6. Sprockets

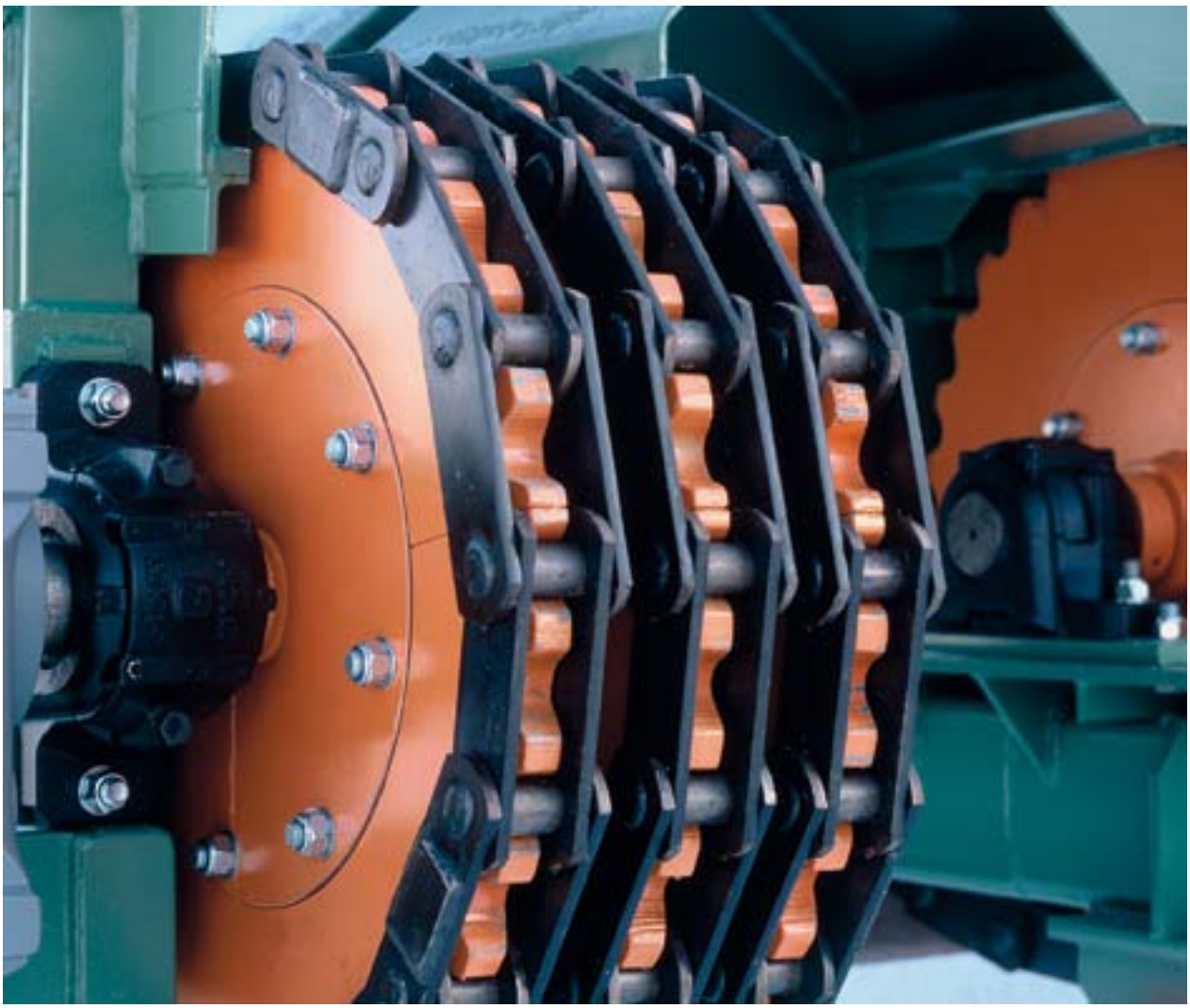
Sprockets

THE SPROCKET TRANSMITS POWER TO THE CHAIN

A high-quality sprocket prevents the chain from wearing.

The sprockets and the return sprockets are among the most significant components in a conveyor. The sprocket transmit the power produced by the operating equipment so that it can move the chain.

In addition to chains and sliding guides, Lapua Chains Ltd also manufactures and delivers sprockets. Acquiring all components from the same manufacturer is both easy and cost-efficient, and the full compatibility of all components is guaranteed.



The syncronization of the sprockets is very important in systems with several parallel chains.

The bush and the tooth must fit together

The properties of the sprocket significantly affect the durability of the entire chain. Incorrect or low-quality sprockets greatly reduce the operational life of the chain.

The sprocket transmits the operating equipment's power, via the chain bushes, to the chain. This is why the compatibility of the sprocket's teeth and the chain's bushes is crucial for the flawless operation and durability of a conveyor.

The bushes are usually exposed to higher levels of stress than any other part of the chain. In most types of chains, the bushes wear down the fastest, which means that the operational life of the bushes defines the operational life of the entire chain.

The compatibility of the sprockets' teeth and the chain's bushes is vital for the durability of the chain.

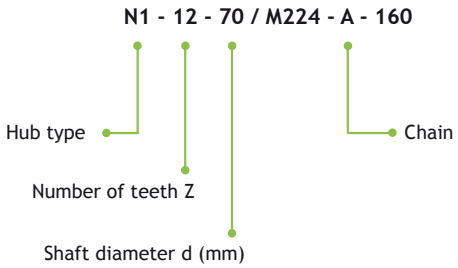
SELECTING A SPROCKET

The manufacturing methods used, the raw materials, and the number of teeth are the most important selection criteria for sprockets.

The number of teeth should never be less than eight. A sufficient number of teeth prevents the polygon effect that causes the chain to jerk and twitch. The faster the conveyor, the greater the number of teeth should be. In lines having several parallel chainss, and for conveyors with double chains, the sprockets must be syncronized.

Return sprockets can usually turn freely in relation to each other. The number of teeth on a return sprocket may be two less than the number of teeth on the drive sprockets, but never less than eight.

Sprocket marking model



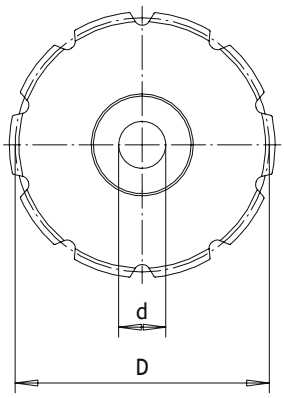
One-piece sprockets

The benefits of a one-piece sprocket are its low purchase price and its simple structure. However, one-piece sprockets are somewhat difficult to replace. During replacement, the shafts have to be removed from their bearings. The sprocket is installed by leading it onto the shaft and locking it into place.

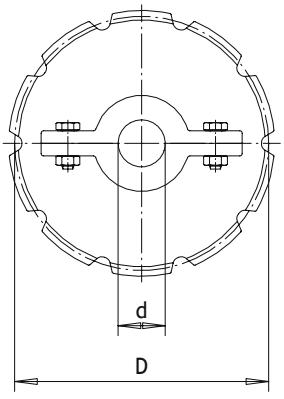
Splittable sprockets

The splittable sprocket is easier to install. As the sprocket consists of two separate halves, the shaft does not have to be removed for its installation. The halves are joined together by a bolt joint in the sprocket.

A splittable sprocket is ideal for demanding applications, in which the installation does not require removing the shaft.

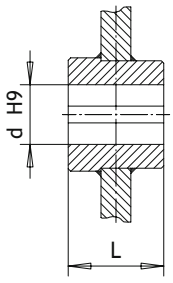


One-piece YN

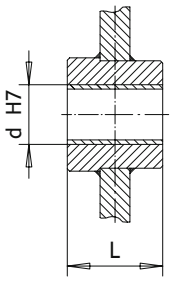


Splittable XN

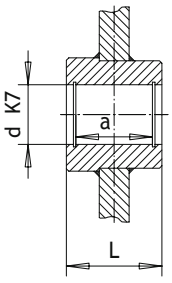
Hub types



N 1
Keyway

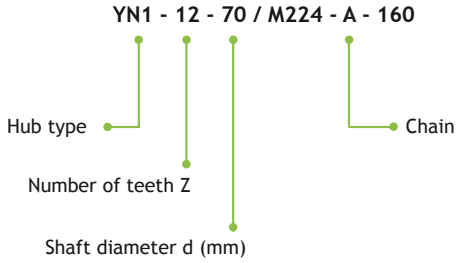


N 2
Bearing bush



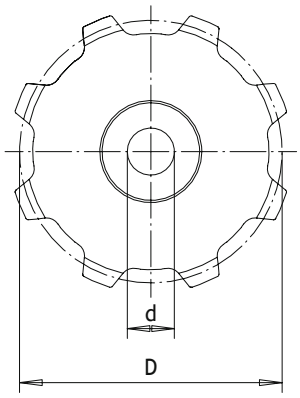
N 4
With ball bearings

Sprocket marking model

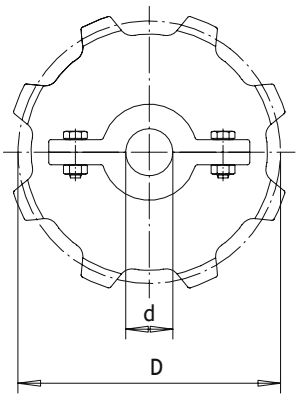


Sprockets with longer tooth gap

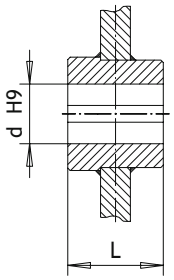
If the chain is to be used to transport materials that could cause blockages, the best option is a sprocket featuring longer tooth gaps than normal. The longer tooth gap will not get blocked and cause the chain to tighten. The disadvantage is that the sprocket may run less precisely. The reference diameters can be seen on the same table as that used for normal sprockets.



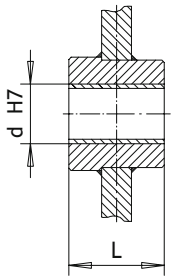
One-piece YN



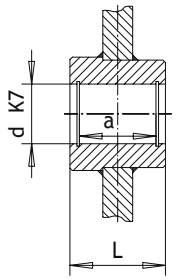
Splittable XN



YN 1
Keyway



YN 2
Bearing bush



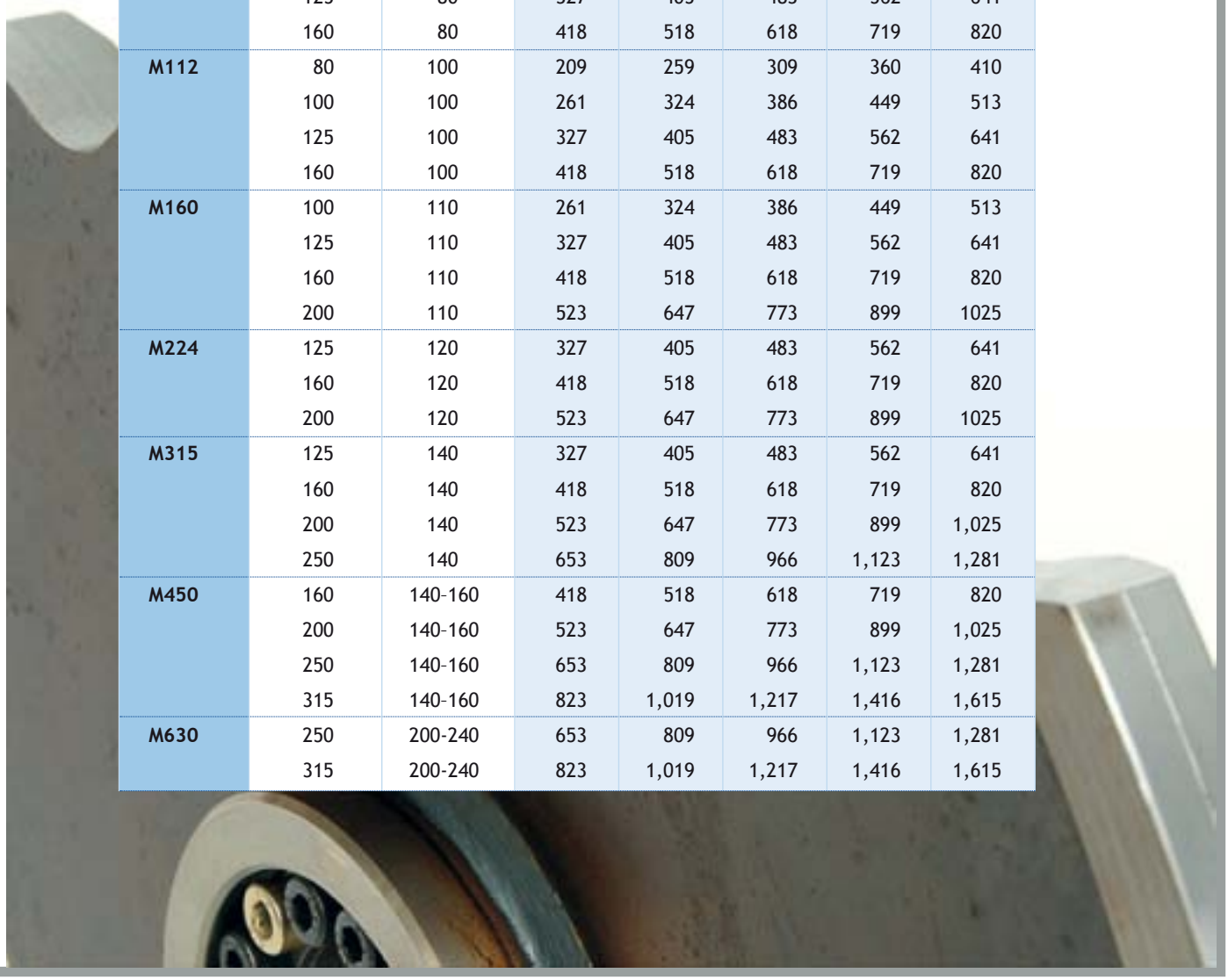
YN 4
With ball bearings

Hub types

SPROCKET REFERENCE DIAMETERS

Reference diameter D in different size classes

Chain no.	Pitch	Length of hub	8	10	12	14	16
M40	63	60	165	204	243	283	323
	80	60	209	259	309	360	410
	100	60	261	324	386	449	513
M56	63	70	165	204	243	283	323
	80	70	209	259	309	360	410
	100	70	261	324	386	449	513
	125	70	327	405	483	562	641
M80	63	80	165	204	243	283	323
	80	80	209	259	309	360	410
	100	80	261	324	386	449	513
	125	80	327	405	483	562	641
	160	80	418	518	618	719	820
M112	80	100	209	259	309	360	410
	100	100	261	324	386	449	513
	125	100	327	405	483	562	641
	160	100	418	518	618	719	820
M160	100	110	261	324	386	449	513
	125	110	327	405	483	562	641
	160	110	418	518	618	719	820
	200	110	523	647	773	899	1025
M224	125	120	327	405	483	562	641
	160	120	418	518	618	719	820
	200	120	523	647	773	899	1025
M315	125	140	327	405	483	562	641
	160	140	418	518	618	719	820
	200	140	523	647	773	899	1,025
	250	140	653	809	966	1,123	1,281
M450	160	140-160	418	518	618	719	820
	200	140-160	523	647	773	899	1,025
	250	140-160	653	809	966	1,123	1,281
	315	140-160	823	1,019	1,217	1,416	1,615
M630	250	200-240	653	809	966	1,123	1,281
	315	200-240	823	1,019	1,217	1,416	1,615

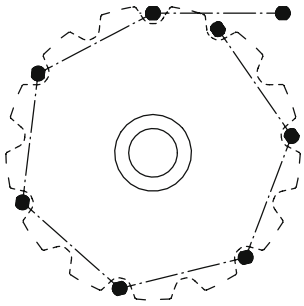


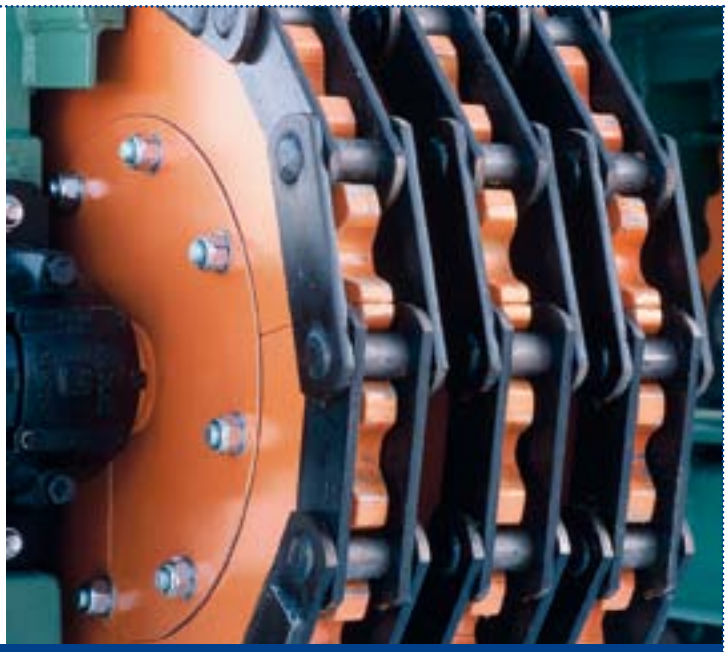
The same hub types are available for use with half-tooth sprockets as for normal sprockets, in both one-piece and splittable configurations.

Half-tooth sprockets

Sprockets wear mostly in their tooth gaps, where the chain bush rubs against the gap. However, this wearing can be halved by using a sprocket with "half tooth" gaps. In practice, extra tooth gaps are made between the existing tooth gaps, making a 10-tooth sprocket into a 21-tooth sprocket. The tooth gaps are spaced such that each gap is only used on every alternate rotation. Wear is significantly reduced, while the sprocket's diameter remains nearly the same as it was before.

The use of sprockets with half-tooth gaps is mainly restricted by the pitch of the chain used. Half-tooth sprockets cannot be used in combination with chains having very short pitches.





Half-tooth sprockets

REFERENCE DIAMETERS AND THE MINIMUM NUMBER OF TEETH FOR HALF-TOOTH SPROCKETS

Reference diameters for half-tooth sprockets (D)

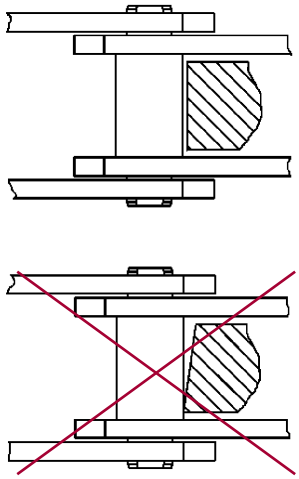
z \ p	63	80	100	125	160	200	250	315
6.5	136	172	215	269	344	430	538	678
7.5	155	197	246	307	393	492	615	774
8.5	174	221	277	346	443	554	692	872
9.5	194	246	308	385	493	616	770	970
10.5	214	271	339	424	543	679	848	1069
11.5	234	297	371	463	593	741	924	1168
12.5	253	322	402	503	643	804	1005	1267
13.5	273	347	434	542	694	867	1084	1366
14.5	293	372	465	581	744	930	1163	1465
15.5	313	397	497	621	795	994	1242	1565
16.5	333	423	528	661	845	1057	1321	
17.5	353	448	560	700	896	1120	1400	
18.5	373	473	592	740	947	1183	1479	
19.5	393	499	623	779	997	1247	1558	
20.5	413	524	655	819	1048	1310		

The minimum number of teeth (z_{min})

The table presents the smallest available pitches and numbers of teeth for chains usable with the various size classes.

Chain	z_{min}	Chain	z_{min}	Chain	z_{min}	Chain	z_{min}
M56-A-63	7.5	M112-A-80	6.5	M224-A-125	6.5	M450-A-200	6.5
M56-A-80	6.5	M112-A-100	6.5	M224-A-160	6.5	M450-A-250	6.5
M56-A-100	6.5	M112-A-125	6.5	M224-A-200	6.5	M450-A-315	6.5
M56-A-125	6.5	M112-A-160	6.5	M224-A-250	6.5	M450-A-400	6.5
M80-A-63	7.5	M160-A-100	6.5	M315-A-160	6.5	M630-A-250	6.5
M80-A-80	6.5	M160-A-125	6.5	M315-A-200	6.5	M630-A-315	6.5
M80-A-100	6.5	M160-A-160	6.5	M315-A-250	6.5	M630-A-400	6.5
M80-A-125	6.5	M160-A-200	6.5	M315-A-315	6.5	M630-A-500	6.5

A machined sprocket saves the chain.



Load peaks stress chains

If the toothing of a sprocket does not match its chain and a tooth touches a chain bush only at its point or corner, then peak loads are applied to the wall of the bush. These peak loads wear down the bush and may cause it to crack.

FLAME-CUT OR MACHINED SPROCKETS?

Sprockets are manufactured by two methods: by flame-cutting and by machining. It is good to know the differences between these two alternatives because the manufacturing method used affects both the price and the operational life of a chain.

Machined sprockets save the chain

A machined sprocket is produced by machining the teeth from a slab by milling. This results in extremely dimensionally accurate teeth and tooth gaps. The perpendicularity of the teeth and the quality of their surfaces are both excellent.

Machined sprockets save the chain. The tooth will always come into contact with the chain bush along its entire width, saving the bush from experiencing any extremely wearing localised loads. When the chains force or speed is very high, a machined, dimensionally accurate sprocket is the best choice.

A flame-cut sprocket is the budget option

The less expensive option is to flame, laser or plasma cut the sprocket into the desired shape from a steel plate. The teeth can be made to size without separate machining.

The dimensional accuracy of the teeth of a flame-cut sprocket is lower than that of a machined sprocket, which means that the tooth system may not, necessarily, be as exactly perpendicular as that of a machined sprocket. If the tooth only touches the chain bush with its point or corner, then a significantly peaked load may be directed at the bush wall. Peaked loads cause significant wear on the bush, even leading to breakage of the chain.

Machined sprockets repay their investment

As a general rule, flame-cut sprockets are best suited for slow, lightly loaded and less critical conveyors. In all other applications, we recommend using a machined sprocket.

When used in any inappropriate application, a flame-cut sprocket will rapidly damage a valuable chain. Even though the purchase costs of a flame-cut sprocket are low, these savings will quickly disappear in the subsequent operating costs.

For more information on selecting the correct sprocket, please contact the Lapua Chains sales team on +358 6 435 1200, or just send us an e-mail to posti@lapua-ketjut.fi.

SPROCKETS' ATTACHMENT METHODS

The type of conveyor, installation conditions and the size of the shaft etc. must all be considered in the selection of the sprocket attachment method and the hub type. One of the most important qualities in a sprocket is that it is easy to replace.

Welding

The simplest way to attach a sprocket on the shaft is to weld it, which means that no other attachment parts are required. However, a welded sprocket cannot be replaced without damaging the shaft, which is why it is poorly suited to demanding applications.

Keyway

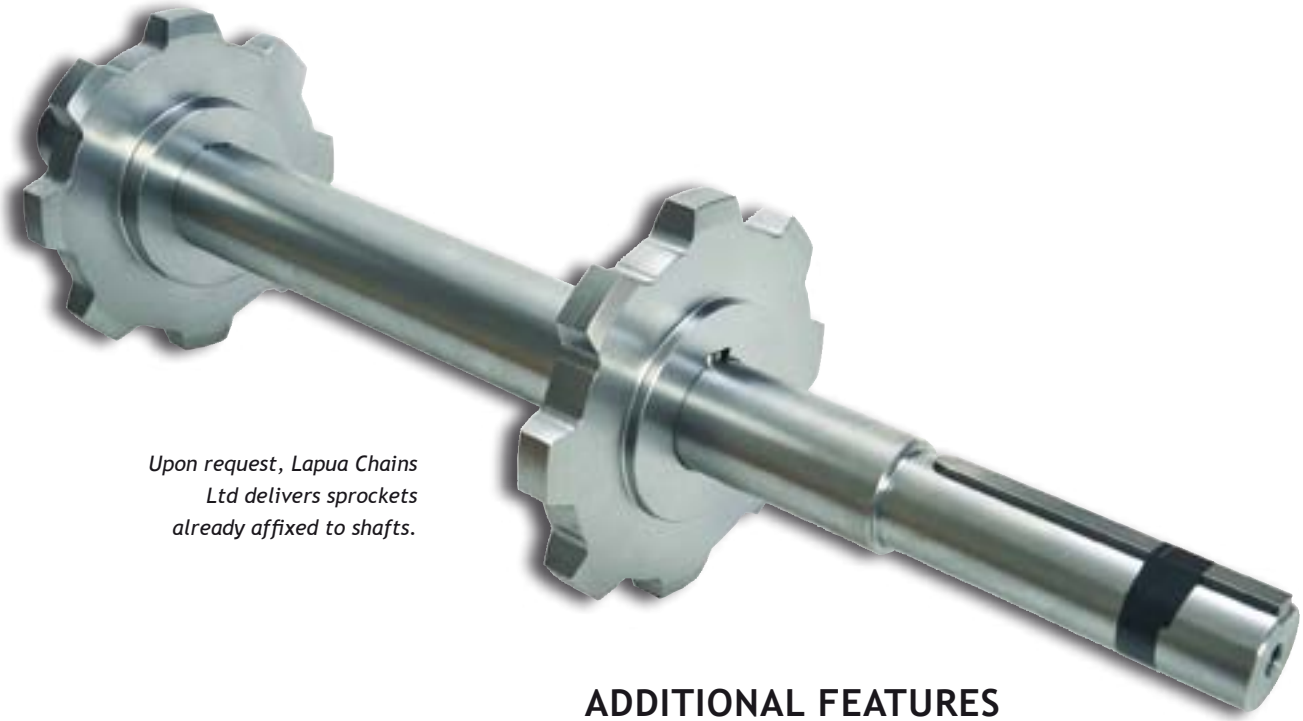
Keyway locking is the most common method of attaching a sprocket. Keyways are machined into the sprocket hub and the shaft, and a separate key piece is then affixed to them. The key piece locks the sprocket onto the shaft with a "shape-closed joint". Longitudinal sliding of the sprocket on the shaft is prevented by separate lock screws.

Keyway milling requires grooves to be machined, but it makes for a very quick installation of the sprocket.

A sprocket equipped with a clamping bush hub is easy to install.

Clamping bush

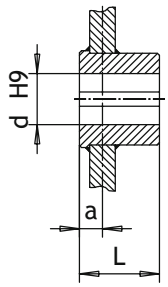
A clamping bush hub is the easiest hub type to affix to a shaft. The hub is made from clamping bushes that can be tightened so that they attach the sprocket to the shaft with friction. The clamping bush is tightened directly onto the shaft, which is why the shaft does not have to be machined.



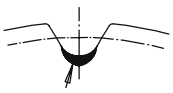
Upon request, Lapua Chains Ltd delivers sprockets already affixed to shafts.

ADDITIONAL FEATURES

Lapua chains offer plenty of practical solutions that improve the operation of sprockets under various applications.



Single-sided hubs



Refuse bevel

Single-sided hubs

When the chains have to be as far apart as possible, but without any increase in the width of the conveyor, then the sprocket can be equipped with a single-sided hub.

Refuse bevel

If the transported material is likely to cause blockages, but a sprocket with a longer tooth gap than normal cannot be fitted, then the chain can be equipped with a refuse bevel. The tooth gap will be cleaned by the bevel in the bottom of the gap.

Lowered teeth

Using teeth of a lower than normal height is a good solution when structures and attachments affixed to the chain limit the space available for the teeth attached to the chain.

Special materials

Most sprockets are made from S355 (Fe52) grade structural steel. If the application requires even better durability, then various wear-resistant, stainless, and acid-resistant steels can be considered.