iwis

wir bewegen die welt

Chain engineering

Design and construction
Examples of calculation

Literature reference:

H.-G. Rachner	-	Steel link chains and chains drives
G. Niemann	-	Machine elements
H. Zollner	-	Chain drives
DIN-Normen		

Important notes
Subject to alteration in the interest of technical advancement.
The **iwis** terms and conditions of sale apply to all claims for liability and warranty.

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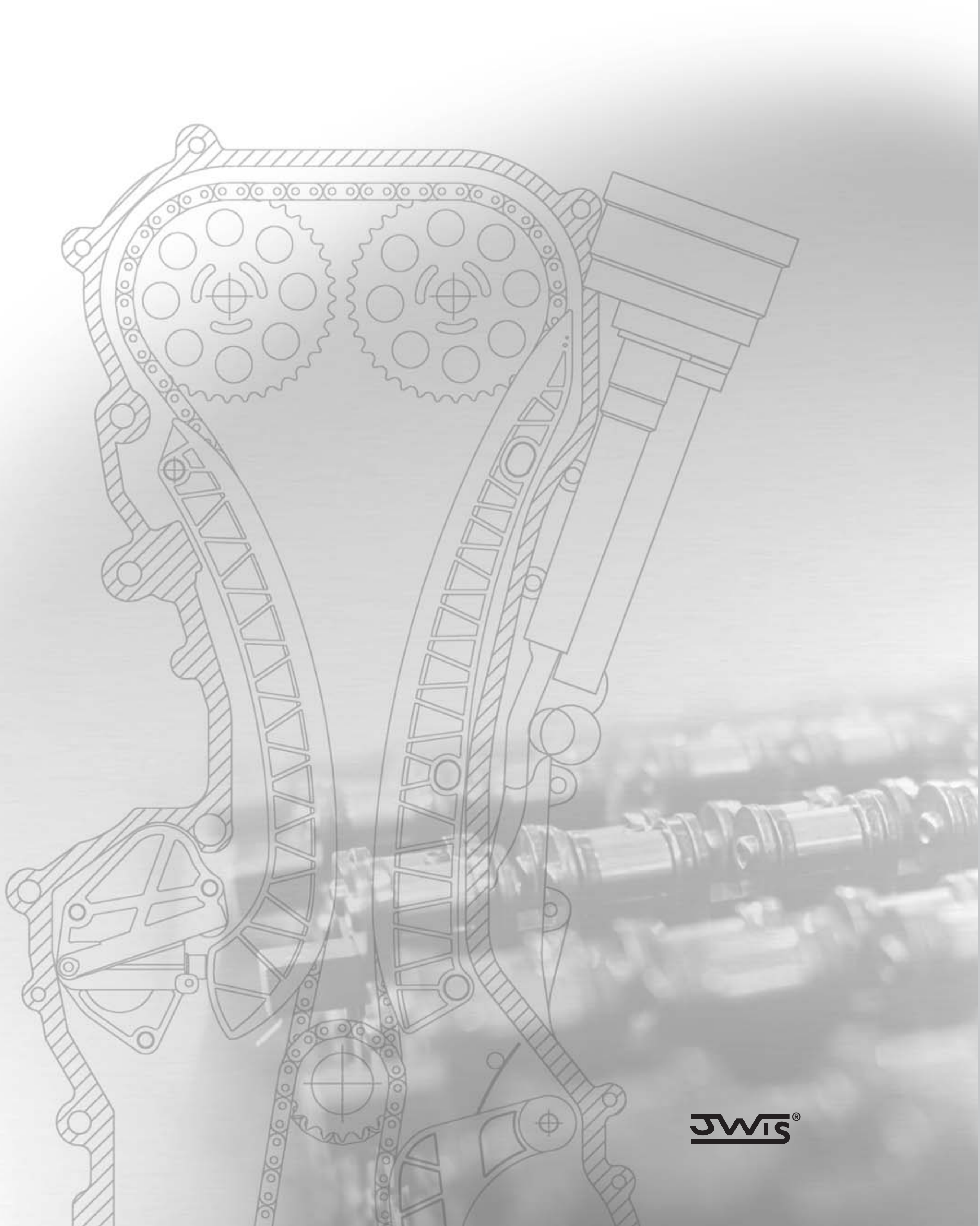
Chain engineering

Design and construction
Examples of calculation



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iwis-High Performance Chains

Quality products with a world reputation

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Quality Plus Points	**What this means for the user**
above-average service life due to excellent wear resistance	longer times between maintenance, less downtime and thus more economic
high consistency, matchless precision, superior length tolerances	perfect functioning of chains running in parallel or in pairs, extremely precise positioning, ease of running, and very quiet operation
breaking strength considerably higher than the DIN/ISO standard, high fatigue strength	greatly increased factors of safety which provides wider selection oportunities
all **iwis** chains are pre-stretched	reduced stretching during running-in
highly efficient initial greasing and corrosion protection	optimum protection, noise reduction
shouldered pins with chains made to DIN 8187 standards	maintenance-friendly, chain which can easily be cut to length

SL – an iwis idea wins through

iwis SL series chains (Super Longlife) have pins with an additional extremely hard surface, under which is a load-bearing high strength hard layer which encloses a tough core.

This special design provides outstanding characteristics:

- highest resistance to wear and therefore prolonged service life
- breaking strength and fatigue strength remain high
- higher resistance to wear at increased temperatures
- improved surface finishes reduce friction properties and enable the chain to better handle deficient operational lubrication
- reduced susceptibility to corrosion
- increased safety with ending stresses

SL chains have proved themselves in practical cases in the most varied chain applications world wide.

iwis chains of this design are designated by the suffix SL.

iwis-High Performance Chains

Quality products with a world reputation

The foundation of **iwis** high quality is based on each individual part being technically perfect

- Use of high-grade head-treatable steels with are made exclusively for IWIS to their material analysis, tolerance and surface quality.

- Each chain part is manufactured a million times daily to the same precision. This production is monitored by SPC (statistical process control).

- All chain parts are heat-treated, using special processes to optimize quality features.

- Constant geometry and high surface quality result from the use of modern production technologies.

- Chains are checked for dimensional accuracy: length tolerance, freedom of articulation and assembly component integrity, inspection of the press-in seating of the pin outer links and bush-inner link interfaces.

- The high standard of quality assurance conforms with the high requirements of the automotive industry, of ISO 9002-1987 and other national and international standards.

- For special applications
  - Surface coatings
  - Special lubrications
  - Reduced length toleranced chains
  - Special materials (eg corrosion resistant)

iwis bush – manufactured as a special, surface treated, seamless closed cylinder.

iwis roller – absolutely cylindrical form even at the impact point guarantees ideal sliding-contact bearing properties

iwis side plate – optimally dimensioned, shaped with precision, and heat-treated for toughness and hardness.

iwis shouldered pin (DIN 8187).
SL serie chains have pins with still higher resistance to wear.

Preface

Quality can only be assessed under arduous conditions. Exceeding the limits, either upwards or downwards, leads t o inevitable expense: Over specification is costly because products and processes are used that are too expensive, equally overload is costly and leads to premature failure.

The correct choice of product is possible only, if the following conditions are known:
- practicable method of calculation and sound theoretical basis
- proven figures from practical experience.

iwis offer you all this as a package.

This present handbook for chain engineering represents a summary of chain technology that the designer requires: Characteristics of various components, calculating formulae and tables. All this is supplemented by descriptions and examples of calculations.

It is possible to have alternative solutions, which can be supported by calculations, to a number of problems.

Optimum results can only be obtained, if the basic information is known and well founded values are available from experience. The User can rely on assistance from our Technical Advisory Dept. This Department has vast applicational experience of chain drives ranging from the camshaft drive for high-speed racing engines to the conveying of special components through drying ovens, from precision conveyors used in copying equipment, and the stop-go operation encountered with power and free conveyor chains in transfer lines in the motor industry.

Reliable products are identified by their accuracy, close tolerances and proven performance. These are the products that **iwis** supply. The latest issue of catalogue “Precision Chains for Drive and Conveyor Purposes”, which is supplemented by a range of special leaflets, provides information in respect of all available standard and special chains, chain wheels, tensioning devices and other chain drive accessories.

This technical handbook extends the range of **iwis** publications and should help the engineer assess and understand the theory and practice of chain drives and the advantages available when **iwis** products are specified and selected.

List of contents

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1 Introduction

The chain drive assumes a special position in the large group of drive mediums for the transmission of torque and power. The great advantage of this type of positive controlled connection is the constant relative speed between driving and driven shafts and the complete elimination of slip, compared with non-positive drives (e.g. belt drives) where slip very often can only be prevented by high belt tension. Steel roller chains are used as drive, transport or conveyor chains for static or alternating loads with slow or high chain speeds transmitting power between two parallel shafts.

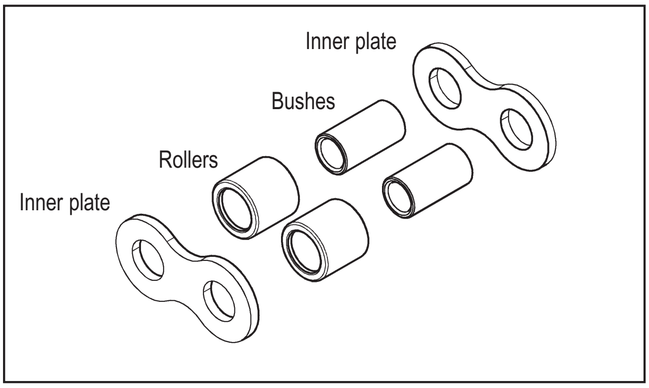
Compared to the use of cables, round link chains, gear and belt drives, the application for steel roller chains must be defined accordingly. The construction of steel roller chain has the advantage of avoiding bending stresses during operation, to which cables are subjected, when they run over pulleys. They are particularly advantageous when long distances between shafts have to be connected, and they are more cost effective than gear drives, due to the fact that no idler gears with bearings are required. Gear drives mean a change of direction. With chain drives the sense of direction remains the same. They constitute a flexible connection between shafts. By using adjustable idler wheels it is possible to control the rotation of two shafts in phase.

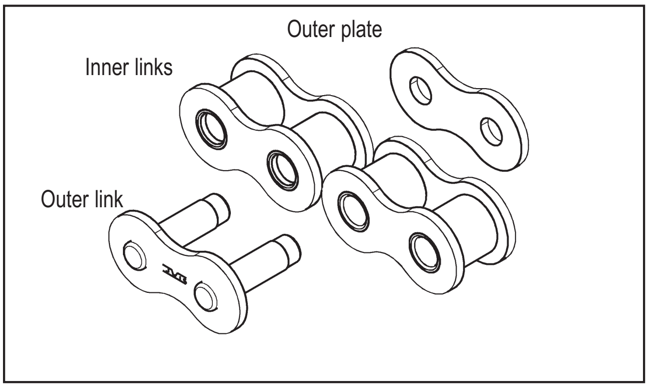
Chains can engage with chain wheels on both sides, which is often required for special drives, which need a change of direction. Chain drives are less sensitive to dirt and lack of maintenance than gear and other drives and can also be used under higher operating temperatures. Steel Roller chains are used throughout engineering. They are used in the manufacturing of machine tools, printing machines, in the textile and packaging industry, for material handling, agricultural machinery, in the construction industry, hydraulic engineering and mining industry, and also in the construction of vehicles and engines.

2 Design of steel roller chains

Steel roller chains consist of a range of individual chain links. Each link in turn consists of individual components some of which are designed to transmit tensile loads and others that allow the articulation of two links in respect of each other. The design of the links is of particular importance. Generally speaking they move only in one plane.

This design of **iwis**-high-perfor-mance roller chains and of bush chains is illustrated in the following drawings.



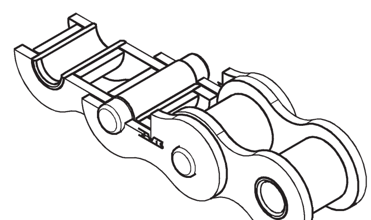


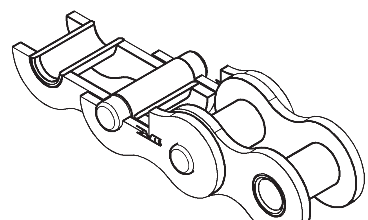
A chain consists of inner and outer links. The inner link consists of two inner plates into which, two bushes are pressed and two rollers, which rotate on the bushes.

In the case of bush chains both rollers are ommitted. Thus the bushes are in direct contact with the chain wheel teeth.

The outer link consists of two outer plates and two bearing pins. The connection of the inner links by adding outer links is shown in the above illustration.

3 Roller and bush chains


Roller chain


Bush chain

iwis manufacture both types of chains. The decision to use one or the other type requires a thorough knowledge of the problems to be solved.

The rollers which rotate on the bushes run with little friction on the teeth of the chainwheel, as there is a constant change in contact area. The grease film between rollers and bushes contributes towards silent running and absorbs shocks.

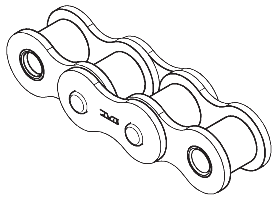
In the case of a bush chain, the teeth of the chain wheel always contact the stationary bushes at the same point. It is therefore important to provide excellent lubrication when using this type of drive.

The bearing area given in the table for each chain size is the projection of the bearing surface between bush and bearing pin. That is the length of the bush, multiplied by the bearing pin diameter. A higher bearing area results in a lower bearing pressure, and therefore reduces wear rate.

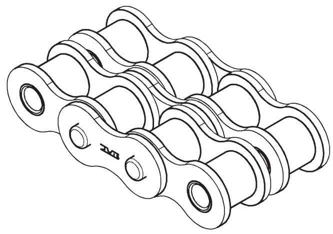
iwis bush chains which are used for heavily stressed camshaft dri-ves in highspeed Diesel engines have been particularly successful.

4 Single and multiple chains

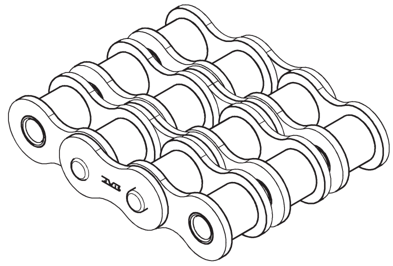
Single chain



Double chain



Triple chain



As soon as the transmission of torque using a single chain requires less than a 15 tooth chainwheel, it is recommended to use a multiple chain with a smaller pitch. This results in a larger number of teeth with the same chain wheel diameter. This improves the polygonal effect of the chain links, and the impact speed of the rollers on the teeth are reduced.

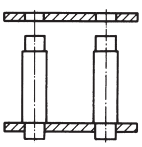
Therefore a drive using a multiple smaller pitch chain will run more quietly than a single chain with a larger pitch.

Multiple chains with a smaller pitch than the single chain should also be selected, if single chains exceed the maximum permissible chain speed that is shown on the graphs on pages 29 and 30.

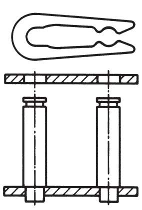
Multiple chains are more sensitive to misalignment of the chainwheels. For reasons of durability it is not recommended to go beyond triplechains. Where a triple chain is insufficient, it is possible to use two double chains or several triple chains. In this case care should be taken to ensure that the chains are matched.

5 Connecting links

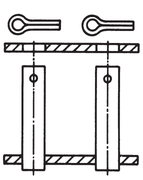
If chains are not supplied as endless chains, the ends are connected by a connecting link. On chains up to and including 1" pitch the plate is retained by means of a spring clip. For chains 1 1/4" pitch and over and chains to DIN 8188 from 3/4" onwards, the link plate is secured by means of a split pin.



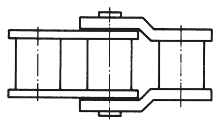
Rivetting link
Chains are endlessly rivetted together using this type of connecting link.



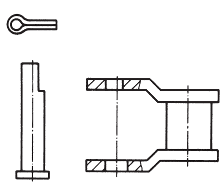
Spring clip connecting link
This spring clip is used to connect chain sections ending with inner links. The closed end of the clip is fitted in the direction of chain motation.



Split pin connecting link
Fulfils the same purpose as the spring clip type.

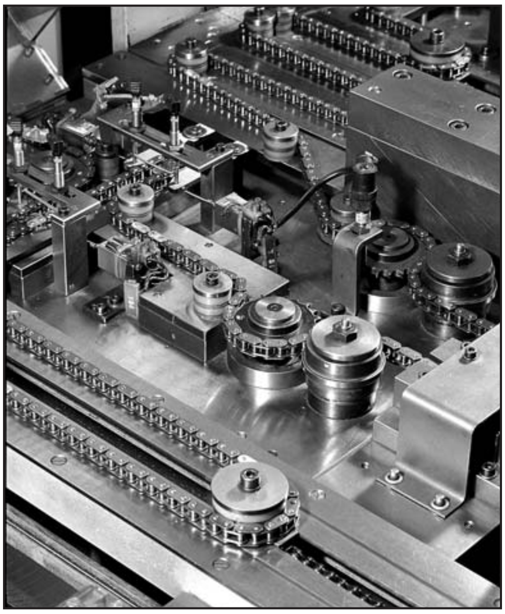


Double cranked link
A double cranked link consists of one cranked link and an inner link. They are used to produce chains with an uneven number of links.



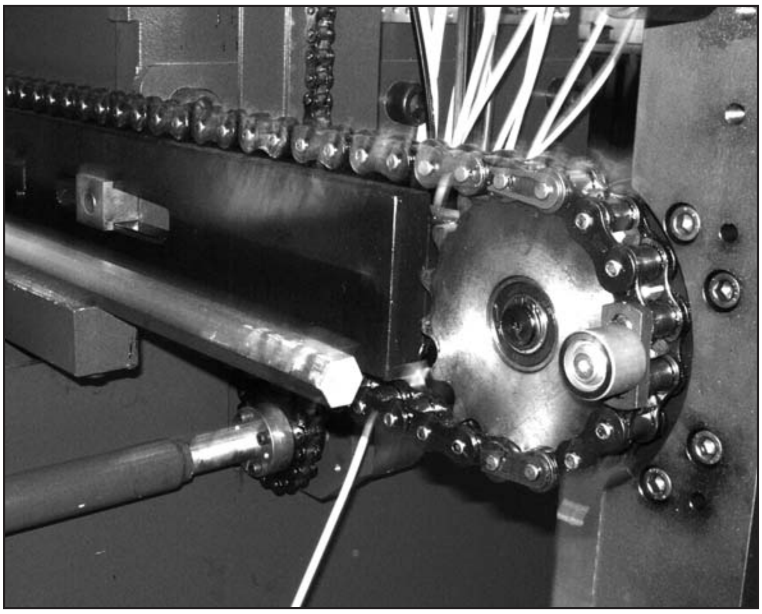
Single-cranked link
with screwed connection
With only one connecting link A, E or K and using this cranked link chains with an uneven number of links can be produced.

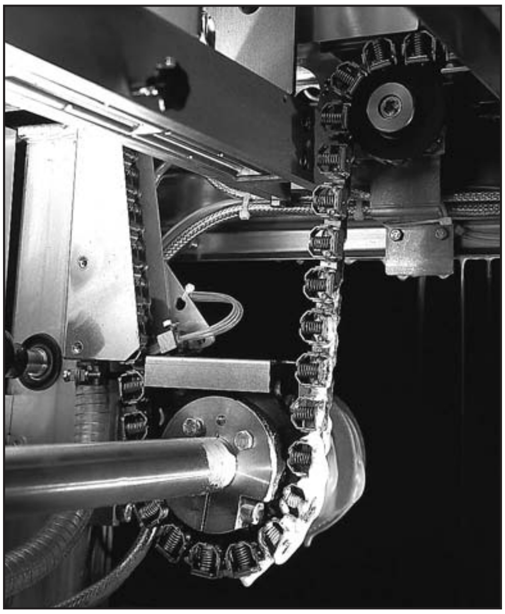
Ein gekröpftes Glied schwächt die Kette und sollte vermieden werden, weil sich sonst die Bruchkraft um ca. 20 % reduziert.



Allgemeiner Maschinenbau:
Hervorragende Verschleißfestigkeit und eingeschränkte Längentoleranz für spezialisierte Anwendungen

Handhabungsindustrie:
Förderketten - zuverlässig, präzise und langlebige Lösungen für anspruchsvolle Anforderungen





Verpackungsindustrie
iwis-Ketten mit speziellen Klemmelementen zum Greifen, Transportieren, Positionieren und Einziehen von Folien und anderen Flachmaterialien

A Power transmission chain

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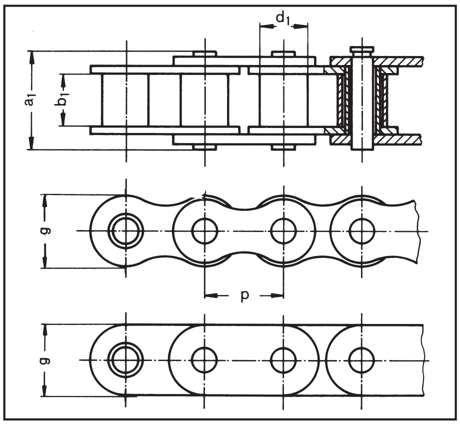

6 **iwis** Roller Chains

British Standard Chains

iwis Designation	Designation pitch x inner width	DIN ISO No.		pitch p mm	width inside b_1 mm	width outside a_1 mm	roller dia. d_1 mm	height of plates g mm	bearing area f cm^2	weight q kg/m	Breaking load F_B Chain made by **iwis** N	Breaking load F_B DIN 8187 Minimum Standard N
Single chains to DIN 8187, Works standards												
G 42	6 x 2,8 mm	04	DIN 8187	6	2,80	6,6	4,00	5,00	0,07	0,12	3 200	3 000
G 52	8 mm x 1/8"	05 B-1	DIN 8187	8	3,16	8,1	5,00	7,10	0,11	0,18	6 000	5 000
G 53 H[1])	8 mm x 3/16"	-	Works standards	8	4,76	11,7	5,00[3])	7,60	0,25	0,34	9 000	-
G 62 1/2[2])	3/8 x 5/32"	-	Works standards	9,525	3,94	11,0	6,35	8,20	0,22	0,34	11 000	-
G 67[2])	3/8 x 7/32"	06 B-1	DIN 8187	9,525	5,72	12,9	6,35	8,20	0,28	0,41	10 500	9 000
P 83 V	1/2 x 3/16"	-	Works standards	12,7	4,88	13,2	7,75	10,20	0,29	0,44	15 500	-
S 84 V	1/2 x 1/4"	-	Works standards	12,7	6,40	15,0	7,75	12,00	0,38	0,58	18 000	-
L 85 SL	1/2 x 5/16"	08 B-1	DIN 8187	12,7	7,75	16,9	8,51	12,20	0,50	0,70	22 000	18 000
M 106 SL	5/8 x 3/8"	10 B-1	DIN 8187	15,875	9,65	19,5	10,16	14,40	0,67	0,95	27 000	22 400
M 127 SL	3/4 x 7/16"	12 B-1	DIN 8187	19,05	11,75	22,7	12,07	16,40	0,89	1,25	34 000	29 000
M 1611	1" x 17 mm	16 B-1	DIN 8187	25,4	17,02	36,1	15,88	21,10	2,10	2,70	75 000	60 000
M 2012	1 1/4 x 3/4"	20 B-1	DIN 8187	31,75	19,56	40,5	19,05	25,40	2,92	3,72	120 000	95 000
M 2416	1 1/2 x 1"	24 B-1	DIN 8187	38,1	25,40	53,1	25,40	33,50	5,50	7,05	211 000	160 000
M 2819	1 3/4 x 31 mm	28 B-1	DIN 8187	44,45	30,95	65,1	27,94	37,00	7,35	8,96	250 000	200 000
M 3219	2" x 31 mm	32 B-1	DIN 8187	50,8	30,95	63,6	29,21	42,30	8,05	10,00	315 000	250 000
Double chains to DIN 8187												
D 52	8 mm x 1/8"	05 B-2	DIN 8187	8	3,16	13,9	5,00	7,10	0,22	0,36	9 100	7 800
D 67[2])	3/8 x 7/32"	06 B-2	DIN 8187	9,525	5,72	23,4	6,35	8,20	0,56	0,78	20 000	16 900
D 85 SL	1/2 x 5/16"	08 B-2	DIN 8187	12,7	7,75	30,8	8,51	12,20	1,00	1,35	40 000	32 000
D 106 SL	5/8 x 3/8"	10 B-2	DIN 8187	15,875	9,65	36,0	10,16	14,40	1,34	1,85	56 000	44 500
D 127	3/4 x 7/16"	12 B-2	DIN 8187	19,05	11,75	42,1	12,07	16,40	1,78	2,50	68 000	57 800
D 1611	1" x 17 mm	16 B-2	DIN 8187	25,4	17,02	68,0	15,88	21,10	4,21	5,40	150 000	106 000
D 2012	1 1/4 x 3/4"	20 B-2	DIN 8187	31,75	19,56	79,7	19,05	25,40	5,84	7,36	210 000	170 000
D 2416	1 1/2 x 1"	24 B-2	DIN 8187	38,1	25,40	101,8	25,40	33,50	11,00	13,85	370 000	280 000
D 2819	1 3/4" x 31 mm	28 B-2	DIN 8187	44,45	30,95	124,7	27,94	37,00	14,70	18,80	500 000	360 000
D 3219	2" x 31 mm	32 B-2	DIN 8187	50,8	30,95	126,0	29,21	42,30	16,10	19,80	530 000	450 000
Triple chains to DIN 8187												
Tr 85	1/2 x 5/16"	08 B-3	DIN 8187	12,7	7,75	44,7	8,51	12,20	1,50	2,00	58 000	47 500
Tr 106	5/8 x 3/8"	10 B-3	DIN 8187	15,875	9,65	52,5	10,16	14,40	2,02	2,80	80 000	66 700
Tr 127	3/4 x 7/16"	12 B-3	DIN 8187	19,05	11,75	61,5	12,07	16,40	2,68	3,80	100 000	86 700
Tr 1611	1" x 17 mm	16 B-3	DIN 8187	25,4	17,02	99,2	15,88	21,10	6,32	8,00	220 000	160 000
Tr 2012	1 1/4 x 3/4"	20 B-3	DIN 8187	31,75	19,56	116,1	19,05	25,40	8,76	11,00	315 000	250 000
Tr 2416	1 1/2 x 1"	24 B-3	DIN 8187	38,1	25,40	150,2	25,40	33,50	16,50	20,31	560 000	425 000
Tr 2819	1 3/4" x 31 mm	28 B-3	DIN 8187	44,45	30,95	184,5	27,94	37,00	22,05	28,00	750 000	530 000
Tr 3219	2" x 31 mm	32 B-3	DIN 8187	50,8	30,95	184,5	29,21	42,30	24,15	29,60	795 000	670 000

[1]) bush chain
[2]) straight side plates
[3]) bush Ø

Chains with the SL suffix have pins with increased resistance to wear

Overall programme with technical data in catalogue “Precision chains for Drive and Conveyor Purposes”

A Power transmission chain

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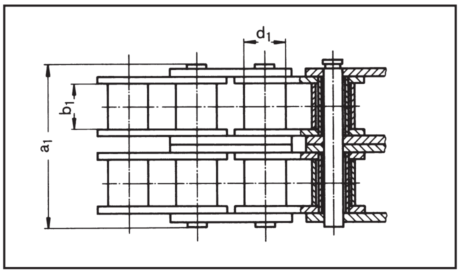
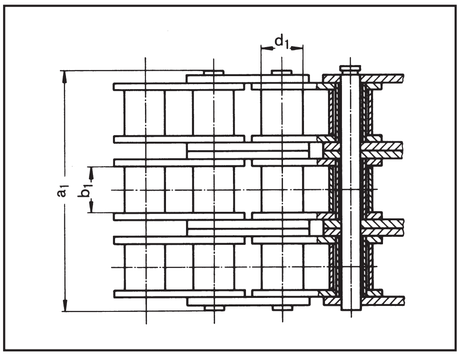




American Standard Chains

iwis Designation	Designation pitch x inner width	DIN ISO No.		pitch p mm	width inside b_1 mm	width outside a_1 mm	roller dia. d_1 mm	height of plates g mm	bearing area f cm^2	weight q kg/m	Breaking load F_B Chain made by **iwis** N	Breaking load F_B DIN 8187 Minimum Standard N
Single chains to DIN 8188 (ANSI-Standard)												
L 85 A	1/2 x 8/16" ANSI 40	08 A-1	DIN 8188	12,7	7,94	16,6	7,95	12,00	0,44	0,60	18 000	14 100
M 106 A	5/8 x 3/8" ANSI 50	10 A-1	DIN 8188	15,875	9,53	20,4	10,16	14,40	0,70	1,00	29 000	22 200
M 128 A SL[1])	3/4 x 1/2" ANSI 60	12 A-1	DIN 8188	19,05	12,70	25,3	11,91	18,00	1,06	1,47	42 000	31 800
M 1610 A	1 x 5/8" ANSI 80	16 A-1	DIN 8188	25,4	15,88	32,1	15,88	22,80	1,79	2,57	68 000	56 700
Double chains to DIN 8188 (ANSI-Standard)												
D 85 A	1/2 x 5/16" ANSI 40-2	08 A-2	DIN 8188	12,7	7,94	31,0	7,95	12,00	0,88	1,19	36 000	28 200
D 106 A	5/8 x 3/8" ANSI 50-2	10 A-2	DIN 8188	15,875	9,53	38,6	10,16	14,40	1,40	1,92	56 000	44 400
D 128 A[1])	3/4 x 1/2" ANSI 60-2	12 A-2	DIN 8188	19,05	12,70	48,1	11,91	18,00	2,12	2,90	84 000	63 600
D 1610 A	1 x 5/8" ANSI 80-2	16 A-2	DIN 8188	25,4	15,88	61,4	15,88	22,80	3,58	5,01	145 000	113 400
Triple chains to DIN 8188 (ANSI-Standard)												
Tr 85 A	1/2 x 8/16" ANSI 40-3	08 A-3	DIN 8188	12,7	7,94	45,4	7,95	12,00	1,32	1,78	50 000	42 300
Tr 106 A	5/8 x 3/8" ANSI 50-3	10 A-3	DIN 8188	15,875	9,53	56,7	10,16	14,40	2,10	2,89	80 000	66 600
Tr 128 A	3/4 x 1/2" ANSI 60-3	12 A-3	DIN 8188	19,05	12,70	71,0	11,91	18,00	3,18	4,28	125 000	95 400
Tr 1610 A	1 x 5/8" ANSI 80-3	16 A-3	DIN 8188	25,4	15,88	90,7	15,88	22,80	5,37	7,47	210 000	170 100

iwis Designation	Designation pitch x inner width	DIN ISO No.		pitch p mm	width inside b_1 mm	width outside a_1 mm	roller dia. d_1 mm	height of plates g mm	weight q kg/m	Breaking load F_B Chain made by **iwis** N	Breaking load F_B DIN 8187 Minimum Standard N
Long pitch chains to DIN 8181											
LR 165 SL	1 x 5/16"	208 B	DIN 8181	25,4	7,75	16,9	8,51	11,80	0,52	22 000	18 000
LR 206 SL	1 1/4 x 3/8"	210 B	DIN 8181	31,75	9,65	19,5	10,16	15,0	0,63	28 000	22 400
LR 247 SL	1 1/2 x 7/16"	212 B	DIN 8181	38,1	11,75	22,7	12,07	16,10	0,85	34 000	29 000
LR 3211	1" x 17 mm	216 B	DIN 8181	50,8	17,02	36,1	15,88	20,60	2,10	75 000	60 000

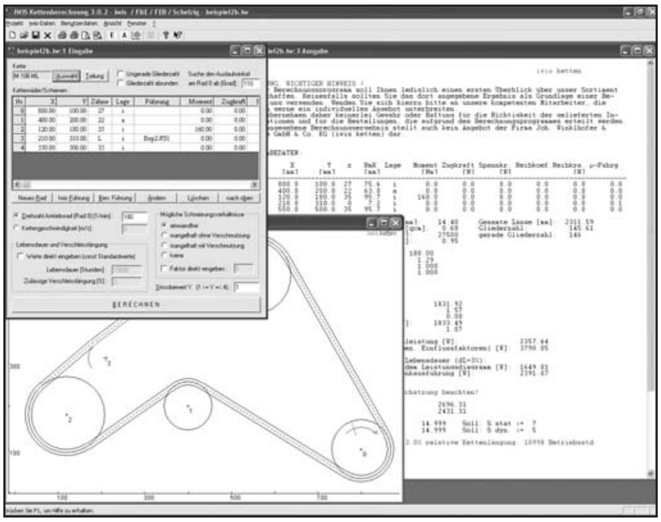
[1]) also available with straight side plates

Chains with the SL suffix have pins with increased resistance to wear

Overall programme with technical data in catalogue “Precision chains for Drive and Conveyor Purposes”

7 Chain preselection programme:

Als Unterstützung bei der Kettentriebauslegung bzw. der Vorauswahl einer geeigneten Kette stellt Ihnen iwis eine spezielle PC-Software zur Verfügung.

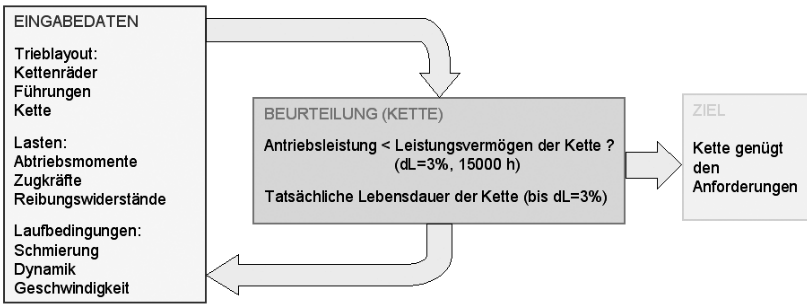


Unter dem Begriff Industriekettentriebe sind

- Antriebsketten zur Leistungsübertragung achsenparalleler Wellen,
- zur Übernahme ruhender und schwellender Lasten,
- als Transport- oder Förderketten in der Anwendung zu diesem Programm zu verstehen.

Die Idee des Programms beruht auf der Berechnung der notwendigen Antriebsleistung zum Kettentrieb, die auf Grund der Anwendung (Abtriebsmomente, Kettenlasten in den Trumabschnitten bei Transportaufgaben und der Reibleistung aus den Reibungsverhältnissen auf den Spann- und Führungsschienen und auch Lagerreibung) erforderlich wird. Dem Anwender obliegt es dann bei Verfehlen seiner Zielvorstellung hinsichtlich der Lebensdauer der Kette, die Laufbedingungen (z. Bsp. Schmierung und Dynamik) zu verbessern oder einen anderen Kettentyp zu wählen.

Die erste Bewertung hat als Auslegungskriterium also immer die Mindestlebensdauer der Kette von 15000 h (bezüglich einer Verschleißlängung von 3%). Außerdem wird die tatsächlich errechnete (zu erwartende) Lebensdauer angegeben; die Soll-Laufzeit des Triebes wäre dann ausschlaggebend.



Mit dem Programm kann nicht direkt ein Kettentrieb berechnet werden, wenn nur die Antriebsleistung des Antriebsmotors vorgegeben wird. Es ist erforderlich, eine lastnehmende Kettenradwelle oder einen Lasttrum nach dem Antriebskettenrad zu benennen. Die Motorleistung muss in jedem Fall größer als die Antriebsleistung sein.

Das Programm ist so aufgebaut, dass der Anwender eine von **iwis** vorgegebene Kettendatenbank verwenden kann, in der alle Berechnungs- und Leistungskennwerte der **iwis ketten** als auch nach DIN 8187, DIN 8188 bzw. ISO 606 abgelegt sind. Es ist auch möglich, bei entsprechender Sachkenntnis, sich eine eigene Kettendatei aufzubauen. Man kann einen Trieb aus mehreren Radachsen und Transport- oder Führungsschienen in einer 2D-Ebene berechnen. Als Spannelemente können Kettenräder oder Schienen definiert werden. Die Kettenlinie wird automatisch aus den Positionen der Triebkomponenten (Räder, Schienen) ermittelt.
Neue Erkenntnisse in der Kettentheorie und Ergebnisse aus Versuchen sowie Programmkorrekturen werden fortlaufend eingearbeitet und durch Versionsnummern gekennzeichnet.

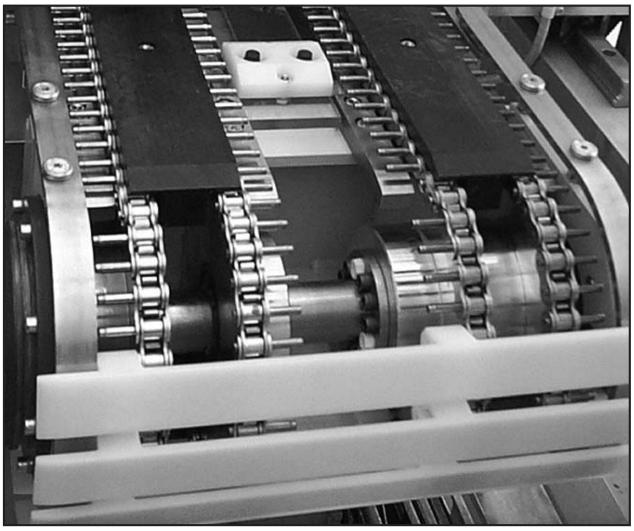
ACHTUNG, WICHTIGER HINWEIS !
Unser Berechnungsprogramm soll Ihnen lediglich einen ersten Überblick über unser Sortiment verschaffen. Keinesfalls sollten Sie das dort angegebene Ergebnis als Grundlage einer Bestellung verwenden. Wenden Sie sich hierzu bitte an unsere kompetenten Mitarbeiter, die Ihnen gerne ein individuelles Angebot unterbreiten.
Wir übernehmen daher keinerlei Gewähr oder Haftung für die Richtigkeit der gelieferten Informationen und für die Bestellungen, die aufgrund des Berechnungsprogramms erteilt werden.
Das angegebene Berechnungsergebnis stellt auch kein Angebot der Firma **iwis** antriebssysteme GmbH & Co. KG dar.

Der Programmaufruf findet über eine Benutzerkennung mit individuellem Passwort statt. Nach der Installation muss deswegen eine Benutzerdatei bei **iwis** angefordert werden. Alle zukünftigen Programmerweiterungen und -korrekturen werden automatisch an alle registrierten Anwender verteilt. Bei Support-Anfragen ist dadurch gewährleistet, dass die Berechnungen auf den gleichen Stand bezüglich der Programmdateien basieren.

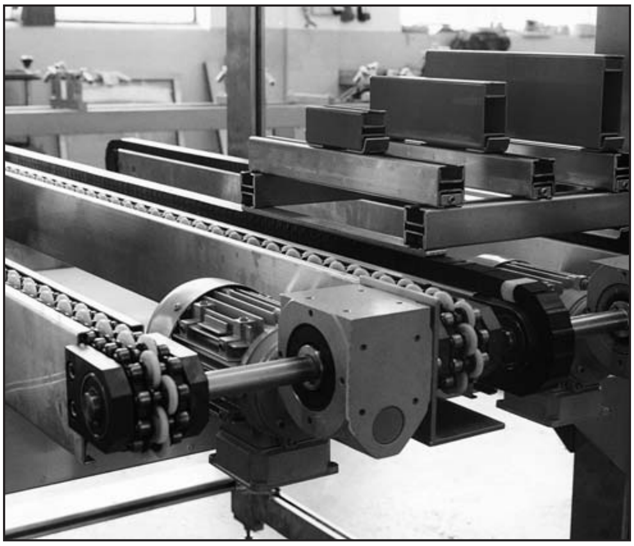
Hinweise, Wünsche und Fehlermeldungen an:
Michael.Panas@iwis.com
Ulrich.Schelzig@iwis.com

Systemvoraussetzungen, Mindestausstattung:

- Prozessor 586 (Pentium/AMD)
- 64 MB Arbeitsspeicher (RAM)
- Grafikkarte mit 800x600 Pixel Auflösung
- CD-ROM Laufwerk
- Windows 98/NT



Packaging industry
Sonderanwendungen für Förderketten im Food & Non-Food Bereich



Machine linkage
iwis-power and free conveyor chains convey, store, accelarate, retard workpieces and workpiece carriers

Conveying applications
iwis high performance chains with attachments

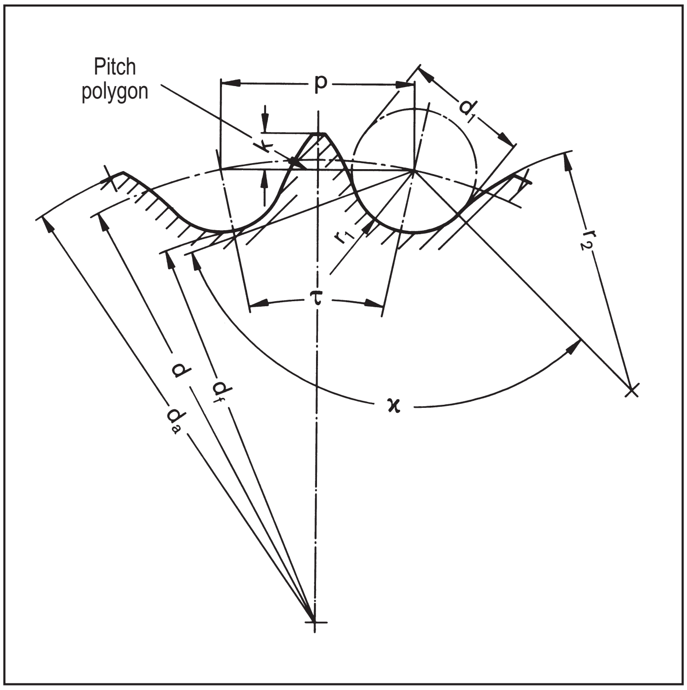
iwis
wir bewegen die welt

1 Design and construction

The shape of the chainwheels is determined by the chain size, number of teeth and the torque to be transmitted.

Wheels with hubs allow the transmission of a higher torque, whereas plate wheels may be used only for the transmission of smaller torques.

The tooth form is designed in accordance with DIN 8196. The calculation of the required values is summarized below.



p	chain pitch
d_1	roller diameter max.
d	pitch circle diameter
d_f	root circle diameter
d_a	top diameter
r_1	tooth radius
τ	tooth angle
χ	roller contact angle
r_2	tooth profile radius
k	tooth height above pitch polygon
z	number of teeth

Pitch circle diameter

$$d = \frac{p}{\sin\frac{\tau}{2}}$$

$$\frac{\tau}{2} = \frac{180°}{z}$$

Root circle diameter

$$d_f = d - d_1$$

Top diameter

$$d_{a\,max} = d + 1{,}25 \cdot p - d_1$$

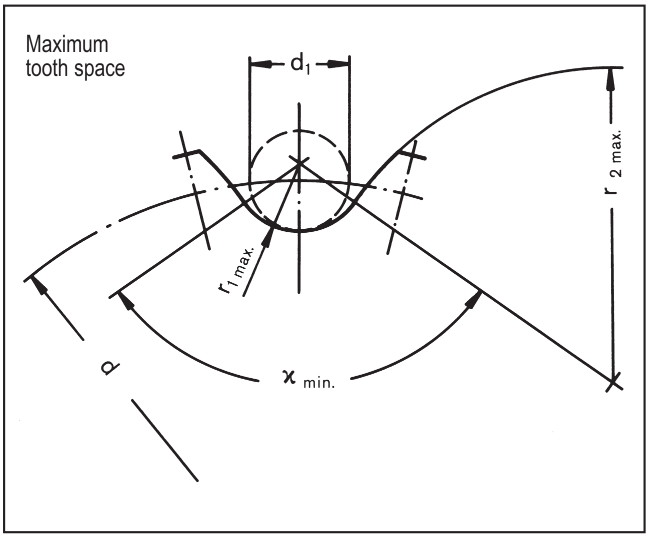
$$d_{a\,min} = d + \left(1 - \frac{1{,}6}{z}\right) \cdot p - d_1$$

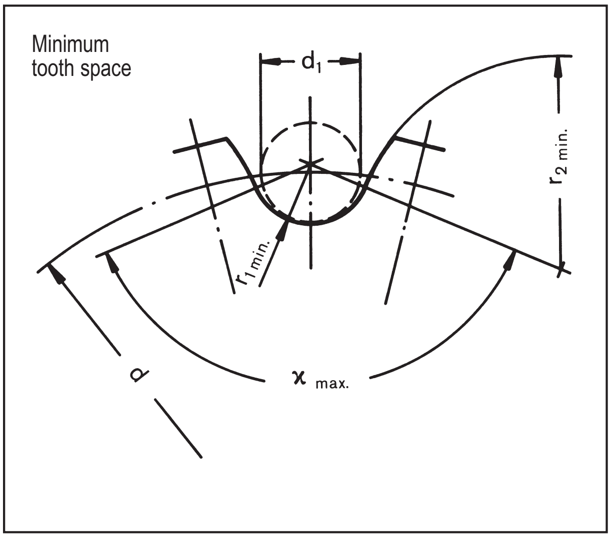
Tooth height

$$k_{max} = 0{,}625 \cdot p - 0{,}5\,d_1 + \frac{0{,}8}{z} \cdot p$$

$$k_{min} = 0{,}5 \cdot (p - d_1)$$

Treten beim Verzahnen Überschneidungen auf, dann wird der effektive maximale Kopfkreisdurchmesser durch das Verzahnungs-Werkzeug bestimmt.





$$r_{1\,max} = 0{,}505\ d_1 + 0{,}069\ \sqrt[3]{d_1}$$

$$\chi_{min} = 120° - \frac{90°}{z}$$

$$r_{2\,max} = 0{,}008\ d_1\left(z^2 + 180\right)$$

$$r_{1\,min} = 0{,}505\ d_1$$

$$\chi_{max} = 140° - \frac{90°}{z}$$

$$r_{2\,min} = 0{,}12\ d_1\left(z + 2\right)$$

Tooth width

Tooth width B_1 is narrower than the inner width b_1 of the chain

Chain pitch B_1	$p \leq 12{,}7$	$p > 12{,}7$
for Single chain wheels	$0{,}93 \cdot b_1$	$0{,}95 \cdot b_1$
for Double and Triple chain wheels	$0{,}91 \cdot b_1$	$0{,}93 \cdot b_1$
for Quadruple chain wheels and over	$0{,}88 \cdot b_1$	$0{,}93 \cdot b_1$

(b_1 inner width of the chain)

Toleranz für die Zahnbreite B_1: h14

Zahnbreite B_2, B_3 usw.
$\hat{=}$ (Anzahl der Kettenstränge – 1) · e + B_1

Abfasung der Zahnbreite c = 0,1 bis 0,15 · p
(für Fahrrad- und
Moped-Kettenräder gilt c = 0,05 bis 0,07 · p)

Radius $r_3 \geq p$

Diameter of relief
Below the root circle (maximum hub diameter)

$$d_s = p \cdot \cot\frac{\tau}{2} - 1{,}04 \cdot g_1 - 0{,}76$$

(g_1 max. height of plates)

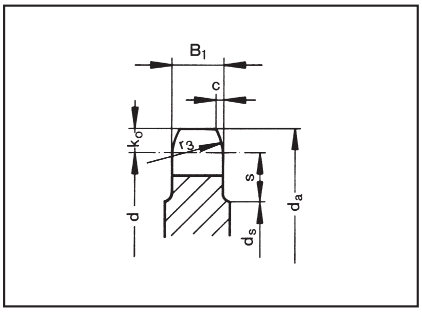
$$\frac{\tau}{2} = \frac{180°}{z}$$

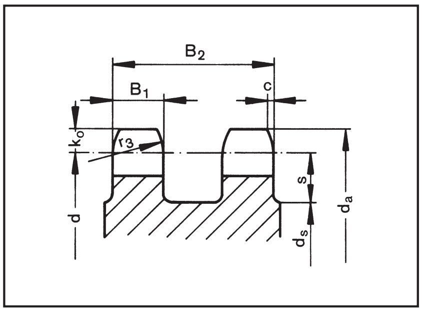
For further chain wheel dimensions see chart on page 18.

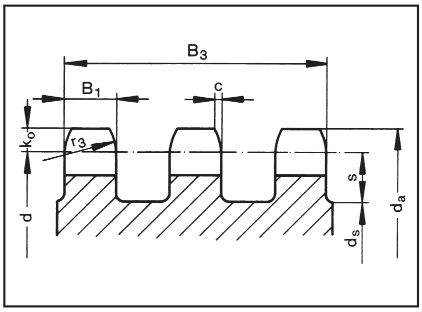
Radius r_4

Chain pitch p	r_4 min.	r_4 max.
up to 9,525	0,2	1
over 9,525 to 19,05	0,3	1,6
over 19,05 to 38,1	0,4	2,5
over 38,1	0,5	6

2 Chain wheel sizes







$$d_a = d + 2 \cdot k_o$$

$$d_s = d - 2 \cdot s$$

d from chain wheel catalogue

Designation iwis	DIN ISO	B_1 h14	B_2 h13	B_3 h12	k_0 [1])	c	r_3	s [2])
Single chains to DIN 8187, Works standard								
G 42	04	2,6	-	-	1,2	0,8	6	4
G 52	05 B-1	2,7	-	-	1,8	1,0	8	5,5
G 53 H	-	4,4	-	-	1,8	1,0	8	6
G 62 ¹/₂	-	3,6	-	-	2,0	1,2	10	6,5
G 67	06 B-1	5,3	-	-	2,0	1,2	10	6,5
P 83 V	-	4,5	-	-	2,6	0,8	13	8
S 84	-	5,9	-	-	2,6	1,6	13	8
L 85 SL	08 B-1	7,2	-	-	2,6	1,6	13	9
M 106 SL	10 B-1	9,1	-	-	3,5	2,0	16	11
M 127 SL	12 B-1	11,1	-	-	4,2	2,4	19	12
M 1611	16 B-1	16,1	-	-	5,5	3,2	26	17
M 2012	20 B-1	18,5	-	-	7,0	4,0	32	21
M 2416	24 B-1	24,1	-	-	8,0	4,8	38	25
M 2819	28 B-1	29,4	-	-	10,0	5,6	44	26
M 3219	32 B-1	29,4	-	-	12,5	6,3	51	28
Double chains to DIN 8187, DIN 8154, Works standards								
D 52	05 B-2	2,7	8,3	-	1,8	1,0	8	5,5
D 67	06 B-2	5,2	15,4	-	2,0	1,2	10	6,5
D 85 SL	08 B-2	7,0	20,9	-	2,6	1,6	13	9
D 106 SL	10 B-2	8,9	25,4	-	3,5	2,0	16	11
D 127	12 B-2	10,8	30,2	-	4,2	2,4	19	12
D 1611	16 B-2	15,8	47,6	-	5,5	3,2	26	17
D 2012	20 B-2	18,1	54,5	-	7,0	4,0	32	21
D 2416	24 B-2	23,6	71,9	-	8,0	4,8	38	25
D 2819	28 B-2	28,8	88,3	-	10,0	5,6	44	26
D 3219	32 B-2	28,8	87,3	-	12,5	6,3	51	28
Triple chains to DIN 8187, DIN 8154								
Tr 67	06 B-3	5,2	-	25,6	2,0	1,2	10	6,5
Tr 85	08 B-3	7,0	-	34,8	2,6	1,6	13	9
Tr 106	10 B-3	8,9	-	42,0	3,5	2,0	16	11
Tr 127	12 B-3	10,8	-	49,7	4,2	2,4	19	12
Tr 1611	16 B-3	15,8	-	79,5	5,5	3,2	26	17
Tr 2012	20 B-3	18,1	-	91,0	7,0	4,0	32	21
Tr 2416	24 B-3	23,6	-	120,3	8,0	4,8	38	25
Tr 2819	28 B-3	28,8	-	147,9	10,0	5,6	44	26
Tr 3219	32 B-3	28,8	-	145,9	12,5	6,3	51	28

Designation iwis	DIN ISO	B_1 h14	B_2 h13	B_3 h12	k_0 [1])	c	r_3	s [2])
Single chains to DIN 8188								
L 85 A	08 A-1	7,3	-	-	2,6	1,6	13	9
M 106 A	10 A-1	9,0	-	-	3,5	2,0	16	11
M 128 ASL	12 A-1	12,0	-	-	4,2	2,4	19	13
M 128 AG	12 A-1	12,0	-	-	4,2	2,4	19	13
M 1610 A	16 A-1	15,0	-	-	5,5	3,2	26	17
Double chains to DIN 8188								
D 85 A	08 A-2	7,2	21,5	-	2,6	1,6	13	9
D 106 A	10 A-2	8,8	26,9	-	3,5	2,0	16	11
D 128 A	12 A-2	11,8	34,5	-	4,2	2,4	19	13
D 1610 A	16 A-2	14,7	43,9	-	5,5	3,2	26	17
Triple chains to DIN 8188								
Tr 85 A	08 A-3	7,2	-	35,9	2,6	1,6	13	9
Tr 106 A	10 A-3	8,8	-	45,0	3,5	2,0	16	11
Tr 128 A	12 A-3	11,8	-	57,3	4,2	2,4	19	13
Tr 1610 A	16 A-3	14,7	-	73,2	5,5	3,2	26	17
Long pitch chains nach DIN 8181								
LR 165 SL	208 B	7,2	-	-	2,7	1,6	13	10,5
LR 206 SL	210 B	9,1	-	-	3,7	2,0	16	12,5
LR 247 SL	212 B	11,1	-	-	4,5	2,4	19	15,0
LR 3211	216 B	16,1	-	-	6,0	3,2	26	19,5
Side bow chains								
L 85 A-SB	-	7,3	-	-	2,6	1,6	13	9
M 106 A-SB	-	9,0	-	-	3,5	2,0	16	11
M 128 A-SB	-	12,0	-	-	4,2	2,4	19	13

[1]) Value for k_o only approx. For 17 teeth and below and application in limit conditions, d_a is calculated in accordance with formula on page 14.

[2]) Value for s only approx. For application in limit conditions d_s is calculated in accordance with formula on page 15.

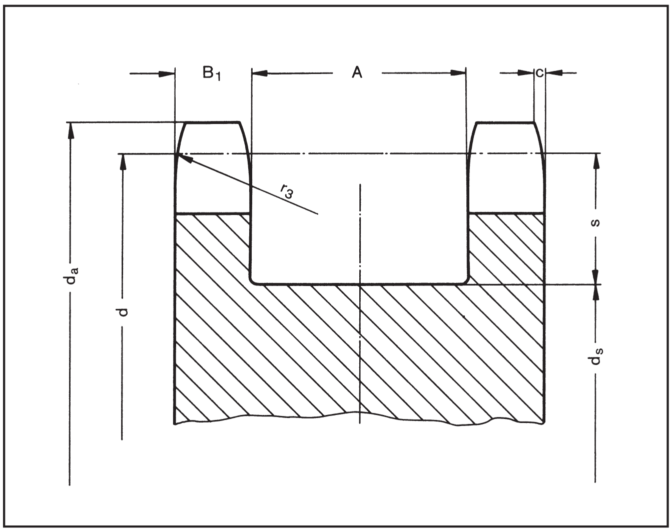
Pitch circle correction for long pitch chains

In the case of roller chains to DIN 8181 (long pitch type) the chain wheels with normal pitch to DIN 8187/88 are often used, in order to avoid a special design. If on the other hand an accurate wrap around these chain wheels has to be achieved, it is necessary to correct the pitch circle diameter. The tooth forming is carried out on a larger pitch circle diameter. The correction is made in accordance with the following formula:

$$\boxed{d = \frac{2 \cdot p}{\sin \frac{360°}{z}}}$$

p = pitch
z = no. of teeth
for chain wheels to DIN 8187/88

Chain wheel section for power and free conveyor chain

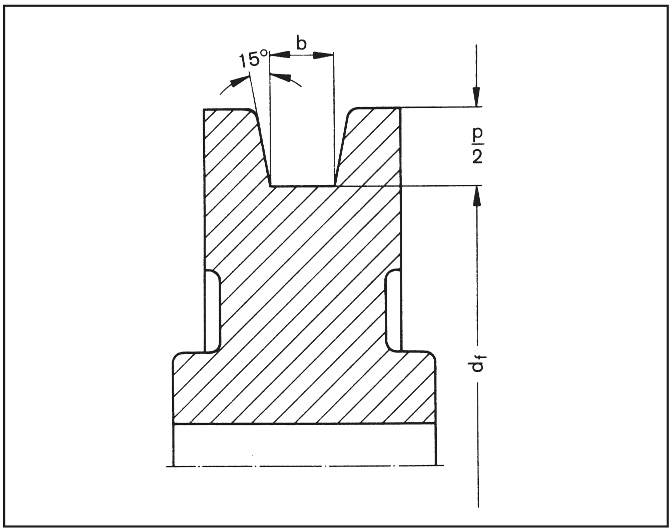


$$\boxed{d = \frac{p}{\sin \frac{180°}{z}}} \qquad \boxed{d_s = d - 2s}$$

z = no. of teeth
d_a, c, r_3 see page 16

iwis designation	Pitch p	B_1	s	A
M 127 SFS/K	19,05	10,8	15	20,7
LR 247 SFS/K	38,1	10,8	15	20,7
M 1611 SFS/K	25,4	11,6	20,5	33,3
LR 3211 SFS/K	50,8	11,6	26	33,3

Guide pulley for high-performance leaf chains



Sizes/dimensions:

Inner roller width
b = $a_1 \cdot 1{,}15$

Permissible min. root circle diameter

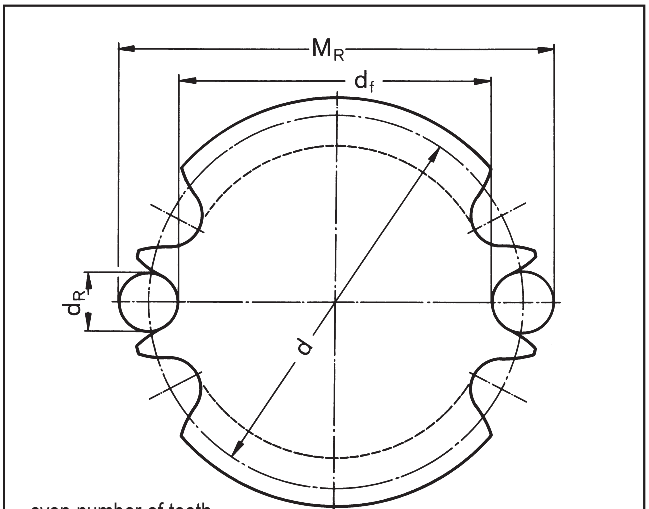
$d_{f_{min}} = p \cdot 5$

a_1 = width of chain from catalogue
p = chain pitch

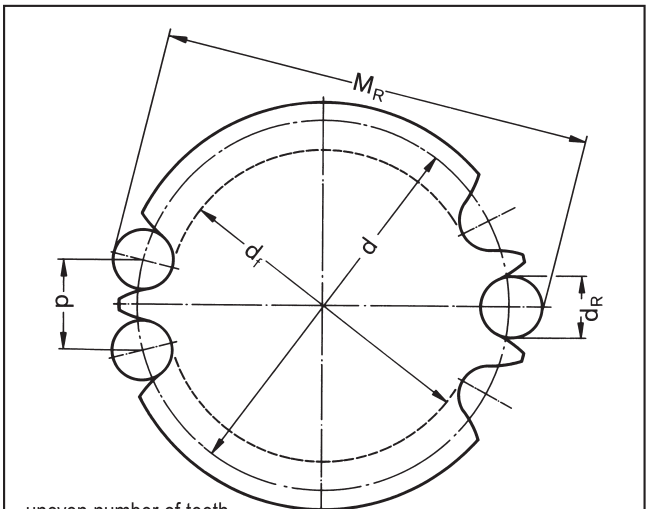
3 Checking chain wheels

The dimensions indicated on pages 16 to 19 must be checked. This applies also to the surface finish.

The root circle diameter, together with the longitudinal tolerance of the chain provides the initial gearing between the chain and the chainwheel. With an excessively small root circle diameter the chain is located relatively high in the tooth form from the very beginning. Thus the capacity for absorbing wear is reduced. Particular care should be taken in the manufacture of chain wheels with a small number of teeth. The accuracy of the root circle diameter can be checked by placing a new chain on the machined teeth. If the individual chain links can be lifted out of the teeth the root circle d iameter is too small. The check thus described can only be used for low requirements. A more accurate check should be carried out by measurement taken over checking pins as shown – M_R.



even number of teeth



uneven number of teeth

$$M_R = d + d_{R\,min}$$

$$M_R = d \cdot \cos\frac{90^\circ}{z} + d_{R\,min}$$

$d_R = d_1$
but with permissible tolerance $^{+0{,}01}_{-0}$

Maße d und M_R siehe Tabellen ab Seite 21

In addition the chainwheels should be checked for run-out and excentricity. DIN 8196 gives the following recommendations:

Concentricity
Max. discrepancy in concentricity between chain wheel bore and root circle diameter when locating the wheel in the bore: 0,0008 d_f + 0,08 or 0,15 (according to which value is the higher), but a maximum of 0,76 mm.

Run-out
Max. run-out allowable between chain wheel bore and face of chain wheel, with the wheel located in the bore is: 0,0009 d_f + 0,08, with a maximum of 1,14 mm

Dimension d – pitch circle diameter and z – no. of teeth – see tables in catalogue “Chain Wheels and Plate Wheels”

Chain wheel bore
Unless otherwise agreed between Manufacturer and Costumer, the chain wheel bores shall have a tolerance range of H 8.

Choice of material
The choice of material depends on the drive conditions, number of teeth, speed and transmitted torque. For small chain wheels with fewer than 30 teeth and an average chain speeds up to approx. 7 m/sec. Steel of a higher strength is used. In the cace of higher chain speeds tempered, case hardened or flame hardened steel is used. For the manufacture of large chain wheels with more than 30 teeth, grey iron or steel castings are used for average speeds, whereas tempered steel is usual for higher chain speeds.

1 Fundamental principles

The suitability of a chain drive for a specific purpose depends upon whether it can sustain the stresses that arise for an assumed period of time. When designing it is necessary to take into account all influencing factors which in their entirety determine the durability of a chain. The following diagram is designed to provide an idea of the interdependence of the influencing factors.

Load factors

Specific drive factors

Link movement
Drive arrangement
Tension/Guide
Lubrication

Static influencing factors

chain pull
centrifugal force

Dynamic influences

Load shocks
Polygon effect
Run in load
Load alternation/ frequency
Dynamic load

Chain factors

Breaking strength

Wear resistance

Durability

Selection factors

Size

Components
Total assembly

Materials

Type
Quality
Heat treatment
Surface treatment

Finish

Component manufacture
Accuracy of assembly
Initial lubrication at factory

There are three significant factors that determine the operational characteristics of the chain:

Breaking strength:
If the load on a chain is increased until the chain breaks, this load will equal the breaking strength and the fracture that occurs is referred to as a forced fracture.

Fatigue resistance
The influencing factors arising from the operational conditions subject the chain to alternating loads. These loads can be recreated on a Pulsator and the cycles required to cause failure can be determined. The test can be repeated with reduced loads, until finally there are no more fractures and the fatigue resistance figure has been established.

Wear resistance
The wear in the chain links and the resulting chain elongation determine the permissible load for roller and bush chains.
In the case of optimum operating conditions, the expected life is 15.000 operating hours with a max. 2 % chain elongation.
Bearing pressure, friction travel (page 27) and quality of lubrication are important factors that affect chain wear.
The selection can be affected by multiplying the capacity to be transmitted by the following factors.

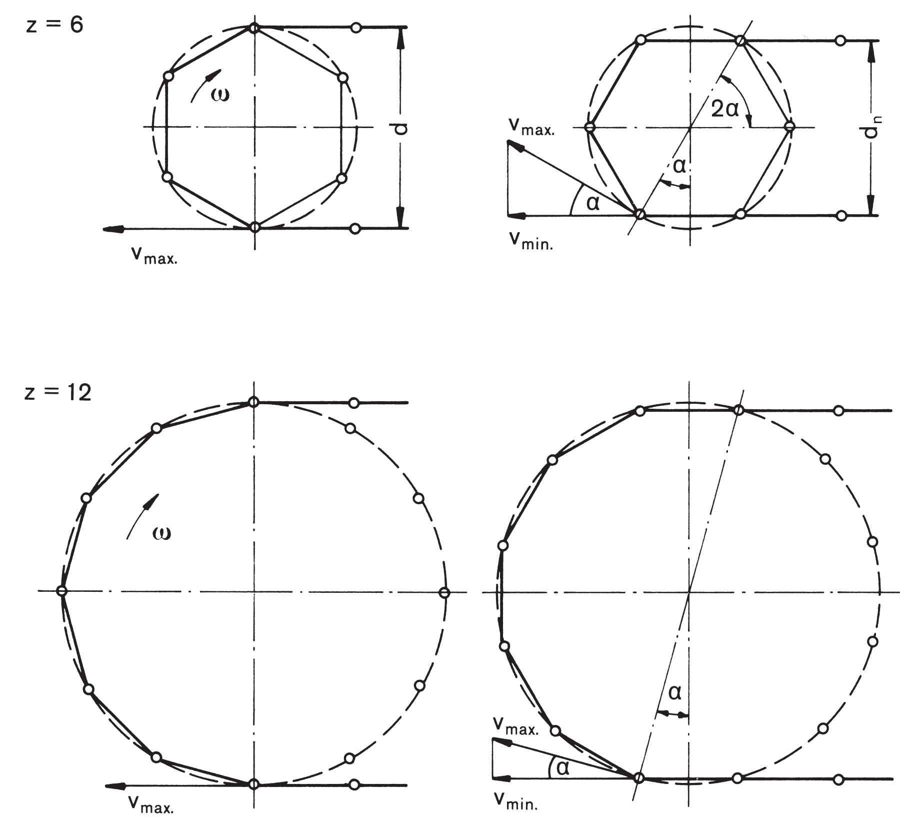
C Layout of chain drives

1.1 Influencing factors

Number of teeth
The influence of the number of teeth z in a small chain wheel is taken into account by factor f_1.

z	11	13	15	17	19	21	23	25
f_1	1,72	1,46	1,27	0,12	1,0	0,91	0,83	0,76

Each chain wheel is a polygon whose number of corners corresponds with the number of teeth. With a constant angular velocity the chain speed v is thus subject to periodic fluctuations between the limit values v_{max} and v_{min} (polygonal effect). In this way the chain is alternately accelerated and decelerated and there are increased loads.



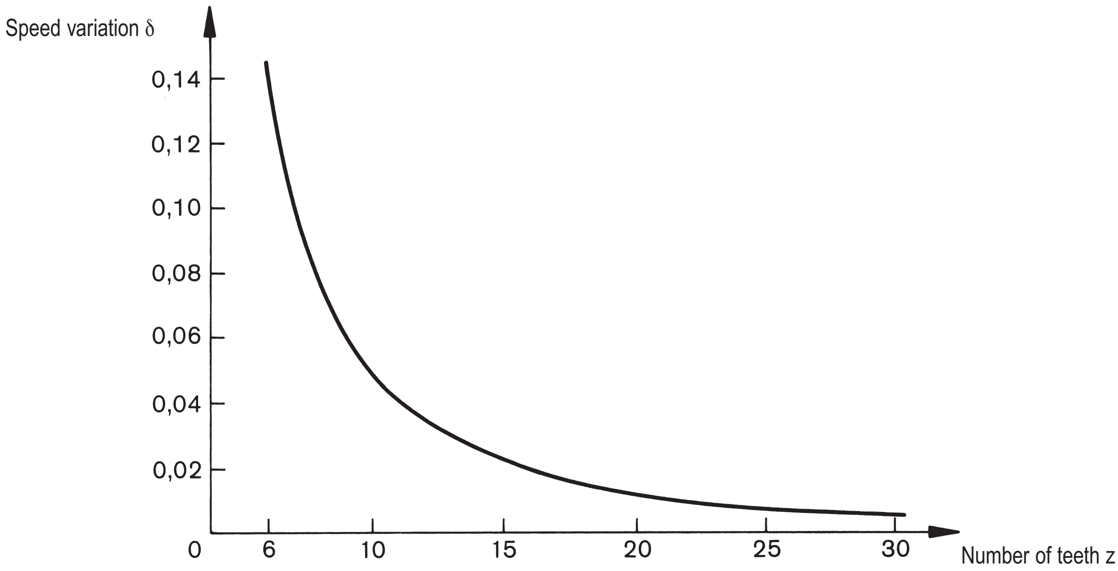
$$v_{min} = \frac{d_n}{2} \cdot \omega = \frac{p \cdot n}{19100 \cdot \tan\frac{180°}{z}} \quad \left[\frac{m}{s}\right]$$

$$v_{max} = \frac{d}{2} \cdot \omega = \frac{p \cdot n}{19100 \cdot \sin\frac{180°}{z}} \quad \left[\frac{m}{s}\right]$$

p = Pitch in mm
n = Rev./Min.
z = Number of teeth

The speed variation due to the alternating speed v_{max} and v_{min} is calculated as follows:

$$\delta = \frac{v_{max} - v_{min}}{v_{mittel}}$$



The speed variation is only dependent on the number of teeth z. It increases with the number of teeth z < 19 to a considerable extent.

This is the reason why small numbers of teeth, particularily in conjunction with higher speeds should be avoided. With $z \geq 19$ the speed variation approaches but does not meet the datum (zero) line asymptotically, that is the polygonal effect is without any influence from z = 19 onwards.

When the chain runs on the chainwheel the link angle is as follows:

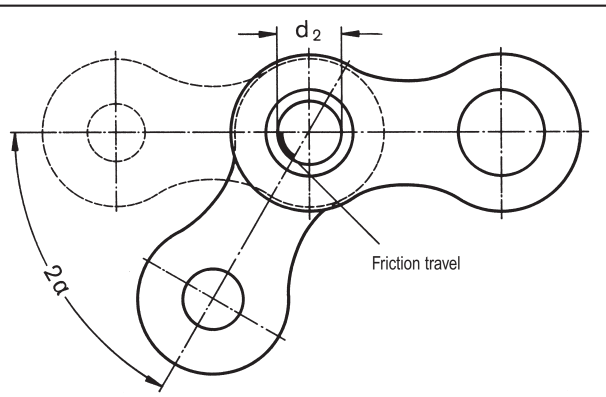
$$2\alpha = \frac{360°}{z}$$

Consequently the deflection (angle of friction) increases with a decreasing number of teeth and wear increases. The friction travel is calculated as follows:

$$s = \frac{d_2 \cdot \pi}{z}$$

[mm]

d_2 = Diameter of bearing pin in mm



The lower the number of teeth the lower the permissible bearing pressure and the higher the polygonal effect.

Speed –
Chain speed

The number of chain revolutions per minute is

$$\frac{n_1 \cdot z_1}{X} \text{ bzw. } \frac{n_2 \cdot z_2}{X}$$

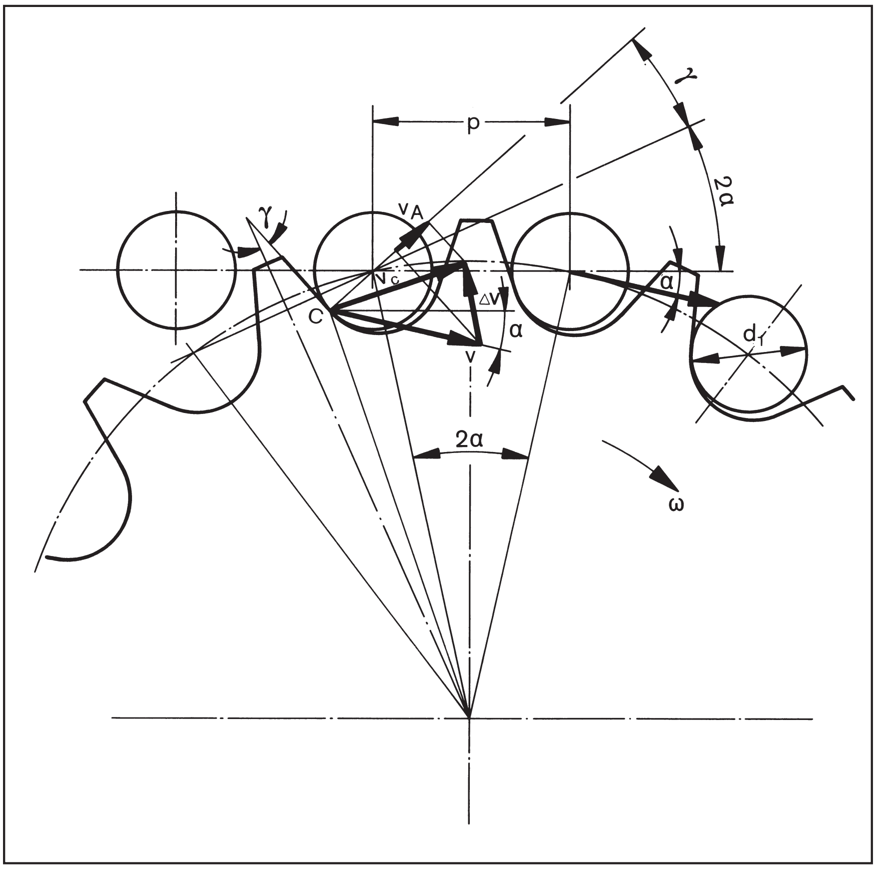
n = Rev./Min. of pinion or wheel
z = Number of teeth in pinion or wheel
X = Number of links

As speed n of the driving wheel increases, the number of chain revolutions increases correspondingly. Each link is deflected more frequently and thus the friction travel and consequently the wear increases. In order to reach the desired durability of 15.000 operating hours with a max. of 2 % chain elongation; it is necessary to reduce the bearing pressure.

Chain speed in meters per second

$$v = \frac{d \cdot n \cdot \pi}{60000} \quad \left[\frac{m}{s}\right]$$

d = Pitch circle diameter in mm



As the chain speed increases the permissible bearing pressure must be reduced.

20 m/s should be considered as the maximum chain speed, with 30 m/s under certain circumstances. These figures drop considerably with an increase in pitch size. The chain speed is a decisive factor for the impact speed vA of the chain wheel against the chain roller, as can be seen from the formula:

$$v_A = \frac{\pi \cdot n \cdot p}{30000} \cdot \sin\left(\frac{360}{z} + \gamma\right) \quad \left[\frac{m}{s}\right]$$

γ = angle of pressure

According to chain size a limit value of approx. 4 m/s is acceptable for v_A. A high impact speed causes high impact energy with a corresponding load on the chain rollers. With a given chain speed v the impact speed is to be kept low by means of a large number of teeth z.

As the chain gears on the wheel the chain rollers impact on the teeth with a shock. The kinetic energy of the impacting mass has to be absorbed by the roller.

Impact energy E_A:
in Newtonmeters

$$E_A = \frac{q \cdot p}{2000} \cdot v_A^{\,2} \qquad [\text{Nm}]$$

Impact force F_A:
in Newtons

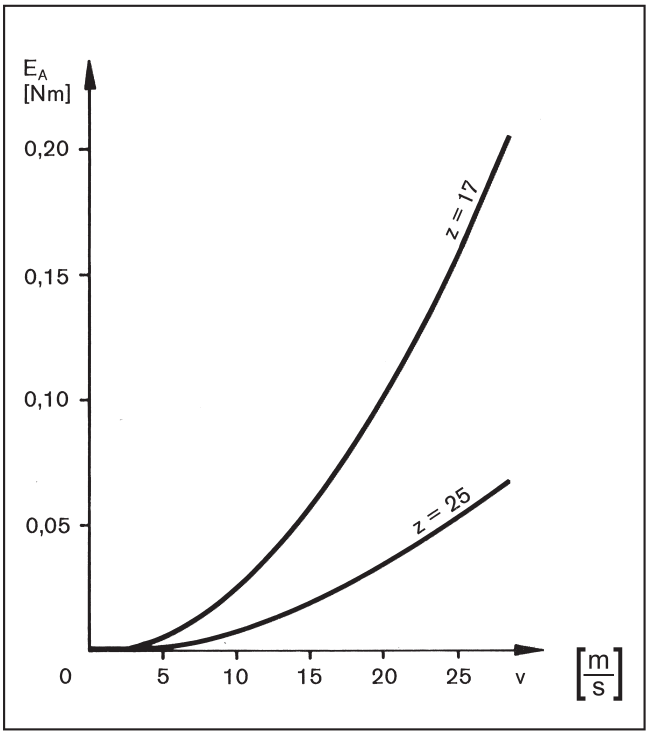
$$F_A = \sqrt{\frac{q \cdot p \cdot b_z \cdot E}{3}} \cdot v_A \qquad [\text{N}]$$

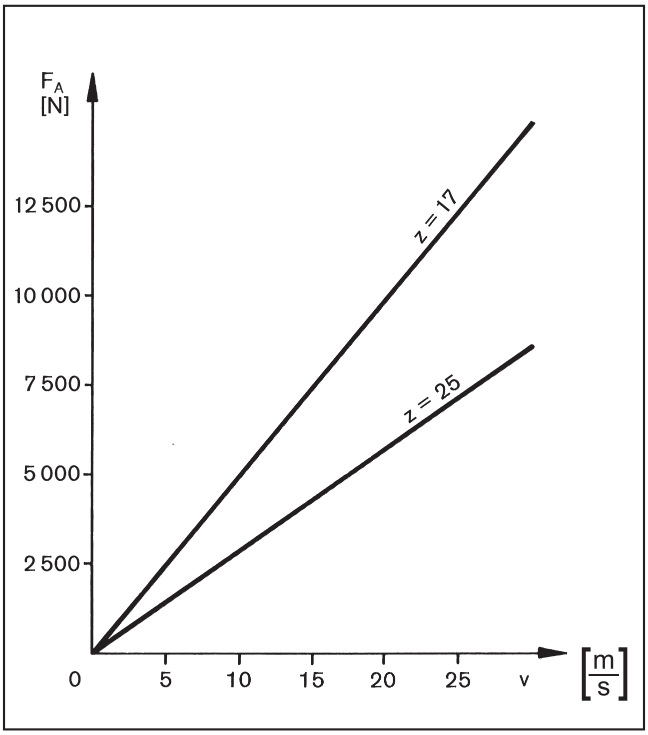
The impact force F_A is absorbed as flank pressure. With a higher speed, and in particular with a low number of teeth z it requires a high degree of flank strength (high degree of surface hardness).

b_z = Width of teeth in mm

q = Weight of chain in $\frac{\text{kg}}{\text{m}}$

E = Modulus of elasticity $\frac{\text{N}}{\text{mm}^2}$





The above diagrams show the impact energy and force in the case of a 1/2 x 5/16" chain, **iwis** reference L 85, depending on speed and number of teeth.

C Layout of chain drives

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Ratio

Effect of ratio i

i	1:1	2:1	$\boxed{3:1}$	5:1	7:1
$\boxed{f_2}$	1,22	1,08	$\boxed{1,0}$	0,92	0,86

When i = 1:1 the friction travel is identical on both chain wheels.

$$\frac{d_2 \cdot \pi}{z_1} = \frac{d_2 \cdot \pi}{z_2}$$

When i = 2:1 the friction travel is:

$$\frac{d_2 \cdot \pi}{z_1} \text{ und } \frac{d_2 \cdot \pi}{z_2}$$

thereby the overall friction travel is reduced.

d_2 = Bearing pin diameter

The higher the ratio the higher the permissible bearing pressure.

The table quotes for i_{max} 7:1. This ratio should only be used in extreme cases and with a very slow running chain drive. As a result of the large arc of contact at the large chain wheel and the high number of teeth in mesh, the chain on the non tensioned side will not engage positively. In this case a ratio of 4:1 should not be exceeded.

Shock factor

Effect of shock factor Y

Y	$\boxed{1}$	2	3	4
$\boxed{f_3}$	$\boxed{1}$	1,37	1,59	1,72

Many chains are subjected to shock loads whose size depends on the type and performance of the driving and driven machines. These shocks lead to an increased load in the chain compared with a shockfree operation.

When designing the chain drive, this shock loading, which represents an increase in the chain pull and affects in particular the durability, must be taken into consideration.

The following shock factors can be taken as an illustration.

Shock factor Y = 1
For machines with shockfree operation, i.e. machines driven by electric motors, i.e. lathes, drilling machines, etc.

Shock factor Y = 2
For planers and shapers, presses of all types, weaver's looms, continous conveyors, etc.

Shock factor Y = 3
for twin-cylinder piston pumps, mixing drums, stampers, lifting gears etc.

Shock factor Y = 4
for single-stage centrifugal compressors, etc.

For more detailed information see table on page 27

Shock factors Y for chain drives (Examples)

The figures given are mean values with a centre distance a
a = 40 x no. of pitches

Allowances have to be made for unfavourable conditions.

Equipment driven		Electric motors	Driving Machine: Compustion engines, slow: 1 cylinder	2 cylinders	fast: up to 2 cylinders	4 cylinders	6 cylinders and more	water turbines: fast	slow	Steam turbines	Piston steam turbines	Multishaft chain drives
Lathes, drilling machines		1										
Milling machines		1,5										
Planing machines		2,3										
Shaping machines		2										
Drawing machines		1,8										
Presses	hydraulic	1,8			2,8	2,5	2,2					
	eccentric	2,5										
	toggle	2										
Woodworking machines		1,8	4,5	4	3,7	3	2,5	2,5	3,5		3,5	1,8
Weaving looms		2										2
Knitting machines	rotating	1,5										
	reciprocating	2										
Spinning machines		1,5										1,5
Piston compressors												
	single stage	2,5		5	4,5	4	3,5					
	twin stage	2		4,5	4	3,5	3					
Centrifugal compressors												
	single stage	1,6	4	3,2	3	2,5	2					
	twin stage	1,3	3	2,7	2,5	2	1,6					
Blowers		1,5		3	2,7	2,5	2					
Fans		2,5		3,7							3,5	2,5
Piston pumps	1 cylinder	2	5	4	3,5	3	2,6	2,5	3,5			
	2 cylinder	1,8	4	3,5	3	2,7	2,3	2,2	2,7			
Centrifugal pumps		1,5	3	2,8	2,5	2,2	2				2,5	
Rolling mills	via gearbox	2,5										
	direct	3										
Press rollers		2										2
Ball mills		1,8										1,8
Tube mills		2										2
Hammer mills		2,5		5	4,5	4	3,5					2,5
Calendar mills	via gearbox	2,5										
	direct	3										
Cellulose grinders		1,8						2,2	3		3,5	1,8
Oscillating screens		2		4	3,5	3,2	2,8				4	2
Stampers		2	5	4	3,5	3,2						
Mixers		1,7	4	3,2	3	2,5	2					
Excavators		3			5	4,5	4				5	
Bodenfräse			5	4,5	4							
Agitators		1,6										1,6
Continous conveyors	for bulk material	1,5	3	2,8	2,5	2,2	2				2,8	1,5
Continous conveyors	for indiv. items	2	4	3,5	3	2,7	2					
Lifting gears		2,5	5	4	3,5	3	2,6					
Fork lift trucks		3			4,5	3,5						
Winch drives		2,5										
Generators	Large installation	1		2				1,2	1,5	1	1,8	1
	Small installation	1,5		2,8				1,7	2,5	1,5	2	1,5
Transmissionen lines (driven)		1,5				2,3	2	2	2,5	1,5	2,5	1,5

Centre distance

Effect of ratio of centre distance $\frac{a}{p}$

a = centre distance centres in mm
p = pitch in mm

$\frac{a}{p}$	20	$\boxed{40}$	60	80	160
$\boxed{f_4}$	1,18	$\boxed{1,0}$	0,91	0,87	0,69

The greater the centre distance the higher the permissible bearing pressure.

If the shaft centre distance is increased, the chain must be increased in length and the number of chain rotations is therefore reduced.

Consequently individual chain links are deflected less frequently, therefore the total friction travel and the wear must be reduced.

A shaft centre distance should be chosen to provide an even number of chain links. A chain with an uneven number of links makes it necessary to use a cranked link, which reduces the chain breaking strength by 20 %.

Lubrication

Effect of lubrication $\boxed{f_5}$

		Chain speed v in $\frac{m}{s}$	< 4	4-7	> 7
f_5	Lubrication	Perfect Inadequate with clean conditions Inadequate with unclean conditions None	1,0 1,4 2,5 5,0	1,0 2,5 4,0 not permissible	1,0 not permissible

Suitable lubrication is an important condition for the durability of a chain whose individual links perform like friction bearings carrying out a pivoting movement. An efficient lubrication system should therefore be used as a matter of course, to ensure that the lubrication film in the link remains intact, thus avoiding unlubricated movements causing a high degree of wear. With inadequate lubrication and unclean operating conditions the transmittable power is reduced by up to 20 %. Thus the efficiency of the chain is reduced more dramaticly than by any other factor.

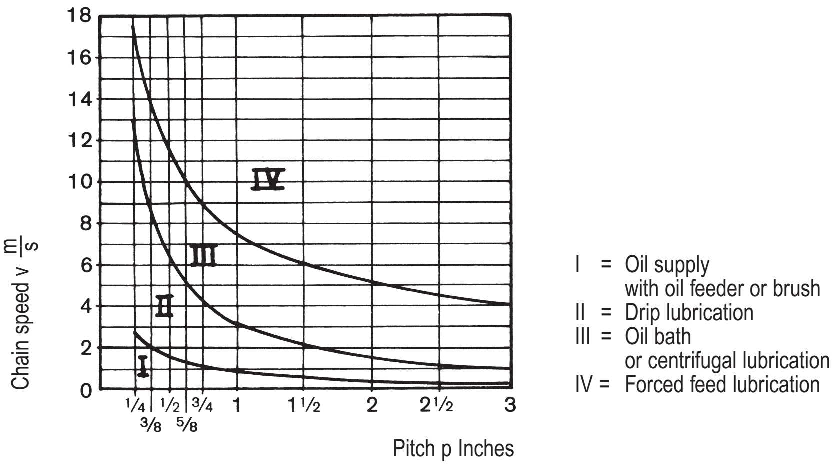
Transmittable power

Chain speed	perfect lubrication	inadequate lubrication clean conditions	 unclean	without lubrication
up to 4 $\frac{m}{s}$	100 %	70 %	40 %	20 %
up to 7 $\frac{m}{s}$		40 %	25 %	not permissible

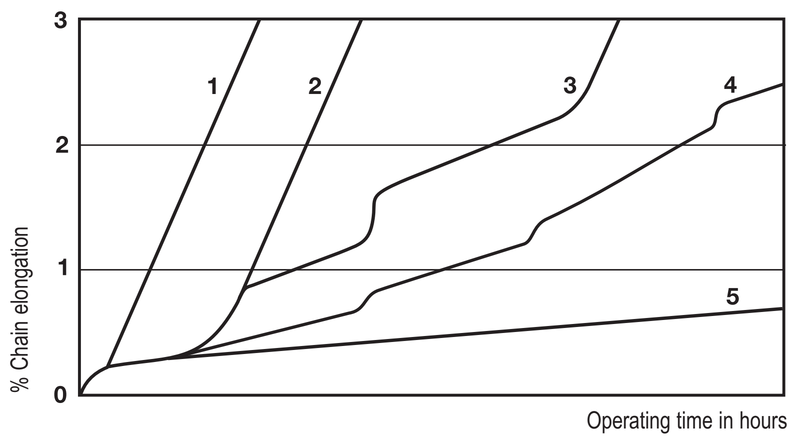
If adequate lubrication is not possible, an oversized chain must be selected, unless a shorter working life is acceptable, as an alternative.

The most suitable lubrication system depends also on the chain speed.

Types of lubrication



Chain elongation compared with operating time and various lubrication conditions is illustrated by the following graph:



Graph 1
Dry running, heavy wear, deterioration of chain within the shortest possible time.

Graph 2
One single lubrication, delayed wear until lubrication is exhausted.

Graph 3
Occasional dry running with manual lubrication, if lubrication intervals are neglected.

Graph 4
Faulty lubrication, irregular wear caused by low quality, unclean, unsuitable or insufficient lubrication.

Graph 5
Complete lubrication, considerable reduction of wear, highest guarantee for long chain life.

Multi shaft drives

Where more than two shafts are driven by a chain, the power should be increased by the factor $\boxed{f_6}$

The use of additional shafts increases the friction travel between chain pin and bush by

$$\frac{d_2 \cdot \pi}{z_1} + \frac{d_2 \cdot \pi}{z_2} + \frac{d_2 \cdot \pi}{z_3} + \cdots\cdot$$

during one chain revolution.

Consequently, factor f_6 should be taken into account for the bearing pressure.

$$f_6 = \sqrt[3]{\frac{\left(\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} + \cdots\right)\frac{10^3}{X}}{0{,}584}}$$

X = Number of links

If the number of shafts is increased, the permissible bearing pressure is reduced.

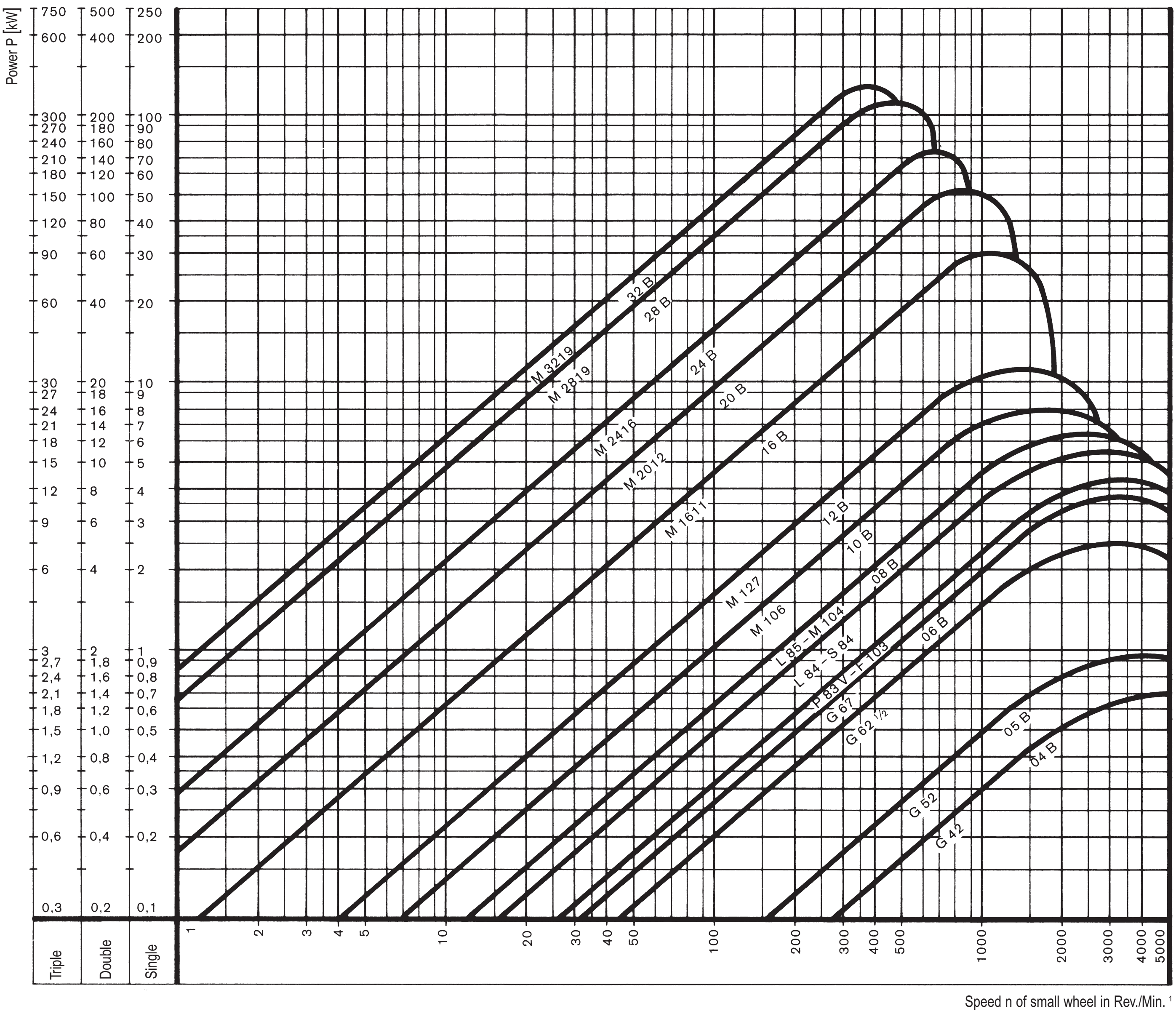
Summary

The previously mentioned factors $f_1 - f_6$ determine significantly the permissible bearing pressure. Relevant determining factors are given in the table on page 35.

2 Chain calculation

2.1 Pre-selection

British Standard Chains
Performance diagram DIN 8187



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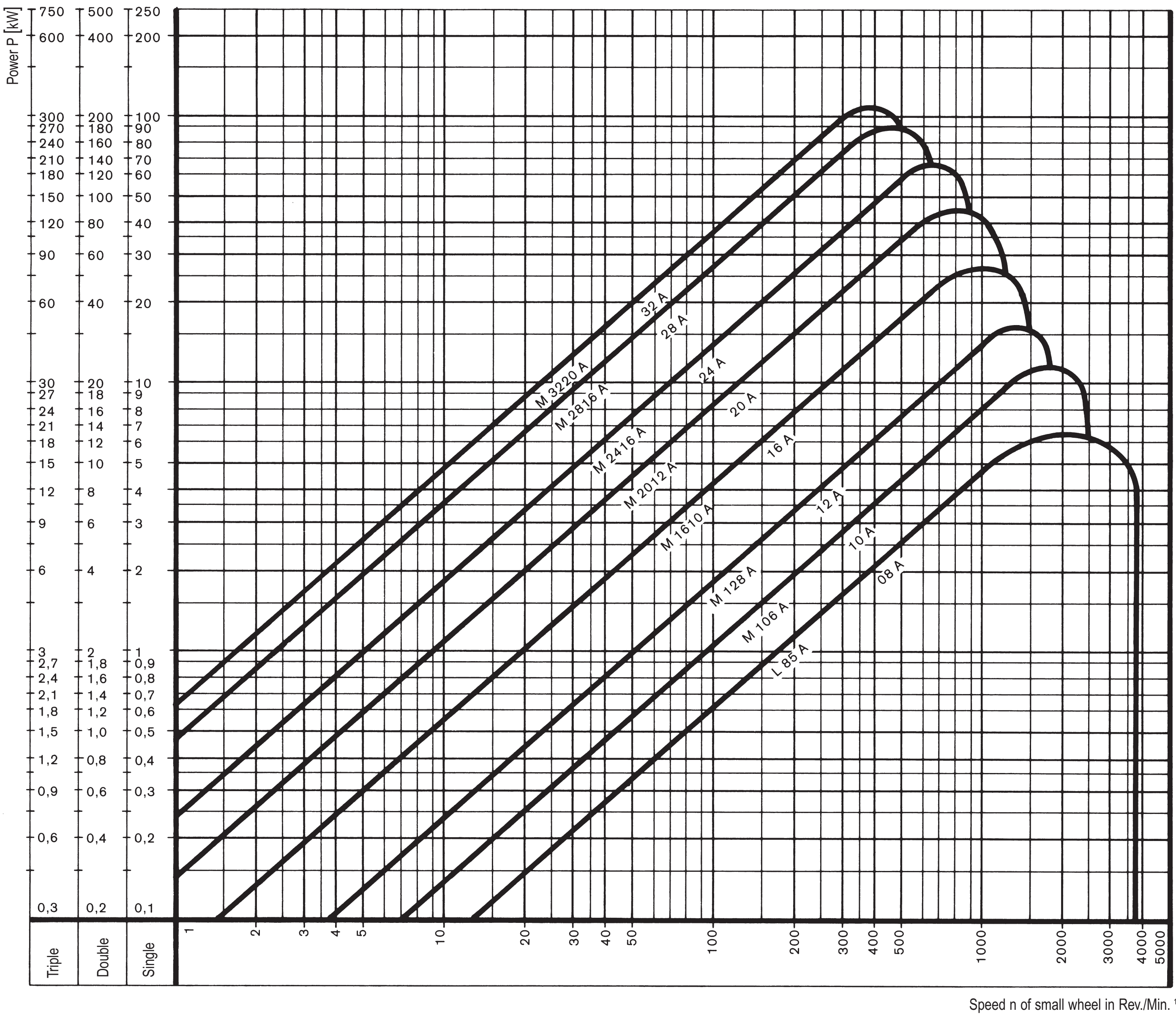
American Standard Chains
Performance diagram DIN 8188



Initial selection by performance diagram

The plotting of the performance curve was based on the following initial values: Number of teeth of small chain wheel z1 = 19, ratio i = 3:1, shockfree operation Y = 1, centre distance 40 x p (p = pitch), perfect lubrication, 2 shafts.

Since these conditions are met in very few cases only, the power to be transmitted P will be corrected to the diagram power P_D, taking into consideration the variable factors f_1 to f_6.

$$P_D = P \cdot f_G$$

Overall factor

$$f_G = f_1 \cdot f_2 \cdot f_3 \cdot f_4 \cdot f_5 \cdot f_6$$

To pre-select a chain the following factors should be taken into account:

Factors:

f_1 Effect of the number of teeth of the small chain wheel z

z	11	13	15	17	19	21	23	25
f_1	1,72	1,46	1,27	1,12	1,0	0,91	0,83	0,76

f_2 Effect of ratio i

i	1:1	2:1	3:1	5:1	7:1
f_2	1,22	1,08	1,0	0,92	0,86

f_3 Effect of Shock factor Y

Y	1	2	3	4
f_3	1	1,37	1,59	1,72

f_4 Effect of ratio of centre distance $\frac{a}{p}$

$\frac{a}{p}$	20	40	60	80	160
f_4	1,18	1,0	0,91	0,87	0,69

f_5 Effect of lubrication

Chain speed v in m/s			< 4	4-7	> 7
f_5	Lubrication	perfect	1,0	1,0	1,0
		inadequate with clean conditions	1,4	2,5	unacceptable
		inadequate with unclean conditions	2,5	4,0	unacceptable
		none	5,0	unacceptable	unacceptable

f_6 Effect of number of chain wheels

$$f_6 = \sqrt[3]{\frac{\left(\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} + \cdots\right)\frac{10^3}{x}}{0{,}584}}$$

f_6 = 1 for drive comprising two shafts

Pre-selection of a chain from DIN 8187 performance curve – Example:

In the performance curve the power (0,25 kW) crosses the vertical speed line (40 min-1) in the upper area of chain L 85. This chain would be adquate, without taking into account the various factors.

Determining diagram power P_D and factor f_G:

The factors are taken from the adjacent tables. Intermediate values are interpolated.

No. of teeth chosen for small chain wheel	$z_1 = 17$	$f_1 = 1{,}12$
Ratio	i = 4	$f_2 = 0{,}96$
Assumed shock factor	Y = 2	$f_3 = 1{,}37$
Ratio of centre distance	$\frac{a}{p} = \frac{380}{12{,}7} = 30$	$f_4 = 1{,}09$
Perfect lubrication		$f_5 = 1$
Chain drive with 2 chain wheels		$f_6 = 1$

$f_G = 1{,}12 \cdot 0{,}96 \cdot 1{,}37 \cdot 1{,}09 \cdot 1 \cdot 1 = 1{,}60$
$P_D = P \cdot f_G = 0{,}25 \cdot 1{,}60 = 0{,}40$ kW

If P_D = 0,40 kW is checked at n = 40 min^{-1} in the power curve, it will be found that the L 85 chain is not strong enough. The next stronger chain M 106 is selected and verified by calculation.
For calculation examples see page 36.

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2.2 Calculation

Summary of formulae

Item to be calculated	Designation	Formula or reference	Unit
Power transmitted	P	$P = \frac{F \cdot v}{1000} = \frac{M \cdot n}{9550}$	kW
Diagram performance	P_D	$P_D = P \cdot f_G$	kW
Influencing factors	f_G	$f_G = f_1 \cdot f_2 \cdot f_3 \cdot f_4 \cdot f_5 \cdot f_6$	--
Torque	M	$M = \frac{9550 \cdot P}{n} = \frac{F \cdot d}{2000}$	Nm
Speed	n	$n = \frac{60000 \cdot v}{d \cdot \pi} = \frac{60000 \cdot v}{z \cdot p}$	min^{-1}
Ratio	i	$i = \frac{n_1}{n_2} = \frac{z_2}{z_1}$	--
Pitch circle diameter	d	$d = \frac{p}{\sin \frac{180°}{z}}$	mm
Chain speed	v	$v = \frac{z \cdot n \cdot p}{60000} = \frac{d \cdot \pi \cdot n}{60000} = \frac{1000 \cdot P}{F}$	$\frac{m}{s}$
Chain pull	F	$F = \frac{1000 \cdot P}{v} = \frac{2000 \cdot M}{d}$	N
Centrifugal force	F_f	$F_f = q \cdot v_2$	N
Total pull	F_G	$F_G = F + F_f$	N
Chain weight per metre	q	see table on page 12	$\frac{kg}{m}$
Bearing pressure, calculated.	p_r	$p_r = \frac{F_G}{f}$	$\frac{N}{cm^2}$
Bearing pressure, permissible	p_{zul}	$p_{zul} = \frac{p_v \cdot \lambda}{f_5 \cdot f_6}$	$\frac{N}{cm^2}$
Bearing area	f	$f = b_2 \cdot d_2$ see table on page 12	cm^2
Determining factors for bearing pressure	p_v	see table on page 35	$\frac{N}{cm^2}$
Friction travel factor	l	see table on page 35	--
Breaking load of chain	F_B	see table on page 12	N
Static breaking load safety factor	γ_{st}	$\gamma_{st} = \frac{F_B}{F_G}$	--
Dynamic breaking load safety factor	γ_d	$\gamma_d = \frac{F_B}{F_G \cdot Y}$	--
Shock factor	Y	see table on page 27	--
No. of links	X	$X = 2\frac{a}{p} + \frac{z_1 + z_2}{2} + \frac{A \cdot p}{a}$	--
Pitch	p	see table on page 12	mm
Compensating factor	A	$A = \left(\frac{z_2 - z_1}{2\pi}\right)^2$ see table on page 41	--
Centre distance $z_1 = z_2$	a	$a = \frac{X - z}{2} \cdot p$	mm
Centre distance z_1 not equal to z_2	a	$a = [2X - (z1 + z2)] \cdot C \cdot p$	mm
Factor for centre distance	C	see table with calculation on page 41	--
Impact speed	v_A	$v_A = \frac{\pi \cdot n \cdot p}{30000} \cdot \sin\left(\frac{360°}{z} + \gamma\right)$	$\frac{m}{s}$
Angle of pressure	γ		Grad

Determining factors for bearing pressure p_V in N/cm²

Chain speed v in $\frac{m}{s}$	No. of teeth of small wheel 11	12	13	14	15	16	17	18	19	20	21	22	23	24	≥ 25
0,1	3020	3060	3110	3160	3205	3235	3255	3285	3335	3365	3385	3415	3430	3460	3480
0,2	2755	2795	2825	2875	2920	2940	2970	3000	3040	3060	3080	3110	3130	3160	3175
0,4	2650	2685	2725	2775	2815	2835	2855	2895	2920	2940	2960	2990	3010	3040	3060
0,6	2530	2570	2600	2650	2685	2705	2725	2765	2795	2815	2835	2855	2875	2905	2920
0,8	2440	2480	2510	2560	2600	2620	2630	2665	2695	2715	2735	2755	2775	2805	2825
1,0	2335	2375	2405	2440	2470	2490	2510	2540	2570	2590	2610	2630	2650	2665	2685
1,5	2245	2285	2315	2355	2385	2405	2420	2450	2480	2500	2520	2540	2560	2580	2600
2,0	2165	2195	2225	2265	2305	2325	2335	2365	2395	2410	2420	2440	2460	2480	2500
2,5	2090	2120	2150	2185	2215	2235	2245	2275	2305	2325	2335	2355	2395	2420	2450
3	2010	2040	2070	2100	2130	2150	2165	2195	2215	2245	2275	2305	2335	2375	2410
4	1705	1795	1885	1960	2030	2060	2090	2120	2140	2175	2215	2255	2295	2335	2375
5	1375	1520	1655	1735	1805	1875	1930	1970	2010	2060	2110	2140	2165	2200	2235
6	1030	1206	1385	1510	1610	1695	1775	1845	1910	1950	2000	2030	2070	2100	2140
7	835	980	1130	1255	1375	1480	1590	1705	1815	1835	1865	1900	1940	1980	2020
8	-	785	1000	1090	1175	1285	1395	1530	1665	1705	1745	1785	1835	1875	1920
10	-	-	795	885	1000	1090	1177	1295	1400	1430	1470	1540	1610	1670	1735
12	-	-	-	-	805	890	1050	1145	1235	1275	1325	1385	1450	1510	1570
15	-	-	-	-	-	-	875	950	1030	1080	1130	1185	1245	1305	1375
18	-	-	-	-	-	-	-	-	865	940	1030	1090	1155	1215	1275

Guide figures below the line should be avoided..

Friction travel factor λ

Shock factor Y	Chains to DIN	a = 20 · p $z_2 : z_1$					a= 40 · p $z_2 : z_1$					a = 60 · p $z_2 : z_1$					a = 80 · p $z_2 : z_1$					a = 160 · p $z_2 : z_1$				
		1:1	2:1	3:1	5:1	7:1	1:1	2:1	3:1	5:1	7:1	1:1	2:1	3:1	5:1	7:1	1:1	2:1	3:1	5:1	7:1	1:1	2:1	3:1	5:1	7:1
1	8187, 8188, 8154	0,70	0,79	0,85	0,92	0,99	0,82	0,93	1,00	1,09	1,16	0,90	1,02	1,10	1,20	1,28	0,94	1,06	1,15	1,25	1,34	1,19	1,35	1,45	1,58	1,68
	8181	0,56	0,63	0,68	0,74	0,79	0,66	0,74	0,80	0,87	0,93	0,72	0,82	0,88	0,96	1,03	0,75	0,85	0,92	1,00	1,07	0,95	1,08	1,16	1,26	1,35
2	8187, 8188, 8154	0,51	0,57	0,62	0,67	0,72	0,60	0,68	0,73	0,79	0,85	0,66	0,74	0,80	0,87	0,93	0,69	0,78	0,84	0,91	0,98	0,87	0,99	1,06	1,15	1,23
	8181	0,41	0,46	0,50	0,54	0,58	0,48	0,54	0,58	0,63	0,68	0,53	0,59	0,64	0,70	0,74	0,55	0,62	0,67	0,73	0,78	0,70	0,79	0,85	0,93	0,99
3	8187, 8186, 8154	0,44	0,49	0,53	0,58	0,62	0,52	0,59	0,63	0,69	0,73	0,57	0,64	0,69	0,75	0,80	0,59	0,67	0,72	0,78	0,84	0,75	0,85	0,91	0,99	1,06
	8181	0,35	0,39	0,42	0,46	0,50	0,42	0,47	0,50	0,55	0,58	0,46	0,51	0,55	0,60	0,64	0,47	0,54	0,57	0,82	0,67	0,60	0,68	0,73	0,80	0,85
4	8187, 8188, 8154	0,40	0,45	0,49	0,53	0,57	0,48	0,54	0,58	0,63	0,67	0,53	0,59	0,64	0,69	0,74	0,55	0,62	0,67	0,73	0,78	0,69	0,78	0,84	0,92	0,97
	8181	0,32	0,36	0,39	0,42	0,46	0,38	0,43	0,46	0,50	0,54	0,42	0,47	0,51	0,55	0,59	0,44	0,50	0,54	0,58	0,62	0,55	0,62	0,67	0,73	0,78

2.3 Examples of calculations

Example 1: A conveyor belt driven by a roller chain from a geared motor.

Drive details:

Power output of geared motor	$P = 0{,}96$ kW
Driving speed	$n_1 = 20$ min^{-1}
Speed of driven shaft	$n_2 = 10$ min^{-1}
Centre distance	a = approx. 1900 mm

a) Preselection of chain from DIN 8187 power diagram, page 31

The intersection between the horizontal power curve (for 0,96 kW) and the vertical speed curve (for 20 min^{-1}) is situated in the upper area of the chain M 1611. This chain would be adequate without taking into consideration the various factors.

Establishing diagram power P_D

For factors see page 33

Number of pinion teeth, selected	$z_1 = 17$	$f_1 = 1{,}12$
Ratio $n_1 : n_2$	$i = 2$	$f_2 = 1{,}08$
Shock factor, assumed	$Y = 2$	$f_3 = 1{,}37$
Ratio for centre distance	$\frac{a}{p} = \frac{1900}{25{,}4} = 75$	$f_4 = 0{,}88$
Lubrication, perfect		$f_5 = 1$
Drive with 2 chain wheels		$f_6 = 1$

$$\boxed{f_G = f_1 \cdot f_2 \cdot f_3 \cdot f_4 \cdot f_5 \cdot f_6}$$

$$= 1{,}12 \cdot 1{,}08 \cdot 1{,}37 \cdot 0{,}88 \cdot 1 \cdot 1$$
$$= 1{,}46$$

$$\boxed{P_D = P \cdot f_G}$$

$$= 0{,}96 \cdot 1{,}46$$
$$= 1{,}4 \text{ kW}$$

If P_D is located again in the power diagram at n = 20 Rev./Min., it will be found that chain M 1611 is unsuitable. The next stronger chain M 2012 is selected.

b) Re-calculating selected chain
Roller chain M 2012

Pitch	$p = 31{,}75$ mm
Breaking load	$F_B = 100\,000$ N
Bearing area	$f = 2{,}94$ cm^2
Chain weight	$q = 3{,}32$ kg/m

Chain wheel

Pitch circle diameter at
$z_1 = 17$ $d = 172{,}79$ mm

1) Chain speed:	$v = \frac{d \cdot \pi \cdot n_1}{60000}$	$= \frac{172{,}79 \cdot \pi \cdot 20}{60000}$	$= 0{,}18 \frac{m}{s}$
2) Chain pull:	$F = \frac{1000 \cdot P}{v}$	$= \frac{1000 \cdot 0{,}96}{0{,}18}$	$= 5333\ N$
3) Centrifugal force:	$F_f = q \cdot v^2$	$= 3{,}32 \cdot 0{,}18^2$	$= 0{,}11\ N$
4) Total pull:	$F_G = F + F_f$	$= 5333\ N$	Centrifugal force ignored
5) Bearing pressure arithmetic:	$p_r = \frac{F_G}{f}$	$= \frac{5333}{2{,}94}$	$= 1813{,}9 \frac{N}{cm^2}$
6) Bearing pressure permissible:	$p_{zul} = \frac{p_v \cdot \lambda}{f_5 \cdot f_6}$	$= \frac{3027 \cdot 0{,}77}{1 \cdot 1}$	$= 2240 \frac{N}{cm^2}$
The arithmetic bearing pressure should not exceed the permissible value. The approx. Value p_V and the friction travel λ are determined by interpolation from the tables on page 35.			
7) Static breaking load safety factor:	$\gamma_{st} = \frac{F_B}{F_G}$	$= \frac{100000}{5333}$	$= 18{,}7$ higher than the recommended minimum value 7
8) Dynamic breaking load safety factor:	$\gamma_d = \frac{F_B}{F_G \cdot Y}$	$= \frac{100000}{5333 \cdot 2}$	$= 9{,}4$ higher than the recommended minimum value 5

According to the table for types of lubrication on page 29, manual lubrication is sufficient.

The re-calculation shows that chain M 2012 was selected correctly. Thus it is possible to establish the exact length of the chain (see page 40). If space restrictions are present, double or triple strand chains of a smaller pitch could be selected.

Example 2: Chain drive to a hydraulic pump. For this the following information is available.

Torque	$M = 45{,}7$ Nm
Driving Speed	$n_1 = 200\ \text{min}^{-1}$
Ratio	$i = 2$
Centre distance	a = approx. 750 mm
Max. permissible external diameter, including chain on wheel:	$d_A = 70$ mm

a) Pre-selection chain from DIN 8187 power curve, page 31

Power:

$$\boxed{P = \frac{M \cdot n_1}{9550}} = \frac{45{,}7 \cdot 200}{9550} = 0{,}96\ \text{kW}$$

The diagram shows that chain L 85 should be used. In view of the higher operating conditions and the maximum diameter restriction on wheel selection preference is given to the Double chain D 67 which has a smaller pitch, but nearly the same breaking load. Furthermore, this provides a sufficient number of teeth with the specified limitation of the chain wheel diameter.

Determining diagram power P_D

Factors, see page 33		
No. of teeth of pinon, selected	$z_1 = 17$	$f_1 = 1{,}12$
Ratio	$i = 2$	$f_2 = 1{,}08$
Shock factor, assumed	$Y = 2$	$f_3 = 1{,}37$
Ratio for centre distance	$\frac{a}{p} = \frac{750}{9{,}525} = 78{,}7$	$f_4 = 0{,}87$
Lubrication, perfect		$f_5 = 1$
Drive with 2 chain wheels		$f_6 = 1$

$$\boxed{f_G = f_1 \cdot f_2 \cdot f_3 \cdot f_4 \cdot f_5 \cdot f_6}$$

$$= 1{,}12 \cdot 1{,}08 \cdot 1{,}37 \cdot 0{,}87 \cdot 1 \cdot 1$$
$$= 1{,}44$$

$$\boxed{P_D = P \cdot f_G}$$

$$= 0{,}96 \cdot 1{,}44$$
$$= 1{,}38\ \text{kW}$$

A new check using this calculated power shows that chain D 67 is not adequate. Therefore Triple chain Tr 67 is selected

b) Re-calculating selected chain

Roller chain Tr 67

Pitch	p	= 9,525 mm
Breaking load	F_B	= 29 000 N
Bearing area	f	= 0,83 cm²
Chain weight	q	= 1,18 kg/m

Chain wheel

Pitch circle diameter at $z_1 = 17$ $d = 51{,}84$ mm

Checking top diameter d_A, including chain.

$d_A = d + g$	$= 51{,}84 + 8{,}26 = 60{,}1$ mm – this is smaller than 70 mm g = height of link plate

1) Chain speed:	$v = \frac{z \cdot n_1 \cdot p}{60000}$	$= \frac{17 \cdot 200 \cdot 9{,}525}{60000}$	$= 0{,}54 \frac{m}{s}$
2) Chain pull:	$F = \frac{1000 \cdot P}{v}$	$= \frac{1000 \cdot 0{,}96}{0{,}54} = 1778$ N	
3) Centrifugal force:	$F_f = q \cdot v^2$	$= 1{,}18 \cdot 0{,}54^2 = 0{,}34$ N	
4) Total pull:	$F_G = F + F_f$	$= 1778$ N	Centrifugal force ignored
5) Bearing pressure arithmetic:	$p_r = \frac{F_G}{f}$	$= \frac{1778}{0{,}83}$	$= 2142{,}17 \frac{N}{cm^2}$
6) Bearing pressure permissible:	$p_{zul} = \frac{p_v \cdot \lambda}{f_5 \cdot f_6}$	$= \frac{2764 \cdot 0{,}78}{1 \cdot 1}$	$= 2156 \frac{N}{cm^2}$ p_r smaller than p_{zul}

The approx. value p_V and the friction travel λ are determined by interpolation from the tables on page 35

7) Static breaking load safety factor:	$\gamma_{st} = \frac{F_B}{F_G}$	$= \frac{29000}{1778}$	$= 16{,}3$ higher than the recommended minimum value 7
8) Dynamic breaking load safety factor:	$\gamma_d = \frac{F_B}{F_G \cdot Y}$	$= \frac{29000}{1778 \cdot 2}$	$= 8{,}16$ higher than the recommended minimum value 5

According to table on page 29, types of lubrication, manual lubrication is sufficient.

The exact chain length can be established in accordance with item 3, page 40.

3 Determining length of chain

3.1 Number of links and centre distance

Chain drive with 2 shafts	Data required	
If the chain size has been determined, it is possible to calculate the number of links, the length of the chain and the exact centre distance.	Pitch of chain	p
	No. of teeth, drive wheel	z_1
	No. of teeth, driven wheel	z_2
	Approx. centre distance in mm	a

1 Chain wheels with identical numbers of teeth $z_1 = z_2$

No. of links:

$$\boxed{X = \frac{2a}{p} + z}$$

Centre distance:

$$\boxed{a = \frac{X - z}{2} \cdot p}$$

2 Chain wheels with different numbers of teeth z_1 not equal to z_2

No. of links:

$$\boxed{X = 2\frac{a}{p} + \frac{z_1 + z_2}{2} + \frac{A \cdot p}{a}}$$

Compensating factor:

$$\boxed{A = \left(\frac{z_2 - z_1}{2 \cdot \pi}\right)^2}$$

or from table on page 41

Centre distance:

$$\boxed{a = \left[2X - \left(z_1 + z_2\right)\right] \cdot C \cdot p}$$ [mm]

C = Factor for centre distance from table on page 41

In most cases the approximate centre distance is given, for which very often an uneven number of links X is obtained. This figure is rounded up to the next even figure, or rounded down, as the case maybe, in order to avoid an uneven number of links. The centre distance is then again calculated with the corrected number of links.

The smallest centre distance for a chain drive consisting of two chain wheels shall always be higher than the arithmetic mean of the outside diameters of both wheels.

$$\boxed{a > \frac{d_{a1} + d_{a2}}{2}}$$ [mm]

With a fixed centre distance and given chain wheel diameter the slack of the chain is compensated by means of a tensioner. See also page 58, drive arrangement.

Compensating factor A

$z_2 - z_1$	A	$z_2 - z_1$	A	$z_2 - z_1$	A	$z_2 - z_1$	A	$z_2 - z_1$	A
1	0,0253	21	11,171	41	42,580	61	94,254	81	166,191
2	0,1013	22	12,260	42	44,683	62	97,370	82	170,320
3	0,2280	23	13,400	43	46,836	63	100,536	83	174,450
4	0,4053	24	14,590	44	49,040	64	103,753	84	178,730
5	0,6333	25	15,831	45	51,294	65	107,021	85	183,011
6	0,912	26	17,123	46	53,599	66	110,339	86	187,342
7	1,241	27	18,466	47	55,955	67	113,708	87	191,724
8	1,621	28	19,859	48	58,361	68	117,128	88	196,157
9	2,052	29	21,303	49	60,818	69	120,598	89	200,640
10	2,533	30	22,797	50	63,326	70	124,119	90	205,174
11	3,065	31	24,342	51	65,884	71	127,690	91	209,759
12	3,648	32	25,938	52	68,493	72	131,313	92	214,395
13	4,281	33	27,585	53	71,153	73	134,986	93	219,081
14	4,965	34	29,282	54	73,863	74	138,709	94	223,817
15	5,699	35	31,030	55	76,624	75	142,483	95	228,605
16	6,485	36	32,828	56	79,436	76	146,308	96	233,443
17	7,320	37	34,677	57	82,298	77	150,184	97	238,322
18	8,207	38	36,577	58	85,211	78	154,110	98	243,271
19	9,144	39	38,527	59	88,175	79	158,087	99	248,261
20	10,132	40	40,529	60	91,189	80	162,115	100	253,302

Factor for centre distance C

$\frac{X - z_1}{z_2 - z_1}$	F	C	D	$\frac{X - z_1}{z_2 - z_1}$	F	C	D	$\frac{X - z_1}{z_2 - z_1}$	F	C	D
13		0,24 991	1	2,00		0,24 421	41	1,33		0,22 968	56
12		990	2	1,95		380	47	1,32		912	58
11		988	2	1,90	20	333	52	1,31		854	61
10		986	3	1,85		281	59	1,30		793	64
9	1	983	5	1,80		222	66	1,29		729	67
8		978	8	1,75		156	75	1,28		662	69
7		970	12	1,70		081	33	1,27		593	73
6		958	21	1,68		048	35	1,26		520	77
5		937	6	1,66		013	36	1,25		443	82
4,8		931	6	1,64		0,23 977	39	1,24		361	86
4,6		925	8	1,62		938	41	1,23		275	90
4,4		917	10	1,60		897	43	1,22		185	95
4,2		907	11	1,58		854	47	1,21		090	100
4,0	5	896	13	1,56	50	807	49	1,20	100	0,21 990	106
3,8		883	15	1,54		758	53	1,19		884	113
3,6		868	19	1,52		705	57	1,18		771	119
3,4		849	24	1,50		648	60	1,17		652	126
3,2		825	30	1,48		588	64	1,16		526	136
3,0		795	17	1,46		524	69	1,15		390	145
2,9		778	20	1,44		455	74	1,14		245	155
2,8		758	23	1,42		381	80	1,13		090	167
2,7		735	27	1,40		301	42	1,12		0,20 923	179
2,6		708	30	1,39		259	44	1,11		744	195
2,5	10	678	35	1,38		215	45	1,10		549	213
2,4		643	41	1,37		170	47	1,09		336	232
2,3		602	50	1,36	100	123	50	1,08		104	256
2,2		552	59	1,35		073	51	1,07		0,19 848	284
2,1		493	72	1,34		022	54	1,06		564	
2,0		421		1,33		022, 968					

Examples for calculating z_1 not equal to z_2

The following is given for a chain drive:

Approx. centre distance	$a = 370$ mm
No. of teeth, drive wheel	$z_1 = 19$
No. of teeth, driven wheel	$z_2 = 60$
Pitch	$p = 25{,}4$ mm

a) No. of links

$$X = 2\frac{a}{p} + \frac{z_1 + z_2}{2} + \frac{A \cdot p}{a}$$

$z_2 - z_1 = 41$
from table on page 41 $\quad A = 42{,}58$

$$X = 2 \cdot \frac{370}{25{,}4} + \frac{19 + 60}{2} + \frac{42{,}58 \cdot 25{,}4}{370}$$

$X = 71{,}55$

The Value X = 71,55 is rounded up to the even figure of X = 72. The exact centre distance is then calculated with this value.

b) Centre distance

$a = [2\,X - (z_1 + z_2)] \cdot C \cdot p$

Establishing value C from table on page 41 and interpolation:

1. $\dfrac{X - z_1}{z_2 - z_1} = \dfrac{72 - 19}{60 - 19} \qquad = 1{,}29268$

2. Nearest table figure $= 1{,}29$

3. . Residual value R = 1,29268 – 1,29 $= 0{,}00268$

4. Interpolated value $\quad I = D \cdot F \cdot R$
from table: Difference $\quad D = 64$
Factor $\quad F = 100$
$I = 64 \cdot 100 \cdot 0{,}00268$
$= 17$

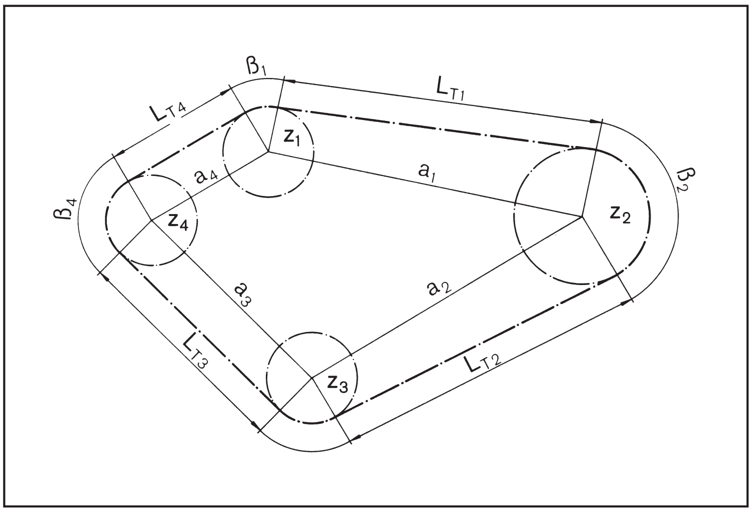
5.Calculation of C: from table

$$\begin{array}{rll} & C_{1,29} & = 0{,}22729 \\ + & I & = \phantom{0{,}227}17 \\ \hline & C & = 0{,}22746 \end{array}$$

$a = [2 \cdot 72 - (19 + 60)] \cdot 0{,}22746 \cdot 25{,}4$
$= 375{,}54$ mm

Chain drive consisting of several shafts

It is possible to produce equations for the calculation of the number of links for chain drives with more than two chain wheels. However, the mathematical calculation is complicated and graphical determination of the chain length is thus easier and in most cases it can be carried out with sufficient accuracy. The basic procedure is shown below.
A large scale should be chosen when the drive details are being drawn. This will minimize errors in chain length calculation.



The pitch circle diameter for the wheels is used as a basis for determining the number of links. The theoretical chain length X' is calculated by the addition of all L_{Ti} and β values.

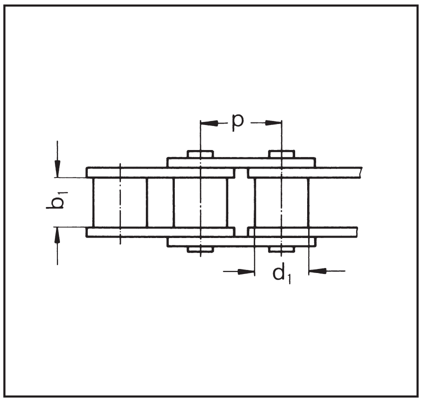
$$X' = \frac{1}{p} \cdot \sum_i L_{Ti} + \sum \frac{\beta_i \cdot z_i}{360°}$$

In the special case where all chain wheels have the same number of teeth and are situated within the chain, the simplified formulae applies for the calculation of the number of links.

$$X' = \frac{1}{p} \cdot \sum_i a_i + z$$

The number of links calculated is generally speaking not a full figure and must therefore be rounded up to the next highest even number. Where it is possible to provide adjustment, this method is sufficiently accurate, otherwise the centre distances or number of teeth should be modified until the correct chain tension is achieved.

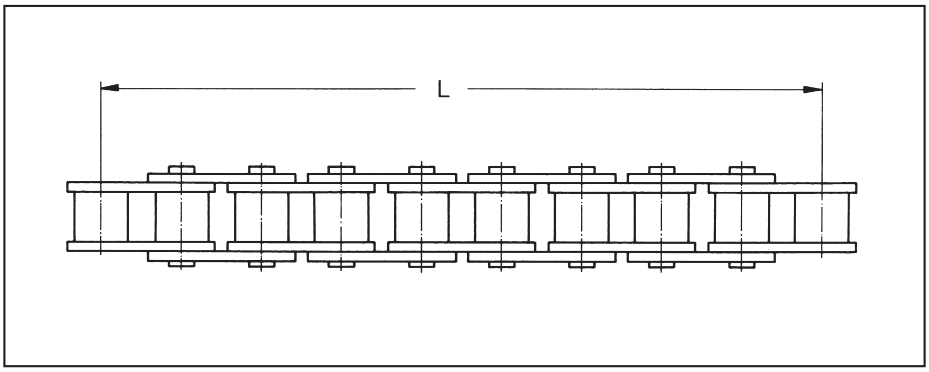
3.2 Measuring chain length



The size of the chain is determined by the pitch p, the inner width b_1 and the diameters of the rollers or bushes d_1 respectively. Multiplying pitch p with the number of links X gives the length L of the chain.

$L = p \cdot X$	[mm]

Establishing length and tolerance of a chain



In the case of **open** chains the stretched (actual) length is measured under load by applying the standard measuring load. The length established is then compared with the nominal lengths to DIN standards, which are listed in the following tables for many pitches and numbers of links. In the case of **endless** chains a circumferential measurement using twice the measuring force is used.

Further note:
With a new chain the tedious counting of links can be left out, if the total chain length is established (in mm) and the relevant number of links for the pitch in questions is read off the tables on pages 45 – 50.
The standard length tolerance for **iwis** chains are better than those specified by normal standards. In addition it is possible to produce chains to closer tolerances still
The permissible tolerance in length may be + 0,15 % for roller and bush chains with a measuring length 49 x pitch. The measurement should be taken with the chain clean and free of lubrication and with the application of the measuring force. The tolerance for differing chain lengths of certain pitches can be calculated, using the following formula:

(+) tolerance = $p \cdot X \cdot 0{,}0015$ [mm]
(DIN 8187/88/81, 8154)
p = pitch
X = number of links

The measuring forces specified for the pitch and type of construction can be taken from the following tables:

Lengths and tolerances

Roller chains with pitch p = 6 mm		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
G 42	04	30

Roller chains with pitch p = 8 mm		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
G 52	05B-1	50
D 52	05B-2	75
G 53 H	–	50

Permissible variation in length of
unlubricated chain under measuring load:

+ 0,15 % % with measured length 49 x the pitch of the chain in mm

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	66	0,10	51	306	0,46	91	546	0,82	131	786	1,18
12	72	0,11	52	312	0,47	92	552	0,83	132	792	1,19
13	78	0,12	53	318	0,48	93	558	0,84	133	798	1,20
14	84	0,13	54	324	0,49	94	564	0,85	134	804	1,21
15	90	0,14	55	330	0,50	95	570	0,86	135	810	1,22
16	96	0,14	56	336	0,50	96	576	0,86	136	816	1,22
17	102	0,15	57	342	0,51	97	582	0,87	137	822	1,23
18	108	0,16	58	348	0,52	98	588	0,88	138	828	1,24
19	114	0,17	59	354	0,53	99	594	0,89	139	834	1,25
20	120	0,18	60	360	0,54	100	600	0,90	140	840	1,26
21	126	0,19	61	366	0,55	101	606	0,91	141	846	1,27
22	132	0,20	62	372	0,56	102	612	0,92	142	852	1,28
23	138	0,21	63	378	0,57	103	618	0,93	143	858	1,29
24	144	0,22	64	384	0,58	104	624	0,94	144	864	1,30
25	150	0,23	65	390	0,59	105	630	0,95	145	870	1,31
26	156	0,23	66	396	0,59	106	636	0,95	146	876	1,31
27	162	0,24	67	402	0,60	107	642	0,96	147	882	1,32
28	168	0,25	68	408	0,61	108	648	0,97	148	888	1,33
29	174	0,26	69	414	0,62	109	654	0,98	149	894	1,34
30	180	0,27	70	420	0,63	110	660	0,99	150	900	1,35
31	186	0,28	71	426	0,64	111	666	1,00	152	906	1,36
32	192	0,29	72	432	0,65	112	672	1,01	152	912	1,37
33	198	0,30	73	438	0,66	113	678	1,02	153	918	1,38
34	204	0,31	74	444	0,67	114	684	1,03	154	924	1,39
35	210	0,32	75	450	0,68	115	690	1,04	155	930	1,40
36	216	0,32	76	456	0,68	116	696	1,04	156	936	1,40
37	222	0,33	77	462	0,69	117	702	1,05	157	942	1,41
38	228	0,34	78	468	0,70	118	708	1,06	158	948	1,42
39	234	0,35	79	474	0,71	119	714	1,07	159	954	1,43
40	240	0,36	80	480	0,72	120	720	1,08	160	960	1,44
41	246	0,37	81	486	0,73	121	726	1,09	161	966	1,45
42	252	0,38	82	492	0,74	122	732	1,10	162	972	1,46
43	258	0,39	83	498	0,75	123	738	1,11	163	978	1,47
44	264	0,40	84	504	0,76	124	744	1,12	164	984	1,48
45	270	0,41	85	510	0,77	125	750	1,13	165	990	1,49
46	276	0,41	86	516	0,77	126	756	1,13	166	996	1,49
47	282	0,42	87	522	0,78	127	762	1,14	167	1002	1,50
48	288	0,43	88	528	0,79	128	768	1,15	168	1008	1,51
49	294	0,44	89	534	0,80	129	774	1,16	169	1014	1,52
50	300	0,45	90	540	0,81	130	780	1,17	170	1020	1,53

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	88	0,13	51	408	0,61	91	728	1,09	131	1048	1,57
12	96	0,14	52	416	0,62	92	736	1,10	132	1056	1,58
13	104	0,16	53	424	0,64	93	744	1,12	133	1064	1,60
14	112	0,17	54	432	0,65	94	752	1,13	134	1072	1,61
15	120	0,18	55	440	0,66	95	760	1,14	135	1080	1,62
16	128	0,19	56	448	0,67	96	768	1,15	136	1088	1,63
17	136	0,20	57	456	0,68	97	776	1,16	137	1096	1,64
18	144	0,22	58	464	0,70	98	784	1,18	138	1104	1,66
19	152	0,23	59	472	0,71	99	792	1,19	139	1112	1,67
20	160	0,24	60	480	0,72	100	800	1,20	140	1120	1,68
21	168	0,25	61	488	0,73	101	808	1,21	141	1128	1,69
22	176	0,26	62	496	0,74	102	816	1,22	142	1136	1,70
23	184	0,28	63	504	0,76	103	824	1,24	143	1144	1,72
24	192	0,29	64	512	0,77	104	832	1,25	144	1152	1,73
25	200	0,30	65	520	0,78	105	840	1,26	145	1160	1,74
26	208	0,31	66	528	0,79	106	88	1,27	146	1168	1,75
27	216	0,32	67	536	0,80	107	856	1,28	147	1176	1,76
28	224	0,34	66	544	0,82	108	864	1,30	148	1184	1,78
29	232	0,35	69	552	0,83	109	872	1,31	149	1192	1,79
30	240	0,36	70	560	0,84	110	880	1,32	150	1200	1,80
32	248	0,37	71	568	0,85	111	888	1,33	151	1208	1,81
32	256	0,38	72	576	0,86	112	896	1,34	152	1216	1,82
33	264	0,40	73	584	0,88	113	904	1,36	153	1224	1,84
34	272	0,41	74	592	0,89	114	912	1,37	154	1232	1,85
45	280	0,42	75	600	0,90	115	920	1,38	155	1240	1,86
36	288	0,43	76	608	0,91	116	928	1,39	156	1248	1,87
37	296	0,44	77	616	0,92	117	936	1,40	157	1256	1,88
38	304	0,46	78	624	0,94	118	944	1,42	158	1264	1,90
39	312	0,47	79	632	0,95	119	952	1,43	159	1272	1,91
40	320	0,48	80	640	0,96	120	960	1,44	160	1280	1,92
41	328	0,49	81	648	0,97	121	968	1,45	161	1288	1,93
42	336	0,50	82	656	0,98	122	976	1,46	162	1296	1,94
43	344	0,52	83	664	1,00	123	984	1,48	163	1304	1,96
44	352	0,53	84	672	1,01	124	992	1,49	164	1312	1,97
45	360	0,54	85	680	1,02	125	1000	1,50	165	1320	1,98
46	368	0,55	86	688	1,03	126	1008	1,51	166	1328	1,99
47	376	0,56	87	696	1,04	127	1016	1,52	167	1336	2,00
48	384	0,58	88	704	1,06	128	1024	1,54	168	1344	2,02
49	392	0,59	89	712	1,07	129	1032	1,55	169	1342	2,03
50	400	0,60	90	720	1,08	130	1040	1,56	170	1360	2,04

C Layout of chain drives

Lengths and tolerances

Roller chains with pitch p = 9,525 mm (3/8")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
G 62 1/2	–	110
G 67	06B-1	90
G 68	–	90
D 67	06B-2	160
Tr 67	06B-3	236

Permissible variation in length of
unlubricated chain under measuring load:

+ 0,15 % % with measured length 49 x the pitch of the chain in mm

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	104,78	0,16	51	485,78	0,73	91	866,78	1,30	131	1247,78	1,87
12	114,30	0,17	52	495,30	0,74	92	876,30	1,31	132	1257,30	1,89
13	123,83	0,19	53	504,83	0,76	93	885,83	1,33	133	1266,83	1,90
14	133,35	0,20	54	514,35	0,77	94	895,35	1,34	134	1276,35	1,91
15	142,88	0,21	55	523,88	0,79	95	904,88	1,36	135	1285,88	1,93
16	152,40	0,23	56	533,40	0,80	96	914,40	1,37	136	1295,40	1,94
17	161,93	0,24	57	542,93	0,81	97	923,93	1,39	137	1304,93	1,96
18	171,45	0,26	58	552,45	0,83	98	933,45	1,40	138	1314,45	1,97
19	180,98	0,27	59	561,98	0,84	99	942,98	1,41	139	1323,98	1,99
20	190,50	0,29	60	571,50	0,86	100	952,50	1,43	140	1333,50	2,00
21	200,03	0,30	61	581,03	0,87	101	962,03	1,44	141	1343,03	2,01
22	209,55	0,31	62	590,55	0,89	102	971,55	1,46	142	1352,55	2,03
23	219,08	0,33	63	600,08	0,90	103	981,08	1,47	143	1362,08	2,04
24	228,60	0,34	64	609,60	0,91	104	990,60	1,49	144	1371,60	2,06
25	238,13	0,36	65	619,13	0,93	105	1000,13	1,50	145	1381,13	2,07
26	247,65	0,37	66	628,65	0,94	106	1009,65	1,51	146	1390,65	2,09
27	257,18	0,39	67	638,18	0,96	107	1019,18	1,53	147	1400,18	2,10
28	266,70	0,40	68	647,70	0,97	108	1028,70	1,54	148	1409,70	2,11
29	276,23	0,41	69	657,23	0,99	109	1038,23	1,56	149	1419,23	2,13
30	285,75	0,43	70	666,75	1,00	110	1047,75	1,57	150	1428,75	2,14
31	295,28	0,44	71	676,28	1,01	111	1057,28	1,59	151	1438,28	2,16
32	304,80	0,46	72	685,80	1,03	112	1066,80	1,60	152	1447,80	2,17
33	314,33	0,47	73	695,33	1,04	113	1076,33	1,61	153	1457,33	2,19
34	323,85	0,49	74	704,85	1,06	114	1085,85	1,63	154	1466,85	2,20
35	333,38	0,50	75	714,38	1,07	115	1095,38	1,64	155	1476,38	2,21
36	342,90	0,51	76	723,90	1,09	116	1104,90	1,66	156	1485,90	2,23
37	352,43	0,53	77	733,43	1,10	177	1114,43	1,67	157	1495,43	2,24
38	361,95	0,54	78	742,95	1,11	118	1123,95	1,69	158	1504,95	2,26
39	371,48	0,56	79	752,48	1,13	119	1133,48	1,70	159	1514,48	2,27
40	381,00	0,57	80	762,00	1,14	120	1143,00	1,71	160	1524,00	2,29
41	390,53	0,59	81	771,53	1,16	121	1152,53	1,73	161	1533,53	2,30
42	400,05	0,60	82	781,05	1,17	122	1162,05	1,74	162	1543,05	2,31
43	409,58	0,61	83	790,58	1,19	123	1171,58	1,76	163	1552,58	2,33
44	419,10	0,63	84	800,10	1,20	124	1181,10	1,77	164	1562,10	2,34
45	428,63	0,64	85	809,63	1,21	125	1190,63	1,79	165	1571,63	2,36
46	438,15	0,66	86	819,15	1,23	126	1200,15	1,80	166	1581,15	2,37
47	447,68	0,67	87	828,68	1,24	127	1209,68	1,81	167	1590,68	2,39
48	457,20	0,69	88	838,20	1,26	128	1219,20	1,83	168	1600,20	2,40
49	466,73	0,70	89	847,73	1,27	129	1228,73	1,84	169	1609,73	2,41
50	476,25	0,71	90	857,25	1,29	130	1238,25	1,86	170	1619,25	2,43

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	104,78	0,16	51	485,78	0,73	91	866,78	1,30	131	1247,78	1,87
12	114,30	0,17	52	495,30	0,74	92	876,30	1,31	132	1257,30	1,89
13	123,83	0,19	53	504,83	0,76	93	885,83	1,33	133	1266,83	1,90
14	133,35	0,20	54	514,35	0,77	94	895,35	1,34	134	1276,35	1,91
15	142,88	0,21	55	523,88	0,79	95	904,88	1,36	135	1285,88	1,93
16	152,40	0,23	56	533,40	0,80	96	914,40	1,37	136	1295,40	1,94
17	161,93	0,24	57	542,93	0,81	97	923,93	1,39	137	1304,93	1,96
18	171,45	0,26	58	552,45	0,83	98	933,45	1,40	138	1314,45	1,97
19	180,98	0,27	59	561,98	0,84	99	942,98	1,41	139	1323,98	1,99
20	190,50	0,29	60	571,50	0,86	100	952,50	1,43	140	1333,50	2,00
21	200,03	0,30	61	581,03	0,87	101	962,03	1,44	141	1343,03	2,01
22	209,55	0,31	62	590,55	0,89	102	971,55	146	142	1352,55	2,03
23	219,08	0,33	63	600,08	0,90	103	981,08	1,47	143	1362,08	2,04
24	228,60	0,34	64	609,60	0,91	104	990,60	1,49	144	1371,60	2,06
25	238,13	0,36	65	619,13	0,93	105	1000,13	1,50	145	1381,13	2,07
26	247,65	0,37	66	628,65	0,94	106	1009,65	1,51	146	1390,65	2,09
27	257,18	0,39	67	638,18	0,96	107	1019,18	1,53	147	1400,18	2,10
28	266,70	0,40	68	647,70	0,97	108	1028,70	1,54	148	1409,70	2,11
29	276,23	0,41	69	657,23	0,99	109	1038,23	1,56	149	1419,23	2,13
30	285,75	0,43	70	666,75	1,00	110	1047,75	1,57	150	1428,75	2,14
31	295,28	0,44	71	676,28	1,01	111	1057,28	1,59	151	1438,28	2,16
32	304,80	0,46	72	685,80	1,03	112	1066,80	1,60	152	1447,80	2,17
33	314,33	0,47	73	695,33	1,04	113	1076,33	1,61	153	1457,33	2,19
34	323,85	0,49	74	704,85	1,06	114	1085,85	1,63	154	1466,85	2,20
35	333,38	0,50	75	714,38	1,07	115	1095,38	1,64	155	1476,38	2,21
36	342,90	0,51	76	723,90	1,09	116	1104,90	1,66	156	1485,90	2,23
37	352,43	0,53	77	733,43	1,10	117	1114,43	1,67	157	1495,43	2,24
38	361,95	0,54	78	742,95	1,11	118	1123,95	1,69	158	1504,95	2,26
39	371,48	0,56	79	752,48	1,13	119	1133,48	1,70	159	1514,48	2,27
40	381,00	0,57	80	762,00	1,14	120	1143,00	1,71	160	1524,00	2,29
41	390,53	0,59	81	771,53	1,16	121	1152,53	1,73	161	1533,53	2,30
42	400,05	0,60	82	781,05	1,17	122	1162,05	1,74	162	1543,05	2,31
43	409,58	0,61	83	790,58	1,19	123	1171,58	1,76	163	1552,58	2,33
44	419,10	0,63	84	800,10	1,20	124	1181,10	1,77	164	1562,10	2,34
45	428,63	0,64	85	809,63	1,21	125	1190,63	1,79	165	1571,63	2,36
46	438,15	0,66	86	819,15	1,23	126	1200,15	1,80	166	1581,15	2,37
47	447,68	0,67	87	828,68	1,24	127	1209,68	1,81	167	1590,68	2,39
48	457,20	0,69	88	838,20	1,26	128	1219,20	1,83	168	1600,20	2,40
49	466,73	0,70	89	847,73	1,27	129	1228,73	1,84	169	1609,73	2,41
50	476,25	0,71	90	857,25	1,29	130	1238,25	1,86	170	1619,25	2,43

Lengths and tolerances

Roller chains with pitch p = 12,7 mm (1/2")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
P 83 V	-	155
S 84	-	180
L 85	08B-1	180
D 85	08B-2	320
Tr85	08B-3	475
	DIN 8188	
L 85 A	08A-1	141
D 85 A	08A-2	282
Tr 85 A	08A-3	423

Roller chains with pitch p = 15,875 mm (5/8")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
M 106	10B-1	224
D 106	10B-2	400
Tr 106	10B-3	600
	DIN 8188	
M 106 A	10A-1	222
D 106 A	10A-2	444
Tr 106 A	10A-3	666

Permissible variation in length of
unlubricated chain under measuring load:

+ 0,15 % % with measured length 49 x the pitch of the chain in mm

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	139,7	0,21	51	647,7	0,97	91	1155,7	1,73	131	1663,7	2,50
12	152,4	0,23	52	660,4	0,99	92	1168,4	1,75	132	1676,4	2,52
13	165,1	0,25	53	673,1	1,01	93	1181,1	1,77	133	1689,1	2,53
14	177,8	0,27	54	685,8	1,03	94	1193,8	1,79	134	1701,8	2,55
15	190,5	0,29	55	698,5	1,05	95	1206,5	1,81	135	1714,5	2,57
16	203,2	0,30	56	711,2	1,07	96	1219,2	1,83	136	1727,2	2,59
17	215,9	0,32	57	723,9	1,09	97	1231,9	1,85	137	1739,9	2,61
18	228,6	0,34	58	736,6	1,10	98	1244,6	1,87	138	1752,6	2,63
19	241,3	0,36	59	749,3	1,12	99	1257,3	1,89	139	1765,3	2,65
20	254,0	0,38	60	762,0	1,14	100	1270,0	1,91	140	1778,0	2,67
21	266,7	0,40	61	774,7	1,16	101	1282,7	1,92	141	1790,7	2,69
22	279,4	0,42	62	787,4	1,18	102	1295,4	1,94	142	1803,4	2,71
23	292,1	0,44	63	800,1	1,20	103	1308,1	1,96	143	1816,1	27,72
24	304,8	0,46	64	812,8	1,22	104	1320,8	1,98	144	1828,8	2,74
25	317,5	0,48	65	825,5	1,24	105	1333,5	2,00	145	1841,5	2,76
26	330,2	0,50	66	838,2	1,26	106	1346,2	2,02	146	1854,2	2,78
27	342,9	0,51	67	850,9	1,28	107	1358,9	2,04	147	1866,9	2,80
28	355,6	0,53	68	863,6	1,30	108	1371,6	2,06	148	1879,6	2,82
29	368,3	0,55	69	876,3	1,31	109	1384,3	2,08	149	1892,3	2,84
30	381,0	0,57	70	889,0	1,33	110	1397,0	2,10	150	1905,0	2,86
31	393,7	0,59	71	901,7	1,35	111	1409,7	2,12	151	1917,7	2,88
32	406,4	0,61	72	914,4	1,37	112	1422,4	2,13	152	1930,4	2,90
33	419,1	0,63	73	927,1	1,39	113	1435,1	2,15	153	1943,1	2,91
34	431,8	0,65	74	939,8	1,41	114	1447,8	2,17	154	1955,8	2,93
35	444,5	0,67	75	952,5	1,43	115	1460,5	2,19	155	1968,5	2,95
36	457,2	0,69	76	965,2	1,45	116	1473,2	2,21	156	1981,2	2,97
37	469,9	0,70	77	977,9	1,47	117	1485,9	2,23	157	1993,9	2,99
38	482,6	0,72	78	990,6	1,49	118	1498,6	2,25	158	2006,6	3,01
39	495,3	0,74	79	1003,3	1,50	119	1511,3	2,27	159	2019,3	3,03
40	508,0	0,76	80	1016,0	1,52	120	1524,0	2,29	160	2032,0	3,05
41	520,7	0,78	81	1028,7	1,54	121	1536,7	2,31	161	2044,7	3,07
42	533,4	0,80	82	1041,4	1,56	122	1549,4	2,32	162	2057,4	3,09
43	546,1	0,82	83	1054,1	1,58	123	1562,1	2,34	163	2070,1	3,11
44	558,8	0,84	84	1066,8	1,60	124	1574,8	2,36	164	2082,8	3,12
45	571,5	0,86	85	1079,5	1,62	125	1587,5	2,38	165	2095,5	3,14
46	584,2	0,88	86	1092,2	1,64	126	1600,2	2,40	166	2108,2	3,16
47	596,9	0,90	87	1104,9	1,66	127	1612,9	2,42	167	2120,9	3,18
48	609,6	0,91	88	1117,6	1,68	128	1625,6	2,44	168	2133,6	3,20
49	622,3	0,93	89	1130,3	1,70	129	1638,3	2,46	169	2146,3	3,22
50	635,0	0,95	90	1143,0	1,71	130	1651,0	2,48	170	2159,0	3,24

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	174,63	0,26	51	809,63	1,21	91	1444,63	2,17	131	2079,63	3,12
12	190,50	0,29	52	825,50	1,24	92	1460,50	2,19	132	2095,50	3,14
13	206,38	0,31	53	841,38	1,26	93	1476,38	2,21	133	2111,38	3,17
14	222,25	0,33	54	857,25	1,29	94	1492,25	2,24	134	2127,25	3,19
15	238,13	0,36	55	873,13	1,31	95	1508,13	2,26	135	2143,13	3,21
16	254,00	0,38	56	889,00	1,33	96	1524,00	2,29	136	2159,00	3,24
17	269,88	0,40	57	904,88	1,36	97	1539,88	231	137	2174,88	3,26
18	285,75	0,43	58	920,75	1,38	98	1555,75	2,33	138,	2190,75	3,29
19	301,63	0,45	59	936,63	1,40	99	1571,63	2,36	139	2206,63	3,31
20	317,50	0,48	60	952,50	1,43	100	1587,50	2,38	140	2222,50	3,33
21	333,38	0,50	61	968,38	1,45	101	1603,38	2,41	141	2238,38	3,36
22	349,25	0,52	62	984,25	1,48	102	1619,25	2,43	142	2254,25	3,38
23	365,13	0,55	63	1000,13	1,50	103	1635,13	2,45	143	2270,13	3,41
24	381,00	0,57	64	1016,00	1,52	104	1651,00	2,48	144	2286,00	3,43
25	396,88	0,60	65	1031,88	1,55	105	1666,88	2,50	145	2301,88	3,45
26	412,75	0,62	66	1047,75	1,57	106	1682,75	2,52	146	2317,75	3,48
27	428,63	0,64	67	1063,63	1,60	107	1698,63	2,55	147	2333,63	3,50
28	444,50	0,67	68	1079,50	1,62	108	1714,50	2,57	148	2349,50	3,52
29	460,38	0,69	69	1095,38	1,64	109	1730,38	2,60	149	2365,38	3,55
30	476,25	0,71	70	1111,25	1,67	110	1746,25	2,62	150	2381,25	3,57
31	492,13	0,74	71	1127,13	1,69	111	1762,13	2,64	151	2397,13	3,60
32	508,00	0,76	72	1143,00	1,71	112	1778,00	2,67	152	2413,00	3,62
33	523,88	0,79	73	1158,88	1,74	113	1793,88	2,69	153	2428,88	3,64
34	539,75	0,81	74	1174,75	1,76	114	1809,75	2,71	154	2444,75	3,67
35	555,63	0,83	75	1190,63	1,79	115	1825,63	2,74	155	2460,63	3,69
36	571,50	0,86	76	1206,50	1,81	116	1841,50	2,76	156	2476,50	3,71
37	587,38	0,88	77	1222,38	1,83	117	1857,38	2,79	157	2492,38	3,74
38	603,25	0,90	78	1238,25	1,86	118	1873,25	2,81	158	2508,25	3,76
39	619,13	0,93	79	1254,13	1,88	119	1889,13	2,83	159	2524,13	3,79
40	635,00	0,95	80	1270,00	1,91	120	1905,00	2,86	160	2540,00	3,81
41	650,88	0,98	81	1285,88	1,93	121	1920,88	2,88	161	2555,88	3,83
42	666,75	1,00	82	1301,75	1,95	122	1936,75	2,91	162	2571,75	3,86
43	682,63	1,02	83	1317,63	1,98	123	1952,63	2,93	163	2587,63	3,88
44	698,50	1,05	84	1333,50	2,00	124	1968,50	2,95	164	2603,50	3,91
45	714,38	1,07	85	1349,38	2,02	125	1984,38	2,98	165	2619,38	3,93
46	730,25	1,10	86	1365,25	2,05	126	2000,25	3,00	166	2635,25	3,95
47	746,13	1,12	87	1381,13	2,07	127	2016,13	3,02	167	2651,13	3,98
48	762,00	1,14	88	1397,00	2,10	128	2032,00	3,05	168	2667,00	4,00
49	777,88	1,17	89	1412,88	2,12	129	2047,88	3,07	169	2682,88	4,02
50	793,75	1,19	90	1428,75	2,14	130	2063,75	3,11	170	2698,75	4,05

iwis
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Lengths and tolerances

Roller chains with pitch p = 19,05 mm (3/4")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
M 127	12B-1	290
D 127	12B-2	530
Tr 127	12B-3	800
	DIN 8188	
M 128 A	12A-1	318
D 128 A	12A-2	636
Tr 128 A	12A-3	954

Roller chains with pitch p = 25,4 mm (1")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
M 1611	16B-1	6000
D 1611	16B-2	1060
Tr 1611	16B-3	1600
	DIN 8188	
M 1610 A	16A-1	567
D 1610 A	16A-2	1134
Tr 1610 A	16A-3	1701
	DIN 8181	
LR 165	208B	180

Permissible variation in length of
unlubricated chain under measuring load:

+ 0,15 % % with measured length 49 x the pitch of the chain in mm

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	209,55	0,31	51	971,55	1,46	91	1733,55	2,60	131	2495,55	3,74
12	228,60	0,34	52	990,60	1,49	92	1752,60	2,63	132	2514,60	3,77
13	247,65	0,37	53	1009,65	1,51	93	1771,65	2,66	133	2533,65	3,80
14	266,70	0,40	54	1028,70	1,54	94	1790,70	2,69	134	2552,70	3,83
15	285,75	0,43	55	1047,75	1,57	95	1809,75	2,71	135	2571,75	3,86
16	304,80	0,46	56	1066,80	1,60	96	1828,80	2,74	136	2590,80	3,89
17	323,85	0,49	57	1085,85	1,63	97	1847,85	2,77	137	2609,85	3,91
18	342,90	0,51	58	1104,90	1,66	98	1866,90	2,80	138	2628,90	3,94
19	361,95	0,54	59	1123,95	1,69	99	1885,95	2,83	139	2647,95	3,97
20	381,00	0,57	60	1143,00	1,71	100	1905,00	2,86	140	2667,00	4,00
21	400,05	0,60	61	1162,05	1,74	101	1924,05	2,89	141	2686,05	4,03
22	419,10	0,63	62	1181,10	1,77	102	1943,10	2,91	142	2705,10	4,06
23	438,15	0,66	63	1200,15	1,80	103	1962,15	2,94	143	2724,15	4,09
24	457,20	0,69	64	1219,20	1,83	104	1981,20	2,97	144	2743,20	4,11
25	476,25	0,71	65	1238,25	1,86	105	2000,25	3,00	145	2762,25	4,14
26	495,30	0,74	66	1257,30	1,89	106	2019,30	3,03	146	2781,30	4,17
27	514,35	0,77	67	1276,35	1,91	107	2038,35	3,06	147	2800,35	4,20
28	533,40	0,80	68	1295,40	1,94	108	2057,40	3,09	148	2819,40	4,23
29	552,45	0,83	69	1314,45	1,97	109	2076,45	3,11	149	2838,45	4,26
30	571,50	0,86	70	1333,50	2,00	110	2095,50	3,14	150	2857,50	4,29
31	590,55	0,89	71	1352,55	2,03	111	2114,55	3,17	151	2876,55	4,32
32	609,60	0,91	72	1371,60	2,06	112	2133,60	3,20	152	2895,60	4,34
33	628,65	0,94	73	1390,65	2,09	113	2152,65	3,23	153	2914,65	4,37
34	647,70	0,97	74	1409,70	2,11	114	2171,70	3,26	154	2933,70	4,40
35	666,75	1,00	75	1428,75	2,14	115	2190,75	3,29	155	2952,75	4,43
36	685,80	1,03	76	1447,80	2,17	116	2209,80	3,31	156	2971,80	4,46
37	704,85	1,06	77	1466,85	2,20	117	2228,85	3,34	157	2990,85	4,49
38	723,90	1,09	78	1485,90	2,23	118	2247,90	3,37	158	3009,90	4,51
39	742,95	1,11	79	1504,95	2,26	119	2266,95	3,40	159	3028,95	4,54
40	762,00	1,14	80	1524,00	2,29	120	2286,00	343	160	3048,00	4,57
41	781,05	1,17	81	1543,05	2,31	121	2305,05	3,46	161	3067,05	4,60
42	800,10	1,20	82	1562,10	2,34	122	2324,10	3,49	162	3086,10	4,63
43	819,15	1,23	83	1581,15	2,37	123	2343,15	3,51	163	3105,15	4,66
44	838,20	1,26	84	1600,20	2,40	124	2362,20	3,54	164	3124,20	4,69
45	857,25	1,29	85	1619,25	2,43	125	2381,25	3,57	165	3143,25	4,71
46	876,30	1,31	86	1638,30	2,46	126	2400,30	3,60	166	3162,30	474
47	895,35	1,34	87	1657,35	2,49	127	2419,35	3,63	167	3181,35	4,77
48	914,40	1,37	88	1676,40	2,51	128	2438,40	3,66	168	3200,40	4,80
49	933,45	1,40	89	1695,45	2,54	129	2457,45	3,69	169	3219,45	4,83
50	952,50	1,43	90	1714,50	2,57	130	2476,50	3,72	170	3238,50	4,86

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	279,4	0,42	51	1295,4	1,94	91	2311,4	3,47	131	3327,4	4,99
12	304,8	0,46	52	1320,8	1,98	92	2336,8	3,51	132	3352,8	5,03
13	330,2	0,50	53	1346,2	2,02	93	2362,2	3,54	133	3378,2	5,07
14	355,6	0,53	54	1371,6	2,06	94	2387,6	3,58	134	3403,6	5,11
15	381,0	0,57	55	1397,0	2,10	95	2413,0	3,62	135	3429,0	5,14
16	406,4	0,61	56	1422,4	2,13	96	2438,4	3,66	136	3454,4	5,18
17	431,8	0,65	57	1447,8	2,17	97	2463,8	3,70	137	3479,8	5,22
18	457,2	0,69	58	1473,2	2,21	98	2489,2	3,73	138	3505,2	5,26
19	482,6	0,72	59	1498,6	2,25	99	2514,6	3,77	139	3530,6	5,30
20	508,0	0,76	60	1524,0	2,29	100	2540,0	3,81	140	3558,0	5,33
21	533,4	0,80	61	1549,4	2,36	101	2565,4	3,85	141	3581,4	5,37
22	558,8	0,84	62	1574,8	2,36	102	2590,8	3,89	142	3606,8	5,41
23	584,2	0,88	63	1600,2	2,40	103	2616,2	3,92	143	3632,2	5,45
24	609,6	0,91	64	1625,6	2,44	104	2641,6	3,96	144	3657,6	5,49
25	635,0	0,95	65	1651,0	2,48	105	2667,0	4,00	145	3683,0	5,52
26	660,4	0,99	66	1676,4	2,51	106	2692,4	4,04	146	3708,4	5,56
27	685,8	1,03	67	1701,8	2,55	107	2717,8	4,08	147	3733,8	5,60
28	711,2	1,07	68	1727,2	2,59	108	2743,2	4,11	148	3759,2	5,64
29	736,6	1,10	69	1752,6	2,63	109	2768,6	4,15	149	3784,6	5,68
30	762,0	1,14	70	1778,0	2,67	110	2794,0	4,19	150	3810,0	5,72
31	787,4	1,18	71	1803,4	2,70	111	2819,4	4,23	151	3835,4	5,75
32	812,8	1,22	72	1828,8	2,74	112	2844,8	4,27	152	3860,8	5,79
33	838,2	1,26	73	1854,2	2,78	113	2870,2	4,31	153	3886,2	5,83
34	863,6	1,30	74	1879,6	2,82	114	2895,6	4,34	154	3911,6	5,87
35	889,0	1,33	75	1905,0	2,86	115	2921,0	4,38	155	3937,0	5,91
36	914,4	1,37	76	1930,4	2,90	116	2946,4	4,42	156	3962,4	5,94
37	939,8	1,41	77	1955,8	2,93	117	2971,8	4,46	157	3987,8	5,98
38	965,2	1,45	78	1981,2	2,97	118	2997,2	4,50	158	4013,2	6,02
39	990,6	1,49	79	2006,6	3,01	119	3022,6	4,53	159	4038,6	6,06
40	1016,0	1,52	80	2032,0	3,05	120	3048,0	4,57	160	4064,0	6,10
41	1041,4	1,56	81	2057,4	3,09	121	3073,4	4,61	161	4089,4	6,13
42	1066,8	1,60	82	2082,8	3,12	122	3098,8	4,65	162	4114,8	6,17
43	1092,2	1,64	83	2108,2	3,16	123	3124,2	4,69	163	4140,2	6,21
44	1117,6	1,68	84	2133,6	3,20	124	3149,6	4,72	164	4165,6	6,25
45	1143,0	1,71	85	2159,0	3,24	125	3175,0	4,76	165	4191,0	6,29
46	1168,4	175	86	2184,4	3,28	126	3200,4	4,80	166	4216,4	6,32
47	1193,8	1,79	87	2209,8	3,31	127	3225,8	4,84	167	4241,8	6,36
48	1219,2	1,83	88	2235,2	3,35	128	3251,2	4,88	168	4267,2	6,40
49	1244,6	1,87	89	2260,6	3,39	129	3276,6	4,92	1^69	4292,6	6,44
50	1270,0	1,91	90	2286,0	3,43	130	3302,0	4,95	170	4318,0	6,48

Lengths and tolerances

Roller chains with pitch p = 31,75 mm (1 1/4")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
M 2012	20B-1	950
D 2012	20B-2	1700
Tr 2012	20B-3	2500
	DIN 8181	
LR 206	210B1	224

Roller chains with pitch p = 38,1 mm (1 1/2")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
M 2416	24B-1	1600
D 2416	24B-2	2800
Tr 2416	24B-3	4250
	DIN 8181	
LR 247	212B	290

Permissible variation in length of
unlubricated chain under measuring load:

+ 0,15 % % with measured length 49 x the pitch of the chain in mm

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute lengthe mm	+ Tol. mm
11	349,25	0,52	51	1619,25	2,43	91	2889,25	4,33	131	4159,25	6,24
12	381,00	0,57	52	1651,00	2,48	92	2921,00	4,38	132	4191,00	6,29
13	412,75	0,62	53	1682,75	2,52	93	2952,75	4,43	133	4222,75	6,33
14	444,50	0,67	54	1714,50	2,57	94	2984,50	4,48	134	4254,50	6,38
15	476,25	0,71	55	1746,25	2,62	95	3016,25	4,52	135	4286,25	6,43
16	508,00	0,76	56	1778,00	2,67	96	3048,00	4,57	136	4318,00	6,48
17	539,75	0,81	57	1809,75	2,71	97	3079,75	4,62	137	4349,75	6,52
18	571,50	0,86	58	1841,50	2,76	98	3111,50	4,67	138	4381,50	6,57
19	603,25	0,90	59	1873,25	2,81	99	3143,25	4,71	139	4413,25	6,62
20	635,00	0,95	60	1905,00	2,86	100	3175,00	4,76	140	4445,00	6,67
21	666,75	1,00	61	1936,75	2,91	101	3206,75	4,81	141	4476,75	6,72
22	698,50	1,05	62	1968,50	2,95	102	3238,50	4,86	142	4508,50	6,76
23	730,25	1,10	63	2000,25	3,00	103	3270,25	4,91	143	4540,25	6,81
24	762,00	1,14	64	2032,00	3,05	104	3302,00	4,95	144	4572,00	6,86
25	793,75	1,19	65	2063,75	3,10	105	3333,75	5,00	145	4603,75	6,91
26	825,50	1,24	66	2095,50	3,14	106	3365,50	5,05	146	4635,50	6,95
27	857,25	1,29	67	2127,25	3,19	107	3397,25	5,10	147	4667,25	7,00
28	889,00	1,33	68	2159,00	3,24	108	3429,00	5,14	148	4699,00	7,05
29	920,75	1,38	69	2190,75	3,29	109	3460,75	5,19	149	4730,75	7,10
30	952,50	1,43	70	2222,50	3,33	110	3492,50	5,24	150	4762,50	7,14
31	984,25	1,48	71	2254,25	3,38	111	3524,25	5,29	151	4794,25	7,19
32	1016,00	1,52	72	2286,00	3,43	112	3556,00	5,33	152	4826,00	7,24
33	1047,75	1,57	73	2317,75	3,48	113	3587,75	5,38	153	4857,75	7,29
34	1079,50	1,62	74	2349,50	3,52	114	3619,50	5,43	154	4889,50	7,33
35	1111,25	1,67	75	2381,25	3,57	115	3651,25	5,48	155	4921,25	7,38
36	1143,00	1,71	76	2413,00	3,62	116	3683,00	5,52	156	4953,00	7,43
37	1174,75	1,76	77	2444,75	3,67	117	3714,75	5,57	157	4984,75	7,48
38	1206,50	1,81	78	2476,50	3,71	118	3746,50	5,62	158	5016,50	7,53
39	1238,25	1,86	79	2508,25	3,76	119	3778,25	5,67	159	5048,25	7,57
40	1270,00	1,90	80	2540,00	3,81	120	3810,00	5,72	160	5080,00	7,62
41	1301,75	1,95	81	2571,75	3,86	121	3841,75	5,76	161	5111,75	7,67
42	1333,50	2,00	82	2603,50	3,91	122	3873,50	5,81	162	5143,50	7,72
43	1365,25	2,05	83	2635,25	3,95	123	3905,25	5,86	163	5175,25	7,76
44	1397,00	2,10	84	2667,00	4,00	124	3937,00	5,91	164	5207,00	7,81
45	1428,75	2,14	85	2698,75	4,05	125	3968,75	5,95	165	5238,75	7,86
46	1460,50	2,19	86	2730,50	4,10	126	4000,50	6,00	166	5270,50	7,91
47	1492,25	2,24	87	2762,25	4,14	127	4032,25	6,05	167	5302,25	7,95
48	1524,00	2,29	88	2794,00	4,19	128	4064,00	6,10	168	5334,00	8,00
49	1555,75	2,33	89	2825,75	4,24	129	4095,75	6,14	169	5365,75	8,05
50	1587,50	2,38	90	2857,50	4,29	130	4127,50	6,19	170	5397,50	8,10

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	419,1	0,63	51	1943,1	2,91	91	3467,1	5,20	131	4991,1	7,49
12	457,2	0,69	52	1981,2	2,97	92	3505,2	5,26	132	5029,2	7,54
13	495,3	0,74	53	2019,3	3,03	93	3543,3	5,31	133	5067,3	7,60
14	533,4	0,80	54	2057,4	3,09	94	3581,4	5,37	134	5105,4	7,66
15	571,5	0,86	55	2095,5	3,14	95	3619,5	5,43	135	5143,5	7,72
16	609,6	0,91	56	2133,6	3,20	96	3657,6	5,49	136	5181,6	7,77
17	647,7	0,97	57	2171,7	3,26	97	3695,7	5,54	137	5219,7	7,83
18	685,8	1,03	58	2209,8	3,32	98	3733,8	5,60	138	5257,8	7,89
19	723,9	1,10	59	2247,9	3,37	99	3771,9	5,66	139	5295,9	7,94
20	762,0	1,14	60	2286,0	3,43	100	3810,0	5,72	140	5334,0	8,00
21	800,1	1,22	61	2324,1	3,49	101	3848,1	5,77	141	5372,1	8,06
22	838,2	1,26	62	2362,2	3,54	102	3886,2	5,83	142	5410,2	8,12
23	876,3	1,31	63	2400,3	3,60	103	3924,3	5,89	143	5448,3	8,17
24	914,4	1,37	64	2438,4	3,66	104	3962,4	5,94	144	5486,4	8,23
25	952,5	1,43	65	2476,5	3,72	105	4000,5	6,00	145	5524,5	8,29
26	990,6	1,49	66	2514,6	3,77	106	4038,6	6,06	146	5562,6	8,34
27	1028,7	1,54	67	2552,7	3,83	107	4076,7	6,12	147	5600,7	8,40
28	1066,8	1,60	68	2590,8	3,89	108	4114,8	6,17	148	5638,8	8,46
29	1104,9	1,66	69	2628,9	3,94	109	4152,9	6,23	149	5676,9	8,52
30	1143,0	1,71	70	2667,0	4,00	110	4191,0	6,29	150	5715,0	8,57
31	1181,1	1,77	71	2705,1	4,06	111	4229,1	6,34	151	5753,1	8,63
32	1219,2	1,83	72	2743,2	4,11	112	4267,2	6,40	152	5791,2	8,69
33	1257,3	1,89	73	2781,3	4,17	113	4305,3	6,46	153	5829,3	8,74
34	1295,4	1,94	74	2819,4	4,23	114	4343,4	6,51	154	5867,4	8,80
35	1333,5	2,00	75	2857,5	4,29	115	4381,5	6,57	155	5905,5	8,86
36	1371,6	2,06	76	2895,6	4,34	116	4419,6	6,63	156	5943,6	8,92
37	1409,7	2,11	77	2933,7	4,40	117	4457,7	6,69	157	5981,7	8,97
38	1447,8	2,17	78	2971,8	4,46	118	4495,8	6,74	158	6019,8	9,03
39	1485,9	2,23	79	3009,9	4,51	119	4533,9	6,80	159	6057,9	9,09
40	1524,0	2,29	80	3048,0	4,57	120	4572,0	6,86	160	6096,0	9,14
41	1562,1	2,34	81	3086,1	4,63	121	4610,1	6,92	161	6134,1	9,20
42	1600,2	2,40	82	3124,2	4,69	122	4648,2	6,97	162	6172,2	9,26
43	1638,3	2,46	83	3162,3	4,74	123	4686,3	7,03	163	6210,3	9,32
44	1676,4	2,51	84	3200,4	4,80	124	4724,4	7,09	164	6248,4	9,37
45	1714,5	2,57	85	3238,5	4,86	125	4762,5	7,14	165	6286,5	9,43
46	1752,6	2,63	86	3276,6	4,92	126	4800,6	7,20	166	6324,6	9,49
47	1790,7	2,69	87	3314,7	4,97	127	4838,7	7,26	167	6362,7	9,54
48	1828,8	2,74	88	3352,8	5,03	128	4876,8	7,32	168	6400,8	9,60
49	1866,9	2,80	89	3390,9	5,09	129	4914,9	7,37	169	6438,9	9,66
50	1905,0	2,86	90	3429,0	5,14	130	4953,0	7,43	170	6477,0	9,72

C Layout of chain drives

Lengths and tolerances

Roller chains with pitch p = 44,45 mm (1 3/4")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
M 2819	28B-1	2000
D 2819	28B-2	3600
Tr 2819	28B-3	5300

Roller chains with pitch p = 50,8 mm (2")		
iwis Designation	DIN	Measuring load in N
	DIN 8187	
M 3219	32B-1	2500
D 3219	32B-2	4500
Tr 3219	32B-3	6700
	DIN 8181	
LR 3211	216B	600

Permissible variation in length of
unlubricated chain under measuring load:

+ 0,15 % % with measured length 49 x the pitch of the chain in mm

No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	488,95	0,73	51	2266,95	3,40	91	4044,95	6,07	131	5822,95	8,73
12	533,40	0,80	52	2311,40	3,47	92	4089,40	6,13	132	5867,40	8,80
13	577,85	0,87	53	2355,85	3,53	93	4133,85	6,20	133	5911,85	8,87
14	622,30	0,93	54	2400,30	3,60	94	4178,30	6,27	134	5956,30	8,93
15	666,75	1,00	55	2444,75	3,67	95	4222,75	6,33	135	6000,75	9,00
16	711,20	1,07	56	2489,20	3,73	96	4267,20	6,40	136	6045,20	9,07
17	755,65	1,13	57	2533,65	3,80	97	4311,65	6,47	137	6089,65	9,13
18	800,10	1,20	58	2578,10	3,87	98	4356,10	6,53	138	6134,10	9,20
19	844,55	1,27	59	2622,55	3,93	99	4400,55	6,60	139	6178,55	9,27
20	889,00	1,33	60	2667,00	4,00	100	4445,00	6,67	140	6223,00	9,33
21	933,45	1,40	61	2711,45	4,07	101	4489,45	6,73	141	6267,45	9,40
22	977,90	1,47	62	2755,90	4,13	102	4533,90	6,80	142	6311,90	9,47
23	1022,35	1,53	63	2800,35	4,20	103	4578,35	6,87	143	6356,35	9,53
24	1066,80	1,60	64	2844,80	4,27	104	4622,80	6,93	144	6400,80	9,60
25	1111,25	1,67	65	2889,25	4,33	105	4667,25	7,00	145	6445,25	9,67
26	1155,70	1,73	66	2933,70	4,40	106	4711,70	7,07	146	6489,70	9,73
27	1200,15	1,80	67	2978,15	4,47	107	4756,15	7,13	147	6534,15	9,80
28	1244,60	1,87	68	3022,60	4,53	108	4800,60	7,20	148	6578,60	9,87
29	1289,05	1,93	69	3067,05	4,60	109	4845,05	7,27	149	6623,05	9,93
30	1333,50	2,00	70	3111,50	4,67	110	4889,50	7,33	150	6667,50	10,00
31	1377,95	2,07	71	3155,95	4,73	111	4933,95	7,40	151	6711,95	10,07
32	1422,40	2,13	72	3200,40	4,80	112	4978,40	7,47	152	6756,40	10,13
33	1466,85	2,20	73	3244,85	4,87	113	5022,85	7,53	153	6800,85	10,20
34	1511,30	2,27	74	3289,30	4,93	114	5067,30	7,60	154	6845,30	10,27
35	1555,75	2,33	75	3333,75	5,00	115	5111,75	7,67	155	6889,75	10,33
36	1600,20	2,40	76	3378,20	5,07	116	5156,20	7,73	156	6934,20	10,40
37	1644,65	2,47	77	3422,65	5,13	117	5200,65	7,80	157	6978,65	10,47
38	1689,10	2,53	78	3467,10	5,20	118	5245,10	7,87	158	7023,10	10,53
39	1733,55	2,60	79	3511,55	5,27	119	5289,55	7,93	159	7067,55	10,60
40	1778,00	2,67	80	3556,00	5,33	120	5334,00	8,00	160	7112,00	10,67
41	1822,45	2,73	81	3600,45	5,40	121	5378,45	8,07	161	7156,45	10,73
42	1866,90	2,80	82	3644,90	5,47	122	5422,90	8,13	162	7200,90	10,80
43	1911,35	2,87	83	3689,35	5,53	123	5467,35	8,20	163	7245,35	10,87
44	1955,80	2,93	84	3733,80	5,60	124	5511,80	8,27	164	7289,80	10,93
45	2000,25	3,00	85	3778,25	5,67	125	5556,25	8,33	165	7334,25	11,00
46	2044,70	3,07	86	3822,70	5,73	126	5600,70	8,40	166	7378,70	11,07
47	2089,15	3,13	87	3867,15	5,80	127	5645,15	8,47	167	7423,15	11,13
48	2133,60	3,20	88	3911,60	5,87	128	5689,60	8,53	168	7467,60	11,20
49	2178,05	3,27	89	3956,05	5,93	129	5734,05	8,60	169	7512,05	11,27
50	2222,50	3,33	90	4000,50	6,00	130	5778,50	8,67	170	7556,50	11,33

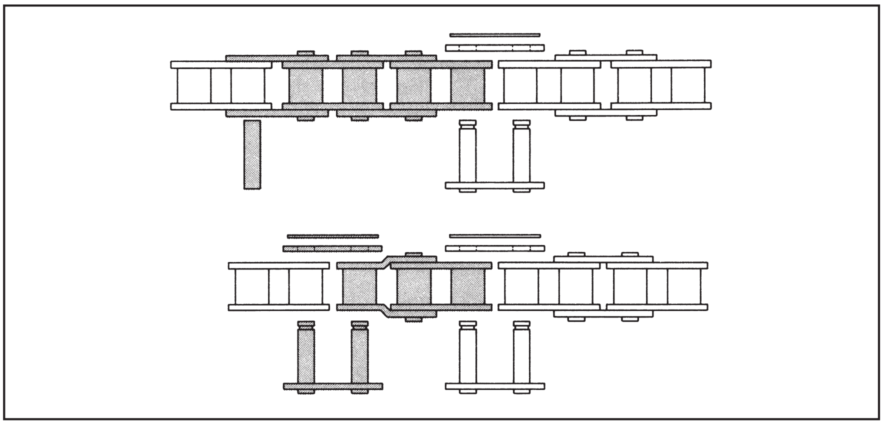
No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm	No. of links	Absolute length mm	+ Tol. mm
11	558,8	0,84	51	2590,8	3,89	91	4622,8	6,93	131	6654,8	9,98
12	609,6	0,91	52	2641,6	3,96	92	4673,6	7,01	132	6705,6	10,06
13	660,4	0,99	53	2692,4	4,04	93	4724,4	7,09	133	6756,4	10,13
14	711,2	1,07	54	2743,2	4,11	94	4775,2	7,16	134	6807,2	10,21
15	762,0	1,14	55	2794,0	4,19	95	4826,0	7,24	135	6858,0	10,29
16	812,8	1,22	56	2844,8	4,27	96	4876,8	7,32	136	6908,8	10,36
17	863,6	1,30	57	2895,6	4,34	97	4927,6	7,39	137	6959,6	10,44
18	914,4	1,37	58	2946,4	4,42	98	4978,4	7,47	138	7010,4	10,52
19	965,2	1,45	59	2997,2	4,50	99	5029,2	7,54	139	7061,2	10,59
20	1016,0	1,52	60	3048,0	4,57	100	5080,0	7,62	140	7112,0	10,67
21	1066,8	1,60	61	3098,8	4,65	101	5130,8	7,70	141	7162,8	10,74
22	1117,6	1,68	62	3149,6	4,72	102	5181,6	7,77	142	7213,6	10,82
23	1168,4	1,75	63	3200,4	4,80	103	5232,4	7,85	143	7264,4	10,90
24	1219,2	1,83	64	3251,2	4,88	104	5283,2	7,92	144	7315,2	10,97
25	1270,0	1,90	65	3302,0	4,95	105	5334,0	8,00	145	7366,0	11,05
26	1320,8	1,98	66	3352,8	5,03	106	5384,8	8,08	146	7416,8	11,13
27	1371,6	2,06	67	3403,6	5,11	107	5435,6	8,15	147	7467,6	11,20
28	1422,4	2,13	68	3454,4	5,18	108	5486,4	8,23	148	7518,4	11,28
29	1473,2	2,21	69	3505,2	5,26	109	5537,2	8,31	149	7569,2	11,35
30	1524,0	2,29	70	3556,0	5,33	110	5588,0	8,38	150	7620,0	11,43
31	1574,8	2,36	71	3606,8	5,41	111	5638,8	8,46	1512	7670,8	11,51
32	1625,6	2,44	72	3657,6	5,49	112	5689,6	8,53	152	7721,6	11,58
33	1676,4	2,51	73	3708,4	5,56	113	5740,4	8,61	153	7772,4	11,66
34	1727,2	2,59	74	3759,2	5,64	114	5791,2	8,69	154	7823,2	11,73
35	1778,0	2,67	75	3810,0	5,71	115	5842,0	8,76	155	7874,0	11,81
36	1828,8	2,74	76	3860,8	5,79	116	5892,8	8,84	156	7924,8	11,89
37	1879,6	2,82	77	3911,6	5,87	117	5943,6	8,92	157	7975,6	11,96
38	1930,4	2,90	78	3962,4	5,94	118	5994,4	8,99	158	8026,4	12,04
39	1981,2	2,97	79	4013,2	6,02	119	6045,2	9,07	159	8077,2	12,12
40	2032,0	3,05	80	4064,0	6,10	120	6096,0	9,14	160	8128,0	12,19
41	2082,8	3,12	81	4114,8	6,17	121	6146,8	9,22	161	8178,8	12,27
42	2133,6	3,20	82	4165,6	6,25	122	6197,6	9,30	162	8229,6	12,34
43	2184,4	3,28	83	4216,4	6,32	123	6248,4	9,37	163	8280,4	12,42
44	2235,2	3,35	84	4267,2	6,40	124	6299,2	9,45	164	8331,2	12,50
45	2286,0	3,43	85	4318,0	6,48	125	6350,0	9,52	165	8382,0	12,57
46	2336,8	3,51	86	4368,8	6,55	126	6400,8	9,60	166	8432,8	12,65
47	2387,6	3,58	87	4419,6	6,63	127	6451,6	9,68	167	8483,6	12,73
48	2438,4	3,66	88	4470,4	6,71	128	6502,4	9,75	168	8534,4	12,80
49	2489,2	3,73	89	4521,2	6,78	129	6553,2	9,83	169	8585,2	12,88
50	2540,0	3,81	90	4572,0	6,86	130	6604,0	9,91	170	8636,0	12,95

3.3 Shortening and lengthening chain

Shortening by one link

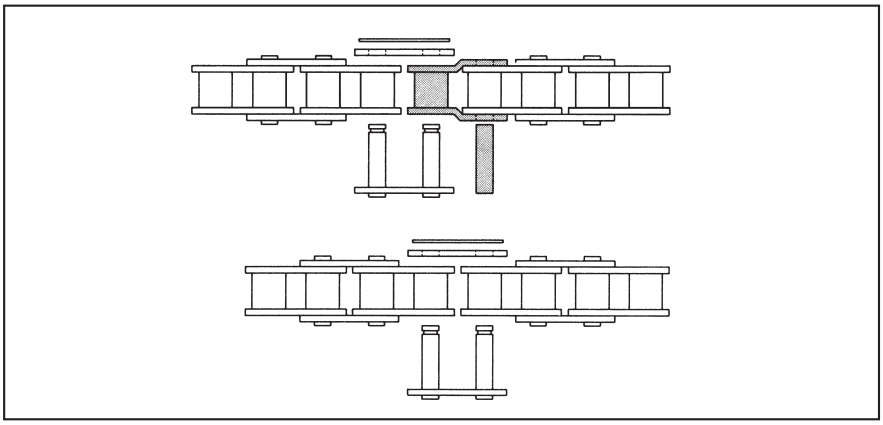
1 A chain with even number of links

To shorten the chain by one link, remove two inner links and two outer links adjacent to the connector link and fit a double cranked link together with a further connector link.



2 A chain with uneven number of links

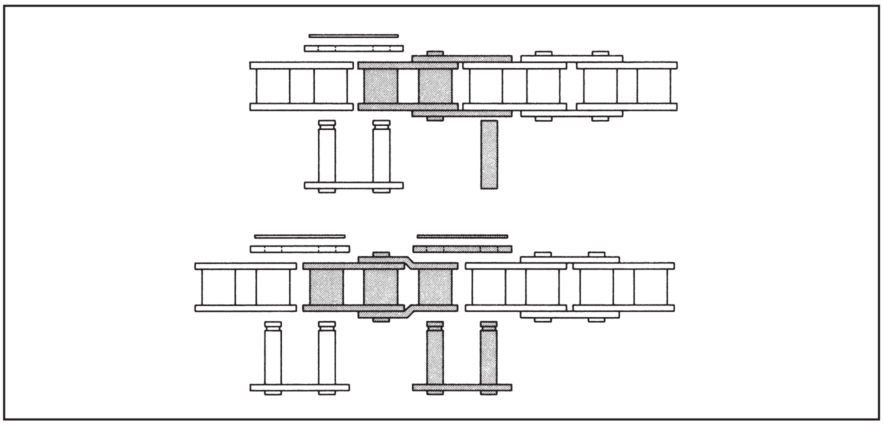
To shorten the chain remove the cranked link.



Extending chain by one link

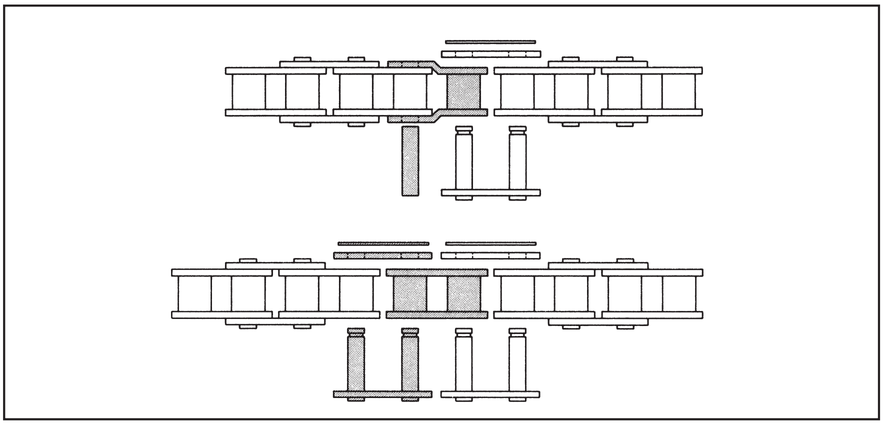
1 A Chain with even number of links

To extend chain by one link remove one inner link and one outer link and fit one double cranked link with a further connector link.



2 A chain with uneven number of links

To extend the chain by one link, remove the single cranked link and fit an inner link with an additional connector link.



Various tools are available to **separate** and **connect** roller and bush chains, to cover the shouldered bearing pin to DIN 8187 and the plain bearing pin to DIN 8188. The types and dimensions are indicated in a separate leaflet.

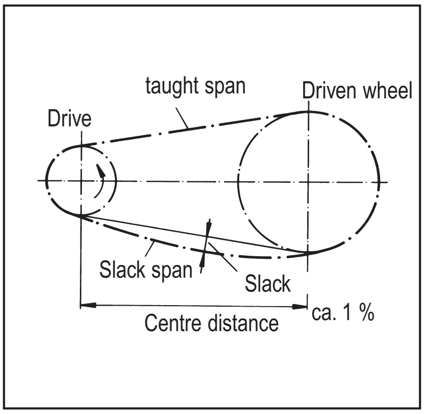
1 Arrangement of drive

When designing a chain drive it is very often impossible to realize the theoretical best arrangement of the chainwheels.

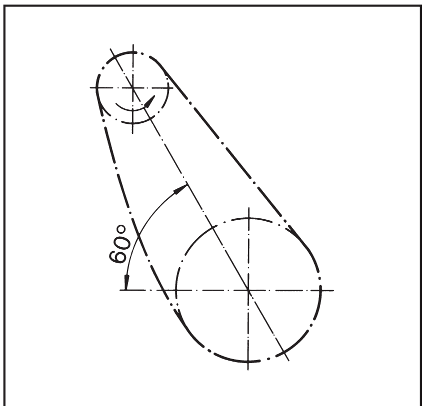
A **horizontal position for the chain wheel shafts** is preferable, where the driven/taught span should be at the top and the slack span below.

For chain drives arranged in the normal position the slack should be approx. 1 % of the centre distance. The mean centre distance can be assumed to be 30 – 60 pitches p. The angle of arc α depends on the following:

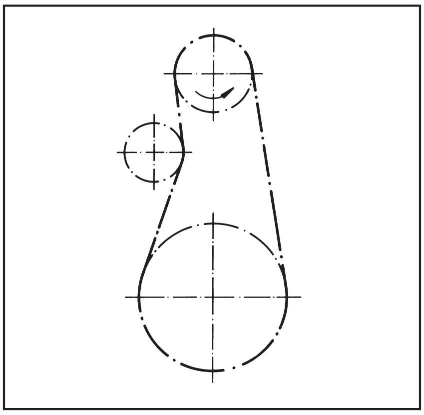
$z_1 \leq 21$	$\alpha \geq 120°$
$z_1 > 21$	$\alpha \geq 90°$



Further examples of chain drive layout:

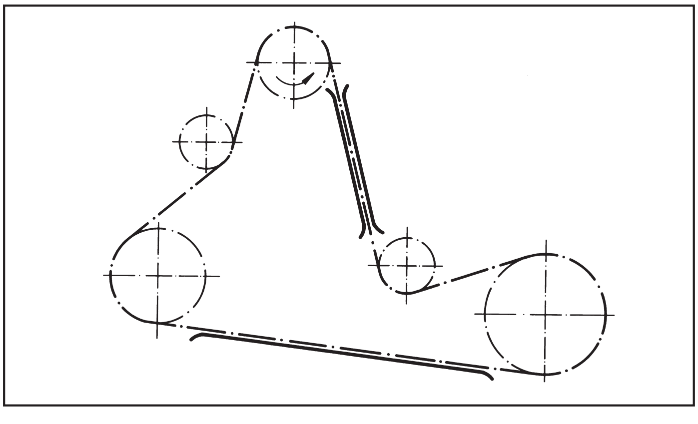


With chain wheels arranged horizontally and up to 60° a tensioner and or guide is not necessarily required.

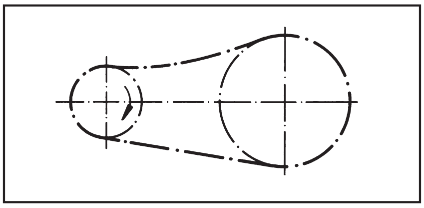


With the chain vertical, a tensioning roller or blade should be provided. An excessive chain length can be compensated by means of a tensioning roller in the case of fixed centre distances.

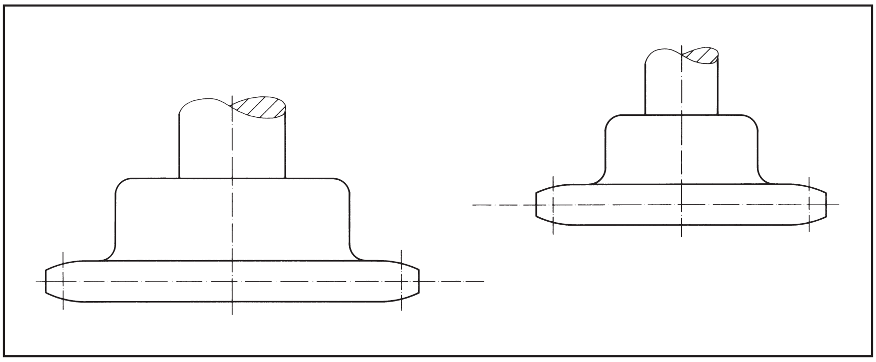
When adapting a drive to a restricted space it is possible to use idler wheels. Where the distance between centres is considerable, chain guides can be used to support the chains.

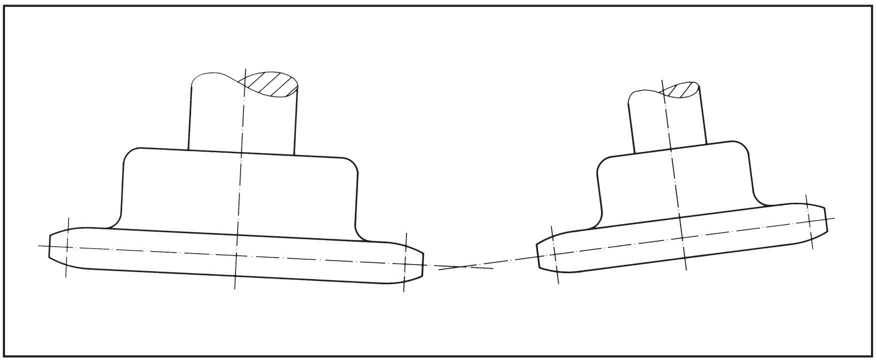


With the driven chain side below, only a short centre distance and minimum slack is permissible, to ensure that the slack chain does not interfer or compact between the wheels.



2 Chain and chainwheel alignment





Accurate chain alignment has a significant effect on chain life. Particular care should be paid to ensure that the shafts are parallel and to the alignment of the chain wheels. As a guide for slow running chain drives a tolerance of 0,2 mm per 100 mm centre distance is given for misalignment. In the case of faster running drives, such as in combustion engines and with short centre distances misalignment of the wheels should not exceed 0,1 mm. With short centre distance drives and vertical chain wheel centres the chain should be supported by means of a guide.
Where the misalignment exceeds the specified value or if there is no support in the case of vertical chain wheel centres, the inner links interfer with the chain wheel teeth, resulting in continuous knocking of the inner link plates, which are eventually pushed outwards until hey contact the outer link plates and thus reduce the freedom of link movement. In addition, lateral vibrations are set up, which accelerate chain wear.

3 Chain tension

Vibrations cause wear and increase the noise level of chain drives. They can be caused by:
- Uneven rotational speed of driver or driven sprocket
- Polygon effect
- Inaccurate alignment
- Vertical and horizontal run-out of sprockets
- Long, loose chain sections
- Insufficient lubrication

A distinction is made between longitudinal and transverse oscillations of the chain. In the case of **longitudinal oscillations** there is a constant change in chain tension between the chain wheels.

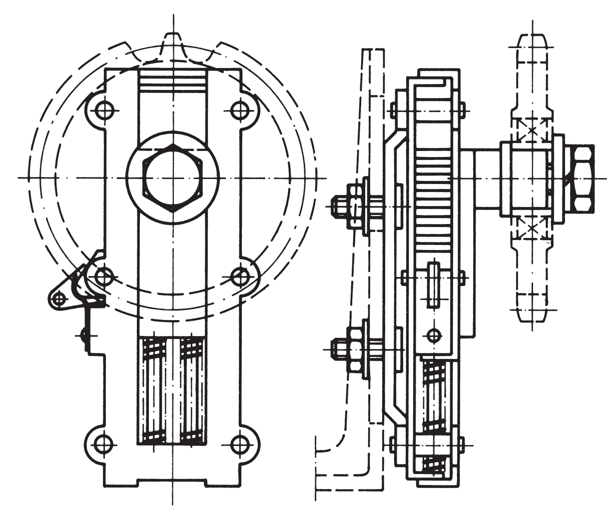
Transverse oscillations are set up with long and loose chain sections as a result of super-imposing pulse and natural frequencies of the drive.

With the correct tension and guiding of the chain the above oscillations can be reduced or even prevented.

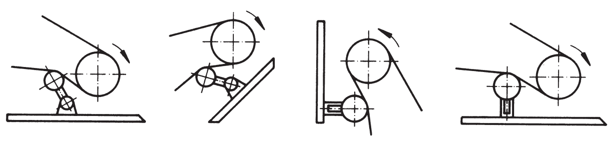
Chain tensioners

The life of a chain drive is increased considerably if a tensioner is used. A chain works satisfactorily up to an elongation due to wear amounting to max. 2 %, provided it is continuously re-tensioned. If this is not done, the slack span begins to hang to an increasing degree and the chain runs unevenly causing additional wear.
The initial load must be sufficient to stabilize the chain running, to eliminate the wear and to prevent jumping of the chain over the teeth.
Excessive high initial tensioner load has to be avoided, since this can increase the chain load and bearing pressure beyond an acceptable level.

Chain tensioner AMS type
With automatic adjustment and non-return mechanism. This tensioner ensures constant damping of oscillations. Two fixing bolts in a groove enable the complete chain tensioner to be moved, thus increasing the range of adjustment. Detailed information is provided in a special brochure.



Installation:
The tensioners offered by **iwis** can be fitted in many positions. They are always fitted on the slack span of the chain drive.



Chain guides

Chain guides are used to support chains where the centre distance is long, in order to reduce the stress as a result of the chain weight. They also reduce transverse and longitudinal oscillations, which increase the wear rate. In addition, chain guides are used to absorb or reduce the force due to the mass, as it occurs when the chain runs off the wheel. Chain guides can be effectively used for noise damping purposes.

4 Maintenance and Lubrication of Chain Drives

Regular maintenance and lubrication are preconditions for low wear and long service life of the chain drive. Maintenance and lubrication frequency, as well as the related relubrication, is determined by operating conditions (tensile forces, temperature, contamination, aggressive media).

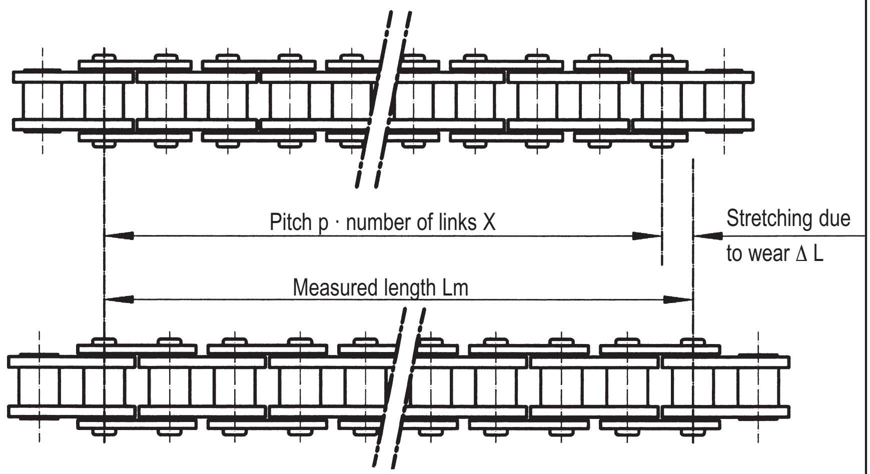
Maintenance

During **regular visual inspections** special attention should be paid to **stretching due to wear, tension, lubrication condition**, and **evidence of wear due to tracking errors**.

Checking the maximum permissible stretching due to wear:

The length of a chain is defined by the pitch p and the number of links X. In the course of time stretching due to wear occurs, and usually this can be measured without removing the chain. The difference from precise measurement with a specified measurement load is slight if measurements are conducted over the highest possible number of chain links, approximately 20 to 40.

Measurement of stretching due to wear



$$\Delta L = \frac{Lm - (p \cdot X)}{p \cdot X} \cdot 100 [\%]$$

The **chain should be replaced** at:

max. 3 %	for simple drives
ca. 2 %	for high-performance drives
ca. 1 %	for special applications (synchronous operation, positioning)

Controlled **retensioning** of the chains has a very positive effect on chain life. Extreme retensioning should be avoided just as much as excessive slack. A guideline figure would be approx. 5 % of the actual chain pulling force. In the case of chains running in parallel both strands must be tensioned equally, at best by a common shaft for both sprockets. If no automatic chain tensioning device is available the chain must be adjusted by hand, by altering the distance betwee the sprocket shafts. A further possibility with long drives is to shorten the chain by removing individual links, provided that wear is relatively light. Various tools are available for dismantling and reassembling the chain. These tools are available for parallel pin and shouldered pin chains.
Before **relubrication** the chains and sprockets should be **cleaned** to remove obstinate contamination and to permit the lubricant to penetrate via the back of the plates. The surface of the chain can also be cleaned using an apropriate solvent. Complete immersion and washing is not recommended as the cleaning agent does not evaporate completely from within the chain and thus the penetration of the fresh lubricant is obstructed.

During **visual inspection**, attention should be paid to evidence of chain linkplate marking and wear due to tracking errors. These are caused by misaligned sprokkets or guides or by chains which are not in parallel.

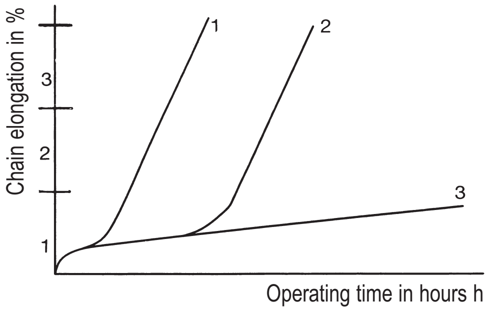
Guide figure for alignment deviations per 100 mm axle separation:
0.1 mm with fast-running drives and close axle spacing;
0.2 mm with slow-running drives.
The sprockets should be constantly inspected and if necessary replaced. We do not recommend that new chains are used with worn sprockets.

iwis
wir bewegen die welt

Lubrication

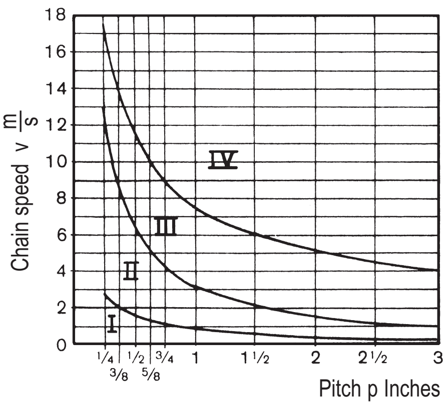
Correct and effective lubrication will protect against high wear resulting from bearing pressure, articulation of pin and bush bore and rotation of the roller. It will considerably lengthen the service life of the chain. An adequate supply of lubricant must be present in the chain parts at all times and under all load conditions. Only then can the lubricant do its job of reducing wear, protecting against corrosion and providing a damping action.

Influence of lubrication on wear and chain stretching



Graph 1 without lubrication, immediate wear is unavoidable
Graph 2 optimum initial lubrication, no re-lubrication, high wear after a short time
Graph 3 optimum initial lubrication and re-lubrication, low wear and long service life

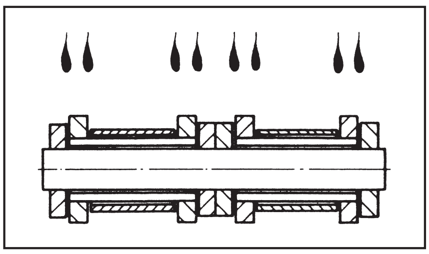
Depending upon the application, **iwis** chains are given the appropriate highgrade lubrication. Due to the articulation of the chain parts the lubricant is used in the course of time. For this reason regular re-lubrication is imperative. Selection of the most suitable lubricating method will depend upon the chain speed and chain pitch.



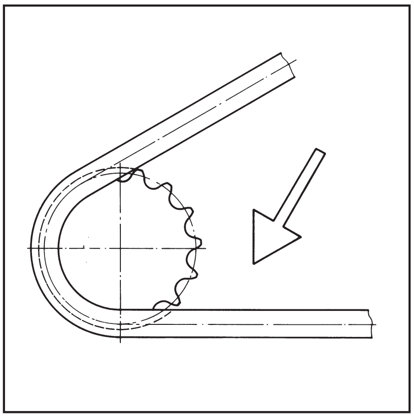
I = oil added with the oil gun or brush
II = drip-feed lubrication
III = oil bath or centrifugal lubrication
IV = pressure circulation lubrication

Chain lubricants must provide a combination of the following properties:
Adhesiveness, compatibility with initial lubricant, corrosion protection, load-carying capacity of the oil film, creep capability, anti-seizing lubrication, high viscosity coupled with good flow properties, stability at high temperatures, water repellency, resistance to different media, etc. Recommendations for the selection of the most suitable lubricant may be obtained from the applications advisory service or a competant tribologist.

Note: Connecting links, when supplied separately, have only been immersion-protected against rust and must be greased upon installation. If the connecting links are supplied together with the chains, they will have been greased with the same lubricant as the chains.

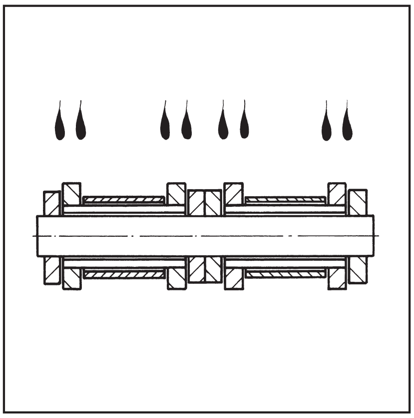


Lubrication methods



Manual lubrication

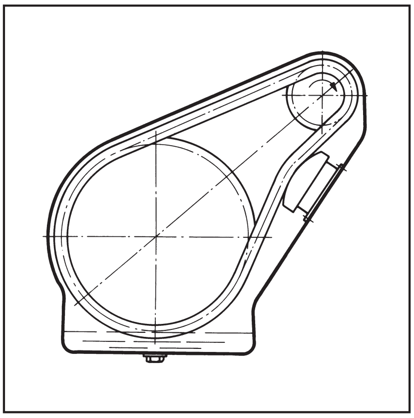
With oil can or brush – very unreliable. Thus it is suitable only for drives that are not in constant service or for drives with slow chain speeds.



Drip feed lubrication

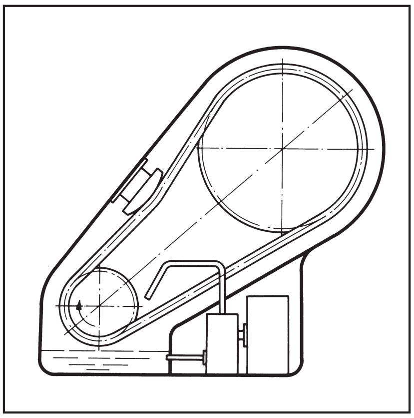
Drip feed is suitable for chain drives that are not highly stressed.

In order to reach the joints, the drip tube should be carefully positioned as shown.



Oil bath lubrication

A chain casing absorbs noise and should be as large as possible, to prevent the chain knocking against the casing wall if the chain elongates due to wear. There is no loss of lubricant in an oil bath. The chain linkplates and rollers should be submerged in the bath. Too great a depth leads to overheating of the oil and its premature oxidation, and causes power loss due to the increased running resistance.



Pressure lubrication

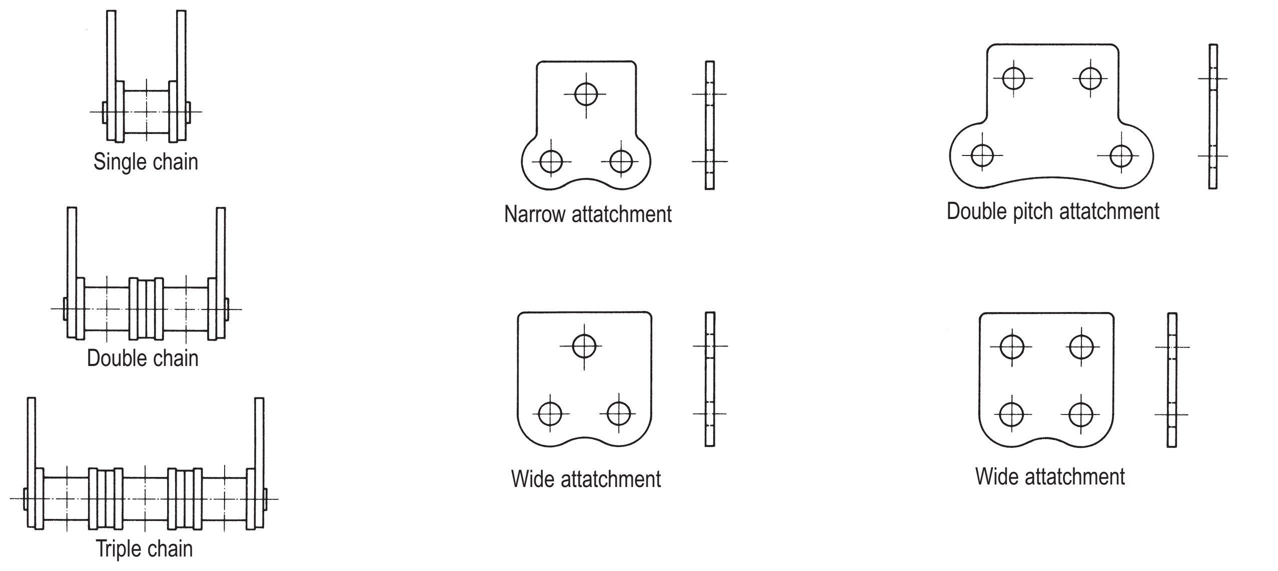
Required for high-speed chain drives and high loads. The oil supply can be connected to an existing pressure pipe or it can be provided by a pump. A tube ejects the oil in the direction of the chain travel over the entire width of the chain, onto the inside of the taught span of the chain. The amount of oil feed depends on the size of the drive and the heat to be dissipated.

1 Conveyor chains – Roller chains with attachments

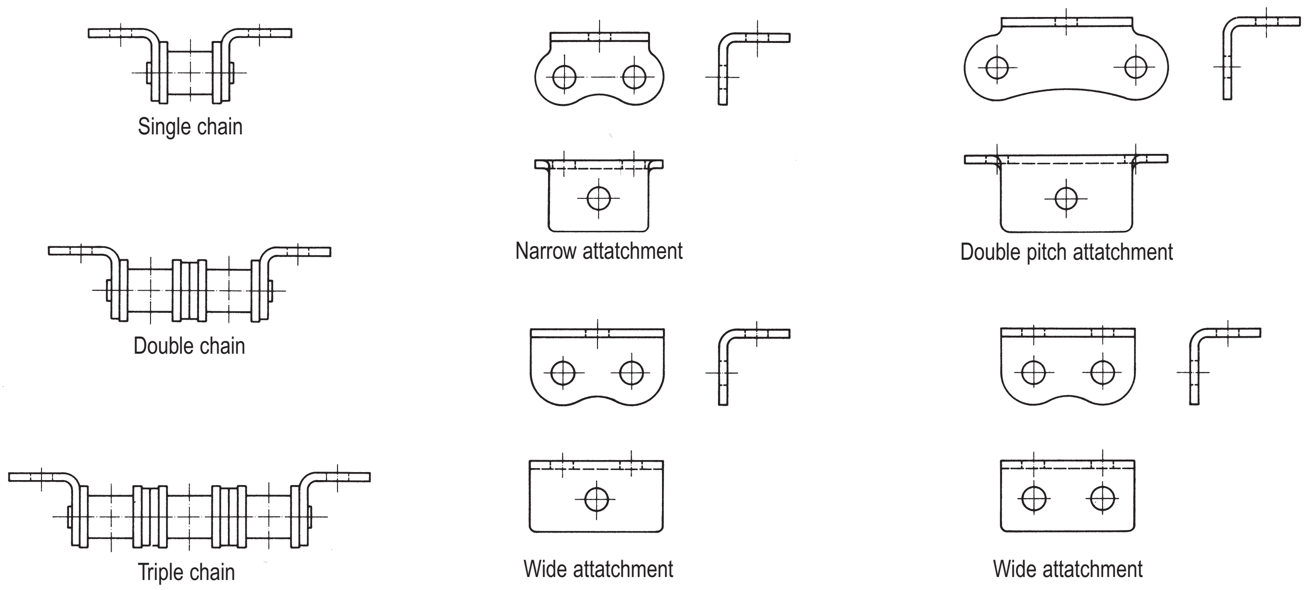
1.1 Attachments

Roller chains are converted into conveyor chains by combining the elements of the standard chain with special attachments, i.e. the straight and bent attachment plates. All attachments are fitted in place of the outer link plates, and the chain breaking load remains unchanged. These attachments can be fitted on one side, both sides and at any distance to single, double and triple chains.

Straight attachment plates



Bent attachment plates

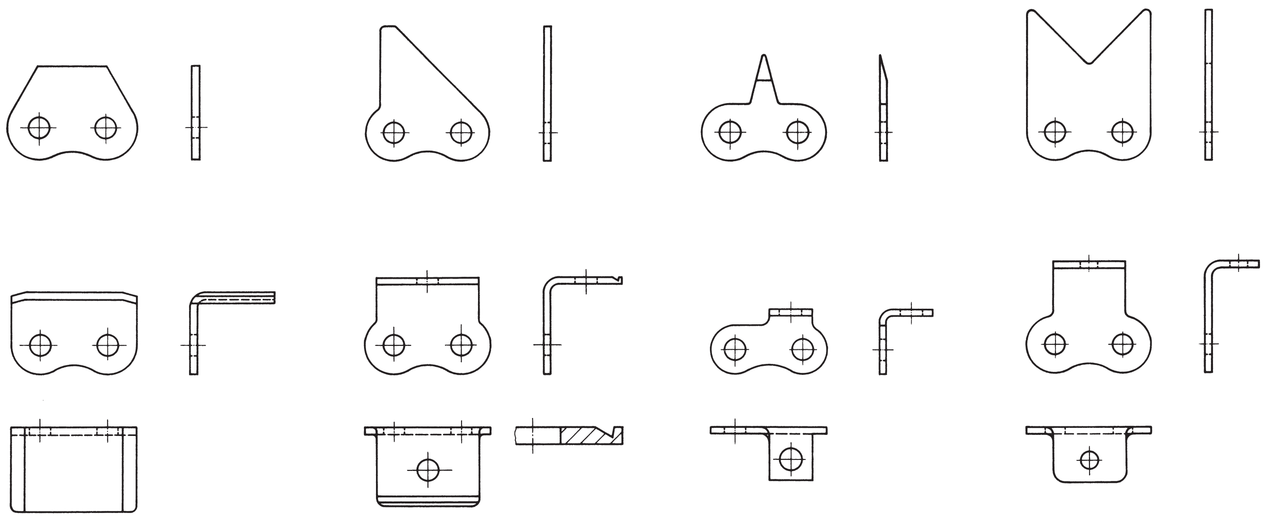


Detailed dimensions are included in catalogue “Precision chains for Drive and Conveyor Purposes”
Further shapes are given in catalogue “Precision chains for Drive and Conveyor Purposes”

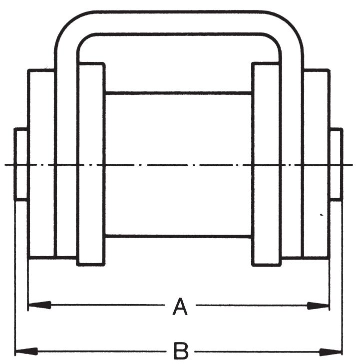
iwis
wir bewegen die welt

Special link plates

These may be straight, cranked, bent and drilled and can be adapted to suit the customer's requirements. A few examples are shown below. Further shapes are given in catalogue 11.



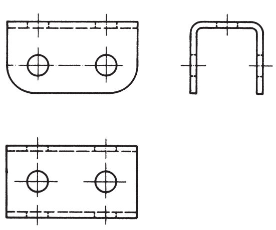
U-Plates

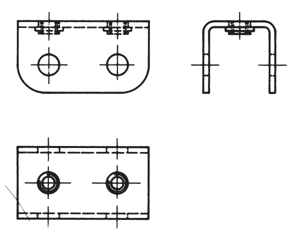


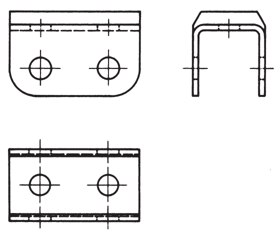
U-Plates are fitted between inner and outer plates. The chain width is larger than standard. See chart.

Chain	Chain width	
	A	B
L 85 SL	17,8	19,8
D 85 SL	31,8	33,9
M 106 SL	20,0	22,0
M 1610A	33,7	36,5

Chain connectors with longer pins are required


With standard holes


With tapped holes


With rubber cover

Detailed dimensions are included in catalogue “Precision chains for Drive and Conveyor Purposes”

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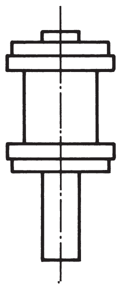
1.2 Extended pins

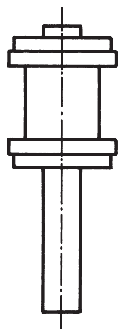
The extended pins can be fitted on one or both sides of the chain and at any distance. There is a press fit between the extended pin and the outer link plates, to secure against rotation. A significant advantage of this conveyor chain design, compared to vertical attatchment plates for example, is the central application of turning moments, which will reduce the risk of moving the chain from the guide.

Applicable for
Roller chain **iwis** standard
Roller chains DIN 8187
Roller chains DIN 8188
Roller chains DIN 8181

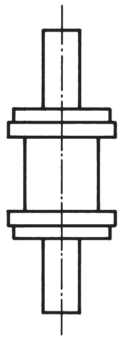
Type A



Type B



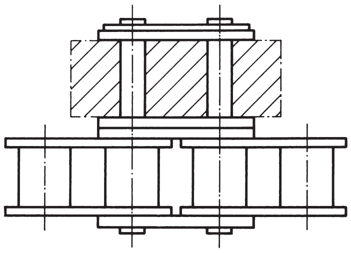
Type C

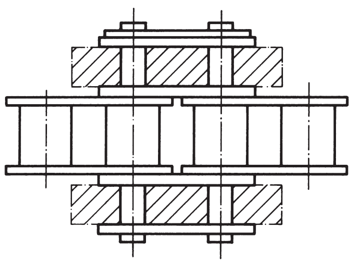


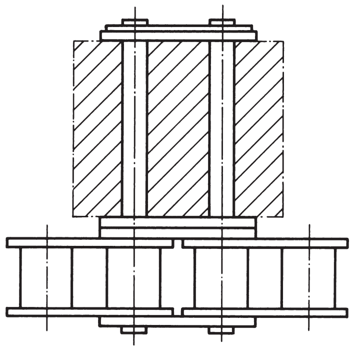
Detailed dimensions are included in catalogue “Precision chains for Drive and Conveyor Purposes”

1.3 Conveyor connecting links

Single, double or triple types
for Roller chains **iwis** standard
for Roller chains DIN 8187
for Roller chains DIN 8188



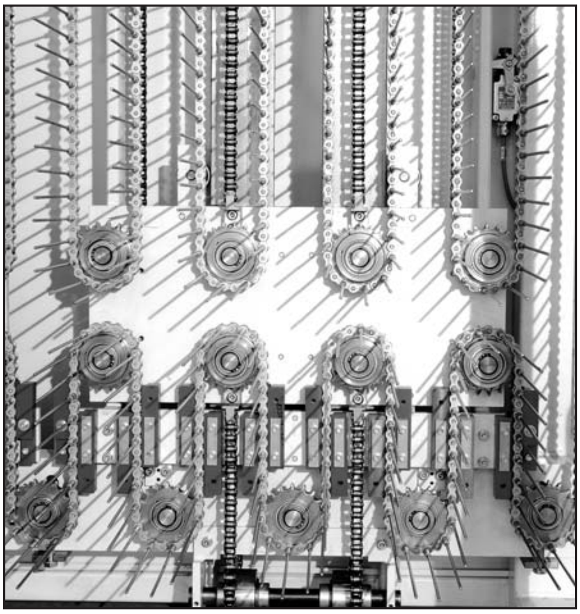




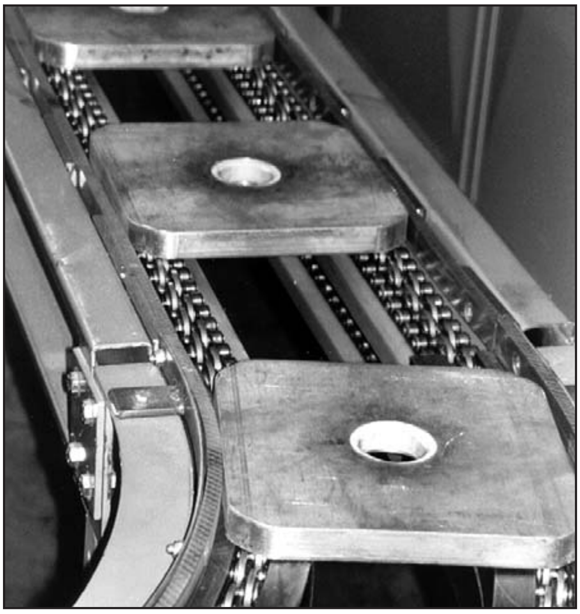
Detailed dimensions are included in catalogue “Precision chains for Drive and Conveyor Purposes”

E Chains for industrial use

Printing industry:
iwis high performance chains running in parallel and accurate synchronous



Tubenindustrie:
iwis Hochleistungs-Rollenketten mit rostbeständigen, leicht auswechselbaren Anbauteilen



Fördersysteme:
Seitenbogen-Stauförderketten
als modulare Umlenkung mit extrem kleinen Kurven-Mindestradien

iwis
wir bewegen die welt

2 Chains for special applications

2.1 MEGAlife Ketten

MEGAlife Ketten können überall dort eingesetzt werden, wo eine Nach-schmierung nicht oder nur bedingt möglich ist. Dazu gehören trockene Umgebungsbedingungen, Reinräume, Anwendungen mit erschwertem Zugang für Wartungsarbeiten sowie Anwendungen, bei denen eine Verschmutzung der Anlage und Fördergüter zu vermeiden ist.

MEGAlife Ketten sind als Rollenketten nach DIN 8187 / ISO 606 für Antriebszwecke oder als Förderketten mit Anbauteilen erhältlich. Die Ketten gibt es in einfacher, zweifacher und dreifacher Ausführung mit Teilungen von 9,525 mm bis 31,75 mm. Die Ketten sind durch vernickelte Einzelteile korrosionsgeschützt und in einem Temperaturbereich von -40°C bis 150°C einsetzbar. Je nach Anwendung werden die Ketten trocken oder mit zusätzlicher Spezialschmierung geliefert. Abhängig von den Betriebsbedingungen erreichen die Ketten hervorragende Standzeiten, die zusätzlich durch eine sparsame Nachschmierung gesteigert werden können. Unter bestimmten Bedingungen können die Ketten sogar dauerhaft wartungsfrei sein.

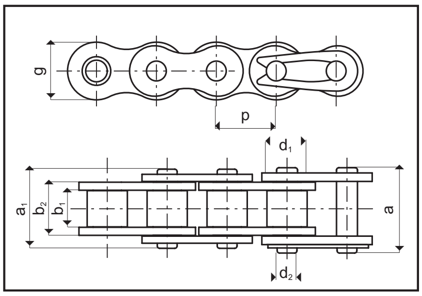
MEGAlife roller chains

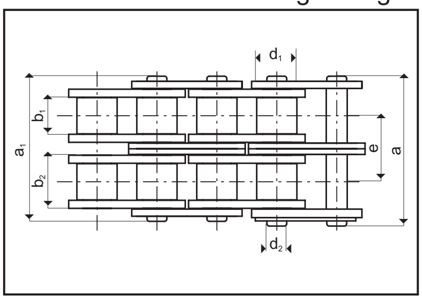
	DIN ISO no.	Pitch p (")	Pitch p (mm)	b_1 (mm) min.	Breaking strength F_B Standard (N) min.	Bearing area f (cm^2)	Weight per m q (kg/m)	b_2 (mm) max.	Inner link g (mm) max.	a_1 (mm) max. 1)	Outer link a (mm) max. 1)	Roller d_1 (mm) max.	Pin d_2 (mm) max.	e (mm)	Article No.
Single															
G 67 ML*	06 B-1	3/8"	9,525	5,72	9.000	0,28	0,41	8,53	8,20	12,90	16,70	6,35	3,31	-	50033917
L 85 ML	08 B-1	1/2"	12,70	7,75	18.000	0,50	0,70	11,30	12,20	16,90	18,50	8,51	4,45	-	50026256
M 106 ML	10 B-1	5/8"	15,875	9,65	22.400	0,67	0,95	13,28	14,40	19,50	20,90	10,16	5,08	-	50026257
M 127 ML	12 B-1	3/4"	19,05	11,75	29.000	0,89	1,25	15,62	16,40	22,70	23,60	12,07	5,72	-	50026258
M 1611 ML	16 B-1	1"	25,4	17,02	60.000	2,10	2,70	25,45	21,10	36,10	36,90	15,88	8,28	-	50028923
Double															
D 67 ML	06 B-2	3/8"	9,525	5,72	16.900	0,56	0,78	8,53	8,20	23,40	24,60	6,35	3,31	10,24	50033832
D 85 ML	08 B-2	1/2"	12,70	7,75	32.000	1,00	1,35	11,30	12,20	30,80	32,40	8,51	4,45	13,92	50027439
D 106 ML	10 B-2	5/8"	15,875	9,65	44.500	1,34	1,85	13,28	14,40	36,00	37,50	10,16	5,08	16,59	50027509
D 127 ML	12 B-2	3/4"	19,05	11,75	57.800	1,78	2,50	15,62	16,40	42,10	43,00	12,07	5,72	19,46	50027457
D 1611 ML	16 B-2	1 "	25,40	17,02	106.000	4,21	5,40	25,45	21,10	68,00	68,80	15,85	8,28	31,88	50033161
D 2012 ML	20 B-2	1 1/4"	31,75	19,56	170.000	5,84	7,36	29,01	25,40	79,70	82,90	19,05	10,19	36,45	50033771
Triple															
TR 85 ML	08 B-3	1/2"	12,70	7,75	47.500	1,50	2,00	11,30	12,20	44,70	46,30	8,51	4,45	13,92	50027510
TR 106 ML	10 B-3	5/8"	15,875	9,65	66.700	2,02	2,80	13,28	14,40	52,50	54,00	10,16	5,08	16,59	50027511
TR 127 ML	12 B-3	3/4"	19,05	11,75	86.700	2,68	3,80	15,62	16,40	61,50	62,50	12,07	5,72	19,46	50027512
TR 1611 ML	16 B-3	1 "	25,40	17,02	160.000	6,32	8,00	25,45	21,10	99,20	100,70	15,88	8,28	31,88	50033628

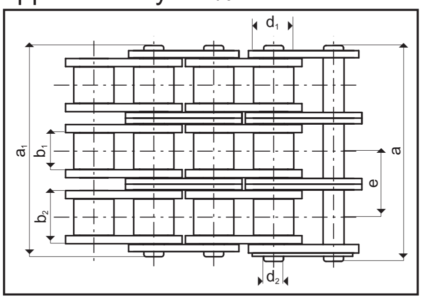
* also available in 10 m length (Art. 50035181)

[1]) Differing dimensions for cranked links

If cranked links are fitted, it should be noted that the breaking strength of the chain may be reduced by approximately 20 %.







Alle Ketten ML auch als Förderketten mit Anbauteilen oder verlängerten Bolzen.

2.2 MEGAlife - Rollenketten mit geraden Laschen

MEGAlife Rollenketten

	DIN ISO Nr.	Pitch p (")	Pitch p (mm)	b_1 (mm) min.	Breaking strength F_B Standard (N) min.	Bearing area f (cm^2)	Weight per m q (kg/m)	Inner link b_2 (mm) max.	Inner link g (mm) max.	a_1 (mm) max. [1]	Outer link a (mm) max. [1]	Roller d_1 (mm) max.	Pin d_2 (mm) max.	e (mm)	Article No.
M 106 GML	10 B-1	$^5/_8$"	15,875	9,65	22.400	0,67	0,95	13,28	13,9	19,50	20,90	10,16	5,08	-	50035304
D 106 GML	10 B-2	$^5/_8$"	15,875	9,65	44.500	1,34	1,85	13,28	13,9	36,00	37,50	10,16	5,08	16,59	50034083
D 127 GML	12 B-2	$^3/_4$"	19,05	11,75	57.800	1,78	2,50	15,62	16,1	42,10	43,00	12,07	5,72	19,46	50034084

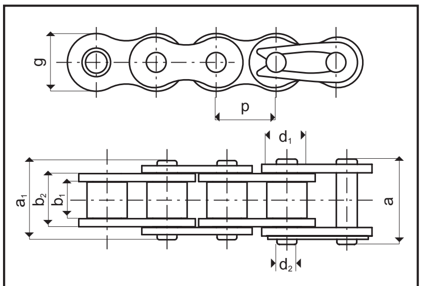
2.3 MEGAlife 2 - roller chains (complying with DIN 8187-1, ISO 606: 1994)

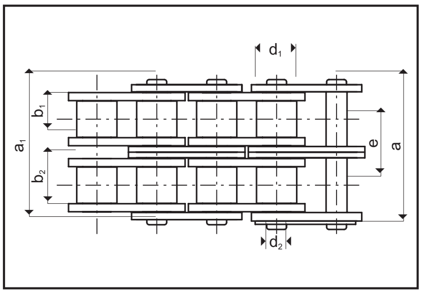
Für Anwendungen mit hohen Geschwindigkeiten und Lasten ist die Reihe MEGAlife 2 besonders geeignet, die sich durch lange Lebensdauer auszeichnet. Durch ein spezielles thermochemisches Verfahren weisen die Bolzen eine hohe Oberflächenhärte auf, was Verschleißbeständigkeit auch bei Geschwindigkeiten über 3 m/s gewährleistet.

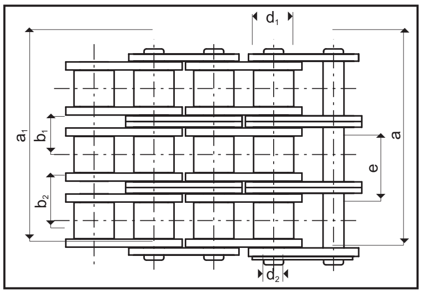
	DIN ISO no.	Pitch p (")	Pitch p (mm)	Breaking strength F_B Norm (N) min.	Bearing area f (cm^2)	Weight per m q (kg/m)	Inner link b_1 (mm) min.	Inner link b_2 (mm) max.	Inner link g (mm) max.	a_1 (mm) max. [1]	Outer link a (mm) max. [1]	Roller d_1 (mm) max.	Pin d_2 (mm) max.	e (mm)	5 m Varianten Article No.
Single															
G 67 ML-2	06 B-1	$^3/_8$ x $^7/_{32}$"	9,525	9.000	0,28	0,41	5,72	8,53	8,20	12,90	14,10	6,35	3,31	-	50030791
L 85 ML-2	08 B-1	$^1/_2$ x $^5/_{16}$"	12,70	18.000	0,50	0,70	7,75	11,30	12,20	16,90	18,50	8,51	4,45	-	50030461
M 106 ML-2	10 B-1	$^5/_8$ x $^3/_8$"	15,875	22.400	0,67	0,95	9,65	13,28	14,40	19,50	20,90	10,16	5,08	-	50030462
M 127 ML-2	12 B-1	$^3/_4$ x $^7/_{16}$"	19,05	29.000	0,89	1,25	11,75	15,62	16,40	22,70	23,60	12,07	5,72	-	50030463
M 1611 ML-2	16 B-1	1"x17mm	25,4	60.000	2,10	2,70	17,02	25,45	21,10	36,10	36,90	15,88	8,28	-	50030464
M 2012 ML-2	16 B-1	1"x17mm	25,4	170.000	5,84	7,36	19,56	29,10	26,60	77,00	79,70	19,05	10,17	36,45	50030465
Double															
D 67 ML-2	06 B-2	$^3/_8$ x $^7/_{32}$"	9,525	16.900	0,56	0,78	5,72	8,53	8,20	23,40	24,60	6,35	3,31	10,24	50031074
D 85 ML-2	08 B-2	$^1/_2$ x $^5/_{16}$"	12,70	32.000	1,00	1,35	7,75	11,30	12,20	30,80	32,40	8,51	4,45	13,92	50030465
D 106 ML-2	10 B-2	$^5/_8$ x $^3/_8$"	15,875	44.500	1,34	1,85	9,65	13,28	14,40	36,00	37,50	10,16	5,08	16,59	50030466
D 127 ML-2	12 B-2	$^3/_4$ x $^7/_{16}$"	19,05	57.800	1,78	2,50	11,75	15,62	16,40	42,10	43,00	12,07	5,72	19,46	50030467
Triple - ML-2 roller chains on request															
Single ANSI roller chains, complying with DIN 8188-1, American standard, ISO 606: 1994															
M 128 AML-2	12 A-1 ANSI 60-1	$^3/_4$ x $^1/_2$"	19,05	31.800	1,06	1,47	12,70	17,75	18,00	25,30	26,70	11,91	5,94	-	5003173
M 1610 AML-2	16 A-1 ANSI 80-1	$^3/_4$ x $^1/_2$"	19,05	56.700	1,79	2,57	15,88	22,40	22,80	32,00	33,90	15,88	7,94	-	50033770

ML-2 conveyor chains on request

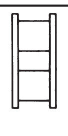
[1]) Differing dimensions for cranked links. If cranked links are fitted, it should be noted that the breaking strength of the chain may be reduced by approximately 20 %.



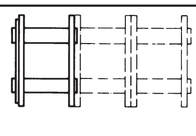




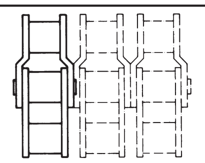
Individual components and connecting links



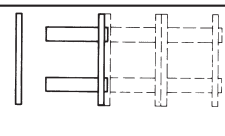
No. 2 Inner link
Standard designation B



No. 3 Connecting link with spring clip
Standard designation E



No. 7 Double cranked link
Standard designation C



No. 8 Outer link
Standard designation A

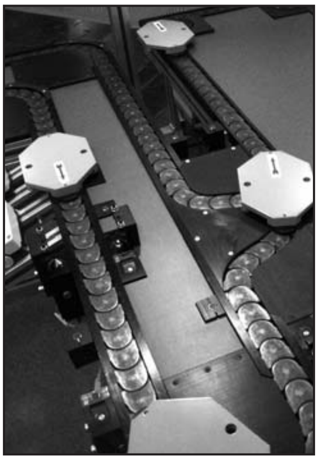
2.4 Corrosion-protected chains

Where conditions are less severe, chains with surface-protected parts can be used. IWIS chains are produced with nickel- and zinc-plated surface coatings. Surface-coated chains provide good corrosion protection: nickel-plated against the effects of moisture, and zinc-plated also against weak organic acids.Nickel-plated surfaces are permitted in the food-stuffs industry.

For technical reasons the pins of these chains are made of normal high-grade steel for chain pins (not SL). More detailed information is available on request.

2.5 Apron chains

Conveying and storage of components through the tightest curves.



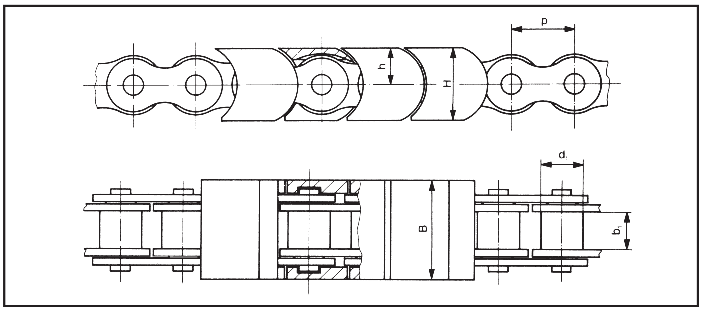
The apron chain is a long-link roller chain 1 1/2 x 7/16" made to DIN 8181 with vertical extended chain pins. Each link is designed as a cranked link with cotter pin. On the extended head of the pin a steel plate is pressure fitted. The meshing shapes of the plates always ensures a constant surface for receiving the components even on the curves.
The apron chain's ability to run around very tight radius curves provides the advantage that long conveyor sections can be concentrated into much smaller spaces.

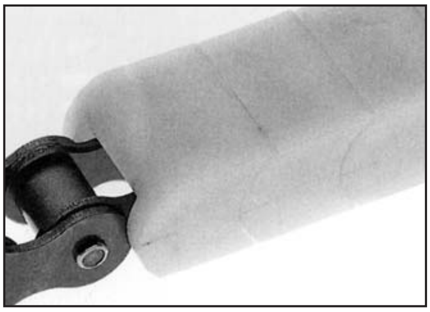
Blattbreite:
  50 / 80 mm
Minimum radius:
  60 mm / 150 mm
Minimum tooth number:
  20 bei 50 mm
  30 bei 80 mm
Number of links:
  Nur gerade Gliederzahl möglich.

iwis designation: conveyor chain LR 247 (apron chain).

2.6 Transfer chains

Conveying, transporting, synchronizing containers, component pallets ...





iwis chain no.	Pitch p mm	Permissible weight load per chain strand N	Breaking strenght **iwis** F_B N	Weight kg/m	Carrier Attachment Width B mm	Height H mm	h mm	max. load per plastic Attachment bügel N
L 85 TF	12,7	6250	22.000	0,82	19,8	15,2	8,0	12
M 106 TF	15,875	8000	27.500	1,18	24,8	17,5	9,5	26
M 127 TF	19,05	9750	34.000	1,59	29,8	19,8	11,0	43

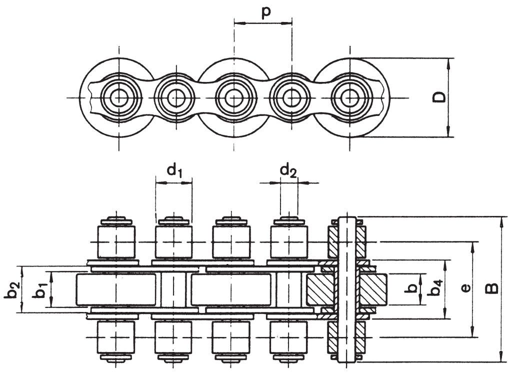
These chains are made to dimensions shown on page 10 under **iwis** reference L 85 SL, M 106 SL and M 127 SL.

The carriers made from high-grade wear-resistant plastic convey the transported items and seal off the chain's functional area.

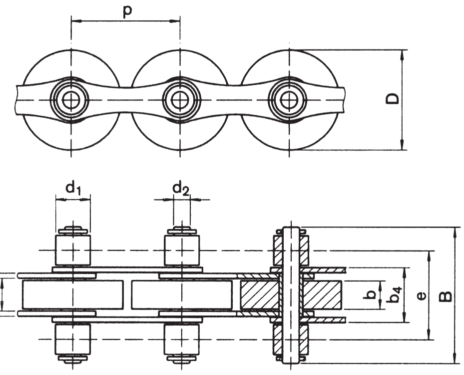
Guide values for chain selection: friction factor 0.1 for determining the pulling capacity of the chain; friction factor 0.25 for calculating the drive power.
For normal loads, a bridge-shaped chain guide on which the chain rollers are carried will be adequate.

2.7 Power and free conveyor chains

Conveying, stopping, accelerating, accumulating

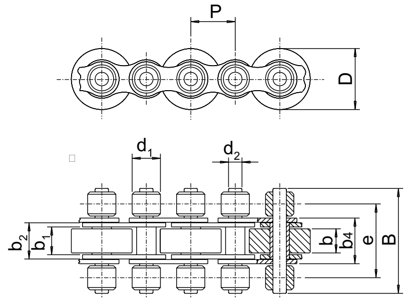


Design M normal pitch

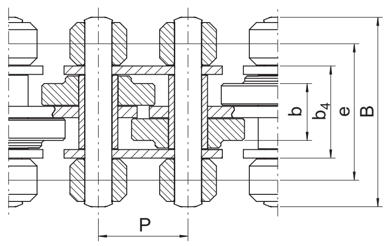


Design LR double pitch

Design OS devoid of washers



Bauform VS versetzte Staurolle



Dimensions - new power and free chains

iwis chain	Pitch p (mm)	Chain width B (mm)	b (mm)	b_4 (mm)	e (mm)	Transport roller Diameter (mm)	Loading capacity (kg)	Weight (kg/m)
L 88 SFK	12,70	27	9,2	14,50	18,70	16,00 [1)]	6	0,85
L 88 SFS	12,70	27	9,2	14,50	18,70	16,00	8	1,40
M 120 SFK	19,05	40	11,70	19,55	29,0	24,0 [1)] / 26,0 / 27,0 [1)] / 28,0	10	1,8
M 120 SFK	19,05	45	11,70	19,55	31,5	24,0 / 26,0 / 27,0 / 28,0	10	1,8
M 120 SFS	19,05	40	11,70	19,55	29,0	24,0 [1)] / 26,0 / 27,0 [1)] / 28,0	15	2,8
M 120 SFS	19,05	45	11,70	19,55	31,5	24,0 / 26,0 / 27,0 / 28,0	15	2,8

[1]) Supplied ex stock

SFK - with plastic transport rollers

SFS - with hardened steel transport rollers

E Chains for industrial use

iwis
wir bewegen die welt

Design	**iwis** Chain no.	Pitch p (mm)	Chain width B (mm)	e (mm)	b_1 (mm)	b_2 (mm) max.	b_4 (mm) max.	Width b (mm)	Transport roller Diameter			Loading capacity (kg)	Diameter Roller d_1 (mm)	Pin d_2 (mm)	Weight (kg/m)
OS	L 85 SFK	12,70	27	18,70	–	–	14,50	9,2	16,00			6	–	–	0,85
	L 85 SFS	12,70	27	18,70	–	–	14,50	9,2	16,00			8	-	–	1,40
	M 127 SFK	19,05	40	27,5	11,75	15,62	19,55	11,0	24,0	26,0	28,0	10	12,07	5,72	2,3
	M 127 SFS	19,05	40	27,5	11,75	15,62	19,55	11,0	24,0	26,0	28,0	–	12,07	5,72	3,1
M	M 127 SFK	19,05	40	27,5	11,75	15,62	19,55	11,0	24,0	26,0	28,0	10	12,07	5,72	2,3
	M 127 SFK	19,05	43	29,0	11,75	15,62	19,55	11,0	24,0	26,0 [1)]	28,0	10	12,07	5,72	2,3
	M 127 SFK	19,05	48	31,5	11,75	15,62	19,55	11,0	24,0	26,0	28,0	10	12,07	5,72	2,3
	M 127 SFS	19,05	40	27,5	11,75	15,62	19,55	11,0	24,0	26,0	28,0	15	12,07	5,72	3,1
	M 127 SFS	19,05	43	29,0	11,75	15,62	19,55	11,0	24,0	26,0	28,0	15	12,07	5,72	3,1
	M 127 SFS	19,05	48	31,5	11,75	15,62	19,55	11,0	24,0 [1)]	26,0	28,0	15	12,07	5,72	3,1
	M 1611 SFK	25,4	67,9	44,9	17,02	25,45	32,0	16,5	38,5	–	–	25	15,88	8,28	4,9
	M 1611 SFS	25,4	67,9	44,9	17,02	25,45	32,0	16,5	38,5	–	–	30	15,88	8,28	7,2
LR	LR 165 SFK	25,4	30,7	20,0	7,75	11,30	14,65	7,5	24,0	–	–	6	8,52	4,45	1,3
	LR 247 SFK	38,1	48	31,5	11,75	15,62	19,55	11,0	24,0	35	–	10	12,07	5,72	2,6
	LR 247 SFS	38,1	48	31,5	11,75	15,62	19,55	11,0	24,0	35	–	10	12,07	5,72	2,6
	LR 3211 SFK	50,8	67,9	44,9	17,02	25,45	32,0	16,5	50,0	38,5	–	25	15,88	8,28	3,6
	LR 3211 SFS	50,8	67,9	44,9	17,02	25,45	32,0	16,5	50,0	38,5	–	30	15,88	8,28	7,6

[1]) Supplied ex stock   SFK - with plastic conveyor rollers   SFS - with hardened steel conveyor rollers

Special designs with guide plates, other transport roller diameters and roller arrangements are available on request.

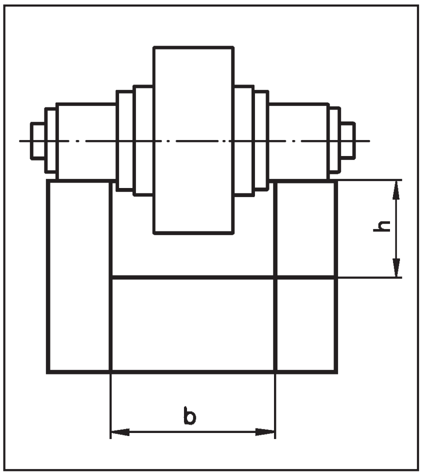
Maximum permissible conveyor length, depending on load, approx. 30 m. In the case of conveyor sections longer than approx. 10 m, guide plates are recommended as compensation for any misalignment in the guides which may be present. The decisive factor in selecting chain size is the load-bearing capacity of the transport rollers and the permissible chain pulling power. Depending on loading, chain guides can be made of plastic or steel.

Option: Chains **M 127 SFK/SFS** with transport rollers 24 and 26 mm diameter can also be supplied with wear-resistant plastic inserts, which seal off the gaps between the transport rollers and protect the chain from ingress of foreign matters.

Dort wo Nachschmierung nicht oder nur bedingt möglich ist und eine reine und trockene Umgebung gegeben sein sollte, können wartungsfreie **iwis** Stauförderketten mit spezieller Gelenkausführung und aus Sintermetall hergestellten Tragrollen eingesetzt werden.

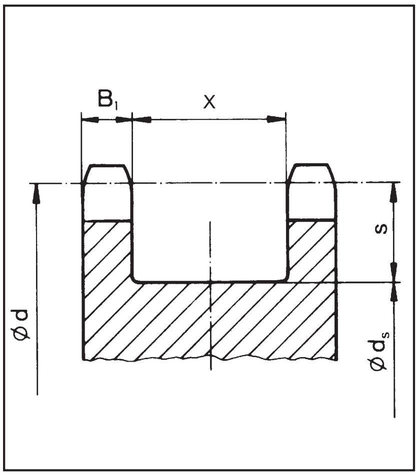
Chain guide

iwis chain	b (mm)	h (mm)
L 88 SF	15	10
L 88 SF SB	15,5	10
M 120 SF	20	15
M 120 SF SB	21	15
M 127 SF	20	15
M 1611 SF	33	20



Chain wheels

iwis chain	Pitch p (mm)	B_1 (mm)	X (mm)	s (mm)
L 88 SF	12,7	4	15,5	10
M 120 SF-B40	19,05	8,3	20,7	15,0
M 127 SF-B40/B43	19,05	8,3	20,7	15,0
M 120 SF-B45	19,05	10,8	20,7	15,0
M 127 SF-B48	19,05	10,8	20,7	15,0
M 1611 SF	25,4	11,6	33,3	20,5



$d_s = d - 2s$

$d = p : (\sin 180° : z)$

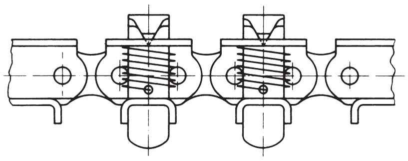
Recommended number of teeth minimum z = 15

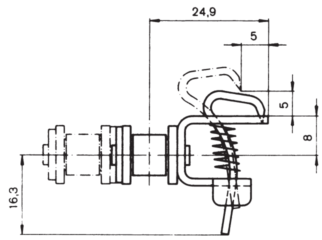
2.8 Grip chains

Gripping, carrying and conveying

iwis chain no.	Pitch p mm	Weight q kg/m
Single strand chain L 85 Grip	12,7	1,15
Double strand chain D 85 Grip	12,7	1,8

Dimensions and values not given are identical to **iwis** chains L 85 SL and D 85 SL.





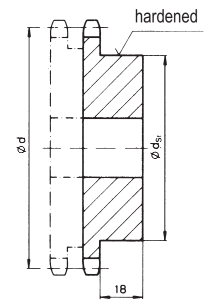
The gripper elements are mounted continuously or at defined intervals on the chain. The entire chain is corrosion-protected by nickel-plating, while the grippers themselves consist of a corrosion-resistant, hardened steel.

In the standard version, the gripper is provided with a point, and it operates within U-shaped plates fitted on one side of the chain at each outer link.

The gripper opens when it runs onto a control disk which can be the hardened sprocket boss. The gripper then swings outwards and permits the transported item to be loaded or unloaded.

The type of control disk will depend on the machine design, available space and mounting possibilities.

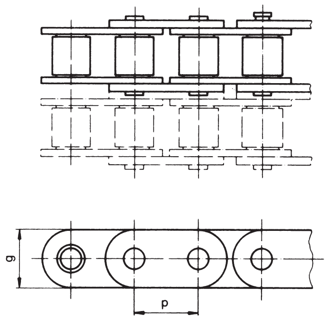
Detailed information is provided in a special brochure.



Example cam

2.9 Pallet transport chains

Roller chains with straight side plates for transporting components or materials



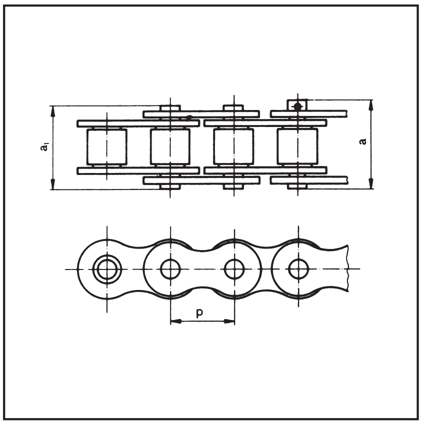
iwis chain no.	Pitch p mm	g mm	Breaking strength F_B **iwis** mean N	Weight kg/m
Single strand chain **M 128 AG**	19,05	18,0	42.000	1,75
Double strand chain **D 128 AG**	19,05	18,0	84.000	3,50

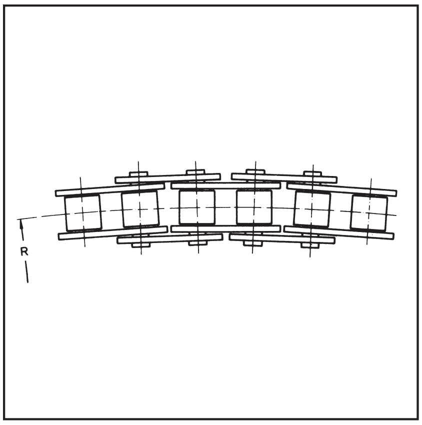
The top and bottom of all link plates are straight. These form a continuous support for material being conveyed. Dimensions and values not given are identical to those of **iwis** chains M 128 A SL or D 128 A to DIN 8188.

Other dimensions available on request.

2.10 Side bow chains

Transporting, conveying, driving on curved tracks





Side bow chains are constructed in the same way as roller chains to DIN 8188. They only deviate from standard dimensions in their pins and outside width.

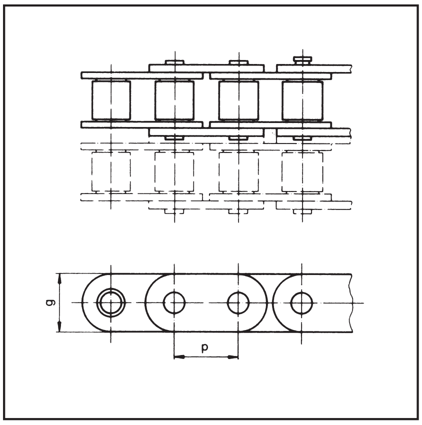
The symmetrically conical pins with a central running surface enable the inner and outer links to run at an angle to one another which means that power can be transferred or loads carried on curved tracks.

iwis chain no.	Pitch p mm	Outer width a_1 mm	a mm	Minimum radius R mm	Breaking strength **iwis** N	Max. permissible chain pull power Continuous N	Transient N	Weight kg/m	Connecting links available
L 85 A-SB	12,7	16,8	17,8	425	10.000	600	1500	0,65	2, 4, 8
M 106 A-SB	15,875	21,0	22,3	500	18.000	900	2500	1,00	2, 4, 8
M 128 A-SB	19,05	26,3	27,7	750	26.000	1200	3700	1,50	2, 4, 8

SB chains are also suitable to a limited extent for cases of use where the slanting position of the shafts determined by design factors makes slight torsion of the chains necessary.
The breaking strength of the chain and the service life to be expected are lower than with conventional chains, as the chain joint cannot be so heavily loaded due to the special pin design. Side bow chains with straight or bent connecting plates can be used as conveyor chains in many applications. The transmission of a load on a curved track requires suitable chain guides on both the driven and the drive sections of the chain – for example, cage rails of high-molecular low-pressure poly-ethylene.

2.11 Hollow bearing pin chains

Simple fitting of mounted parts and cross-members



iwis chain no.	Pitch p mm	g mm	B mm	D mm	Breaking strength **iwis** N	Weight kg/m
M 128 HB	19,05	18,0	25,5	6	36.500[1])	1,23

[1]) Breaking strength without inserted pins 34 500 N

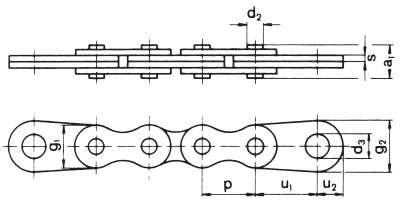
The main dimensions of the special sleeve chain are identical to those of **iwis** chain M 128 A SL to DIN 8188.
The hollow pins can be located at any pitch point or at any pitch interval. Pins of 6 mm diameter can simply be inserted into the hollow bearing pins.

iwis
wir bewegen die welt

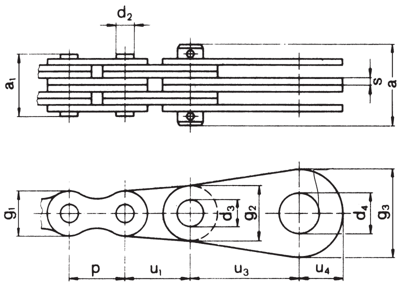
2.12 Leaf chains

Load chains for lifting and pulling

End link design A



End link design B
(from combination 4 x 4)

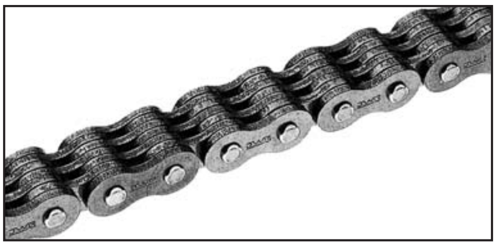


iwis Designation	p (Zoll)	p (mm)	Plate combination	Arrangement	Breaking load F_B iwis min (N)	Bearing area f (cm²)	Weight q (kg/m)	Bearing pin diameter d_2 (mm)	a_1 (mm)	a (mm)	Plate height g_1 (mm)	Plate thickness s (mm)	d_3 (mm)	d_4 (mm)	g_2 (mm)	g_3 (mm)	u_1 (mm)	u_2 (mm)	u_3 (mm)	u_4 (mm)
	Pitch								Overall width				End link dimensions							
FL 522	–	8,0	2 x 2		5.000	0,05	0,15	2,31	5,6	–	6,3	1,0	6,2	–	16,0	–	15,0	10,0	–	–
FL 523	–	8,0	2 x 3		7.000	0,05	0,19	2,31	6,7	–	6,3	1,0	6,2	–	16,0	–	15,0	10,0	–	–
FL 623 ¹)	3/8	9,525	2 x 3		10.000	0,08	0,32	3,31	8,3	–	8,1	1,2	6,2	–	16,0	–	15,0	10,0	–	–
FL 623 b¹)	3/8	9,525	2 x 3		20.000	0,20	0,46	3,31	10,9	–	8,2	2,0	6,2	–	–	–	–	–	–	–
FL 823 b	1/2	12,70	2 x 3		28.000	0,18	0,65	4,45	12,4	–	10,8	2,0	8,2	–	18,0	–	20,0	11,0	–	–
FL 834 a	3/8	12,70	3 x 4		21.000	0,17	0,42	3,68	13,1	–	9,1	1,5	8,2	–	18,0	–	20,0	11,0	–	–
FL 834 b	1/2	12,70	3 x 4		42.000	0,27	0,91	4,45	16,5	–	10,8	2,0	8,2	–	18,0	–	20,0	11,0	–	–
FL 845 a	1/2	12,70	4 x 5		34.000	0,24	0,67	3,68	16,9	25	9,1	1,6	8,2	12,2	18,0	25,0	20,0	11,0	30,0	15,0
FL 845 b	1/2	12,70	4 x 5		52.000	0,32	1,00	4,45	19,0	25	10,8	1,8	8,2	12,2	18,0	25,0	20,0	11,0	30,0	15,0
FL 866 a	1/2	12,70	6 x 6		44.000	0,36	0,88	3,68	21,7	28	9,1	1,6	8,2	12,2	18,0	25,0	20,0	11,0	30,0	15,0
FL 866 bd	1/2	12,70	3 x 3 ²)		62.000	0,40	1,17	4,45	20,6	28	10,8	1,5	8,2	12,2	18,0	25,0	20,0	11,0	30,0	15,0
FL 1044 bd	5/8	15,875	2 x 2 ²)		57.000	0,37	1,12	5,08	16,8	28	13,7	1,8	10,4	16,2	20,0	35,0	25,0	12,0	45,0	21,0
FL 1066 bd	5/8	15,875	3 x 3 ²)		86.000	0,55	1,68	5,08	24,0	35	13,7	1,8	10,4	16,2	20,0	35,0	25,0	12,0	45,0	21,0
FL 1266 bd	3/4	19,05	3 x 3 ²)		115.000	0,76	2,18	5,72	30,0	40	14,9	2,2	10,4	16,2	20,0	35,0	25,0	12,0	45,0	21,0
FL 1644 d	1	25,40	2 x 2 ²)		157.000	1,00	2,92	8,28	28,0	40	20,8	3,0	12,2	18,2	25,0	40,0	30,0	15,0	50,0	24,0
FL 1666 d	1	25,40	3 x 3 ²)		231.000	1,50	4,35	8,28	41,0	50	20,8	3,0	12,2	18,2	25,0	40,0	30,0	15,0	50,0	24,0

¹) Straight side plates

²) doppelt

End link design A is arranged only as an inner link, which enables the connection of end link B as an outer link.
iwis leaf chains are manufactured from precision **iwis** chain parts to DIN 8187. The chain selection will be determined by the size and frequency of shock loading and the appropiate national lifting regulations.

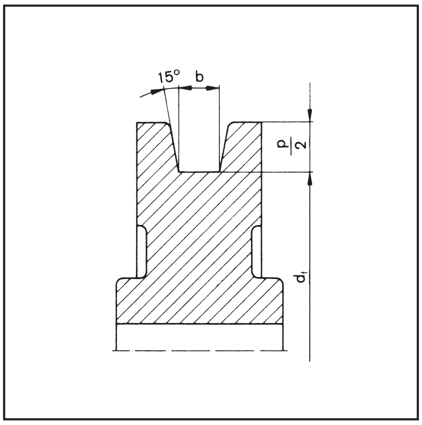


Example of a leaf chain guide roller

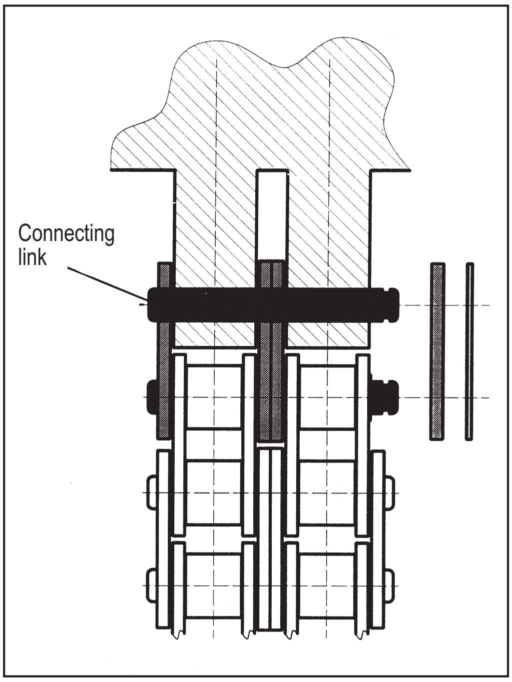
Inside width of roller:
$b = a_1 \cdot 1{,}15$

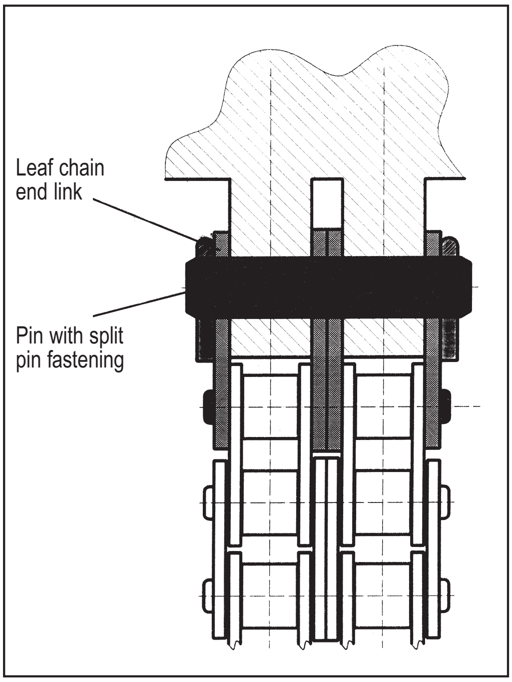
Minimum diameter:
$d_{f\,min} = p \cdot 5$

Use the largest possible diameter.



Special applications – fastening of roller chains
iwis roller chains can also be used as load chains. Roller chain connecting links (spring clip links) or leaf chain end links are examples of fastening possibilities.



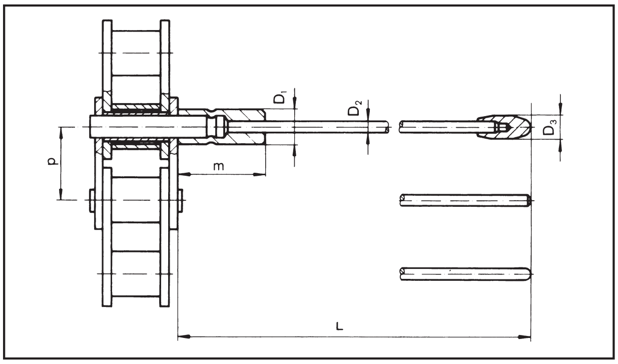


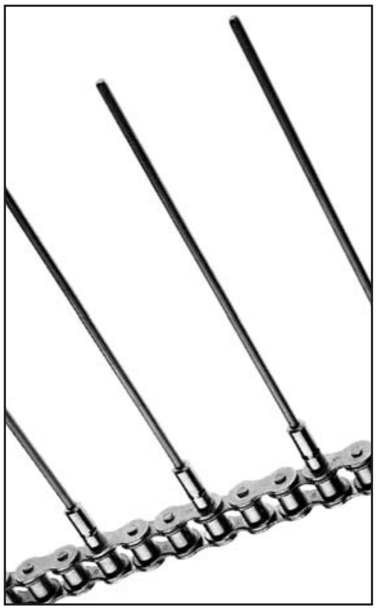
2.13 Tube or can conveyor chains

Careful take-up and transportation of thin-walled hollow articles

The field in which these conveyor chains are most frequently used is in the production of tubes and cans. These hollow articles, which are usually light, thin-walled and sensitive, must run through numerous processing stations and are there cleaned, lacquered, dried, packed and so on. These items are conveyed in large quantities at high speed over long transportation paths. Depending on the individual process, other stresses are strong contamination and temperature influences.
In the **production of tubes** as a rule high-performance roller chains with pitches between $^1/_2$" and 1" are used. The hollow articles are taken up by spring steel pins whose spacing and length will depend on the size of the work-piece. The spring steel pins are pressed onto extended bearing pins and secured against rotation. The shape of the pin end can be made to match requirements. In the case of repairs it must be possible to replace the pin easily and rapidly. A special tool is available for chains L 85 SL, M 106 SL and M 127 SL.

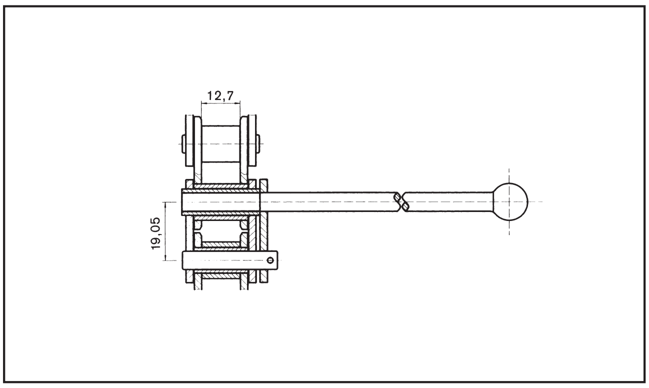
iwis chain No.	Pitch p mm	L max. mm	D1 mm	m mm	D2 mm	D3 mm
L 85 SL	12,7	300	8,0	22,0	3,5	7,0
M 106 SL	15,875	300	8,0	22,0	4,0	8,0
M 127 SL	19,05	300	8,0	22,0	4,0	8,0
M 1611	25,4	300	12,0	30,0	4,0	8,0

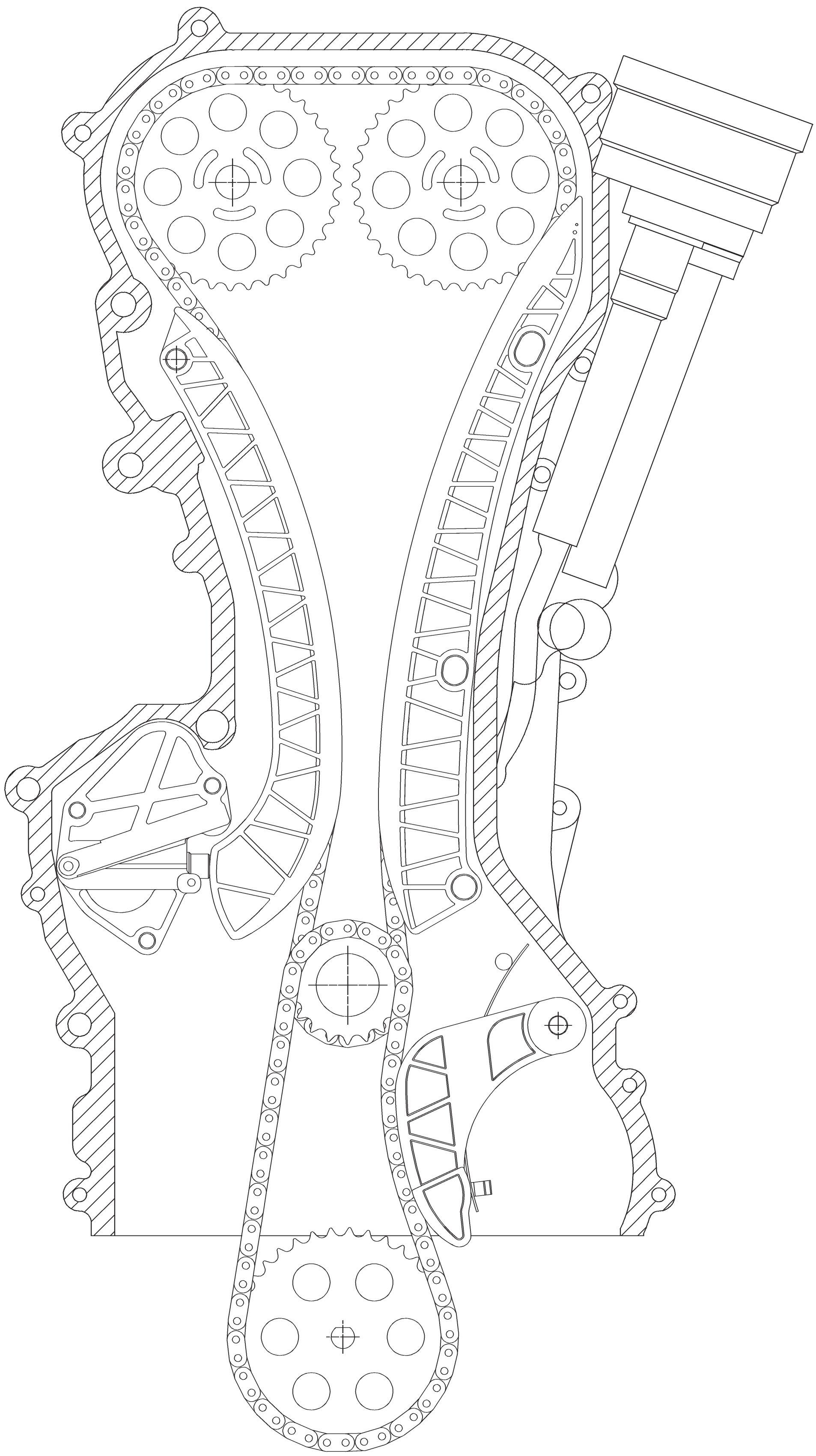




In the **production of cans**, a high-performance $^3/_4$ x $^1/_2$" roller chain to DIN 8188 is to be preferred which is fitted with hollow pins at the straight attachment fastening points (M 128 HB). Here predominantly solid pins are inserted into the hollow pins at defined intervals and secured against rotation by means of screws, splints or other special fittings. Depending on the items being conveyed, the pins are available in various lengths and shapes.

Examples





Nockenwellensteuerung und Ölpumpenantrieb mit **iwis**-Einfachketten an einem 3-Zylinder-DOHC-Motor

F Automotive drive chains

iwis
wir bewegen die welt

Amongst the various applications for chain drives the engine and gear design covering vehicles and stationary equipment require particulary high levels of precision, performance, and durability. In the course of many decades roller and bush type chains of certain standard dimensions have proved to be particularly suitable. **iwis** have influenced the development in this sector from the very beginning and have become leaders in this field.

iwis Programme:

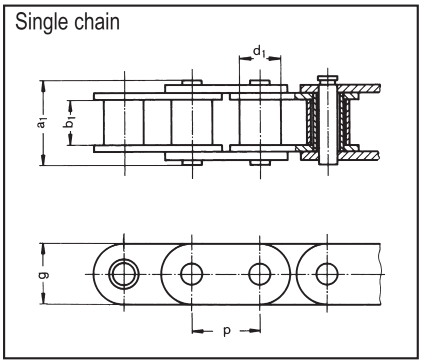
This comprises a number of single and double chains designed as roller or bush chains. Each one of these types has certain characteristics which make them particularly suitable for certain applications. New types are being developed in conjunction with new engine developments. The best materials and precision production processing together with the highest quality standards ensure a timing chain that will satisfy the demanding requirements of today's high performance engines.

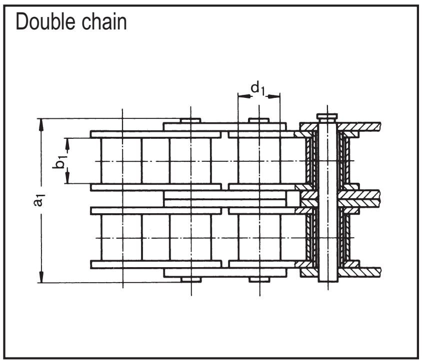
Higher engine loads and operating speeds, along with new extremes of torsional vibration and temperatures make it essential to utilize a timing chain that combines high strength and low wear elongation. This will result in more precise camshaft timing as well as reducing timing variation over the life of the engine.
The table on page 70 shows a summary of roller and bush chains for engines.

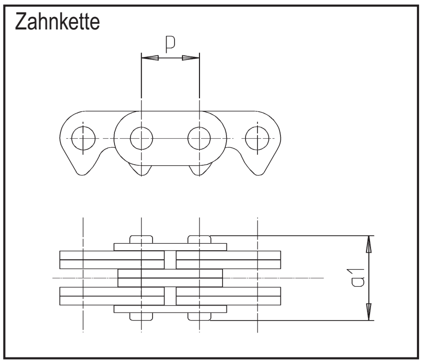
Characteristics and typical applications of selected types of chains

7 mm x $^{2}/_{16}$" – G 44 H – 8 mm x $^{3}/_{16}$" – G 53 H / D53H – bush chains	Characteristics: Single bush chains, 8 mm pitch, large bearing pin diameter, large bearing area. Standard gearing as with 8 mm roller chain.	Principal applications: Reduced weight due to small pitch, compared with $^{3}/_{8}$" chain, thus reduced centrifugal force and impact speed. Particularly suitable for drives with high speeds (e.g. mass balancing) or as timing chains on small engines (motorcycles) or drive chains for auxiliary equipment.
8 mm x $^{3}/_{16}$" – Z 53 R – Zahnketten	Merkmale: akustisch optimierte Zahnkette mit 8 mm Teilung. Kettenräder mit spezieller Verzahnung	Anwendungsschwerpunkte: Steuertriebe mit kritischem Akustikverhalten
$^{3}/_{8}$ x $^{7}/_{32}$" – G 67/G 68/D 67 – roller chains	Characteristics: Single and double roller chains, type G 68 with increased bearing area compared with G 67.	Principal applications: Timing drives, oil pump drives, drives for auxiliary equipment, gearbox chains. G 68 is used increasingly as a replacement of double roller chains of a similar pitch.
$^{3}/_{8}$ x $^{7}/_{32}$" – G 67H/D 67 H – bush chains	Characteristics: Single and double chains, bush type for standard chainwheels as used for 3/8" roller chains. Large bearing pin diameter, large bearing area.	Principal applications: Heavy duty drives, e.g. Diesel engines with a highly impulsive load.

Dimensions



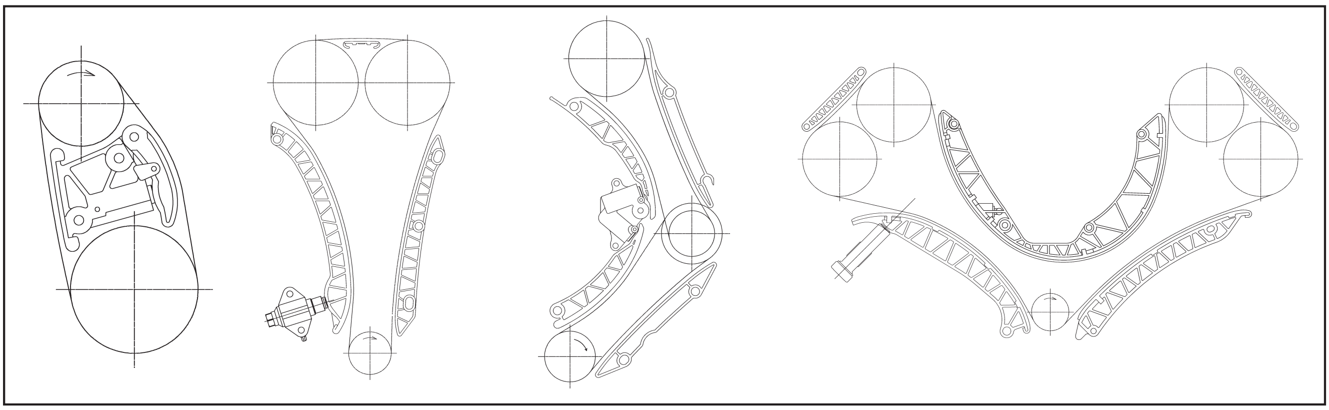




iwis-designation	Designation pitch x inner width	DIN ISO Nr.	pitch p		width		roller/ bush ø	height of plates	baring area	chain weight	**iwis** break-ing load
			inch	mm	inside b_1 mm min.	outside a_1 mm max.	d_1 mm max.	g	f cm2	q kg/m	F_B N
Single chains											
G 44 H	7 mm x $^{2}/_{16}$"	-	-	7,000	3,5	9,9	4,00	6,8	0,165	0,26	7000
G 53 H[1]) [2])	8 mm x $^{3}/_{16}$"	-	-	8,000	4,76	11,8	5,00	7,60	0,25	0,34	9000
G 67	$^{3}/_{8}$ x $^{7}/_{32}$"	06 B-1	$^{3}/_{8}$	9,525	5,72	12,9	6,35	8,26	0,28	0,41	12000
G 68[2])	$^{3}/_{8}$ x $^{7}/_{32}$"	-	$^{3}/_{8}$	9,525	5,72	14,0	6,35	8,26	0,32	0,44	12500
G 68 H[1])[2])	$^{3}/_{8}$ x $^{7}/_{32}$"	-	$^{3}/_{8}$	9,525	5,5	13,9	6,35	9,60	0,47	0,59	14000
Double chains											
D 53 H	8 mm x $^{3}/_{16}$"	-	-	8,000	4,76	20,9	5,00	7,60	0,49	0,62	12000
D 67	$^{3}/_{8}$ x $^{7}/_{32}$"	06 B-2	$^{3}/_{8}$	9,525	5,72	23,4	6,35	8,26	0,56	0,78	19000
D 67 H[1])[2])	$^{3}/_{8}$ x $^{7}/_{32}$"	-	$^{3}/_{8}$	9,525	5,5	23,7	6,35	9,60	0,76	0,89	19000
Zahnkette											
Z 53 R[2])	8 mm x $^{3}/_{16}$"	-	-	8,000	-	11,8	-	-	0,15	0,45	17000

[1]) Bush type chains [2]) **iwis** standard

Chain drives used on combustion engines are subjected to an inherent sequence of unequal loads. In addition to the engine characteristics, the number of cylinders, arrangement of drive components and the type and number of auxiliary drives are factors of significance.
By using tensioning and guide elements which are carefully designed to the relevant engine, it is possible to optimize the life of the chain drive to match that of the engine without requiring any additional maintenance, apart from the specified engine maintenance. Simple rails made of plastic or metal with plastic or rubber linings are used as guides, depending whether the chain track is straight or curved. If there is a danger that the chain may be subjected to lateral oscillations, rails with lateral guides are used, which guide either between the inner link plates or enclose the chain in a U-section.



iwis
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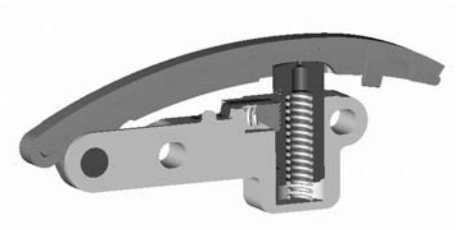
The **tensioners** have a number of functional characteristics which are available in a combination to suit the application.

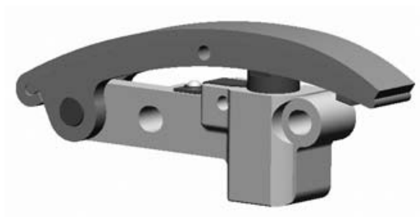
These are:

– Effort created by mechanical spring
– Effort created by oil pressure, which also acts as a damper
– Damping by oil supplied without pressure. Non-return valve
– Lubrication hole in the tensioning pad for chain lubrication and aeration
– Nonreturn mechanism to limit the reverse travel
– Device to return the tensioner without the need to dismantle.
– Tensioner with rubber pad for direct contact with chain
– Double piston for simultaneous tensioning/damping of several chains

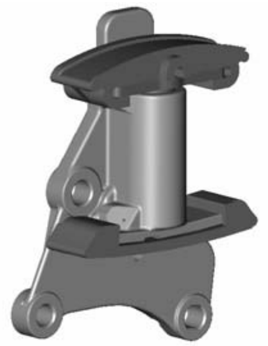
Examples



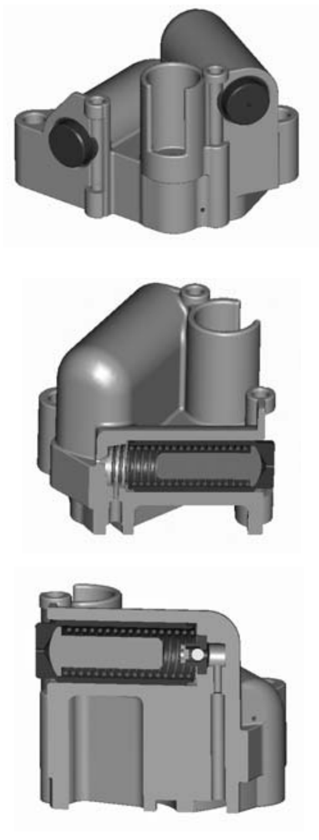
Tensioning effort by means of spring, oil pressure damping and non-return mechanism
Splash hole for chain lubrication



Tensioner with non-return mechanism and piston resetting mechanism, oil pressure damping

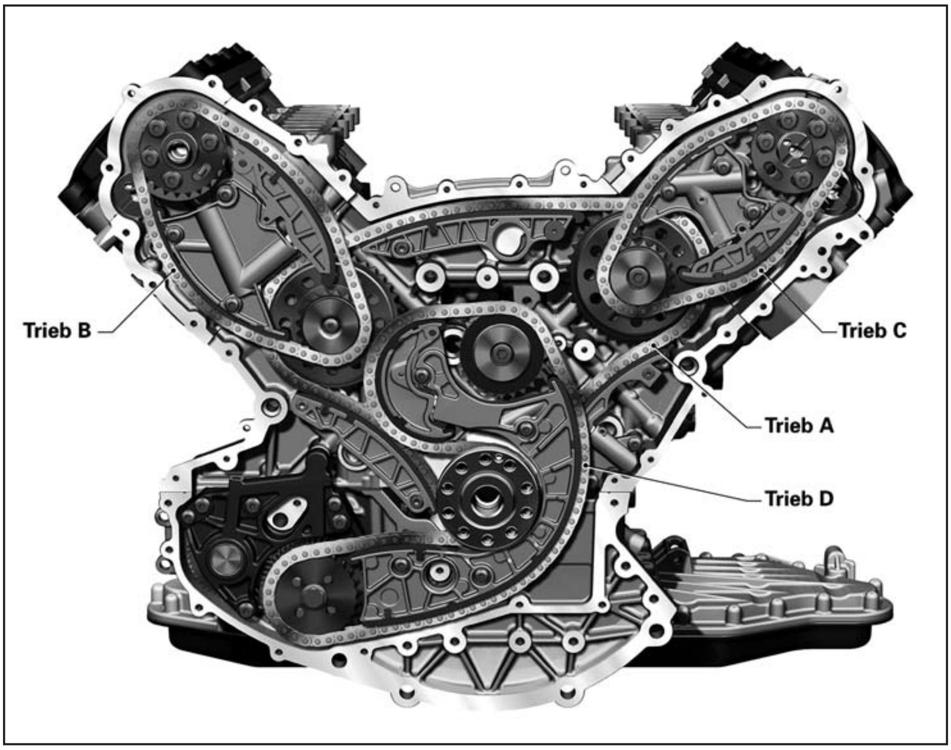


Type for tensioning/guide rail

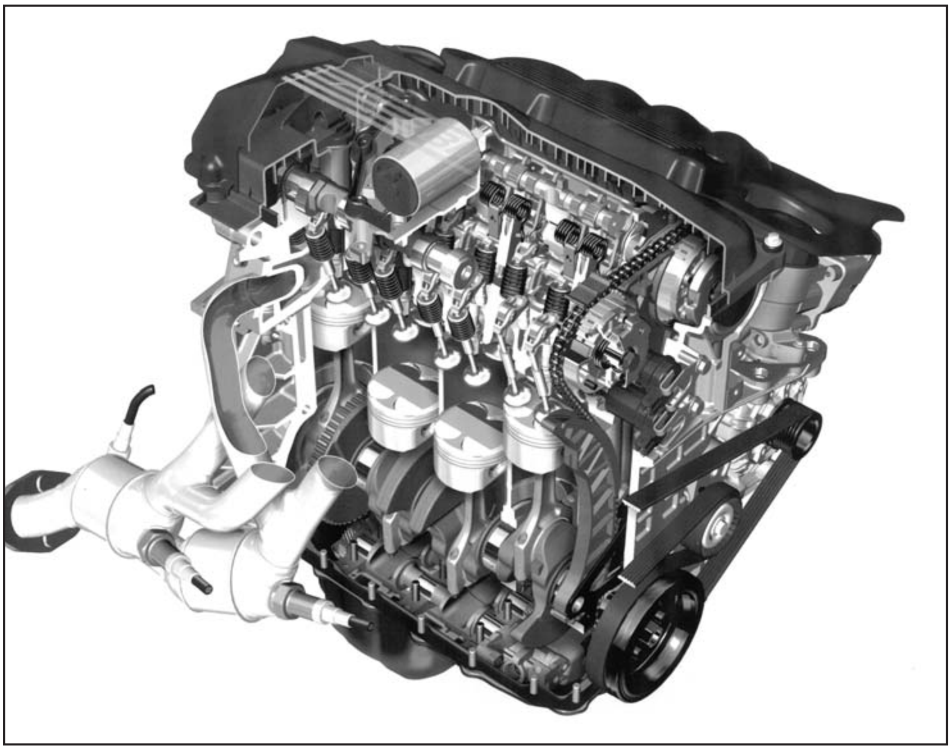


Double piston type for direct tensioning of two chain sections.
Oil filled, non-return valve

With pressure pin to operate articulating tensioner or guide rail.
Fitted in engine casing



Nockenwellensteuerung mit **iwis**-Ketten an einem V8-Motor



Nockenwellenantrieb bei einem 4-Zylinder-DOHC-Motor mit kleinteiliger Einfach-Kette

New chain types

iwis
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Over the past years, the main requirements for chains focused on minimum elongation throughout the vehicle's life cycle and high strength. Recently, however engine designers have expressed a further wish for reduced noise emission and improved chain dynamics. This new demand arises from the realization of smoother combustion processes due to new injection technology and the reduction in noise emission from accessory drives in the combustion engine, through which the timing chain drive is being perceived to a greater extent as a source of noise.

In response to these demands, two new chain generations have been developed and are repres-ented by the **iwisupreme** and **iwistar** versions. Both chains combine stan-dard iwis chain characteristics with additionally optimised acoustic and dynamic performance.

iwisupreme

Due to their kinematics characteri-stics, inverted tooth chains in particular, display major potential for an improvement in dynamic and acoustic performance. Whereas inverted tooth chain drives have proven their perfor-mance for many years in timing chain drives with less dynamic loading, up to present it has not been possible worldwide to implement them on engines with challenging dynamic demands (e.g. diesel engines) due their greater chain elongations in comparison to bush and roller chains.

The **iwisupreme** version is based on the operating principle of an inverted tooth chain (see figure 1). By optimising the kinematical motion sequence at the chain infeed and outfeed, the infeed pulse and irregularity of motion and power transmission (chordal action) could be reduced. Extensive engine trials indicated an improvement in chain dynamics as well as in acoustic performance. The link plate contour was designed so that even very small teeth numbers of 18 on the smallest chain sprocket could be achieved, which has a very positive effect on the demand of radial design space.

A bush was integrated in the inner link of the tooth link plates to improve the wear and tear characteristic. Whereas on conventional inverted tooth chains the articulated movement takes place between the tooth link plate and the pin at the chain sprocket infeed and outfeed, on the **iwisupreme** version, the interaction between bushing and pin is analogous to that of bush and roller chains. The design-related improvement in tribological conditions is reflected in per-ceptibly lower wear and tear values in comparison to conven-tional inverted tooth chains and permits even implementation in diesel engines.
Due to the compact design of inverted tooth chains, in which a greater number of transmitting link plates can be featured in comparison to roller and bush chains, a significant benefit in terms of strength can also be observed on the **iwisupreme**.

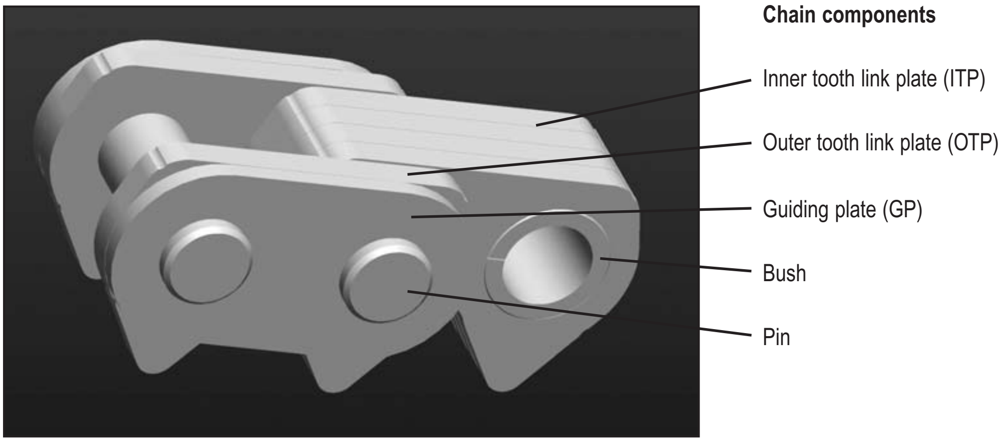

Figure 1: Design of the **iwisupreme** chain variant

iwis**tar**

The inner dynamics of a chain drive and acoustic behaviour perceived by the customer are mainly determined by the polygonal effect of chains that increases as the number of teeth on the chain sprocket decreases.

The **iwistar** variant was developed on the basis of proven bush and roller chains with the objective to improve the dynamics and acoustic performance (see figure 2).

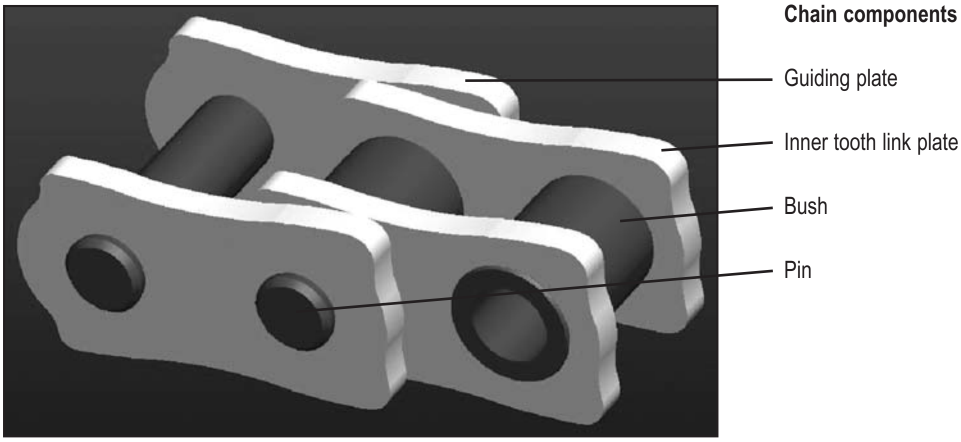

Figure 2: Design of the **iwistar** chain variant

In order to reduce the unevenness at chain infeed and outfeed, the chain rests on a supporting ring by its specially shaped outer and inner link plates (see figure 3). As it runs into the chain sprocket, the chain is lifted by the interaction of link plate contours and supporting ring. The design of the geometry of the link plate contours intends the inner tooth link plate to roll off the supporting disc while the chain wheel turns and at the same time, the lifting of the chain is counteracted by the engagement of the chain sprocket. As such, the polygonal effect can be almost completely eliminated and smooth chain running assured.

Figure 3: Chain infeed motional sequence

By implementing the **iwistar** variant, a perceptible reduction in inner chain excitation and an improvement in acoustic performance can be achieved. As the wear and tear and strength values of the **iwistar** variant are identical to that of standard bushing chains, users can implement the chains without any restrictions.

Both newly developed variants, **iwisupreme** and **iwistar**, are available in pitches of 7 mm, 8 mm and 9.525 mm. The main geometrical dimensions have been selected so that when converting a bush or roller chain drive, there is no need to replace the rails.

G Appendix

Conversion chart

Inch (") in mm						English feet (ft) to cm		PS to kW		kW to PS	
Inch	Inch	mm	Inch	Inch	mm	feet	cm	PS	kW	kW	PS
$^{1}/_{32}$	0,031	0,794	$^{13}/_{16}$	0,812	20,637	1,0	30,5	1,0	0,73	1,0	1,36
$^{1}/_{16}$	0,062	1,587	$^{27}/_{32}$	0,844	21,431	1,1	33,5	1,5	1,10	1,5	2,04
$^{3}/_{32}$	0,094	2,381	$^{7}/_{8}$	0,875	22,225	1,2	36,6	2,0	1,47	2,0	2,72
$^{1}/_{8}$	0,125	3,175	$^{29}/_{32}$	0,906	23,019	1,3	39,6	2,5	1,83	2,5	3,4
$^{5}/_{32}$	0,156	3,969	$^{15}/_{16}$	0,937	23,812	1,4	42,7	3,0	2,20	3,0	4,08
$^{3}/_{16}$	0,187	4,762	$^{31}/_{32}$	0,969	24,606	1,5	45,7	3,5	2,57	3,5	4,76
$^{7}/_{32}$	0,219	5,556	1	1	25,4	1,6	48,8	4,0	2,94	4,0	5,44
$^{1}/_{4}$	0,25	6,35	1 $^{1}/_{32}$	1,031	26,194	1,7	51,8	5,0	3,67	5,0	6,8
$^{9}/_{32}$	0,281	7,144	1 $^{1}/_{16}$	1,062	26,987	1,8	54,9	6,0	4,41	6,0	8,16
$^{5}/_{16}$	0,312	7,937	1 $^{3}/_{32}$	1,094	27,781	1,9	57,9	7,0	5,14	7,0	9,52
$^{11}/_{32}$	0,344	8,731	1 $^{1}/_{8}$	1,125	28,575	2,0	61,0	8,0	5,83	8,0	10,88
$^{3}/_{8}$	0,375	9,525	1 $^{5}/_{32}$	1,156	29,369	2,5	76,2	9,0	6,61	9,0	12,24
$^{13}/_{32}$	0,406	10,319	1 $^{3}/_{16}$	1,187	30,162	3,0	91,4	10,0	7,35	10,0	13,6
$^{7}/_{16}$	0,437	11,112	1 $^{7}/_{32}$	1,219	30,956	3,5	106,7	11,0	8,09	11,0	14,96
$^{15}/_{32}$	0,469	11,906	1 $^{1}/_{4}$	1,25	31,75	4,0	121,9	12,0	8,82	12,0	16,32
$^{1}/_{2}$	0,5	12,7	1 $^{9}/_{32}$	1,281	32,544	4,5	137,2	13,0	9,56	13,0	17,68
$^{17}/_{32}$	0,531	13,494	1 $^{5}/_{16}$	1,312	33,337	5,0	152,4	14,0	10,30	14,0	19,04
$^{9}/_{16}$	0,562	14,287	1 $^{11}/_{32}$	1,344	34,131	10,0	304,8	15,0	11,03	15,0	20,4
$^{19}/_{32}$	0,594	15,081	1 $^{3}/_{8}$	1,375	34,925	15,0	457,2	16,0	11,76	16,0	21,76
$^{5}/_{8}$	0,625	15,875	1 $^{13}/_{32}$	1,406	35,719	20,0	609,6	17,0	12,5	17,0	23,12
$^{21}/_{32}$	0,656	16,669	1 $^{7}/_{16}$	1,437	36,512	25,0	762,0	18,0	13,23	18,0	24,48
$^{11}/_{16}$	0,687	17,462	1 $^{15}/_{32}$	1,469	37,306	30,0	914,4	19,0	13,97	19,0	25,84
$^{23}/_{32}$	0,719	18,256	1 $^{1}/_{2}$	1,5	38,1	35,0	1066,8	20,0	14,70	20,0	27,20
$^{3}/_{4}$	0,75	19,05	1 $^{3}/_{4}$	1,75	44,45	40,0	1219,2	25,0	18,38	25,0	34,0
$^{25}/_{32}$	0,781	19,844	2	2	50,8	50,0	1524,0	50,0	36,76	50,0	68,0

1" english	= 25,399956 mm	1 m/s	= 196,8 ft/min	1 inch	= 0,0833 feet	= 0,0278 yard
1" american	= 25,40005 mm	1 m/s	= 3,28 ft/s	1 foot	= 12 inch	= 0,333 yard
1 lb	= 0,454 kp	1 m/s	= 3,6 km/h	1 yard	= 36 inch	= 3 feet
1 kp	= 2,205 lb	1 km/h	= 0,278 m/s			
1 PS	= 0,98 HP	1 ft/s	= 0,305 m/s			
1 HP	= 1,014 PS					

iwis High Performance chains for all branches of industry:

- general mechanical engineering
- printing machinery
- packaging machinery
- textile machinery
- machine tools
- plastics processing machinery
- woodworking machinery
- agricultural machinery
- office machines
- copiers
- building materials machinery
- Baumaschinen
- conveying and lifting machinery
- chemical and process engineering
- Papierherstellungs- und Bearbeitungsmaschinen
- Keramik und Glasindustrie
- Medizintechnik

Questionnaire for chain drives

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Enquiry from:	Date:
Address:	Dealt with by:
Telephone:	

Drive (input)		
Electric, hydraulic, pneumatic combustion engines/motors (2, 4 or 6 cyls)?		
Power output?		kW
RPM?		min^{-1}
Max. Torque?	bei n = min^{-1}	Nm
Continuous power or peak power?		
Speed constant, varying or impulsive?		
Operating time, cyclic operation?		
Are shock absorbing transmissio-elements present (friction clutch)?		

Output		
Type of driven machine?		
RPM?		min^{-1}
Power requirement? for starting - normal running - max.		kW
Load even, varying or impulsive?		
Direction of rotation continuous or alternating? (show in diagram)		

Chain drive		
Centre distance		mm
Does the design allow the centre distance to be modified?	±	
Possibility to provide tensioner? (adjustability, idler, chain guide)		
Could the centre distance alter in service? e.g. rear wheel suspension on a motorcycle		
Required or current ratio respectively?		
Shafts horizontal or vertical?		
Can the drive be protected against dirt and dust or can it be enclosed?		
What type of lubrication is possible? (manual, drip, oil bath, pressure)		
External factors? (temperature in °C, dust, moisture, fibres)		

Questionnaire for chain drives

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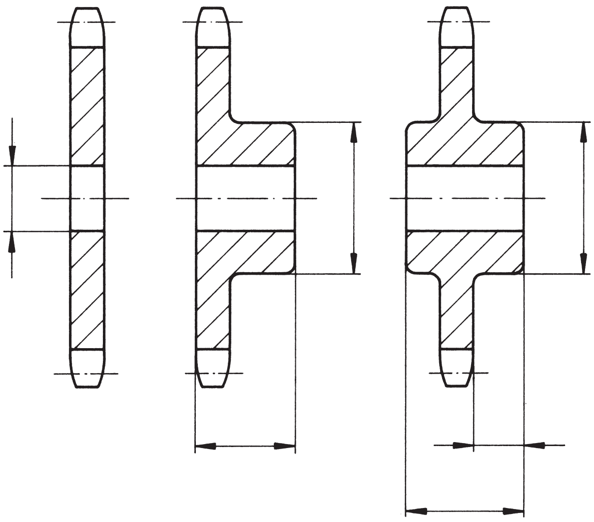
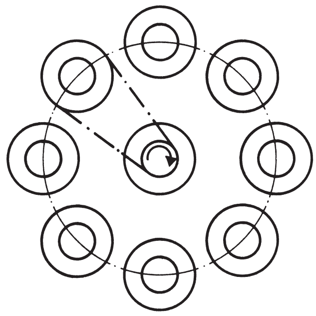
Chain		
Chains planned or exisiting drive?		
Is the chain replacing an existing drive?		
Max. permissible chain width?		mm

Chain wheels			
No. of teeth?	z_1 =	z_2 =	
Max. permissible outside diameter, incl. chain?			mm
Chain wheel as a disc or with hub, pre-drilled or with finished bore?			

The relevant dimensions with permissible tolerances should be entered in the diagram below.





Example used:
Drive running in clockwise direction,
in inclined arrangement, speed
reducing ration

Drawing of drive layout

iwis
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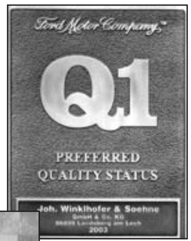
90 Jahre Erfolgsgeschichte iwis ketten

1916	Firmengründung durch den Kgl. Bayr. Kommerzienrat Johann Baptist Winklhofer. Zunächst Herstellung von Zündern in einer stillgelegten Fabrik. Nach dem 1. Weltkrieg wurden dann u.a. auch Zweiradketten produziert.
1933	Dr. Rudolf und Otto Winklhofer, Söhne des Firmengründers, treten in die väterliche Firma ein.
1939	Aufnahme von Steuerketten in das Produktionsprogramm und Lieferungen an BMW und Skoda.
1972	Beginn der Kettenspannerfertigung.
1975	Herr Dipl.-Ing. Gerhard Winklhofer übernimmt in 3. Generation die Gesamtleitung von **iwis**.
1988	Erste Qualitäts-Audits werden erfolgreich bestanden.
1990	**iwis** erhält den ersten System-Auftrag von der Automobilindustrie.
1991	**iwis** erhält den Q1-Award von Ford und wird nach DIN ISO 9002 zertifiziert.
1992	Erste VDA-6-Audits werden erfolgreich durchgeführt.
1993	orwis ketten spol.sr.o Strakonice wird als eigenständiges Unternehmen in Tschechien gegründet.
1994	Zertifizierung nach DIN ISO 9001.
1996	**iwis** erhält den Bayerischen Qualitätspreis 1996.
1997	**iwis** erfüllt die Bedingungen der EG-Öko-Audit-Verordnung für das Umweltmanagement.
1998	**iwis** erhält den Umweltpreis 1998 der Landeshauptstadt München.
1999	Herr Dipl.-Kfm. Johannes Winklhofer übernimmt in 4. Generation die Geschäftsführung von **iwis**. Zertifizierung QS 9000, DIN EN ISO 14001, DIN ISO 9001:2000
2000	Eröffnung des hochmodernen Produktionsstandortes in Landsberg. Die EG-Öko-Audit-Verordnung wurde 2000 erfolgreich rezertifiziert.
2001	Zertifizierung VDA 6.1.
2002	Zertifizierung ISO TS 16949. Rezertifizierung DIN EN ISO 14001 (Werk München). Zertifizierung DIN EN ISO 14001 (Werk Landsberg). **iwis** erhält den Bayerischen Qualitätspreis 2002 und den Bayerischen Frauenförderpreis 2002.
2004	Das Werk 3 in Landsberg wird Sieger beim Wettbewerb »Fabrik des Jahres« in der Kategorie Standort Champion.
2005	**iwis** wird Gesamtsieger beim Wettbewerb »Fabrik des Jahres« Erlangung des Zertifikates für das Audit »Beruf & Familie« von der Hertie-Stiftung für eine familiengerechte Personalpolitik.
2006	**iwis** erhält im 90. Jubiläumsjahr den Preis “Bayern Best 50”. Erwerb der Flexon GmbH.



Das Unternehmen

Die Firma **iwis** - Joh. Winklhofer & Söhne GmbH und Co. KG ist ein mittelständisches Unternehmen der Automobilzulieferindustrie und der Antriebstechnik für den allgemeinen Maschinenbau. Folgende Unternehmensbereiche sind Teil der Gesellschaft:

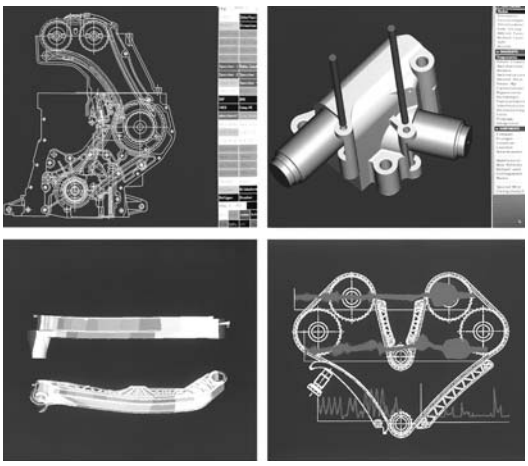
iwis Motorsysteme

Die Division für Automobilanwendungen hat sich hier inzwischen als Systemhersteller in der Weltspitze etabliert. Neben der Fertigung von Steuerketten und der Herstellung von Kettenspannern ist **iwis** weltweiter Anbieter von Steuer-, Nockenwellen-, Massenausgleichs- und Ölpumpensystemen. **iwis**-Kettentriebssysteme laufen in Millionen von Benzin- und Dieselmotoren mit langer Lebensdauer bei völliger Wartungsfreiheit. Das Steuertrieb-Modul wird entsprechend den Kundenanforderungen in einer Art Baukastenset aus dem jeweils passenden Bauteil (Steuerkette, Kettenspanner, Führungsschiene und Kettenrad) entwickelt und hergestellt.

Anwendungsbeispiel Automobilindustrie: Kettentriebsystem für BMW V8-Ottomotor

Forschung und Entwicklung

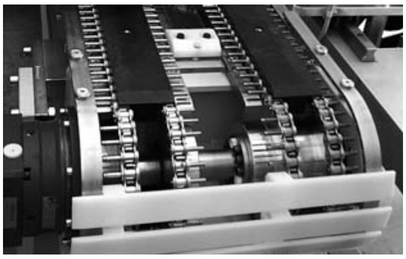
Die Division Forschung und Entwicklung bietet Engineering Support für Steuertriebe, Massenausgleichs- und Ölpumpentriebe, sowie für Antriebssysteme des allgemeinen Maschinenbaus. Die Projekte unserer Kunden werden während der Entwicklungsphase bis hin zur Serienreife von uns begleitet. Durch Spezial-Prüfstände sowie modernste Konstruktions- und Berechnungsmethoden ist Simultaneous Engineering jederzeit gewährleistet. Dadurch werden schnellste Reaktionszeiten im gemeinsamen Entwicklungsablauf garantiert.



1-4: 2D-Steuerkettentrieb, 3D-Hydraulischer Kettenspanner, FE-Berechnung einer Führungsschiene, Simulationsrechnung eines Steuerkettentriebs

iwis Antriebssysteme

Als Tochtergesellschaft für Industrieanwendungen, bietet **iwis** Antriebssysteme mit den Produkten Präzisionsketten, Kettenräder und Kettenspanner für Antriebs- und Fördertechnik vielseitige Industrieanwendungen. Im Lieferprogramm enthalten sind Rollenketten, Förderketten, wartungsfreie MEGAlife-Ketten, korossionsbeständige CR-Ketten, Staufórderketten, Spezialförderketten, Kettenführungen, Kettenräder, Kettenspanner, Werkzeuge und die notwendigen Kettenschmierstoffe. Unsere Stärke ist, die Ketten weit über die DIN-Norm hinaus in extrem engen Längentoleranzen zu fertigen. Als Systemlieferant bieten wir in der Antriebstechnik innovative und kundenspezifische Problemlösungen.



Anwendungsbeispiel Verpackungsindustrie: MEGAlife-Ketten M106ML in Aktion

Flexon

Flexon ist mit seinen Marken ELITE und **ecoplus**® ein international tätiges, hochspezialisiertes Dienstleistungsunternehmen der Antriebstechnik. Die Flexon Produktpalette umfasst Rollenketten, Landmaschinenketten, Spezialketten, Flyerketten, Kettenräder und Zubehör für alle Anwendungsgebiete. Industrie, Landwirtschaft und viele andere Bereiche profitieren neben der hohen Qualität und Zuverlässigkeit der Flexon Produkte vor allem von der Flexibilität der Serviceleistungen.

Hochspezialisierte Produktpalette mit den Marken ELITE und **ecoplus**®

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