



## TSUBAKIMOTO CHAIN CO.

Japan Headquarters +81 6-6441-0011 <http://tsubakimoto.com>

### Global Group Companies

#### AMERICAS

United States of America	U.S. TSUBAKI POWER TRANSMISSION, LLC	+1 847-459-9500	<a href="http://www.ustsubaki.com/">http://www.ustsubaki.com/</a>
Brazil	TSUBAKI BRASIL EQUIPAMENTOS INDUSTRIAIS LTDA.	+55 11-3253-5656	<a href="http://tsubaki.ind.br/">http://tsubaki.ind.br/</a>
Canada	TSUBAKI of CANADA LIMITED	+1 905-676-0400	<a href="http://tsubaki.ca/">http://tsubaki.ca/</a>

#### EUROPE

Netherlands	TSUBAKI EUROPE B.V.	+31 78-6204000	<a href="http://tsubaki.eu/">http://tsubaki.eu/</a>
France	KABELSCHLEPP FRANCE S.A.R.L.	+33 1-34846365	<a href="http://kabelschlepp.fr/">http://kabelschlepp.fr/</a>
Germany	TSUBAKI DEUTSCHLAND GmbH TSUBAKI KABELSCHLEPP GmbH	+49 8105-7307100 +49 2762-4003-0	<a href="http://tsubaki.de/">http://tsubaki.de/</a> <a href="http://kabelschlepp.de/">http://kabelschlepp.de/</a>
Italy	KABELSCHLEPP ITALIA S.R.L.	+39 0331-350962	<a href="http://kabelschlepp.it/">http://kabelschlepp.it/</a>
Russia	OOO TSUBAKI KABELSCHLEPP	+7 499-4180212	<a href="http://kabelschlepp.ru/">http://kabelschlepp.ru/</a>
United Kingdom	TSUBAKIMOTO U.K. LTD.	+44 1623-688-700	<a href="http://tsubaki.eu/">http://tsubaki.eu/</a>

#### INDIAN OCEAN RIM

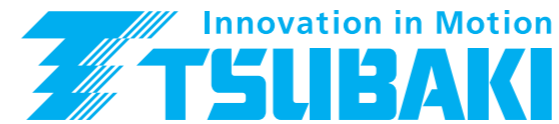
Singapore	TSUBAKIMOTO SINGAPORE PTE. LTD.	+65 6861-0422/3/4	<a href="http://tsubaki.sg/">http://tsubaki.sg/</a>
Australia	TSUBAKI AUSTRALIA PTY. LTD.	+61 2-9704-2500	<a href="http://tsubaki.com.au/">http://tsubaki.com.au/</a>
India	TSUBAKI INDIA POWER TRANSMISSION PTE. LTD.	+91 44-4231-5251	<a href="http://tsubaki.sg/">http://tsubaki.sg/</a>
Indonesia	PT. TSUBAKI INDONESIA TRADING	+62 21-571-4230/1	<a href="http://tsubakimoto.co.id/">http://tsubakimoto.co.id/</a>
Malaysia	TSUBAKI POWER TRANSMISSION (MALAYSIA) SDN. BHD.	+60 3-7859-8585	<a href="http://tsubaki.sg/">http://tsubaki.sg/</a>
New Zealand	TSUBAKI AUSTRALIA PTY LIMITED - NEW ZEALAND BRANCH	+64 275-082-726	<a href="http://tsubaki.com.au/">http://tsubaki.com.au/</a>
Philippines	TSUBAKIMOTO SINGAPORE PTE. LTD. - PHILIPPINES REPRESENTATIVE OFFICE	+63 2-464-7129	<a href="http://tsubaki.ph/">http://tsubaki.ph/</a>
Thailand	TSUBAKIMOTO (THAILAND) CO., LTD.	+66 2-262-0667	<a href="http://tsubaki.co.th/">http://tsubaki.co.th/</a>
Vietnam	TSUBAKIMOTO SINGAPORE PTE. LTD. - VIETNAM REPRESENTATIVE OFFICE	+84 8-3999-0131/2	<a href="http://tsubaki.net.vn/">http://tsubaki.net.vn/</a>

#### EAST ASIA

Korea	TSUBAKIMOTO KOREA CO., LTD.	+82 2-2183-0311	<a href="http://tsubakimoto-tck.co.kr/">http://tsubakimoto-tck.co.kr/</a>
Taiwan	TAIWAN TSUBAKIMOTO CO.	+886 33-293827/8/9	<a href="http://tsubakimoto.com.tw/">http://tsubakimoto.com.tw/</a>

#### CHINA

China	TSUBAKIMOTO CHAIN (SHANGHAI) CO., LTD.	+86 215396-6651/2	<a href="http://tsubaki.cn/">http://tsubaki.cn/</a>
-------	--	-------------------	---



NEW

# TSUBAKI PLASTIC TOP CHAIN TTUPM-H / WT2515G-M

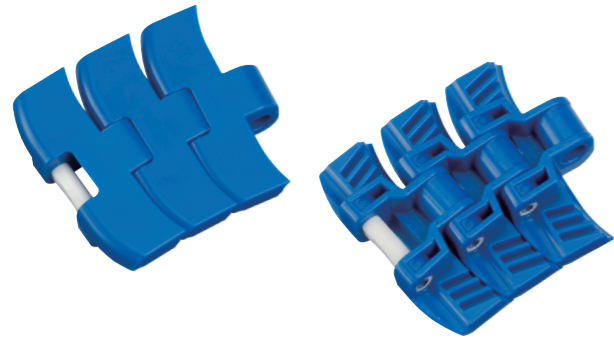
Top Chain



# A New Solution from Tsubaki – Plastic Top Chains Ideal for Beverage Container Conveyance

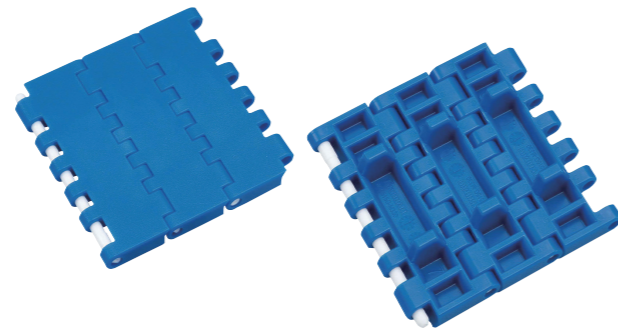
Prevents chain floating on curved sections when used in combination with magnet-embedded rails

## TTUPM-H Type



Plug-less structure prevents plug drop-out

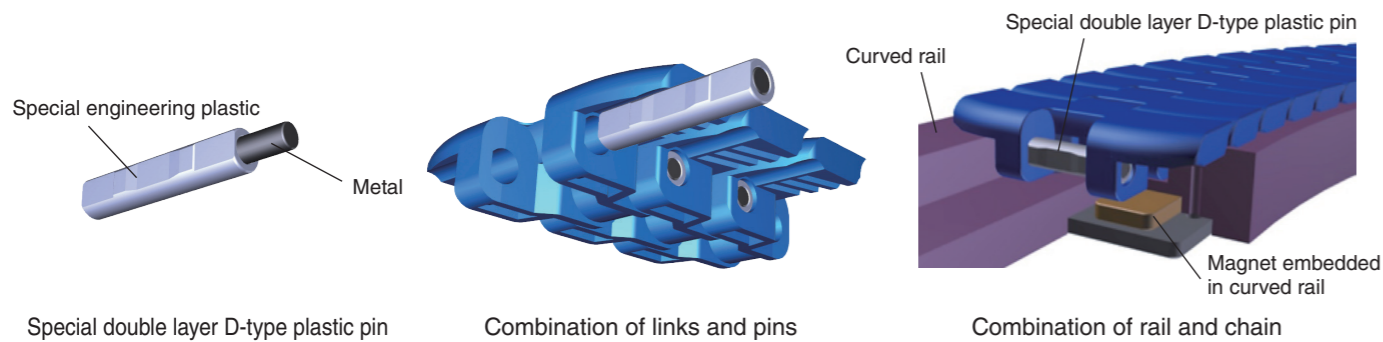
## WT2515G-M Type



## TTUPM-H Type

### Feature 1

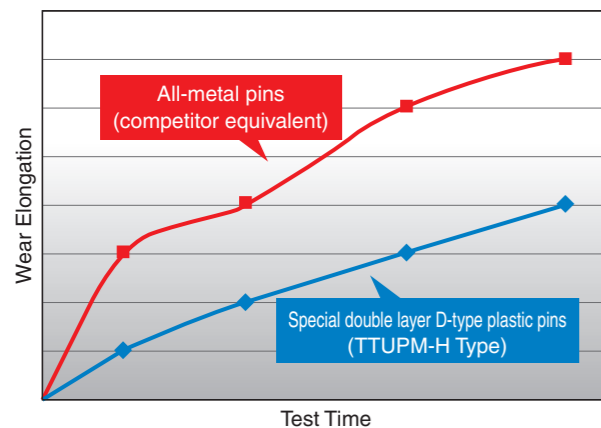
TTUPM-H Type uses the world's first special double layer D-type plastic pin combining both plastic and metal. It possesses all the features of plastic while preventing floating through magnetism.



### Feature 2

All-metal pins wear when exposed to water, causing significant wear elongation. However, special double layer D-type plastic pins use special engineering plastic where they slide against the links to further minimize wear elongation in contact with water and prolong the life of the chain.

### Wear Elongation Comparison Graph



### Test Conditions

The graph on the left shows our in-house test results.

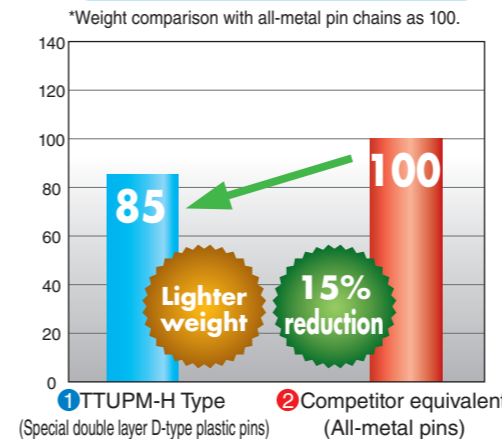
Comparison

- 1 Special double layer D-type plastic pins (New Tsubaki TTUPM-H Type)
  - 2 All-metal pins (Competitor equivalent)
- Chain speed: 60 m/min  
Ambient temperature, 5 kg weight load  
Contact with water (water drip)

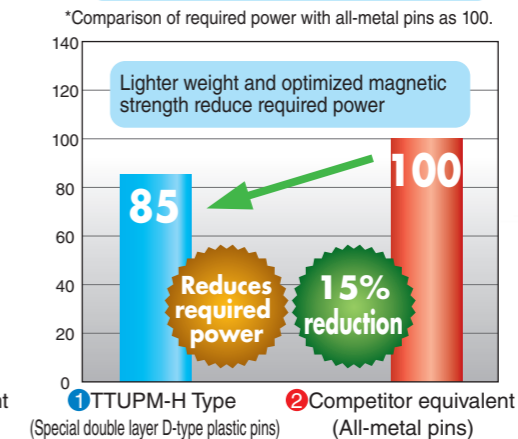
### Feature 3

Special double layer D-type plastic pins are much lighter than conventional pins. They are 15% lighter than all-metal pins, and thus can reduce chain attraction to magnet-embedded rails in curved sections to optimum levels and reduce capacitance.

### Reduces Chain Weight



### Required Power Reduction Graph



### Test Conditions

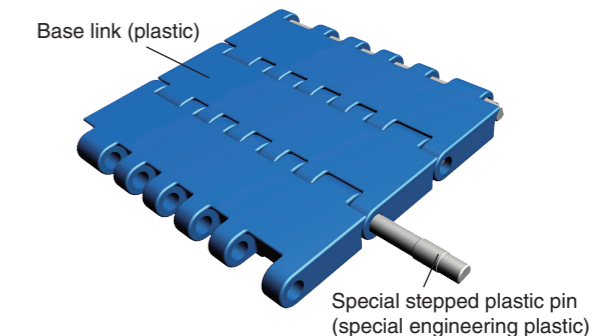
Comparison

- 1 Special double layer D-type plastic pins (New Tsubaki TTUPM-H Type)
  - 2 All-metal pins (Competitor equivalent)
- Chain speed: 60 m/min  
Ambient temperature, 5 kg weight load  
Test conveyor: Approx. 2,600 mm  
One curved section

## WT2515G-M Type

### Feature 4

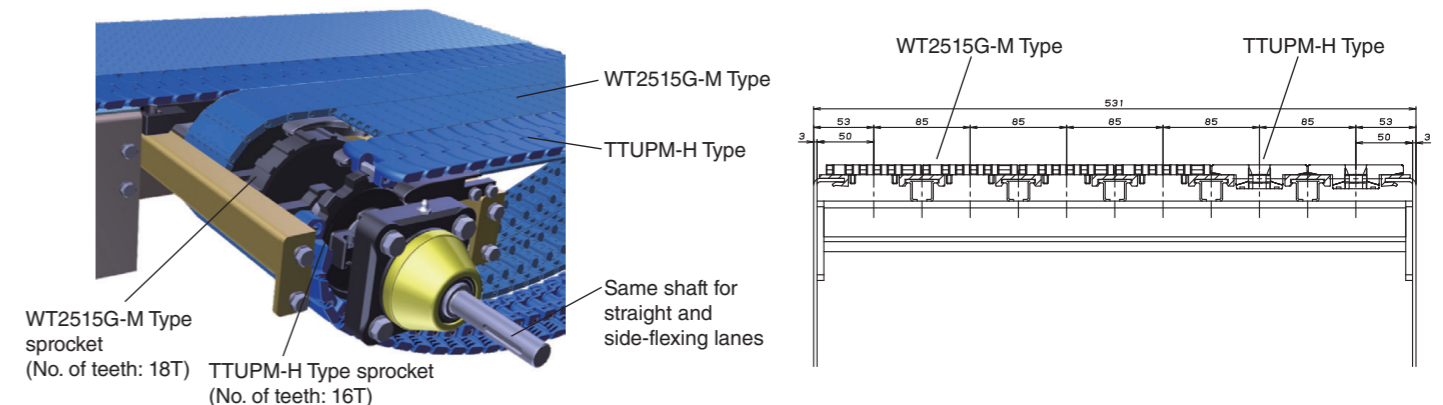
WT2515G-M Type uses special stepped plastic connecting pins. While plugged types (with plugs to prevent pin drop-out) have a risk of foreign matter entering when plugs drop out, there is no risk with special stepped plastic pins, which combine pins and a pin drop-out prevention structure. The simple structure of only links and pins also makes handling easy.



## Combining TTUPM-H and WT2515G-M Types

### Feature 5

Side-flexing TTUPM838H and straight-running WT2515G-M Types can be installed on the same frame structure, which allows for simple conveyor design for multi-lane applications. The figure below shows an example of installing both types.

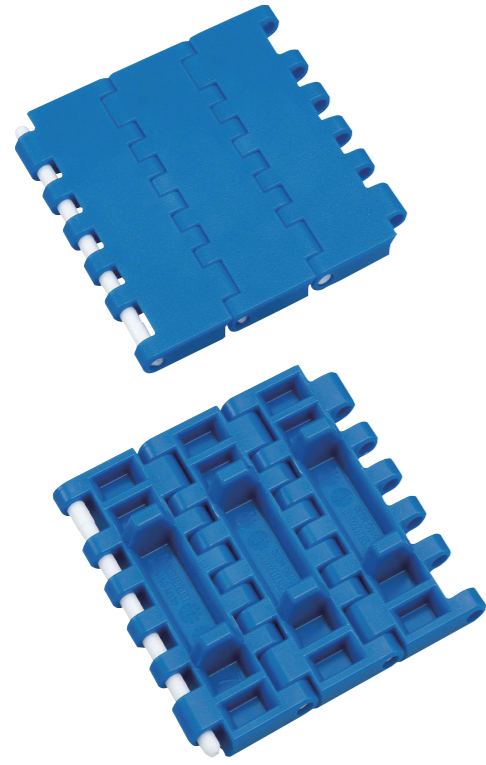




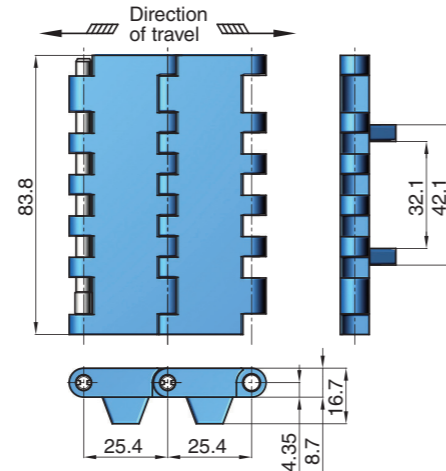
# Plastic Modular Chain WT2515G-M Type

**Straight**

## Plastic Chain

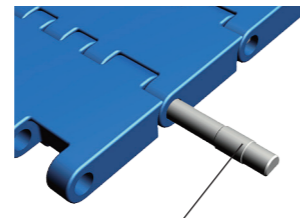


### Plan view



### Connecting pin

Special stepped plastic pins / Orange  
(Material: Special engineering plastic)  
Model no.: WT2515G-PLA-JPD



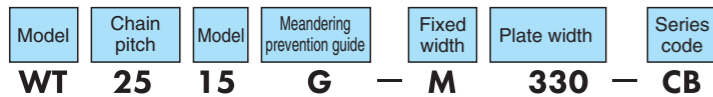
Special stepped plastic pins (special engineering plastic)  
\* Note that pins are to be removed from a certain direction. (See page 9)

### Chain (plastic pins)

Product code	Model no.	Top plate		Pin	Max. allowable load kN(kgf)	Approx. mass kgf/m	Back bend radius mm
		Material	Color				
K13	WT2515G-M330-CB	Low-friction polyacetal (carbon black filled)	Blue	Special stepped plastic pin	1.9(190)	0.8	25

- Notes) 1. A chain consists of the required number of units of links and a fraction less than one unit. 1 unit = 120 links  
2. Made-to-order product.  
3. Only low-friction polyacetal (carbon black filled) is available.  
4. Only connecting pins are orange. Base chain pins are white.  
5. Operating temperature range is -20°C to (60) 80°C. (60)°C is for wet conditions.  
6. Allowable chain speed: 100 m/min. (with lubrication) and 50 m/min (without lubrication)

### Chain model numbering

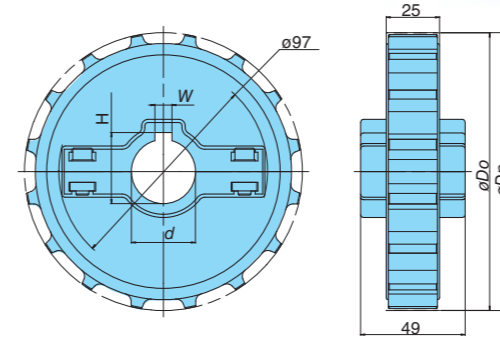


G: With meandering prevention guide  
330: 83.8 mm  
CB: Low-friction, wear-resistant type (Blue)

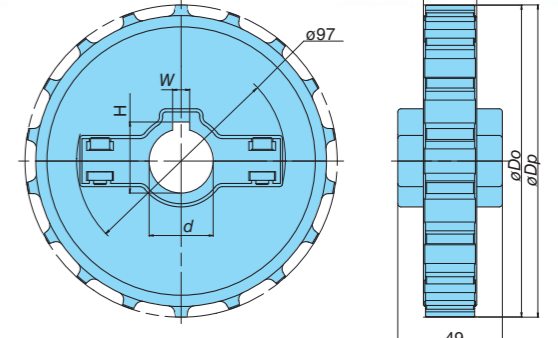
\* No space is required between characters and codes.

## Sprocket

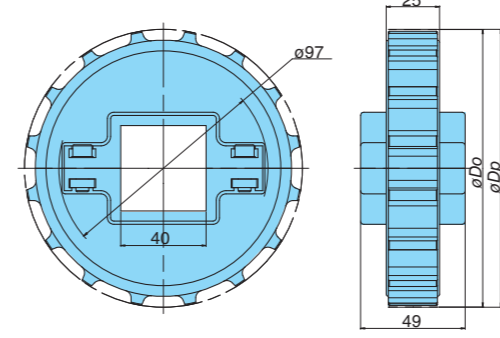
### WT-SW2250-16T (Round hole)



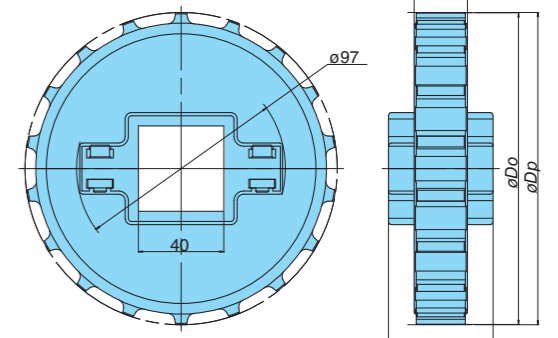
### WT-SW2250-18T (Round hole)



### WT-SW2250-16T (Square hole)



### WT-SW2250-18T (Square hole)

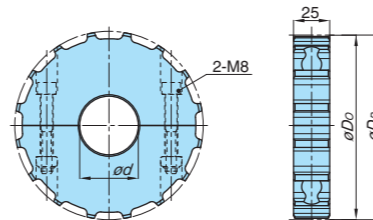


Product code	Model no.	Teeth	Pitch diameter $D_p$	Outer diameter $D_o$	Bore diameter $d$	Keyway		Bore shape	Shaft	Material	Type
						W	H				
<b>K151202</b>	<b>WT-SW2250-16T30</b>	16	130.2	130	30	8	33.3	Round hole	Round 30 polished steel bar	Reinforced polyamide (Black)	Split
<b>K151203</b>	<b>WT-SW2250-16T40</b>				40				Round 40 polished steel bar		
K15	WT-SW2250-16T40S				40				Square hole		
<b>K151204</b>	<b>WT-SW2250-18T30</b>	18	146.3	146	30	8	33.3	Round hole	Round 30 polished steel bar		
<b>K151205</b>	<b>WT-SW2250-18T40</b>				40				Round 40 polished steel bar		
K15	WT-SW2250-18T40S				40				Square hole		

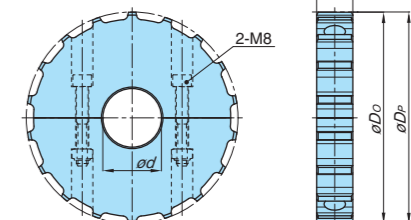
- Notes) 1. Operating temperature range is -20°C to 80°C.  
2. Square-hole sprockets are loosely fitted to the shaft to accommodate the thermal expansion between the chain and conveyor, as well as chain-sprocket installation errors.  
3. Use round-hole sprockets only when the chain width is 680 mm or shorter and temperature variations are within 30°C.  
4. Models in boldface are stock items (standard products) while models in normal face are made-to-order products.

## Idler Wheel

### WT-SW2250-16T-IW-M



### WT-SW2250-18T-IW-M



Product code	Model no.	Teeth	Pitch diameter $D_p$	Outer diameter $D_o$	Bore diameter $d$	Shaft	Material	Type
<b>K151206</b>	<b>WT-SW2250-16T30IW-M</b>	16	130.2	130	30	Round 30 polished steel bar	Polyamide (White)	Split
<b>K151207</b>	<b>WT-SW2250-16T40IW-M</b>				40	Round 40 polished steel bar		
<b>K151208</b>	<b>WT-SW2250-18T30IW-M</b>	18	146.3	146	30	Round 30 polished steel bar		
<b>K151209</b>	<b>WT-SW2250-18T40IW-M</b>				40	Round 40 polished steel bar		

- Notes) 1. Operating temperature range is -20°C to 80°C.  
2. Use only as an idler wheel.  
3. Standard product.

## 1. Selection

### Precautions for Selection

- Plastic Top Chains are not recommended for use in operating conditions where they may be subject to impact or catch foreign material as this may damage or break the chains. Consider using a metal chain. Also, use inverter control, etc. to slowly start and stop the conveyor.
- Plastic Top Chains may suffer premature wear when used in operating conditions where they may contact abrasive material. Consider using a metal chain.
- Contact a Tsubaki representative before using Plastic Top Chains in contact with special liquids (acidic or alkaline chemicals or solutions) or in special environments (UV rays, etc.).
- 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 contact with steam.
- Toxic gases may be generated if Chemical Resistant Series (including Super Chemical Resistant Series) chains are exposed directly to open flame or temperatures above 150°C. Do not expose these series to excessive heat or open flame.
- Plastic chains are flammable. Do not use above the maximum allowable temperature or near open flame, as they may catch fire and generate dangerous toxic gases.

### Corrosion Resistance against Different Liquids

When selecting a chain, refer to Table 1 to check whether the material is appropriate for the intended application. You can also use this corrosion resistance data to check the material of the rail used with the Top Chain. The table shows results obtained in a laboratory at 20°C and does not guarantee usability in all conditions. Consider the overall operating conditions (including humidity) with actual use. The table shows the material of the constituent components used in the top plates and chain individually, so be sure to check them the material in combination. Reagents with no concentration indicated are saturated or a 100% solution. Use caution when mixing solutions as their conditions differ.

Table 1. Corrosion resistance against different liquids

Liquid	TTUPM-H Type		WT2515G-M Type		Liquid	TTUPM-H Type		WT2515G-M Type	
	○	△	○	△		○	△	○	△
Acetic acid (10%)	×	×	○	○	Milk / Butter	○	○	○	○
Acetone	×	○	○	○	Nitric acid (5%)	×	×	×	×
Alcohol	○	○	○	○	Oil (vegetable, mineral)	○	○	○	○
Ammonia solution	△	△	○	○	Paraffin	○	○	○	○
Beer	○	○	×	×	Phosphoric acid (10%)	×	×	×	×
Benzene	○	○	×	×	Potassium hydroxide	×	×	×	×
Carbon tetrachloride	△	△	×	×	Seawater	×	△	×	△
Chromic acid (5%)	×	×	○	○	Soap water	○	○	○	○
Citric acid	×	×	×	×	Sodium chloride	×	○	×	○
Drinking water / Coffee	○	○	×	×	Sodium hydroxide (25% caustic soda)	×	×	×	×
Formic acid (50%)	×	×	×	×	Sodium hypochlorite	×	×	×	×
Fruit juice	○	○	×	×	Sulfuric acid (5%)	×	×	×	×
Gasoline	○	○	○	○	Vegetable juice	○	○	○	○
Hydrochloric acid (2%)	×	×	×	×	Vinegar	×	△	×	△
Hydrogen peroxide solution (3%)	×	×	○	○	Water	○	○	○	○
Iodine	×	×	○	○	Whiskey	○	○	○	○
Lactic acid	×	△	○	○	Wine	○	○	○	○

○: Sufficient corrosion resistance △: Corrosion resistance under certain operating conditions ×: No corrosion resistance

### Step 1. Check Conveyance Conditions

- Conveyed material
  - Material used in container or conveyed material
  - Weight per unit
  - Shape/dimensions
- Conveyance route
  - Linear or curved conveyance
  - Conveyor length/width
  - Layout
  - Space
- Conveyance conditions
  - Conveyance amount
  - Conveyance interval
  - Conveyor speed
  - Lubrication
  - Item stacking (accumulation, ratio)
- Conveyance atmosphere
  - Temperature
  - Chemicals, water, humidity, and other corrosive conditions (See Table 1)
  - Glass shards, paint chips, metal chips, sand, and other abrasive material
  - Exposure to ultraviolet light

### Step 2. Selection of Rail Material

Select the appropriate rail material.

Table 2. Rail material selection chart

Chain type	Rail material	Without lubrication		With lubrication	
		Abrasive material			
		No	Yes	No	Yes
Plastic top chain, Plastic block chain, Plastic modular chain	Stainless steel	B	D	A	A
	Steel	A	C	D	D
• For straight conveyor • For curved conveyor	Solidur (P rail)	D	×	A	×
	PMW rail PLF rail	B	×	A	×
	M rail SJ-CNO	A	×	×	×

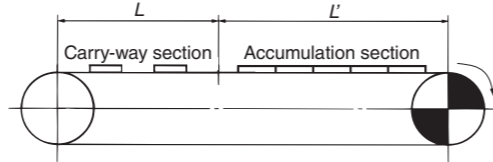
A: Strongly recommended  
B: Recommended  
C: Very usable  
D: Usable  
×: Not appropriate

	Material/Color	Feature
Solidur (P rail)	<ul style="list-style-type: none"> <li>Ultra-high molecular weight polyethylene</li> <li>White or green</li> </ul>	<ul style="list-style-type: none"> <li>Most common rail</li> <li>Machine-cut or extruded product</li> <li>When using a plastic chain, this rail is recommended for wet conditions</li> <li>Low water absorption; chemical-resistant and shock-proof.</li> </ul>
PMW rail PLF rail	<ul style="list-style-type: none"> <li>Low-friction, wear-resistant ultra-high molecular weight polyethylene</li> <li>White</li> </ul>	<ul style="list-style-type: none"> <li>Lower friction compared to P rail; wear-resistant rail</li> <li>Machine-cut</li> </ul>
M rail SJ-CNO	<ul style="list-style-type: none"> <li>Special polyamide</li> <li>Blue (M rail)</li> <li>Purple (SJ-CNO)</li> </ul>	<ul style="list-style-type: none"> <li>Dry-only rail</li> <li>Wear-resistant rail</li> <li>Machine-cut product</li> </ul>

Note: Operating temperature range: Solidur (P rail) : -20°C to 60°C M rail / SJ-CNO : -20°C to 80°C PMW rail / PLF rail

### Step 3. Calculating Chain Load and Required Power

#### 3-1. Calculating F in linear conveyance



1) Description of symbols

- $F$  = Chain load — kN
- $m_1$  = Chain weight — kg/m
- $L$  = Length of carry-way section — m
- $m_2$  = Conveyed item weight in carry-way section — kg/m
- $L'$  = Length of accumulation part — m
- $m_3$  = Weight of carried item in accumulation part — kg/m
- $\mu_1$  = Dynamic coefficient of friction of chain/rail — (See Table 3)
- $\mu_2$  = Dynamic coefficient of friction of the chain and conveyed item in accumulation section — (See Table 4)
- $\mu_3$  = Coefficient of magnetism — (See Table 5)
- $\alpha_L$  = Coefficient of angle when using a side-flex rail — (See Table 6)
- $\alpha_s$  = Coefficient of length — (See Table 6)
- $r$  = Side-flex radius — m
- $P$  = Required power — kW
- $V$  = Chain speed — m/min
- $\eta$  = Power transmission device efficiency in drive section

#### SI units (kN)

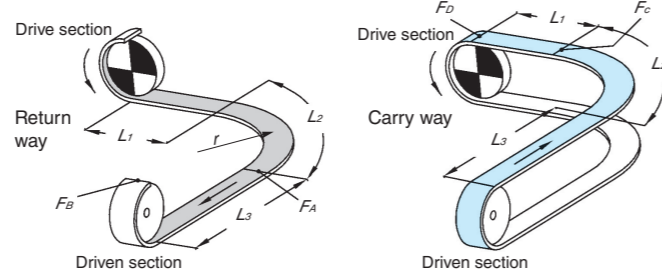
##### Chain load

$$F = 9.80665 \times 10^{-3} \{ (2.1 m_1 + m_2) L \cdot \mu_1 + (2.1 m_1 + m_3) L' \cdot \mu_1 + m_3 \cdot L' \cdot \mu_2 \}$$

##### Required power

$$P = \frac{F \cdot V}{60 \eta}$$

#### 3-2. Calculating F in curved conveyance (with one curved section)



$$F = 9.80665 \times 10^{-3} \cdot F_D \text{ (kN)}$$

##### Return-way load

$$F_A = m_1 (L_1 + L_2) \mu_1 \alpha_L 90^\circ$$

$$L_2 = r \times \alpha_s 90^\circ$$

##### [Load of B part: $F_B$ ]

$$F_B = 1.1 \times (F_A + m_1 \cdot L_3 \cdot \mu_1)$$

##### Carry-way load

##### [Load of C part: $F_C$ ]

$$F_C = \{ F_B + (m_1 + m_2) L_2 \cdot (\mu_1 + \mu_3) + (m_1 + m_2) \cdot L_3 \cdot \mu_1 + m_3 \cdot (L_2 + L_3) \cdot \mu_2 \} \times \alpha_L 90^\circ$$

$$L_2 = r \times \alpha_s 90^\circ$$

##### [Load of D part: $F_D$ ]

$$F_D = F_C + \{ (m_1 + m_2) L_1 \cdot \mu_1 + m_3 \cdot L_1 \cdot \mu_2 \}$$

The coefficients shown in Tables 3 through 6 are based on in-house test data. Actual coefficients may differ depending on the operation conditions, atmosphere, shape of the conveyed items, chain grime, and other conditions. Use the coefficients given to calculate chain load.

Table 3. Dynamic coefficient of friction of chain/rail  $\mu_1$

Top plate material	Condition	UHMW-PE
CB	No lubrication or water-lubricated	0.2

Table 4. Dynamic coefficient of friction of chain/conveyed items  $\mu_2$

Top plate material	Condition	Material of carried item			
		Aluminum can Steel can	Glass bottle	Plastic container	Carton
CB	No lubrication or water-lubricated	0.19	0.12	0.16	0.29

Table 5. Magnet factor  $\mu_3$

Top plate material	Condition	Magnet factor
CB	No lubrication or water-lubricated	0.47

Table 6. Angle and length factors when using curved rails  $\alpha_L, \alpha_s$

Top plate material	Condition	Horizontal bend angle $\alpha_L$		
		30°	60°	90°
CB	No lubrication or water-lubricated	0.19	0.12	0.16
Length factor $\alpha_s$		0.5	1.0	1.6

Top plate material	Condition	Horizontal bend angle $\alpha_L$		
		120°	150°	180°
CB	No lubrication or water-lubricated	1.50	1.70	1.85
Length factor $\alpha_s$		2.1	2.6	3.1

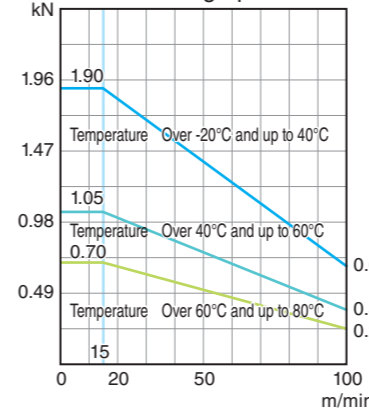
### Step 4. Selecting a Chain Size

Select a Top Chain with a maximum allowable load greater than the maximum load (F) applied to the chain.

Also, take the conveyor speed and ambient temperature into consideration, referencing the allowable load graphs in Tables 7 and 8.

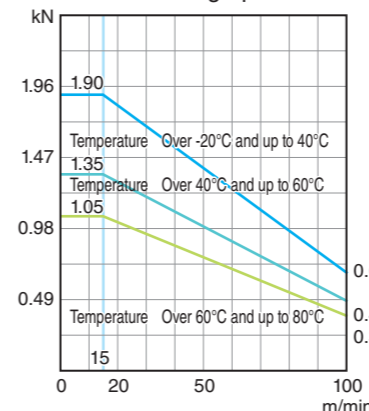
$$F \leq \text{Max. allowable chain load (depending on speed and temperature)}$$

Table 7. Allowable load graph for WT2515G-M330-CB



Allowable chain speed  
With lubrication: 100 m/min.  
Without lubrication: 50 m/min.

Table 8. Allowable load graph for TTUPM838H-CB

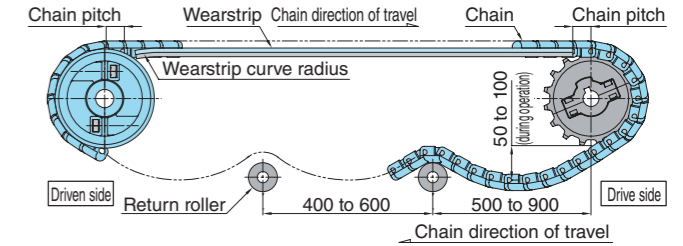


Allowable chain speed  
With lubrication: 100 m/min.  
Without lubrication: 50 m/min.

## 2. Conveyor Design

### 1. Conveyor Parts Arrangement

Guide rail arrangement depends on the installation space and other factors. An example is shown in the figure below.



#### 1) Chain slack

The first return roller should be placed 500 to 900 mm from the drive. The amount of slack in the chain between return rollers should be 50 to 100 mm. Using different intervals or amounts of slack may result in chain skipping.

#### 2) Return roller intervals

Place the return rollers at even intervals after the first return roller just after the drive. (Recommended roller interval is about 400 to 600)

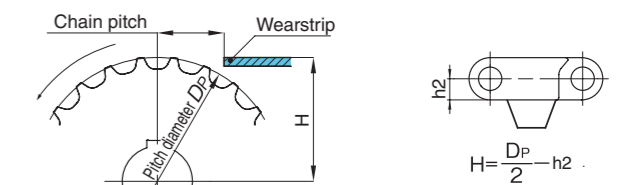
#### 3) Engagement angle

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

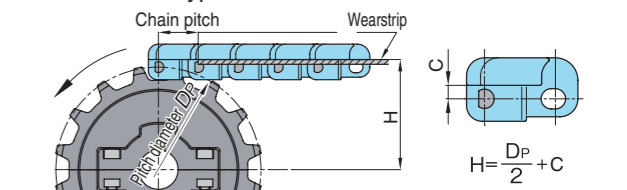
#### 4) Height of wearstrip on carry way (H)

See figure below.

##### ① WT2515G-M Type



##### ② TTUPM-H Type



\* Keep the length of one pitch on both the drive and driven sides.

#### 5) Return rollers

Return rollers receive the top side of the chain on the return way. Use return rollers taking into consideration the chain back bend radius. As a general rule, the chain back bend radius should not be greater than the radius of the return rollers.

Chain back bend radius (unit: mm)

Chain	Back bend radius R
WT2515G-M	25
TTUPM838H	70

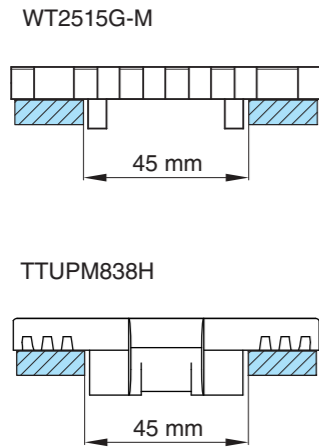
#### 6) Wearstrip ends

Keep the length of one pitch of the chain between the shaft center and the wearstrip end on the drive and driven sides. Also the wearstrip end of the driven unit must be rounded or chamfered to prevent the wearstrip from catching or snagging the chain.

## 2. Installing Wearstrips

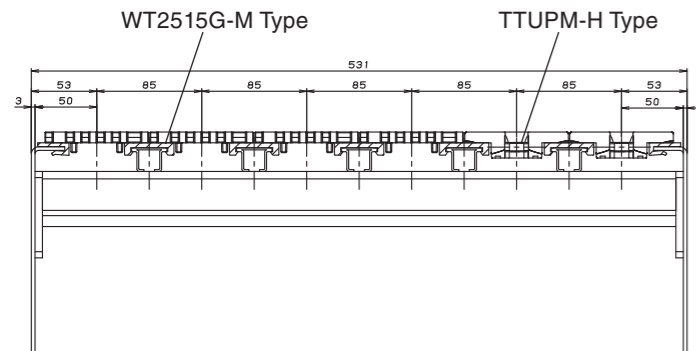
See below for guide clearances for the chain, as well as chain alignment pitch when using multiple lanes.

### Single lane



### Multi-lane

For multi-lane applications, the lateral pitch should be 85 mm. An example is shown in the figure below, but note that it depends on the installation space.



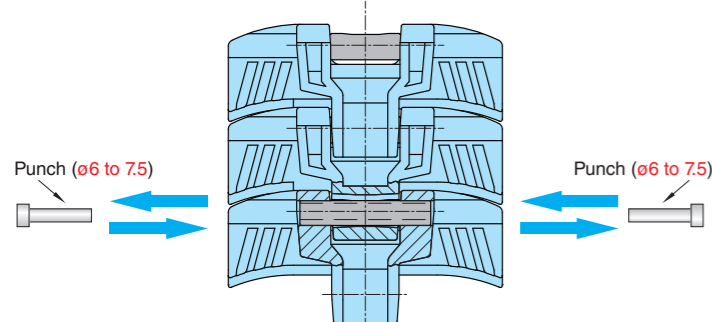
## 3. Assembly and Disassembly of the Chain

### Assembly and Disassembly of TTUPM838H

The D-pin type connecting pins can be inserted/removed from either side.

Use a punch with an outer diameter of 6 to 7.5 mm.

Ensure that the pins are fully but not excessively inserted.

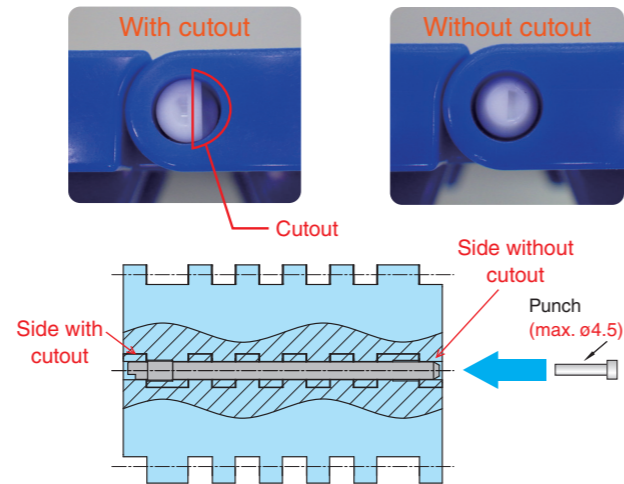


\* Do not use a punch with an outer diameter smaller than 6 mm or greater than 7.5 mm as they may damage the chain and/or pin.

## Assembly and Disassembly of WT2515G-M330

### Disassembly

Apply the punch (with max. diameter of 4.5 mm) to the side of the pin without a cutout, and punch out the pin by tapping the punch with a hammer.



\* Note that pins need to be removed from the correct direction.

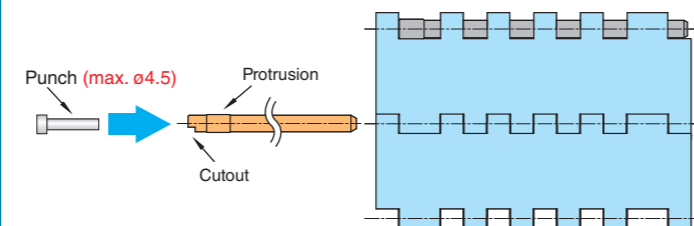
### Assembly

Use the dedicated connecting pins (special stepped plastic pin (orange)).

Insert the pin from the side without cutout into the link.

Connect the chain by applying a punch to the side with cutout and tapping the pin into the link.

Pins can be inserted from either side of the link.



### Re-assembly

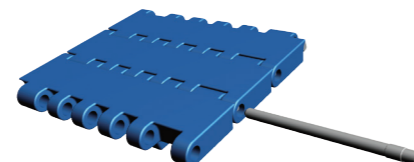
Do not reuse a previously inserted connecting pin (special stepped plastic pin (orange)) to connect chains.

#### ■ Connecting pin (special stepped plastic pin)

Use the dedicated connecting pin (special stepped plastic pin) to assemble the chain.

The special stepped plastic pins are colored orange so they can be distinguished from the base chain pins (white).

One connecting pin is provided for each chain.



## 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

- 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.
- 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.
- 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.

The logo mark and goods name entered into this catalog are the trademark and registered trademark of Tsubakimoto Chain Co., Ltd. in Japan and other countries.