



AVENTICS

INVERTED TOOTH CHAINS
DRIVE AND CONVEYOR

Rexroth
Pneumatics



Drive and transport solutions packed with power and precision

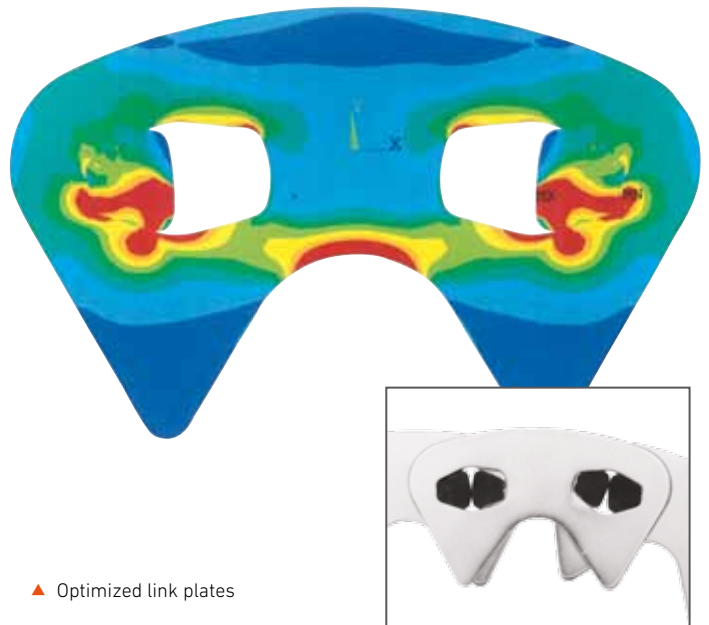
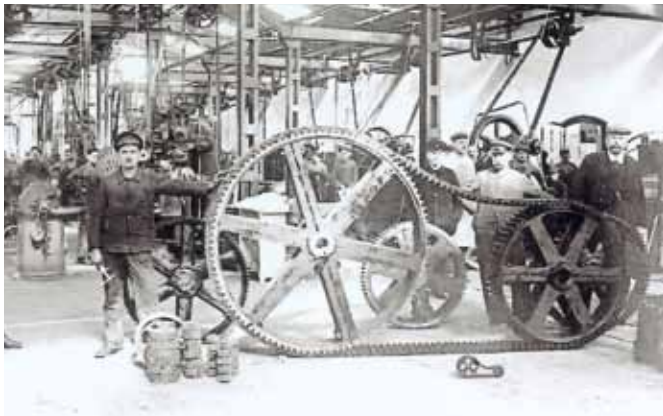
Like many great ideas, Leonardo da Vinci had it first: constructing a drive based on a chain and sprocket. 400 years later, the concept finally found a taker. We used it to develop our cutting-edge inverted tooth chain technology and have perfected it in every detail. Today, it is the ideal solution for countless applications.

Tailor-made for your application: drive and transport solutions with inverted tooth chains

The secret to our high-quality inverted tooth chains lies in their construction – a combination of numerous link plates and profile pins. The result: a powerful and flexible chain drive that can be perfectly adapted to the task at hand. Two-pin rolling pivot joints are just one unique feature.

- Technology leader for inverted tooth chain applications
- Unparalleled variety – the right inverted tooth chain for any application
- Over 100 years of experience, active worldwide

We have shaped inverted tooth chain technology from its inception and maintain the world's largest delivery program.



We have worked in close cooperation with our customers for decades to consistently optimize our products and systems. This allows us to provide efficient solutions for increasing demands for top quality and productivity. AVENTICS inverted tooth chains not only fulfill today's requirements, but are also a future-oriented technology with unique advantages. We are always striving to create even better solutions. Our customers should be utterly confident that they are receiving state-of-the-art inverted tooth chain technology together with the best possible service.

Undercover artists, indispensable and ultra-efficient

Our inverted tooth chains are indispensable components in a variety of applications

These "modest" components are often inconspicuous, but should not be underestimated in terms of their importance for a wide variety of production processes. Powerful, precise, fast, smooth-running, temperature-resistant, and durable, inverted tooth chains are often the superior drive and transport solutions.



Customer care, product development, and design – our expertise lies in creating seamless links

Using the latest technical methods and field-specific knowledge of our customers' tasks, we calculate and develop the most suitable configuration.

- Industry-specific product innovations
- Components with needs-based add-ons
- Customer-specific overall solutions

Not a day goes by ...

Inverted tooth chains in our daily lives:



7:00 a.m.

Breakfast. Inverted tooth chains most likely had a hand in producing the packaging for your juice. And your eggs!



8:00 a.m.

Your daily commute. Inverted tooth chains probably helped to safely guide your car along the assembly line.



11:00 a.m.

Meeting. Several inverted tooth chains moved these water bottles through different production stages, even at more than 500°C!



2:00 p.m.

Lunch. Inverted tooth chains were used to produce the real wood veneer on your table, not to mention the elegant wine glasses.



6:00 p.m.

Back home. Your solar collectors were probably produced by vacuum coating equipment with inverted tooth drive chains.



8:00 p.m.

At the theater. You were moved and so was the stage. You guessed it: all thanks to inverted tooth chains.

Inverted tooth chain drives – the concept with unsurpassed characteristics

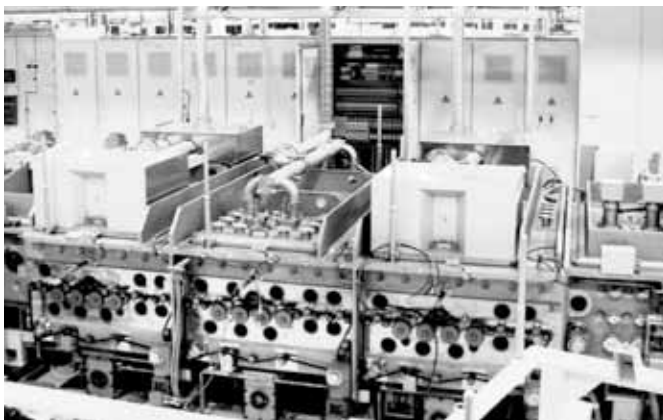
Inverted tooth chains for demanding drives

Our inverted tooth chain drives make the grade when it comes to precise, fast, and silent drives. Modern machinery production requires top-performing drives that offer a high degree of economic efficiency and reliability. AVENTICS inverted tooth chain drives are the perfect solution for these requirements.

- Small dimensions, high efficiency
- Long service life, easy assembly
- High speeds, extremely quiet operation
- High torques

The design advantages mainly result from the unique two-pin rolling pivot joint and the excellent meshing conditions of the inverted tooth chain and sprocket. In conjunction with the low impact typical for tooth chains, this drive solution is distinguished by extremely smooth, even running, with the highest precision. The interlocking power transmission between the inverted tooth chain and the sprocket teeth eliminates slippage and the need for pre-tensioning.

With high-quality materials and production processes, inverted tooth chains can even be used in harsh environments, at high temperatures, or with aggressive agents.



▲ Biflex inverted tooth chains in vacuum coating equipment for solar cells



▲ HPC inverted tooth chains in chocolate dosing equipment in the food industry

Powerful, precise, fast, and silent



Inverted tooth chains are used for classic circuit operation. Their technical features also make them ideal for reverse-operation drives. AVENTICS inverted tooth chain drives help you significantly increase the service life of your application, minimize downtimes, and thus ensure absolutely efficient operation.

Our online Chain Calculator can help you with the first steps to finding the right inverted tooth chain solution. Take advantage of this online tool to submit your request. To apply our calculation tool and get further information, visit us at:

www.aventics.com/toothchain

Inverted tooth conveyor chains – systematic advantages

Inverted tooth chains for conveying and linkage systems

AVENTICS has extensive experience in creating optimum conveyor belt designs with inverted tooth chains. For our conveyor technology, we focus on cost-effective, user-friendly solutions that provide unparalleled durability and availability.

- Space-saving and variable in both form and width due to the chain's link plate construction
- Slip-free, quiet operation with involute toothing
- Functional reliability and a long service life with low wear and tear
- Resistant to extreme temperatures and ambient conditions

The automotive industry and hollow glass manufacturers have relied on inverted tooth chains for decades, a sure sign of their unsurpassed advantages.



Variable, versatile, reliable, and durable



▲ For forged parts in hot areas



▲ Easy integration of special links as drivers

Limitless application opportunities

Whether large or small, heavy or light, circular or square, our inverted tooth conveyor chains convey it all, with accuracy and reliability. Precise, safe, cost-efficient.

- Versatility thanks to application-specific designs
- Interlocking driving with link plate form or special drivers

Talk to us today! Tell us about your applications; we'll supply the solutions. toothchain@aventics.com

AVENTICS GmbH

Tooth Chain Drives
Zur Dessel 14
31028 Gronau (Leine), Germany
Tel. +49 5182 5870
Fax +49 5182 58730
toothchain@aventics.com
www.aventics.com/toothchain



Your Contact:

Further contacts:
www.aventics.com/contact

The data specified only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.



AVENTICS

DRIVE TECHNOLOGY
WITH INVERTED TOOTH
CHAINS FROM AVENTICS

Rexroth
Pneumatics



Fast. Precise. Silent. The inverted tooth chain's ability to transfer high loads in small spaces ensures that multiple drive applications are optimally implemented. The perfectly adjusted geometry of inverted tooth chain and sprocket engagement helps to minimize the intensity of chain link impact, thus illustrating the drive element's well-earned reputation of silent running.

Inverted tooth chain drives from AVENTICS – full-strength application solutions

The variable construction of the inverted tooth chains makes any required chain width and length possible. Especially in tight spaces or with large shaft center distances, this allows for a solution optimized to the application and the actual load in question.

AVENTICS Inverted tooth chains for drives

In conjunction with the low impact typical for tooth chains, this drive solution is distinguished by extremely smooth, even, and precise running. As opposed to e.g. roller chains, wear is evenly distributed over all joints and all pitches are increased at the same rate. As a result, all inverted tooth chain links always scribe one common pitch circle. The interlocking power transmission between the inverted tooth chain and the sprocket is slip-free, and no pre-tensioning is necessary.

- Space-saving and variable in type, design and width
- Slip-free and silent
- Functional reliability and extended service-life
- Robustness, simple assembly/disassembly

Thanks to the use of premium materials and production processes, tooth chains can also be used in harsh ambient conditions, at high temperatures, or with aggressive chemicals. Substantially extended application life, minimized downtime – AVENTICS chain drives assure cost-effective use.

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The inverted tooth chain's design: A multitude of strengths

The inverted tooth chain is a cohesive network of sturdy links. Depending on the required length and width, it is made of a variety of link plates and profile pins. The result: a powerful and flexible chain drive that can be perfectly adapted to the specific task at hand.

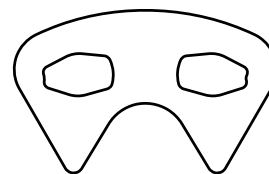
Inverted tooth chain construction

The image shows an HPC inverted tooth chain with a center guide. A chain is made up of a certain number of links which are also named as pitches. The chain length—meaning the number of chain links—depends on the number of teeth on the sprocket and the shaft center distance.

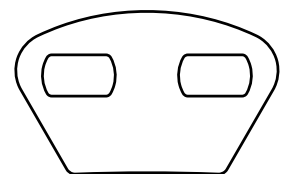
Depending on the chain width, each link will have a certain number of link plates arranged in a staggered configuration from link to link. These links are connected to one another by the rolling pivot joint.

Force and motion are transmitted via the toothed plates. Each link plate is provided with two joint bores to accommodate the rolling pivot joint.

The rolling pivot joint is composed of two profile pins that are designed according to the chain type. Both pins are held captive within the plates. When a joint moves—as the chain enters and exits the sprocket—the two profile pins roll against each other. The remaining sliding friction is minimized.



▲ Toothed plate



▲ Guide plate

Die Zahnkette setzt sich zusammen aus:

- Toothed plates
- Guide plates
- Rolling pivot joint – consists of 2 profile pins
- Rivet washers

Types of standard guides

Guide plates

Guide plates generally do not contribute to power transmission. Special guide plates designed as reinforcement plates can be used in slow-running, high-performance drives suffering a limited amount of space. In addition to their guide functions, these link plates also contribute to power transmission. Please contact us if you would like more details on this option.

Center guide

The illustration of an inverted tooth chain with a center guide shows the guide plates located in the center. The wheel toothing also features a profiled guideway to support the guide plates. The lateral play within the groove corresponds to link plate thickness for standard sprockets.

Side guide

The side guide is particularly favored for narrow widths since the toothing is not weakened by the guideway. Here, the sprocket runs between the guide plates and the minimum play needs to be adjusted to the minimum thickness of the toothed link plate package.

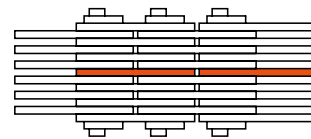
Multiple center guide

Guide plates can also be arranged in several rows in an inverted tooth chain as a multiple guide, meaning the construction is either a multiple center guide or a combined center/side guide. These modifications are used to provide better support in drives with vertical shafts, for example. In this case, additional support flanges on the sprocket are not required.

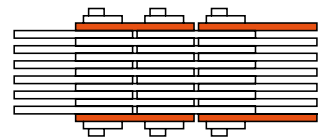


▲ HPC sprocket with an center guide

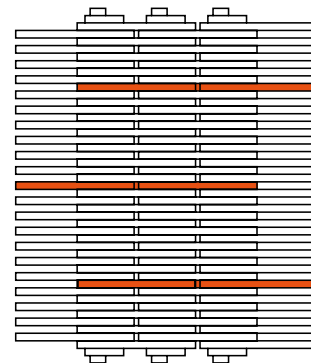
Center guide



Side guide



Multiple center guide



◀ Drive chain with reinforcement plates, combination of center and side guide

Inverted tooth chains and sprockets in perfect harmony



Properly machined sprockets are essential to the inverted tooth chain's safe operation and long service life. Using sprockets from other manufacturers invalidates the inverted tooth chain warranty.



▲ Customer-specific sprocket manufacturing

No room for false teeth

The signature involute-toothing guarantees the quietest running possible of the tooth chain drive. If quiet running is a priority, wheels with higher numbers of teeth are preferred for higher speeds. When determining the number of teeth, the outside space required— including the applied chain –and the permissible sprocket bore needs to be taken into account in addition to the minimum number of teeth for the respective type. The tip diameters specified in the tables on the relevant type pages apply to wrap drives only. Using inverted tooth chains without wrap requires specially-toothed wheels. Sprockets can be ordered ready for installation and manufactured according to the customer's specifications. Usually, C45 steel sprockets with hardened tooth flanks are used or cast-iron sprockets from GG or GGG. An uneven amount of teeth should be preferable especially for cast-iron sprockets. Other metallic and non-metallic materials are also possible. The wheel width depends on the inverted tooth chain width and guide type.

Special types

2-part sprockets can be delivered for later installation on through shafts. The toothing can be milled directly in a shaft.

Flanges or feed disks

The sprocket guideway is done away with on special inverted tooth chains lacking guide plates. The sprockets can be equipped with flanges on both sides to act as a lateral guide for the inverted tooth chain. Conditions are similar for drives with vertical shafts. A feed disk with an enlarged diameter is mounted at the bottom of the sprockets. The tooth chain is supported by the protruding ring surface and relieves the guide plates from the chain's weight.



The secret's in the technology

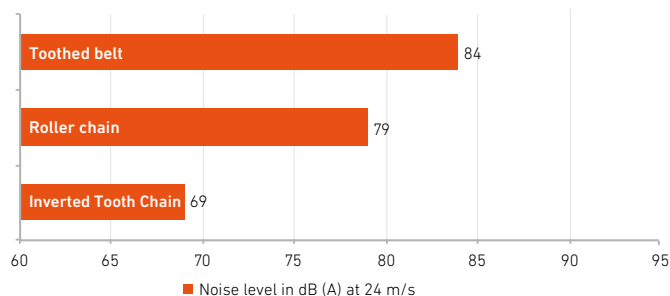
Classic wrap operation? Counter-running drive shafts? Individual drive systems? With their special design, AVENTICS inverted tooth chains offer a variety of unique product characteristics.

Runs like a whisper

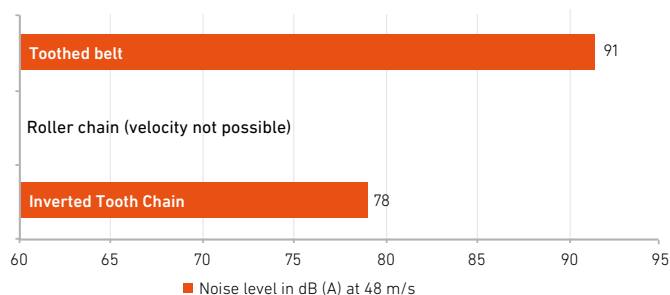
The skillful reduction of chain link impact is one of the basic reasons behind the exemplary smooth running and lack of noise. The intensity of the impact is the result of the chain link mass and the speed of impact. The equivalent characteristic values of AVENTICS inverted tooth chains are significantly lower than those of other drive types.

Noise levels compared to other drives

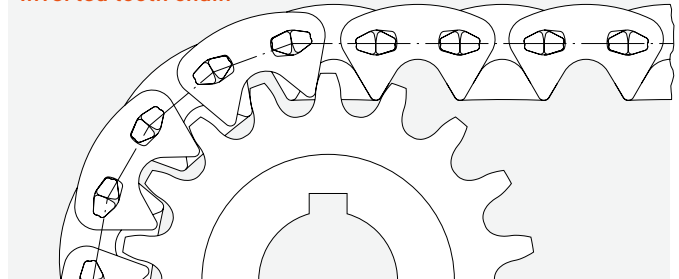
At 24 m/s



At 48 m/s



Inverted tooth chain



Roller chain



Engineering advantages compared to roller chains

The pictures reveal the fundamental difference of wear elongation during operation. Roller chains consist of outer and inner links which are subjected to varying wear and tear. Inner links experience a different degree of wear than outer links. Therefore outer links describe a larger pitch circle. This causes the chain to move jerkily and also places uneven stress on the sprocket teeth. At the same time, vibrations result in a noise level increase.

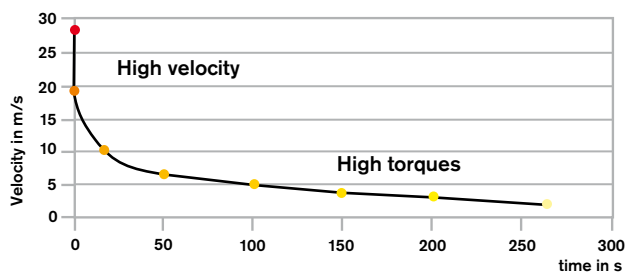
Advantages of inverted tooth chains over toothed belts ...

Variable loads—where belts start to jump, the inverted tooth chain can hold court

Within their maximum carrying capacities, inverted tooth chains with a particular drive can transfer a variety of loads (torques, speeds) with the same quality. This applies especially to winder and universal spindle drives. Toothed belts can be optimally engaged only within a small load range since only the data from one operating point are used to determine the pre-tensioning. This leads to considerable problems in drives whose loads are frequently changing or whose use cannot be predicted by the customer.

For most of the time—or even generally—the belt drive is either tensioned too little or too much and is thus subjected to stronger wear resulting from flank friction. This is particularly true in belt disks with reduced tooth flank backlash, the so-called zero-gap meshing.

Example: Winder velocity profile



Even with varying loads, an inverted tooth chain is the optimum solution.

Using inverted tooth chains avoids the consequences of faulty belt tensioning:

- Danger of skipping
- Greatly reduced service life
- Higher temperatures resulting from friction
- Increased energy consumption
- Less efficiency
- Damage to permanently lubricated bearing and integrated measuring systems (among others)

Overlapping pre-tensioning and working load leads to higher belt loads, wider belts, and thus noise problems at higher speeds.

Static load



Static bearing load: Totaled initial pretension

Dynamic load



Dynamic bearing load: Totaled result of overlapping operating load and pretension

Pre-tensioning—do bearings really have to suffer?

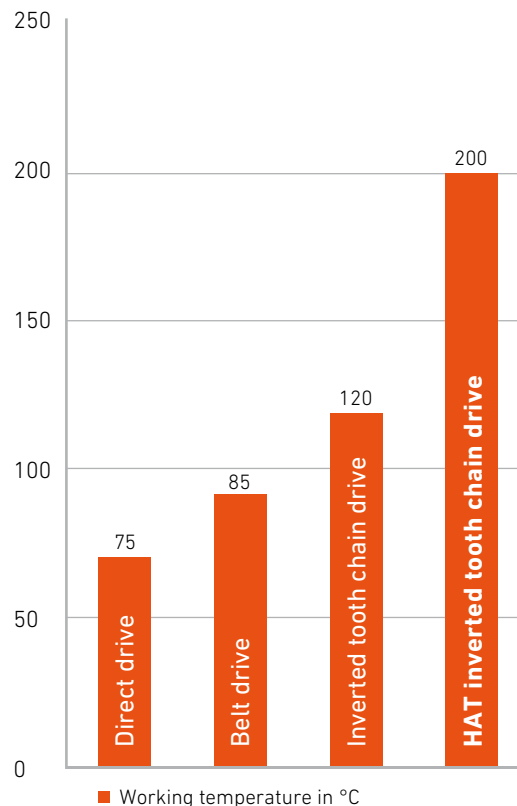
Inverted tooth chains generally run without pre-tensioning, eliminating a large part of the bearing load. Toothed belt drives sometimes need to be pre-tensioned with more than the drive load component to ensure safe transmission of the operating load. This is true to an even greater extent for Poly V and flat belt drives. The pre-tensioning force is determined based on normal, dry conditions. Any reduction of the friction coefficient through ambient influences, for example, must also be compensated for on toothed belts by further increasing the pre-tensioning.

... and over other drive solutions

Heating things up

Throughout many years of development work, AVENTICS has consistently been able to substantially improve inverted tooth chain performance in high-temperature drive applications. In conjunction with the original AVENTICS rolling pivot joint, even our standard drives can be continuously operated in ambient temperatures up to 120°C – and are thus clearly better than most other drive elements. Additionally, our HAT (High Ambient Temperature) inverted tooth chains and sprockets can be used with heat-resistant lubricants at temperatures of up to 200°C without any noticeable increase in wear.

Working temperature compared to other drives



More assets at a glance: Advantages of AVENTICS inverted tooth drive chains over ...

... belts

- More resistant to chemicals, especially when cooling lubricants are used
- Simple assembly thanks to the possibilities of pin locks associated with correspondingly short downtimes or the lack of extra construction
- Reduced sensitivity to temperatures > 85°C and extremes in humidity, e.g. material does not swell and the tensile member does not shrink when moisture is absorbed

... other steel pintle chains

- Very high maximum speed
- Low and uniform wear
- Low running noise
- Good meshing conditions
- Low wear even with standard sprockets
- Highly flexible width
- Smooth running, not susceptible to vibration
- High efficiency
- Consistent, high quality

... gear wheels/gear boxes

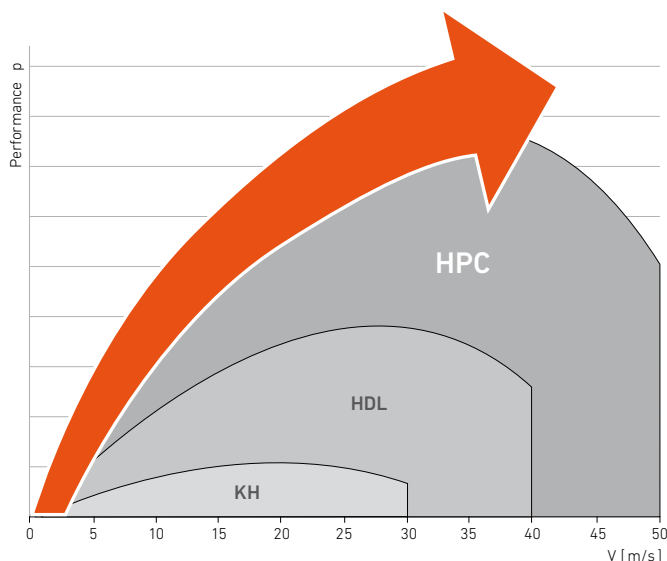
- Low cost for wide shaft center distances
- Meshing unaffected by fluctuations in temperature
- Quiet at every operating point
- Zero tooth flank backlash
- High tolerances for shaft arrangement
- Possible to combine rotatory and linear motion
- Good self-damping
- Highly efficient at every operating point
- Moderate costs for special solutions

Inverted tooth chains from AVENTICS – the benchmark for wrap drives.

AVENTICS has the right drive concept for every application

AVENTICS – the art of optimization

Faster, stronger, quieter. Constant progress is the only way to reach this goal. The development of the very first inverted tooth chain to the original type HPC from AVENTICS is the result of many years of effort put in by a motivated team of technicians and engineers. All to your advantage!



Biflex–flexible to both sides

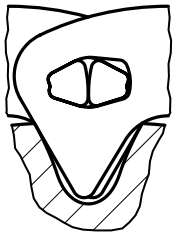
Our invention. For performance and precision, fully symmetrical link plates provide equal drive on both sides and in both directions. Problems with counter-running shafts, S-shaped wraps, or space-saving tensioning methods can be eliminated with AVENTICS inverted tooth drive chains.



Individual–ready to meet your requirements

The maximum flexibility of the inverted tooth chain drive system allows it to be adapted easily to the most diverse requirements. We can supply your application solution – from individual special link plates to complete specialized inverted tooth chains.





HPC

Type designation:
HPC
Pages 12 – 15

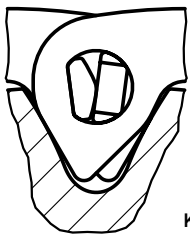
Available pitches:	3/8", 1/2", 3/4", 1", 1 1/2"	
Minimum number of teeth on the sprockets:	3/8" bis 3/4"	17 teeth
	1", 1 1/2"	19 teeth
	from 1 m/s	≥ 23 teeth
Max. velocity:	up to 50 m/s	



HDL

Type designation:
HDL
Pages 24, 26 – 27

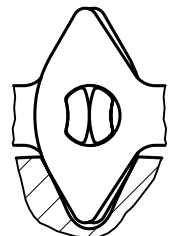
Available pitches:	3/8", 1/2", 3/4", 1"	
Minimum number of teeth on the sprockets:	17 teeth	
	from 1 m/s	23 teeth
	Max. velocity:	up to 40 m/s



KH

Type designation:
KH
Pages 25, 28 – 29

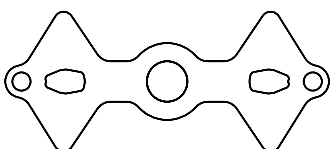
Available pitches:	5/16", 3/8", 1/2", 5/8", 3/4", 1", 1 1/2", 2", 2 1/2"	
Minimum number of teeth on the sprockets:	5/16" bis 3/4"	13 teeth
	from 1"	15 teeth
	Max. velocity:	up to 30 m/s
	from 1"	up to 25 m/s



Biflex

Type designation:
BIZ
Pages 16 – 19

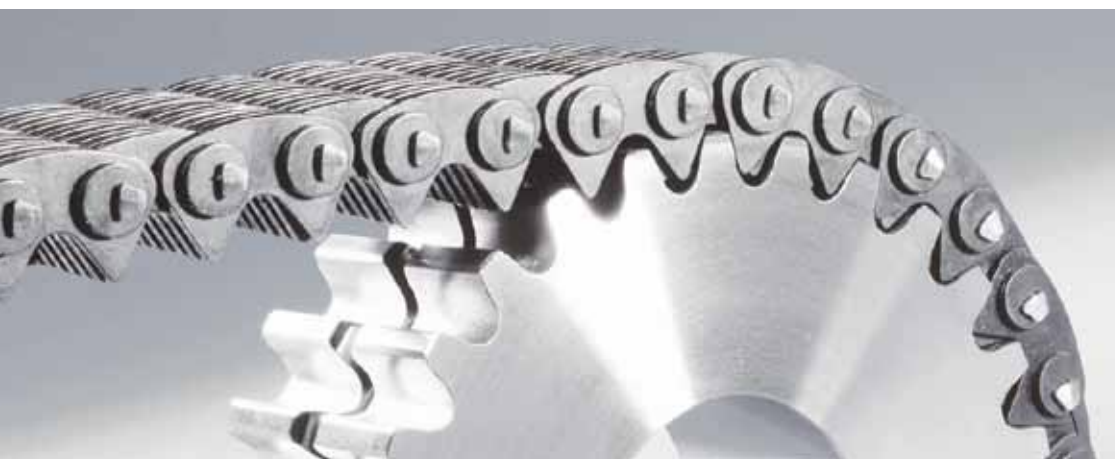
Available pitches:	3/8", 1/2", 3/4", 1"	
Minimum number of teeth on the sprockets:	3/8", 1/2", 3/4"	18 teeth
	1"	19 teeth
	≥ 23 teeth preferred	
Max. velocity:	up to 40 m/s	


Tradition meets innovation
Pages 20 – 23

Special chains of all types and pitches are individually adapted to the requirements specified. Using the latest technology and expertise acquired from over 100 years of experience, we are in the prime position to develop and produce a configuration perfect for your needs.

HPC inverted tooth chain drives

State of the art. The most powerful type of AVENTICS inverted tooth chains sets new standards for wrap drives. Faster, quieter, and more precise than any other inverted tooth chain type before, the latest generation of inverted tooth drive chains with rolling pivot joint meets the highest demands.



The original: the HPC inverted tooth chain from AVENTICS

Enhancements made to the proven HDL range unite the familiar and outstanding characteristics with new, extra advantages.

- Improved quiet running and low noise
- Low-friction rolling pivot joint with the optimum efficiency
- Higher load capacity and narrower inverted tooth chain width
- More resistant to wear and minimized elongation
- Inverted tooth chain velocities up to 50 m/s



Stronger. Faster. Quieter

Over 60% more powerful than before.

- Higher dynamic rigidity, apparent on the eye and back cross section reinforcements
- Wedge-shaped joint profiles ensure a play-free position in the link plate bore and prevent self-movement that increases wear
- Compact cross section increases the joint's resistance to shearing and bending

Power:

$$P = \frac{M \cdot n}{9550}$$

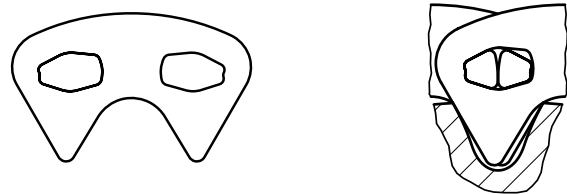
Velocity:

$$v = \frac{Z \cdot p \cdot n}{60000} \leq 50 \text{ m/s}$$

P = power in kW	p = pitch in mm
M = torque in Nm	Note: Torque M and speed n must refer to the same sprocket with the number of teeth Z.
n = speed in r.p.m.	
v = velocity in m/s	
Z = number of teeth	

Optimized link plate form and joint kinematics

HPC



HDL



KH



Design breaking load

step 1:

$$F_{\text{Berf}}^* \geq \frac{P \cdot k}{v} \cdot S_{\text{min}}$$

How to calculate the required design breaking load:

1. Initial calculation according to step 1.
2. Select an inverted tooth chain from the table on page 14.
3. Recalculate according to step 2 and select again if necessary.

F_{Berf} = design breaking load in kN	The impact factor must be adjusted to the actual torque in case of maximum speed. In general, a value of $k = 1$ is sufficient, deviating from the start-up behavior.
P = power in kW	
k = impact factor according to table	
v = velocity in m/s	
G = inverted tooth chain weight in kg/m	
S_{min} = type/application-dependent safety coefficient HPC = 8...10	

Design breaking load

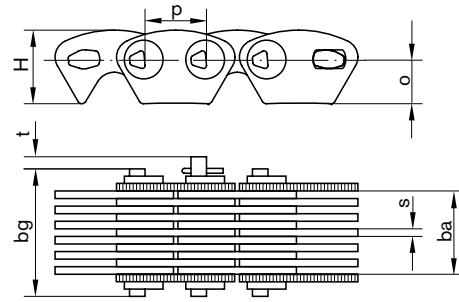
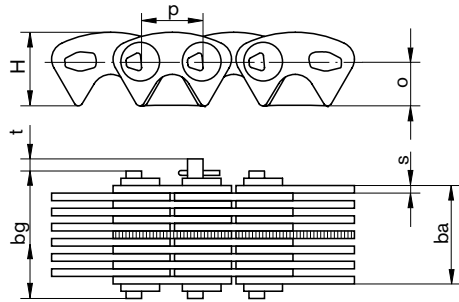
step 2:

$$F_{\text{Berf}} \geq \left(\frac{P \cdot k}{v} + G \cdot v^2 \cdot 10^{-3} \right) \cdot S_{\text{min}}$$

Design impact factor values

Load	Drive motors		
	Soft startup drive	Three-phase current motor	Piston motor
Even	1.0	1.2	1.5
Medium impacts	1.3	1.5	2.0
Heavy impacts	≥ 1.7	≥ 2.0	≥ 2.5

HPC inverted tooth chains

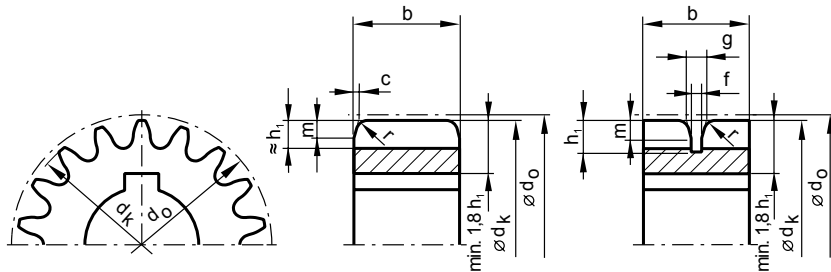


Pitch p	Designation no.	RZ	Nominal width b_n	Working width b_s	Total width b_g	Design breaking load	Weight [kg/m]	Sprocket width b	H	o	s	t
3/8" = 9.525 mm	HPC 015 A	10	15	12.5	19.9	25.4	1.0	11.5	11.3	6.8	1.5	2.0
	HPC 020 A	13	20	17.2	24.5	30.1	1.2	16.0				
	HPC 025	17	25	26.6	30.8	39.3	1.5	30.0				
	HPC 030	21	30	32.9	37.1	48.6	1.8	35.0				
	HPC 040	25	40	39.1	43.3	57.9	2.2	45.0				
	HPC 050	33	50	51.6	55.8	76.4	2.9	55.0				
	HPC 065	41	65	64.2	68.4	94.9	3.6	70.0				
1/2" = 12.7 mm	HPC 320 A	13	20	17.2	26.3	34.1	1.6	16.0	15.2	9.0	1.5	2.5
	HPC 325	17	25	26.6	32.6	52.7	2.0	30.0				
	HPC 330	21	30	32.9	38.9	65.1	2.4	35.0				
	HPC 350	33	50	51.6	57.6	102.3	3.8	55.0				
	HPC 375	49	75	76.7	82.7	152.0	5.6	80.0				
	HPC 3100	65	100	101.7	107.7	201.6	7.5	105.0				
	HPC 3125	81	125	126.8	132.8	251.3	9.3	130.0				
3/4" = 19.05 mm	HPC 525	13	25	27.0	34.0	80.1	3.0	30.0	22.5	13.5	2.0	3.5
	HPC 540	21	40	43.7	50.7	129.4	4.9	50.0				
	HPC 550	25	50	52.0	59.0	154.0	5.8	55.0				
	HPC 585	41	85	85.3	92.3	252.6	9.5	90.0				
	HPC 5100	49	100	101.9	108.9	301.9	11.4	105.0				
	HPC 5125	61	125	126.9	133.9	375.9	14.1	130.0				
	HPC 5150	73	150	151.8	158.8	449.8	16.9	155.0				
	HPC 5200	97	200	201.8	208.8	597.7	22.5	205.0				
1" = 25.4 mm	HPC 640	13	40	40.2	48.2	152.4	6.0	45.0	30.0	18.0	3.0	4.0
	HPC 650	17	50	52.6	60.6	199.4	7.9	55.0				
	HPC 665	21	65	65.0	73.0	246.3	9.7	70.0				
	HPC 675	25	75	77.4	85.4	293.2	11.6	80.0				
	HPC 6100	33	100	102.1	110.1	387.0	15.3	105.0				
	HPC 6125	41	125	126.9	134.9	480.9	19.0	130.0				
	HPC 6150	49	150	151.7	159.7	574.7	22.7	155.0				
	HPC 6200	65	200	201.2	209.2	762.4	30.1	205.0				
1 1/2" = 38.1 mm	HPC 850	17	50	52.8	64.8	303.4	11.8	60.0	45.0	27.0	3.0	6.0
	HPC 865	21	65	65.2	77.2	374.8	14.6	75.0				
	HPC 875	25	75	77.6	89.6	446.2	17.4	85.0				
	HPC 8100	33	100	102.5	114.5	589.0	22.9	110.0				
	HPC 8125	41	125	127.3	139.3	731.8	28.5	135.0				
	HPC 8150	49	150	152.1	164.1	874.6	34.1	160.0				
	HPC 8200	65	200	201.8	213.8	1160.2	45.2	210.0				

Dimensions in mm – Design breaking load in kN – RZ (Number of rows) = number of all link plates per joint – Other pitches and widths on request.

■ HPC inverted tooth chains are delivered open and with a split pin lock if not specified otherwise. ■ Revolving chains require an even number of links. Chains with an uneven number of links could not be closed. ■ Uneven numbers of links are permitted only if the ends of the chain are connected to external parts.

HPC inverted tooth sprockets



Minimum number of teeth:

3/8" to 3/4" = 17 teeth

1", 1 1/2" = 19 teeth

from 1 m/s ≥ = 23 teeth

Tip diameter d_k					
Number of teeth z	3/8"	1/2"	3/4"	1"	1 1/2"
17	46.3	61.5	92.7	—	—
18	49.5	65.7	98.9	—	—
19	52.6	69.9	105.1	139.8	210.4
20	55.7	74.0	111.4	148.1	222.8
21	58.8	78.2	117.6	156.4	235.2
22	61.9	82.3	123.8	164.6	247.5
23	65.0	86.4	129.9	172.8	259.9
24	68.1	90.5	136.1	181.1	272.2
25	71.1	94.7	142.3	189.3	284.5
26	74.2	98.8	148.4	197.5	296.8
27	77.3	102.9	154.6	205.7	309.0
28	80.4	107.0	160.7	213.8	321.3
29	83.4	111.1	166.8	222.0	333.6
30	86.5	115.1	173.0	230.2	345.8
31	89.6	119.2	179.1	238.4	358.1
33	95.7	127.4	191.3	254.7	382.5
35	101.8	135.6	203.6	271.0	407.0
37	107.9	143.7	215.8	287.3	431.4
39	114.0	151.9	228.0	303.5	455.8
41	120.1	160.0	240.2	319.8	480.2
43	126.2	168.1	252.4	336.0	504.5
45	132.3	176.2	264.6	352.3	528.9
47	138.4	184.4	276.8	368.5	553.2
49	144.5	192.5	288.9	384.8	577.6
51	150.6	200.6	301.1	401.0	601.9
55	162.7	216.8	325.5	433.4	650.6
60	177.9	237.1	355.9	474.0	711.4
70	208.3	277.6	416.6	555.0	832.9
80	238.7	318.1	477.4	636.0	954.4
90	269.1	358.6	538.1	716.9	1075.8
100	299.4	399.1	598.8	797.9	1197.2
110	329.8	439.6	659.5	878.8	1318.6
120	360.1	480.0	720.2	959.7	1439.9
130	390.4	520.5	780.9	1040.6	1561.3
140	420.8	560.9	841.5	1121.5	1682.6
150	451.1	601.4	902.2	1202.4	1803.9

Guideway and profile					
Pitch p	3/8"	1/2"	3/4"	1"	1 1/2"
g	4.0	4.0	5.0	8.0	9.0
f	3.0	3.0	4.0	6.0	6.0
h_1	5.5	7.0	11.0	14.0	22.0
m	4.0	5.0	8.0	9.0	16.0
r	2.0	2.0	3.0	3.0	4.0
c	0.5	0.5	0.5	1.0	1.5

The pitch circle diameter helps determine the correct external diameter of the sprocket with an attached chain in new condition.

Pitch circle diameter:

$$d_0 = \frac{p}{\sin(180^\circ/z)}$$

Max. diameter incl. chain

$$D_{\max} = d_0 + 2 \cdot (H-o)$$

Biflex inverted tooth chain drives

The highest flexibility possible—symmetrically toothed link plates on both sides yield equal performance and precision during bilateral use. It's the ideal solution for changes in direction of rotation or for multi-shaft drives.



More freedom with BIFLEX inverted tooth chains

BIFLEX link plates are completely symmetrical and provide full interlocking with the sprockets on both sides.

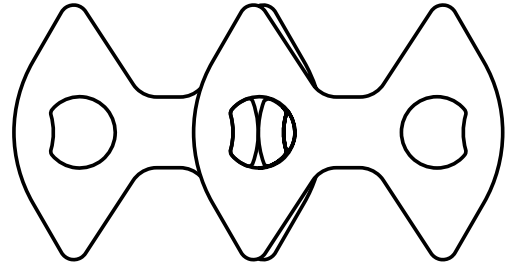
- As a drive for counter-running shafts
- As a drive for any number of shafts using an S-shaped wrap
- As an alternative to tensioning the inverted tooth chain when space is tight—idler sprockets can mesh on both sides
- As a drive along the lines of the pin wheel principle with tangential engagement



Flexible to both sides

A balanced combination

- Uses the same joint profile as the HDL model
- Pivot pins are arranged symmetrically. These move to the center in tensioned chains, thereby permitting the same amount of bending in each direction
- Joints experience longitudinal play in straight position, i.e., the chain links can be pushed together slightly. This play is essential for the function, but the compression effect does not appear in practice due to missing pressure forces



Power:

$$P = \frac{M \cdot n}{9550}$$

Velocity:

$$v = \frac{Z \cdot p \cdot n}{60000} \leq 40 \text{ m/s}$$

P	=	power in kW	p	=	pitch in mm
M	=	torque in Nm	Note: Torque M and speed n must refer to the same sprocket with the number of teeth Z.		
n	=	speed in r.p.m.			
v	=	velocity in m/s			
Z	=	number of teeth			

This chain connects the advantages of the well-established HDL technology with equivalent properties for both sides and directions.

Design breaking load

step 1:

$$F_{\text{Berf}}^* \geq \frac{P \cdot k}{v} \cdot S_{\text{min}}$$

How to calculate the required design breaking load:

1. Initial calculation according to step 1.
2. Select an inverted tooth chain from the table on page 14.
3. Recalculate according to step 2 and select again if necessary.

F_{Berf}	=	design breaking load in kN	The impact factor must be adjusted to the actual torque in case of maximum speed. In general, a value of $k = 1$ is sufficient, deviating from the start-up behavior.
P	=	power in kW	
k	=	impact factor according to table	
v	=	velocity in m/s	
G	=	inverted tooth chain weight in kg/m	
S_{min}	=	type/application-dependent safety coefficient Biflex = 8...10	

Design breaking load

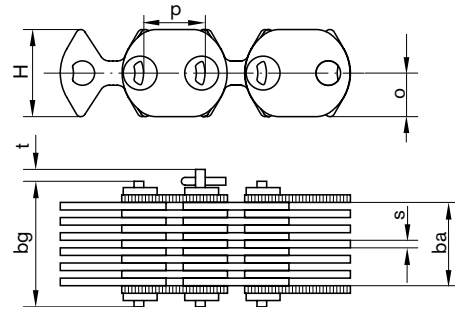
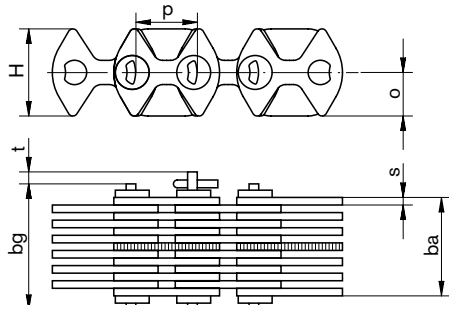
step 2:

$$F_{\text{Berf}} \geq \left(\frac{P \cdot k}{v} + G \cdot v^2 \cdot 10^{-3} \right) \cdot S_{\text{min}}$$

Design impact factor values

Load	Drive motors		
	Soft startup drive	Three-phase current motor	Piston motor
Even	1.0	1.2	1.5
Medium impacts	1.3	1.5	2.0
Heavy impacts	≥ 1.7	≥ 2.0	≥ 2.5

Biflex inverted tooth chains

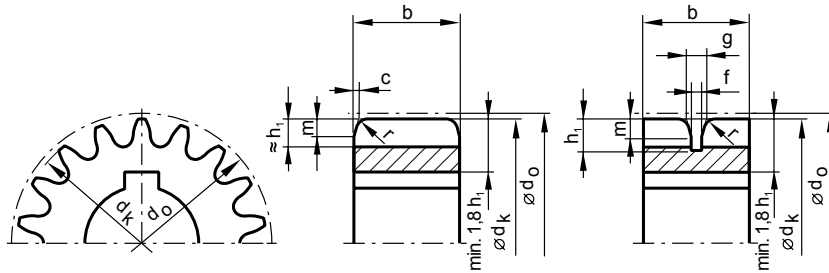


Pitch p	Designation no.	RZ	Nominal width b_n	Working width b_s	Total width b_g	Design breaking load	Weight [kg/m]	Sprocket width b	H	o	s	t
3/8" = 9.525 mm	BIZ 015 A	10	15	12.5	19.9	16.4	0.9	11.5	14.0	7.0	1.5	2.0
	BIZ 020 A	13	20	17.2	24.5	20.1	1.2	16.0				
	BIZ 025	17	25	26.6	30.8	31.0	1.4	30.0				
	BIZ 030	21	30	32.9	37.1	38.3	1.8	35.0				
	BIZ 040	25	40	39.1	43.3	45.6	2.1	45.0				
	BIZ 050	33	50	51.6	55.8	60.3	2.8	55.0				
	BIZ 065	41	65	64.2	68.4	74.9	3.5	70.0				
1/2" = 12.7 mm	BIZ 315 A	10	15	12.5	21.3	27.9	1.2	11.5	18.0	9.0	1.5	2.5
	BIZ 320 A	13	20	17.2	25.9	34.1	1.6	16.0				
	BIZ 325	17	25	26.6	32.2	52.7	1.9	30.0				
	BIZ 330	21	30	32.9	38.5	65.1	2.4	35.0				
	BIZ 340	25	40	39.1	44.7	77.5	2.8	45.0				
	BIZ 350	33	50	51.6	57.2	102.3	3.7	55.0				
	BIZ 365	41	65	64.2	69.8	127.2	4.6	70.0				
	BIZ 375	49	75	76.7	82.3	152.0	5.5	80.0				
	BIZ 380	53	80	82.9	88.5	164.4	5.9	85.0				
	BIZ 3100	65	100	101.7	107.3	201.6	7.3	105.0				
	BIZ 3125	81	125	126.8	132.4	251.3	9.1	130.0				
	BIZ 3150	97	150	151.8	157.4	300.9	10.9	155.0				
3/4" = 19.05 mm	BIZ 530 A	15	30	27.0	38.2	77.3	3.5	26.0	27.0	13.5	2.0	3.5
	BIZ 535	17	35	35.4	42.4	101.1	3.8	40.0				
	BIZ 550	25	50	52.0	59.0	148.7	5.6	55.0				
	BIZ 565	33	65	68.6	75.6	196.3	7.4	75.0				
	BIZ 585	41	85	85.3	92.3	243.9	9.2	90.0				
	BIZ 590	45	90	93.6	100.6	267.7	10.1	100.0				
	BIZ 5100	49	100	101.9	108.9	291.5	11.0	105.0				
	BIZ 5125	61	125	126.9	133.9	362.9	13.7	130.0				
	BIZ 5135	65	135	135.2	142.2	386.7	14.6	140.0				
	BIZ 5150	73	150	151.8	158.8	434.3	16.4	155.0				
	BIZ 5200	97	200	201.8	208.8	577.1	21.8	205.0				
1" = 25.4 mm	BIZ 640	13	40	40.2	48.2	151.9	5.8	45.0	36.0	18.0	3.0	
	BIZ 650	17	50	52.6	60.6	198.6	7.6	55.0				
	BIZ 665	21	65	65.0	73.0	245.4	9.4	70.0				
	BIZ 675	25	75	77.4	85.4	292.1	11.2	80.0				
	BIZ 6100	33	100	102.1	110.1	385.6	14.8	105.0				
	BIZ 6125	41	125	126.9	134.9	479.1	18.4	130.0				
	BIZ 6150	49	150	151.7	159.7	572.6	22.0	155.0				
	BIZ 6200	65	200	201.2	209.2	759.6	29.2	205.0				

Dimensions in mm – Design breaking load in kN – RZ (Number of rows) = number of all link plates per joint – Other pitches and widths on request.

■ Biflex inverted tooth chains are delivered open and with a split pin lock if not specified otherwise. ■ Revolving chains require an even number of links. Chains with an uneven number of links could not be closed. ■ Uneven numbers of links are permitted only if the ends of the chain are connected to external parts.

Biflex inverted tooth sprockets



Minimum number of teeth:

3/8", 1/2", 3/4" = 18 teeth

1" = 19 teeth

Z ≥ 23 is preferred.

Use smaller numbers of teeth only on sprockets which transfer torque at velocities up to v = 1 m/s.

Tip diameter d_k				
Number of teeth z	3/8"	1/2"	3/4"	1"
18	49.0	65.3	98.3	—
19	52.1	69.5	104.5	139.4
20	55.2	73.6	110.7	147.6
21	58.3	77.7	116.9	155.8
22	61.4	81.8	123.0	164.0
23	64.5	85.9	129.2	172.2
24	67.5	90.0	135.3	180.4
25	70.6	94.1	141.5	188.6
26	73.7	98.2	147.6	196.8
27	76.7	102.3	153.7	204.9
28	79.8	106.4	159.8	213.1
29	82.9	110.5	166.0	221.3
30	85.9	114.6	172.1	229.4
31	89.0	118.7	178.2	237.6
33	95.1	126.8	190.4	253.6
35	101.2	134.9	202.6	270.1
37	107.3	143.1	214.8	286.6
39	113.4	151.2	227.0	302.6
41	119.5	159.3	239.2	318.9
43	125.6	167.5	251.3	335.1
45	131.7	175.6	263.5	351.3
47	137.8	183.7	275.7	367.6
49	143.9	191.8	287.8	383.8
51	149.9	199.9	300.0	400.0
55	162.1	216.1	324.3	432.4
60	177.3	236.4	354.7	472.9
70	207.7	276.9	415.4	553.9
80	238.0	317.4	476.2	634.9
90	268.4	357.9	536.9	715.8
100	298.7	398.3	597.5	796.7
110	329.1	438.8	658.2	877.6
120	359.4	479.2	718.9	958.5
130	389.8	519.7	779.6	1039.4
140	420.1	560.1	840.2	1120.3
150	450.4	600.6	900.9	1201.2

Guideway and profile				
Pitch p	3/8"	1/2"	3/4"	1"
g	4.0	4.0	5.0	8.0
f	3.0	3.0	4.0	6.0
h ₁	5.5	7.0	11.0	14.0
m	4.0	5.0	8.0	9.0
r	2.0	2.0	3.0	3.0
c	0.5	0.5	0.5	1.0

The pitch circle diameter helps determine the correct external diameter of the sprocket with an attached chain in new condition.

Pitch circle diameter:

$$d_0 = \frac{p}{\sin(180^\circ/z)}$$

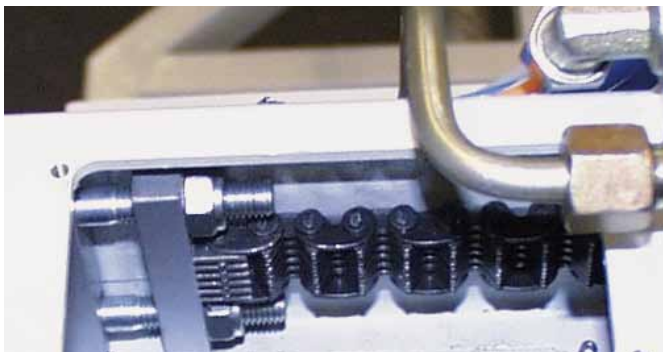
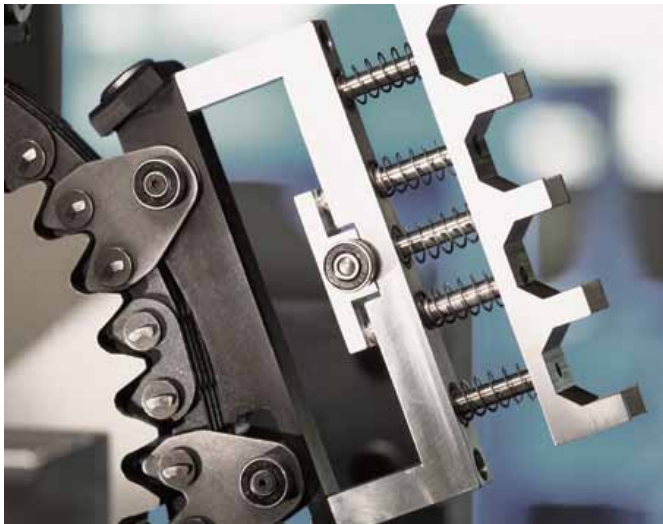
Max. diameter incl. chain:

$$D_{\max} = d_0 + 2 \cdot (H-o)$$

Specific solutions with specific variants

Special components

- Special links are easily integrated as drivers or incremental transducers.
- Parts from other manufacturers can be easily incorporated using special link plates or adapter pieces.



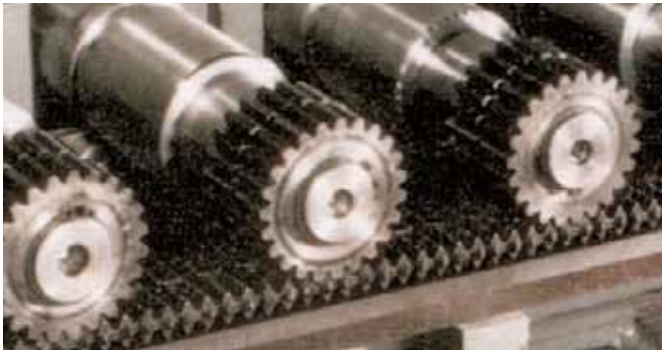
Special types

- Made from stainless steel
- With specially treated surfaces
- For clean room applications
- Special joints for inverted tooth chains without rigid backing



Specific solutions for specific tasks

Special applications



Roller table drive applications

- Cost-efficient group drive
- Uniform synchronous running
- No backlash when reversing
- Quiet even at high speeds
- Good meshing conditions minimize wear



Gear rim applications

- More cost-efficient than a milled gear rim
- Suitable for large transmission ratios
- Full circle rotary motion or swivel motion along an angle segment possible in reverse or continuously



Gripper and robot drive applications

- Precise synchronized motion
- High load capacity even at narrow widths
- Optimum meshing depth on the toothing provides a high degree of security against skipping



Flexible shaft coupling applications

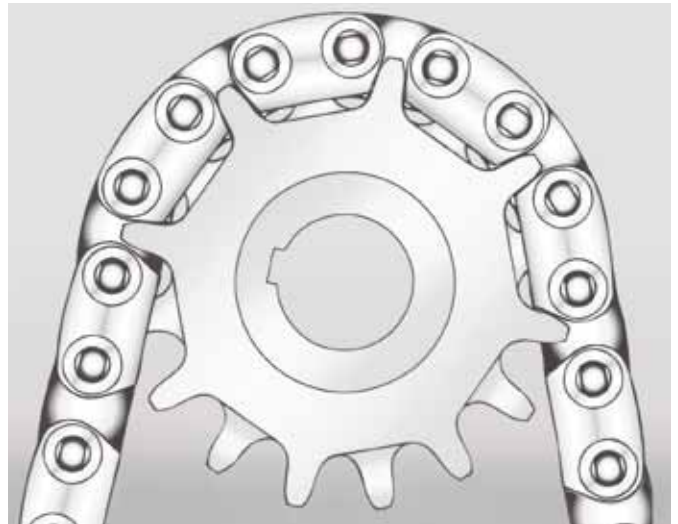
- High elasticity
- Uncouples quickly by opening the lock or by axial movement while chain stays closed
- Angles can be shifted to 1° and shafts can be shifted radially to 2% of the pitch

Specific solutions for specific applications

Special designs – when the ordinary is no longer sufficient

CC compact inverted tooth chains

- Chain links made from solid link plate blocks of maximum durability
- Sprockets with involute-toothing in special versions
- Intended for slow runners with the highest possible power density
- Available in many sizes and models from 3/8" to 2 1/2" pitch, in special pitches up to 5"
- Also available with HPC pivot pins or round bolts—chains either have rigid backing or can be bent over both sides



Tow chains

- Able to transfer heavy tensile loads while small in size
- Product carriers can be coupled by integrated sleeves or workpiece support using integrated bolts
- Particularly low height when installed in horizontal position
- Unmeshed cover link plates can provide screening



Pusher tooth chains

- Thrusts transmitted via link plate contact surface
- Involute-toothing creates ideal meshing conditions on the sprocket
- For especially quiet stroke drives

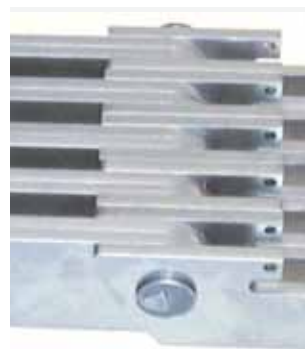
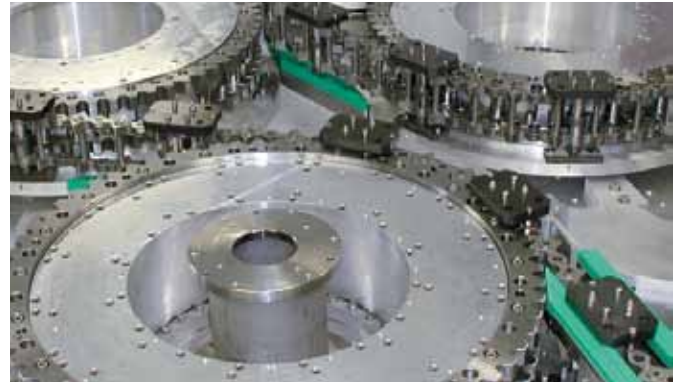


Optimally configured for special applications

Special inverted tooth chains in special pitches

Combine inverted tooth chain components or specific product advantages to customized solutions, e.g.:

- Low-wear rolling pivot joint to increase velocity
- Compact link plate construction to maximize power transmission
- Involute-toothing on sprockets for extremely quiet running



- ▶ Special link plate forms optimized for the application; complex geometries through cutting-edge manufacturing processes

Advantages of using AVENTICS inverted tooth chain solutions over the alternatives...

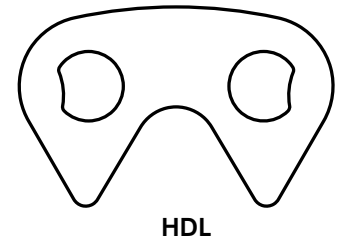
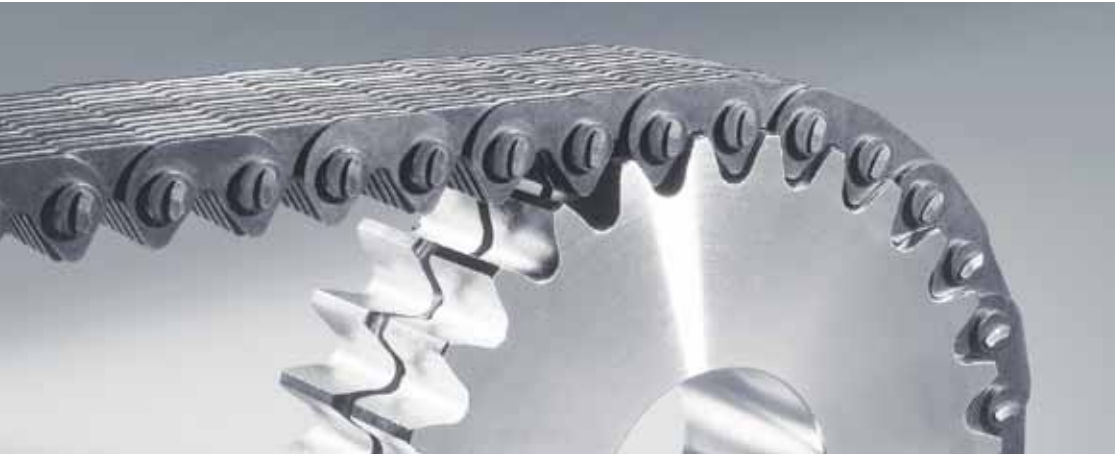
... customer's own design

- ✓ Cost savings
- ✓ Development capacity freed up
- ✓ Comprehensive cross-sector expertise from nearly 100 years of development activities

... standard solutions based on roller chains

- ✓ Higher quality tooth meshing and quieter running
- ✓ Less elongation
- ✓ Increased permissible speed
- ✓ Less requirements regarding lubrication and maintenance

HDL inverted tooth chain drives



The first optimization: Inverted tooth chains type HDL

Improvements to the link plate form and joint kinematics compared to the KH type help transfer larger forces within smaller spaces and enable velocities of up to 40 m/s. An important milestone on the road towards the HPC type.

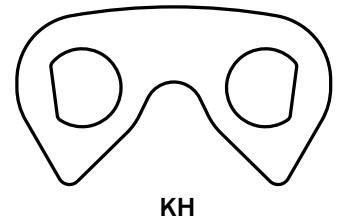


A tradition of quality

Our inverted tooth chains are always state-of-the-art. HDL inverted tooth chain drives have set numerous records and even today are considered an efficient solution for specific applications.

"Aerodynamic Research Volkswagen" – A trial vehicle equipped with a high-performance inverted tooth chain drive has set a number of world records.

KH inverted tooth chain drives



The forefather of drive chains with a rolling pivot joint

KH model inverted tooth chains set the stage for the triumph of inverted tooth chain drives in demanding applications. Available in pitches from 5/16" to 2" as a standard design in many older systems. Also available as a special 2 1/2" design for heavy-duty drives and slow running machines (e.g. KH 11350, 2 1/2" x 350 mm). Please get in touch with us if you would like more information.

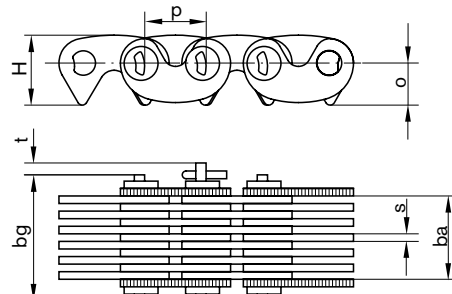
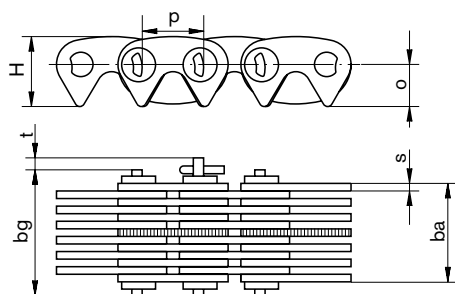


A tradition of quality

Our inverted tooth chains have always been at the front of the pack when it comes to moving large objects. Even today, KH inverted tooth chains are still used in special applications.

During the construction of the Elbe tunnel in Hamburg, KH inverted tooth chains were put to work as the gear rim for the tunneling machine.

HDL inverted tooth chains

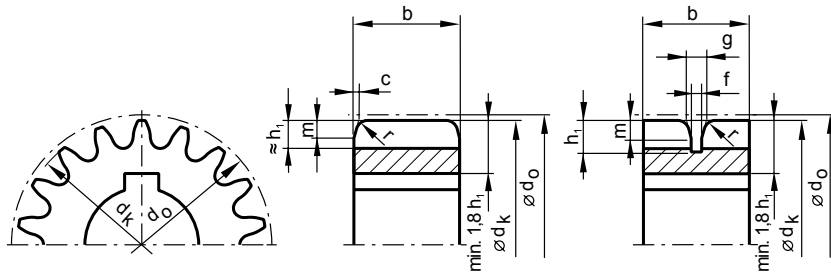


Pitch p	Designation no.	RZ	Nominal width b_n	Working width b_s	Total width b_g	Design breaking load	Weight [kg/m]	Sprocket width b	H	o	s	t
3/8" = 9.525 mm	HDL 015 A	10	15	12.5	19.9	14.5	0.9	11.5	10.9	6.7	1.5	2.0
	HDL 020 A	13	20	17.2	24.5	17.7	1.1	16.0				
	HDL 025	17	25	26.6	30.8	27.4	1.4	30.0				
	HDL 030	21	30	32.9	37.1	33.9	1.7	35.0				
	HDL 040	25	40	39.1	43.3	40.3	2.0	45.0				
	HDL 050	33	50	51.6	55.8	53.2	2.6	55.0				
	HDL 065	41	65	64.2	68.4	66.2	3.3	70.0				
1/2" = 12.7 mm	HDL 315 A	10	15	12.5	21.3	20.2	1.1	11.5	14.5	8.7	1.5	2.5
	HDL 320 A	13	20	17.2	25.9	24.7	1.4	16.0				
	HDL 325	17	25	26.6	32.2	38.2	1.8	30.0				
	HDL 330	21	30	32.9	38.5	47.3	2.2	35.0				
	HDL 340	25	40	39.1	44.7	56.3	2.6	45.0				
	HDL 350	33	50	51.6	57.2	74.3	3.4	55.0				
	HDL 365	41	65	64.2	69.8	92.3	4.3	70.0				
	HDL 375	49	75	76.7	82.3	110.3	5.1	80.0				
	HDL 3100	65	100	101.7	107.3	146.4	6.7	105.0				
3/4" = 19.05 mm	HDL 530 A	15	30	27.0	38.2	59.6	3.3	26.0	21.0	10.7	2.0	3.5
	HDL 535	17	35	35.4	42.4	78.0	3.7	40.0				
	HDL 540	21	40	43.7	50.7	96.3	4.5	50.0				
	HDL 550	25	50	52.0	59.0	114.7	5.4	55.0				
	HDL 565	33	65	68.6	75.6	151.4	7.1	75.0				
	HDL 585	41	85	85.3	92.3	188.1	8.9	90.0				
	HDL 5100	49	100	101.9	108.9	224.9	10.6	105.0				
	HDL 5125	61	125	126.9	133.9	279.9	13.2	130.0				
	HDL 5150	73	150	151.8	158.8	335.0	15.8	155.0				
	HDL 5200	97	200	201.8	208.8	445.2	20.9	205.0				
1" = 25.4 mm	HDL 640	13	40	40.2	48.2	112.1	5.6	45.0	27.7	14.0	3.0	6.0
	HDL 650	17	50	52.6	60.6	146.6	7.3	55.0				
	HDL 665	21	65	65.0	73.0	181.1	9.0	70.0				
	HDL 675	25	75	77.4	85.4	215.6	10.7	80.0				
	HDL 6100	33	100	102.1	110.1	284.7	14.1	105.0				
	HDL 6125	41	125	126.9	134.9	353.7	17.5	130.0				
	HDL 6150	49	150	151.7	159.7	422.7	21.0	155.0				
	HDL 6200	65	200	201.2	209.2	560.7	27.8	205.0				

Dimensions in mm – Design breaking load in kN – RZ (Number of rows) = number of all link plates per joint – Other pitches and widths on request.

■ HDL inverted tooth chains are delivered open and with a split pin lock if not specified otherwise. ■ Revolving chains require an even number of links. Chains with an uneven number of links could not be closed. ■ Uneven numbers of links are permitted only if the ends of the chain are connected to external parts.

HDL inverted tooth sprockets



Minimum number of teeth:
The theoretical minimum is 17, but
in practice, it should not be below
23 teeth.

Tip diameter d_k				
Number of teeth z	3/8"	1/2"	3/4"	1"
17	48.1	63.9	100.7	134.3
18	51.2	68.0	106.9	142.6
19	54.3	72.2	113.1	150.8
20	57.4	76.3	119.3	159.1
21	60.5	80.4	125.5	167.3
22	63.5	84.6	131.6	175.5
23	66.6	88.7	137.8	183.7
24	69.7	92.8	143.9	191.9
25	72.8	96.9	150.0	200.1
26	75.8	101.0	156.2	208.3
27	78.9	105.0	162.3	216.4
28	82.0	109.1	168.4	224.6
29	85.0	113.2	174.5	232.7
30	88.1	117.3	180.7	240.9
31	91.2	121.4	186.8	249.0
33	97.3	129.5	199.0	265.3
35	103.4	137.7	211.2	281.6
37	109.5	145.8	223.4	297.9
39	115.6	153.9	235.6	314.1
41	121.7	162.1	247.8	330.3
43	127.8	170.2	260.0	346.6
45	133.9	178.3	272.1	362.8
47	139.9	186.4	284.3	379.0
49	146.0	194.5	296.4	395.3
51	152.1	202.6	308.6	411.5
55	164.3	218.9	332.9	443.9
60	179.5	239.1	363.3	484.4
70	209.9	279.6	424.0	565.4
80	240.2	320.1	484.8	646.4
90	270.6	360.6	545.5	727.3
100	300.9	401.1	606.1	808.2
110	331.3	441.5	666.8	889.1
120	361.6	482.0	727.5	970.0
130	391.9	522.4	788.2	1050.9
140	422.3	562.8	848.8	1131.8
150	452.6	603.3	909.5	1212.6

Guideway and profile				
Pitch p	3/8"	1/2"	3/4"	1"
g	4.0	4.0	5.0	8.0
f	3.0	3.0	4.0	6.0
h_1	6.0	7.0	12.0	15.0
m	4.0	5.0	8.0	10.0
r	2.0	2.0	3.0	3.0
c	0.5	0.5	0.5	1.0

The pitch circle diameter helps
determine the correct external diameter of the
sprocket with an attached chain in new condition.

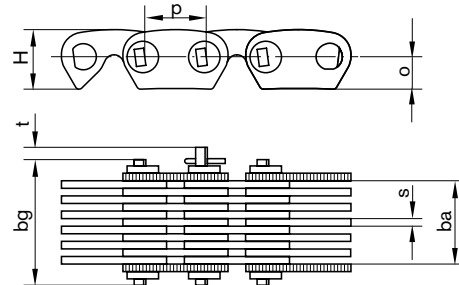
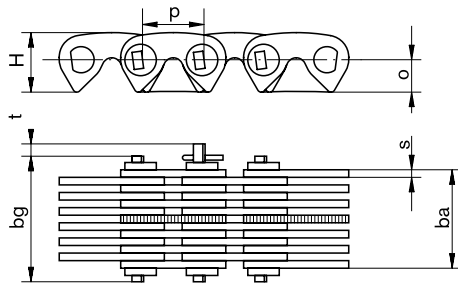
Pitch circle diameter:

$$d_0 = \frac{p}{\sin(180^\circ/z)}$$

Max. diameter incl. chain:

$$D_{\max} = d_0 + 2 \cdot (H-o)$$

KH inverted tooth chains

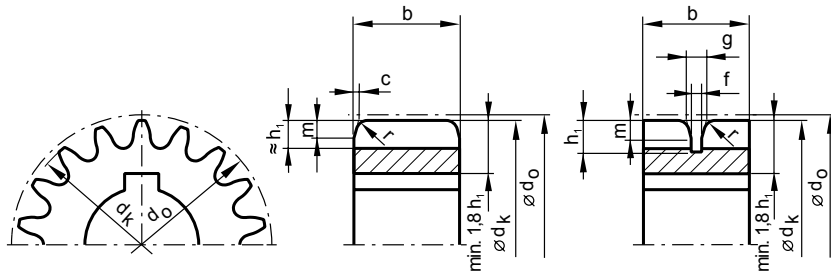


Pitch p	Designation no.	RZ	Nominal width b_n	Working width b_s	Total width b_g	Design breaking load	Weight [kg/m]	Sprocket width b	H	o	s	t
5/16" = 7.9375 mm	KH 2212 A	12	12	10.7	16.8	5.6	0.5	9.5	7.7	4.2	1.0	2.0
	KH 2215 A	14	15	12.8	18.9	6.6	0.6	11.5				
	KH 2220 A	18	20	17.0	23.2	8.6	0.7	15.5				
	KH 2225	25	25	26.6	30.6	12.7	0.9	30.0				
3/8" = 9.525 mm	KH 015 A	10	15	12.5	19.9	12.1	0.8	11.5	9.2	5.2	1.5	2.0
	KH 020 A	13	20	17.2	24.5	14.8	1.0	16.0				
	KH 025	17	25	26.6	30.8	22.9	1.1	30.0				
	KH 030	21	30	32.9	37.1	28.3	1.4	35.0				
	KH 040	25	40	39.1	43.3	33.7	1.7	45.0				
1/2" = 12.7 mm	KH 315 A	10	15	12.5	21.3	16.0	1.0	11.5	12.3	6.7	1.5	2.5
	KH 320 A	13	20	17.2	25.9	19.6	1.2	16.0				
	KH 325	17	25	26.6	32.2	30.3	1.4	30.0				
	KH 330	21	30	32.9	38.5	37.4	1.8	35.0				
	KH 340	25	40	39.1	44.7	44.6	2.1	45.0				
	KH 350	33	50	51.6	57.2	58.9	2.8	55.0				
5/8" = 15.875 mm	KH 425	13	25	27.0	32.8	39.7	1.9	30.0	15.4	8.4	2.0	3.0
	KH 435	17	35	35.4	41.2	52.0	2.5	40.0				
	KH 450	25	50	52.0	57.8	76.5	3.6	55.0				
	KH 465	33	65	68.6	74.4	100.9	4.8	70.0				
3/4" = 19.05 mm	KH 535	17	35	35.4	42.4	65.0	2.9	40.0	18.5	10.1	2.0	3.5
	KH 550	25	50	52.0	59.0	95.6	4.3	55.0				
	KH 565	33	65	68.6	75.6	126.2	5.7	75.0				
	KH 575	37	75	77.0	84.0	141.5	6.4	80.0				
1" = 25.4 mm	KH 650	17	50	52.6	60.6	126.4	5.9	55.0	24.6	13.1	3.0	4.0
	KH 665	21	65	65.0	73.0	156.1	7.3	70.0				
	KH 675	25	75	77.4	85.4	185.9	8.7	80.0				
	KH 6100	33	100	102.1	110.1	245.4	11.4	105.0				
1 1/2" = 38.1 mm	KH 865	21	65	65.2	77.2	232.0	10.8	75.0	36.9	20.1	3.0	6.0
	KH 875	25	75	77.6	89.6	276.2	12.9	85.0				
	KH 8100	33	100	102.5	114.5	364.6	17.0	110.0				
	KH 8150	49	150	152.1	164.1	541.4	25.2	160.0				
2" = 50.8 mm	KH 9100	25	100	104.5	117.5	478.1	22.6	110.0	49.2	26.8	4.0	7.0
	KH 9115	29	115	121.2	134.2	554.6	26.2	125.0				
	KH 9150	37	150	154.7	167.7	707.6	33.5	160.0				
	KH 9180	45	180	188.1	201.1	860.6	40.7	190.0				

Dimensions in mm – Design breaking load in kN – RZ (Number of rows) = number of all link plates per joint – Other pitches and widths on request.

■ KH inverted tooth chains are delivered open and with a split pin lock if not specified otherwise. ■ Uneven numbers of links are permitted for revolving chains. However, in this case the design breaking load will be reduced to approx. 80% of the value in the table. ■ Uneven numbers of links are also permitted if the ends of the chain are connected to external parts.

KH inverted tooth sprockets



Minimum number of teeth:
 5/16" to 3/4" = 13 teeth
 from 1" = 15 teeth

Tip diameter d_k								
Number of teeth z	5/16"	3/8"	1/2"	5/8"	3/4"	1"	1 1/2"	2"
13	31.9	38.6	51.5	64.4	77.2	—	—	—
14	34.5	41.7	55.6	69.5	83.4	—	—	—
15	37.1	44.8	59.7	74.6	89.6	119.4	179.2	238.9
16	39.7	47.9	63.8	79.8	95.7	127.6	191.5	255.4
17	42.3	51.0	67.9	84.9	101.9	135.8	203.8	271.7
18	44.9	54.0	72.0	90.0	108.0	144.0	216.0	288.1
19	47.4	57.1	76.1	95.1	114.1	152.2	228.3	304.4
20	50.0	60.1	80.1	100.2	120.2	160.3	240.5	320.7
21	52.5	63.2	84.2	105.3	126.3	168.5	252.7	337.0
22	55.1	66.3	88.3	110.4	132.4	176.6	264.9	353.3
23	57.7	69.3	92.3	115.4	138.5	184.7	277.1	369.5
24	60.2	72.3	96.4	120.5	144.6	192.9	289.3	385.8
25	62.8	75.4	100.5	125.6	150.7	201.0	301.5	402.1
26	65.3	78.4	104.5	130.7	156.8	209.1	313.7	418.3
27	67.8	81.5	108.6	135.8	162.9	217.3	325.9	434.6
28	70.4	84.5	112.7	140.8	169.0	225.4	338.1	450.8
29	72.9	87.6	116.7	145.9	175.1	233.5	350.3	467.0
30	75.5	90.6	120.8	151.0	181.2	241.6	362.4	483.3
31	78.0	93.7	124.8	156.1	187.3	249.7	374.6	499.5
33	83.1	99.8	133.0	166.2	199.5	266.0	399.0	532.0
35	88.2	105.8	141.1	176.3	211.6	282.2	423.3	564.4
37	93.2	111.9	149.2	186.5	223.8	298.4	447.6	596.8
39	98.3	118.0	157.3	196.6	235.9	314.6	471.9	629.2
41	103.4	124.1	165.4	206.7	248.1	330.8	496.2	661.6
43	108.4	130.1	173.5	216.9	260.2	347.0	520.5	694.0
45	113.5	136.2	181.6	227.0	272.4	363.2	544.8	726.4
47	118.6	142.3	189.7	237.1	284.5	379.4	569.1	758.8
49	123.7	148.4	197.8	247.2	296.7	395.6	593.4	791.2
51	128.7	154.5	205.9	257.3	308.8	411.8	617.7	823.6
55	138.8	166.6	222.1	277.6	333.1	444.1	666.2	888.3
60	151.5	181.7	242.3	302.9	363.4	484.6	726.9	969.3
70	176.8	212.1	282.7	353.4	424.1	565.5	848.3	1131.1
80	202.1	242.4	323.2	404.0	484.8	646.4	969.7	1292.9
90	227.4	272.8	363.6	454.6	545.5	727.3	1091.0	1454.7
100	252.7	303.1	404.1	505.1	606.1	808.2	1212.3	1616.4
110	277.9	333.5	444.5	555.6	666.8	889.0	1333.6	1778.1
120	303.2	363.7	484.9	606.2	727.4	969.9	1454.9	1939.9
130	328.5	394.3	525.4	656.8	788.1	1050.8	1576.2	2101.7
140	353.7	424.6	565.8	707.3	848.8	1131.7	1697.6	2263.4
150	379.0	454.7	606.2	757.8	909.4	1212.5	1818.8	2425.1

Guideway and profile				
Pitch p	5/16"	3/8"	1/2"	5/8"
g	3.5	4.0	4.0	5.0
f	2.5	3.0	3.0	4.0
h_1	5.0	6.5	8.0	10.0
m	3.0	4.0	5.0	6.0
r	2.0	2.0	2.0	3.0
c	0.5	0.5	0.5	0.5

Guideway and profile				
Pitch p	3/4"	1"	1 1/2"	2"
g	5.0	8.0	9.0	11.0
f	4.0	6.0	6.0	8.0
h_1	12.0	16.0	23.0	31.0
m	8.0	10.0	16.0	20.0
r	3.0	3.0	4.0	4.0
c	0.5	1.0	1.5	1.5

The pitch circle diameter helps determine the correct external diameter of the sprocket with an attached chain in new condition.

Pitch circle diameter:

$$d_0 = \frac{p}{\sin(180^\circ/z)}$$

Max. diameter incl. chain:

$$D_{\max} = d_0 + 2 \cdot (H - o)$$

Calculate, order, assemble – Simple and well thought out

Calculating the length

The required length of an inverted tooth chain in links to fit a given center distance can be calculated with the formula provided.

Shaft center distance

With the exception of the KH type, continuous chains can only be closed if they have an even number of links. After selecting the number of links based on the calculated length, the final center distance can be determined.

The formulas shown apply only to drives with two sprockets which comply with the recommended wrap angle and transmission ratios below 6. We are more than happy to perform the calculations for you, especially for drives involving more than two sprockets. It goes without saying that other commercially available computing programs can also be used.

Calculating length:

$$X = 2 \cdot \frac{a}{p} + Z \quad ; \text{ for } i = 1$$

$$X = 2 \cdot \frac{a}{p} + \frac{Z_1 + Z_2}{2} + \left(\frac{Z_2 - Z_1}{2 \cdot \pi} \right)^2 \cdot \frac{p}{a}$$

Shaft center distance:

$$a = \frac{p}{2} \cdot (X - Z) \quad ; \text{ for } i = 1$$

$$a = \frac{p}{4} \cdot \left[X - \frac{Z_1 + Z_2}{2} + \sqrt{\left(X - \frac{Z_1 + Z_2}{2} \right)^2 - 8 \cdot \left(\frac{Z_2 - Z_1}{2 \cdot \pi} \right)^2} \right]$$

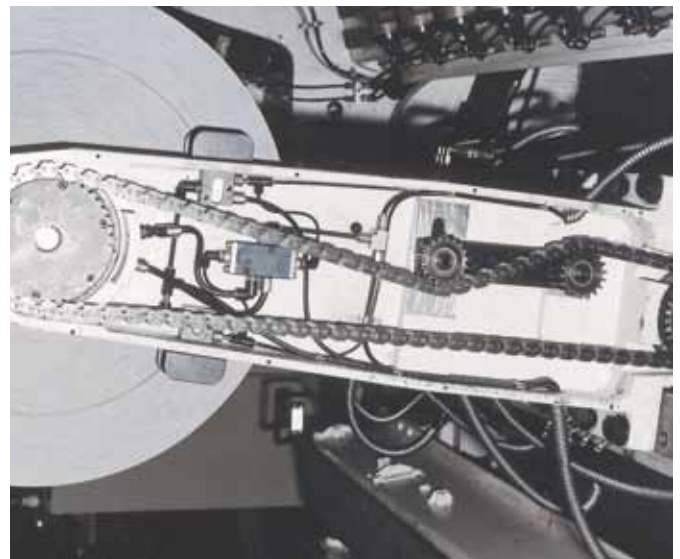
X	=	number of links	Z ₁	=	number of teeth on the small sprocket
a	=	shaft center distance in mm	Z ₂	=	number of teeth on the large sprocket
p	=	pitch in mm			
Z	=	number of teeth Z = Z ₁ = Z ₂			
		for i = 1			
i	=	transmission ratio			

Sales designations for inverted tooth chain drives

1. Type marking HPC BIZ HDL KH	2. Pitch 22 = 5/16" 0 = 3/8" 3 = 1/2" 4 = 5/8" 5 = 3/4" 6 = 1" 8 = 1 1/2" 9 = 2" 11 = 2 1/2"	3. Nominal width in mm	4. Version marking (optional) A = External guide Z = Version with reinforcement plates D = Double link plates
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The inverted tooth chains shown in the tables are a mere selection from our product range. Please get in touch with us if you need a width or pitch not listed here.

For additional information, pls. visit our online catalog www.aventics.com/toothchain-catalog



What to observe

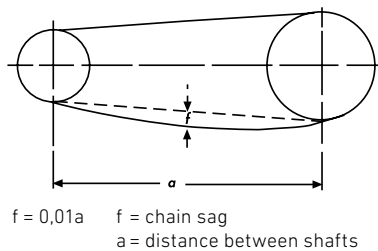
Sprocket wrap angle

For a proper function of inverted tooth chain drives, a minimum sprocket wrap angle of $\beta = 120^\circ$ must be observed for up to 27 teeth. If more teeth are used, the wrap angle must be at least $\beta = 90^\circ$. The minimum wrap angle of the idler sprocket should be at least: $\beta = 360^\circ/Z$ (Z = number of teeth)

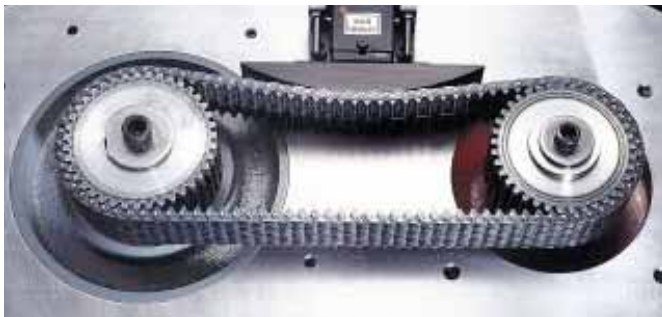
Please get in touch with us if you have other operating conditions or require tangential meshing.

Inverted tooth chain tensioning and sag

Pre-tensioning of inverted tooth chains generally is not necessary. The chain has been properly installed when the return strand sags 1% of the distance between the shafts while the loaded chain is running.

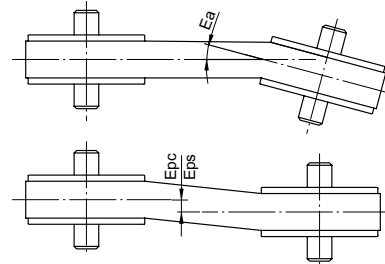


Excess chain slack must be corrected by spacing the shafts farther apart or by using an idler sprocket. In the return strand, idlers are arranged working outwards; in Biflex inverted tooth chains, the wheels also work from outwards to inwards.



▲ It is also possible to use sliding rails to tension the inverted tooth chains on the backside. The bending radius for HPC inverted tooth chains should be at least 30 times the pitch used. A factor of 20 is sufficient for all other types of inverted tooth chains.

Sprocket assembly



The sprockets must be parallel to each other.

Permissible error $E_a \leq 1^\circ$

The sprockets must be aligned correctly.

Permissible error

- With center guides:
 $E_{pc} \leq \text{guideway width } f_{\max} - \text{link plate thickness } s_{\min}$
- With side guides:
 $E_{ps} \leq \text{working width } b_{A\min} - \text{sprocket width } b_{\max}$

The axial play on the sprockets must be minimized.

Adjusting and re-tensioning

If pre-tensioning is needed to prevent backlash on reversible drives, the longest strand does not sag when properly adjusted. However, it can be forced manually to up to $\pm 2\%$ of the distance between the shafts. After initial start-up, the chain experiences a first elongation phase. Since this process is based on loads, the chain length, speed, and other factors, it is impossible to predict how long this initial elongation will last. It is quite possible that re-tensioning will be necessary after a short running-in period. Later re-tensioning can be performed as needed (elongation due to operating is substantially less). Shorter distances between shafts and consistent direction of loaded travel eliminate the need for re-tensioning. Applications which do not feature the option of re-tensioning or lack sufficient tensioning space can also use inverted tooth chains elongated at the factory. This is a special process which preempts initial elongation before the chain is delivered..

Applying, closing, shortening and lengthening

Assembling inverted tooth chains

Inverted tooth chains are normally delivered open and can be closed with the accompanying split pin or rivet pin lock after installation. If needed, inverted tooth chains can be supplied endless riveted; in such cases, ensure that the chain can be laid on the sprockets without any problems before assembly begins. Continuous drives require an even number of links—otherwise the ends of the inverted tooth chain will not meet. An uneven number of links is permitted only on inverted tooth chains in which the ends of the chain are connected to external parts such as adapter pieces or tension locks. Please do not deviate from the instructions given below—they are the prerequisites for the chain drive's trouble-free operation, quiet running, and long service life.



Applying and closing inverted tooth chains with two-pin system

The inverted tooth chain is laid around the sprockets so that both ends can meet in the tothing and mesh with each other if possible. Axle and rolling pivots are consecutively fed into the link plate bore. Important: a wrong pin arrangement can disturb quiet running and can even cause the chain to break under certain circumstances. The rivet washer is then applied, the cotter pin is inserted and closed; rivet closures are riveted manually. The tightness of the rivet washer is an intentional security measure and must not be tampered with by modifying the pin end. Always remember to arrange the axle pins and pivot pins properly.

Shortening and lengthening chains/Note the correct pin assembly



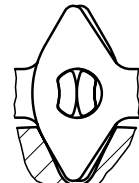
HPC



HDL



KH



Biflex

- Open the split pin to open the inverted tooth chain.
- Remove the rivet washer and pull the pin from the joint.
- Grind the rivet head off in case of riveted lock.
- To shorten, proceed in the same manner on the other end of the section to be removed.
- Join the ends and close the inverted tooth chain.

- It is important to pay attention to the correct number and orientation of the link plates.
- To lengthen, join the ends of the section to be inserted with the ends of the inverted tooth chain. Close them as described above with the accompanying split pins or rivet pin locks.

The right lubrication

A well-lubricated inverted tooth chain

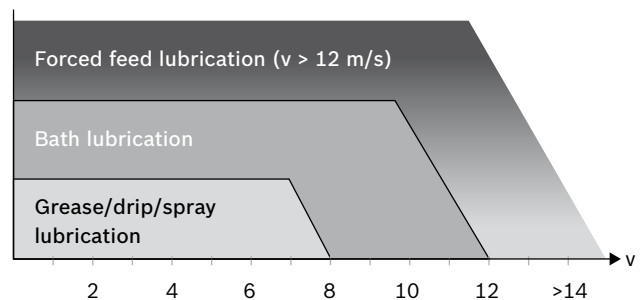
A dry-running chain can experience a much shorter service life. The oil film placed on the chain at the factory is for corrosion protection only and does not act as a lubricant. The type of lubrication is based primarily on the circumferential speed of the inverted tooth chain and can be determined using the diagram below. However, this system does not adequately cover drive cases with an extremely wide range of speed profiles or which operate under harsh ambient conditions. When in doubt, please get in touch with us.



Lubricants

Lubricants in use should generally have a viscosity of at least 220 mm²/s (cSt) according to DIN 51562-01. We also especially recommend for open inverted tooth chain drives the use of sprays such as VISCOGEN KL-23 or comparable. Of course, conventional grease lubrication is also an option although its low creep characteristics may not be sufficient for the required joint lubrication. When in doubt, just let us know – we will check the lubricant you have selected any time. We are also happy to recommend lubricants for special applications – in the food industry or for high-temperature applications, for instance.

Lubrication dependent on inverted tooth chain velocity (v in m/s)



Grease, drip, and spray lubrication

Lubrications with greases capable of flowing, oils with good adhesive and creep characteristics, or lubricants thinned with volatile components. Lubricate regularly according to speed.

Bath lubrication

Lubrication by oil bath immersion. The inverted tooth chain should be set so that its joints are immersed at the deepest point when the chain is stopped.

Automatic lubrication device

Lubrication of the inverted tooth chain without oil-tight housing. Minimal amount of lubricant can be applied thanks to adjustable dosage. Lubricant is applied to the chain teeth using tubes and brushes. Up to one year of maintenance-free operation.

Forced feed lubrication

This requires closed, oil-tight housings. The inverted tooth chain lies above the oil basin and the spray nozzles are directed at the toothed side.

Customer service, engineering, design – Advantages you can dig your teeth into

Using the latest technical methods and field-specific knowledge needed for the customer's tasks, we calculate and develop the most suitable configuration. Inverted tooth chains and sprockets are perfectly adapted to each other.



Inverted tooth chains for conveying



Whether for heavy-duty, robust operation, or to convey parts with small or large dimensions, processed or unprocessed workpieces, or even fragile items: AVENTICS inverted tooth conveyor chains guarantees trouble-free operation of your conveying system.

These factors are met through the following pre-requisites:

- Low-friction rolling pivot joint made from case hardened steel and exhibiting a high degree of efficiency, resistance to wear, and durability
- Inverted tooth chain link plates with FE-optimized outlines made from high resistance heat-treated steel
- Sprockets featuring hardened involute toothing for smooth, impact-free meshing and a long service life

When compared to other conveyor systems, the advantages shine through:

- Optimum use of space due to maximum versatility as a modular system
- The proverbial quiet running; **in a word: silent chain**
- Extremely long service life and availability
- High temperature resistance
- Highly robust and durable



AVENTICS GmbH

Tooth Chain Drives
Zur Dessel 14
31028 Gronau (Leine), Germany
Tel. +49 5182 5870
Fax +49 5182 58730
toothchain@aventics.com
www.aventics.com/toothchain



Your Contact:

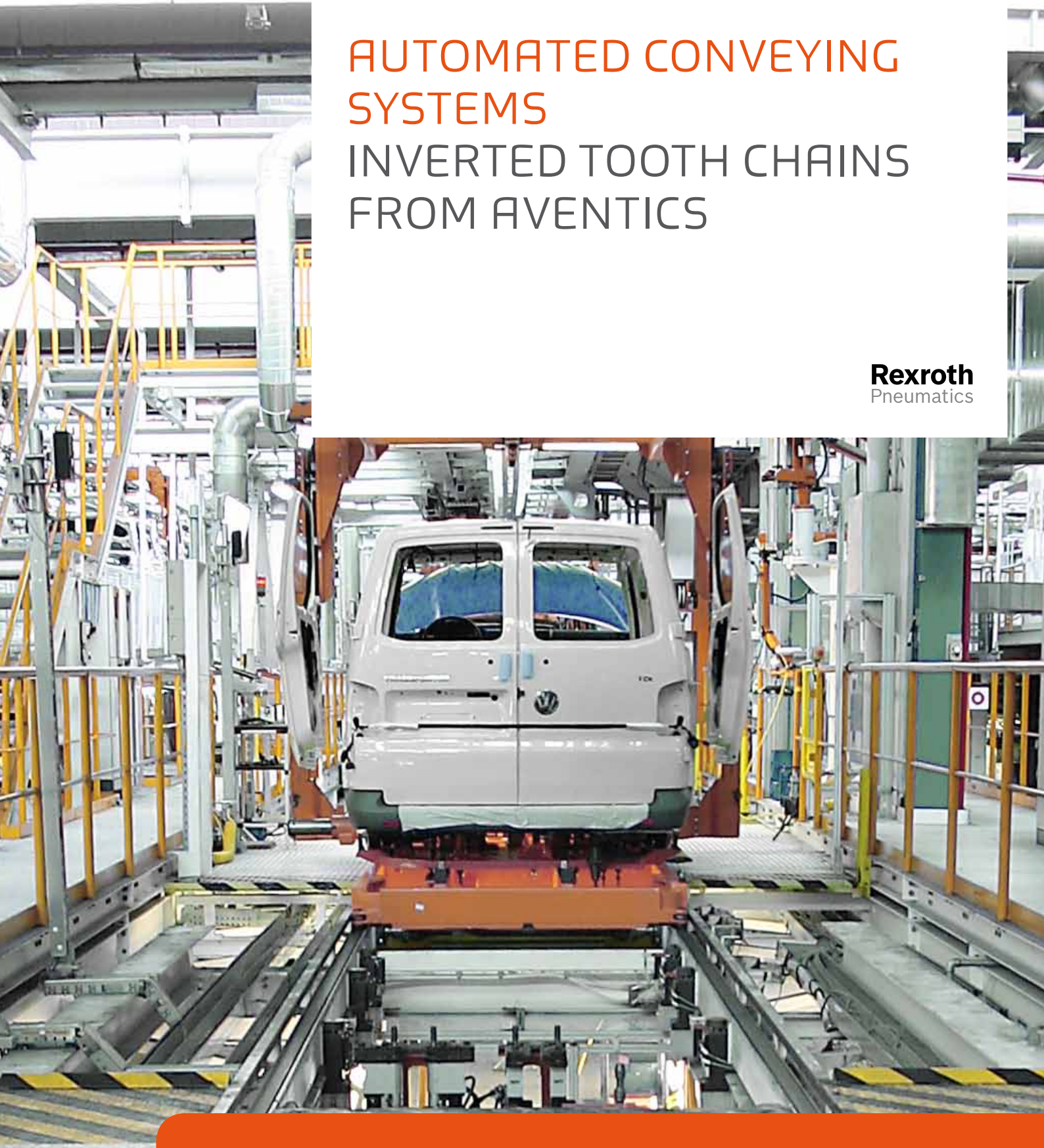
Further contacts:
www.aventics.com/contact

The data specified only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.



AUTOMATED CONVEYING SYSTEMS INVERTED TOOTH CHAINS FROM AVENTICS

Rexroth
Pneumatics





Our inverted tooth chains transport and convey products, workpieces, and materials securely and reliably, whether processed or unprocessed, large or small, light or heavy, bulky or round. AVENTICS inverted tooth conveyor chains guarantee success in every area.

The flexible solution for your conveying applications: Inverted tooth chains from AVENTICS

The technical variety of inverted tooth conveyor chains covers a wide range of applications. Whether for heavy-duty, robust operation, or to convey parts with small or large dimensions, processed or unprocessed workpieces, or even fragile items: An inverted tooth chain is the profitable solution for all types of use.

AVENTICS inverted tooth conveyor chains

The variable construction of an inverted tooth chain guarantees the optimal execution of the respective conveying task. Thanks to the multitude of available link plate forms, in many cases it's possible to fix the goods to be conveyed right onto the inverted tooth chain – without additional mechanisms.

Various pitches, link plate forms, and materials are available in order to make the right chain selection in terms of weight and ambient conditions.

- Space-saving and variable in type, design and width
- Slip-free and silent
- Functional reliability and extended service-life
- Robustness, simple assembly/disassembly

By significantly lengthening your replacement intervals, AVENTICS can also reduce your costs when it comes to the purchase of spare parts. Substantially extended equipment life and significantly reduced downtime – AVENTICS inverted tooth conveyor chains assure cost-effective production.

04 AVENTICS inverted tooth conveyor chains

- 04 Advantages, Characteristics, Types
- 08 Layout, Calculation

10 Technical data inverted tooth conveyor chains

- 10 2 x 1/2" with two-pin system
- 11 1/2" with two-pin system
- 12 1/2" with one-pin system
- 13 1" with one-pin/two-pin system

14 Additional information

- 14 Order codes, Specific solutions
- 16 Sprockets
- 18 Chain guides
- 19 Installation and maintenance

22 Product development



A distinguished conveying system

Inverted tooth chains for conveying and linkage systems provide optimum conveyor-belt systems. AVENTICS has extensive experience in this area. Economical, user-friendly solutions are the main priority for our conveying technology, which is unsurpassed in terms of service life and availability.

Inverted tooth conveyor chains from AVENTICS work slip-free and bring every part to the right location at the prescribed time

Depending on their type and shape, the workpieces sit either directly on the chains, on pallets, or on carrier devices that have been specially integrated into the chain. More than 500 different driver link plates are also available to help accomplish this task.

If required, uncomplicated and additional link plates for workpiece transport may be attached to the conveyor. Depending on their type and shape, products are transported directly on the inverted tooth chain that are designed according to the specific requirements. For special needs, inverted tooth chains are also available with smoothed surfaces. With the help of product carriers or pallets, bulky items are brought to the required position by two narrow inverted tooth chains. The inverted tooth chain features smooth and even running, a special advantage in case of difficult geometry, e.g. a high center of gravity.

- Are space-saving and variable in both form and width due to the chain's lameller construction
- Operate slip-free and quietly with the help of involute-toothing
- Ensure functional reliability and a long service life with low wear and tear
- Provide versatility through application-specific design
- Promote large bearing surfaces and low surface pressure through special link plate forms
- Use premium materials for high resistance to temperature and ambient conditions
- Offer easy assembly and disassembly due to the chain's specific design
- Reduce wear on transported goods through top-quality surfaces
- Feature interlocking driving through link plate forms or special drivers

Avoidable problems of various conveyor systems with ...

... belts

- Damage due to sharp-edged parts
- High degree of wear
- Lack of thermal and chemical resistance
- Difficult to repair
- Complex assembly
- Large roller diameter
- Large in width
- High pre-load forces

... roller conveyors

- Loud running noises
- Low accuracy
- Changing conveyance height
- Many individual drives
- Lack of interlocking driving
- Limited accessibility
- Small bearing surface
- Missing design variants

... roller chains

- Limited width adjustment
- Small bearing surface
- High surface pressure
- High wear with accumulation operation
- No immediate driving with accumulation roller chains
- Uneven or high elongation
- Unbalanced running
- Large wheel diameters

Inverted tooth chains from AVENTICS – maximum versatility as a modular system.

AVENTICS inverted tooth conveyor chains offer constant improvement

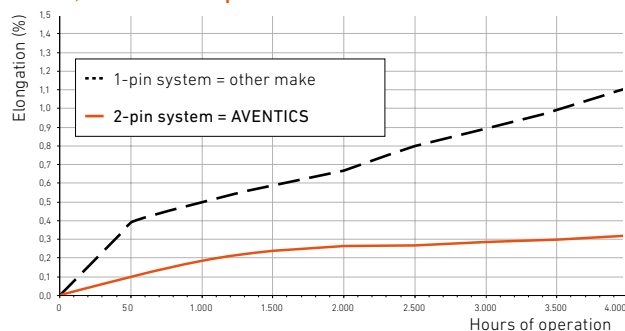


New link plate forms for the extended pitch version TRILEG – inverted tooth conveyor chains

- Reduced vertical wear caused by abrasion on the teeth across the entire chain
- 30 % reduction in pressure and sliding loads
- Advantage of lower chain elongation for inverted tooth conveyor chains with extended pitch due to minimizing the number of joints is not impaired



Length behavior of inverted tooth chains, one- and two-pins versions



▲ Laser-welded



▲ Riveted

The axle pivots in AVENTICS inverted tooth conveyor chains are laser-welded to the outer link plates

- Smooth contact surfaces on both sides. Since the rivet heads no longer protrude, inverted tooth conveyor chains may be routed directly along the guide rails
- Increase in service life. What doesn't protrude cannot be damaged!
- Pivot pins do not drift laterally
- Substantially larger side surfaces without sharp-edged rivet heads prevent side wear on tooth chains and guide rails
- These new inverted tooth chains are fully compatible with existing models. No modifications or sprocket reworking is necessary

AVENTICS joint systems

All one-pin systems experience up to three times as much elongation due to sliding friction. This leads to increased pivot wear. AVENTICS 2-part rolling pivot joint with its tempered pivot and axle pivots creates only rolling friction and thus substantially reduces wear.

Design characteristics



Inverted tooth chains with a 2-part rolling pivot joint constitute the inverted tooth conveyor chains with the least amount of wear due to elongation. Thanks to optimized link plate forms, they also provide an enlarged sliding area.

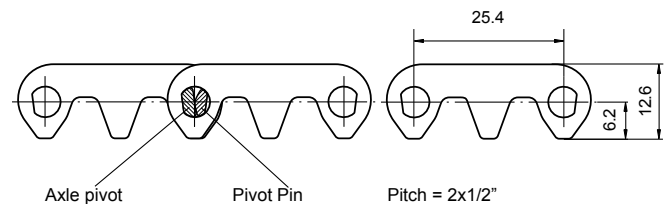
All models are available in the following standard variations

- Tight link construction
- Loose link construction with spacer disks or bushings

Additional versions for special applications

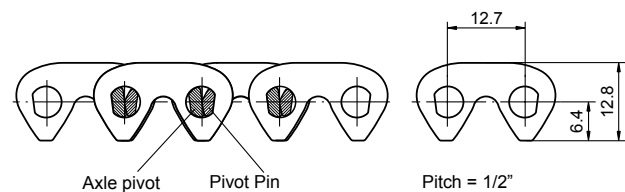
- Inverted tooth chains with smoothed backs for fragile surfaces, for use in accumulation operation and for improved stability (smoothed on both sides upon request)
- Inverted tooth chains made from stainless steel for demanding ambient conditions
- Inverted tooth chains with galvanized or nickel-plated links
- Inverted tooth chains with drivers or special link plates to fit individual conveying needs

Extended pitch 2 x 1/2" TRILEG



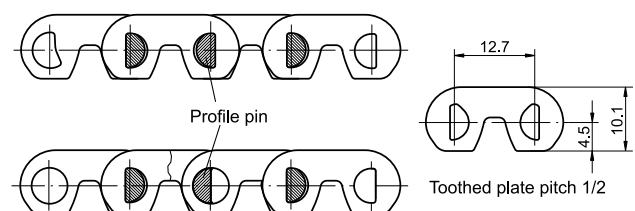
- Less elongation due to wear
- Less vertical wear in the TRILEG version
- Reduced weight allows for easier assembly and less drive energy
- Improved oil and chip removal

Regular pitch 1/2"



- Can be used for smaller parts
- Universally applicable, especially for smaller return drum diameters
- Compact, durable, and stable under load

Low model 1/2"



- Extremely large bearing area on the tooth side
- Robust version with a profile pin
- Reduced link height
- Special version without rigid backing available

Types of standard guides

Inverted tooth chains are usually centered on the chain wheel with unmeshed link plates, also known as guide plates. In general, all types of guides have their advantages, and in some circumstances, the guide plates in inverted tooth conveyor chains may be dispensed with completely. Please ask us for more information.

It goes without saying that all of our standard guide types are available at the same conditions. For all external guide variants, please indicate the meshing width.

External Guide



- The inverted tooth chain displays a row of guide plates which enclose the cogs and center the chain
- A completely homogenous link plate formation in the chain's middle is possible
- Adjustment to wheel width necessary



▲ TRILEG with internal guide

Internal Guide



- The middle of the inverted tooth chain contains a row of guide plates which run into a guideway in the wheel and thus center the chain
- All-purpose, independent of the existing wheel width

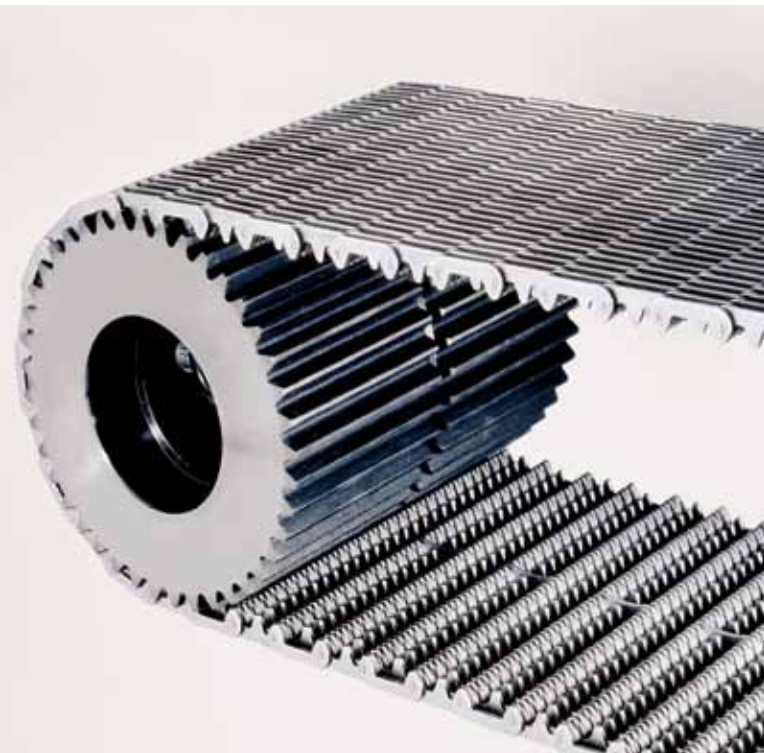
A brief overview of the variety of standard designs:

End version	Link plate type	Construction	Guide
Inverted tooth conveyor chains in machine-specific widths, lengths, material type and with special modifications	Extended pitch TRILEG with two-pin system	tight	internal
		loose	external
	Regular pitch with two-pin system	tight	internal
		loose	external
	Low model with one-pin system	tight	internal
		loose	external
		tight	internal
		loose	external
		tight	internal
		loose	external
		tight	internal
		loose	external

The right layout: a pre-requisite for a long service life

The chain width is measured according to the traction necessary to overcome friction. This friction may be doubled in accumulation zones. The collapse load of an inverted tooth chain should also be considered when extremely heavy weight loads are involved. In case of doubt, please send us your layout. We're happy to assist you!

The actual power requirement can also be determined for a specified conveying speed. In order to prevent an overload caused by oversized motors, the final chain selection is recommended based on the existing drive torque.



Traction and effective power requirement:

$$F_1 = 9,81 \cdot G \cdot \mu \cdot N_R$$

$$P_{\text{eff}} = F_1 \cdot v \cdot 10^{-3}$$

$$F_2 = \frac{2 \cdot M_d}{d_K} \cdot 10^{-3} \geq F_1$$

F_1	= traction [N]	P_{eff}	= effective power requirement [kW]
G	= conveyed weight [kg]	v	= conveying speed [m/s]
μ	= friction factor, dry sliding friction up to 0.15 adhesion/synthetics up to 0.4	M_d	= torque [Nm]
N_R	= number of normal friction surface pairs: $N_R = 1$ loaded chains in accumulation zones: $N_R = 2$	d_K	= tip diameter [mm]

Explanations:

The chains slide along rails. Metal or synthetic materials are customarily used as wear surfaces and should be accounted for when determining the value μ . A distortion of the bearing area (e.g. placed under pressure during longer downtimes) could result in an increased breaking torque ($\mu = 0.4$) when synthetic materials are involved. (See page 18 for more details on slide rails.)

The selection of an inverted tooth conveyor chain is based on the calculation of the chain's width, which follows the formula:

Chain width:

$$b_a = \frac{F_{1,2} \cdot y}{10 \cdot p \cdot N_z}$$

b_a	= chain width [mm]	y	= $1.0 + (A - 5) \cdot 0.06$ with A = shaft distance [m] Max. value 2.0!
$F_{1,2}$	= traction force [N]	p	= chain pitch 12.7 [mm]*
y	= length factor for $A = 5$ m and above according to the formula:	N_z	= number of chains

*Must also be used for an extended pitch of $2 \times 1/2$ ".

Explanations:

Factor y : Extra lengths are necessary to prevent the "stick-slip" effect on longer stretches, which may occur as a jerky slide at the end of the conveyor. The calculated width should first be rounded up to an existing working width b_g (taken from the table), depending on type and pitch. For laser-welded inverted tooth conveyor chains, the total width b_g corresponds to the working width.

Important: The calculated chain width only applies to chains with a tight link plate construction. If choosing an inverted tooth conveyor chain with a loose construction, e.g. with disks or bushings, please ask for a consultation first. In general, special link plates do not affect the width and are described in further detail on page 15. The determined working width b_a must be doubled for rustproof inverted tooth conveyor chains.

A simple calculation is important



Required surface length:

$$L_{\text{req}} = \frac{100 \cdot G}{b_a \cdot N_z \cdot G_{\text{spec}}}$$

L_{req}	= required surface length [mm]	N_z	= number of chains
G	= conveyed weight [kg]	G_{spec}	= specific surface load [kg/mm ²]
b_a	= required chain width [mm] (from calculations on page 8)		(from the diagram)

Please keep in mind that both the diagram and the calculation formula contain type-specific data which CANNOT be applied to other models. Only tight inverted tooth chain widths are regarded here. Please contact us concerning versions with spacer disks or bushings.

The smaller the permissible pressure load, respectively as well the choice of the specific surface load G_{spec} , the longer is the service life of the sliding material.



Selecting sliding materials

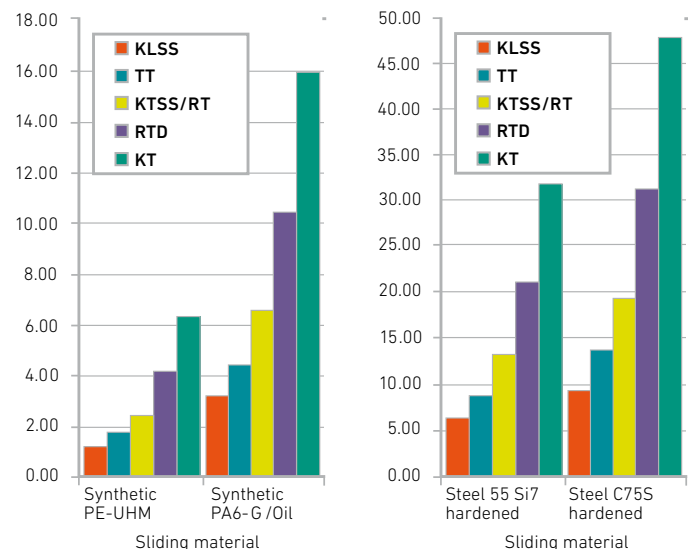
The permissible specific pressure load plays a key role when it comes to selecting sliding materials. Ambient conditions such as temperature, humidity, dust, etc. greatly influence this choice.

The following materials are used:

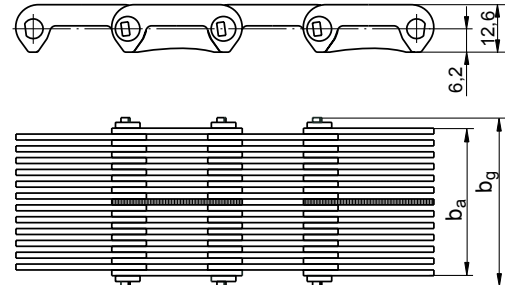
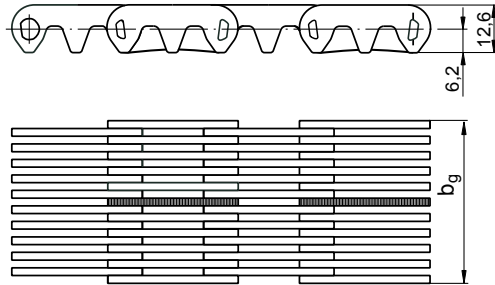
- PE and PA synthetic materials similar to DIN 7728
- Spring band steel 55 or 65 Si7 or C75S (hardened and tempered)

For these most frequently used or recommended materials, the required bearing length is roughly determined in the following. It depends on the inverted tooth chain type and may not exceed the permissible pressure load that has been determined for the working width.

Specific surface load G_{spec} [kg/mm²]



Inverted tooth conveyor chains 2 x 1/2" with two-pin system



Laser-welded – 2 mm link plates			Riveted – 1.5 mm link plates				General	
Designation	Max. width b_g	Weight [kg/m]	Designation	Max. working width b_a	Max. total width b_g	Weight [kg/m]	Nom. width	Wheel width b
TT-12-SL	14.5	0.7	KLSS 312 A	9.4	18.1	0.6	12	9.5/8.5
TT-15-SL	18.6	0.9	KLSS 315 A	12.5	21.3	0.7	15	13.5/11.5
TT-20-SL	22.7	1.1	KLSS 320 A	18.8	27.5	0.9	20	17.5
TT-25-CL	26.8	1.2	KLSS 325	26.6	32.2	1.1	25	30
TT-30-CL	31.0	1.4	KLSS 330	29.7	35.3	1.2	30	35
TT-35-CL	35.1	1.6	KLSS 335	36.0	41.6	1.4	35	40
TT-40-CL	39.2	1.8	KLSS 340	42.3	47.9	1.7	40	45
TT-45-CL	43.4	2.0	KLSS 345	45.4	51.0	1.8	45	50
TT-50-CL	51.6	2.3	KLSS 350	51.6	57.2	2.0	50	55
TT-55-CL	55.8	2.5	KLSS 355	54.8	60.4	2.2	55	60
TT-60-CL	59.9	2.7	KLSS 360	61.0	66.6	2.4	60	65
TT-65-CL	64.0	2.9	KLSS 365	64.2	69.8	2.5	65	70
TT-70-CL	68.1	3.1	KLSS 370	70.4	76.0	2.8	70	75
TT-75-CL	76.4	3.4	KLSS 375	76.7	82.3	3.0	75	80
TT-80-CL	80.5	3.6	KLSS 380	79.8	85.4	3.1	80	85
TT-85-CL	84.7	3.8	KLSS 385	86.1	91.7	3.4	85	90
TT-90-CL	88.8	4.1	KLSS 390	89.2	94.8	3.5	90	95
TT-95-CL	97.1	4.3	KLSS 395	95.5	101.1	3.7	95	100
TT-100-CL	101.2	4.5	KLSS 3100	101.7	107.3	4.0	100	105
TT-115-CL	117.7	5.2	KLSS 3115	114.2	119.8	4.4	115	120
TT-125-CL	126.0	5.6	KLSS 3125	126.8	132.4	4.9	125	130
TT-140-CL	138.4	6.2	KLSS 3140	139.3	144.9	5.4	140	145
TT-150-CL	150.7	6.7	KLSS 3150	151.8	157.4	5.9	150	155
TT-175-CL	175.5	7.8	KLSS 3175	176.8	182.4	6.8	175	180
TT-200-CL	200.3	8.9	KLSS 3200	201.9	207.5	7.8	200	205
TT-250-CL	249.9	11.1	KLSS 3250	252.0	257.6	9.7	250	255
TT-300-CL	299.4	13.3	KLSS 3300	302.0	307.6	11.7	300	305

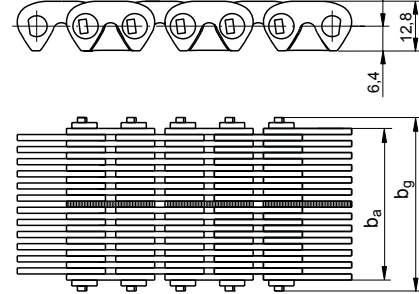
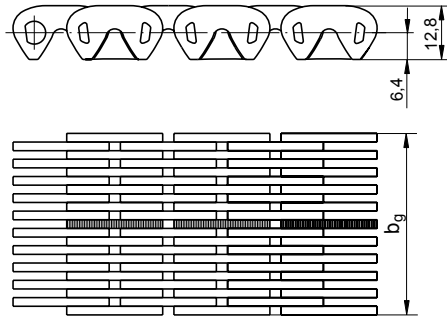
Measurements are in millimeters – for sprocket specifications, please see pages 16 and 17.

Modifications: ■ Loose construction with spacer disks or spacer bushings ■ With smoothed surface or smooth on both sides
 ■ Slip-smoothed ■ Integration of driver plates ■ Additional widths available upon request

Use only even link numbers. Number of links equals number of pitches. The manufacturing tolerance for the working width and total width is -1%.

Note: Inverted tooth chains are delivered with a riveted closure. When using split pin fasteners, bear in mind the protruding pin head on one side.

Inverted tooth conveyor chain 1/2" with two-pin system



Laser-welded – 2 mm link plates			Riveted – 1.5 mm link plates				General	
Designation	Max. width b_g	Weight [kg/m]	Designation	Max. working width b_a	total width b_g	Weight [kg/m]	Nom. width	Wheel width b
RT-12-SL	14.5	0.9	KTSS 312 A	9.4	18.1	0.8	12	9.5/8.5
RT-15-SL	18.6	1.1	KTSS 315 A	12.5	21.3	1.0	15	13.5/11.5
RT-20-SL	22.7	1.4	KTSS 320 A	18.8	27.5	1.4	20	17.5
RT-25-CL	26.8	1.6	KTSS 325	26.6	32.2	1.6	25	30
RT-30-CL	31.0	1.9	KTSS 330	29.7	35.3	1.8	30	35
RT-35-CL	35.1	2.1	KTSS 335	36.0	41.6	2.2	35	40
RT-40-CL	39.2	2.4	KTSS 340	42.3	47.9	2.5	40	45
RT-45-CL	43.4	2.6	KTSS 345	45.4	51.0	2.7	45	50
RT-50-CL	51.6	3.1	KTSS 350	51.6	57.2	3.1	50	55
RT-55-CL	55.8	3.3	KTSS 355	54.8	60.4	3.3	55	60
RT-60-CL	59.9	3.6	KTSS 360	61.0	66.6	3.6	60	65
RT-65-CL	64.0	3.8	KTSS 365	64.2	69.8	3.8	65	70
RT-70-CL	68.1	4.1	KTSS 370	70.4	76.0	4.2	70	75
RT-75-CL	76.4	4.5	KTSS 375	76.7	82.3	4.5	75	80
RT-80-CL	80.5	4.7	KTSS 380	79.8	85.4	4.7	80	85
RT-85-CL	84.7	5.0	KTSS 385	86.1	91.7	5.1	85	90
RT-90-CL	88.8	5.4	KTSS 390	89.2	94.8	5.2	90	95
RT-95-CL	97.1	5.7	KTSS 395	95.5	101.1	5.6	95	100
RT-100-CL	101.2	5.9	KTSS 3100	101.7	107.3	6.0	100	105
RT-115-CL	117.7	6.9	KTSS 3115	114.2	119.8	6.7	115	120
RT-125-CL	126.0	7.4	KTSS 3125	126.8	132.4	7.4	125	130
RT-140-CL	138.4	8.1	KTSS 3140	139.3	144.9	8.1	140	145
RT-150-CL	150.7	8.8	KTSS 3150	151.8	157.4	8.8	150	155
RT-175-CL	175.5	10.3	KTSS 3175	176.8	182.4	10.3	175	180
RT-200-CL	200.3	11.7	KTSS 3200	201.9	207.5	11.7	200	205
RT-250-CL	249.9	14.6	KTSS 3250	252.0	257.6	14.6	250	255
RT-300-CL	299.4	17.4	KTSS 3300	302.0	307.6	17.5	300	305

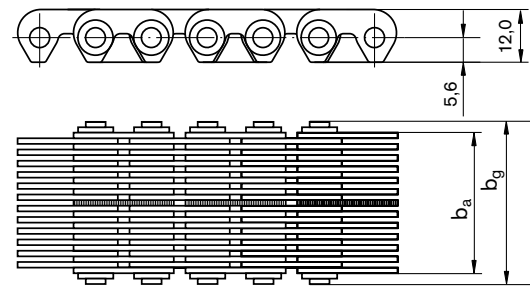
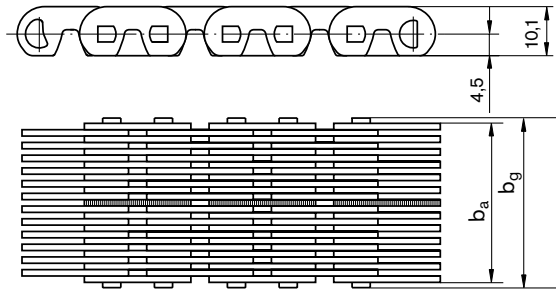
Measurements are in millimeters – for sprocket specifications, please see pages 16 and 17.

Modifications: ■ Loose construction with spacer disks or spacer bushings ■ With smoothed surface or smooth on both sides
 ■ Slip-smoothed ■ Integration of driver plates ■ Additional widths available upon request

Use only even link numbers. Number of links equals number of pitches. The manufacturing tolerance for the working width and total width is -1%.

Note: Inverted tooth chains are delivered with a riveted closure. When using split pin fasteners, bear in mind the protruding pin head on one side.

Inverted tooth conveyor chain 1/2" with one-pin system



Low model – 1.5 mm link plates				Rustproof – 1.5 mm link plates				General	
Designation	Max. working width b_a	Max. total width b_g	Weight [kg/m]	Designation	Max. working width b_a	Max. total width b_g	Weight [kg/m]	Nom. width	Wheel width b
KT 312 A	9.4	15.1	0.7	RTD 312 A	9.4	18.5	1.2	12	8.5
KT 315 A	12.5	18.3	0.9	RTD 315 A	12.5	21.7	1.4	15	11.5
KT 320 A	17.2	22.9	1.1	RTD 320 A	17.2	26.3	1.7	20	16
KT 325	26.6	29.2	1.1	RTD 325	26.6	32.6	2.0	25	30
KT 330	29.7	32.3	1.6	RTD 330	29.7	35.7	2.2	30	35
KT 335	36	38.6	1.9	RTD 335	36	42	2.6	35	40
KT 340	42.3	44.9	2.2	RTD 340	42.3	48.3	2.9	40	45
KT 345	45.4	48	2.3	RTD 345	45.4	51.4	3.1	45	50
KT 350	51.6	54.2	2.7	RTD 350	51.6	57.6	3.5	50	55
KT 355	54.8	57.4	2.8	RTD 355	54.8	60.8	3.7	55	60
KT 360	61	63.6	3.1	RTD 360	61	67	4.0	60	65
KT 365	67.3	69.9	3.4	RTD 365	67.3	73.3	4.4	65	70
KT 370	70.5	73.1	3.6	RTD 370	70.5	76.5	4.6	70	75
KT 375	75.1	77.7	3.8	RTD 375	75.1	81.1	4.8	75	80
KT 380	79.8	82.4	4.1	RTD 380	79.8	85.8	5.1	80	85
KT 385	86.1	88.7	4.4	RTD 385	86.1	92.1	5.5	85	90
KT 390	89.2	91.8	4.5	RTD 390	89.1	95.1	5.7	90	95
KT 395	95.5	98.1	4.9	RTD 395	95.5	101.5	6.1	95	100
KT 3100	100.2	102.8	5.1	RTD 3100	100.2	106.2	6.2	100	105
KT 3115	114.3	116.9	5.8	RTD 3115	114.3	120.3	7.2	115	120
KT 3125	123.6	126.2	6.3	RTD 3125	123.6	129.6	7.7	125	130
KT 3140	139.3	141.9	7.0	RTD 3140	139.3	145.3	8.6	140	145
KT 3150	148.7	151.3	7.5	RTD 3150	148.7	154.7	9.2	150	155
KT 3175	173.7	176.3	8.8	RTD 3175	173.7	179.7	10.6	175	180
KT 3200	198.8	201.4	10.0	RTD 3200	198.8	204.8	12.1	200	205
KT 3250	248.8	251.4	12.6	RTD 3250	248.8	254.8	15.0	250	255
KT 3300	298.9	301.5	15.0	RTD 3300	298.9	304.9	18.1	300	305

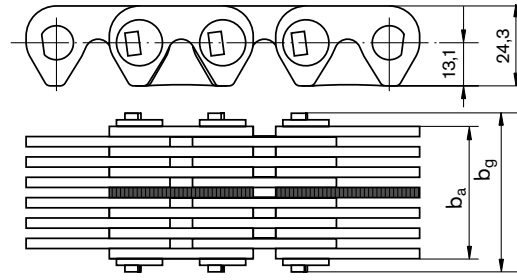
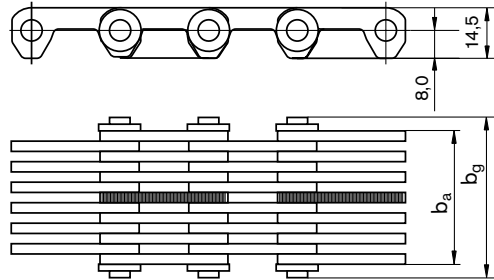
Measurements are in millimeters—for sprocket specifications, please see pages 16 and 17.

Modifications: ■ Loose construction with spacer disks or spacer bushings ■ With smoothed surface or smooth on both sides
(Applies only to low model) ■ Slip-smoothed (Applies only to low model) ■ Integration of driver plates ■ Additional widths available upon request

Use only even link numbers. Number of links equals number of pitches. The manufacturing tolerance for the working width and total width is -3%.

Note: Inverted tooth chains are delivered with a riveted closure. When using split pin fasteners, bear in mind the protruding pin head on one side.

Inverted tooth conveyor chain 1" with one-pin/two-pin system



Low model – 3 mm link plates (one-pin system)					
Designation	Max. working width b_a	Max. total width b_g	Weight [kg/m]	Nom. width	Wheel width b
LCC 6200	198	206	10.0	200	210
LCC 6250	247	255	12.4	250	260
LCC 6300	302	310	15.2	300	310
LCC 6350	351	359	17.6	350	360
LCC 6400	400	408	20.1	400	410
LCC 6450	449	457	22.5	450	460
LCC 6500	497	505	25.0	500	510

Measurements are in millimeters – for sprocket specifications, please see pages 16 and 17.

For especially heavy operation, inverted tooth conveyor chains with 1" pitches are available: type LCC with a low construction and type KT 6..

Due to its robust link geometry, the LCC type is especially well suited for greater widths and its bending capability over the chain back is almost unlimited (no rigid backing).

Normal model – 3 mm link plates (two-pin system)					
Designation	Max. working width b_a	Max. total width b_g	Weight [kg/m]	Nom. width	Wheel width b
KT 630	27.9	35.9	3.4	30	35
KT 640	40.2	48.2	4.7	40	45
KT 650	52.6	60.6	6.1	50	55
KT 675	77.4	85.4	8.8	75	80
KT 6100	102.1	110.1	11.5	100	105
KT 6125	126.9	134.9	14.2	125	130
KT 6150	151.7	159.7	17.3	150	155

Measurements are in millimeters – for sprocket specifications, please see pages 16 and 17.

Type KT 6.. differs from other 1" drive tooth chains in that the link plate backs as well as the teeth have been leveled. As a result, these link plate forms provide the best conditions for transporting heavy workpieces together with the especially low-wear rolling pivot joint. This version also acts as a friction drive for the precise synchronization of sheet glass transfer rolls.

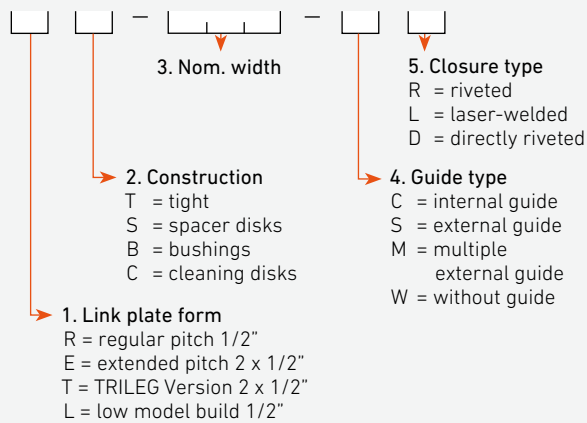
Modifications: ■ Loose construction with spacer disks ■ With smoothed surface or smooth on both sides
■ Integration of driver plates or milled driver blocks ■ Additional widths available upon request

Use only even link numbers. Number of links equals number of pitches. The manufacturing tolerance for the working width and total width is -2%.

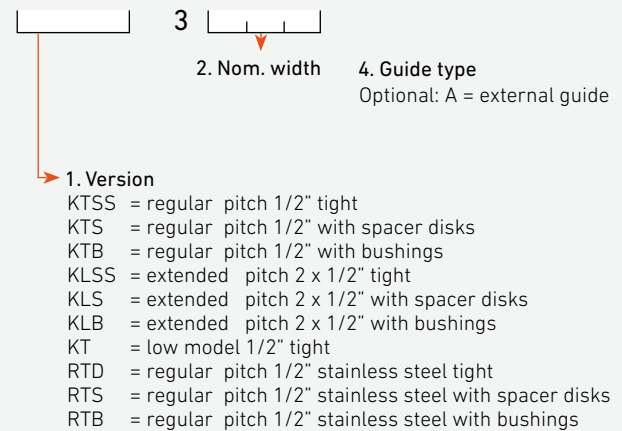
Note: Inverted tooth chains are delivered with a riveted closure. When using split pin fasteners, bear in mind the protruding pin head on one side.

Order codes for inverted tooth conveyor chains

Order codes for 2 mm link plate thickness



Order codes for 1.5 mm link plate thickness



The standard inverted tooth chains contained in the chart present a selection of our product range. Laser-welded inverted tooth conveyor chains include two additional rivet closures for servicing.

If not explicitly stated, all inverted tooth chains – with the exception of the low model which is riveted directly – are manufactured with riveted disks.

Different possible chain designs



▲ Ridged surfaces for slip-free wood transport



▲ Precision plate chain mounted on an inverted tooth chain base



▲ Drag chain to couple transport trolleys



▲ Link plate package with integrated longitudinal profile



▲ Cycle line with massive driver blocks



▲ Stable driver coupling



▲ Driver link plates for cross-bars



▲ Inverted tooth chain in mirrored pairs for packaging lines

We are used to the unusual. Specially designed inverted tooth chains

Special link plates further expand the area of inverted tooth chain applications.

Various possibilities exist:

- Special inverted tooth chains made entirely from special link plates, e.g. ring or forked plates to take up cross-bars or link plates with ridged backs for wood transport
- Special link plates only at certain positions, e.g. for fastening mold halves on packaging lines or, on both sides of the chain, fastening link on a support ring to serve as a toothed ring
- Special inverted tooth chains with extra parts, e.g. massive driver blocks for cycle lines, welded disks for precise plate conveyors, or plastic or ceramic components for the bearing-surface

There is a large selection of existing special link plates. Additional forms can be produced quickly through laser cutting.



▲ Workpiece supports for light bulb elements



▲ Ceramic items for an inverted tooth chain cover in hot areas



▲ Improved precision with punched ring links



▲ Plastic carriers for sensitive workpiece surfaces



▲ Inverted tooth chain in mirrored pairs for outfeed lines



▲ Inverted tooth chain with clamping bolts as toothed ring segment



▲ Prism inverted tooth chain with plastic link plates for centering profile rods



▲ Plastic clips for complete coverage of the inverted tooth chain

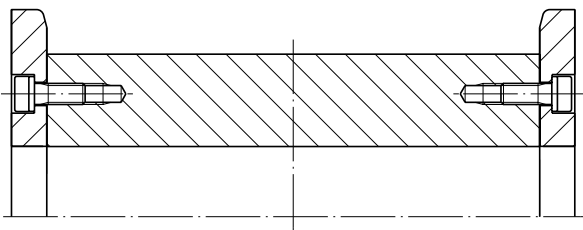
The right sprockets for each task

Task-specific inverted tooth conveyor chain versions are just as multifaceted as the proper sockets. Optimal adaptation of all relevant dimensions and profiles to one another results in an accurate toothing, the first step to trouble-free continuous operation.

Whereas regular and extended pitch share an identical toothing profile, the low model has its own toothing profile. Sprockets are manufactured according to customer's visions as far as technically possible. Tooth formation is adjusted to the guide version of the selected inverted tooth chain. When ordering replacement sprockets for existing external guide chains, please indicate the type and current toothing width.

To ensure constant belt height at transfer points, we also offer customer-specific solutions for return rollers without toothing where the external diameter including the chain corresponds to the sprockets currently in use. The chain can then be guided with hardened flanged wheels mounted on both sides. The total width of the inverted tooth chain must be accounted for. When used in laser-welded inverted tooth conveyor chains, return rollers with flanged wheels enjoy a much longer service life thanks to reduced wear.

Usually, C45 steel sprockets with hardened tooth flanks are supplied. Although other materials are possible, steel wheels are preferred for up to 30 teeth.



The reference diameter helps determine the correct external diameter of the sprocket with an attached chain in new condition:

Pitch diameter:

$$d_0 = \frac{p}{\sin(180^\circ/z)}$$

Max. diameter w. inverted tooth chain:

$$D_{\max} = d_0 + X$$

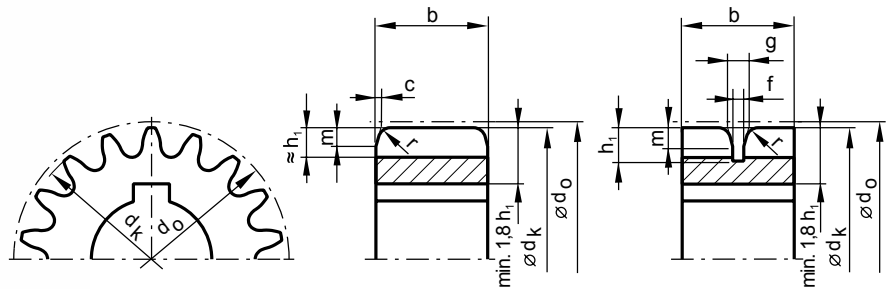
Recommended slide rail height:

$$h_{\text{slide}} \approx (d_0 \cdot 1.02)/2 - o$$

Pitch	Design	Factor X	Value o
1/2"	Regular	12.8	6.4
	Extended	12.8	6.2
	Low	11.2	4.5
1"	Regular	22.4	13.1
	LCC	13.0	8.0

◀ Slide rail height
Raising the rail surface by 2% of the sprocket diameter reduces contact pressure on the teeth and promotes quiet running.

Sprocket dimensions



For 1/2" wheels, different tooth widths apply to the two chain pivot constructions. Sprocket orders must specify whether inverted tooth chains will use a one- or two-pin system.

Chain width determines sprocket width. Narrower sprocket widths are possible in special cases. Extremely wide chains may make use of a series of narrower disks positioned side by side at a distance.

Sprockets with proper toothing are a pre-requisite for the chain's reliable functioning and long service life. The guarantee for inverted tooth chains does not apply to wheels of foreign make.

Guide groove and profile

Pitch	1/2"	1" KT	1" LCC
g	4	8	8
f	3	6	6
h_1	8	16	12
m	5	10	6
r	2	3	3
c	0,5	1	1

Pitch	Design	Minimum amount of teeth
1/2"	Regular	17
	Extended	26, pref. 35
	Low	15
1"	Regular	15
	LCC	12

Sprockets

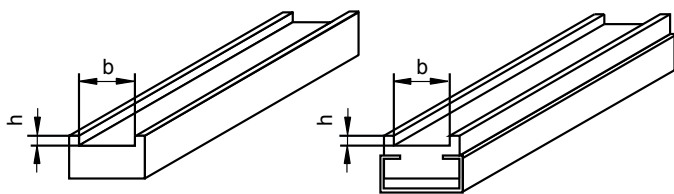
Pitch Design No. of teeth	1/2"		1"		
	d ₀	d _k	All d ₀	Standard d _k	LCC d _k
12	—	—	98.1	—	94.4
13	—	—	106.1	—	102.7
14	—	—	114.1	—	110.9
15	61.1	59.7	122.2	119.4	119.1
16	65.1	63.8	130.2	127.6	127.3
17	69.1	67.9	138.2	135.8	135.5
18	73.1	72.0	146.3	144.0	143.7
19	77.2	76.1	154.3	152.2	151.8
20	81.2	80.1	162.4	160.3	160.0
21	85.2	84.2	170.4	168.5	168.1
22	89.2	88.3	178.5	176.6	176.3
23	93.3	92.3	186.5	184.7	184.4
24	97.3	96.4	194.6	192.9	192.5
25	101.3	100.5	202.7	201.0	200.7
26	105.4	104.5	210.7	209.1	208.8
27	109.4	108.6	218.8	217.3	216.9
28	113.4	112.7	226.9	225.4	225.0
29	117.5	116.7	234.9	233.5	233.1
30	121.5	120.8	243.0	241.6	241.3
31	125.5	124.8	251.1	249.7	249.4
32	129.6	128.9	259.1	257.8	257.5
33	133.6	133.0	267.2	266.0	265.6
34	137.6	137.0	275.3	274.1	273.7
35	141.7	141.1	283.4	282.2	281.8
36	145.7	145.1	291.4	290.3	289.9
37	149.8	149.2	299.5	298.4	298.0
38	153.8	153.2	307.6	306.5	306.1
39	157.8	157.3	315.7	314.6	314.2
49	198.2	197.8	396.4	395.6	395.2
59	238.6	238.2	477.2	476.5	476.2
69	279.0	278.7	558.1	557.4	557.1
79	319.4	319.1	638.9	638.3	638.0
89	359.9	359.6	719.7	719.2	718.9
99	400.3	400.0	800.6	800.1	799.8

Measurements are in mm - Intermediate values should be interpolated

Functional reliability by perfect guidance



The following minimum requirements apply to inverted tooth chains with 1/2" pitch, depending on the type of closure:



Closure type	h	b
Laser-welded	Link height *)	$b_g + 1 \text{ mm}$
With rivet disk	a) 2 mm	a) $b_g + 1 \text{ mm}$
or directly riveted	b) Link height *)	b) $b_g + 1 \text{ mm}$

(RTD execution of situation a) is NOT permissible)

*) This requires the use of rivet closures. A high lateral guide without laser-welded closure generally implies much higher side wear on the slide rails.

Guiding the inverted tooth chain

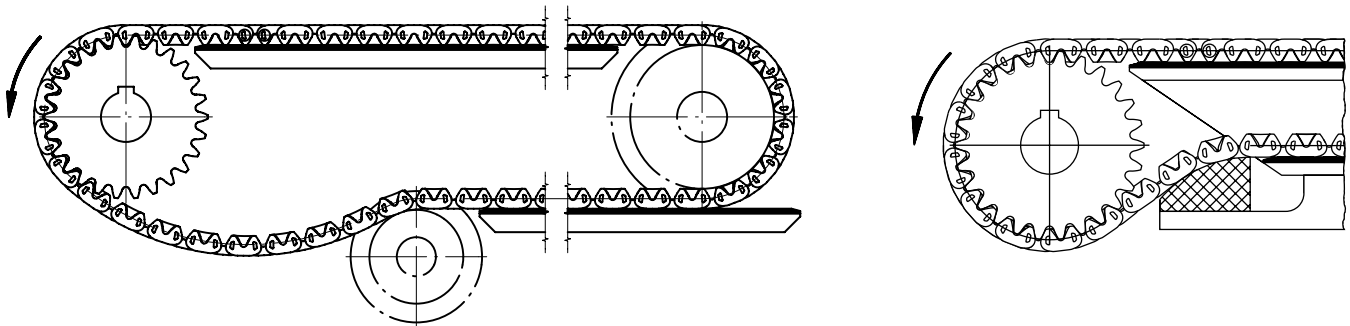
Chain guiding takes place on both sides through wedge steel with feed slopes or in a U-shape in commercially available plastic profiles. The right material together with the slide surface is selected according to the intended use. The returning chain section must also be supported in case of intervals of one meter or more between axles, e.g. with sliding surfaces in concave profiles, separate slide rails or supporting rollers. The diameter of these rollers is determined by the type of inverted tooth chain.

The correct selection of sliding material substantially increases reliable operation and service life of the inverted tooth chain. Standard profiles for conveyor belts may also be used.

Laser-welded inverted tooth conveyor chains from AVENTICS feature the best lateral guide qualities.



Installation and maintenance



The interlocking drive of inverted tooth conveyor chains eliminates the need for pre-tensioning

The drive has to be placed in the direction of traction. Re-tensioning usually occurs by adjusting the distance between the axes. If the end of the re-tensioning stretch has been reached, the inverted tooth chain can easily be shortened. Additionally, a self-tensioning effect (due to the chain's own weight) can be expected when a one-meter-long section of the lower belt sags from the drive wheel.

As inverted tooth chain drives do not possess much bilateral flexibility, they should be bent gently over the backs. Depending on the pitch and version, the empty side can be returned with appropriate sprockets (see chart).

Belts with S-shaped wraps, e.g. with a center drive, are available with bilaterally flexible inverted tooth chains. Reverse operation is possible in a pre-tensioned inverted tooth chain; however, this requires a special layout.

Lubrication

Additional lubrication should follow in longer intervals based on use and intensity. The lubricant should be applied to the chain teeth from the inside. Also automatic stand-alone lubrication devices could be used for minimized lubrication.

Inverted tooth chains are delivered only corrosion-proof. A thorough initial lubrication must take place before installation.

Overview of the allowable bending radii for the return unit:

Inverted tooth chain type	bending radius
1/2" riveted	> 40 mm
1/2" laser-welded	> 75 mm
2 x 1/2" riveted	> 80 mm
2 x 1/2" laser-welded	> 150 mm
KT (nonrigid backside version), RTD/RTS/RTB, LCC	no limitation



Easy assembly and correct shortening of inverted tooth chains

Use only even link numbers. Other-wise, lateral offsets may develop at the junction between both ends. Normal riveted inverted tooth chains are closed with rivets and may be opened at any point by grinding off a rivet head. A new rivet closure is needed to reseal the opening. The following operation applies to inverted tooth chains with direct riveting or laser-welding:

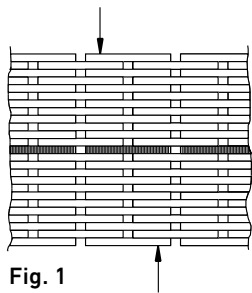


Fig. 1

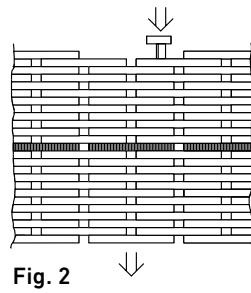


Fig. 2

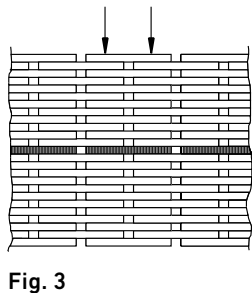


Fig. 3

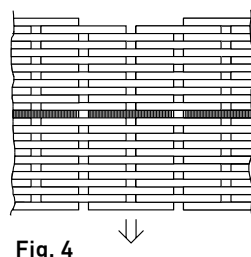


Fig. 4

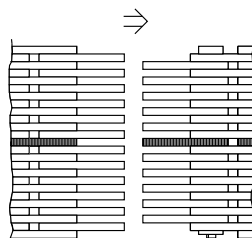


Fig. 5

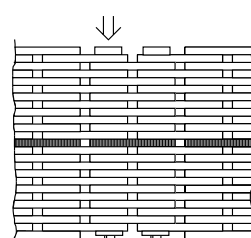


Fig. 6

Closing

- Join both ends and connect them with the accompanying rivet closure
- For laser-welded inverted tooth chains, grind off any protruding rivet head to the outer link

Shortening

Fig. 1:

- Force open the weld by hitting the pin's front side (if possible, offset on both sides to allow each support pin to remain connected to a welding link)

Fig. 2:

- Remove the first support pin with the connected welding link and replace it with the rivet closure support pin
- The pivot pin need not be changed
- Remove the second support pin likewise with the welding link
- Rivet

Fig. 3:

- Measure off the necessary length and disconnect both welds on one side (blasting the link on its front)

Fig. 4:

- Remove welding link with both rolling pivot joints
- Remove individual parts and single links as well as a chain section

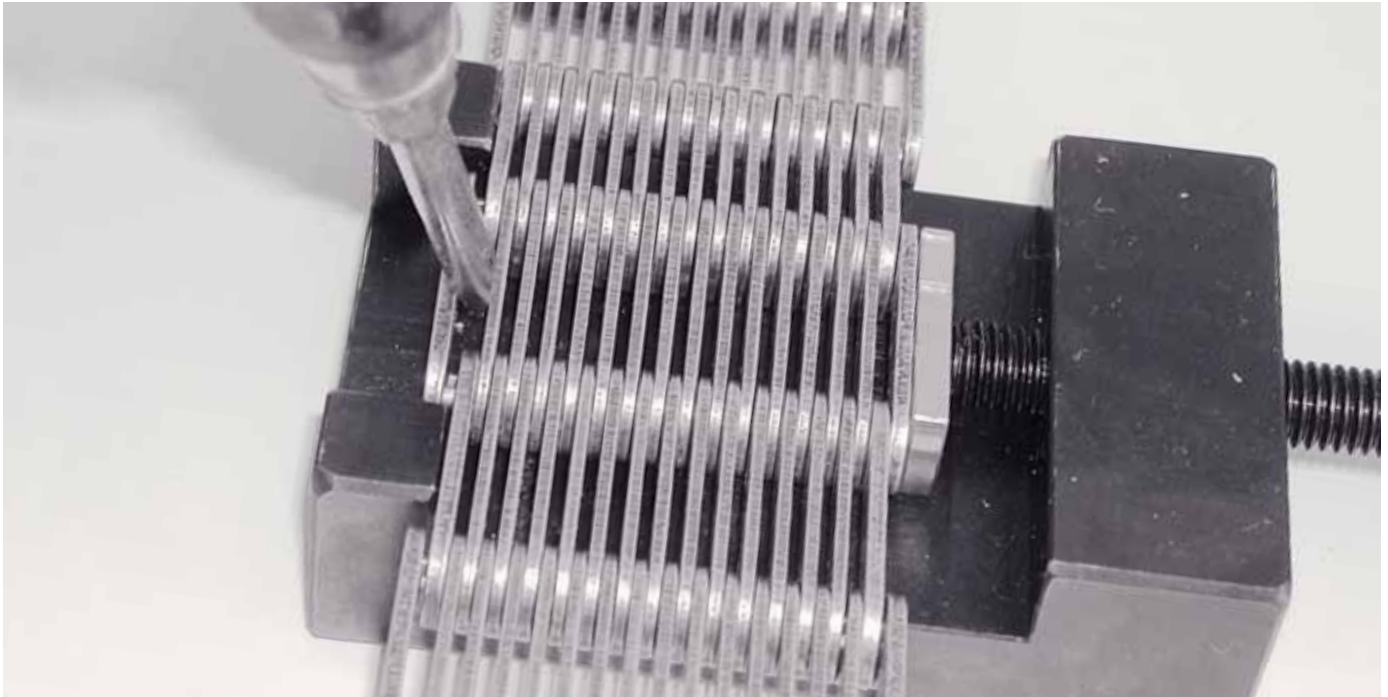
Fig. 5:

- Push the now inversely arranged ends of the inverted tooth chain into one another as to make the holes congruent

Fig. 6:

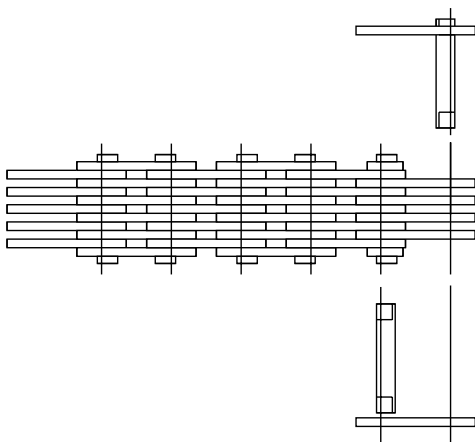
- Insert rivet closure (first the support pin with the disk, then the pivot pin)
- Rivet and abrade both rivet heads until they are flush with the outer surface of the welding link

Special features



Auxiliary tools

In order to facilitate the opening of the laser-welded inverted tooth chain, we have developed a tool to clamp the inverted tooth chain and increase the clearance between the link plates on the side to be opened. Thus, a link plate may be removed with a common screwdriver.



Features of inverted tooth chains in a one-pin-system (Type KT)

A weakened structure due to single closures combined with an omission of external link plates is especially undesirable in narrow widths. Therefore, a double-riveted closure is supplied with these versions (e.g. KT 312A).

A pin with an attached but unriveted disk prevents the outer link plates from falling off. The double-riveted closure consists of three individual parts, as shown on the right.

The shortening resembles the laser-welded version, with opening according to Fig. 3. Where necessary, two lower ends must be laid against one another and separated by equal distances. Loose link plates then fill those spaces.

The double-riveted closure is sandwiched in and riveted after insertion of the corresponding outer link plate.

Customer service, engineering, design – Advantages you can dig your teeth into

Using the latest technical methods and field-specific knowledge needed for the customers' tasks, we calculate and develop the most suitable configuration. Inverted tooth chains and sprockets are perfectly adapted to each other.



Inverted tooth chains for drives



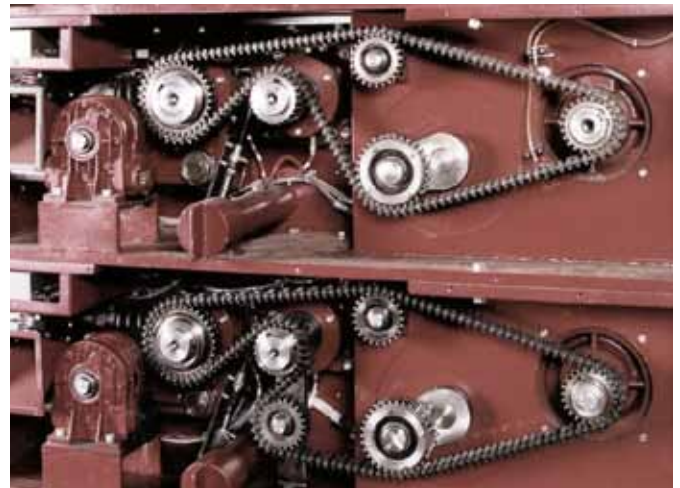
These were designed for the transmission of great traction, torque, and power, even at high rotations and speeds up to 50 m/s as well as slower-running machines at full capacity. In all of these cases, service life and functional reliability are indispensable.

These factors are met through the following pre-requisites

- Friction-free rolling pivot joints made from case hardened steel and exhibiting a high degree of efficiency, resistance to wear, and durability
- Inverted tooth chain link plates with FE-optimized outlines made from high-resistance heat-treated steel
- Sprockets featuring hardened involute-toothing for smooth, impact-free meshing

When compared to other wrap drives, steel pivot drives, and belt drives, the advantages shine through

- Optimum use of space due to high power density
- The proverbial quiet running; **in a word: silent chain**
- Extremely long service life
- Very low lubrication requirements
- High temperature tolerance



AVENTICS GmbH

Tooth Chain Drives
Zur Dessel 14
31028 Gronau (Leine), Germany
Tel. +49 5182 5870
Fax +49 5182 58730
toothchain@aventics.com
www.aventics.com/toothchain



Your Contact:

Further contacts:
www.aventics.com/contact

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