92	40.17	47.33	61.33	75.00	88.33	114.17	140.00	170.83	201.67	200.83	191.67	160.00	114.17	56.58	.–	–
25	608.00	9.83	18.42	26.50	34.33	42.00	49.50	64.08	78.33	92.50	120.00	146.67	179.17	211.67	206.67	196.67	163.33	114.17	53.42	.–	–
28	680.50	11.17	20.83	30.00	38.83	47.42	55.92	72.50	88.33	104.17	135.00	165.00	201.67	229.17	222.50	210.00	170.00	112.50	41.75	.–	–
30	729.00	12.00	22.42	32.25	41.83	51.17	60.25	78.08	95.83	112.50	145.83	178.33	217.50	240.00	231.67	217.50	172.50	109.17	31.67	.–	–
32	777.40	12.92	24.00	34.58	44.83	54.83	64.58	83.33	102.50	120.83	155.83	190.83	233.33	250.00	240.00	224.17	174.17	105.00	19.92	.–	–
35	850.10	14.17	26.50	38.17	49.42	60.42	71.17	92.50	112.50	132.50	172.50	210.00	257.50	263.33	251.67	232.50	174.17	95.00	.–	.–	–
40	973.20	16.42	30.58	44.08	57.08	69.75	82.17	106.67	130.00	153.33	197.50	243.33	290.00	282.50	265.83	240.83	168.33	71.83	.–	.–	–

5.11 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 56 B – 1 88.9 mm pitch, European version

DIN 8187

Number of teeth	Reference Ø mm	Small sprocket revolution 5	10	15	20	25	30	40	50	60	80	100	125	150	175	200	250	300	350	400	450
		Hand lubrication		Drip lubrication					Oil bath lubrication					Forced feed lubrication							
13	371.50	8.20	15.29	22.03	28.49	34.94	41.12	53.33	65.12	76.76	99.36	121.53	148.75	170.30	175.42	140.34	70.17	20.42	–	–	–
14	399.50	8.87	16.55	23.86	30.87	37.76	44.49	57.68	70.59	83.07	107.78	131.64	161.38	189.45	179.52	151.56	75.78	19.50	–	–	–
15	427.60	9.57	17.82	25.68	33.39	40.70	47.99	62.17	76.07	89.54	116.06	141.74	174.01	196.00	182.28	156.80	78.40	18.32	–	–	–
16	455.70	10.26	19.08	27.50	35.79	43.65	51.50	66.65	81.54	95.99	124.33	151.56	185.24	206.50	192.06	165.20	82.60	16.80	–	–	–
17	483.80	10.96	20.49	29.47	38.18	46.60	54.86	71.15	87.01	102.44	132.75	162.79	197.87	217.00	201.81	173.60	75.95	14.93	–	–	–
18	512.00	11.65	21.76	31.29	40.55	49.54	58.38	75.65	92.49	109.04	141.74	172.61	210.50	227.50	211.58	182.00	75.05	12.66	–	–	–
19	540.20	12.34	23.02	33.26	43.08	52.63	61.89	80.28	98.09	115.64	150.16	182.43	223.13	236.84	220.26	189.47	73.42	10.03	–	–	–
20	568.20	13.07	24.42	35.08	45.47	55.57	65.54	84.91	103.70	122.22	158.58	193.66	237.16	246.16	228.93	196.93	66.46	7.12	–	–	–
21	596.50	13.78	25.68	37.05	47.99	58.52	69.04	89.39	109.33	128.83	167.00	203.48	249.79	255.50	237.62	204.40	56.21	3.80	–	–	–
22	624.70	14.45	26.94	38.87	50.39	61.60	72.55	94.02	114.93	135.43	175.72	214.71	262.42	264.84	246.30	211.87	47.67	0.28	–	–	–
23	652.90	15.16	28.34	40.84	52.91	64.70	76.20	98.65	120.69	141.74	183.84	224.53	273.00	275.05	253.89	220.04	41.23	–	–	–	–
24	681.10	15.86	29.60	42.66	55.44	67.65	79.70	103.28	126.30	148.75	192.26	235.76	273.87	282.34	254.67	225.87	31.05	–	–	–	–
25	709.30	16.55	31.02	44.63	57.81	70.73	83.36	107.91	131.91	155.77	202.08	246.99	287.45	296.34	267.33	237.07	26.67	–	–	–	–
28	793.90	18.81	35.08	50.52	65.39	79.86	94.17	122.09	148.75	175.42	227.34	277.86	320.84	311.21	289.43	256.67	19.25	–	–	–	–
30	850.50	20.21	37.76	54.31	70.44	86.17	101.46	131.49	161.38	189.45	245.58	300.31	336.00	325.92	303.10	268.80	–	–	–	–	–
32	907.00	21.76	40.42	58.23	75.49	92.33	108.75	140.33	172.61	203.48	262.42	321.36	350.00	339.50	325.50	280.00	–	–	–	–	–
35	991.80	23.86	44.63	64.28	83.22	101.75	119.85	155.77	189.45	223.13	290.49	353.64	368.66	357.60	342.85	294.93	–	–	–	–	–
40	1133.10	27.65	51.50	74.23	96.12	117.46	138.37	179.63	218.92	258.21	332.59	406.00	399.91	383.64	371.92	324.80	–	–	–	–	–



5.12 Transmittable output’s (kW)
for Rex-High-Capacity-Roller Chains 08 A – 1
12.7 mm pitch, American version

ANSI 40-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 50	200	400	600	900	1200	1800	2400	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	9000
		Hand lubrication		Drip lubrication				Oil bath lubrication				Forced feed lubrication									
13	53.10	0.23	0.80	1.50	2.16	3.11	4.02	4.99	3.24	2.32	1.84	1.51	1.27	1.07	0.93	0.82	0.72	0.65	0.58	0.53	–
14	57.10	0.25	0.87	1.62	2.33	3.37	4.36	5.58	3.62	2.59	2.06	1.68	1.41	1.21	1.04	0.92	0.82	0.72	0.66	0.59	–
15	61.10	0.27	0.93	1.75	2.52	3.62	4.70	6.19	4.02	2.88	2.28	1.87	1.57	1.33	1.16	1.02	0.90	0.81	0.72	.–	–
16	65.10	0.29	1.00	1.87	2.70	3.88	5.03	6.82	4.42	3.17	2.52	2.06	1.72	1.47	1.27	1.12	0.99	0.89	0.80	.–	–
17	69.10	0.31	1.07	2.00	2.88	4.15	5.37	7.47	4.85	3.47	2.76	2.26	1.89	1.62	1.40	1.23	1.09	0.97	0.87	.–	–
18	73.10	0.32	1.14	2.12	3.07	4.42	5.72	8.13	5.28	3.78	3.00	2.46	2.06	1.76	1.52	1.33	1.18	1.06	0.96	.–	–
19	77.20	0.35	1.21	2.26	3.25	4.68	6.06	8.75	5.73	4.10	3.26	2.67	2.23	1.91	1.65	1.45	1.28	1.15	1.04	.–	–
20	81.20	0.37	1.27	2.38	3.43	4.95	6.41	9.25	6.19	4.42	3.52	2.88	2.41	2.06	1.78	1.57	1.39	1.24	1.12	.–	–
21	85.20	0.38	1.35	2.52	3.62	5.22	6.76	9.75	6.66	4.77	3.78	3.09	2.59	2.22	1.92	1.68	1.49	1.33	1.21	.–	–
22	89.20	0.41	1.42	2.64	3.81	5.48	7.10	10.25	7.14	5.11	4.06	3.32	2.78	2.37	2.06	1.81	1.60	1.43	.–	.–	–
23	93.30	0.42	1.48	2.77	3.99	5.75	7.45	10.75	7.63	5.46	4.33	3.55	2.97	2.54	2.20	1.93	1.72	1.53	.–	.–	–
24	97.30	0.45	1.56	2.90	4.18	6.02	7.80	11.25	8.13	5.82	4.62	3.78	3.17	2.71	2.34	2.06	1.82	1.63	.–	.–	–
25	101.30	0.47	1.62	3.03	4.37	6.29	8.15	11.75	8.67	6.19	4.91	4.02	3.37	2.88	2.49	2.19	1.94	.–	.–	.–	–
28	113.40	0.52	1.83	3.42	4.94	7.12	9.25	13.25	10.25	7.33	5.82	4.77	3.99	3.41	2.96	2.59	2.30	.–	.–	.–	–
30	121.50	0.57	1.98	3.69	5.32	7.67	9.92	14.33	11.33	8.13	6.46	5.28	4.42	3.78	3.27	2.88	.–	.–	.–	.–	–
32	129.60	0.61	2.12	3.96	5.71	8.22	10.67	15.33	12.50	9.00	7.12	5.82	4.88	4.17	3.61	3.17	.–	.–	.–	.–	–
35	141.70	0.67	2.33	4.37	6.28	9.08	11.75	16.92	14.33	10.25	8.13	6.66	5.58	4.77	4.13	.–	.–	.–	.–	.–	–
40	161.90	0.77	2.70	5.04	7.26	10.42	13.58	19.50	17.50	12.50	9.92	8.13	6.82	5.82	.–	.–	.–	.–	.–	.–	–

5.13 Transmittable output’s (kW)
for Rex-High-Capacity-Roller Chains 10 A – 1
15.875 mm pitch, American version

ANSI 50-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 50	100	300	500	900	1200	1500	1800	2100	2400	2700	3000	3300	3500	4000	4500	5000	5400	5800	6200
		Hand lubrication		Drip lubrication			Oil bath lubrication					Forced feed lubrication									
13	66.30	0.45	0.84	2.25	3.55	6.05	7.85	7.97	5.97	4.72	3.88	3.25	2.77	2.41	2.21	1.80	1.51	1.29	1.14	1.03	–
14	71.30	0.48	0.91	2.43	3.83	6.56	8.50	8.92	6.67	5.28	4.33	3.63	3.10	2.69	2.47	2.01	1.68	1.44	1.27	.–	–
15	76.40	0.52	0.97	2.62	4.14	7.07	9.17	9.92	7.41	5.86	4.80	4.02	3.44	2.98	2.73	2.23	1.87	1.60	1.42	.–	–
16	81.40	0.56	1.05	2.81	4.44	7.57	9.83	10.92	8.16	6.45	5.29	4.43	3.78	3.28	3.02	2.46	2.06	1.76	1.57	.–	–
17	86.40	0.60	1.12	3.00	4.74	8.08	10.50	11.92	8.92	7.07	5.79	4.86	4.15	3.60	3.30	2.69	2.26	1.93	1.71	.–	–
18	91.40	0.64	1.19	3.19	5.04	8.58	11.17	13.00	9.75	7.70	6.32	5.29	4.52	3.92	3.59	2.93	2.46	2.11	.–	.–	–
19	96.40	0.67	1.26	3.38	5.35	9.08	11.83	14.08	10.58	8.33	6.85	5.74	4.90	4.25	3.90	3.18	2.67	2.28	.–	.–	–
20	101.50	0.72	1.33	3.58	5.65	9.67	12.50	15.17	11.42	9.00	7.39	6.20	5.29	4.59	4.21	3.43	2.88	2.47	.–	.–	–
21	106.50	0.75	1.41	3.78	5.96	10.17	13.17	16.08	12.25	9.67	7.96	6.67	5.69	4.94	4.53	3.70	3.09	2.66	.–	.–	–
22	111.60	0.79	1.47	3.97	6.27	10.67	13.83	16.92	13.17	10.42	8.50	7.16	6.11	5.30	4.86	3.97	3.32	2.85	.–	.–	–
23	116.60	0.83	1.55	4.17	6.57	11.17	14.50	17.75	14.08	11.08	9.08	7.65	6.52	5.66	5.19	4.23	3.55	.–	.–	.–	–
24	121.60	0.87	1.62	4.36	6.88	11.75	15.25	18.58	15.00	11.83	9.75	8.15	6.95	6.03	5.53	4.52	3.78	.–	.–	.–	–
25	126.70	0.91	1.70	4.56	7.19	12.25	15.92	19.42	15.92	12.58	10.33	8.67	7.40	6.42	5.88	4.80	4.02	.–	.–	.–	–
28	141.80	1.00	1.92	5.15	8.13	13.83	18.00	21.92	18.92	14.92	12.25	10.25	8.75	7.61	6.97	5.69	.–	.–	.–	.–	–
30	151.90	1.11	2.02	5.55	8.75	14.92	19.33	23.67	20.92	16.58	13.58	11.42	9.75	8.42	7.73	6.31	.–	.–	.–	.–	–
32	162.00	1.18	2.22	5.95	9.42	16.00	20.75	25.33	23.08	18.25	15.00	12.50	10.75	9.25	8.50	6.95	.–	.–	.–	.–	–
35	177.10	1.31	2.44	6.55	10.33	17.67	22.83	27.92	26.42	20.92	17.08	14.33	12.25	10.67	9.75	7.96	.–	.–	.–	.–	–
40	202.30	1.51	2.82	7.57	11.92	20.33	25.92	32.25	32.25	25.50	20.92	17.50	15.00	13.00	11.92	.–	.–	.–	.–	.–	–

5.14 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 12 A-1 19.05 mm pitch, American version

ANSI 60-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 50	100	200	500	700	900	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3500	3800	4000	4600
		Hand lubrication		Drip lubrication			Oil bath lubrication						Forced feed lubrication								
13	79.60	0.77	1.43	2.68	6.12	8.30	10.42	12.75	10.08	8.24	6.95	5.90	5.12	4.49	3.98	3.57	3.21	2.55	2.25	2.08	–
14	85.60	0.83	1.56	2.91	6.62	9.00	11.33	14.25	11.33	9.25	7.77	6.59	5.72	5.02	4.45	3.98	3.58	2.85	2.51	2.33	–
15	91.60	0.90	1.67	3.13	7.14	9.67	12.17	15.75	12.50	10.25	8.58	7.31	6.34	5.57	4.94	4.42	3.97	3.16	2.78	2.58	–
16	97.60	0.97	1.80	3.36	7.66	10.42	13.08	16.92	13.83	11.25	9.50	8.05	6.98	6.13	5.44	4.87	4.38	3.47	3.07	2.85	–
17	103.70	1.03	1.92	3.59	8.18	11.08	13.92	18.08	15.17	12.33	10.42	8.83	7.65	6.72	5.96	5.33	4.79	3.81	3.36	3.12	–
18	109.70	1.10	2.04	3.82	8.67	11.75	14.83	19.17	16.50	13.42	11.33	9.58	8.33	7.32	6.49	5.81	5.22	4.15	3.66	3.40	–
19	115.70	1.17	2.17	4.05	9.25	12.50	15.67	20.33	17.92	14.58	12.25	10.42	9.08	7.93	7.04	6.30	5.67	4.50	3.97	3.68	–
20	121.80	1.23	2.29	4.28	9.75	13.25	16.58	21.50	19.33	15.75	13.25	11.25	9.75	8.58	7.60	6.81	6.12	4.86	4.28	.–	–
21	127.80	1.30	2.41	4.51	10.25	13.92	17.50	22.67	20.75	16.92	14.25	12.08	10.50	9.25	8.18	7.32	6.58	5.22	4.61	.–	–
22	133.90	1.37	2.53	4.74	10.83	14.67	18.42	23.83	22.25	18.17	15.33	13.00	11.25	9.92	8.75	7.85	7.06	5.61	4.94	.–	–
23	139.90	1.43	2.66	4.97	11.33	15.33	19.33	25.00	23.83	19.42	16.33	13.92	12.00	10.58	9.42	8.42	7.55	5.99	.–	.–	–
24	145.90	1.50	2.78	5.21	11.83	16.08	20.25	26.17	25.33	20.67	17.42	14.75	12.83	11.25	10.00	8.92	8.04	6.38	.–	.–	–
25	152.00	1.57	2.91	5.44	12.42	16.83	21.17	27.42	27.00	22.00	18.58	15.75	13.67	12.00	10.67	9.50	8.58	6.79	.–	.–	–
28	170.10	1.77	3.29	6.15	14.00	19.00	23.92	30.92	32.00	26.08	22.00	18.67	16.17	14.17	12.58	11.25	10.17	8.05	.–	.–	–
30	182.30	1.91	3.54	6.62	15.08	20.50	25.75	33.33	35.50	28.92	24.33	20.67	17.92	15.75	14.00	12.50	11.25	.–	.–	.–	–
32	194.40	2.04	3.80	7.11	16.17	21.92	27.58	35.75	39.08	31.83	26.83	22.75	19.75	17.33	15.42	13.75	12.42	.–	.–	.–	–
35	212.50	2.25	4.18	7.83	17.83	24.17	30.42	39.42	44.67	36.42	30.75	26.08	22.58	19.83	17.58	15.75	14.17	.–	.–	.–	–
40	242.80	2.60	4.83	9.08	20.58	27.92	35.08	45.50	52.25	44.50	37.50	31.83	27.58	24.25	21.50	19.25	.–	.–	.–	.–	–

5.15 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 16 A – 1 25.4 mm pitch, American version

ANSI 80-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 25	50	100	200	300	400	500	700	900	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000
		Hand lubrication		Drip lubrication				Oil bath lubrication				Forced feed lubrication									
13	106.10	0.97	1.80	3.36	6.26	9.00	11.67	14.25	19.33	24.25	21.00	16.00	12.67	10.42	8.67	7.42	6.43	5.65	5.01	4.48	–
14	114.10	1.04	1.95	3.63	6.78	9.75	12.67	15.50	20.92	26.25	23.50	17.83	14.17	11.58	9.75	8.30	7.19	6.31	5.60	5.01	–
15	122.20	1.12	2.10	3.92	7.31	10.50	13.67	16.67	22.58	28.33	26.00	19.83	15.75	12.83	10.75	9.17	7.97	7.00	6.21	0.35	–
16	130.20	1.21	2.25	4.20	7.83	11.25	14.58	17.83	24.17	30.33	28.67	21.83	17.33	14.17	11.83	10.17	8.75	7.71	6.84	.–	–
17	138.20	1.29	2.40	4.48	8.33	12.08	15.58	19.08	25.83	32.42	31.33	23.83	18.92	15.50	13.00	11.08	9.58	8.42	7.47	.–	–
18	146.30	1.37	2.56	4.77	8.92	12.83	16.58	20.33	27.50	34.42	34.17	26.00	20.67	16.92	14.17	12.08	10.50	9.17	8.16	.–	–
19	154.30	1.45	2.71	5.06	9.42	13.58	17.58	21.50	29.17	36.50	37.08	28.25	22.42	18.33	15.33	13.08	11.33	10.00	8.83	.–	–
20	162.40	1.53	2.87	5.35	10.00	14.33	18.58	22.75	30.83	38.67	40.08	30.50	24.17	19.83	16.58	14.17	12.25	10.75	0.79	.–	–
21	170.40	1.62	3.02	5.63	10.50	15.17	19.67	24.00	32.50	40.75	43.08	32.83	26.00	21.33	17.83	15.25	13.25	11.58	.–	.–	–
22	178.50	1.70	3.17	5.92	11.08	15.92	20.67	25.25	34.17	42.83	46.25	35.17	27.92	22.83	19.17	16.33	14.17	12.42	.–	.–	–
23	186.50	1.78	3.33	6.22	11.58	16.67	21.67	26.42	35.83	44.92	49.33	37.58	29.83	24.42	20.50	17.50	15.17	13.25	.–	.–	–
24	194.60	1.87	3.49	6.51	12.17	17.50	22.67	27.75	37.50	47.00	51.67	40.08	31.75	26.00	21.83	18.58	16.17	14.17	.–	.–	–
25	202.70	1.95	3.65	6.81	12.67	18.25	23.67	29.00	39.17	49.17	54.08	42.58	33.83	27.67	23.17	19.83	17.17	6.95	.–	.–	–
28	226.80	2.21	4.12	7.69	14.33	20.67	26.75	32.75	44.33	55.50	61.08	50.50	40.08	32.83	27.50	23.50	20.33	.–	.–	.–	–
30	243.00	2.37	4.44	8.28	15.42	22.25	28.83	35.25	47.75	59.83	65.75	56.00	44.42	36.33	30.50	26.00	20.42	.–	.–	.–	–
32	259.10	2.55	4.76	8.92	16.58	23.83	30.92	37.75	51.17	64.17	70.58	61.67	48.92	40.08	33.36	28.67	.–	.–	.–	.–	–
35	283.40	2.81	5.24	9.75	18.25	26.33	34.08	41.67	56.42	70.67	77.75	70.58	56.00	45.83	38.42	32.83	.–	.–	.–	.–	–
40	323.70	3.24	6.06	11.33	21.08	30.33	39.33	48.08	65.08	81.67	90.00	85.83	68.42	56.00	46.92	.–	.–	.–	.–	.–	–

5.16 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 20 A – 1 31.75 mm pitch, American version

ANSI 100-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 10	25	50	100	200	300	400	500	600	700	800	900	1000	1100	1200	1400	1600	1800	2000	2200
		Hand lubrication			Drip lubrication		Oil bath lubrication						Forced feed lubrication								
13	132.70	0.81	1.85	3.44	6.43	12.00	17.25	22.42	27.33	32.25	37.08	35.08	29.42	25.08	21.75	19.08	15.17	12.42	10.42	–	–
14	142.70	0.87	2.00	3.73	6.96	13.00	18.75	24.25	29.67	34.92	40.08	39.17	32.83	28.00	24.33	21.33	16.92	13.83	11.58	–	–
15	152.70	0.94	2.16	4.02	7.50	14.00	20.17	26.17	31.92	37.67	43.25	43.50	36.42	31.08	27.00	23.67	18.75	15.42	12.92	–	–
16	162.70	1.02	2.31	4.31	8.04	15.00	21.58	28.00	34.25	40.33	46.33	47.92	40.08	34.25	29.67	26.08	20.67	16.92	14.17	–	–
17	172.80	1.08	2.47	4.60	8.58	16.00	23.08	29.92	36.58	43.08	49.50	52.42	43.92	37.50	32.50	28.50	22.67	18.50	15.17	–	–
18	182.20	1.15	2.62	4.89	9.17	17.00	24.58	31.83	38.92	45.83	52.67	57.17	47.92	40.92	35.42	31.08	24.67	20.25	13.83	–	–
19	192.90	1.22	2.78	5.19	9.67	18.08	26.00	33.75	41.25	48.58	55.83	62.00	51.92	44.33	38.42	33.75	26.75	21.92	5.58	–	–
20	202.90	1.29	2.94	5.48	10.25	19.08	27.50	35.67	43.58	51.33	59.00	66.50	56.08	47.92	41.50	36.42	28.92	23.67	.–	–	–
21	213.00	1.36	3.10	5.78	10.75	20.17	29.00	37.58	45.92	54.08	62.17	70.08	60.33	51.50	44.67	39.17	31.08	25.42	.–	–	–
22	223.10	1.42	3.26	6.08	11.33	21.17	30.50	39.50	48.33	56.92	65.42	73.75	64.75	55.25	47.92	42.00	33.33	27.33	.–	–	–
23	233.20	1.50	3.42	6.38	11.92	22.17	32.00	41.42	50.67	59.75	68.58	77.33	69.17	59.08	51.17	44.92	35.67	29.17	.–	–	–
24	243.20	1.57	3.58	6.68	12.50	23.25	33.50	43.42	53.08	62.50	71.83	81.00	73.67	62.92	54.58	47.83	38.00	31.08	.–	–	–
25	253.30	1.64	3.74	6.97	13.00	24.33	35.00	45.33	55.42	65.33	75.08	85.00	78.42	66.92	58.00	50.92	40.42	30.25	.–	–	–
28	283.60	1.85	4.22	7.89	14.75	27.50	39.58	51.25	62.67	73.83	85.00	95.83	92.50	79.33	68.75	60.33	47.92	4.12	.–	–	–
30	303.80	2.00	4.56	8.50	15.83	29.58	42.67	55.25	67.50	79.58	91.67	103.33	103.33	88.33	76.25	66.92	53.08	.–	.–	–	–
32	323.90	2.14	4.88	9.08	17.00	31.75	45.67	59.25	72.42	85.00	98.33	110.83	113.33	96.67	84.17	73.75	58.50	.–	.–	–	–
35	354.20	2.36	5.38	10.00	18.75	34.92	50.33	65.25	79.75	94.17	108.33	121.67	130.00	110.83	95.83	84.17	40.33	.–	.–	–	–
40	404.70	2.72	6.22	11.58	21.67	40.33	58.17	75.33	92.50	108.33	125.00	140.83	156.67	135.83	117.50	103.33	.–	.–	.–	–	–

5.17 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 24 A – 1 38.1 mm pitch, American version

ANSI 120-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 10	25	50	100	150	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
		Hand lubrication		Drip lubrication			Oil bath lubrication					Forced feed lubrication									
13	159.20	1.37	3.12	5.81	10.83	15.58	20.25	29.17	37.75	46.17	54.42	49.50	40.50	33.92	29.00	25.08	22.08	19.58	17.50	15.75	–
14	171.20	1.47	3.38	6.29	11.75	16.92	21.92	31.58	40.92	50.00	58.92	55.33	45.25	37.92	32.42	28.08	24.67	21.83	19.58	10.50	–
15	183.30	1.59	3.63	6.77	12.67	18.25	23.58	34.00	44.08	53.83	63.42	61.33	50.25	42.08	35.92	31.17	27.33	24.25	21.67	3.75	–
16	195.30	1.71	3.89	7.27	13.58	19.50	25.33	36.50	47.25	57.75	68.08	67.58	55.33	46.33	39.58	34.33	30.08	26.67	23.92	.–	–
17	207.30	1.82	4.16	7.76	14.50	20.83	27.00	38.92	50.42	61.67	72.67	74.00	60.58	50.75	43.33	37.58	33.00	29.25	26.17	.–	–
18	219.40	1.94	4.42	8.25	15.42	22.17	28.75	41.42	53.58	65.50	77.25	80.58	66.00	55.33	47.25	40.92	36.00	31.92	23.83	.–	–
19	231.50	2.06	4.68	8.75	16.33	23.50	30.42	43.92	56.83	69.50	81.92	87.50	71.58	60.00	51.17	44.42	38.92	34.58	17.33	.–	–
20	243.60	2.17	4.96	9.25	17.25	24.83	32.17	46.42	60.08	73.50	86.67	94.17	77.33	64.75	55.33	47.92	42.08	37.33	9.25	.–	–
21	255.60	2.29	5.22	9.75	18.17	26.17	33.92	48.92	63.33	77.50	91.67	101.67	83.17	69.67	59.50	51.58	45.25	40.17	.–	.–	–
22	267.70	2.41	5.49	10.25	19.17	27.58	35.67	51.42	66.58	81.42	95.83	109.17	89.17	74.75	63.83	55.33	48.50	41.83	.–	.–	–
23	279.80	2.52	5.77	10.75	20.08	28.92	37.50	54.00	69.92	85.83	100.83	115.83	95.00	79.92	68.17	59.08	51.92	35.33	.–	.–	–
24	291.90	2.65	6.04	11.25	21.00	30.33	39.25	56.50	73.25	89.17	105.83	120.83	101.67	85.00	72.67	62.92	55.25	27.17	.–	.–	–
25	304.00	2.77	6.31	11.75	22.00	31.67	41.00	59.08	76.50	93.33	110.00	126.67	108.33	90.83	77.33	67.00	58.75	.–	.–	.–	–
28	340.30	3.12	7.12	13.33	24.83	35.75	46.33	66.75	86.67	105.83	124.17	143.33	128.33	107.50	91.67	79.42	.–	.–	.–	.–	–
30	364.50	3.37	7.68	14.33	26.75	38.58	49.92	71.92	93.33	114.17	134.17	154.17	141.67	119.17	101.67	88.33	.–	.–	.–	.–	–
32	388.70	3.61	8.23	15.33	28.67	41.25	53.42	77.00	100.00	121.67	143.33	165.00	156.67	130.83	111.67	85.00	.–	.–	.–	.–	–
35	425.00	3.97	9.08	16.92	31.58	45.50	58.92	85.00	110.00	134.17	158.33	181.67	179.17	150.00	128.33	56.92	.–	.–	.–	.–	–
40	485.60	4.59	10.50	19.58	36.50	52.58	68.08	98.33	127.50	155.00	183.33	210.00	212.50	170.00	85.83	.–	.–	.–	.–	.–	–

5.18 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 28 A – 1 44.45 mm pitch, American version

ANSI 140-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 10	25	50	100	150	200	250	300	350	400	450	500	550	600	700	800	900	1000	1100	1200
		Hand lubrication		Drip lubrication		Oil bath lubrication								Forced feed lubrication							
13	185.80	2.12	4.85	9.08	16.92	24.33	31.50	38.50	45.33	52.08	58.75	65.33	71.83	78.25	70.50	55.92	45.75	38.33	32.75	28.42	–
14	199.80	2.30	5.26	9.83	18.33	26.33	34.17	41.75	49.17	56.50	63.75	70.83	77.92	84.17	78.75	62.50	51.17	42.83	36.58	31.67	–
15	213.80	2.48	5.67	10.58	19.75	28.42	36.75	45.00	53.00	60.92	68.67	76.33	84.17	91.67	87.50	69.33	56.75	47.58	40.58	33.33	–
16	227.90	2.66	6.07	11.33	21.17	30.42	39.42	48.25	56.83	65.25	73.58	81.83	90.00	98.33	95.83	76.33	62.50	52.33	44.75	28.92	–
17	241.90	2.84	6.47	12.08	22.58	32.50	42.08	51.42	60.67	69.67	78.50	87.50	95.83	105.00	105.00	83.33	68.50	57.33	49.00	24.83	–
18	256.00	3.02	6.88	12.83	24.00	34.50	44.75	54.67	64.42	74.00	83.33	92.50	101.67	110.83	115.00	90.83	75.00	62.50	53.33	18.92	–
19	270.10	3.20	7.31	13.33	25.42	36.67	47.50	58.33	68.42	78.58	88.33	98.33	108.33	118.33	124.17	99.17	80.92	67.75	57.83	10.83	–
20	284.10	3.38	7.72	14.42	26.83	38.67	50.08	61.25	72.25	82.92	93.33	104.17	114.17	125.00	134.17	106.67	87.50	73.17	60.83	4.33	–
21	298.30	3.57	8.14	15.17	28.33	40.83	52.83	64.67	76.17	87.50	98.33	110.00	120.83	131.67	142.50	115.00	94.17	78.75	57.50	.–	–
22	312.30	3.75	8.58	16.00	29.83	42.92	55.58	68.00	80.17	92.50	104.17	115.83	126.67	138.33	150.00	123.33	100.83	84.17	51.67	.–	–
23	326.40	3.94	9.00	16.75	31.25	45.08	58.33	71.33	84.17	96.67	109.17	120.83	133.33	145.00	156.67	131.67	107.50	90.00	46.67	.–	–
24	340.50	4.12	9.42	17.58	32.75	47.17	61.08	74.75	88.33	100.83	114.17	126.67	139.17	151.67	164.17	140.00	115.00	95.83	38.75	.–	–
25	354.70	4.31	9.83	18.33	34.25	49.33	63.83	78.08	91.67	105.83	119.17	132.50	145.83	158.33	171.67	149.17	122.50	100.00	31.50	.–	–
28	397.00	4.87	11.08	20.75	38.67	55.67	72.08	88.33	104.17	119.17	135.00	150.00	164.17	179.17	194.17	176.67	145.00	81.67	.–	.–	–
30	425.30	5.24	12.00	22.33	41.67	60.00	77.67	95.00	111.67	128.33	145.00	161.67	177.50	193.33	209.17	195.83	145.83	69.17	.–	.–	–
32	453.50	5.62	12.83	23.92	44.67	64.33	83.25	101.67	120.00	137.50	155.83	172.50	190.00	206.67	223.33	210.00	140.00	54.00	.–	.–	–
35	495.90	6.20	14.17	26.33	49.25	70.92	91.67	112.50	132.50	151.67	171.67	190.83	209.17	228.33	246.67	201.67	119.17	24.00	.–	.–	–
40	566.60	7.16	16.33	30.50	56.83	81.83	105.83	130.00	152.50	175.83	198.33	220.00	241.67	263.33	258.33	173.33	71.67	.–	.–	.–	–

5.19 Transmittable output's (kW) for Rex-High-Capacity-Roller Chains 32 A – 1 50.8 mm pitch, American version

ANSI 160-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution 10	25	50	100	150	200	250	300	350	400	500	550	600	700	750	800	850	900	950	1000
		Hand lubr.	Drip lubrication			Oil bath lubrication					Forced feed lubrication										
13	212.30	3.06	7.02	13.08	24.33	35.00	45.33	55.50	65.33	75.08	85.00	103.33	90.00	78.50	62.50	56.25	51.17	30.67	15.00	–	–
14	228.30	3.32	7.58	14.17	26.33	37.92	49.17	60.08	70.75	81.42	91.67	112.50	100.00	87.50	69.83	62.83	57.17	28.50	11.25	–	–
15	244.30	3.57	8.22	15.25	28.42	40.83	52.92	64.75	76.25	87.50	99.17	120.83	111.67	97.50	77.50	69.75	55.25	26.33	7.50	–	–
16	260.40	3.83	8.75	16.33	30.42	43.75	56.75	69.42	81.75	94.17	105.83	130.00	122.50	107.50	85.00	71.58	53.33	24.17	4.17	–	–
17	276.50	4.08	9.33	17.42	32.50	46.75	60.58	74.08	87.50	100.00	113.33	138.33	134.17	117.50	93.33	73.42	51.42	22.00	.–	–	–
18	292.60	4.34	10.00	18.58	34.58	49.67	64.42	78.75	92.50	106.67	120.00	147.50	146.67	128.33	101.67	75.33	49.50	19.83	.–	–	–
19	308.70	4.61	10.58	19.67	36.67	52.67	68.33	83.33	98.33	113.33	127.50	156.67	158.33	138.33	110.83	77.50	47.50	17.67	.–	–	–
20	324.70	4.87	11.17	20.83	38.75	55.75	72.25	88.33	104.17	120.00	135.00	165.00	176.67	150.00	112.50	79.17	45.00	15.00	.–	–	–
21	340.90	5.13	11.75	21.92	40.83	58.75	76.17	93.33	110.00	125.83	142.50	174.17	178.33	160.83	106.67	72.75	40.50	12.83	.–	–	–
22	357.00	5.40	12.42	23.08	43.00	61.75	80.08	97.50	115.00	132.50	149.17	183.33	180.00	172.50	100.83	66.33	36.00	.–	.–	–	–
23	373.10	5.67	13.00	24.17	45.08	64.75	84.17	102.50	120.83	139.17	156.67	192.50	181.67	170.83	95.00	59.92	31.50	.–	.–	–	–
24	389.20	5.93	13.58	25.33	47.17	67.83	88.33	107.50	126.67	145.83	164.17	200.00	183.33	169.17	89.17	53.50	27.00	.–	.–	–	–
25	405.30	6.20	14.25	26.50	49.33	70.92	91.67	112.50	132.50	152.50	171.67	207.50	185.00	167.50	83.33	47.08	15.83	.–	.–	–	–
28	453.70	7.01	16.08	29.92	55.75	80.08	104.17	126.67	149.17	172.50	194.17	216.67	188.33	162.50	65.83	27.92	.–	.–	.–	–	–
30	486.00	7.55	17.25	32.25	60.08	86.67	111.67	136.67	160.83	185.00	209.17	225.00	191.67	158.33	54.17	15.00	.–	.–	.–	–	–
32	518.30	8.09	18.58	34.58	64.42	92.50	120.00	146.67	172.50	199.17	224.17	221.67	185.00	149.17	43.33	.–	.–	.–	.–	–	–
35	566.70	8.92	20.42	38.08	70.92	101.67	132.50	161.67	190.00	219.17	246.67	219.17	179.17	136.67	25.00	.–	.–	.–	.–	–	–
40	647.50	10.33	23.58	44.00	81.92	117.50	152.50	186.67	220.00	253.33	285.00	216.67	166.67	112.50	.–	.–	.–	.–	.–	–	–

5.20 Transmittable output's (kW)
for Rex-High-Capacity-Roller Chains 40 A – 1
63.5 mm pitch, American version

ANSI 200-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution																			
		5	10	15	20	30	40	50	60	80	100	150	200	250	300	350	400	450	550	600	650
		Hand lubrication				Drip lubrication					Oil bath lubrication				Forced feed lubrication						
13	265.40	3.02	5.62	8.09	10.50	15.08	19.58	23.92	28.17	36.50	44.67	64.33	83.25	101.67	120.00	128.33	114.17	95.83	50.00	22.50	–
14	285.40	3.26	6.09	8.75	11.33	16.33	21.25	25.92	30.50	39.58	48.33	69.67	90.00	110.00	130.00	135.83	120.00	100.00	49.83	19.83	–
15	305.40	3.52	6.56	9.42	12.25	17.67	22.83	27.92	32.92	42.67	52.08	75.08	97.50	119.17	143.33	143.33	125.83	104.17	49.17	16.75	–
16	325.50	3.77	7.03	10.17	13.08	18.92	24.50	29.92	35.25	45.67	55.83	80.50	104.17	127.50	150.00	150.00	130.83	107.50	47.92	12.92	–
17	345.60	4.02	7.51	10.83	14.00	20.17	26.17	32.00	37.67	48.75	59.67	85.83	111.67	135.83	156.67	155.83	135.83	110.00	46.00	8.42	–
18	365.70	4.28	7.98	11.50	14.92	21.50	27.83	34.00	40.00	51.92	63.42	91.67	118.33	145.00	162.50	161.67	140.00	112.50	43.75	3.42	–
19	385.80	4.53	8.50	12.17	15.83	22.75	29.50	36.00	42.42	55.00	67.25	96.67	125.83	153.33	169.17	167.50	143.33	114.17	40.67	.–	–
20	405.90	4.80	8.92	12.92	16.67	24.08	31.17	38.08	44.92	58.17	71.08	102.50	132.50	162.50	191.67	172.50	147.50	115.83	37.17	.–	–
21	426.10	5.06	9.42	13.58	17.58	25.33	32.83	40.17	47.33	61.33	74.92	108.33	140.00	170.83	197.50	177.50	150.00	116.67	33.00	.–	–
22	446.20	5.32	9.92	14.25	18.50	26.67	34.58	42.25	49.75	64.50	78.83	113.33	146.67	180.00	204.17	181.67	152.50	116.67	28.42	.–	–
23	466.30	5.58	10.42	15.00	19.42	28.00	36.25	44.33	52.17	67.67	82.67	119.17	154.17	188.33	210.00	185.83	155.00	116.67	23.08	.–	–
24	486.50	5.84	10.92	15.67	20.33	29.33	38.00	46.42	54.67	70.83	86.67	125.00	161.67	197.50	215.00	190.00	156.67	116.67	17.50	.–	–
25	506.70	6.10	11.42	16.42	21.25	30.58	39.67	48.50	57.08	74.00	90.83	130.00	169.17	206.67	220.00	193.33	158.33	115.00	11.17	.–	–
28	567.10	6.90	12.83	18.50	24.00	34.58	44.83	54.83	64.50	83.33	102.50	147.50	190.83	233.33	233.33	201.67	160.00	110.00	.–	.–	–
30	607.50	7.43	13.83	20.00	25.83	37.25	48.33	59.00	69.50	90.00	110.00	158.33	205.83	250.83	240.83	205.00	159.17	104.17	.–	.–	–
32	647.80	7.97	14.83	21.42	27.75	40.00	51.75	63.33	74.58	96.67	118.33	170.00	220.00	269.17	247.50	206.67	155.83	95.83	.–	.–	–
35	708.40	8.75	16.42	23.58	30.58	44.00	57.08	69.75	82.17	106.67	130.00	187.50	242.50	286.67	254.17	207.50	149.17	80.17	.–	.–	–
40	809.40	10.17	18.92	27.25	35.33	50.83	65.92	80.58	95.00	123.33	150.00	216.67	280.00	302.50	259.17	200.83	129.17	45.50	.–	.–	–

5.21 Transmittable output's (kW)
for Rex-High-Capacity-Roller Chains 48 A – 1
76.2 mm pitch, American version

ANSI 240-1 / DIN 8188

Number of teeth	Reference Ø mm	Small sprocket revolution																			
		5	10	15	20	25	30	40	50	60	80	100	125	150	175	200	250	300	350	400	450
		Hand lubrication			Drip lubrication					Oil bath lubrication						Forced feed lubrication					
13	318.40	3.89	7.27	10.47	13.53	16.67	19.50	25.33	30.92	36.50	47.17	52.50	70.83	83.33	95.00	97.50	87.50	70.83	49.17	23.33	–
14	342.40	4.22	7.87	11.33	14.67	17.92	21.17	27.42	33.50	39.50	51.17	62.50	76.67	90.00	103.33	103.33	91.67	74.17	50.83	22.30	–
15	366.50	4.55	8.47	12.20	15.83	19.33	22.83	29.58	36.17	42.50	55.17	67.50	82.67	97.50	111.67	109.17	96.67	77.50	51.67	21.00	–
16	390.60	4.87	9.07	13.07	17.00	20.83	24.50	31.67	38.75	45.58	59.17	72.00	89.17	104.17	118.33	115.00	101.67	80.00	52.50	19.20	–
17	414.70	5.19	9.73	14.00	18.17	22.17	26.08	33.83	41.33	48.67	63.08	77.50	94.17	111.67	124.17	120.83	105.00	82.50	52.50	17.10	–
18	438.80	5.53	10.33	14.88	19.25	23.50	27.75	35.92	43.92	51.75	67.50	82.00	100.00	118.33	130.00	125.83	109.17	85.00	52.50	14.50	–
19	463.00	5.88	10.93	15.80	20.50	25.00	29.42	38.17	46.67	55.00	71.33	86.67	105.83	125.00	135.00	130.83	113.33	86.67	56.67	11.45	–
20	487.10	6.21	11.60	16.67	21.67	26.42	31.17	40.33	49.25	58.33	75.83	91.67	112.50	133.33	140.83	135.83	116.67	88.33	55.83	8.20	–
21	511.30	6.54	12.20	17.58	22.83	27.83	32.83	42.50	51.92	61.25	79.33	96.67	118.33	139.17	145.83	140.83	120.00	89.17	50.83	4.33	–
22	535.50	6.87	12.80	18.47	24.00	29.25	34.50	44.67	54.58	64.50	83.33	101.67	125.00	146.67	151.67	145.00	122.50	90.83	49.17	.–	–
23	559.60	7.20	13.47	19.40	25.17	30.83	36.25	46.83	57.33	67.50	87.50	106.67	130.83	154.17	155.83	149.17	125.83	91.67	47.50	.–	–
24	583.80	7.53	14.13	20.28	26.67	32.17	37.92	49.08	60.00	70.83	91.67	111.67	136.67	161.67	160.83	153.33	128.33	91.67	45.00	.–	–
25	608.00	7.87	14.73	21.20	27.50	33.58	39.58	51.25	62.67	74.17	95.83	117.50	143.33	169.17	165.00	157.50	130.83	91.67	42.50	.–	–
28	680.50	8.93	16.67	24.00	31.00	37.83	44.75	58.33	70.67	83.33	108.33	131.67	161.67	183.33	178.33	168.33	135.83	90.00	33.33	.–	–
30	729.00	9.60	17.92	25.83	33.33	40.92	48.17	62.50	76.67	90.00	116.67	142.50	174.17	191.67	185.00	174.17	138.33	87.50	25.00	.–	–
32	777.40	10.33	18.87	27.67	35.83	43.83	51.67	66.67	82.00	96.67	124.67	152.50	186.67	200.00	191.67	179.17	139.17	84.17	15.83	.–	–
35	850.10	11.33	21.20	30.50	39.58	48.33	56.92	74.17	90.00	106.00	138.00	168.33	205.83	210.83	201.67	185.83	139.17	75.83	.–	.–	–
40	973.20	13.13	24.47	35.25	45.83	55.83	65.75	85.33	104.17	122.67	158.33	195.00	231.67	225.83	212.50	192.50	135.00	57.50	.–	.–	–

6. Methods of calculation

6.1 Drive unit: electric gear motor – chain drive – stirring device

6.1.1 Data

Drive unit:	electric geared motor
driven machine:	stirring device
output to be transmitted:	P = 10 kW
driving motor revolution:	n_1=50 r.p.m.
gear ratio:	i = 2
distance between centres (at lib.)	40 x t (scheduled)

6.1.2 Determining the number of teeth

A satisfactory running performance and low running noise are to be achieved.

The number of teeth is determined in accordance with the selection criteria for the number of teeth at $Z_1 = 19$.

6.1.3 Driven sprocket number of teeth

With a 1 : 2 gear ratio, the resulting driven sprocket number of teeth is:

$Z_2 = Z_1 \cdot i = 19 \cdot 2 = 38$

6.1.4 Allowance for correction value y

Based on the impact load table (page 12) and correction value table (page 11) the correction value resulting for the electric gear motor/ stirrer drive group is y = 1.0.

The suitable chain can now be directly selected in the performance tables on grounds of value N = 10 kW for the output to be transmitted.

6.1.5 Selecting the chain

The bar chart (on page 21) regarding the allowed chain pitch depending on speed shows all available pitches to be feasible.

The preliminary selection diagram (page 21) recommends chain 24 B – 1.

In the performance table for chain 24 B – 1 (page 27), we note that with n = 50 r.p.m. and the preselected number of teeth $Z_1 = 19$, the specified 10 kW can be transmitted; 10.5 kW being permissible.

6.1.6 Selecting multiple chains

In this case, multiple chains are out of question seeing there exist neither a space restriction, nor any speed/chain pitch problems.

6.1.7 Lubrication

According to the performance table (page 27), drip lubrication will suffice for achieving a basic service life of 15,000 working hours.

6.2 Drive unit: V 8 diesel engine – chain drive – reciprocating pump

6.2.1 Data

Drive unit:	V 8 diesel engine
driven machine:	multi-cylinder reciprocating pump
drive output:	P = 500 kW
drive revolution:	n_1 = 700 r.p.m.

The chain drive is driven directly by the diesel engine via a mechanical clutch.

Pump drive revolution:	n_2 = 490 r.p.m.
distance between centres:	approx. 2000 mm

(specified for reasons of available space).

$$i = \frac{n_1}{n_2} = \frac{700}{490} = 1.43$$

In the projected field of application, a roller chain is required that meets ANSI standards as it is intended for an oil drilling rig.

6.2.2 Determining the number of teeth

A chain drive for a 24-hour operation is required here.

The other requirements to be met are:

a) smooth chain running at a low generation of vibrations and noise;

b) absolutely reliable operation.

Towards meeting the stringent requirements made on this chain, the number of teeth selected is $Z_1 = 35$.

6.2.3 Driven chain wheel number of teeth

The following driven chain wheel number of teeth results from i = 1.43 and $Z_1 = 35$:

$$Z_2 = Z_1 \cdot i = 35 \cdot 1.43 = 50$$

6.2.4 Allowance for correction value y

As indicated on the table in page 11, the correction value here is: y = 1.4.

Hence, the corrected output amounts to:

$$P_K = P \cdot y = 500 \cdot 1.4 = 700 \text{ kW}$$

6.2.5 Selecting the cahin

Towards obtaining an optimal solution in the light of techniques and economy, a chain pitch according to the bar chart in page 21 is selected that will reach maximum output with the specified 700 r.p.m. revolution, being a 38.1 mm pitch.

According to the ANSI line of products, this will be chain type 120.

6.2.6 Selecting multiple chains

The ANSI 120 – 1 performance diagram shows that with n_1 = 700 r.p.m. and $Z_1 = 35$, a 181.67 kW output can be transmitted by the single chain.

The multiple-strand factor must now be determined from corrected output P_K compared to diagram value P_T towards obtaining the number of chain strands to be applied:

$$MF = \frac{P_K}{P_T} = \frac{700}{181.6} = 3.85$$

According to the table regarding the multiple-strand factor in page 14, a multiple-strand chain must be selected that at the least meets the above value.

This requirement is filled by choosing a 6-strand chain with an MF of 4.0.

In this case, the correct chain selection hence reads:

six-strand chain to ANSI 120 – 6 (24 A – 6).

6.2.7 Lubrication

According to the performance table on page 34, a forced feed lubrication (spray lubrication) is required here for achieving a basic wear life of approx. 15,000 working hours.

6.3 Drive: electric gear motor – chain drive – mixer

6.3.1 Data

Drive:	electric gear motor
driven unit:	mixer
diameter:	2,700 mm
output to be transmitted:	P = 23.5 kW
drive revolution:	n_1 = 40 r.p.m.
drum revolution:	n_2 = 5.7 r.p.m.
gear ratio:	i = 7

A single-strand chain to DIN 8187 is specified as the mixer drum works in a covered location. It is hence protected and not exposed to any particular contamination.
The distance between centres is determined at a = 3,000 mm (looped drive).

6.3.2 Determining the number of teeth

The requirements on the chain running performance are average. Considering the moderate speed, choosing a 17-tooth drive sprocket is permissible.

6.3.3 Driven sprocket

A looped drive according to the Rexnord Drum Drive System should here be chosen.

With an n_1 = 5.7 r.p.m. drum revolution and a Z_1 = 17 number of teeth, the theoretical number of teeth resulting on grounds of the gear ratio is: i = 7.

$Z_2 = Z_1 \cdot i = 17 \cdot 7 = 119.$

In the said case, only each fourth tooth is to be realized. So as to allow for division in the specified manner, the theoretical number of teeth is increased to 120. This implies a correction of the drum revolution to n_2 = 5.66, a value that may be regarded as permissible.

The individual teeth that are, in fact, mounted to the drum OD (with every fourth tooth realized) hence, amount to:

120 : 4 = 30.

6.3.4 Allowance for correction value y

On account of the product to be processed, the driven mixing drum suffers considerable reversing jerks. The correction value determined from the tables in pages 11 and 12 amounts to y = 1.7.

The corrected output value hence is:

$P_K = P \cdot y = 23.5 \cdot 1.7 = 39.95$ kW.

6.3.5 Selecting the chain according to the bar chart

Theoretically, all available chain pitches shown on the bar chart in page 21 may be chosen for the given driver sprocket revolution.

The preliminary selection diagram shows single chain 48 B – 1 to be appropriate, in this case.

According to the performance table, this chain offers a transmittable output of 42.25 kW with the chosen Z_1 = 17 number of teeth and the n_1 = 40 r.p.m. revolution.

The transmittable output hence, is slightly higher than the corrected output of 39.95 kW to be transmitted.

Chain to be applied: 48 B – 1

6.3.6 Selecting multiple-strand chains

This will not be necessary and, with drum drives, it is only practiced in exceptional cases.

6.3.7 Lubrication

According to the performance table, drip lubrication should be applied.

Please note:

Rexnord offer a drum drive system of their own design. This system possesses many advantages. Please call for our special brochure (Rexnord chains for drum drives).

As a rule, rotary chains are used in the case of drum drives that are subjected to severe operating conditions.

Our existing computerized calculation program allows for providing you with the accurate technical design for your drive at short notice. Please indicate your drive data.

6.4 Drive: gear shaft – chain drive – spindle

6.4.1 Data

Drive:	machine tool
driven machine part:	spindle
output to be transmitted:	$P = 5.5$ kW
drive shaft revolution:	$n_1 = 5{,}500$ r.p.m.
spindle revolution:	$n_2 = 2{,}700$ r.p.m.

An oil spray lubrication will be installed.

Application of an ANSI chain is preferred as the installation is to be supplied to the American market.

6.4.2 Determing the number of teeth for both sprockets

The space available for the driven sprocket is restricted. The diameter of this sprocket (complete with the chain placed on it) may not exceed 200 mm.

Apart from the number of teeth, the sprocket diameter is also defined by the chain pitch. This pitch is is determined in the first place.

6.4.3 Allowance for correction value y

Operation is steady and free from jerks. The correction value hence, is: $y = 10$.

6.4.4 Selecting the chain

As results from the bar chart on page 21, only a ½ " chain pitch is in question here, seeing this chain pitch is still just within the normal revolution range.

As American standards are specified, ANSI 40 is therefore in question.

Please note:

Should revolutions within the ceiling revolution range occur, then please contact Rexnord for information.

The ANSI 40 chain possesses a plate link height of 11.6 mm. This value must be added to the reference diameter for determining the OD plus applied chain.

OD = reference dia. plus g.

g to be taken from the chain table.

With the selected number of teeth, i. e. $Z_1 =$ 43, the following OD results for the wheel plus chain:

OD = 174 + 11.6 = 185.6 mm.

From the above indicated $Z_2 = 43$ number of teeth and the given revolutions of $n_1 = 5{,}500$ r.p.m. and $n_2 =$ approx. 2,700 r.p.m., the following number of teeth results for the driver sprocket:

$$Z_1 = \frac{Z_2 \cdot n_2}{n_1} = 21.1$$

selected: $Z_1 = 21$.

The following actual revolution n_2 results from the chosen number of teeth:

$$n_2 = \frac{n_1 \cdot Z_1}{Z_2} = \frac{5{,}500 \cdot 21}{43} = 2{,}686 \text{ r.p.m.}$$

The revolution meets the requirement reading approx. 2,700 r.p.m. and is hence accepted.

The number of teeth is acceptable according to the criteria governing selection of the number of teeth (page 8).

6.4.5 Selecting multiple chains

In accordance with performance table ANSI 40-1, with $n_1 = 5{,}500$ r.p.m. and $Z_1 = 21$, the single chain transmits an output of $P = 1.92$ kW as per table.

From the above output as per table and output $P = 5.5$ kW to be transferred, the following required multiple-strand factor ensues:

$$MF = \frac{P}{P_T} = \frac{5.5}{1.92} = 2.86 \text{ (required)}$$

In this case, an ANSI 40 – 4 quadruple chain with an existing MF = 3.0 multiple-strand factor should, in fact, be chosen.

Considering the high speed and consequently relatively high number of flexures and roll-overs, the impact on the required fatigue strength is substantial. Moreover, the width of the available space is also limited.

For this reason, the application of single chains that are adjusted in groups will be preferrable.

With an 1.92 kW output per single chain (as per the tables), 3 (grouped) single chains will do suffice, in this instance. A multiple-chain factor conforming to the number of strands used should be applied, if several one-strand chains are chosen. The transmittable output produced with this approach equals:

$1.92\ kW \cdot 3 = 5.76\ kW$

Comments:

3 single chains possess a far superior fatigue strength compared with a quadruple chain. And, the higher redundancy offered in this case ranks as an advantage.

6.4.6 Lubrication

Pressurized lubrication by circulation (= spray lubrication) as indicated on the performance table should here be provided for.

7. Examples for application

7.1 The application of Rexnord Heavy Roller Chains

7.1.1 Design considerations

With exacting operating conditions where a high reliability is demanded, the application of Rexnord ANSI Roller chains of the Heavy-Duty Series "H" will be called for.

Their by 40 % higher fatigue strength compared with the basic chains allows for a safe application even in parts where the limits of performance of the normal series is exceeded.

If, with an application of roller chains of the ANSI standard series, the fatigue strength will not meet the requirements for operational reliability, then application of the relevant Heavy Chain will offer an uncomplicated solution.

This chain runs on the same sprockets as the corresponding standard ANSI chain. The complete range of heavy chains is included in the Rexnord Roller Chain Catalogue.

7.1.2 Heavy Roller Chain Design Criteria

A decision for application of Heavy Roller Chains should be made if the following problems exist:

a) When selecting the chain:

If a severe impact load is determined when assessing the correction value, so for instance, with a correction value of y = 1.4 to 1.7, then a heavy roller chain should be selected for reasons of operational reliability.

As to its fatigue strength, it possesses the crucial advantage for achieving a satisfactory operational reliability.

b) Short-time chain service:

According to the performance tables, anticipated wear life comes up to approx. 15,000 working hours.

For the short-time chain drives that are customary with building and farming machines, a too low capacity for an assumed wear life of merely 4.000 to 6.000 working hours is frequently resorted to for reasons of space and/or costs.

In these cases, concessions are made for the fact that the chain will be working inside the fatigue strength range. Fatigue fractures (= endurance failures) can then not be ruled out.

A reliable and operationally safe roller chain is acquired by choosing the relevant ANSI Heavy Version instead of a DIN or ANSI roller chain.

A typical field of application (apart from many others) here is the application with rotovators.

c) With the arrival of chain failures:

If the DIN or ANSI roller chains applied suffer fatigue fractures (= endurance failures) in the course of operation, then in most cases operativeness can be restored by placing heavy chains of the same pitch on the existing sprockets.

This reflects a simple and nontheless effective solution of the problem.

7.2 Application of roller chains with rotary racks

The advantages of Rexnord roller chains as against hollow-pin chains reside in their superior precision and fatigue strength.

7.2.1 Selection criteria

The quality committee for rotary racks specifies a so-called static security of $S_{stat} = 7$ as the minimum value for the application of chains.

7.2.2 Design

Whereas neither the quality, nor a potential multi-strandedness are taken into account in the static security factor, fatigue strength reflects a reliable value regarding both these influence quantums bearing on chain design.

Selection of the chains to be applied should be made in the light of an adequate fatigue strength. And, the chain's tractive force should not exceed its fatigue strength.

For achieving an adequate operational reliability and wear life, a chain should be chosen that will ensure that the bearing area pressure will not exceed 6,000 N/cm^2.

Rexnord will make all fatigue strength values available at any time, on request.

7.3 Application of roller chains with straight link plates for transporting palettes

7.3.1 Selection criteria

Roller chains with straight link plates for transporting palettes have been operating successfully for years. As a rule, these chains will have a ⅜" to 2" pitch and be of a single, or also a duplex version.

Whereas the chain applied will generally be supported on the guide rail via the chain roller, in this instance, the product to be transported rests directly on the chain link plates.

The application of roller chains in transporting palettes and goods reflects the most inexpensive and reliable method. Moreover, roller chains achieve an extraordinarily long service life.

7.3.2 Design

Criteria

With a moderate to medium vertical load, plastic material (PE-UHMW) is used for supporting the rollers. Higher loads make a support on steel guides (e.g. key steel) necessary.

On principle, two criteria prevail for selecting the chain:

- ▶ admissible tractive force of the chain;
- ▶ admissible vertical load per chain roller.

Tractive force of the chain

The existing tractive force is determined by two factors, i.e. the given vertical load per chain strand and the coefficient of sliding friction and/or roller friction.

As a rule, it may be assumed that the chain rollers rotate at a delay referred to the chain motion, with the proportion of slide motion here reduced to approx. 15 to 30 percent.

Empirical studies show that the following coefficient of sliding/rolling friction can be substituted for the motion of the chain on the guide rails.

Of course, a higher tear-away resistance results when the chain is started. The relevant values can be taken from the following table.

Coefficient of sliding/rolling friction μ

Merely the tractive forces occurring in operation need be assessed in determining the chain. The tear-away moment (static friction) may here be disregarded as it is of importance only for assessing the necessary motor output.

Table regarding the coefficient of sliding/rolling friction μ

Lubrication	Plastic guide	Steel guide	Tear-away resistance (static friction)
good	0.09	0.10	0.18
moderate	0.10	0.12	0.20
inferior	0.12	0.14	0.23
very inferior	0.16	0.18	0.28

The admissible vertical roller loading

The admissible Hertzian compression defines the allowed vertical chain roller loading.

The following table throws a light upon the admissible vertical loadability of each chain roller, guided on steel guides.

Chain type	admissible vertical loading of each roller (kg)
06 B – GL	20
08 B – GL	35
10 B – GL	45
12 B – GL	55
12 A – GL	55
16 B – GL	70
20 B – GL	90
24 B – GL	120
32 B – GL	160

Should the given vertical loading exceed the admissible value, then the following options can be resorted to:

- ▶ Selection of a multiple-strand chain;
- ▶ Selection of several single strand chains (or the matched version);
- ▶ Chain sliding not on the chain rollers; far more, the chain link plates are supported directly on the steel guides. Depending on the operating conditions, the coefficient of sliding friction amounts to μ = 0.2 to 0.3;
- ▶ Support offered largely by the chain rollers and link plates and simultaneously by sectional slide guides. We would recommend to consult us in this case.

The admissible tractive forces upon which the design of roller chains for transporting palettes are based are determined by the given compression acting on the link-joint surface and by chain speed. The are indicated on the following table.

Admissible tractive forces of roller chains for transporting palettes (per chain strand in Newton)

	Chain speed up to 1 m/s			Chain speed exceeding 1 m/s		
Chain type	Lubrication good	Lubrication moderate	Lubrication inferior	Lubrication good	Lubrication moderate	Lubrication inferior
06 B – 1 GL	1,000	780	500	840	650	400
06 B – 2 GL	2,000	1,560	1,000	1,680	1,300	800
08 B – 1 GL	1,800	1,350	960	1,500	1,100	750
08 B – 2 GL	3,600	2,700	1,800	3,000	2,200	1,500
10 B – 1 GL	2,400	1,800	1,200	2,000	1,500	1,000
10 B – 2 GL	4,800	3,600	2,400	4,000	3,000	2,000
12 B – 1 GL	3,200	2,500	1,600	2,700	2,000	1,300
12 B – 2 GL	6,400	5,000	3,200	5,400	4,000	2,600
16 B – 1 GL	7,500	5,900	3,800	6,300	4,800	1,500
16 B – 2 GL	15,000	11,800	7,500	12,600	9,600	6,200
20 B – 1 GL	10,600	8,300	5,300	9,000	6,800	4,500
24 B – 1 GL	20,000	15,800	10,000	17,000	12,900	8,500
32 B – 1 GL	30,000	24,000	15,000	26,000	19,500	13,000
12 A – 1 GL/60 – 1 GL	3,700	2,900	1,900	3,200	2,400	1,600

Admissible number of teeth with palette transporting installations

For achieving satisfactory chain running and a no-jerk transport, the sprockets ought possess 15 teeth at the least.

Where higher demands exist, these can only be met by 17-tooth and 19-tooth sprockets.

7.3.3 Example of a calculation

A palette transporting installation of 8 m length (distance between centres) is to be equipped with two chain conveyors. The delivery speed is 0.6 m/s. Lubrication may be defined as being "moderate". With full-loading operation, the weight of the palettes bearing on each chain strand totals at 4,800 kg. The weight of each individual palette amounts to 800 kg. On grounds of the palette type selected, a 130 mm contact surface length per palette base must be assumed. The palette base load amounts to 200 kg. Chain slides on steel guides.

Chain selection

Determing the tractive force:

Tractive force is determined in the first place on grounds the maximum total loading weight after the following equation:

Tractive force: $F = G \cdot g \cdot \mu$ [N]

wherein:
F = tractive force
G = weight load (kg)
g = 9.81 m/s^2
μ = coefficient of sliding/rolling friction (page 45)

In this case, with moderate lubrication and degradation on steel guides, coefficient μ = 0.12.

$F = 4,800 \cdot 9.81 \cdot 0.12 = 5,650$ N

With v = 0.6 m/s and lubrication being moderate, the table of admissible tractive forces shows chain 16 B – 1 GL with 5,900 N admissible tractive to be adequate.

As a rule, when determining the tractive force, the chain's unloaden weight need not be considered. This weight's influence is negligible.

Determining the vertical roller loading

Considering a total 800 kg/palette weight and a foot print weight of 200 kg/palette base and with 130 mm palette base contact length, the resulting supporting force per chain roller amounts to:

$$n_{st} = \frac{l}{p}$$

wherein:
n_{st} = nos. of rollers
l = contact length (mm)
p = pitch (mm)

$$n_{st} = \frac{130}{25.4} = 5.11$$

Hence, 5 chain rollers bear at a time.

And so, the vertical load on each chain roller is: 200 : 5 = 40 kg.

The table (page 45) of permissible supporting forces proves 70 kg to be the maximum allowed loading of a chain roller. Application of chain 16 B – 1 GL as selected hence, is correct.

7.4 Application of stainless steel roller chains

7.4.1 Design considerations

Stainless steel chains are generally applied with low chain speeds of up to 1.5 m/s.

Rexnord stainless steel chains are suitable for temperatures ranging from – 40 C to + 400 C.

7.4.2 Design criteria

Allowed tractive forces

The Rexnord line of stainless steel roller chains possess a number of particular properties. The link plate material is of an outstandingly high strength (magnetizable).

The link-joints offer an optimal resistance to wear.

A lubrication that is matched to the relevant temperature ranges will have an extremely positive influence on wear life, whereas, non-lubricated running will naturally impair this wear feature.

Table regarding the allowed tractive force

	Temperature range – 40 to + 200 C			Temperature range 200 to 400 C	
Chain type	allowed tractive force with N up to 0.5 m/s	N 1.0 m/s	N 1.5 m/s	allowed tractive force with N up to 0.5 m/s	N 1.0 m/s
08 B – 1 SS	750	580	500	470	360
10 B – 1 SS	1,000	770	650	600	480
12 B – 1 SS	1,400	1,100	950	870	680
16 B – 1 SS	3,000	2,300	2,000	1,800	1,400
08 B – 2 SS	1,280	1,000	850	800	624
10 B – 2 SS	1,700	1,300	1,100	1,000	800
12 B – 2 SS	2,400	1,800	1,600	1,500	1,100
16 B – 2 SS	5,000	3,800	3,400	3,100	2.375

7.5 Application of roller chains with plastic sliding bearings

7.5.1 Selection criteria

A chain's wear life is crucially influenced by lubrication. Even though an adequate lubrication can generally be provided for, still, a considerable number of applications remain where relubrication at regular intervals will not be possible, or will simply be undesirable. Chains in farming machines or in bottling stations may, for example, be operated in a damp environment or in water. And, as regards miscellaneous other chain drives, for instance, in mechanical equipment and conveyor systems operating in the food, beverages and tobacco industries and packing and textile facilities, lubricants may frequently pose the hazard of contaminating the products to be processed.

It is particularly with these applications that the roller chains with plastic sliding bearings we developed have met with considerable success. They are largely maintenance-free and, with a bigger run-in elongation due to the plastic deformation of the plastic bush, they still offer a better resistance to wear than normal chains will under the same conditions of inadequate lubrication.

And, briquettings as well as corrosion and therefore stiff-links are avoided.

The configuration of a chain link with a plastic sleeve is illustrated below. A plastic bush is accommodated such that it floats between the pin and the steel bush. This plastic bush is extremely abrasionproof and is resistant to oil, greases, alkalis and solvents.

Roller chains with plastic sliding bearings are produced both as single and duplex chains and also as long-link roller chains and roller chains for farming machines. As to their dimensions, they coincide with those of normal roller chains.

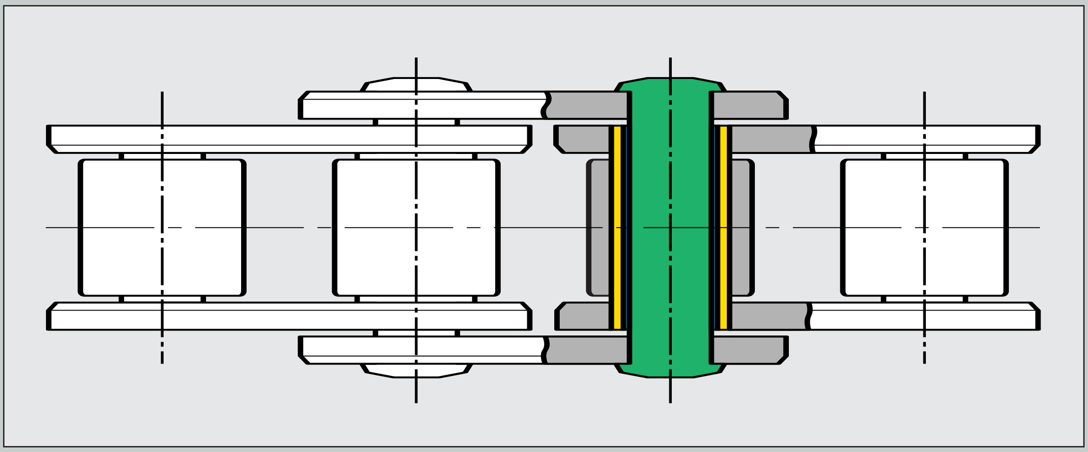
7.5.2 Design

As to the transmittable output, roller chains with plastic sliding bearings possess a comparatively low capacity. The influence of chain temperature on wear life is considerable seeing the plastic material's specific wear resistance is particularly susceptible to temperature.

A temperature exceeding 80 C will reduce the service life by approx. 50 percent, irrespective of whether it is due to friction inside the bearing area, or the ambient temperature.

It is hence advisable, to subject the selected chain to a test run for assessing its suitability, if higher chain temperatures are to be expected.

Fig. 14: Configuration of a chain link with a plastic sliding bearing between bush and pin.



Bush Plastic bush Pin

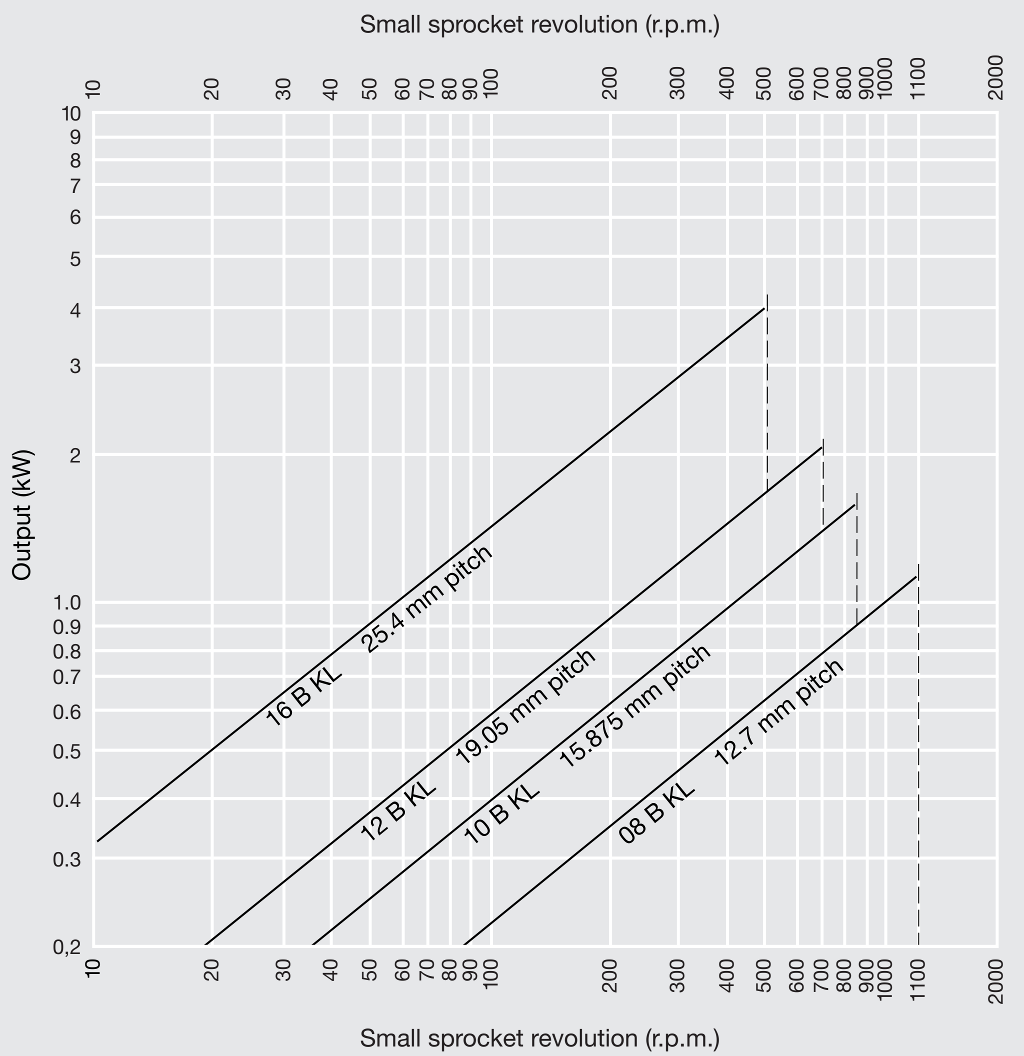


Fig. 15: Performance diagram of roller chains with plastic sliding bearings.

Even though chains with plastic sliding bearings are, on principle, maintenance-free, lubricating at longer intervals will enhance their wear life!

In the case of chains with plastic sliding bearings, diverging operating conditions may have a more considerable bearing on their resistance to wear than with standard roller chains. The diagram can therefore only give a clue for selecting a chain. As to a selection for standard application, this should be supported by tests.

Considering that the wear resistance of plastic sliding bearings is impaired by an increase in temperature, the above performance values should be reduced by 20 percent with temperatures of 50 C, and by 50 percent with temperatures of 80 C.
The general recommendations regarding lubricating do not apply to chains with plastic sliding bearings.

7.6 Application of Rexnord oil-field roller chains

7.6.1 Selection criteria

Compared with the high-capacity roller chains to ANSI standards, Rexnord oil-field roller chains possess optimal running and performance features.

They are produced with chain rollers of a high fatigue resistance and precision.

Their superior quality becomes evident in an application under the rough conditions of an oil rig with extremely high output transmission chain speeds.

Rexnord produce single to octuple-type oil field roller chains of a 1 " to a 3 " pitch to ANSI standards, i.e. ranging from ANSI 80 to ANSI 240.

7.6.2 Design

Whereas extremely high chain speeds occur in a chain compound and with a number of other drives that frequently require the application of multiple-strand roller chains, there also exist ranges where the impact load is high and chain speed is low.

The diversity of demands made disallows stipulating a general rule regarding the design.

All quantities that have a bearing on the chains should be defined in a technical dialogue between the chain user and producer. A suitable proposal based on existing experience can then be submitted.

Chains may currently be running inside the ceiling revolution range (cf. fig. 11 in page 21), considering the partly very high chain speeds.

In these cases care should be taken to ensure that only chains with stable rollers (such as, the Rexnord oilfield version) are applied. Moreover, the driver sprockets should have a minimum of 25 to 32 teeth so as to avoid the polygon effect and not to overtax the chain rollers.

7.7 Application of roller chains in storage and retrieval units, looping towers and general lifting devices

7.7.1 Selection criteria

With lifting gear, the sprockets should not have less than the specified minimum number of teeth. Vibration-free chain running and steady lifting motions can only be achieved with sprockets whose number of teeth is adequate.

This applies in particular to big lifting heights, for instance, with high-bay warehouse storage and retrieval units. For ensuring smooth and vibration-free running, we recommend choosing the following minimum number of teeth depending on the lifting height:

up to 5 m lifting height – min 19 teeth
up to 10 m lifting height – min 21 teeth
up to 20 m lifting height – min 23 teeth
over 20 m lifting height – min 25 teeth.

The aforegoing recommendation applies both to the driver sprocket and all idler sprockets in the loaded strand range.

The sprocket distances between centres should be ...n.5 times the pitch. This also enhances smooth chain running and a vibration-free operation.

The table on page 51 reflects the allowed bearing area pressure depending on chain speed. These values apply to the aforementioned number of teeth and they also apply to kinematic drives.

7.7.2 Design

A high-bay storage and retrieval unit is equipped with two liftchains.

Total hoisting weight: 6,000 kgs
Tractive force each chain,
hence: F = 30,000 N
Average chain speed v = 1.0 m/s
hoisting height: 35 m
Impact load: nil, smooth starting on account of an hydraulic starting clutch

Chain design:

With an average v = 1.0 m/s hoisting speed, the allowed bearing area pressure as per table amounts to:

$p = 3{,}800\ N/cm^2$

The rearranged formula reads:

$$p = \frac{F}{A}$$

resulting in the following link-joint surface:

$$A\ erf. = \frac{F}{p} = \frac{30{,}000}{3{,}800} = 7.89\ cm^2$$

Chain 32 B – 1 with a bearing area of 8.11cm² and 250,000 N breaking load is chosen from the catalogue.

This chain's fatigue strength (in Rexnord quality) amounts to 47,000 N.

Hence, the actual bearing area pressure results in:

$$p = \frac{F}{A} = \frac{30{,}000}{8.11} = 3{,}699\ N/cm^2$$

This value is admissible, the max allowed value being 3,800 N/cm².

Actual operational reliability results from the equation:

$$S_{dyn} = \frac{\text{fatigue strength}}{\text{tractive force}} = \frac{DF}{F} = \frac{47{,}000}{30{,}000} = 1.57$$

The safety factor determined shows the chosen chain to offer "lasting strength".

7.7.3 Allowed bearing area pressure depending on chain speed

Chain speed m/s	allowed bearing area pressure N/cm²	Lubrication
0.05 to 0.50	4,500	manual
0.51 to 1.0	3,800	manual
1.1 to 2.0	3,300	manual
2.1 to 4.0	2,750	drip lubrication
4.1 to 7.0	2,250	drip lubrication

From the point of view of statics, chain safety amounts to:

$$S_{stat} = \frac{FB}{F} = \frac{250{,}000}{30{,}000} = 8.33$$

This value is fully adequate seeing the competent authority specifies a static minimum safety standard of $S_{stat} = 8.0$.

Comment:
In view of the considerable hoisting height, avoiding chain vibrations requires to be given special attention. Sprockets with 25 teeth are applied in accordance with the recommendations.

For ensuring a horizontal position of the lifting platform in all stages of motion, the chains are adjusted in single lengths and in the total length as a pair. This adjustment is agreed with the chain producer so as to meet existing requirements.

Moreover, the chains are supplied as chains tested for their „non-spinning" property so as to avoid any rotation of the chains with the given big hoisting heights.

Lubrication:
Hand lubrication with an oil of viscosity class 250 cSt (at 40 C) should be made quarterly.

Please note:
If the fatigue strength determined is not adequate for a given load and an originally selected multiple chain, then the application of several chains should offer a solution.

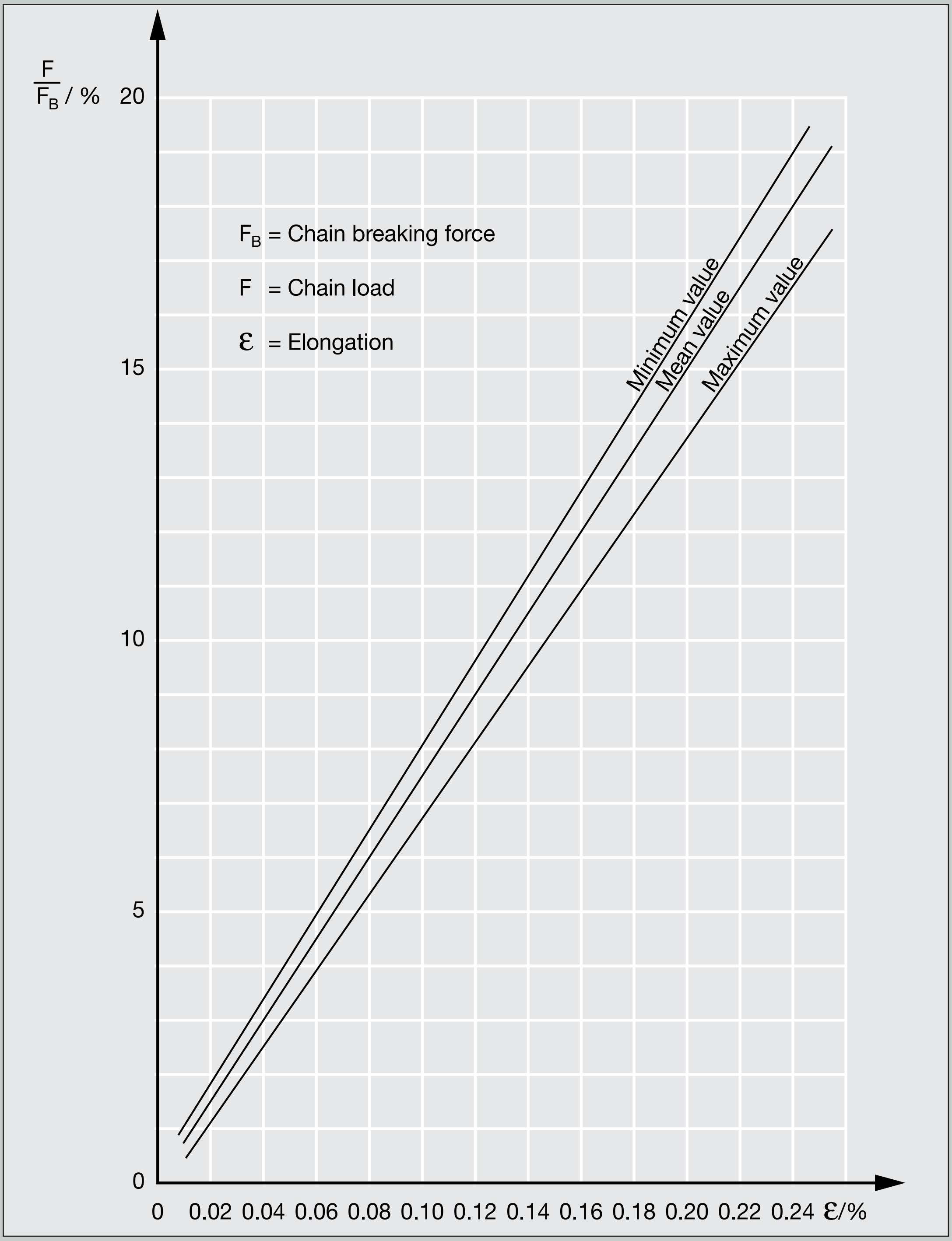
In this case, chain tying should be made by means of a cartwright beam.

The elastic elongation of the hoisting chain is shown on fig. 16.

Characteristic load elongation curves for determining elastic elongation.

Apart from the elastic elongation, the production length tolerance to DIN (0 to + 0.15 %) and the chain's wear elongation must also be taken into consideration, as well as the elasticity of the oil film.

Fig. 16: Characteristic load elongation curves for determining elastic elongation.



7.8 Application of Rexnord Plate Link Chains

7.8.1 Selection criteria

As shown on the two true-to-scale sectional drawings of a Rexnord Plate Link Chain and the relevant ANSI 160-1 Roller Chain, the newly developed plate link chains offer a number of crucially advantageous changes in design.

The roller chain

The roller chain possesses a so-called internal link that consists of two internal link plates and the pressed-in chain bushes, as well as, the chain roller accommodated on top.

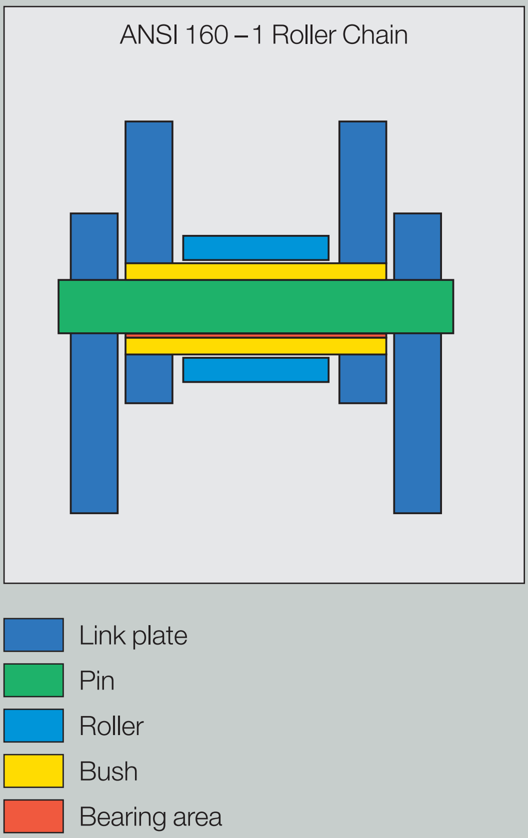
The plate link chain

Instead of an internal link, the plate link chain possesses four mobile „internal link plates" that, as with flyer chains, form the bearing area directly with the chain pin.

No chain bush exists.

Compared with roller chains, the pin has a much bigger diameter.

It possesses a chain roller for interaction with chain.



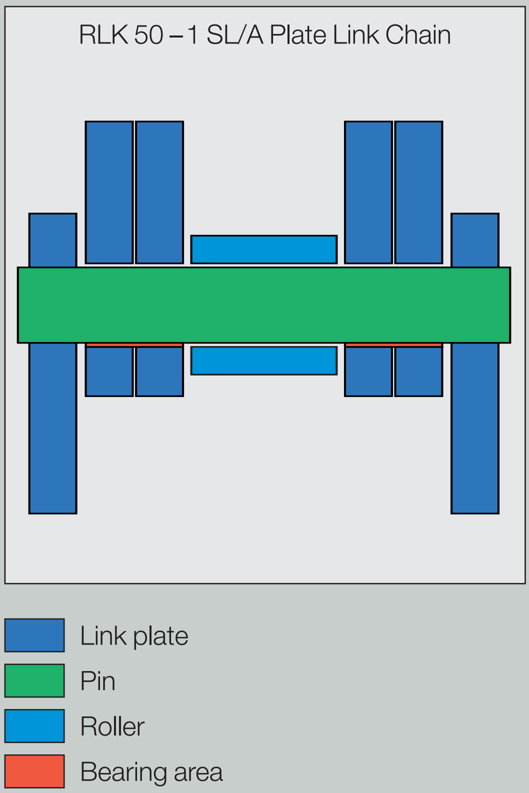


Fig. 17: Sectional drawing of a roller chain and a plate link chain.

7.8.2 *The advantages of the Rexnord Plate Link Chain*

Contamination of the roller chains will occur in many working conditions of application.

This contamination in conjunction with the luboil applied will lead up to generation of the so-called grease collar at the points where the lubricant is entered between inside and outside link plates.

The outcome being that the lubricant will no longer be admitted to the bearing area (between chain bush and pin). Then, even with repeatedly applied luboil, no proper lubrication is possible any longer with the chain link-joint practically being sealed.

With severe changes of temperature (night-to-day and/or temporary direct solar radiation), this condition moreover causes condensation water to settle in the bearing area.

The inevitable consequence of this condition is corrosion forming on the pins and bushes that constitute the bearing area. Deep corrosion pitting and fretting corrosion due to the lack of an effective lubrication will lead up to the extended effects of caking in the bearing area.

The chain roller chain links will become stiff.

Next, disallowed rotary forces (torques) will be generated by the chain pins and chain bushes.

The above effects are aggregated and will so frequently cause chain bushes and pins to break after the relatively short operating time of a mere a few hundred working hours.

The plate link chain developed by Rexnord offers crucial advantages in this respect:

- ▶ It no longer possesses a susceptible thin-walled chain bush. A non-existing item cannot break!
- ▶ The passage for entering the lubricant and aerating the bearing area (so as to prevent formation of condensate and consequently of briquetting) is approx. eight times shorter, and consequently better.
- ▶ Bigger pin diameters with approx. 50 % more shell surface and a more than 80 % increase of the section modulus.
- ▶ Increase of the bearing area surfaces and, hence, an enhanced wear life by the application of four mobile internal link plates.
- ▶ An enhanced operational safety and, hence, an increased redundency by the application of four mobile internal link plates.
- ▶ No stiff links and no caking of the bearing areas.
- ▶ No more sudden unexpected chain failures.
- ▶ Absolute operational reliability throughout the total period of wear life.
- ▶ Plate link chains can be applied to the existing roller sprockets.
- ▶ Considerable costs saved on account of less downtime.
- ▶ A three to five times longer service life than that of the corresponding roller chain in problematic working conditions of application.

Practical experience with liftchains applied on container straddle carriers and in the iron and steel industry show the improved operational reliability and service life to be of the highest order in places where operating conditions are particularly problematic.

7.9 Application of Rexnord Marine Diesel Roller Chains

7.9.1 Selection criteria

The roller chain series that is optimized as to design, material, quality and precision meets the most exacting demands.

It reflects an unparalleled quality in all chain technology.

The advantages of marine diesel chains:

- ▶ A 30 % higher load capacity compared with the Rexnord roller chains.
- ▶ Due to its optimized fatigue strength, it offers absolute operational reliability throughout the total running time.
- ▶ Progressive run-in elongation is ruled out as the chain bushes are honed after being pressed in.
- ▶ Optimal running, noise and vibration performance on grounds of the superior precision and close tolerances of all structural members
- ▶ The application of marine diesel roller chains is of advantage in all working conditions where other roller chains touch on the boundaries of their capacity with regard to service life, running performance, and operational reliability, as well as, with an adverse progressive elongation.

7.9.2 Design

The most exacting demands are made on marine diesel engine timing chains. They are required to perform absolutely reliably throughout the total approx. 20 years of application. For this reason, Rexnord marine diesel roller chains are optimized with regard to all technical concerns, such as, wear resistance and operational reliability.

Rexnord have realized every advanced new technology here. As regards quality, marine diesel roller chains are second to none. They reflect the last word in quality.

Design criteria regarding application

Marine diesel roller chains are subjected to extraordinary demands as to their fatigue strength. They are not only required to transmit high tractive forces at simultaneously extremely high chain speeds, but must far more also, cope with considerable torsional oscillations emanating from the crankshaft and the camshafts. And, the high demands also include a noiseless chain running.

On principle, chain design is based on a comprehensive and direct technical dialogue between the chain producer and client for realizing an optimal design based on existing comprehensive technology and experiences.

The most important criteria are:

1. Selection of an appropriate chain pitch conforming to the chain speed.
2. Selection of the number of strands to be applied. As a rule, this will be 1 to 3 single strands. Duplex or triplex chains are not used. This offers higher fatigue resistance and better redundancy.
3. The demands for a smooth and even running performance of the chain involve a minimum number of teeth equalling Z = 25 to 40.
4. Lubrication relies on a spray process that is integrated in the engine lubricating circuit.

8. Computing chain drive reliability by means of safety factors

8.1 Static safety factor = risk factor?

In many a sphere of application, such as, with lifting gear, or with chain drives rated for short duty cycles, the chain drive design will be based exclusively on the aspects of operational reliability.

Many additional working conditions of application exist for which static safety factors are specified.

As a rule, the specified static safety value will read: S = 3.5 to S = 10. Choosing an appropriate safety factor is aggravated by the wide band of more than 180 %.

Static safety factors provide neither for the influence of chain quality, nor multi-strandedness.

Fatigue strength alone is meaningful as to whether a chain offers “lasting strength”. And, fatigue strength simultaneously provides the correct quality assessment and an appropriate rating of the influence of multi-strandedness.

8.2 Design criteria for assessing the safety of chain drives

A roller chain can only be correctly selected for its operational reliability, if its fatigue strength is equal to, or exceeds the load:

$$S_{dyn} \geq 1$$

The following example based on practical experience is intended for explaining the interrelations of a chain quality’s breaking force and fatigue strength and of the relevant multistrandedness.

8.3 Example based on practical experience

8.3.1 The description of the example

A roller chain is to be applied in the central operation of a battery of numerous valves controlling gas and air flow volumes.

The requirement being for absolute operational reliability , considering that a failure of the valve control might give rise to an explosion. On grounds of the moderate duty cycles,
bearing area wear (= wear life) may be neglected.

The user chose the chain dimensions in accordance with the parameters contained in a reference book on chain techniques. This manual shows a sixfold safety of $S_{stat} = 6$ to be an adequate dimensioning with regard to the chain breaking force as this would provide for adequate load bearing capacity (= fatigue strength).

In accordance with an existing maximum 100,000 N chain tractive force, a triplex (2 " pitch) roller chain 32 B – 3 having a minimum 670,000 N breaking force was chosen. For reasons of the costs, the client applied an imported chain.

Static safety hence, amounted to:

$$S_{stat} = \frac{\text{breaking force}}{\text{tractive force}} = \frac{670{,}000}{100{,}000} = 6.7$$

After an extremely brief application of a mere 50 working hours, the link plates of an internal link broke. Chain failure caused a malfunction of the gas and air control system. An explosion followed and the resulting damage ran up millions.

The breaking test made in a subsequent investigation of the defective chain proved the breaking force actually to be 740,000 N.

The fatigue strength determined in a pulser test amounted to a mere 34,400 N.

The following actual safety factors resulted:

a) Static safety factor:

$$S_{stat} = \frac{\text{breaking force}}{\text{tractive force}} = \frac{740{,}000}{100{,}000} = \mathbf{7.4}$$

b) Dynamic safety factor:

$$S_{dyn} = \frac{\text{fatigue strength}}{\text{tractive force}} = \frac{34{,}400}{100{,}000} = \mathbf{0.34}$$

8.3.2 Evaluation

Whereas the static safety value reflects an adequate dimensioning, the actually existing fatigue strength value shows that the loading was here applied in the finite life fatigue strength range and the chosen chain could, in fact, only be "strong" for a limited period of time and not "lastingly strong".

A chain can only be "lastingly strong" if the given load will not exceed fatigue strength.

In this concrete case, the so-called $S_{stat} = 6$ safety factor proposed resided in the erroneous assumption that the fatigue strength would then automatically suffice, i. e. that it amounted to at least ⅙ = 16.7 % of the breaking force.

This assumption is erroneous for two reasons in that the two most important influence quantities, viz.:

- multi-strandedness and
- chain quality

had been overlooked altogether.

8.3.3 The influence of multi-strandedness on fatigue strength

Decades of investigations regarding roller chain fatigue strength have shown that with chains of similar quality, the triplex chain version offers merely half the fatigue strength (on a percentage basis) of a single roller chain of equal breaking force.

Judging by their breaking force, triplex roller chains of a good quality offer a fatigue strength of merely approx. 10 percent. For this reason, only a so-called static safety factor of S = 10 may be relied on when selecting them.

8.3.4 The influence of chain quality on fatigue strength

Subsequent examination of the chains showed them to have the following deficiencies:

- Ill-quality bore holes.
- Inadequate press fit.
- Marginal decarburization of the chain link plates.
- Inadequate hardness values of the link plates.
- Foreign inclusions in the material.

And, inspite of these numerous deficiencies that reduced fatigue strength to a measured value of 34,400 N, the breaking force was still assessed at 740,000 N.

In the past, numerous studies have confirmed that even grave deficiencies in quality, heat treatment and production will hardly have a negative influence on the breaking force, whereas the actual quality, i. e. the fatigue strength, will naturally be considerably reduced.

A 32 B – 3 2" pitch triplex roller chain of a good quality has a fatigue strength of approx. 74,000 N (= 10 % breaking force).

The fatigue strength drop to a mere 34,000 N is solely due to quality. In this case it amounts to a mere 46 % of the standard value.

This drop results in a fatigue strength that is limited to approx. 50 working hours. The asymptotic course of the stress-number curve offers an explanation for this drop in fatigue strength. Reference is made here to the representation in our paper "Chain drive technology". We should bear in mind that the tractive force is 100,000 N, whereas fatigue strength and, hence, allowed tractive force amounts to a mere 34,000 N.

8.4 The safety factor to be selected

The static safety factor to be selected for ensuring safe operation should take fatigue strength, and accordingly also, multi-strandedness and quality into account. The safety factor that is actually necessary for a triplex chain of equally low quality would then read as follows:

$$S_{stat} \text{ necessary} = \frac{\text{breaking force}}{\text{fatigue strength}}$$

$$= \frac{740{,}000}{34{,}400} = 21.5$$

The safety factor to be taken as a basis for this chain selection hence, is not:

$S_{stat} = 6$, but is, far more: $S_{stat} = 21.5$!

Permissible tractive force may not exceed fatigue strength. With a triplex chain of the deficient quality found here, the ratio of breaking force to this value then results in the required safety factor.

8.5 Influence of chain quality on the static safety factor

As has already been mentioned, a good quality triplex roller chain will possess a fatigue strength amounting to 10 % of its breaking force. A static safety factor of S = 10 would then do suffice for this chain's design.

The difference between the definitely necessary static safety factor of $S_{stat} = 21.5$ and the value of $S_{stat} = 10$ hence, amounts to 11.5.

In this case, the so-called static safety value must be more than doubled for compensating the deficiency in quality (= fatigue strength).

Only with this safety value of $S_{stat} = 21.5$ taken as a basis for selecting the chain, will a troublefree operation be ensured if a chain of similar inadequate quality is applied.

Conclusion:

If one were to apply a triplex roller chain originating from the same source and of an identically deficient quality for a tractive force of 100,000 N, then, based on the actually necessary static safety value of $S_{stat} = 21.5$, the chain to be selected should read as follows:

Necessary breaking force:
= tractive force · static safety value
= 100,000 N · 21.5 = 2,150,000 N.

For achieving full operational reliability a 56 B – 3 3 ½" pitch triplex roller chain with an effective 2,240,000 N breaking force would have to be applied, in this case.

This would reflect a version of huge dimensions, as well as, an unacceptable price: performance ratio.

8.6 The optimal chain design

Under the given conditions of:

1. maximum tractive force:
   F = 100,000 N;
2. absolute operational reliability;
3. very short operating cycles at a mere
   v = 2 m/min speed,

the following drive solution for controlling the valves was chosen on grounds of these preset standards:

Application of two ANSI 160 – 1 roller chains with 63,000 N fatigue strength each and a breaking force of 226,800 N, matched as a pair.

The aggregate fatigue strength of both chains amounts to: twice 63,000 equalling 126,000 N.

The resulting dynamic safety of this drive hence, is:

$$S_{dyn} = \frac{\text{fatigue strength}}{\text{tractive force}} = \frac{126{,}000}{100{,}000} = 1.26$$

The static safety factor amounts to:

$$S_{stat} = \frac{\text{total breaking force}}{\text{tractive force}}$$

$$= \frac{2 \cdot 226{,}800}{100{,}000} = \frac{453{,}600}{100{,}000} = 4.5$$

The dynamic safety factor proves that the selected drive operates continuously in the fatigue strength range. It is so absolutely reliable at all times. Though the static safety factor achieves merely an S = 4.5 value (a university reference book specifies min. S = 6), absolute operation reliability is nonetheless given.

The following results from an evaluation of this chain design:

1. The fatigue strength of two ANSI 160 – 1 chains is much bigger than that of an ANSI 160 – 2 duplex roller chain with merely 91,000 N.
2. It is even moderately higher than with an ANSI 160 – 3 triplex chain with 122,000 N. (Refer also to Rexnord catalogue “Chain drive technology” on page 16.)
3. A considerable saving is made by choosing two good quality ANSI 160-1 chains instead of a low quality size 56 B – 3 chain.

8.7 Analysis of the results

The following conclusions may be drawn from the aforegoing deliberations:

1. A static safety factor of S = 6 will not suffice when selecting a good quality triplex chain. In this case, the so-called safety factor should read: $S_{stat} = 10$.
2. If one chooses a lower quality triplex chain, a static safety factor of $S_{stat} = 20$ will not suffice. Hence, selection of the appropriate static safety factor is of itself an element of uncertainty.
3. The only approach to solving this complex set of problems is to base both the design and the evaluation of a chain’s quality on its fatigue strength.

9. Adjusting Roller Chains

9.1 Standard roller chains admissible deviation from length

According to mandatory standards, roller chains may have an allowed deviation from length of + 0.15 %. This corresponds to a permissble 1.5 mm/1m deviation from chain length. With an up to (and including) ¾" pitch, measuring must be made on a minimum length of 610 mm, and on a minimum length of 1,220 mm with chains of 1in to 4-½" pitch.

For measuring, the chain must be dry and free from grease and the measuring load must amount to 1 % of the breaking force. The chain should be supported across its total length for measuring.

The theshold values determined by the method described above cannot be referred to shorter chain sections than the lengths indicated. And, it is also disallowed to apply the measured values to all sections of a long chain strand. All individual sections of a shorter or longer chain need not necessarily show the same tolerances.

9.2 Isolating the tolerance with pair and/or group running

As results from the specified tolerances, chains may show relatively considerable deviations as regards their final length and also the length of intermediate sections. Two chains applied as a pair may hence, have an allowed 15 mm difference in length across a total length of 10 metres. In addition, individual sections within a chain strand of 10 metres length may show different tolerances. And, even though both chains will have an identical final length, the individual sections within this chain need not necessarily be of the same length. This applies similarly to the individual sections of both chains in relation to one another.

Matching such chains is therefore necessary for achieving a satisfactory and operationally reliable running property with chains that are intended for running in pairs and/or groups.

Matching is necessary in the following individual cases, so for instance with:

- lifting devices equipped with more than one chain;
- paternoster elevator systems;
- chains with cross-linkages by cross bars, bent lug link plates and/or extended pins;
- chains applied for kinematic duties;
- roller chains designed for control operations;
- application of several single chains to drives instead of multiple chains.

It is the identical length that counts when adjusting chains for paired and/or grouped running, or when matching individual sections within a longer chain length. As a rule, it is not of importance whether the actual length is within the lower, mean, or upper tolerance range of 0.15 % referred to the absolute length.

9.3 Accuracy of adjustment

Whereas mandatory standards allow for an absolute + 0.15 % tolerance in length, far smaller deviations are determined for the adjustment.

When it come to problems of chain adjustment, the chain producer should be consulted with regard to the methods to be applied and the accuracy required. The best technical and also most economic method can then be agreed on grounds of existing experience.

9.4 *Chain pairings matching made by client without prior in-shop adjustment*

If roller chains are applied for running in pairs and/or groups without their having first been matched accordingly, the following conditions may occur:

- lead and/or delay of the chains and of individual chain sections;
- alternating lead and/or delay referred to one another;
- straining of the chains referred to one another, if they are cross-linked by means of cross ties or catches;
- considerable straining forces accumulating in the chains referred to one another that will cause destruction of cross ties, catches and, even of sprockets and/or drive shafts;
- premature wear of chains and sprockets on account of straining forces;
- excessive noise;
- faulty running operation with kinematic and control and load transfer functions;
- premature fatigue fracture (endurance failure) of the chain, or the fastening elements.

The problems indicated above will make themselves felt, in particular, in the case of mixed chains originating from different batches (or even from different producers) that are applied in paired running.

With requirements for paired and/or grouped running that are not extremely exacting, some customers will use chains originating from the same batch. Even though it may be assumed that the chains' actual lengths and/or their position in the length tolerance field will be relatively good according to Gaussian error distribution, this approach is still considered to be inadequate for meeting higher demands.

In the first place, the chain producer should be required to confirm that all chains used for adjusting originate from one only batch. And, in addition, it must be ensured that none of these chains can, or will, have been confused at any point in (first in-first out) stockturn and/or storage.

Even if this method offers most positive results, a certain number of chains may be counted upon to fail in satisfactory paired running.

No absolute reliability is warranted by the above indicated method.

9.5 *Sprockets for paired and grouped running*

For achieving an accurate running in pairs and/or groups, it is also necessary to position the sprockets (that are accommodated on the drive shaft) such that all gearings are exactly aligned. The sprockets must either be grooved identically, i. e. in relation to the tooth centre, or tooth space, or otherwise, they must be fastened to the drive shaft by means of a clamping bushing and aligned accurately in the course of assembly.

Idler Sprockets should be mounted to rotate freely independently of one another for avoiding any potential and unnecessary straining of chains that are firmly linked together by means of cross ties or conveyor elements.

9.6 *Matching chains in an ungreased state*

For achieving an adequately exact matching the chains should be free from grease.
Hence, greased chains drawn from stock are absolutely unsuitable for matching.
This should be borne in mind when ordering chains.

Final remarks

Chain drive design

The performance numbers shown in the design tables are based on empirical values and on the superior capacity of Rexnord Roller Chains.

The existing bearing area pressure and the chain fatigue strength are allowed for in the values indicated both in the performance tables and in all other particulars regarding performance. And, the performance-numbers also reflect the chain rollers' fatigue resistance.

Breaking load is of no relevance in this context.

Reliability criteria

We must bear in mind that merely a chain's fatigue strength can be relied on to indicate whether a chain is "lastingly strong", or not.

Please contact us, if you want to determine this value for your own considerations with regard to reliability.

General technical problems

A comprehensive experience of many years in chain design and application allows us to offer a concrete answer to the many technical problems arising.

Please do not hesitate to contact us!