

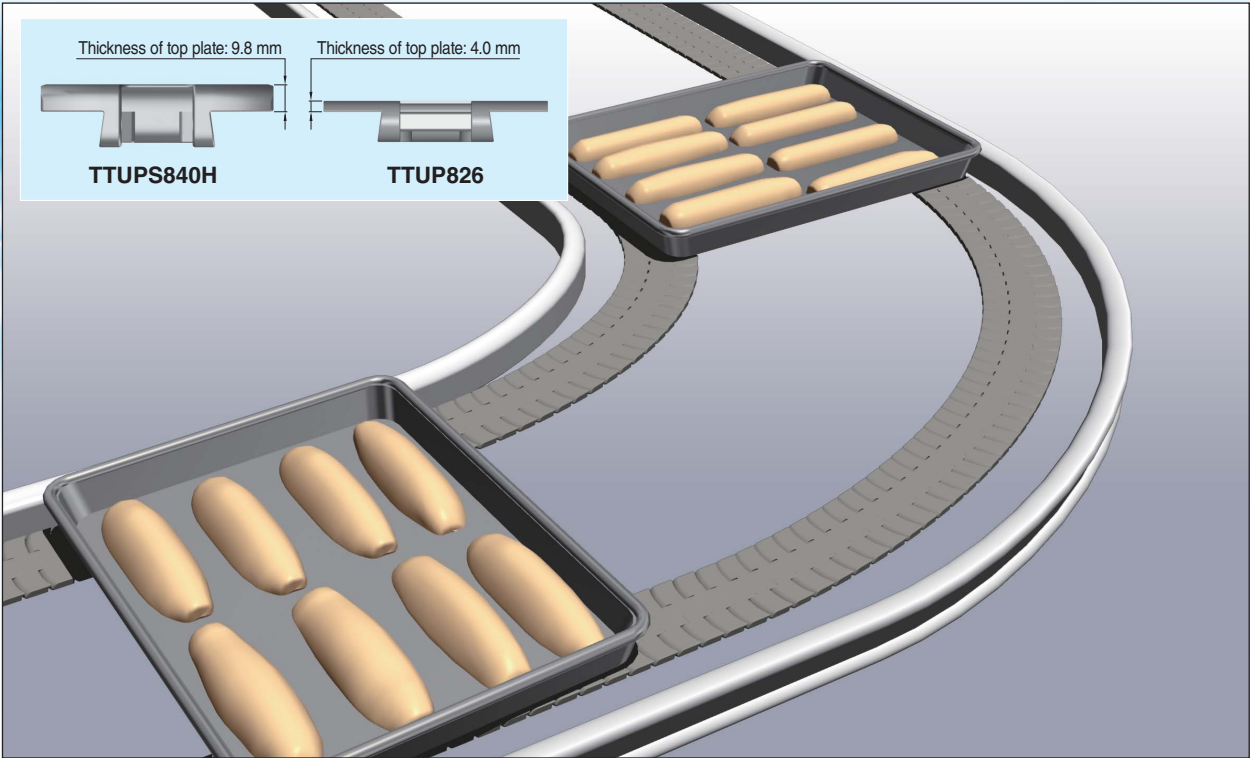
# **TSUBAKI**

## **Plastic Top Chain**

### **TTUPS-H**




**TTUPS-H Plastic Top Chain with thicker top plates.**  
The top plates are more robust than on conventional Plastic Top Chain models. Recommended for curved parts of food conveyor lines.



- Feature 1** ➔ Adopted **an even, thick top plate** with enhanced durability. Ideal for conveying food trays.
- Feature 2** ➔ Standard type (gray) has **anti-static properties**. This prevents static electricity (sparks) build-up due to friction.
- Feature 3** ➔ Adopted a **D-pin shape for connecting pins**. This prevents cracks caused by pin fitting. Chains can also be disassembled and connected from either side.
- Feature 4** ➔ Plastic chain **does not produce metal debris from abrasion** that can be caused by sliding metal trays.
- Feature 5** ➔ Straight running types **BTC8H-M** and **BTM8H-M** can use **a common sprocket**.

■ Introduction of related products

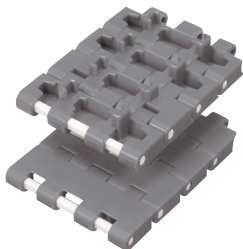


**TSUBAKI**  
Plastic Modular Chain  
BTM8H-M and BTC8H-M

**Tsubaki**  
**Plastic Modular Chain**  
**BTM8H-M and BTC8H-M**

BTM8H-M allows for inclined straight running of metal trays by using magnets. BTC8H-M is recommended for flat, straight running.

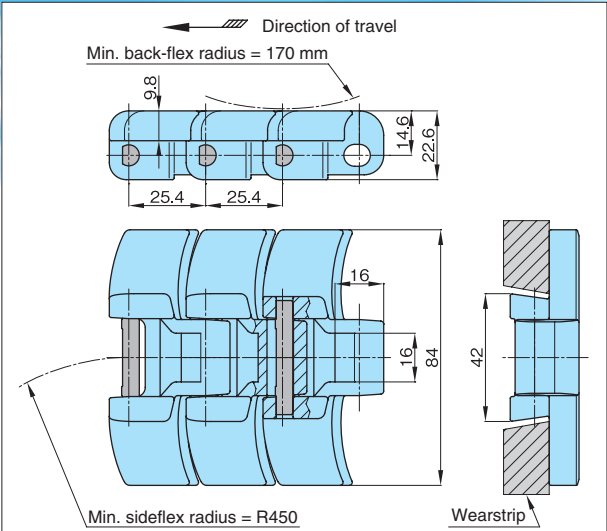
The same sprocket used for TTUPS-H can be used, which enables standardization of design and service parts.



Standard product (gray)

Features

- Top plate with a thickness of 9.8 mm makes for a more chip-proof chain compared to conventional models.
- D-pin shape has been adopted for the connecting pins, which prevents the occurrence of cracks from the fitting of pins into the pin holes and enables pin insertion from either side during maintenance.



Chain (Stainless Steel Pins)

Tsubaki model no.	Material	Material mark	Link color	Anti-static effect	Max. allowable load kN[kgf]	Approx. mass kg/m	Operating temperature range °C	Max. allowable speed m/min		TTUPS-H
								With lube	No lube	
TTUPS840H-G	Standard	G	Gray	Anti-static	1.08 {110}	1.8	-20 to 80	100	50	●
TTUPS840H		-	Blue	-						○

Note: 1. ●: Standard product ○: Made-to-order product  
For further specification requirements, please contact a Tsubaki representative.  
2. Plastic pins are not available.  
3. Standard chain length is 120 links.

Model Numbering

Chain type

Plate width

Chain type

Chain material

TTUPS840H—G

(840=84.0mm) G: Standard type (gray)  
B: Standard type (blue)

Note: Do not leave spaces between letters and symbols.

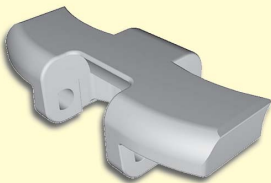
Connecting Pin

304 stainless steel D-pin  
Model no. TTUP-SUS-JPD

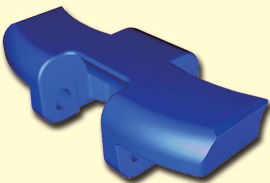
Specifications (Plastic chain material)

Standard type

General-purpose polyacetal chain links



Color: Gray  
(standard product)



Color: Blue  
(Made-to-order product)

1. Standard type (gray, blue)

Standard grade polyacetal resin with excellent mechanical properties is used.

2. Anti-static type (gray only)

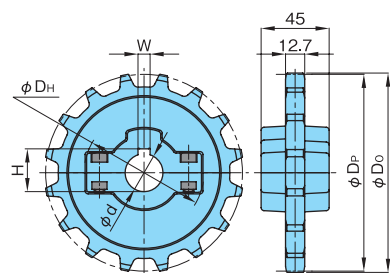
This type has anti-static properties that prevent the adhesion of dust and wear debris as well as sparks from static electricity. (Available only in gray)

\* Magnets can also be integrated into the chain link. Please contact a Tsubaki representative for further information.

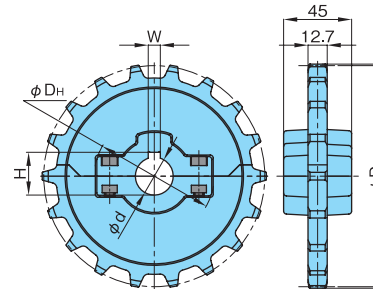


## Split sprocket

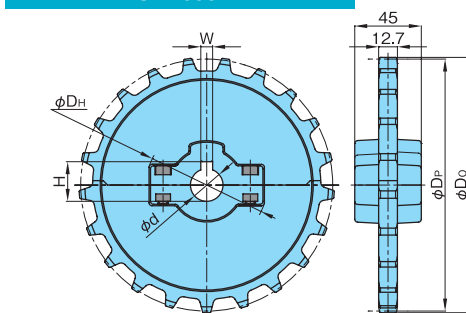
WT-SW2500-16T



WT-SW2500-18T



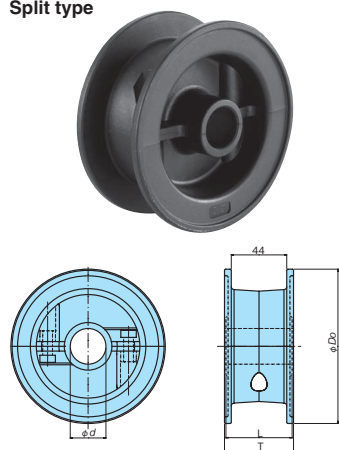
WT-SW2500-21T



Tsubaki model no.	Teeth	Pitch diameter D <sub>P</sub>	Outside diameter D <sub>O</sub>	Bore shape	Bore diameter d	Keyway		Hub diameter D <sub>H</sub>	Approx. mass kg	Type	Material		WT-SW2500
						W	H				Body	Bolts and nuts	
WT-SW2500-16T25	16	130.2	131.9	Round	25	8	28.3	82	0.26	Split	Reinforced polyamide (Black)	Stainless steel	●
WT-SW2500-16T30					30	8	33.3		0.25				●
WT-SW2500-16T35					35	10	38.3		0.24				●
WT-SW2500-16T40					40	12	43.3		0.24				●
WT-SW2500-18T25	18	146.3	148.3		25	8	28.3		0.30				●
WT-SW2500-18T30					30	8	33.3		0.29				●
WT-SW2500-18T35					35	10	38.3		0.28				●
WT-SW2500-18T40					40	12	43.3		0.28				●
WT-SW2500-21T25	21	170.4	172.7		25	8	28.3		0.36				○
WT-SW2500-21T30					30	8	33.3		0.35				○
WT-SW2500-21T35					35	10	38.3		0.34				○
WT-SW2500-21T40					40	12	43.3		0.33				○

Note: 1. ●: Standard product ○: Made-to-order product  
2. Bolt tightening torque: 5.7 N·m  
3. When assembling the sprockets, do not mix the pairs.  
4. Operating temperature range: -20°C to 80°C.  
5. Machined solid sprockets (steel or engineering plastic) can also be fabricated upon request. Contact a Tsubaki representative for further information.

**Idler wheel**

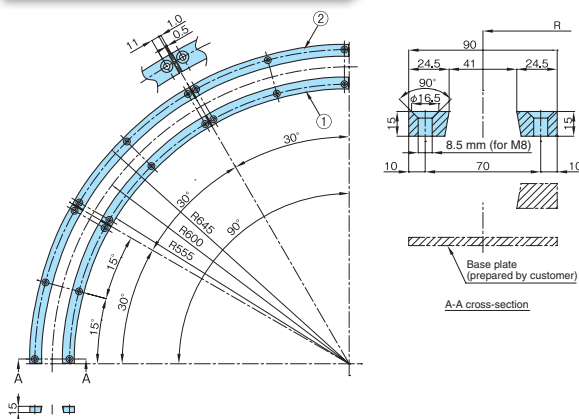


Tsubaki model no.	Equivalent no. of teeth	Outside diameter Do	Shaft diameter d	Hub length L	Width T	Approx.mass kg	Material	Type		
TP-C12077BT-IW	15	129.8	25	61	58	0.26	Bolt & nut: Stainless steel  Body: Polyamide (color: black)	Split		
TP-C12078BT-IW			30			0.25				
TP-C12079BT-IW			35			0.28				
TP-C12080BT-IW			40			0.25				
TP-C121928BT-IW	16.5	142.2	25	61	58	0.29				
TP-C121929BT-IW			30			0.27				
TP-C121930BT-IW			35			0.30				
TP-C121931BT-IW			40			0.27				
TP-C12081BT-IW	18	154.7	25	61	58	0.32				
TP-C12082BT-IW			30			0.30				
TP-C12083BT-IW			35			0.32				
TP-C12084BT-IW			40			0.30				

Note:

1. Standard product.
2. Operating temperature range: -20°C to 80°C.
3. Bolt tightening torque: 6 N·m {0.61 kgf·m}
4. When assembling the halves of the idler wheel, do not mix the halves with halves from other idler wheels.
5. Should not be used under abrasive conditions.
6. Shaft metal must be polished.
7. Solid type idler wheels are also available. Contact a Tsubaki representative for further information.

## Corner rails



No.	Tsubaki model no.	Center radius (mm)	Side	Material	Color	Angle
①	PR-TTUPSH-R600WIN30	600	Inside	Ultra high molecular weight polyethylene	White	30°
②	PR-TTUPSH-R600WOUT30		Outside			
①	PR-TTUPSH-R600GIN30	600	Inside	Ultra high molecular weight polyethylene	Green	30°
②	PR-TTUPSH-R600GOUT30		Outside			

Note: Made-to-order product

## ■ Model Numbering

Plastic rail	Chain type	Chain side-flex radius	Color	Side	Angle
--------------	------------	------------------------	-------	------	-------

PR—TTUPSH—R600 W IN 30

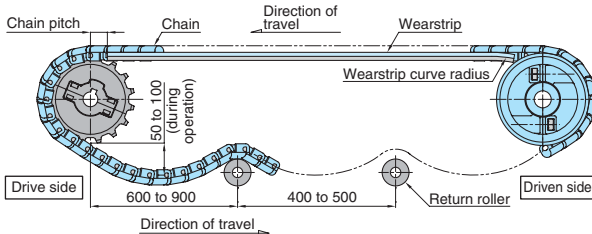
W: White      IN: Inside  
G: Green      OUT: Outside

Note: Do not leave spaces between letters and symbols.

# Conveyor Design

## 1. Conveyor Design

The layout of the guide rails for chains will vary according to the installation space available and other parameters. A typical layout is shown below. For details, please refer to the layout for top chain return-way straight running part (page 15) of the Tsubaki Top Chain Engineering Manual. (Catalog No. ME12Y2)



### 1) Chain slack

Return rollers should be spaced at interval of 600 to 900 mm to support the return-way of the chain. The amount of slack in the chain between return rollers should be 50 to 100 mm. This slack prevents chain skipping on the sprocket. Using different intervals or slacks may result in chain skipping.

### 2) Engagement angle

The engagement angle between the drive sprocket and the chain must be greater than 150°.

### 3) Wearstrip ends

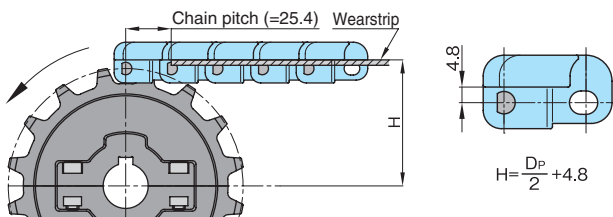
A distance equivalent to the pitch spacing of the chain must be established between the end of the wearstrip and the respective shaft centers on both the drive and driven ends. Also, the tail end of the return wearstrip on the driven side must be rounded or chamfered (sloped) to prevent catching or snagging of the chain.

### 4) Height of wearstrip on carry way (H)

See figure below.

## 1-1. Installation of drive/driven-side wearstrips

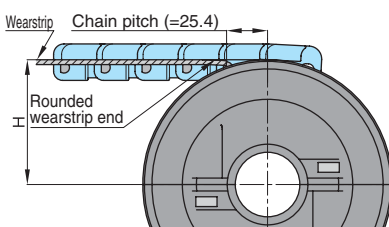
[Drive side]



Sprocket model number	Pitch diameter DP	H
WT-SW2500-16T	130.2	69.9
WT-SW2500-18T	146.3	77.95
WT-SW2500-21T	170.4	90

[Driven side]

When using an idler wheel (no teeth) for chains with top plates



Tsubaki model no.	H
TP-C12077BT-IW	64.9
TP-C12078BT-IW	
TP-C12079BT-IW	
TP-C12080BT-IW	
TP-C121928BT-IW	71.1
TP-C121929BT-IW	
TP-C121930BT-IW	
TP-C121931BT-IW	
TP-C12081BT-IW	77.35
TP-C12082BT-IW	
TP-C12083BT-IW	
TP-C12084BT-IW	

## 1-2. Installation of carry-way straight running part wearstrip

1. Ensure that the guide width is 2 mm larger than the chain hinge width.
2. With the multi-lane line, if the chain traveling direction is opposite or if the chain traveling direction is the same but the speed differs, a T-shape wearstrip or similar should be used in order to prevent the chain top plates from touching. (Figure 2)
3. If a multi-lane line has the same traveling direction and speed, it is recommended that the chain top plates have an interval of 1.4 to 3 mm. (Figure 3)
4. Due to no wear in the frame, the use of a wearstrip is recommended.
5. In considering of wear, the wearstrip should have a thickness of at least 3 mm.

Figure 1. Receiving part on the chain carry way (straight running part)

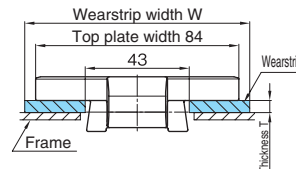


Figure 2. Multi-lane line with speed difference

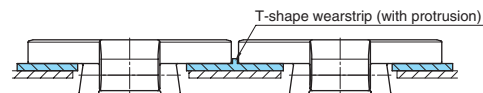
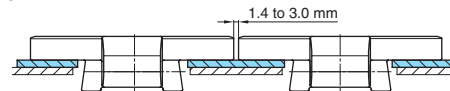


Figure 3. Multi-lane line with same speed



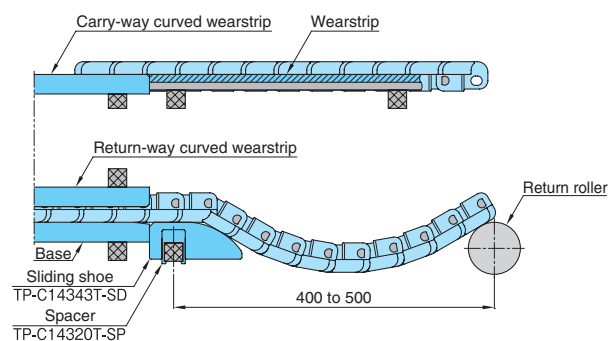
For information on return-way straight running part layout, please refer to the layout for top chain return-way straight running section (page 15) of the Tsubaki Top Chain Engineering Manual. (Catalog No. ME12Y2)

## 1-3. Installation of side-flex part wearstrip

Installing corner rails:

Install slide shoes (TP-C14343T-SD) on both edges of the return-way corner rail as a chain guide.

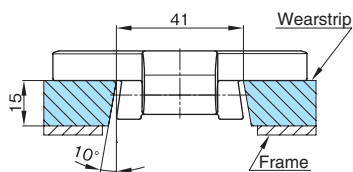
Conveyor side view cross-section diagram



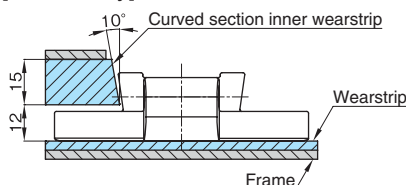
For information on curved wearstrip installation, please refer to page 14 of the Tsubaki Top Chain Engineering Manual. (Catalog No. ME12Y2)

# Conveyor Design / Allowable Load Graph / Handling

Chain and wearstrip cross-section (side-flex part)  
[Carry way]



[Return way]



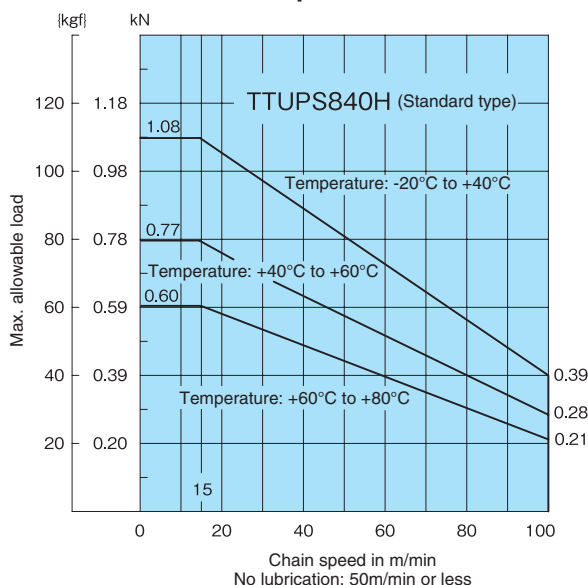
## 2. Selection

### 2-1. Calculation of chain load and required power

For instructions on how to calculate the chain load and required power, please refer to pages 9 through 11 of the Tsubaki Top Chain Engineering Manual. (Catalog No. ME12Y2)

For performance, see the graph below.

### 2-2. Allowable Load Graph

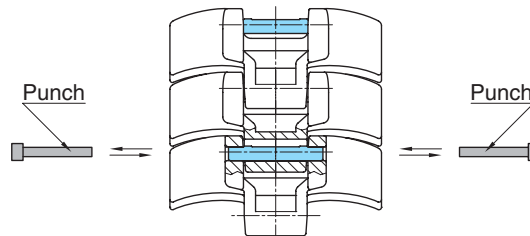


## 3. Chain handling

### 3-1. Assembly and disassembly of chain

The D-pin type connecting pins allow for disassembly from any part of the chain.

The pins can be inserted/removed from either side.



### 3-2. Chain Replacement Standards

Item	Method of Inspection	Criteria for Judgment(*)	
		Grade	Percentage of chain elongation
Chain elongation due to wear	Measure the length of 10 top plates by means of a measure with the chain slightly stretched to eliminate backlash through the chain links.  Measurement of length of 10 top plates (L) 	A	$0 \leq x < +1.2\%$
		B	$+1.2\% \leq x < +2.6\%$
		C	$+2.6\% \leq x$
		Percentage of elongation = (Measured length - Reference length)/Reference length $\times 100$ Reference length = chain pitch $\times 10$ Example: TTUPS-H chain: Result of measuring 10 links (reference length: 254mm) Percentage of elongation and judgment when measured length was 259mm: Percentage of elongation $X = (259 - 254) / 254 \times 100 \approx 2.0$ . From table above, judgment is B.	
Wear of top plate	Use a vernier caliper to measure the thickness of the part of the top plate that slides on the wearstrip. Also, verify that there are no bumps, depressions, or other irregularities measuring more than 1 mm in height or depth on the conveyor surface.	Grade	Plate thickness 9.8 mm
		A	8.3-9.8 mm
		B	5.9-8.2 mm
		C	5.8 mm or thinner
Deformation of top plate	Inspect whether or not there is any place where the chain articulation is not proper due to corrosion. If corrosion should worsen, remove rust and measure the thickness of the link plate by means of a vernier caliper.	Replace the part if deemed that it may affect operation. For scratches on the upper surface of the top plate due to abnormal contact, investigate the wearstrip on the return way to find the causes and repair it as necessary.	

- (\*) A: Can be still used.  
B: Still has margin of chain life but necessary to consider replacement.  
C: Chain life is already exceeded, needs to be replaced.

TSUBAKI  
TOP CHAIN



TSUBAKI  
TOP CHAIN  
ENGINEERING MANUAL



For conveyor design information and information on the calculation of load and selection of accessories and chains that are not listed in this catalog, please refer to the Tsubaki Top Chain catalog and engineering manual.

# For Your Safety When Using the Chain



## Warning

To avoid danger, observe the following rules.

### General

- Do not use chain or chain accessories for any purpose other than their originally intended use.
- Never perform additional work on chain (including machining, grinding, annealing, cleaning with acids or alkalis, electroplating, or welding or cutting with a torch which will cause heat effects). These processes may cause the chain to break during operation, leading to a risk of severe injury.
- When replacing a worn or damaged part, do not replace just the worn or damaged part. Replace all parts with new parts. The chain may break during operation, leading to a risk of severe injury.
- When using chain in a lifting device, set up a safety barrier and do not allow anyone to go under the equipment. Also, when jigs or tools are connected to the edges of the chain, be sure to adequately lubricate the connecting parts. Detachment of the chain or unexpected chain breakage may lead to severe injury from flying or falling parts.
- Strictly observe the general guidelines listed in Section 1, Chapter 1, 2nd Edition of the Japanese Occupational Safety and Health Regulations as well as rules and regulations concerning occupational safety and health in your region/country. Always install safety equipment (safety covers, etc.) on chain and sprockets. There is a risk of severe injury from conveyed items or the chain as a result of becoming caught in the chain or from unexpected chain breakage.
- Chain and sprockets must be inspected on a regular basis. Damaged parts, or parts that have reached the end of their service life, should be replaced with new parts. There is a risk not only of the chain not functioning properly, but also of severe injury from chain breakage or abnormal operation. Perform the work as instructed in the manual, catalog or other documentation that was provided with the product.

### During Installation

- Before starting work, turn off the power switch and take measures to prevent it from being turned on accidentally. There is a risk of severe injury from becoming caught in the chain.
- Always wear safety goggles when using hammers while working to connect chains. There is a risk of severe injury from flying metal fragments or splinters.
- Secure the chain and parts to prevent them from moving freely. There is a risk of severe injury from chain components moving under their own weight, or from falling and body parts becoming pinched in the chain.



## Caution

To prevent accidents, observe the following rules.

- Understand the structure and specifications of the chain that you are handling.
- Before installing chain, inspect it to make sure no damage occurred during delivery.
- Inspect and maintain chain and sprockets at regular intervals.
- Chain strength varies by manufacturer. Only Tsubaki products should be used when chain is selected using Tsubaki catalogs.
- Start and stop the chain gradually, and do not subject it to sudden impact.
- Do not apply initial tension to the chain.
- Consult with a Tsubaki representative before using the chain in cases where it will be in contact with special liquids or used under special environments.
- When disconnecting chains that have engineering plastic pins, do not reuse a pin once removed since it may not engage properly or it may even come loose.
- When using chains with engineering plastic pins under wet conditions, make sure that the temperature does not exceed 60°C.
- The link material for ULF ultra low friction series contains silicone-based lubricant. Therefore, do not use this chain for printing processes, or in cases where silicone will have a harmful effect.
- The TP-IR18/IR60/RR55 (return rollers), PR520-M (M plastic rail), and SJ-CNO are dry conveyor parts (lube-free, no water adhesion). DIA, MPD, MF, HS, and KV150 chains are specifically for dry environments. Do not use these on a conveyor under wet conditions (environments where they will come into contact with water, soapy water or other liquids), since this may cause the chain to malfunction. Bearing corner discs are also designed for use in dry environments.
- Using a plastic top chain in a wet environment will decrease the resin's self-lubricating ability and thus shorten the life of the chain. Since this is especially true with stainless steel pins, we recommend using plastic pins or KV series chain.
- The operating temperature range for accessories, sprockets, and idler wheels made of UHMW-PE (ultra-high molecular weight polyethylene) is -20°C to 60°C. Also, do not use in environments where such components will be exposed to steam.
- Toxic gases may be generated if the Chemical Resistant series (including Super Chemical Resistant) is exposed directly to open flame, or to temperatures above 150°C. Do not expose to excessive heat or to open flame.
- Plastic chain is flammable. Do not use at temperatures above the maximum allowable temperature or use near open flame. Combustion may generate dangerous toxic gases.



## Warranty

### 1. LIMITED WARRANTY

Products manufactured by Seller: (a) conform to the design and specifications, if any, expressly agreed to in writing by Seller; and (b) are free of defects in workmanship and materials at the time of shipment. The warranties set forth in the preceding sentence are exclusive of all other warranties, express or implied, and extend only to Buyer and to no other person. ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY EXCLUDED.

### 2. NON-RELIANCE

Buyer is not relying upon any advice, representations or warranties (except the warranties expressly set forth above) of Seller, or upon Seller's skill or judgment regarding the Seller's products. Buyer is solely responsible for the design and specifications of the products, including without limitation, the determination of suitability for Buyer's application of the products.

### 3. CLAIMS

- (a) Any claim relating to quantity or type shall be made to Seller in writing within 7 days after receipt of the products; any such claim made thereafter shall be barred.
- (b) Any claim under the above-stated Limited Warranty shall be made to Seller in writing within three (3) months after receipt of the products; any such claim made thereafter shall be barred.
- (c) Seller's liability for breach of warranty or otherwise is limited to repair or replacement, at Seller's option, of non-conforming or defective products. Buyer waives all other remedies, including, but not limited to, all rights to consequential, special or incidental damages, including, but not limited to,

damages resulting from personal injury, death or damage to or loss of use of property.

- (d) Repair, alteration, neglect or misuse of the products shall void all applicable warranties.

### 4. INDEMNIFICATION

Buyer will indemnify, defend and hold Seller harmless from all loss, liability, damage and expense, including attorneys' fees, arising out of any claim (a) for infringement of any patent, trademark, copyright, misappropriation of trade secrets, unfair competition or similar charge by any products supplied by Seller in accordance with the design or specifications furnished by Buyer, or (b) arising out of or connected with the products or any items into which the products are incorporated, including, but not limited to, any claim for product liability (whether or not based on negligence or strict liability of Seller), breach of warranty, breach of contract or otherwise.

### 5. ENTIRE AGREEMENT

These terms and conditions constitute the entire agreement between Buyer and Seller and supersede any inconsistent terms and conditions, whether contained in Buyer's purchase order or otherwise, and whether made heretofore or hereafter.

No statement or writing subsequent to the date hereof which purports to modify or add to the terms and conditions hereof shall be binding unless consented to in writing, which makes specific reference hereto, and which has been signed by the party against which enforcement thereof is sought. Seller reserves the right to change these terms and conditions without prior notice.



## TSUBAKIMOTO CHAIN CO.

### Headquarters

Nakanoshima Mitsui Building  
3-3-3 Nakanoshima, Kita-ku  
Osaka, 530-0005, Japan  
Phone : +81-6-6441-0011  
URL : <http://tsubakimoto.com>

### Chain & Power Transmission Sales

1-3 Kannabidai, 1-chome  
Kyoutanabe,  
Kyoto, 610-0380, Japan  
Phone : +81-774-64-5022

### Group companies

#### NORTH and SOUTH AMERICA

**U.S. TSUBAKI POWER TRANSMISSION, LLC**  
301 E. Marquardt Drive, Wheeling, IL 60090, U.S.A.  
Phone : +1-847-459-9500  
URL : <http://www.ustsubaki.com>

**TSUBAKI of CANADA LIMITED**  
1630 Drew Road, Mississauga, Ontario, L5S 1J6, Canada  
Phone : +1-905-676-0400  
URL : <http://tsubaki.ca>

**TSUBAKI BRASIL EQUIPAMENTOS INDUSTRIAIS LTDA.**  
R. Pamplona, 1018, CJ. 73/74, Jd. Paulista  
CEP 01405-001, São Paulo, S.P. Brazil  
Phone : +55-11-3253-5656  
URL : <http://tsubaki.ind.br>

#### EUROPE

**TSUBAKIMOTO EUROPE B.V.**  
Aventurijn 1200, 3316 LB Dordrecht, The Netherlands  
Phone : +31-78-620-4000  
URL : <http://tsubaki.eu>

**TSUBAKIMOTO U.K. LTD**  
Osier Drive, Sherwood Park, Annesley, Nottingham  
NG15 0DX, United Kingdom  
Phone : +44-1623-688-700  
URL : <http://tsubaki.eu>

**TSUBAKI DEUTSCHLAND GmbH**  
ASTO Park Oberpfaffenhofen, Friedrichshafener Straße 1  
D-82205, Gilching, Germany  
Phone : +49-8105-7307100  
URL : <http://tsubaki.eu>

**ООО "TSUBAKI KABELSCHLEPP"**  
Prospekt Andropova 18, Building 6  
115432 Moscow, Russia  
Phone : +7-499-418212  
URL : <http://tsubaki.eu>

#### ASIA and OCEANIA

**TAIWAN TSUBAKIMOTO CO.**  
No. 33, Lane 17, Zihciang North Road  
Gueishan Township Taoyuan County Taiwan R.O.C.  
Phone : +886-3-3293827/8/9  
URL : <http://tsubakimoto.com.tw>

**TSUBAKIMOTO CHAIN (SHANGHAI) CO. LTD.**  
Room 601, Urban City Centre, 45 Nanchang Road  
Huangpu District, Shanghai 2000020, People's Republic of China  
Phone : +86-21-5396-6651/2  
URL : <http://chunben.com>

**TSUBAKI INDIA POWER TRANSMISSION PTE. LTD.**  
Chandrika Chambers No.4, 3rd Floor, Anthony Street  
Royapettah, Chennai, Tamil Nadu 600014, India  
Phone : +91-44-4231-5251  
URL : <http://tsubaki.sg>

**TSUBAKIMOTO SINGAPORE PTE. LTD.**  
25 Gul Lane, Jurong, Singapore 629419  
Phone : +65-6861-0422/3/4  
URL : <http://tsubaki.sg>

**TSUBAKIMOTO SINGAPORE PTE. LTD.**  
**VIETNAM REPRESENTATIVE OFFICE**  
H&H Building 8F, 209 Hoàng Văn Thụ,  
Phủ Nhuận District, Hồ Chí Minh City, Vietnam  
Phone : +84-8-3999-0131/2  
URL : <http://tsubaki.sg>

**PT. TSUBAKI INDONESIA TRADING**  
Wisma 46 - Kota BNI, 24th Floor, Suite 24.15  
Jl. Jend. Sudirman, Kav. 1, Jakarta 10220, Indonesia  
Phone : +62-21-571-4230/31  
URL : <http://tsubaki.sg>

**TSUBAKI POWER TRANSMISSION (MALAYSIA) SDN. BHD.**  
No. 22, Jalan Astaka U8/84A,  
Bukit Jelutong Industrial Park  
Section U8, 40150 Shah Alam, Selangor, Malaysia  
Phone : +60-3-7859-8585  
URL : <http://tsubaki.sg>

**TSUBAKI AUSTRALIA PTY. LTD.**  
Unit E, 95-101 Silverwater Road  
Silverwater NSW 2128, Australia  
Phone : +61-02-9704-2500  
URL : <http://tsubaki.com.au>

**NEW ZEALAND BRANCH**  
2 Kalmia Street, Ellerslie, Auckland 1051, New Zealand  
Phone : +64-275-082-726  
URL : <http://tsubaki.com.au>

**TSUBAKIMOTO (THAILAND) CO. LTD.**  
388 Exchange Tower, 19th Floor Unit 1902  
Sukhumvit Road, Klongtoey, Bangkok 10110, Thailand  
Phone : +66-2-262-0667/8/9  
URL : <http://tsubaki.co.th>

**TSUBAKIMOTO CHAIN CO. KOREA OFFICE**  
#1401, West Wing, Hanshin Intervalley 24, 707-34  
Yeoksam 2(i)-dong, Gangnam-gu, Seoul, Republic of Korea  
Phone : +82-02-2183-0311  
URL : <http://tsubakimoto.com>

Distributed by: