



CATALOGUE 1 | DRIVE CHAIN

Innovation in Motion
TSUBAKI

INTRODUCTION TO TSUBAKI ROLLER CHAIN

Glossary

1. Minimum Tensile Strength as per ISO Standardisation

This is the Minimum Tensile Strength determined by ISO. If a roller chain fails a tensile load below this value, it does not surpass the standards.

2. Minimum Tensile Strength as per TSUBAKI Standardisation

This is a minimum value determined by statistical processes at TSUBAKI. If a roller chain fractures at a tensile load below this value, it does not surpass TSUBAKI standards. TSUBAKI standards are higher than ISO standards.

3. Average Tensile Strength as per TSUBAKI Standardisation

This is a fracture load reading obtained after a long period of actual tensile strength testing of a large number of chain strands. Of course, when any given strand of roller chain fractures, this value may be higher or lower, so it does not represent a guaranteed value.

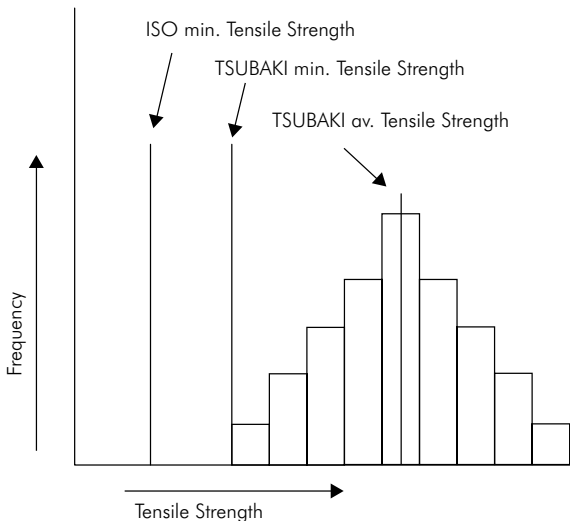


Fig. 1 Relationship between the three tensile strengths mentioned above.

4. Tensile Strength Testing Method

As shown in Fig. 2, a roller chain with minimum of five links is fixed at both ends by clevises and tensioned until fracture occurs. The type of fracture can be used to determine the cause of the breakage of the chain (Fig. 3).

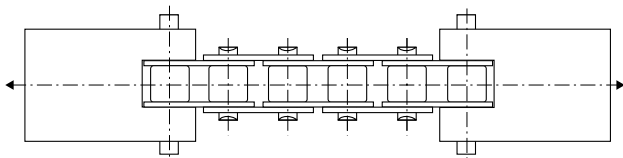


Fig. 2 Tensile Strength test

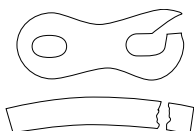


Fig. 3 Shape of fracture

5. Maximum Allowable Load

The Maximum Allowable Load (M.A.L.) of a roller chain (excluding Stainless Steel Chain and Engineering Plastic Chain) is the value derived from the lowest fatigue limit. When a load lower than this value is repetitively applied to the roller chain, fatigue failure will never occur.

The TSUBAKI M.A.L. is determined after 10 million repetitive loads instead of 3 million repetitive loads which is the European Standard.

The Maximum Allowable Load of Stainless Steel Chain and Engineering Plastic Chain is determined by the surface pressure between the pins and bushes.

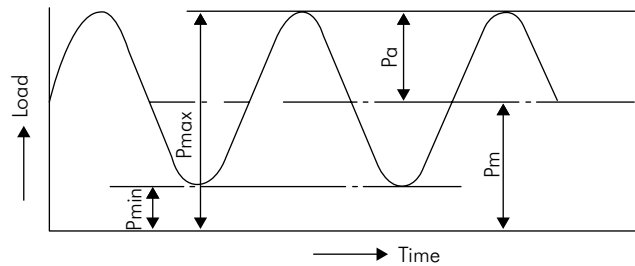


Fig. 4 Summary chart for repetitive loads

6. Ring Coining Process

For easy assembling the pin and link plate of a connecting link are slip fit. In general, this type of connecting link has a 20% lower fatigue strength than the chain itself. However, TSUBAKI developed a special process to eliminate that loss of fatigue strength and still satisfy the customers demand for easy assembling: the patented Ring Coining process. By applying the patented Ring Coining process, TSUBAKI generates a cold deformation around the pin hole of the connecting link plate. This results in residual stress around the pin hole and thereby adds strength. By using this process, transmission capacity is increased back to 100%.

TSUBAKI applies the patented Ring Coining process to all slip fit connecting links.

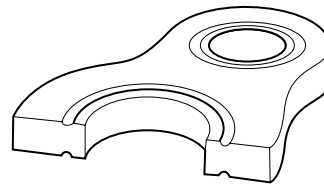


Fig. 5 Ring Coining

For severe conditions, TSUBAKI has developed the Heavy Duty Chain series. These chains are standard equipped with press fit connecting links. The installation is more difficult than in case of standard connecting links.

INTRODUCTION TO TSUBAKI ROLLER CHAIN

7. Ball Drifting Process

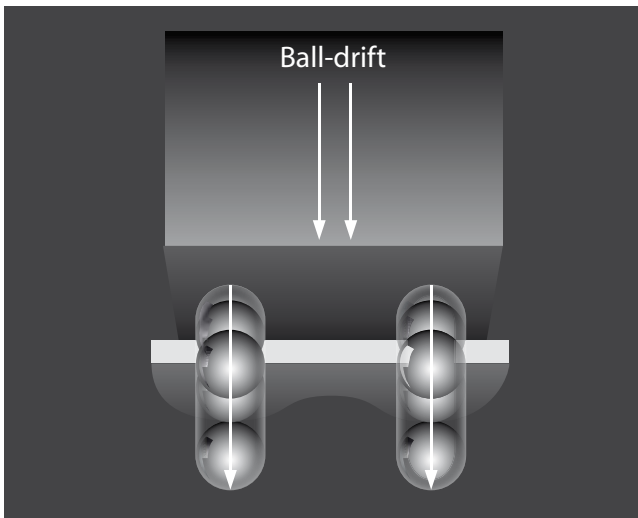


Fig. 6 Ball Drifting

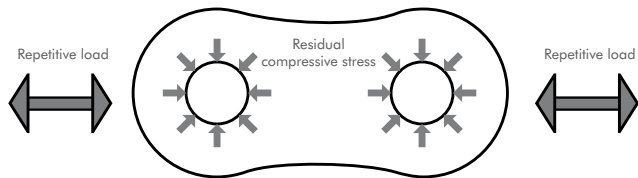


Fig. 7 Residual Compressive Stress

Ball drifting is the process of pressing a hardened steel ball through a hole in an already hardened steel plate (Fig. 6). The goal of this process is to create local plastic deformation and effectively add compressive stress (Fig. 7) to the walls of the hole. Besides this, the process generates precisely controlled holes for an optimum press fit. Together, this leads to significantly improved fatigue life (up to 30%).

8. Shot Peening Process

Shot peening is a process used to produce a compressive residual stress layer and modify mechanical properties of metals. It means impacting a surface with shot (round metallic or ceramic particles) with force sufficient to create plastic deformation.

At TSUBAKI, all basic chain parts (except pins) are shot peened.

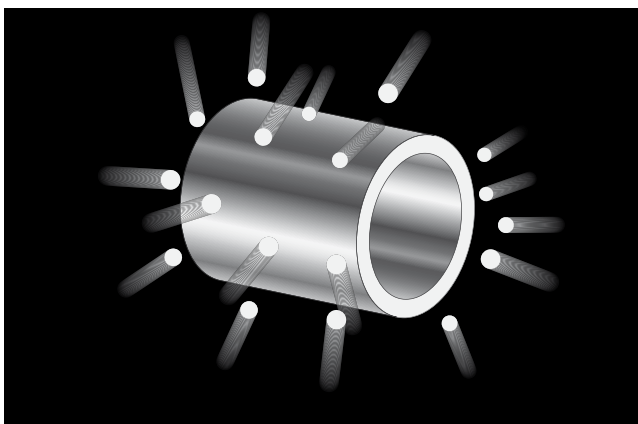


Fig. 8 Shot Peening

Shot Peening increases resistance to:

- fatigue failure
- corrosion fatigue
- hydrogen assisted cracking
- cavitation erosion
- stress corrosion cracking
- galling
- fretting

9. Pre-Loading Process

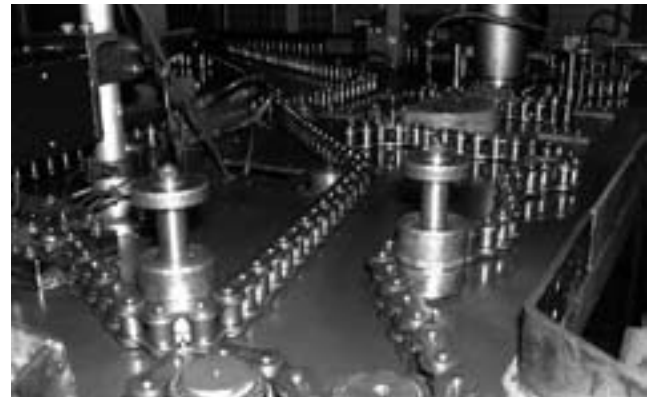
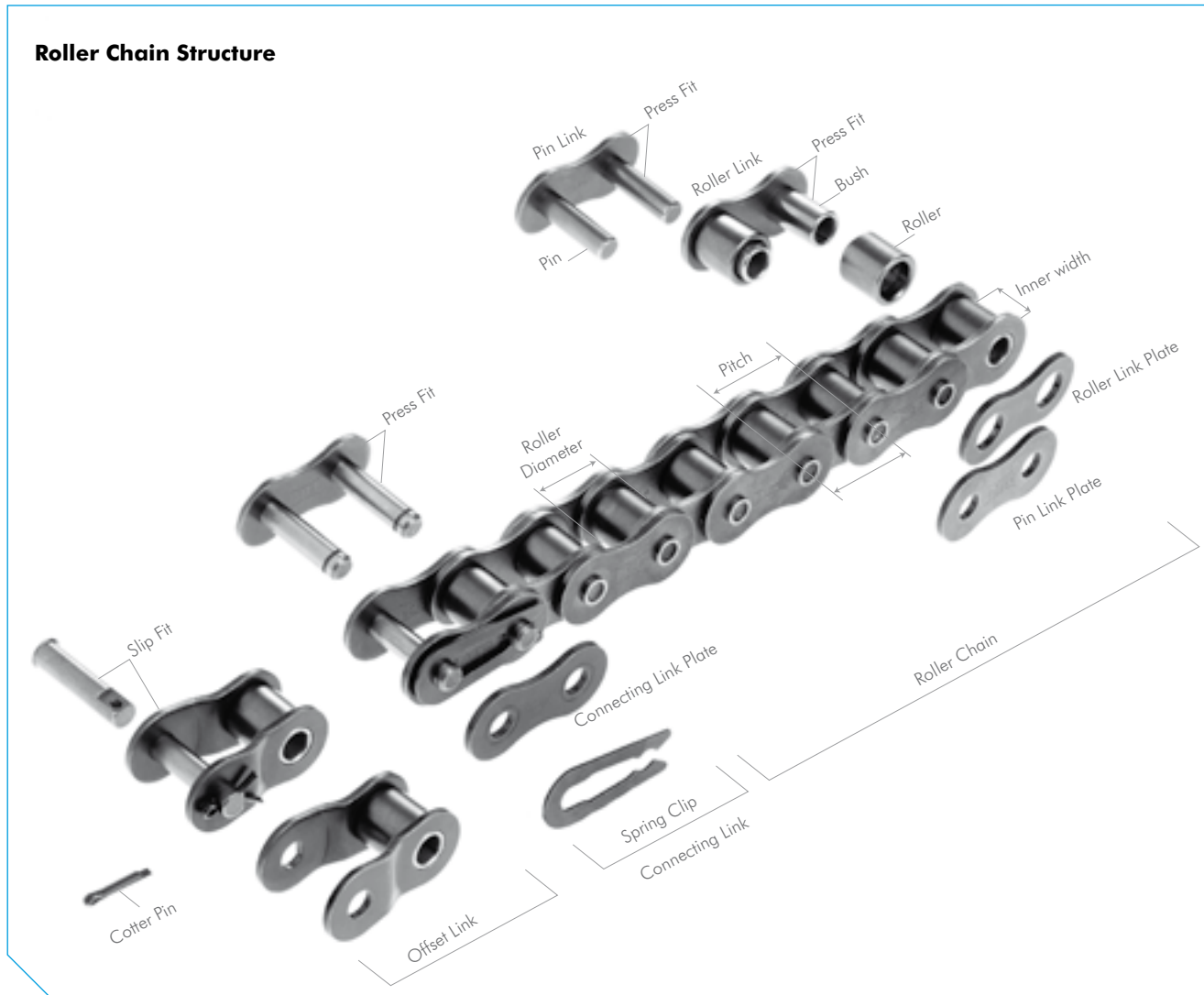


Fig. 9 Pre-Loading

After the assembly of a chain, TSUBAKI always applies an initial load, which is called a pre-load. The pre-load force approximates the recommended Maximum Allowable Load and is applied to seat the various chain components such as pins, bushes and link plates. The benefit of pre-loading is that it minimizes the initial elongation. Minimization of this initial elongation increases the chains service life therefore pre-loading is very important.

INTRODUCTION TO TSUBAKI ROLLER CHAIN



Roller Chain Structure

1. Three Basic Dimensions

Pitch, Roller Diameter and Inner Width are known as the “Three Basic Dimensions of Roller Chain.” When these three dimensions are identical, roller chains and sprockets are dimensionally compatible.

2. Basic Parts

Link Plate

The plate is the component that bears the tension placed on the chain. Usually this is a repeated loading, sometimes accompanied by shock. Therefore, the plate must not only have great static tensile strength, it must also hold up to the dynamic forces of load and shock.

Pin

The pin is subject to shearing and bending forces transmitted by the plate. At the same time, it forms a load-bearing part (together with the bush) when the chain flexes during sprocket engagement. Therefore, the pin needs high tensile and shear strength,

resistance to bending, and must also have sufficient endurance against shock and wear.

Bush

The bush is subject to complex forces from all parts, especially from the repetition of shock loads when the chain engages the sprocket. Therefore, the bush needs extremely high shock resistance. In addition, the bush forms a load-bearing part together with the pin and as such requires great wear resistance.

Roller

The roller is subject to impact load as it mates with the sprocket teeth during engagement of the chain with the sprocket. After engagement, the roller changes its point of contact and balance. It is held between the sprocket teeth and bush, and moves on the tooth face while receiving a compression load. Therefore, it must be resistant to wear and still have strength against shock, fatigue and compression. (RS25 and RS35 are bush chains and do not have rollers).

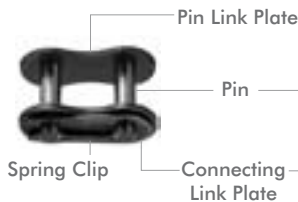
Roller Link

Two bushes are press fit into two roller link plates and rollers are

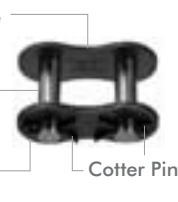
INTRODUCTION TO TSUBAKI ROLLER CHAIN

Connecting Links

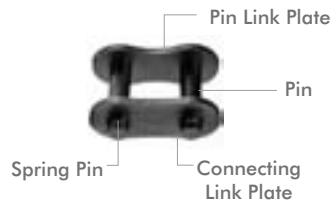
Spring Clip Connecting Link



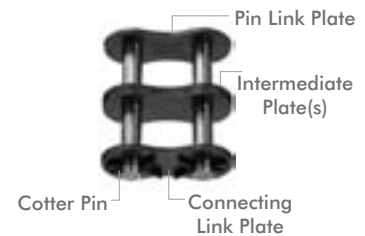
Cotter Pin Connecting Link



Spring Pin Connecting Link



Cotter Pin Connecting Link Multi-Strand (2-strand shown)

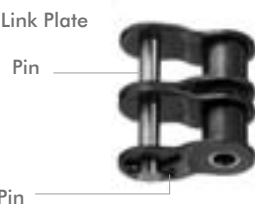


ONE Pitch Offset Links (OL)

Single Strand



Multi-strand (2-strand shown)



TWO Pitch Offset Links (2POL)

Single Strand



Multi-strand (2-strand shown)



inserted to allow rotation around the outside of the bushes during operation. This is the same for single and for multi strand chains.

Pin Link and Intermediate Plate

The pin link consists of two pins that have been press fit into two pin link plates. In case of multi-strand roller chain up till size 08B, an intermediate plate is added to the pin link. In case of multi-strand roller chain above size 08B, two intermediate plates are added to the pin link. The intermediate plates are slip fit for standard roller chain and press fit for SUPER roller chain.

3. Assembly Parts

Roller chains are usually made up of a number of inner and outer links in an endless formation. Although offset links can be used when there is an odd number of links in the roller chain, it is better to use a design that requires an even number of links. If an odd number of links cannot be avoided, it is recommended to use a two-pitch offset link in stead of a one-pitch offset link. As it is riveted into the chain, a two-pitch offset link has a 100% Maximum Allowable Load, where as the one-pitch offset link has a Maximum Allowable Load of 65%.

Connecting Links

There are three types of connecting links: spring clip connecting link, cotter pin connecting link and spring pin connecting link.

It's common to use slip fit spring clip connecting links for small size roller chains. Cotter pin and spring pin connecting links are used for large size roller chains and on customer request.

Offset Links

An offset link is used when an odd number of chain links is required. Different types are available:

One pitch offset link (OL).

The pin and two plates are slip fit. The fatigue strength is 35% lower than the chain itself.

Two pitch offset link (2POL).

Two pitch offset links are the combination of a roller link and an offset link connected with a rivet pin. The fatigue strength is the same as the fatigue strength of the base chain. Please refer to the dimension tables for roller chain types and sizes suitable for offset links.

BS LAMBDA LUBE FREE ROLLER CHAIN

TSUBAKI's LAMBDA Chains were the first in the industry to use a special oil-impregnated bush. Since their launch in 1988, they have been adopted for diverse industries and applications, and their performance has been highly rated. TSUBAKI has a wide line-up of lube-free, long life products that help customers reduce costs.

Technical Evolution

As a pioneer in the lube-free chain market, TSUBAKI will reveal some of the key elements behind BS LAMBDA's outstanding performance:

Sintered Bush

A special oil-impregnated sintered bush in combination with a special coated pin for long-term internal lubrication is the secret of TSUBAKI BS LAMBDA's long economic life and wear resistance.

Easy Cutting

BS LAMBDA chain can be disassembled quick and safely with an original TSUBAKI Chain Tool without damaging the bushes (RS08B-LM-1 to RS16B-LM-1).

Patented Ring Coining Process

Breakage of the chains connecting link is no issue at TSUBAKI thanks to this unique feature. By applying the patented Ring Coining process, TSUBAKI generates a cold deformation around the pin hole of the connecting link plate. This results in residual stress around the pin hole and thereby adds strength. By using this process transmission capacity is 100% of the base chain.

Special Environments

TSUBAKI BS LAMBDA has outstanding performance in temperatures up to 150°C. For temperatures above 150°C TSUBAKI has a special high-temperature BS LAMBDA available. Please contact TSUBAKI for more detailed information.

For applications in the food industry, TSUBAKI can supply BS LAMBDA chain with bushes impregnated with food grade lubricating oil (NSF-H1 and H3 certified).

When an application needs water wash downs or is exposed to moisture, and lubrication is not possible or desirable, LAMBDA N.E.P. is most efficient.

Advantages

TSUBAKI has enhanced the BS LAMBDA with the following advantages:

Save Maintenance Costs

No expensive labour costs as it is not required to manually lubricate this chain.

Save Purchasing Costs

Lower frequency of purchasing due to the high quality of the chain and it's long economic life. No purchasing of lubricants or lubrication systems necessary.

Higher Productivity

No unforeseen downtime due to chain breakdown. Less time required for maintenance and therefore more time for production.

Environmental Friendly

Applications run clean thus reducing the risk of contaminating products, machines, floor etc.

Inter-Changeability

Chains:

BS LAMBDA Chains are fully interchangeable with standard BS roller chains.

Sprockets:

Standard BS roller chain sprockets can be used. However, due to the extended lifetime of BS LAMBDA chain, TSUBAKI recommends to install sprockets with hardened teeth in every LAMBDA application.

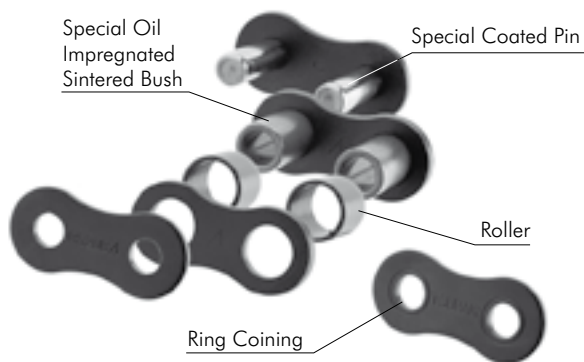
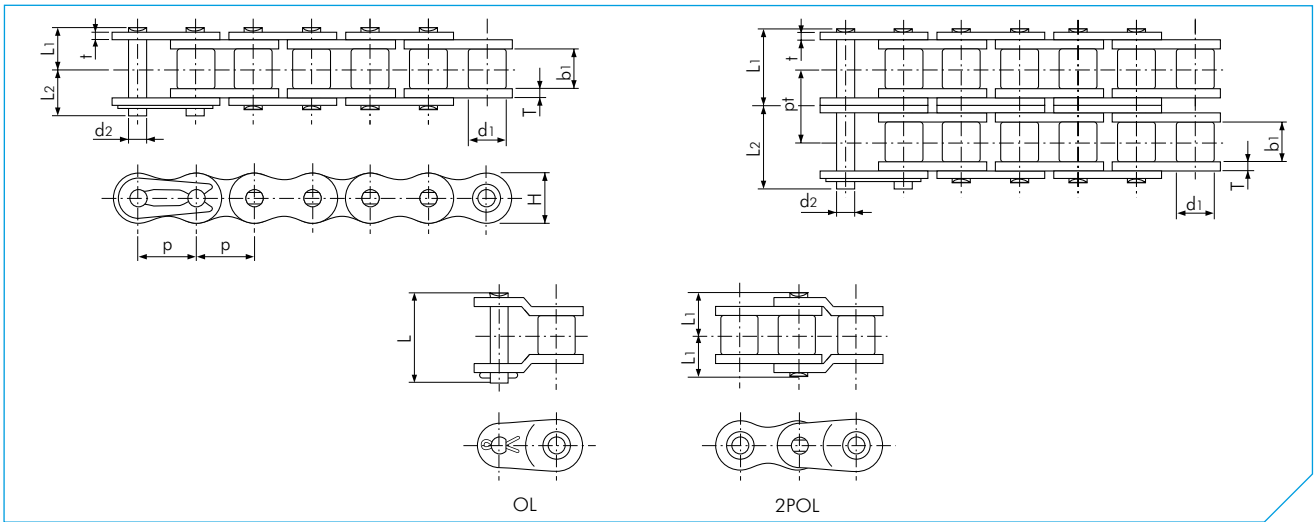


Fig. 10 Basic Construction

BS LAMBDA LUBE FREE ROLLER CHAIN



BS LAMBDA Chain

Dimensions in mm

TSUBAKI Chain No.	Pitch p	Roller Diameter d1	Inner Width b1	Pin			Link Plate			Transverse Pitch pt	Min. Tensile Strength acc. to ISO 606 kN	Approx. Mass kg/m	
				Diameter d2	Length L1	Length L2	Length L	Thickness T	Thickness t				Height H (max)
RF06B-LM-1	9.525 (3/8")	6.35	5.72	3.28	6.10	7.70	15.10	1.30	1.00	8.20	-	8.9	0.39
RF06B-LM-2					11.20	12.80	25.90				10.24	16.9	0.75
RS08B-LM-1	12.70 (1/2")	8.51	7.75	4.45	8.40	10.00	18.60	1.60	1.60	12.00	-	17.8	0.70
RS08B-LM-2					15.30	16.90	34.50				13.92	31.1	1.35
RS10B-LM-1	15.875 (5/8")	10.16	9.65	5.08	9.55	11.25	20.80	1.50	1.50	14.70	-	22.2	0.95
RS10B-LM-2					17.85	19.55	39.40				16.59	44.5	1.85
RS12B-LM-1	19.05 (3/4")	12.07	11.68	5.72	11.10	13.00	24.40	1.80	1.80	16.10	-	28.9	1.25
RS12B-LM-2					20.85	22.75	45.90				19.46	57.8	2.50
RS16B-LM-1	25.40 (1")	15.88	17.02	8.28	17.75	19.95	39.30	4.00	3.20	21.00	-	60.0	2.70
RS16B-LM-2					33.55	35.75	73.40				31.88	106.0	5.40
RS20B-LM-1	31.75 (1 1/4")	19.05	19.56	10.19	19.90	23.10	46.60	4.40	3.40	26.40	-	95.0	3.85
RS20B-LM-2					38.25	41.45	84.60				36.45	170.0	7.65
RS24B-LM-1	38.10 (1 1/2")	25.40	25.40	14.63	26.65	31.85	61.70	6.00	5.60	33.40	-	160.0	7.45
RS24B-LM-2					50.80	56.00	112.80				48.36	280.0	14.65

Note:

1. Connecting links are clip type for sizes up to RS16B-LM, and cotter type for sizes RS20B-LM to RS24B-LM.
2. RF06B-LM chain has flat shaped link plates.
3. Intermediate plate of RF06B-LM-2 and RS08B-LM-2 is a solid plate.
4. Centre sink riveting is applied for RS08B-LM-1 to RS16B-LM-1. Double stake riveting is applied to all other sizes including multi-strand chain.
5. Warning: previous generations of Lambda chain can not be connected with the above chains due to different dimensions.
6. When a single pitch offset link is used, please calculate a 35% reduction of the fatigue strength.
7. Also available in N.E.P specification.

BS X-LAMBDA LUBE FREE ROLLER CHAIN

Ten years after introducing the number-one LAMBDA Chain to the market in 1988, TSUBAKI has developed innovative technology that sets the bar even higher for lube-free chain performance. To the user the benefits that X-LAMBDA provides mean increased productivity, reduced maintenance and a cleaner working environment.

Technical Evolution of BS LAMBDA

BS X-LAMBDA chain is a quantum leap for power transmission technology. The basic BS LAMBDA components (a special coated pin and an oil-impregnated sintered bush) come completed with special felt seals (patent pending) between inner and outer link plate that lock in lubrication while keeping dirt and abrasives out.

Because of this evolution BS X-LAMBDA chain greatly increases the performance of the BS LAMBDA chains. When your operation needs to run clean, when machines and conveyed materials must be free from contact with oil, or when lubrication is difficult, BS X-LAMBDA chain can extend the life of your operation drastically.

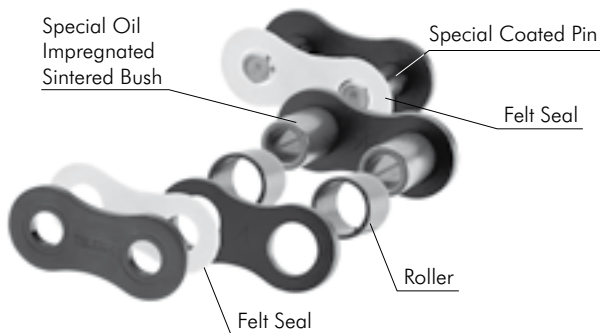


Fig. 11 Basic Construction

Advantages

Additional to all BS LAMBDA advantages, TSUBAKI has enhanced the BS X-LAMBDA with the following additional advantages:

Extended Wear Life

Even longer wear life than BS LAMBDA chain (over 5 times longer).

Applicable in Dusty Environments

Extra protection of critical areas due to the specially developed felt seal.

Connecting Method

When connecting the chain, use a BS X-LAMBDA chain connecting link (with a felt seal). As shown in Fig. 12 insert felt seals between the outer plate and the connecting link plate, then attach the link.

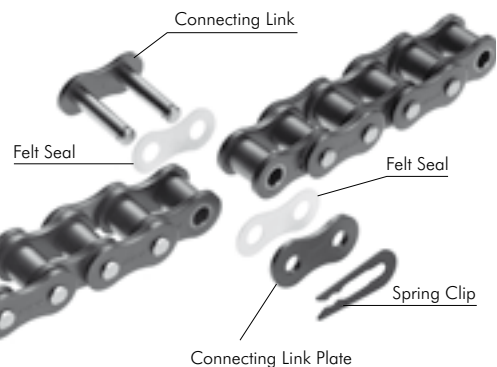


Fig. 12 Connecting Method BS X-LAMBDA

Inter-Changeability

Chains:

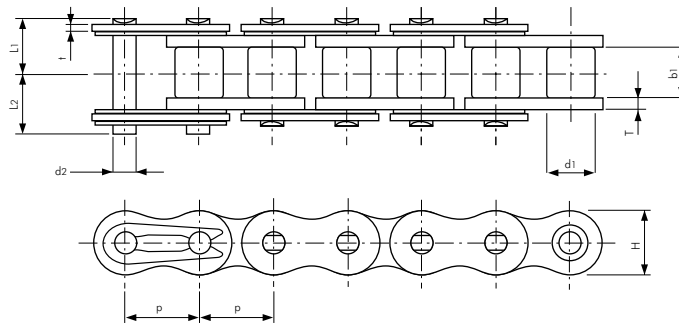
BS X-LAMBDA chain is interchangeable with standard BS roller chain. However, as the pins are longer than those of the standard BS roller chain, please make sure that there is no interference with the machine.

Sprockets:

Standard BS roller chain sprockets can be used. However, due to the extended lifetime of BS X-LAMBDA chain, TSUBAKI advises to install sprockets with hardened teeth in every LAMBDA application.



BS X-LAMBDA LUBE FREE ROLLER CHAIN



BS X-LAMBDA Chain

Dimensions in mm

TSUBAKI Chain No.	Pitch p	Roller Diameter d1	Inner Width b1	Pin			Link Plate			Min. Tensile Strength acc. to ISO 606 kN	Approx. Mass kg/m
				Diameter d2	Length		Thickness T	Thickness t	Height H (max)		
					L1	L2					
RS08B-LMDX-1	12.70 (1/2")	8.51	7.75	4.45	9.00	10.60	1.60	1.60	12.00	17.8	0.70
RS10B-LMDX-1	15.875 (5/8")	10.16	9.65	5.08	10.30	12.00	1.50	1.50	14.70	22.2	0.95
RS12B-LMDX-1	19.05 (3/4")	12.07	11.68	5.72	11.90	13.80	1.80	1.80	16.10	28.9	1.25
RS16B-LMDX-1	25.40 (1")	15.88	17.02	8.28	18.55	20.75	4.00	3.20	21.00	60.0	2.70

Note:

1. Connecting links are clip type for sizes up to RS12B-LMDX, and cotter type for size RS16B-LMDX.
2. Due to the use of the felt seal, the pins are longer. Check for machine interference.
3. X-LAMBDA offset links are not available.
4. X-LAMBDA double strand chain is not available.
5. Due to the oil in the felt seal, more oil adheres to the surface of X-LAMBDA chain than regular LAMBDA chain.