SKSSWEDEN

Catalogue 1 | Drive Chain

Innovation in Motion
TSUBAKI

TSUBAKI | Chain Products | 2008

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.

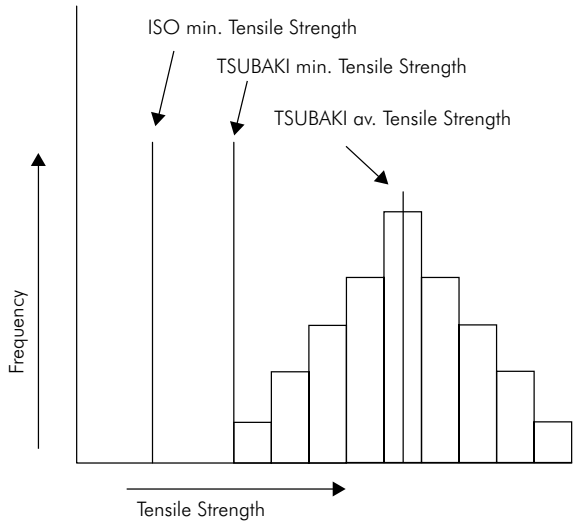


Fig. 1 Relationship between the three tensile strengths mentioned above.

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).

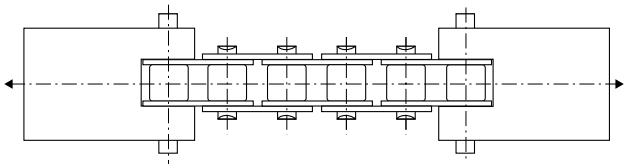


Fig. 2 Tensile Strength test

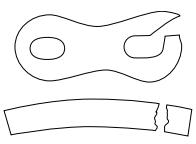


Fig. 3 Shape of fracture

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.

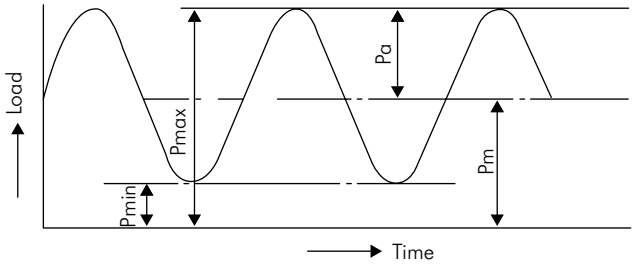


Fig. 4 Summary chart for repetitive loads

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.

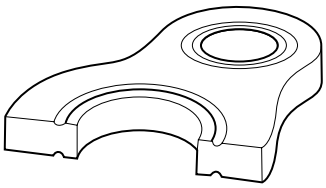


Fig. 5 Ring Coining

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.

7. Ball Drifting Process

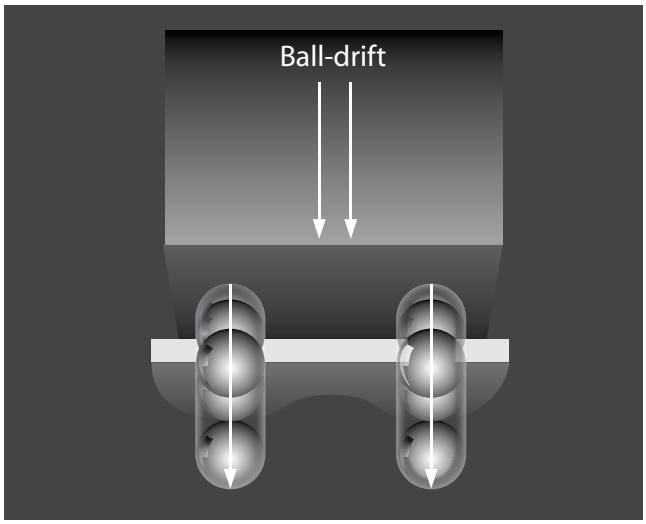


Fig. 6 Ball Drifting

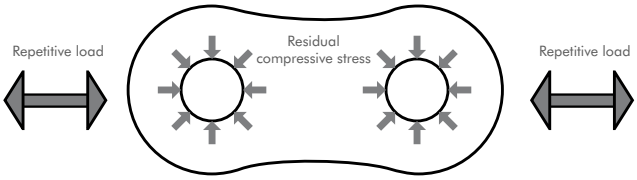


Fig. 7 Residual Compressive Stress

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.

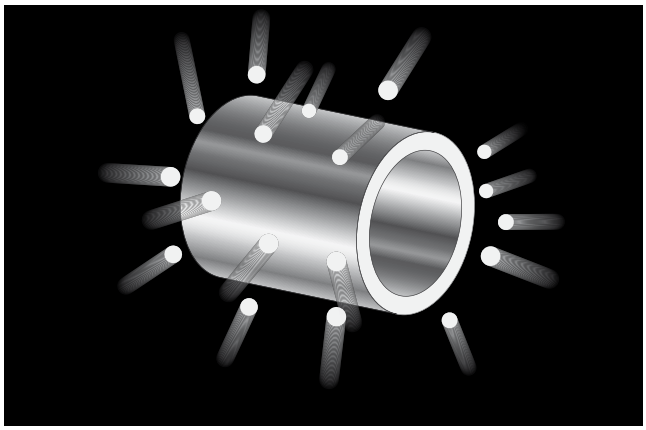


Fig. 8 Shot Peening

Shot Peening increases resistance to:

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

9. Pre-Loading Process

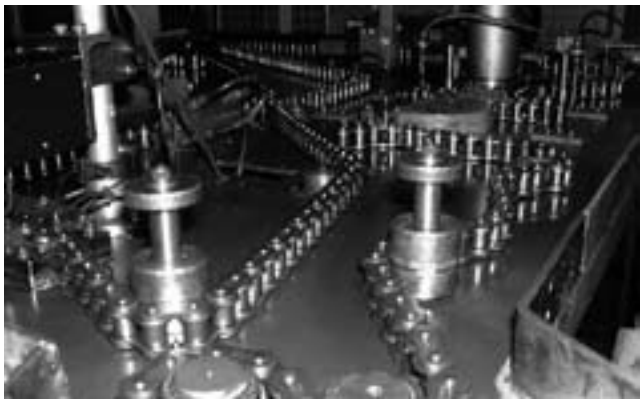
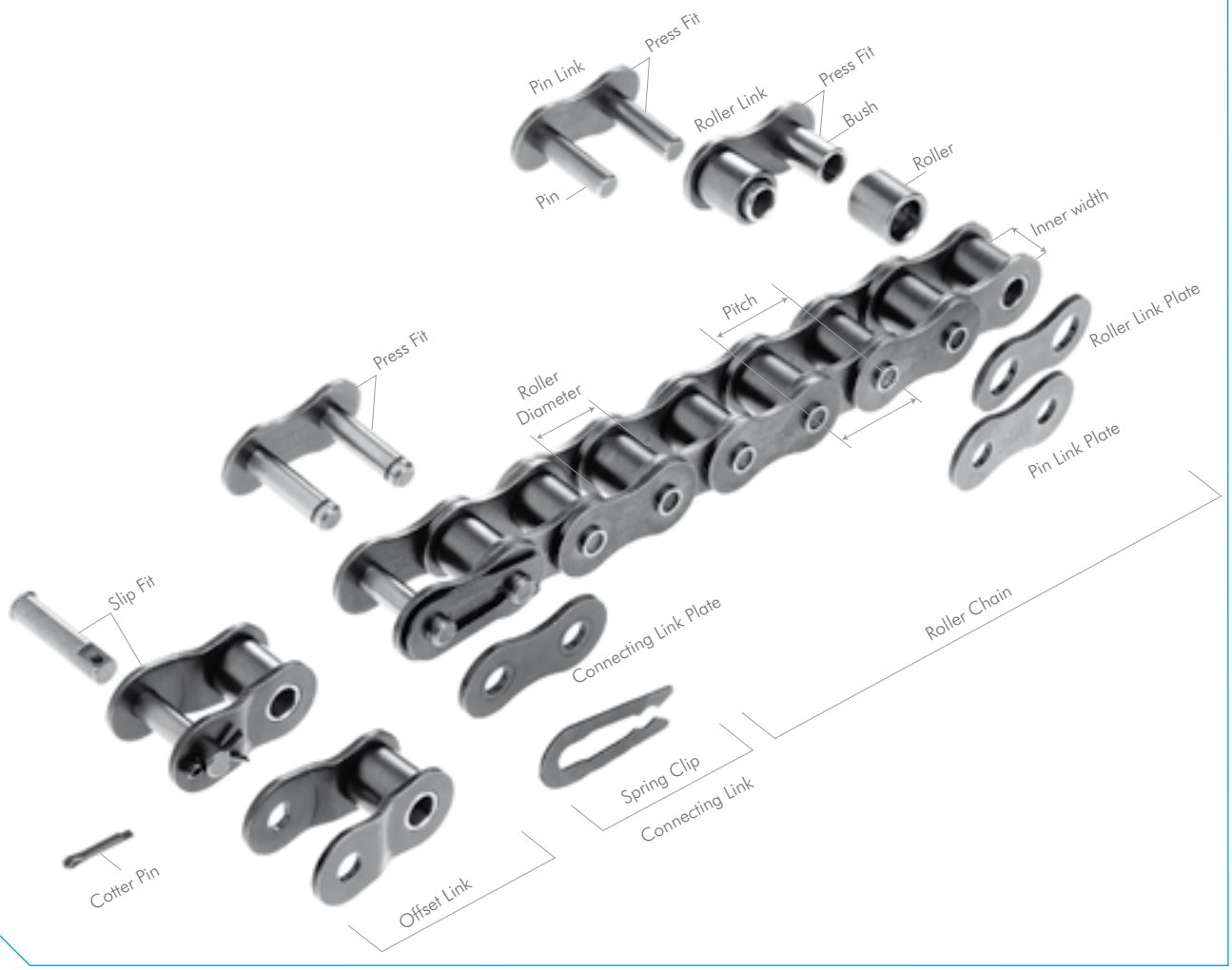


Fig. 9 Pre-Loading

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



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).

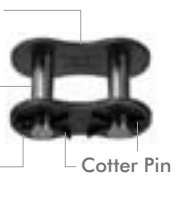
Roller Link

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

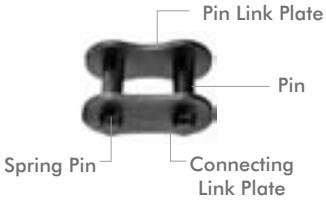
Connecting Links

Spring Clip Connecting Link

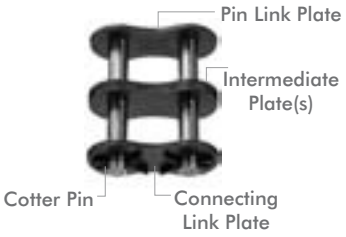
Cotter Pin Connecting Link



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.

ANSI HEAVY DUTY ROLLER CHAIN

The superior performance of TSUBAKI Heavy Duty chains is the result of a comprehensive quality control network that begins with selection of the world's finest steel materials. It continues with inspection and analysis of quality and performance in 20 different work areas. At TSUBAKI quality control is not just a one time check; it is a total dedication. It is your assurance of long lasting and dependable performance.

TSUBAKI offers Heavy Duty chains for applications that exceed the capabilities of TSUBAKI ANSI G7 standard roller chain. Heavy Duty chain should be considered in the following situations:

1. Harsh environments where the chain will be subjected to heavy impact.
2. Compact drives for equipment or machines that must work in tight spaces.
3. When higher transmission power, allowable load or tensile strength is required.
4. When a lower rate of elastic elongation is required.

H Series

H Series chain differs only from the ANSI G7 Series chain in the thickness of the link plates. The link plates have the same thickness as the link plates of the next larger pitch size in ANSI G7 Series. The increased thickness of the link plates provides a 10% greater capacity for absorbing shock loads. In short, H Series chains are especially suitable for situations where the load is heavy and operating speed is low (up to 50 m/min) or where operating conditions are severe.

HT Series

HT Series chain provides a (10% to 20%) higher Tensile Strength than ANSI G7 Series chain by using through-hardened pins and link plates of the next larger pitch size in ANSI G7 series. HT Series chain also provides a higher shock load resistance and is best suited for low operating speeds - up to 50 m/min Dimensions of the chain are identical to the H Series chain.

SUPER Series

The dimensions of these series are identical to those of ANSI G7 Series chain. The special design of the SUPER Series link plate delivers exceptional performance. The pitch holes are critically formed and ball drifted and the pins are through-hardened for greater shock resistance (25% to 30%). SUPER Series chains offer 10% higher tensile strength than the equivalent size ANSI G7 Series chain. SUPER Series chains can be used to replace the next larger pitch size of ANSI G7 Series, making them ideal for applications where chain space is limited. Best suited for low speed operating conditions - up to 50 m/min.

SUPER-H Series

The thickness of the SUPER-H Series link plates is the same as the next larger pitch size of SUPER Series chain. The pins are also through-hardened which provides a higher tensile strength and a higher shock load resistance than SUPER Series chain. The pitch holes are critically formed and ball drifted. SUPER-H Series chains can be used to replace the next larger size of ANSI standard chain, making them ideal for applications where space is limited. Best suited for low speed operating conditions - up to 50 m/min.

ULTRA SUPER Series

ULTRA SUPER Series offer longer wear life, greater shock load resistance (170%) and higher tensile strength (150%) than any other TSUBAKI roller chain. The pins are through-hardened and the pin holes are critically formed and ball drifted. The diameter of the pins has been increased. This chain is well suited for applications where there are space limitations. The heavy duty construction of the ULTRA SUPER Series chain allows it to replace chains up to two pitch sizes larger ANSI G7 Series chain. It is best suited for low speed operating conditions up to 50 m/min.

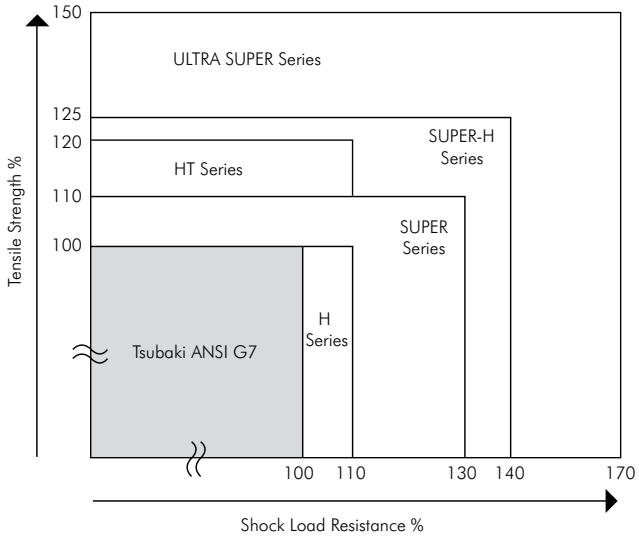
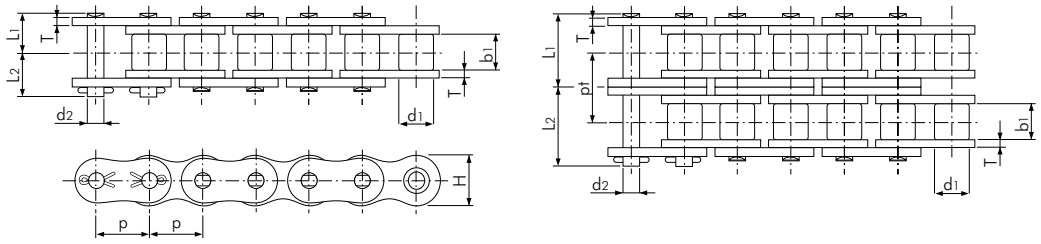


Fig. 16 Comparison of Tensile Strength / Shock Load Resistance

ANSI HEAVY DUTY ROLLER CHAIN



H Series

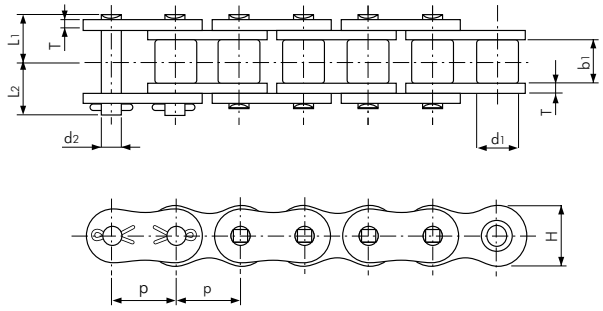
Dimensions in mm

TSUBAKI Chain No.	Pitch p		Roller Diameter d1	Inner Width b1	Pin Diameter d2	Pin Length L1	Pin Length L2	Link Plate Thickness T	Link Plate Height H (max)	Transverse Pitch pt	Av. Tensile Strength acc. to Tsubaki kN	Approx. Mass kg/m
RS60-H-1	19.05	(3/4")	11.91	12.70	5.96	14.80	17.00	3.20	18.10	-	44.1	1.80
RS60-H-2						27.80	29.90			26.10	88.3	3.59
RS80-H-1	25.40	(1")	15.88	15.88	7.94	18.30	20.90	4.00	24.10	-	78.5	3.11
RS80-H-2						34.60	37.20			32.60	157.0	6.18
RS100-H-1	31.75	(1 1/4")	19.05	19.05	9.54	21.80	24.50	4.80	30.10	-	117.7	4.58
RS100-H-2						41.40	44.10			39.10	235.4	9.03
RS120-H-1	38.10	(1 1/2")	22.23	25.40	11.11	26.95	30.55	5.60	36.20	-	166.8	6.53
RS120-H-2						51.40	55.00			48.90	319.8	12.90
RS140-H-1	44.45	(1 3/4")	25.40	25.40	12.71	28.90	33.10	6.40	42.20	-	215.8	8.27
RS140-H-2						54.95	59.50			52.20	419.9	16.38
RS160-H-1	50.80	(2")	28.58	31.75	14.29	33.95	38.45	7.15	48.20	-	269.8	10.97
RS160-H-2						64.90	69.60			61.90	529.7	21.78
RS200-H-1	63.50	(2 1/2")	39.68	38.10	19.85	42.90	48.10	9.50	60.30	-	461.0	18.41

Note:

1. Standard ANSI sprockets can be used for single strand chain.
2. Multi strand chains need special sprockets, contact Tsubaki for more detailed information.
3. Sprockets with a low teeth number must have hardened teeth.
4. Steel grade of sprockets must be C45 or higher.

ANSI HEAVY DUTY ROLLER CHAIN



HT Series

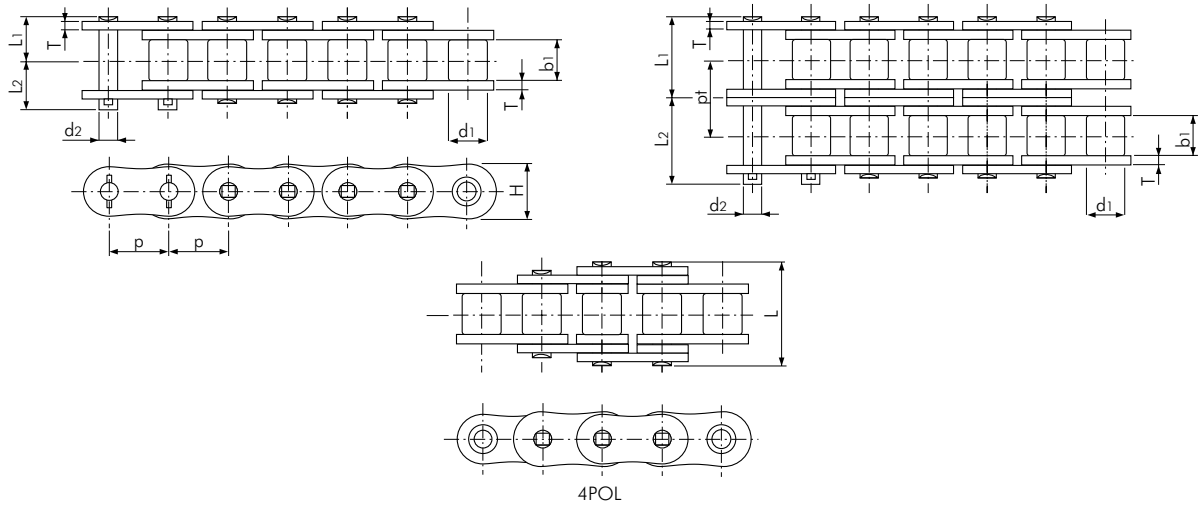
Dimensions in mm

TSUBAKI Chain No.	Pitch p		Roller Diameter d1	Inner Width b1	Pin Diameter d2	Pin Length L1	Pin Length L2	Link Plate Thickness T	Link Plate Height H (max)	Min. Tensile Strength acc. to Tsubaki kN	Av. Tensile Strength acc. to Tsubaki kN	Approx. Mass kg/m
RS60-HT-1	19.05	(3/4")	11.91	12.70	5.96	14.80	17.00	3.20	18.10	48.1	55.9	1.80
RS80-HT-1	25.40	(1")	15.88	15.88	7.94	18.30	20.90	4.00	24.10	81.4	93.2	3.11
RS100-HT-1	31.75	(1 1/4")	19.05	19.05	9.54	21.80	24.50	4.80	30.10	124.0	142.0	4.58
RS120-HT-1	38.10	(1 1/2")	22.23	25.40	11.11	26.95	30.55	5.60	36.20	167.0	191.0	6.53
RS140-HT-1	44.45	(1 3/4")	25.40	25.40	12.71	28.90	33.10	6.40	42.20	218.0	250.0	8.27
RS160-HT-1	50.80	(2")	28.58	31.75	14.29	33.95	38.45	7.15	48.20	278.0	319.0	10.97
RS200-HT-1	63.50	(2 1/2")	39.68	38.10	19.85	42.90	48.10	9.50	60.30	486.0	559.0	18.41
RS240-HT-1	76.20	(3")	47.63	47.63	23.81	54.80	62.30	12.70	72.40	768.0	883.0	29.13

Note:

1. Semi press-fit type connecting links are supplied.
2. Standard ANSI sprockets can be used for single strand chain.
3. Sprockets with a low teeth number must have hardened teeth.
4. Steel grade of sprockets must be C45 or higher.
5. Multi strand chains are available on request.
6. Pins are quad riveted.

ANSI HEAVY DUTY ROLLER CHAIN



SUPER Series

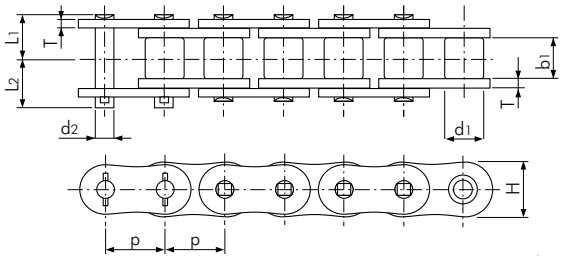
Dimensions in mm

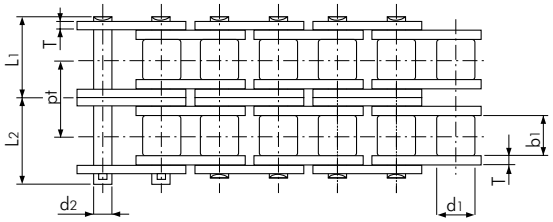
TSUBAKI Chain No.	Pitch p		Roller Diameter d1	Inner Width b1	Pin Diameter d2	Pin Length L1	Pin Length L2	Pin Length L	Link Plate Thickness T	Link Plate Height H (max)	Transverse Pitch pt	Min. Tensile Strength acc. to Tsubaki kN	Av. Tensile Strength acc. to Tsubaki kN	Approx. Mass kg/m
RS80-SUP-1	25.40	(1")	15.88	15.88	7.94	16.25	19.25	39.30	3.20	24.10	-	74.2	85.3	2.81
RS80-SUP-2						30.90	33.90	-			29.30	148.0	171.0	5.62
RS100-SUP-1	31.75	(1 1/4")	19.05	19.05	9.54	19.75	22.85	48.00	4.00	30.10	-	111.0	127.0	4.25
RS100-SUP-2						37.70	40.80	-			35.80	222.0	255.0	8.38
RS120-SUP-1	38.10	(1 1/2")	22.23	25.40	11.11	24.90	28.90	59.90	4.80	36.20	-	162.0	186.0	6.30
RS120-SUP-2						47.60	51.60	-			45.40	324.0	373.0	12.44
RS140-SUP-1	44.45	(1 3/4")	25.40	25.40	12.71	26.90	31.70	65.70	5.60	42.20	-	213.0	245.0	8.04
RS160-SUP-1	50.80	(2")	28.58	31.75	14.29	31.85	36.85	77.20	6.40	48.20	-	273.0	314.0	10.79
RS200-SUP-1	63.50	(2 1/2")	39.68	38.10	19.85	39.00	44.80	94.90	8.00	60.30	-	439.0	505.0	17.63
RS240-SUP-1	76.20	(3")	47.63	47.63	23.81	47.90	55.50	116.00	9.50	72.40	-	639.0	735.0	25.63

Note:

1. When a 4POL is used, please calculate a 10% reduction of the fatigue strength.
2. Standard ANSI sprockets can be used.
3. Pins are quad riveted.

ANSI HEAVY DUTY ROLLER CHAIN





SUPER-H Series

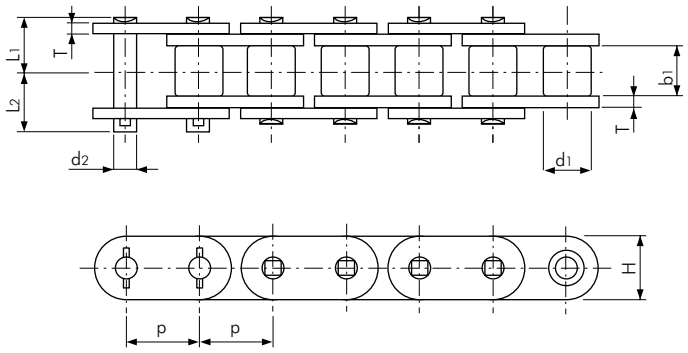
Dimensions in mm

TSUBAKI Chain No.	Pitch p		Roller Diameter d1	Inner Width b1	Pin Diameter d2	Pin Length L1	Pin Length L2	Link Plate Thickness T	Link Plate Height H (max)	Transverse Pitch pt	Min. Tensile Strength acc. to Tsubaki kN	Av. Tensile Strength acc. to Tsubaki kN	Approx. Mass kg/m
RS80-SUP-H-1	25.40	(1")	15.88	15.88	7.94	18.30	20.90	4.00	24.10	-	85.3	98.1	3.29
RS80-SUP-H-2						34.60	37.20			32.60	171.0	196.0	6.52
RS100-SUP-H-1	31.75	(1 1/4")	19.05	19.05	9.54	21.80	24.50	4.80	30.10	-	127.0	145.0	4.88
RS100-SUP-H-2						41.40	44.10			39.10	253.0	290.0	9.51
RS120-SUP-H-1	38.10	(1 1/2")	22.23	25.40	11.11	26.95	30.55	5.60	36.20	-	171.0	196.0	6.94
RS140-SUP-H-1	44.45	(1 3/4")	25.40	25.40	12.71	28.90	33.10	6.40	42.20	-	222.0	255.0	8.88
RS160-SUP-H-1	50.80	(2")	28.58	31.75	14.29	33.95	38.45	7.15	48.20	-	281.0	324.0	11.72
RS200-SUP-H-1	63.50	(2 1/2")	39.68	38.10	19.85	42.90	48.10	9.50	60.30	-	520.0	598.0	19.68
RS240-SUP-H-1	76.20	(3")	47.63	47.63	23.81	54.80	62.30	12.70	72.40	-	802.0	922.0	30.47

Note:

1. Offset links are not available.
2. Press-fit type connecting links are supplied.
3. Standard ANSI sprockets can be used with single strand chain only.
4. Sprockets with a low teeth number must have hardened teeth.
5. Steel grade of sprockets must be C45 or higher.
6. Multi strand chains need special sprockets, contact Tsubaki for more detailed information.
7. Pins are quad riveted.

ANSI HEAVY DUTY ROLLER CHAIN



ULTRA SUPER Series

Dimensions in mm

TSUBAKI Chain No.	Pitch p	Roller Diameter d1	Inner Width b1	Pin Diameter d2	Pin Length L1	Pin Length L2	Link Plate Thickness T	Link Plate Height H (max)	Min. Tensile Strength acc. to Tsubaki kN	Av. Tensile Strength acc. to Tsubaki kN	Approx. Mass kg/m
RF100-US-1	31.75 (1 1/4")	19.05	19.05	10.32	22.35	25.35	4.80	30.10	149.0	172.0	5.07
RF120-US-1	38.10 (1 1/2")	22.23	25.40	12.28	27.55	31.55	5.60	36.20	213.0	245.0	7.22
RF140-US-1	44.45 (1 3/4")	25.40	25.40	13.97	29.50	34.20	6.40	42.20	273.0	314.0	9.24
RF160-US-1	50.80 (2")	28.58	31.75	15.62	34.50	40.20	7.10	48.20	341.0	392.0	12.19

Note:

1. Standard ANSI sprockets can be used if the sprocket teeth have been hardened.
2. Steel grade of sprockets must be C45 or higher.
3. Offset links are not available.
4. Multi-strand chains are not available.
5. Press-fit type connecting links are supplied.
6. Pins are quad riveted.