RENOLD | Tooth Chain

Drive Technology
驱动技术
With Inverted Tooth Chains
from Renold

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.

快捷，精密，无声。齿形链可以在狭窄的空间里面运输高载荷确保能够优化实现多重驱动应用。齿形链和链轮之间完美地几何调整有助于降低对链条强度的影响，从而说明无声运行的驱动元件应得的声誉。

Inverted tooth chain drives from Renold
齿形链

Drive solutions full of power and precision: precisely tailored to the application
充满了动力和精密的驱动解决方案: 为应用量身定制

Renold inverted tooth chains for drives
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. In conjunction with the low impact typical for tooth chains, this drive solution is distinguished by extremely smooth, even, and precise running. 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 – Renold chain drives assure cost-effective use.

Renold驱动齿形链
齿形链多样的结构能使满足各种所需链条的宽度和长度。特别是在狭小空间或与大轴中心距离,这解决优化的应用和实际负荷的问题。典型结合的低影响齿形链,这种驱动解决方案的特点是非常光滑,甚至能够精确运行。齿形链和链轮之间的联锁动力传动滑动自由而且不需要预拉。

- 节约空间而且提供各式类型，设计和宽度
- 自由滑动和无声
- 功能可靠性和使用寿命延长
- 坚固，简易装配/拆卸

由于使用优质材料和生产过程,齿形链也可以在严酷的环境条件下使用,高温或积极的化学物质。这样大大扩展应用寿命，降低停机时间——Renold链传动装置确保成本有效使用。

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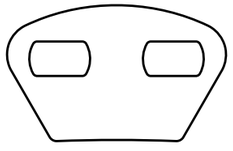
Inverted tooth chain construction
齿形链结构

The construction of a silent chain out of a plurality of individual plates implies many advantages
无声链结构是单独链板的多元化，这就意味着很多优势

Toothed plate
带齿链板



Guide plate
导向链板

The inverted tooth chain is composed of:
- Toothed plates
- Guide plates
- Rolling pivot joint – consists of 2 profile pins
- Rivet washers

齿形链包括：
- 带齿链板
- 导向链板
- 滚动枢轴关节-包括2个型销
- 铆接垫圈

Inverted tooth chain construction

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. 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 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.

齿形链结构

齿形链是一个有凝聚力的坚固的网格链接。根据需要的长度和宽度,它是由各种链接板块和型销组成。结果是:一个强大且灵活的链传动,可以完美地适应手头特定的任务。图像显示了HPC齿形链带中心导片。链条是由一定数量的链节组成称为节距。链条长度代表着链节的数量 - 这取决于链轮上的齿数和轴中心距。
根据链条宽度,每个链节都有一定数量的链接板块交错配置在一个链接链接。这些链接是通过滚动枢轴关节连接到另一个。
通过齿板传递动力和运动。每个链接板块提供了两个联合孔经来容纳滚动枢轴关节。

根据链条类型滚动枢轴关节是由两个型销进行设计。两个型销都固定在链板上。当链条与链轮进行接触时关节会进行移动 - 两个型销相互滚动。使剩余滑动摩擦最小化。

Types of standard guides
标准导片类型

Guide plates

Guide plates generally do not contribute to power transmission. Guide plates prevent the inverted tooth chain from drifting sideways on the sprockets. 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

In the inverted tooth chain shown to the right, the guide plates are located on the outer sides of the chain. 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.

导向链板

导向链板一般不会导致动力传输。导向链板防止齿形链偏离链轮轨道。特殊导向链板设计能够强化链板用于低速运转,有限的空间需要高性能驱动器。除了他们的导向功能,这些连接链板也有助于动力传输。如果你想知道这个选项的更多细节请联系我们。

中心导片

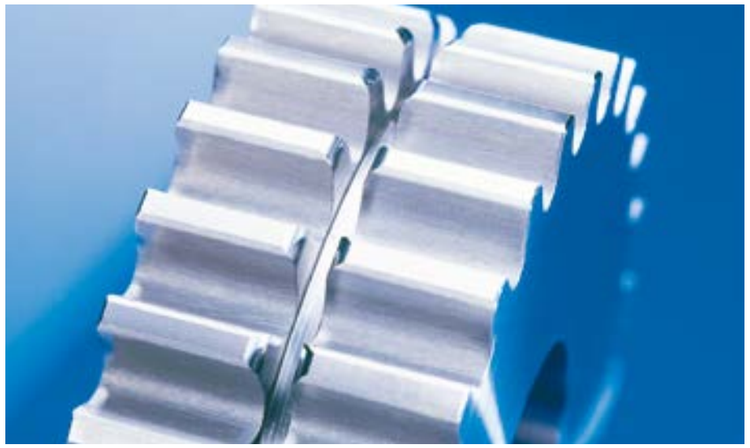
图解的齿形链中心导片显示了导片位于中心。轮子啮合还有一个导片导轨支持. 槽内的横动量对应于标准链轮连接板厚度。

侧导片

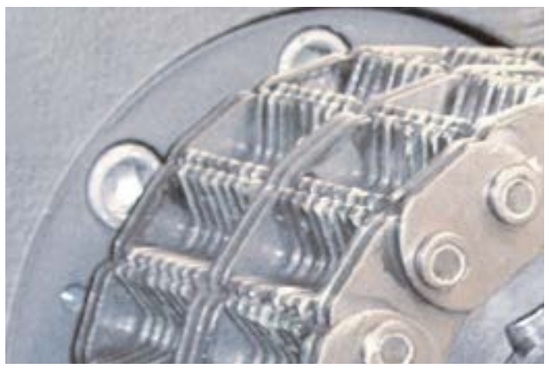
右图显示的齿形链,导片位于链条的外侧。侧导片特别适合于狭窄的宽度, 自啮合不会被导轨削弱。这里,链轮在导片之间运行需要根据链板最小厚度进行调整。

多重中心导片

导片也可以位于链条中不同排数中作为多重导片, 意味着结构不是多重中心导片就是中心/侧边导片结合。这些修改是用来提供对垂直轴驱动更好地支持,例如。在这种情况下,不需要额外的法兰上的链轮支持。

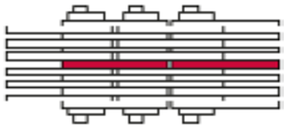


HPC sprocket with an center guide
HPC链轮带中心导片

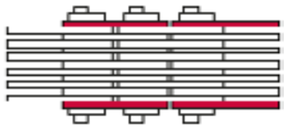


Drive chain with reinforcement plates, combination of center and side guide
传动链与强化链板、中心导片和和侧导片的组合

Center guide
中心导片



Side guide
侧导片



Multiple center guide
多重导片

Inverted tooth chains and sprockets
齿形链和链轮

Chain and sprocket have to fit perfectly:
Rely on our know-how!

链条和链轮必须完美配合:依靠我们的知识!

Customer-specific sprocket manufacturing
客户特定的链轮制造

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.
正常加工链轮对齿形链的安全运行和使用寿命长至关重要。
使用从其他制造商的链轮无法对齿形链保修。

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 preferred 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.

不允许错误的链齿
渐开线啮合保证齿形链最安静的驱动运行。如果安静的运行是一个优先级，链轮齿数越多越适合于更快的速度。在确定轮齿的数量时，需要考虑外部空间,包括应用的链条——除了需要考虑各自的类型所选的最小齿数也需要考虑允许的链轮孔径。顶端直径表中指定的相关页面只适用于保护罩驱动类型。使用没有保护罩的齿形链要求特殊啮合链轮。
链轮可以根据客户安装和生产的规格下单。通常,可以使用C45钢制链轮带硬齿侧翼或从GG或GGG铸铁链轮。应该优先考虑奇数链齿特别是铸铁链轮。
其他金属和非金属材料也是可能的。链轮宽度取决于齿形链宽度和导片类型

特殊类型
双部分链轮可以交付后通过轴进行安装。可以直接研磨轴啮合。

喂料盘的凸缘
链轮导轨适用于特殊缺乏导片的齿形链。链轮可以配备两边凸缘作为齿形链横向导片。条件与垂直轴驱动是相似的。一个大直径的喂料盘安装在链轮的底部。齿链受凸环表面支持和缓解导片从链条上的重量。

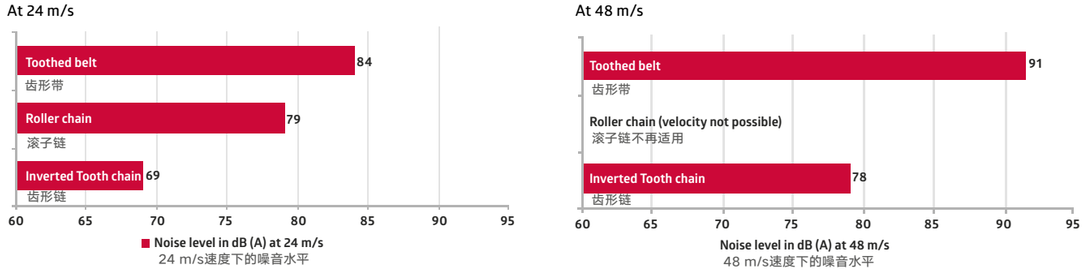
The secret's in the technology
技术的秘诀
The many benefits of inverted tooth chain drives over other drive solutions are by design
齿形链的设计使他领先于其他驱动解决方案且带来许多好处

Classic wrap operation? Counter-running drive shafts? Individual drive systems? With their special design, Renold inverted tooth chains offer a variety of unique product characteristics.
经典的缠绕操作吗? 计算运行驱动轴?单独传动系统? Renold齿形链的特殊设计提供了独特的产品特点。

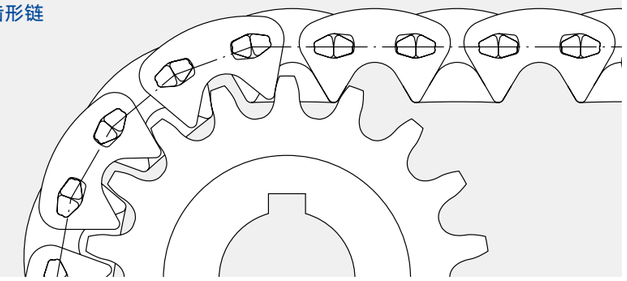
Runs like a whisper
The skillful reduction of chain link impact is one of the basic reasons behind the exemplary smooth running and lack of noise. The intensity of the impact is the result of the chain link mass and the speed of impact. The equivalent characteristic values of Renold inverted tooth chains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

低声运行
熟练减少链节间影响是平稳运行和无噪音背后的基本原因之一。影响的强度决定链条质量和影响的速度。Renold齿形链的等效特征值明显低于其他驱动类型。

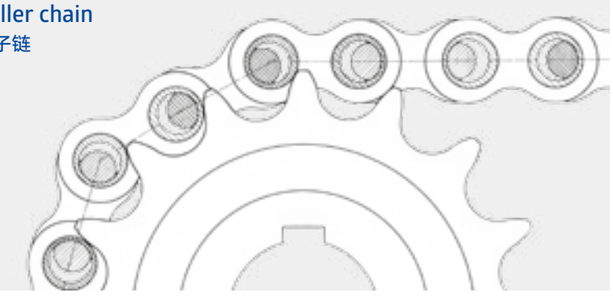
Noise levels compared to other drives
与其他驱动比较的噪音水平



Inverted tooth chain
齿形链



Roller chain
滚子链



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.

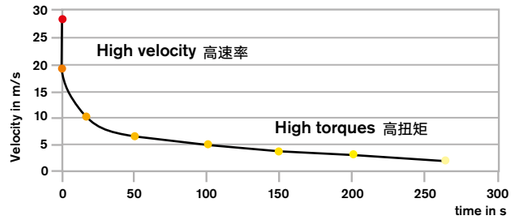
滚子链条相比的设计优势
图片揭示在操作磨损伸长的根本区别。滚子链条由外链节和内链节分别受到不同的磨损。内链节外链节经历不同程度的磨损。因此外链节描述一个更大的节距圈。这也导致链条颠簸地移动,造成对链齿的不均匀压力。同时,振动导致噪音水平增加。

Advantages over toothed belts ...
相比齿形带的优势

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.

可变载荷–当皮带开始跳跃时,齿形链可以大展腿脚
在其最大承载能力,齿形链与特定驱动在同样的质量传递不同载荷(扭矩、速度)。这尤其适用于络筒机和万向接轴驱动。齿形带只能优化了小负荷范围之内,因为只有使用一个操作点来确定预应力。这导致需要考虑经常改变负载的问题或客户无法预测的问题。大部分时间——甚至一般皮带驱动不是过多就是过少,因而侧面受到更强摩擦导致磨损。尤其在带盘中能够减少链齿侧面反冲,所谓的零距离啮合。

Example: Winder velocity profile
例子:络筒机速率剖面



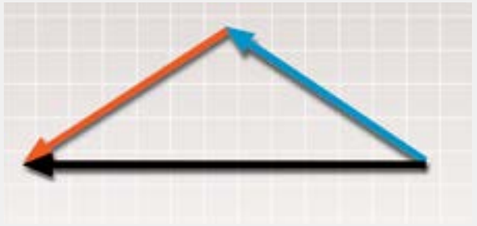
Even with varying loads, an inverted tooth chain is the optimum solution.
即使有不同的负载,齿形链是最优的解决方案。

Using inverted tooth chains prevents 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)

使用齿形链防止皮带拉力故障:
- 跳齿的危险
- 大大降低使用寿命
- 高温产生的摩擦
- 能源消耗增加
- 低效率
- 永久破坏润滑轴承和集成测量系统(其他)

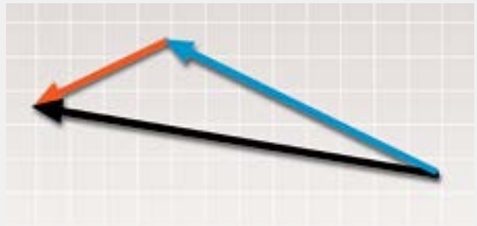
Overlapping pre-tensioning and working load leads to higher belt loads, wider belts, and thus noise problems at higher speeds.
重叠预先系紧,工作负荷会导致更高的皮带负载,更宽皮带,因此在更快速度上造成噪声问题。

Static load
静负载



Static bearing load: Totaled initial pretension
静态负载: 总体初步预紧力

Dynamic load
动负载



Dynamic bearing load: Totaled result of overlapping operating load and pretension
动态负载: 重叠操作负荷和预紧力的总计结果

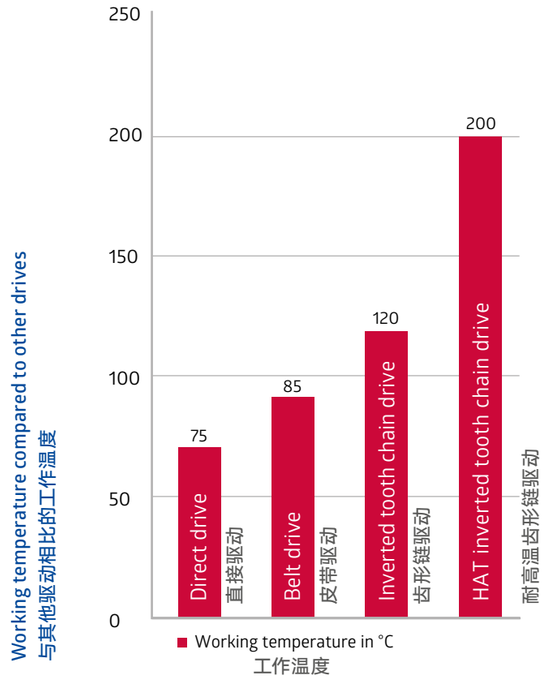
Pre-tensioning – do bearings really have to suffer?
Inverted tooth chains generally run without pre-tensioning, eliminating a large part of the bearing load. Toothed belt drives sometimes need to be pre-tensioned with more than the drive load component to ensure safe transmission of the operating load. 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.

预紧力 – 轴承真的需要忍受吗?
齿形链通常运行时无需预紧, 消除了轴承很大一部分受到的负荷。齿形带传动有时需要拉伸到超过驱动载荷组件,确保安全传输的运行载荷。对于聚乙烯V和平皮带驱动会产生更大的影响。预紧力基于正常和干燥条件上确定。通过环境影响减少摩擦系数,例如,必须通过加大预紧力来对齿形带做补偿。

… and other drive solutions
…其他驱动解决方案

Heating things up
Throughout many years of development work, Renold has consistently been able to substantially improve inverted tooth chain performance in high-temperature drive applications. In conjunction with the original Renold 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.

加热起来
经过多年的开发工作,Renold一直能够显著改善齿形链在高温驱动应用下的性能。结合Renold滚动枢轴关节,甚至我们的标准驱动可以在环境温度高达120°C下连续操作 – 因此显然比大多数其他驱动因素好。此外,我们的耐高温齿形链和链轮润滑剂可以用于温度高达200°C下不产生任何明显的磨损增加。



More assets at a glance: Advantages of Renold inverted tooth drive chains over ...
其他驱动解决方案

... 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

... 与皮带相比
- 更耐化学物质,特别是使用冷却润滑剂
- 由于销锁与相应的停机时间短相关联的可能性或缺乏额外的结构使得能够简单装配
- 对> 85°C温度和极端的湿度的敏感度降低,如材料不膨胀,水分被吸收时拉伸成员不缩水

... 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

... 与其他钢制枢轴链相比
- 非常快的最高速度
- 低磨损和均衡磨损
- 低运行噪音
- 良好的啮合条件
- 甚至与标准链轮也能低磨损
- 更加灵活的宽度选择
- 稳定运行, 不容易受到振动
- 高效率
- 一致的,高质量

... 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

... 与齿轮/齿轮箱相比
- 轴中心距离低成本
- 啮合受到温度变化的影响
- 在每一个步骤运行安静
- 无链齿侧面反冲
- 轴系配置的高公差
- 可以结合旋转和直线运动
- 良好自阻尼
- 每个步骤高效运行
- 特殊解决方案时价格适中

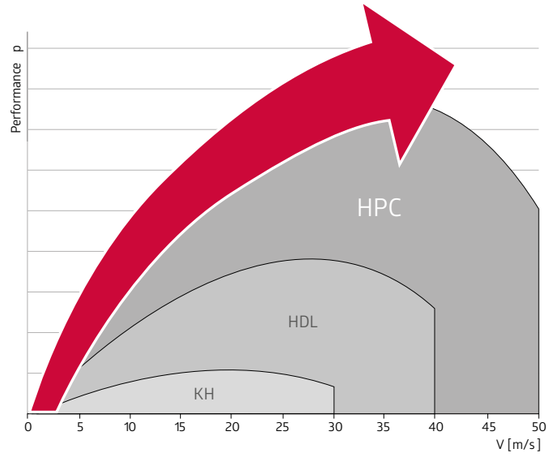
Inverted tooth chains from Renold – the benchmark for wrap drives.
Renold的齿形链 - 包装驱动的标杆

The different tooth chain types
齿形链其他不同类型
One-sided, both-sided, all-round – Renold offers the right drive concept for every application
单边,双边,全面 - Renold为每个应用提供了正确的驱动概念

Renold – the art of optimization
Renold – 优化的艺术
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 Renold is the result of many years of effort put in by a motivated team of tech-nicians and engineers. All to your advantage!
更快,更强,更安静。不断的进步是达到这一目标的唯一途径。发展的第一个齿形链的原始Renold　HPC 型是多年技术人员和工程师团队努力的结果。所有都是你的优势!

Biflex – flexible to both sides
Biflex – 两边灵活
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 Renold inverted tooth drive chains.
我们的发明。对于性能和精度,完全对称的连接链板提供双边两个方向相同的驱动。Renold齿形驱动链可以消除轴计数器的问题,s型的缠绕或节省空间的张力方法。

Individual – ready to meet your requirements
单独 - 可以满足您的要求
The maximum flexibility of the inverted tooth chain drive system allows it to be adapted easily to the most diverse require-ments. We can supply your application solution – from individual special link plates to complete specialized inverted tooth chains.
齿形链传动系统的最大的灵活性使得它很容易适应最多样化的需求。我们可以为您的应用提供解决方案——从单独特殊连接链板完成特定的齿形链。



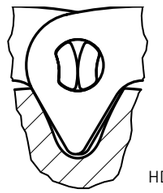
HPC

Type designation / 类型名称: HPC
Available pitches / 可供节距: 3/8“, 1/2“, 3/4“, 1“, 1 1/2“

Minimum number of teeth on the sprockets / 链轮链齿最小数量:
- 3/8“ bis 3/4“: 17 teeth
- 1“, 1 1/2“: 19 teeth
- from 1 m/s: ≥ 23 teeth

Max. velocity / 最大速率: up to 50 m/s

Pages 20 – 24
第20–24页



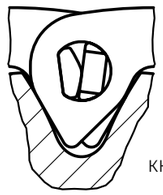
HDL

Type designation / 类型名称: HDL
Available pitches / 可供节距: 3/8“, 1/2“, 3/4“, 1“

Minimum number of teeth on the sprockets / 链轮链齿最小数量:
- 17 teeth
- from 1 m/s 23 teeth

Max. velocity / 最大速率: up to 40 m/s

Pages 33 – 36
第33–36页



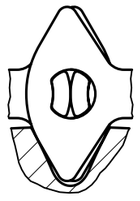
KH

Type designation / 类型名称: KH
Available pitches / 可供节距: 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 / 链轮链齿最小数量:
- 5/16“ bis 3/4“: 13 teeth
- from 1“: 15 teeth

Max. velocity / 最大速率:
- 5/16“ bis 3/4“: up to 30 m/s
- from 1“: up to 25 m/s

Pages 34, 37 – 38
第34,37–38页



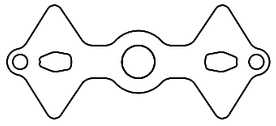
Biflex

Type designation / 类型名称: BIZ
Available pitches / 可供节距: 3/8“, 1/2“, 3/4“, 1“

Minimum number of teeth on the sprockets / 链轮链齿最小数量:
- 3/8“, 1/2“, 3/4“: 18 teeth
- 1“: 19 teeth
- ≥ 23 teeth preferred

Max. velocity / 最大速率: up to 40 m/s

Pages 25 – 28
第25–28页



Tradition meets innovation

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.

传统遇到创新

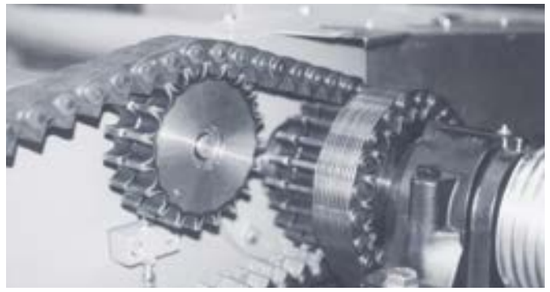
所有类型和节距的特殊链条都是单独适应指定的需求。结合100多年的经验使用最新的技术和专长,我们是致力于开发和生产适合您需要的产品。

Pages 29 – 32
第29–32页

HPC inverted tooth chain drives
HPC齿形链驱动
The original: the HPC inverted tooth chain from Renold – stronger, faster, quieter
原型: Renold的HPC齿形链-更强, 更快, 更轻

State of the art. The most powerful type of Renold 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.

技术的最新水平。Renold最强大的齿形链类型奠定缠绕驱动的新标准。比以前其他的齿形链类型更快,更静,更精确,最新一代的带滚动枢轴关节的齿形驱动链满足最高的要求。



The original: the HPC inverted tooth chain from Renold
Enhancements made to the proven HDL range unite the familiar and outstanding characteristics with new, extra advantages.

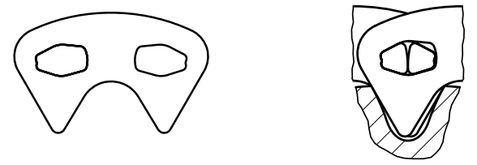
- Improved quiet running and low noise
- Low-friction rolling pivot joint with the optimum efficiency
- Higher load capacity and narrower inverted tooth chain width
- More resistant to wear and minimized elongation
- Inverted tooth chain velocities up to 50 m/s

原型: Renold的HPC齿形链
增强型的HDL系列结合对性能的熟悉和理解增添了新的更多优势

- 改善安静运行和低噪音
- 低摩擦滚动枢轴关节形成最佳效率
- 更高的负载能力和更窄齿形链宽度
- 更耐磨损和伸长最小化
- 齿形链速率达到50m/s

Optimized link plate form and joint kinematics
优化链接板形和关节运动学

HPC



HDL

KH

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

比以前更强大的60%以上。
- 更高的动态刚度,明显增强的孔处和截面
- 楔形关节确保链节孔径能够自由定位和以防自行移动来增加磨损
- 紧凑截面增加接头的抗性和抗弯强度

Power and Velocity:

Power:

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

Velocity:

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

P = power in kW
M = torque in Nm
n = speed in r.p.m.
v = velocity in m/s
Z = number of teeth

p = pitch in mm
Note: Torque M and speed n must refer to the same sprocket with the number of teeth Z!

动力和速率:

动力:

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

速率:

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

P = 动力(kW)
M = 扭矩(Nm)
n = 速度
v = 速率(m/s)
Z = 齿数

p = 节距(毫米)

注:转矩M和速度n必须引用
相同的链轮齿数Z !

Design breaking load
设计破断载荷:

Design breaking load
step 1:

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

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 23
3. Recalculate according to step 2 and select again if necessary

F_{Berf} = design breaking load in kN
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

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.

Design breaking load
step 2:

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

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

设计破断载荷
步骤一:

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

如何计算所需的设计破坏载荷:

1. 根据步骤一进行初步计算
2. 根据第23页的表格选择齿形链
3. 根据步骤二重新计算，如果必要需要重新选择

F_{Berf} = 设计破断载荷kN
P = 动力kW
k = 根据影响因素表
v = 速率
G = 齿形链重量公斤/米
S_{min} = 类型/根据应用确认安全系数

影响因子必须根据实际转矩最大速度调整。一般来说,k = 1是充分的,偏离启动行为。

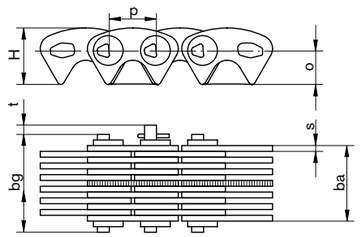
设计破断载荷
步骤二:

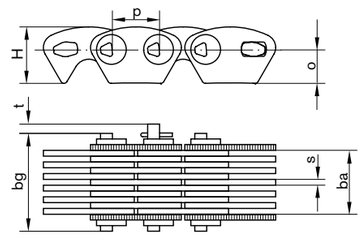
$$F_{Berf} \geq \left(\frac{P \cdot k}{v} + G \cdot v^2 \cdot 10^{-3}\right) \cdot S_{min}$$

设计影响因子值

载荷	驱动电机: 软启动驱动	三相交流电动机	活塞式发动机
平坦	1.0	1.2	1.5
中等的影响	1.3	1.5	2.0
较大的影响	≥ 1.7	≥ 2.0	≥ 2.5

HPC inverted tooth chains
HPC 齿形链





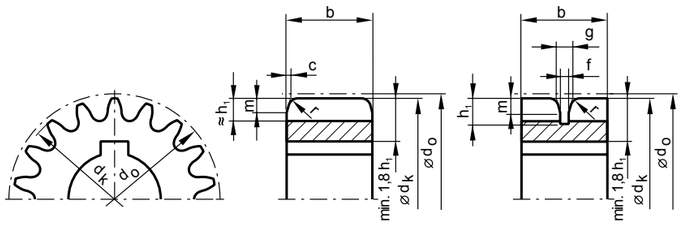
Pitch p 节距	Designation no. 编码	RZ	Nominal width b_n 定义宽度	Working width b_a 工作宽度	Total width b_g 总宽度	Design breaking load 设计破断载荷	Weight [kg/m] 重量	Sprocket width b 链轮宽度	H	o	s	t
3/8" = 9.525 mm	HPC 015 A	10	15	12.5	19.9	25.4	1.0	11.5	11.3	6.8	1.5	2.0
	HPC 020 A	13	20	17.2	24.5	30.1	1.2	16.0				
	HPC 025	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.

尺寸（毫米） - 设计破断载荷kN - RZ(排数)=每个关节的所有连接链板数量——可按要求提供其他节距和宽度。
■HPC齿形链，开放式供货，如果不指明的话会带开口销锁.
■成环链条需要偶数数量链节，奇数数量链节没有办法关闭.
■奇数数量链节只允许链条的两端连接到外部的部分

HPC inverted tooth sprockets
HPC 齿形链链轮



Minimum number of teeth:
最少齿数:

3/8“ to 3/4“	= 17 teeth
3/8"到3/4 "	=17个
1“, 1 1/2“	= 19 teeth
1 ", 11/2 "	=19个
from 1 m/s ≥	= 23 teeth
1 m/s以上	=23个

Tip diameter d_k 齿顶圆直径

Number of theeth z 齿数	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 导轨和剖面

Pitch p 节距	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.
分度圆直径可以帮助确定正确附加链链轮的外径。

Pitch circle diameter 分度圆直径:

$$d_0 = \frac{p}{\sin(180\,°/z)}$$

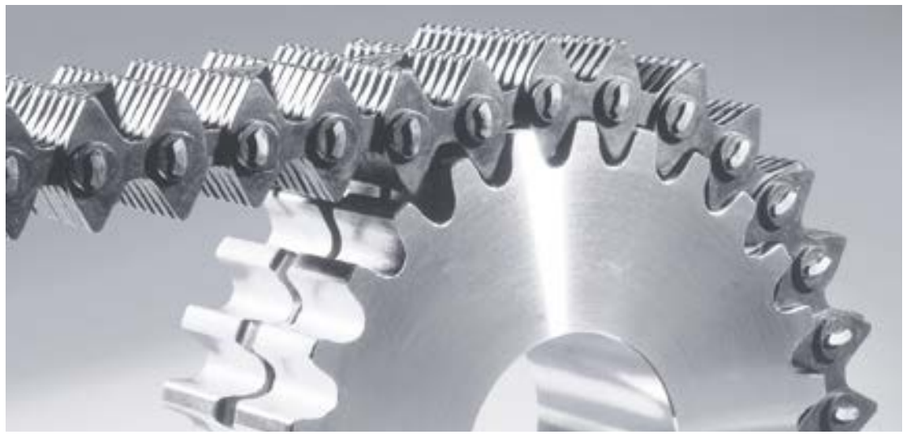
Max. diameter incl. chain 包括链条最大直径

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

Dimensions in mm – Interpolate intermediate values
尺寸（毫米）- 插入中间值

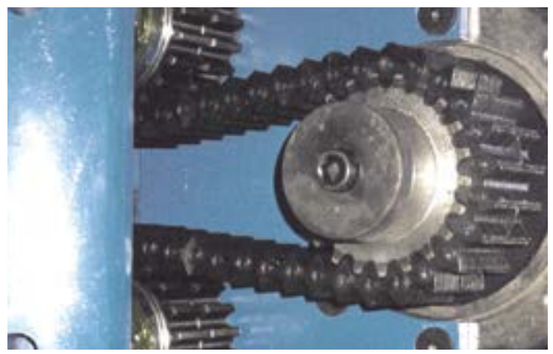
Biflex inverted tooth chain drives
Biflex 齿形驱动链

More freedom with Biflex inverted tooth chains: flexible to both sides
Biflex齿形链有更多的自由:灵活的两边



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.

最高的灵活可能性——两边对称齿连接板在双面使用中产生相等的性能和精度。方向变化的理想旋转解决方案或多轴驱动。



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

Biflex齿形链有更多自由
Biflex链接链板完全对称,链轮两边提供完整的联锁。

- 作为计数轴的驱动
- 作为任意使用s型缠绕数量的驱动轴
- 空间紧张时作为齿形链张紧的替代——从动链轮可以双边啮合
- 沿着销轴轮切向接触的原则进行驱动

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

平衡的组合

- HDL模板使用相同的关节轮廓
- 枢轴销对称排列。这些移动到中新拉张链条,从而允许在每个方向相同的弯曲量
- 关节连续地经历纵向间隙，即链节稍微会被推到一起。间隙是对功能非常重要，不过压缩效应一般不会在实践中出现因为缺少压力。

Power and velocity 动力和速率

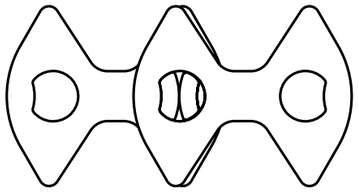
Power 动力:

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

Velocity 速率:

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

P = power in kW 动力kW
M = torque in Nm 扭矩Nm
n = speed in r.p.m. 速度(每分钟转数)
v = velocity in m/s 速率(米/秒)
Z = number of teeth 齿数
p = pitch in mm 节距(毫米)
Note: Torque M and speed n must refer to the same sprocket with the number of teeth Z!
备注：扭矩M和速度n必须引用相同的链轮齿数Z



This chain connects the advantages of the well-established HDL technology with equivalent properties for both sides and directions. This also results in the same design breaking load as with the HPC type.
这个链条连接的优点在于在双方和双向上很好地诠释HDL技术和其等价属性。这也会导致与HPC类型相同的设计破断载荷。

Design breaking load 设计的破断载荷:

Design breaking load 设计的破断载荷
step 1 第一步:

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

How to calculate the required design breaking load:
如何计算所需的设计破坏载荷:
1. Initial calculation according to step 1 最初的计算根据第一步。
2. Select an inverted tooth chain from the table on page 27. 从27页的表中选择一个齿形链。
3. Recalculate according to step 2 and select again if necessary. 根据第二步重新计算，如有必要重新选

F_{Berf} = design breaking load in kN 设计的破断载荷
P = power in kW 动力(kW)
k = impact factor according to table 根据标准算出影响系数
v = velocity in m/s 速率
G = inverted tooth chain weight in kg/m 齿形链重量 kg/m
S_{min} = type/application-dependent safety coefficient Biflex = 8...10 类型/应用 – 独立安全系统Biflex =8...10

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.
影响因素根据实际扭矩进行调整来适应最快速度。总的来说，k值 = 1是充分的,偏离启动行为。

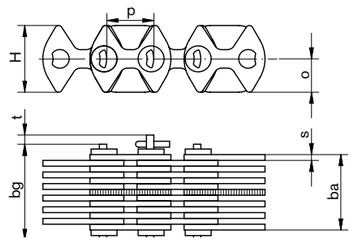
Design breaking load 设计的破断载荷
step 2 第二步:

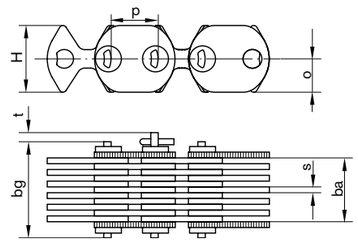
$$F_{Berf} \geq \left(\frac{P \cdot k}{v} + G \cdot v^2 \cdot 10^{-3} \right) \cdot S_{min}$$

Design impact factor values 设计的影响系数值

Load 载荷	Drive motors 驱动电机		
	Soft startup drive 软启动驱动	Three-phase current motor 三相交流电动机	Piston motor 活塞式发动机
Even 平坦	1.0	1.2	1.5
Medium impacts 中等的影响	1.3	1.5	2.0
Heavy impacts 较大的影响	≥ 1.7	≥ 2.0	≥ 2.5

Biflex inverted tooth chains
Biflex 齿形链





Pitch p 节距	Designation no. 编码	RZ	Nominal width b_n 定义宽度	Working width b_a 工作宽度	Total-width b_g 总宽度	Design breaking load 设计破断载荷	Weight [kg/m] 重量	Sprocket width b 链轮宽度	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				

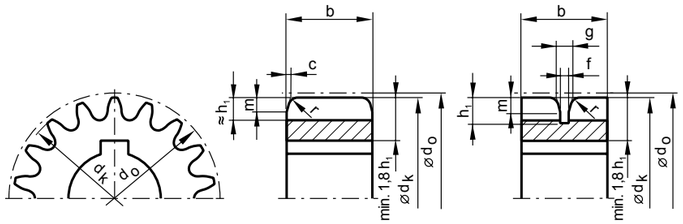
Dimensions in mm – Design breaking load in kN – RZ (Number of rows) = number of all link plates per joint – Other pitches and widths on request.

- 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.

尺寸(毫米) – 设计破断载荷kN – RZ(排数)=每个关节的所有连接链板数量——可按要求提供其他节距和宽度。

- Bilfex齿形链,开放式供货，如果不指明的话会带开口销锁.
- 成环链条需要偶数数量链节，奇数数量链节没有办法关闭.
- 奇数数量链节只允许链条的两端连接到外部的部分.

Biflex inverted tooth sprockets
Biflex 齿形链链轮



Minimum number of teeth
最少齿数:
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.
只能在链轮使用较小的齿数传动扭矩在速度v = 1 m / s为止。

Tip diameter d_k 齿顶圆直径				
Number of teeth z 齿数	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	286.4
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 导轨和剖面				
Pitch p 节距	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.
节距圆直径可以帮助确定正确的链轮附加链条的新直径。

Pitch circle diameter 节距圆直径:

$$d_0 = \frac{p}{\sin(180\,°/z)}$$

Max. diameter incl. chain 包括链条最大直径:

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

Dimensions in mm – Interpolate intermediate values
尺寸（毫米）- 插入中间值

Specific solutions
具体的解决方案
With specific variants, components and special types for special applications
与特定的变量,零件和特殊类型来适应特殊应用

For 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

特殊零件

- 特殊的链节很容易当驱动或增量的集成传感器
- 从其他制造商的零件可以很容易地合并使用特殊连接链板或适配器

For special types

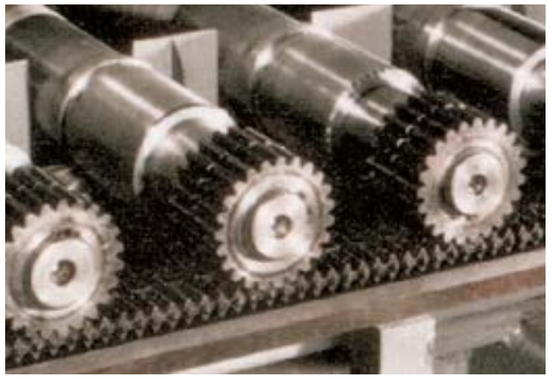
- Made from stainless steel
- With specially treated surfaces
- For clean room applications
- Special joints for inverted tooth chains without rigid backing

特殊类型

- 不锈钢材质
- 用经过特殊处理后的表面
- 适合绝对无尘室应用
- 齿形链的特别关节缺乏刚性支持

For special applications

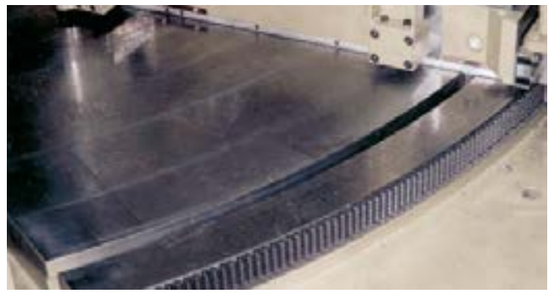
Roller table drive applications
- Cost-efficient group drive
- Uniform synchronous running
- No backlash when reversing
- Quiet even at high speeds
- Good meshing conditions minimize wear



特殊应用

辊道驱动应用
- 有成本效益组驱动
- 统一的同步运行
- 倒转时没有反冲
- 高速下也能安静运行
- 良好的啮合条件减少磨损

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



齿轮缘应用
- 更有成本效益的研磨齿轮缘
- 适合大型传动比率
- 大圈沿着一个角度旋转或转动可以进行反向运动或不断运动

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

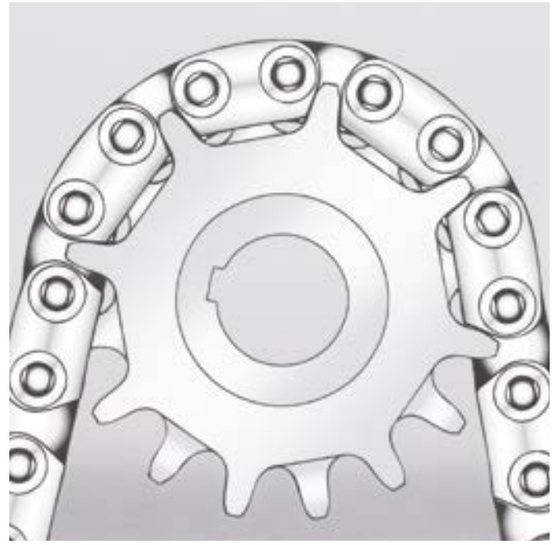
抓器和机器人驱动的应用
- 精确的同步运动
- 即使在狭窄的宽度高负载能力
- 优化啮合的啮合深度提供了一个跳跃高度的安全

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

灵活的联轴器应用
- 高弹性
- 链条关闭时通过打开锁或轴向运行打开挂钩
- 角度可以转移到1°和轴可以径向转向节距的2%

For 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



特殊设计 – 当普通的不再足够

CC紧凑齿形链
- 链条连接链板制成的固体块达到最大的耐用性
- 在特殊版本链轮与渐开线啮合
- 用于最高功率密度低速运动
- 从3/8 " 到2 1/2 " 有许多尺寸和模型可供选择,在特殊节距能达到5” 为止
- 也提供HPC枢轴销或圆螺栓 – 链条要不有刚性支持或双边折弯

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

牵引链
- 能够传输小尺寸高拉伸载荷
- 产品载体可以通过集成轴套或使用集成的螺栓的工件支持耦合
- 当安装在水平位置时适合特别低的高度
- 非啮合覆盖链板可以提供筛查

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

推杆式齿形链
- 通过连接链板接触表面传播
- 渐开线啮合创建理想的链轮啮合条件
- 特别是安静冲程驱动

For optimally configured 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

最优配置的特殊应用

特殊节距的特殊齿形链
结合齿形链零件或特定的产品优势来定制的解决方案,例如:

- 低磨耗滚动枢轴关节来增加速率
- 紧凑的连接板结构使动力传输最大化
- 渐开线对链轮的啮合运行非常安静

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

特殊链接板形式优化应用;通过先进制造工艺生产复杂的几何图形

Advantages of using Renold inverted tooth chain solutions over the alternatives...
使用Renold齿形链解决方案与其他选择的优势…

... 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

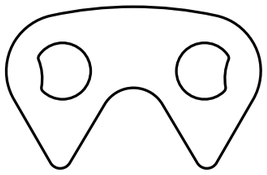
...客户的自我设计

- 节约成本
- 释放开发能力
- 从近100年的发展活动得到全面的跨部门的专业知识

...基于滚子链条的标准解决方案

- 更高质量的链齿啮合和更安静运行
- 更少伸长
- 增加允许的速度
- 更少润滑和维护的需求

HDL inverted tooth chain drives
HDL 齿形链驱动
The first optimization: Inverted tooth chains type HDL
第一个优化:HDL齿形链



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.

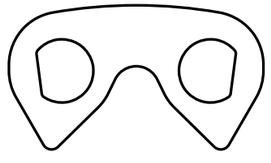
与KH类型比较链板形状改进和关节运动学帮助在更小的空间运输更大力量,使速度高达40米/秒。对HPC类型是一个重要的里程碑。

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.

传统的质量
我们齿形链总是最新的技术。HDL齿形链驱动有大量的记录,即使在今天在一些特定应用中也被认为是一种有效的解决方案。
"大众空气动力学研究"——试验车辆配备一套高性能的齿形链传动创造了许多世界纪录。

KH inverted tooth chain drives
KH 齿形链驱动
The forefather of drive chains with a rolling pivot joint
传动链的祖先带滚动枢轴关节



KH

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.

KH齿形链在要求的应用中建立齿形链胜利的舞台。可提供节距从5/16"到2"，在许多老系统中作为标准设计。也可作为一种特殊的2 1/2 "设计重型驱动和缓慢运行机器(例如KH 11350 2 1/2 "×350毫米)。如果你想更多的信息请联系我们。

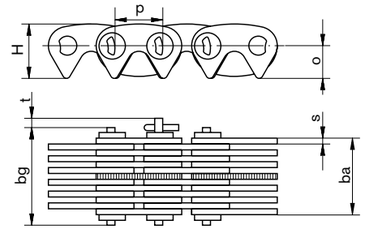
A tradition of quality
Our inverted tooth chains have always been at the front of the pack when it comes to moving large objects. Even today, KH inverted tooth chains are still used in special applications.

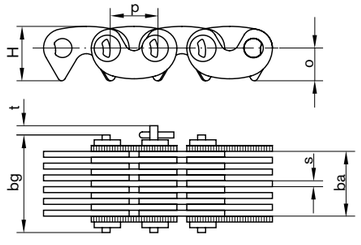
During the construction of the Elbe tunnel in Hamburg, KH inverted tooth chains were put to work as the gear rim for the tunneling machine.

传统的质量
我们齿形链移动大对象一直在包装的前面。即使在今天,KH齿形链仍用于特殊应用。

在汉堡的易北河隧道的建设中,KH齿形链在隧道机作为齿圈进行工作。

HDL inverted tooth chains
HDL 齿形链





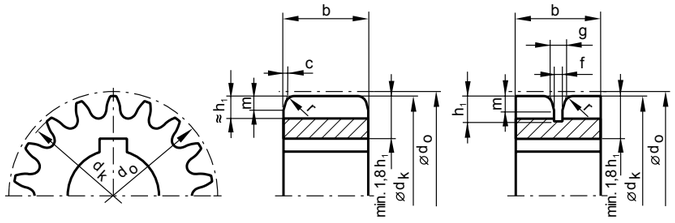
Pitch p 节距	Designation no. 编码	RZ	Nominal width b_n 定义宽度	Working width b_a 工作宽度	Total width b_g 总宽度	Design breaking load 设计破断载荷	Weight [kg/m] 重量	Sprocket width b 链轮宽度	H	o	s	t
3/8" = 9.525 mm	HDL 015 A	10	15	12.5	19.9	14.5	0.9	11.5	10.9	6.7	1.5	2.0
	HDL 020 A	13	20	17.2	24.5	17.7	1.1	16.0				
	HDL 025	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.

尺寸(毫米) – 设计破断载荷kN – RZ(排数)=每个关节的所有连接链板数量——可按要求提供其他节距和宽度。
■ HDL齿形链 开放式供货，如果不指明的话会带开口销锁.
■ 成环链条需要偶数数量链节，奇数数量链节没有办法关闭.
■ 奇数数量链节只允许链条的两端连接到外部的部分

HDL inverted tooth sprockets
HDL 齿形链轮



Minimum number of teeth:
The theoretical minimum is 17, but in practice, it should not be below 23 teeth.
链齿的最小数量:
理论上最小17
但在实践中,它不应该低于23齿

Tip diameter d_k 齿顶圆直径				
Number of teeth z 齿数	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 导轨和剖面				
Pitch p 节距	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
节距圆直径可以帮助确定正确的链轮附加链条的新直径。

Pitch circle diameter 节距圆直径: :

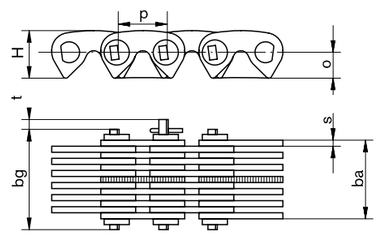
$$d_0 = \frac{p}{\sin(180\,°/z)}$$

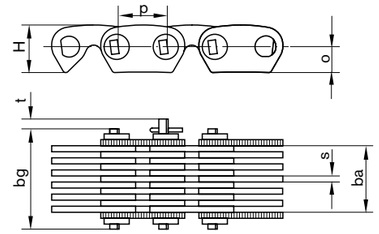
Max. diameter incl. chain 包括链条最大直径:

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

Dimensions in mm – Interpolate intermediate values
尺寸（毫米）- 插入中间值

KH inverted tooth chains
KH 齿形链





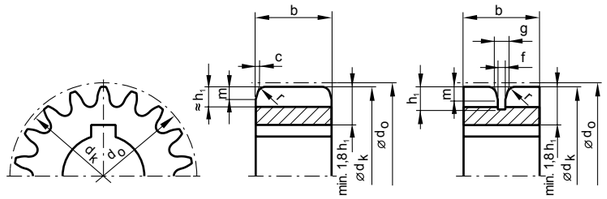
Pitch p 节距	Designation no. 编码	RZ	Nominal width b_n 定义宽度	Working width b_a 工作宽度	Total width b_g 总宽度	Design breaking load 设计破断载荷	Weight [kg/m] 重量	Sprocket width b 链轮宽度	H	o	s	t
5/16" = 7.9375 mm	KH 2212 A	12	12	10.7	16.8	5.6	0.5	9.5	7.7	4.2	1.0	2.0
	KH 2215 A	14	15	12.8	18.9	6.6	0.6	11.5				
	KH 2220 A	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 335	25	35	39.1	44.7	44.6	2.1	40.0				
	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.

尺寸(毫米) - 设计破断载荷kN - RZ(排数)=每个关节的所有连接链板数量——可按要求提供其他节距和宽度。
■ KH齿形链 开放式供货，如果不指明的话会带开口销锁.
■ 成环链条需要偶数数量链节，不过表中所示的设计破断载荷约降至80%
■ 奇数数量链节只允许链条的两端连接到外部的部分

KH inverted tooth sprockets
KH 齿形链轮



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

最少齿数:
5/16"到3/4 " =13个
1 "以上 =15个

Tip diameter dk 齿顶圆直径

Number of teeth z 齿数	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

Dimensions in mm – Interpolate intermediate values
尺寸（毫米）- 插入中间值

Guideway and profile 导轨和剖面

Pitch p 节距	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 导轨和剖面

Pitch p 节距	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.
节距圆直径可以帮助确定正确的链轮附加链条的新直径。

Pitch circle diameter 节距圆直径:

$$d_0 = \frac{p}{\sin(180\,°/z)}$$

Max. diameter incl. chain 包括链条最大直径:

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

Calculate, order, assemble
计算，订单，装配

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.

长度计算
适合给定中心距离的齿形链长度节数可通过公式计算

轴中心距
除了KH类型、偶数链节的连续链节才能关闭。基于计算出的长度选择链节数量,这才能最终确定中心距。
所示的公式只适用于用两个链轮驱动符合推荐的包角和低于6的传输比率。
我们非常乐意为你计算,特别是对涉及多于两个链轮的驱动。不言而喻也可以使用电脑程序来进行计算。

Calculating length 长度计算:

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

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

Shaft center distance 轴中心距:

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

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

X = number of links 链节数量
a = shaft center distance in mm 轴中心距(毫米)
p = pitch in mm 节距(毫米)
Z = number of teeth $Z = Z_1 = Z_2$ for i = 1 i=1时，齿数$Z = Z1 = Z2$
i = transmission ratio 传输比率
Z_1 = number of teeth on the small sprocket 小链轮上的齿数
Z_2 = number of teeth on the large sprocket 大链轮上的齿数

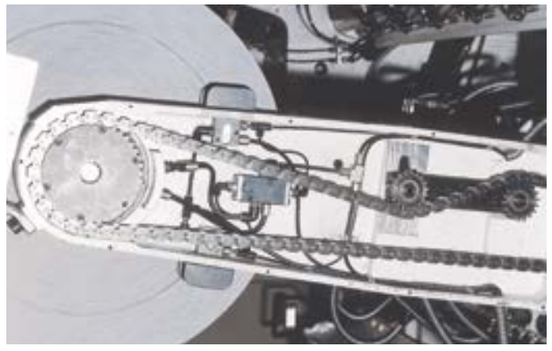
Sales designations for inverted tooth chain drives 齿形链传动的销售代码

1. Type 类型
marketing
HPC
BIZ
HDL
KH

2. Pitch 节距
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 定义宽度（毫米）

4. Version marking (optional) 版本标记(可不填)
A = External guide 外导片
Z = Version with reinforcement plates 加强链板版本
D = Double link plates 双链节链板



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.

表中所示的齿形链是从我们的产品范围一个纯粹的选择。如果您需要的宽度或节距不在所列范围里请联系我们

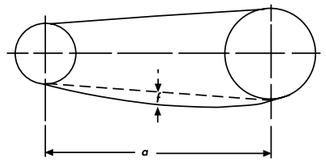
What to observe
观察什么

Sprocket wrap angle
For a proper function of inverted tooth chain drives, a minimum sprocket wrap angle of ß = 120° must be observed for up to 27 teeth. If more teeth are used, the wrap angle must be at least ß = 90°. The minimum wrap angle of the idler sprocket should be at least: ß = 360°/Z (Z = number of teeth).
Please get in touch with us if you have other operating conditions or require tangential meshing.

链轮包角
齿形链传动的正确功能,最低链轮包角ß= 120°必须适用到齿数为27为止。如果使用更多齿数,包角必须保证至少ß= 90°。最低的从动链轮包角至少应该:ß= 360°/ Z(Z =齿数)。

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.

齿形链张紧和松弛
齿形链通常是没有必要预张紧。
当链条被正确安装时当加载链运行时，轴之间的距离返回链松弛度1%。



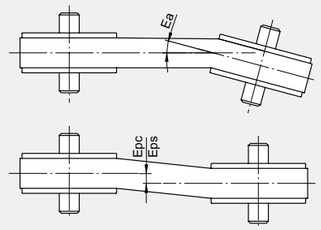
f = 00 01a f = chain sag
链条下垂度
a = distance between shafts
轴之间的距离

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.
多余的链条松弛必须通过间距轴之间的距离或通过使用一个从动链轮纠正。返回链,从动链轮排列工作外,在Biflex齿形链,轮子也从外到向内工作。

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.

还可以使用滑轨用于齿形链背面张紧。HPC齿形链的弯曲半径应该至少是节距使用的30倍。所有其他类型的齿形链20倍就足够了。

Sprocket assembly

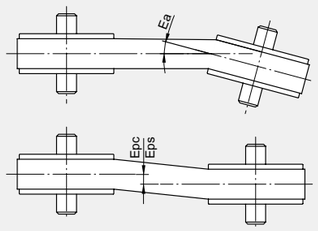


The sprockets must be parallel to each other.
Permissible error Ea ≤ 1°

The sprockets must be aligned correctly.
Permissible error
- With center guides:
  Epc ≤ guideway width f_{max} – link plate thickness s_{min}
- With side guides:
  Eps ≤ working width b_{Amin} – sprocket width b_{max}

The axial play on the sprockets must be minimized.

链轮装配



链轮必须相互平行。
允许误差Ea ⩽ 1°

链轮必须正确对齐。
允许误差
- 带中间导片:
  Epc ≤ guideway width f_{max} – link plate thickness s_{min}
- 带外导片:
  Eps ≤ working width b_{Amin} – sprocket width b_{max}

链轮上的轴向间隙必须最小化。

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 ± 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.

调整和再拉紧
如果需要预先拉紧,防止可逆的驱动器出现反弹,最长链正确调整时不会出现凹陷。然而,它可以迫使手动调整轴之间的距离±2%。初始启动后,链条经历第一次伸长阶段。因为这个过程是基于负载,链条长度、速度、和其他因素,它是无法预测这首次伸长会持续多久。经过周期性的试运转后很有可能需要重新拉紧。
可以根据需要后面执行再拉紧(由于操作伸长是很少的)。轴间较短的距离和一致的加载方向运行消除再拉紧的必要性。应用无法再拉紧或缺乏足够的张紧空间工厂应该也可以使用伸长的齿形链。这是一个特殊的过程,链条交付之前就已经初始伸长。

Applying, closing, shortening and lengthening
应用, 关闭, 短缩和加长

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.

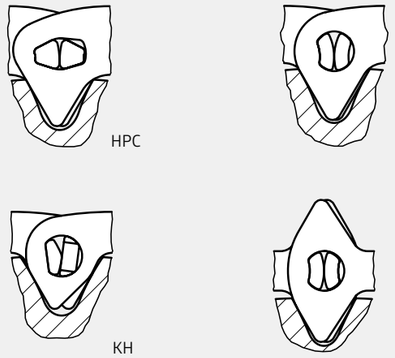
齿形链装配
齿形链通常交付时是开放的, 在安装后可使用随带的开口销或铆钉销锁关闭。如果需要,齿形链可以提供无尽的铆接;在这种情况下,在装配之前确保链条没有任何问题安放在链轮上。
连续驱动需要偶数链节 - 否则齿形链末端不能满足.
奇数链节齿形链只存在在链条末端被连接到外部部件的情况, 比如说适配器或张力锁。
请不要偏离下面的指示-他们是链条无故障操作驱动, 运行安静, 使用寿命长的先决条件。

Adapter pieces at use of uneven number of links
奇数链节使用适配器

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 toothing and mesh with each other if possible. Axle and rolling pivots are consecutively fed into the link plate bore. Important: an incorrect 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.

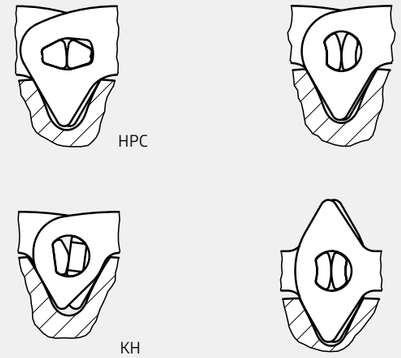
两销轴系统的齿形链应用和关闭
齿形链坐落在链轮上, 如果可能的话这样两端可以满足彼此啮合。轴和滚动枢轴连续输入链板孔。重要的是:一个不正确的销轴安排能打扰安静的运行,甚至在某些情况下能导致链条断裂。
然后使用铆接垫圈,插入开口销进行关闭;铆接垫圈的紧凑度是一种内在的安全措施,不得通过修改尾销被篡改。永远记住正确安排轴销和枢轴销。

Shortening and lengthening chains/ Note the correct pin assembly



- 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

缩短和延长链条/ 注意正确的销轴组装



- 打开开口销来打开齿形链
- 去掉铆接垫圈和从关节中拿出销轴
- 磨掉铆接头以防铆接锁
- 缩短,继续以同样的方式移除另一端的部分
- 连接末端并关闭齿形链
- 重要的是要注意链节的正确数量和方向
- 延长,加入的两端部分插入齿形链的末端。如上所述使用随带开口销或铆接销轴锁进行关闭

The right lubrication
正确润滑

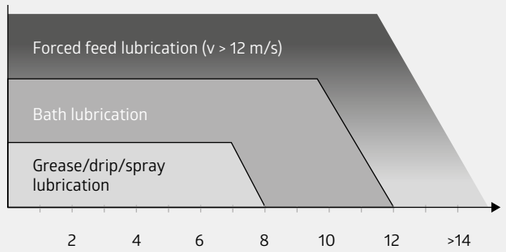
A well-lubricated inverted tooth chain
A dry-running chain can experience a much shorter service life. The oil film placed on the chain at the factory is for corrosion protection only and does not act as a lubricant. The type of lubrication is based primarily on the circumferential speed of the inverted 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 oper-ate 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.

正确润滑齿形链
干运转会使链条的使用寿命大大缩短。为了保持低磨损，应定期润滑传动齿形链和输送齿形链。
润滑剂的类型多数情况下取决于齿形链的速度. 然而,这个系统并不充分地覆盖所有极其广泛的速度驱动情况以及或在恶劣的环境条件操作。有疑问时,请与我们取得联系!

润滑
根据DIN 51562 - 01润滑油在使用粘度一般应该有一个至少220平方毫米/秒(cSt)。我们还特别推荐使用VISCOGEN KL 23喷雾剂等或可代替品打开传动齿形链。当然,传统油脂润滑也是一个选项虽然低蠕变特征并不足以满足所需的关节润滑。有疑问时,请让我们知道,我们将检查你任何时间选择的润滑剂。我们也乐意为特殊的应用推荐润滑剂——例如食品行业或高温应用。

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



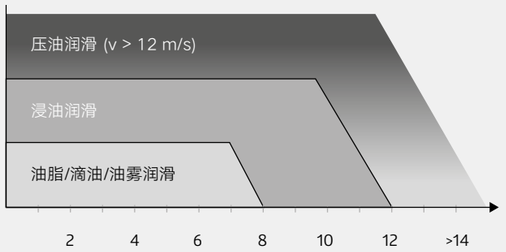
Grease, drip, and spray lubrication
Lubrications with greases capable of flowing, oils with good adhesive and creep characteristics, or lubricants thinned with volatile components. Lubricate regularly according to speed.

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.

根据齿形链速度润滑(V=m/s)



油脂，滴油，油雾润滑
利用流动性油脂和具有良好附着及流动能力的润滑油润滑，或利用经过挥发性成分稀释的润滑剂润滑. 根据速度定期润滑.

浸油润滑
通过浸入油池润滑。调整齿形链，确保齿形链在静止状态下最低点以及所有连接都浸在油中。

自动润滑设备
润滑齿形链不带油密外壳。由于调整剂量可以应用最少的润滑剂。润滑剂使用油和油刷应用于链齿。一年的免维修操作。

压油润滑
这需要关闭,不透油的外壳。齿形链高于油池上和喷雾喷嘴对准链齿的一面

Innovative and accurate
革新和精确
Customer service, engineering, design –
Advantages you can dig your teeth into
客户服务, 工程, 设计 - 让您没齿难忘的先进优势

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.

使用最新的技术方法和为解决客户的任务所需

领域的知识,我们计算和开发最合适的配置。

齿形链和链轮是完全适应彼此。

Inverted tooth conveyor chains
齿形输送链
We are not only driving, we are also conveying
我们不仅仅驱动, 也同样输送

Whether for heavy-duty, robust operation, or to convey parts with small or large dimensions, processed or unprocessed workpieces, or even fragile items: Renold 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

无论是重型、可靠操作或运输小或大尺寸零件,加工或未加工的工件,甚至易碎物品: Renold齿形链确保您的输送系统无故障运行

通过以下先决条件可以满足这些因素
- 渗碳钢的低摩擦滚动枢轴链节, 呈现高效率, 耐磨性和持久性等性能
- 高阻热处理钢材的FE优化外型齿形链
- 链轮以硬化渐开线啮合平稳,无冲击啮合

与其他曲率, 钢制枢轴和皮带驱动, 我们都是非常有优势
- 由于高功率密度到达空间优化
- 众所周知安静运行; 换句话说: 无声链
- 服务寿命特别长
- 耐高温
- 高度坚固和耐用

雷诺德传动机械（杭州）有限公司
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