TSUBAKI
PLASTIC MODULAR CHAIN
WT2706-K

PLASTIC TOP CHAIN
Patent
## WT2706-K Plastic Modular Chain
Ideal for Conveying Containers, Food, and Rubber Sheets

### Specifications (Plastic Chain Materials)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature 1</td>
<td>Plug-clip pin retention system enables easy connection and disconnection of modules and reuse of pins.</td>
</tr>
<tr>
<td>Feature 2</td>
<td>Protrusions on the ribs of each module make positioning them easy and facilitate assembly.</td>
</tr>
</tbody>
</table>

### General-purpose polyacetal chain links

- **General-purpose type**
- Uses a commercial-grade polyacetal resin with excellent mechanical properties (tensile strength, sliding characteristics).

### Applications
- Versatile type of chain that can be used in a wide range of applications
- Color: Blue

### Polyacetal chain links with better low-friction/anti-wear properties than the Standard Series

#### 1. Protects conveyed items
- Coefficient of friction is 15% to 45% lower than that of the Standard Series, resulting in reduced line pressure during accumulation and minimized potential for scratching or other damage to conveyed items.

#### 2. Long life (compared to Standard Series)
- Chain life is 1.2 to 2 times longer than the Standard Series because of lower chain load.

#### 3. Smooth divergence and accumulation of conveyed items

#### 4. Less required drive power

### Low Friction/Wear Resistant Series

- Color: Brown

### Heat Resistant Series

- Color: White

### Polypropylene chain links with superb chemical resistance

#### 1. Maximum usable temperature: 105°C
- Ideal for use where hot water is used.

#### 2. Chemical resistant
- Excellent chemical resistance, including to acids and alkaline substances. Ideal for use where chemicals are used for cleaning.

#### 3. High friction
- Coefficient of friction is 1.2 to 1.6 times higher than that of the Standard Series. Can be used at a slight incline under dry conditions where there is no oil adhering to the conveyed items.

#### 4. Lightweight
- About 40% lighter than polyacetal chain. Reduces drive power requirements.

### Applications
- Ideal in harsh conditions (high speeds, high loads) where chain elongation is accelerated, resulting in short chain replacement cycles
- Ideal in high line pressure conditions where conveyed goods may be damaged
- Conveyor lines in beverage plants where hot water is used
- Conveyor for batteries
- Slightly inclined conveyors
Features

- Plug-clip pin retention system enables easy connection and disconnection of modules and reuse of pins.
- Chain widths can be configured in 3-inch (76.2 mm) units. Modules can be cut to allow 1/3-inch units.

<table>
<thead>
<tr>
<th>Chain width X mm</th>
<th>Standard B</th>
<th>Low Friction/Wear Resistant LFB</th>
<th>Heat Resistant HTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>228.6</td>
<td>WT2706-K09-B</td>
<td>WT2706-K09-LFB</td>
<td>WT2706-K09-HTW</td>
</tr>
<tr>
<td>304.8</td>
<td>WT2706-K12-B</td>
<td>WT2706-K12-LFB</td>
<td>WT2706-K12-HTW</td>
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<td>WT2706-K15-HTW</td>
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<td>WT2706-K21-HTW</td>
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<td>WT2706-K24-HTW</td>
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<td>WT2706-K33-HTW</td>
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<td>914.4</td>
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<td>WT2706-K36-HTW</td>
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<td>WT2706-K39-LFB</td>
<td>WT2706-K39-HTW</td>
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<td>1066.8</td>
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<td>WT2706-K42-LFB</td>
<td>WT2706-K42-HTW</td>
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<td>1143.0</td>
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<td>WT2706-K45-LFB</td>
<td>WT2706-K45-HTW</td>
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<tr>
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<td>WT2706-K48-B</td>
<td>WT2706-K48-LFB</td>
<td>WT2706-K48-HTW</td>
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<td>WT2706-K51-HTW</td>
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<td>WT2706-K54-HTW</td>
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</tr>
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<td>1524.0</td>
<td>WT2706-K60-B</td>
<td>WT2706-K60-LFB</td>
<td>WT2706-K60-HTW</td>
</tr>
</tbody>
</table>

Note:
1. Chain width X shown is a nominal width. Actual width range is ±0.7% at 20°C operating temperature. Chain width is subject to expansion or contraction with changes in temperature. Expansion/contraction rate is 0.00015/°C for Standard and LFB chains and 0.00011/°C for HTW chains, based on a reference temperature of 20°C.
2. Made-to-order product.

Model Numbering

<table>
<thead>
<tr>
<th>Chain type</th>
<th>Chain pitch</th>
<th>Chain type</th>
<th>Chain width</th>
<th>Chain material</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT</td>
<td>27</td>
<td>06</td>
<td>K24</td>
<td>B</td>
</tr>
</tbody>
</table>

Note: Do not leave spaces between letters and symbols.
### Sprockets for WT2706-K Chain

#### Calculate Chain Tension

1) Calculate the tension acting on the chain and required power

**Note:** For special conveyors (pasteurizers, warmers, coolers), see page 38 of the Tsubaki Top Chain Engineering Manual (catalog no. ME12Y2) or contact a Tsubaki representative.

<table>
<thead>
<tr>
<th>Material</th>
<th>60</th>
<th>0.35</th>
<th>0.2</th>
<th>72</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel, stainless</td>
<td>60</td>
<td>0.35</td>
<td>0.2</td>
<td>72</td>
<td>0</td>
</tr>
<tr>
<td>Steel</td>
<td>60</td>
<td>0.35</td>
<td>0.2</td>
<td>72</td>
<td>0</td>
</tr>
<tr>
<td>Plastic rail</td>
<td>55</td>
<td>0.4</td>
<td>0.3</td>
<td>95</td>
<td>0.2</td>
</tr>
<tr>
<td>Solidur (P-1)</td>
<td>55</td>
<td>0.4</td>
<td>0.3</td>
<td>95</td>
<td>0.2</td>
</tr>
<tr>
<td>PMW</td>
<td>55</td>
<td>0.4</td>
<td>0.3</td>
<td>95</td>
<td>0.2</td>
</tr>
<tr>
<td>Oil-resistant steel (PMW)</td>
<td>55</td>
<td>0.4</td>
<td>0.3</td>
<td>95</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**Power Required**

\[ P = \frac{F \cdot V}{6120 \eta \cdot SF} \]  

**Gravimetric Units (kgf)**

\[ F = 9.80665 \times 10^{-3} \times S_f \times \left( \frac{2.1m_1+m_2}{S_1} \cdot \mu_1 + \frac{2.1m_1+m_3}{S_2} \cdot \mu_1 + m_3 \cdot \frac{S_2}{S_1} \cdot \mu_2 \right) \]  

**Power Required**

\[ P = \frac{F \cdot V}{6120 \eta \cdot SF} \]  

**Table 1: Coefficient of Dynamic Friction between Chain and Other Materials (\(\mu_1, \mu_2\))**

<table>
<thead>
<tr>
<th>Chain material</th>
<th>Lubrication</th>
<th>Steel, stainless</th>
<th>Solidur P (plastic rail)</th>
<th>PMW</th>
<th>Metallic (SK-21)</th>
<th>Glass bottles</th>
<th>PTFE (Teflon)</th>
<th>Paper (nylon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry, water</td>
<td>0.25</td>
<td>0.25</td>
<td>0.20</td>
<td>0.25</td>
<td>0.22</td>
<td>0.25</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>LFB Dry, water</td>
<td>0.20</td>
<td>0.20</td>
<td>0.12</td>
<td>0.14</td>
<td>0.17</td>
<td>0.22</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>HTW Dry, water</td>
<td>0.32</td>
<td>0.30</td>
<td>—</td>
<td>0.35</td>
<td>0.30</td>
<td>0.35</td>
<td>0.35</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. The coefficients of friction listed above are for room temperature (50°C or less). For high temperatures exceeding 50°C, use 0.50.  
2. The friction coefficient is based on experiments conducted by Tsubaki. Contamination on the chain, the shape of the bottom surface of conveyed goods, and other factors will cause slight differences in friction coefficient values. In particular, because the shape of the bottom surface, the type of paper material, etc., of paper packs and paper-based beverage containers may produce significant differences in friction coefficient values, we recommend that the coefficient of friction be measured for each type of conveyed item. Use the values given in Table 1 to calculate chain tension.  
3. M plastic rails and SJ-NCO are specifically designated for dry conditions.  
4. For lubrication with water, the friction coefficient may be significantly larger than the values given in Table 1 depending on the type of conveyed item. In addition, adhesion may occur.

#### Determine Sprocket Installation Pitch

The diagram on the next page show the location and distance between sprockets (pitch) for WT2706-K chain. Find the percentage of maximum allowable load (maximum allowable load per 1 meter of chain width) that the tension per 1 meter of chain width \(F'\) derived by means of formula (2) represents. Note that the locations and pitch may change depending on chain tension rate \(F_1\).

**Formula of Chain Tension Rate F1 (%)**

\[ F_1 = \frac{100F'}{A} \]  

**Chain Tension**

\[ F = 9.80665 \times 10^{-3} \times S_f \times \left( \frac{2.1m_1+m_2}{S_1} \cdot \mu_1 + \frac{2.1m_1+m_3}{S_2} \cdot \mu_1 + m_3 \cdot \frac{S_2}{S_1} \cdot \mu_2 \right) \]  

**Chain Tension Rate F1 (%)**

\[ F_1 = \frac{100F'}{A} \]  

**Allowable Load Graphs**

**Determine Chain Size and Width**

1) The maximum tension applied to the chain (kN) derived using formula (1) is converted into chain tension per one meter of chain width (F/\(\text{kgf/m}) by the following formula.

\[ F = \frac{1000F'}{A} \]  

2) A chain can be used when the tension per one meter of chain width \(F'\) that is obtained using formula (1) below a curve representing the maximum allowable load of the chain that takes into account chain speed and temperature. If the tension, thus obtained, is found to be within the allowable range, determine the size and width of the chain.

#### Conveyor Design

- **Calculate Chain Tension**
- **Power Required**
- **Gravimetric Units (kgf)**
- **Power Required**
- **Table 1: Coefficient of Dynamic Friction between Chain and Other Materials (\(\mu_1, \mu_2\))**
- **Determine Sprocket Installation Pitch**
- **Determine Chain Size and Width**
- **Allowable Load Graphs**
Determine Sprocket Locations
Sprockets can be installed on WT2706-K chain in an axial direction. When installing sprockets, be sure to check for allowable load. The sprocket locations shown below are recommended under the following conditions:
- When the chain tension rate is 0% to 50%. Sprockets should be installed every 101.6 mm (4 inches) and allowing for a certain amount of space from the edges of the module.
- When the chain tension rate is 50% to 75%. Sprockets should be installed every 76.2 mm (3 inches) and allowing for a certain amount of space from the edges of the module.
- When the chain tension rate is 75% to 100%. Sprockets should be installed every 50.8 mm (2 inches) and allowing for a certain amount of space from the edges of the module.

Note: The wearstrip of the drive sprocket section and the end of return rollers should be 50 to 100 mm. This slack prevents chain teeth jumping.

Layout of Supports for Chains
The layout of the supports for chains will vary according to the installation space available and other parameters. A typical layout is shown below.

Note: The wearstrip of the drive sprocket section and the end of return rollers should be 50 to 100 mm. This slack prevents chain teeth jumping.

1. Amount of Chain Slack
Table 2 shows the spacing L between return rollers supporting the chain on the return way below the drive sprocket. The amount of slack in the chain between return rollers should be 50 to 100 mm. This slack prevents chain teeth jumping. There is a possibility of chain teeth jumping if the amount of slack is outside this range.

Table 2: Return Roller Spacing L

<table>
<thead>
<tr>
<th>Chain type</th>
<th>Chain tension rate (%)</th>
<th>L (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT2706</td>
<td>50% or less</td>
<td>450 to 500</td>
</tr>
<tr>
<td></td>
<td>More than 50%</td>
<td></td>
</tr>
</tbody>
</table>

2. Engagement Angle
The engagement angle of the chain on the drive sprocket should be at least 180°. If the angle is small, teeth jumping may occur.

3. Wearstrip Ends
A distance C equivalent to the pitch spacing of the chain should be provided between the sprocket and the end of the wearstrip. In addition, the end of the driven-side wearstrip should be rounded or chamfered to prevent the chain from snaring or catching on the wearstrip.

4. Location of Sprockets and Wearstrips
See illustration below.

Guide Clearance
Leave a clearance between the chain and the wearstrip (guide clearance) as indicated below to allow for thermal expansion.

A typical example is shown below.

Example of Wearstrip Installation (at Ambient Temperature)
Wearstrips should be located at equal intervals alternating with sprockets.

Conveyor Layout
There are two methods of supporting the return way: the return roller system and the return way system. Examples are shown below.

1) Support System Using Return Rollers

\[ \text{Drive side} \]

\[ \text{Chain} \]

\[ \text{Drive side} \]

\[ \text{Slack (Ʌ)} = 50 \text{ to } 100 \text{ mm} \]

\[ \text{A} = \text{Sprocket outside diameter} \]

Support System Using Wearstrips

\[ \text{Drive side} \]

\[ \text{Roller or spool roller} \]

\[ \text{Guide flange} \]

\[ \text{PVC pipe} \]

\[ \text{Polished steel bar} \]

\[ \text{Distance between curved ends} \]

The center distance of the rollers (in the direction of the conveyor width) should be adjusted according to the width of the chain to be used.
For information on conveyor design, calculation of load, and selection of accessories and chains 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 alkalies, electropolishing, 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 falling 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.

Directing Initial Attention
- 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 hammer 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 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-R1R6R6R5S5 (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.
- Tensile stress 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 change 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 claim made thereafter shall be barred. 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.

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