Innovation in Motion
TSUBAKI

TSUBAKI
SYNCHRONOUS BELTS & BELT SPROCKETS

Instruction Manual

＜Read First＞

- Users handling synchronous belts and belt sprockets or equipment utilizing them are advised to read this instruction manual thoroughly before use.
- Keep this instruction manual easily accessible for quick reference when needed.
- Please handle and store this instruction manual with care.

TSUBAKIMOTO CHAIN CO.

For safe use of Synchronous Belts and Belt Sprockets

Please read before use.

Before using the product, read catalogs and instruction manuals carefully. While using the product, pay full attention to the following items, and handle the product properly. Safety signs preceding the description of each item reflects the degree of seriousness of such item. The definition of such safety signs are as follows;

⚠ **Warning**	Improper handling may cause death or serious injury to the user.
⚠ **Caution**	Improper handling may cause injury to the user or property damage only.

Use and Applications

⚠ **Warning** Always install a separate safety device when bodily injury or serious property damage is likely to occur if the equipment spins, runs by itself, or stops due to belt breakage.

⚠ **Warning** Do not use the belts as a suspension or traction use.

⚠ **Warning** Provide an ionizing system if there is a risk of fire or malfunction of control device due to static electricity generated by the belt transmission device.

⚠ **Caution** Insulation characteristics vary depending on the belt type, please contact a Tsubaki representative.

⚠ **Caution** For details on the presence of substances restricted for use in specific industries or applications, please contact a Tsubaki representative.

⚠ **Caution** Never perform additional work on the belt, as this may impair the quality and performance.

Function and Performance

⚠ **Caution** Do not use the belt other than the application and allowable range specified in the catalog and design materials for each belt. It may cause premature failure.

⚠ **Caution** Adhesion of water, oil, chemicals, paint, dust, or other substances to the belt or belt sprocket may cause degradation of transmission power and premature failure of the belt or belt sprocket.

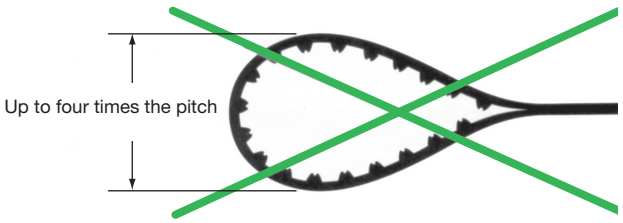
⚠ **Caution** Synchronous belts may generate loud noise during high-speed operation. In that case, install a soundproof cover.

Storage and Transportation

⚠ **Caution** Use appropriate transportation equipment or devices when transporting or handling heavy belts or belt sprocket. Lifting by hand may cause back pain or other injuries.

⚠ **Caution** Do not forcibly bend the belt or place heavy objects on it during transportation or storage. It may cause bending tendency or scratches to the belt, resulting in premature failure.

⚠ **Caution** Do not fold the synchronous belt into a small size. The limit diameter for bending is four times the pitch. If you bend it to a small diameter, the cord inside the belt will break and the performance will be significantly degraded.



⚠ **Caution** The synchronous belt wraps around the tooth surface of the belt sprockets and transmits power, so the tooth surface is also an important component.
When handling the synchronous belt and belt sprockets, be careful not to scratch the tooth surface.

⚠ **Caution** Store the belt and belt sprockets in a low humidity environment at a temperature between -10 to 40°C, and avoid direct sunlight during storage.

Installation and Operation

Warning Always install a safety cover on rotating parts including the belt and belt sprocket. There is a risk of getting hair, gloves, clothing, etc. caught in the belt or belt sprocket. In addition, there is a risk of injury due to the belt breakage or belt sprocket failure.

Warning For maintenance, inspection and replacement of belts and belt sprockets, follow the following points.
1.Always turn off the switch and stop the belt and belt sprocket before performing any work.
2.If there is a risk of the belt sprocket moving due to removing the belt, secure the belt sprocket before performing the work.
3.Make sure that the switch does not accidentally turn on during the work.

Caution When replacing a belt or belt sprocket, please use the same type as the one that was previously used. Using a different type may cause premature damage.

Caution If there is misalignment in the belt sprocket, it may cause early belt failure or flange detachment. Please make the necessary adjustments.

Caution Loosen the belt tension before replacing a belt. Forcing the belt over the flange or prying the belt with a screwdriver may cause premature failure of the belt sprocket.

Caution Please use the appropriate tension for the belt installation according to the catalog or design materials. Improper tension may cause early belt failure or shaft damage.

Caution When adding processing to the belt sprocket, carry out the following:
1.Remove burrs and sharp corners from the processed area.
2.Ensure dimensional accuracy after processing.
3.Ensure belt sprocket strength after processing.

Caution When assembling the flange to the belt sprocket, please ensure that there are no foreign objects in the fitting area between the belt sprocket body and the flange, and fix it so that there is no wobbling. Improper fixing may cause the flange to detach.
Flanges should not be used with belt sprocket made by other manufacturers or other applications. This product is designed to be used with Tsubaki belt sprockets.

Service life

Caution Due to the nature of the material, it undergoes aging over time. It is recommended to replace at least every five years for optimal performance.

Inspection

Caution Inspect the belts and belt sprockets periodically and replace them if any abnormality is observed.

Handling of used products

Caution Please do not burn the belt. Harmful gases may be generated.

Warranty

1.Warranty Period

Products manufactured by Tsubakimoto Chain Co. (“Products”) are warranted against defects in materials and workmanship for eighteen (18) months from the date of shipment from the factory or twelve (12) months from the date the Products are first placed into operation (calculated from the date the Products have been installed on the customer’s equipment), whichever comes first.

2. Scope of Warranty

During the warranty period, if defects arise in the Products when installed, used, and maintained correctly in accordance to Tsubakimoto Chain’s catalogs, installation manuals (including any documents specially prepared and provided to the customer) and the like, Tsubakimoto Chain will repair or replace such defective Products thereof free of charge upon confirmation of said defect by Tsubakimoto Chain. This warranty shall only apply to Products received, and Tsubakimoto Chain shall not be liable for the following costs and/or damages (including installation manuals or other documents specially prepared and provided to the customer):

(1) Costs required for removing the defective Products from or re-installing the replacement Products on the customer’s equipment for replacement or repair of the defective Product, as well as any associated installation costs.
(2) Costs required to transport the customer’s equipment, if needed, to a repair shop or the like.
(3) Any consequential or indirect damages or loss of profits or benefits the customer may incur due to the defects or repair of the Products.

3. Out of Warranty Service and Repair

Regardless of the warranty period, Tsubakimoto Chain will provide investigation, repair, and/or manufacture of the Products for a fee should the Products experience problems or anomalies under the following situations.

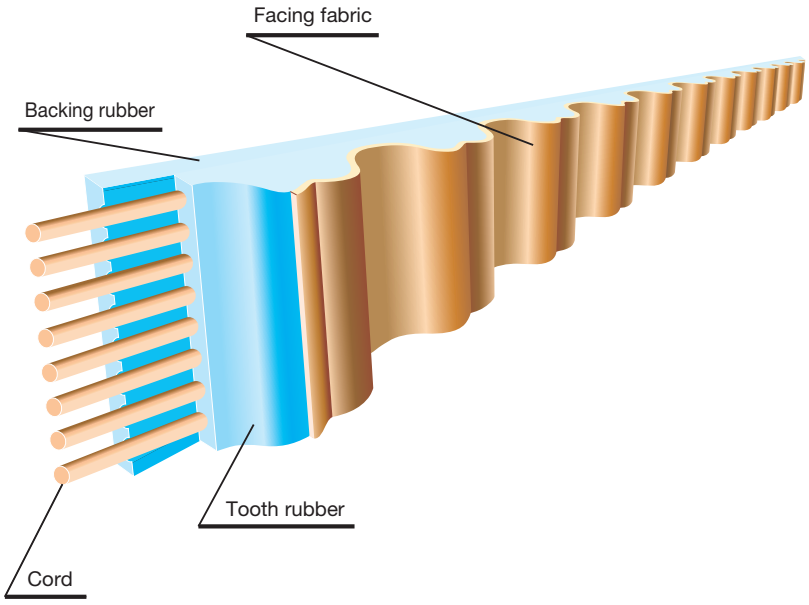
(1) Placement, installation (including connecting and disconnecting), lubrication, or maintenance of the Products not in accordance with Tsubakimoto Chain’s catalogs, installation manuals (including documents specially prepared and provided to the customer), or the like.
(2) Use of the Products (including operating conditions, environment, and allowances) not in accordance with Tsubakimoto Chain’s catalogs, installation manuals (including documents specially prepared and provided to the customer), or the like.
(3) Inappropriate disassembly, modification, or processing of the Products by the customer.
(4) Use of the Products with damaged or worn products.
(5) When the operating conditions exceed the performance of the Products as selected using the Tsubakimoto Chain selection method.
(6) Use of the Products in conditions other than what have been discussed.
(7) When consumables such as bearings, oil seals, and lubricant in the Products deplete, wear, or degrade.
(8) When secondary damage occurs to the Products due to initial or primary damage or failure to the customer’s equipment.
(9) Damage or failure of the Products due to forces majeure such as natural disasters.
(10) Damage or failure of the Products due to unlawful conduct by third parties.
(11) Damage or failure of the Products due to causes not attributable to Tsubakimoto Chain

Contents

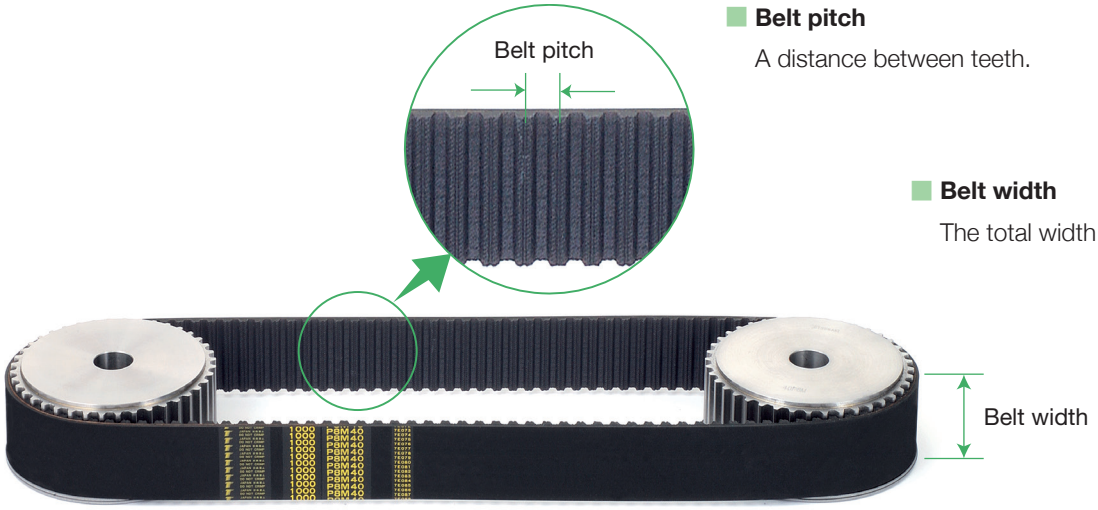
Structure

Structure & Materials

- **Backing rubber** : Durable and wear-resistant Chloroprene rubber (High Intensity Synthetic rubber) protects the core wires and enables long life.
- **Cord** : High-tensile glass fiber (or aramid fiber) with extremely low elongation has been used to enable high-precision transmission.
- **Tooth rubber** : Tooth rubber integrally molded with backing rubber enables high-load synchronous transmission.
- **Facing fabric** : Wear resistance and self-lube enable smooth meshing and low noise.



Nomenclature



Belt pitch

A distance between teeth.

Belt width

The total width of the belt.

Belt length

The total length of the belt. The belt length is indicated in millimeter.

"Belt pitch" x "Number of teeth of belt" = "Belt length" (mm)

Belt tooth profile

Tsubaki original high performance tooth profile (PX tooth profile).

Layout Design

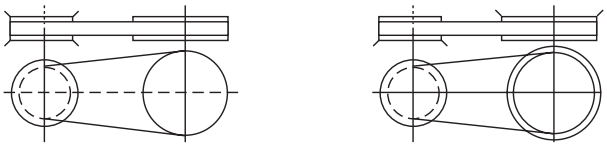
Installation of guide flanges

The synchronous belt when running tends to deviate in the axial direction of the belt sprockets. In order to prevent the synchronous belt from coming off the belt sprockets, guide flanges are installed on the belt sprockets. The guide flange installation standard is as follows:

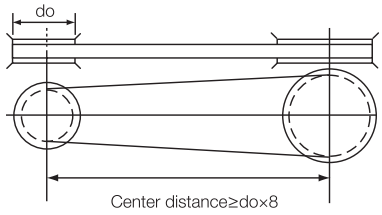
Horizontal-shaft transmission

Install guide flanges on both sides of either belt sprocket or on one side of one belt sprocket and another flange on the opposite side of the other belt sprocket. (Example 1) Where the belt sprocket center distance is greater than 8 times the outside diameter of the small belt sprocket, install guide flanges on both sides of both belt sprockets. (Example 2)

(Example 1)

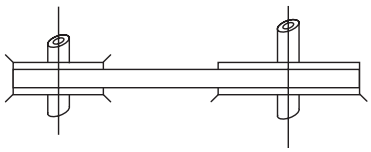


(Example 2)



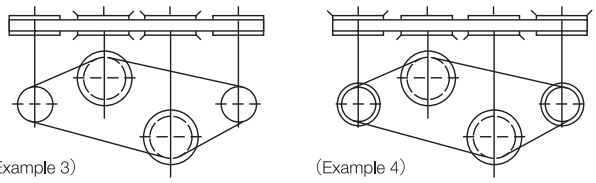
Vertical-shaft transmission

Since the belt is likely to disengage downward, install guide flanges on both sides of one belt sprocket and another guide flange on the lower side of the other belt sprocket.



Multiple-shaft transmission

Install guide flanges on both sides of every other belt sprocket (Example 3) or install guide flanges on one side of all belt sprockets alternately (Example 4).



(Example 3) (Example 4)

Use of an idler

An idler is used in the following cases:

- The distance between the shafts are fixed and an idler is used for adjustment of the installation tension.
- The speed ratio is large and the number of meshing teeth of the small belt sprocket needs to be increased.
- No belt guide can be used on the drive and driven belt sprockets.

Precautions for using the idler

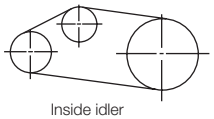
- The idler must be fixed and used on the slack side.
- Note that if the parallelism between the axis of the idler and the axes of both belt sprockets is poor, the idler may cause the belt to disengage from the belt sprockets.
- Determine the idler diameter according to the following criteria.

Inside idler…Belt sprocket having the number of teeth greater than the minimum number of teeth of belt sprocket in the following table.
Outside idler…Uncrowned belt sprocket without teeth which of the pitch circle diameter should be greater than 1.2 times of the belt sprocket in the following table.

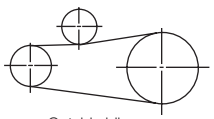
Minimum number of teeth of belt sprocket for selection of an idler

Type \ Revolution r/min	900 or below		Over 900, 1200 or below		Over 1200, 1800 or below		Over 1800, 3600 or below	
	No. of teeth	Pitch circle dia.	No. of teeth	Pitch circle dia.	No. of teeth	Pitch circle dia.	No. of teeth	Pitch circle dia.
P2M	16	10.19	16	10.19	18	11.46	20	12.73
P3M・UP3M	14	13.37	14	13.37	16	15.28	18	17.19
P5M・UP5M	18	28.65	20	31.83	24	38.20	28	44.56
P8M・UP8M	24	61.12	26	66.21	26	66.21	28	71.30
P14M・UP14M	28	124.78	28	124.78	28	124.78	34	151.52

Note: For revolutions above 3600 r/min, refer to the Standard Transmission Capacity Table.



Inside idler



Outside idler

Layout Design

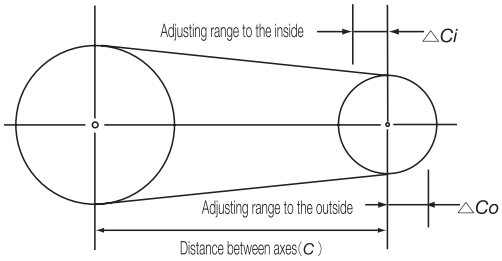
Adjustment of distance between two axes

In the transmission of only driving and driven belt sprockets, without using an idler, provide the adjusting margin (table below) of the distance between axes at the bearing including the manufacturing length (tolerance) of belt.

Adjusting margin of inter-axial distance

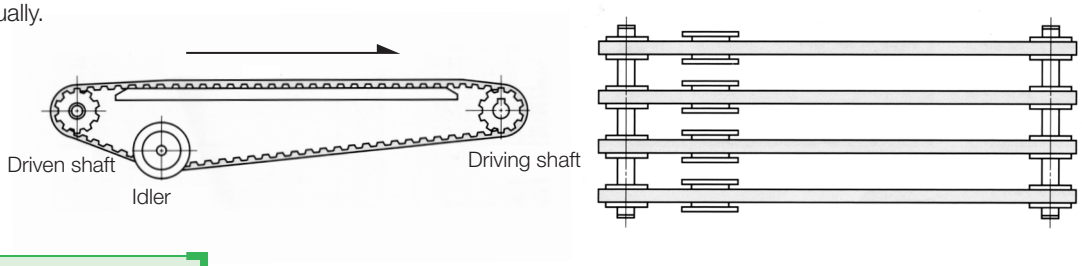
mm

	Type / Belt length	P2M·P3M·P5M UP3M·UP5M	P8M·P14M UP8M·UP14M
△Co	500 or below	3	3
	Over 500, 1000 or below	5	5
	Over 1000, 2000 or below	10	10
	Over 2000	15	15
△Ci	Common	10	15



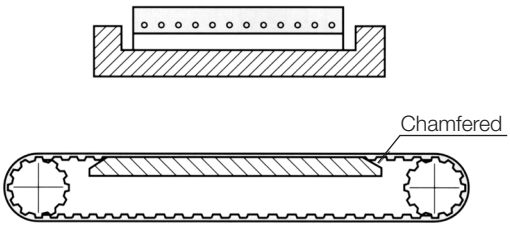
Multi-strand system

If more than one belt is used in parallel, install idler belt sprockets independently from each other in order to adjust the belt installation tension individually.



Guide rail

Apply a guide rail as shown below if objects are conveyed on the back of the belt. The rail should have side guides, and the longitudinal ends should be chamfered.



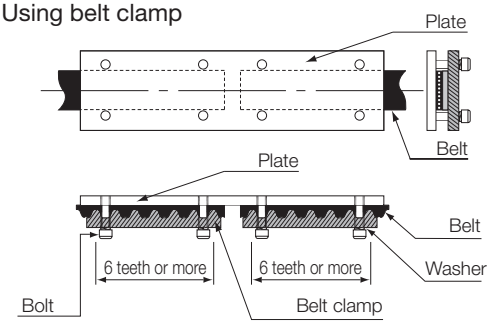
Suggested friction coefficients of the synchronous belts are shown in the table below:

Stainless steel	Polyamide	Ultra-high-molecular -weight polyethylene
0.6	0.3	0.3

Open-ended belt

Connecting methods

Using belt clamp



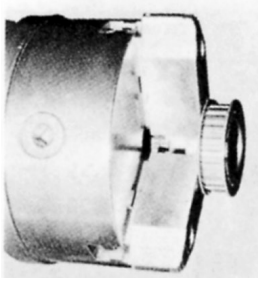
Handling instructions

- Do not make holes in the belt for installation.
- Fasten all bolts uniformly.
- The bolts shall be fastened tight enough for the spring washers on the nut side to become flat.
  If the bolts are fastened too much, the belt may be deformed.
- Bolts for tightening, spring washers, etc. shall be prepared by customer.
- Chamfer the angles of the plate that contact the belt.
- Check for any loose bolts periodically for maintenance. Refasten them if they are loose.
- Please contact Tsubaki representative for the vertical installation.

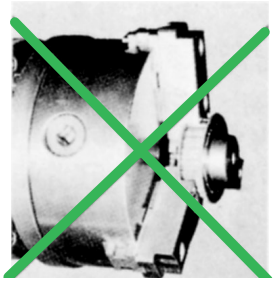
Machining and Assembly of the Belt sprockets

Additional processing of stock items

The best way to process a shaft bore of a belt sprocket is to secure the outer diameter of the teeth section with a chuck. However, in the case of the BF and B Type Standard Belt Sprockets, the concentricity of the outer diameters of the teeth section and the hub is machined correctly. Therefore, it is recommended to secure the outer diameter of the hub with a chuck when processing shaft bore. In addition, as the flange rotates when machining a DF Type Belt Sprocket, put a setscrew in the tapped hole before machining to prevent rotation.



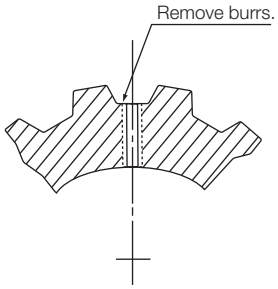
An example of chucking BF type



Never chuck flange part

Tapping

When tapping the bottom, remove burrs completely as they will damage the belt.
(For belt sprockets with hub, tap the hub.)

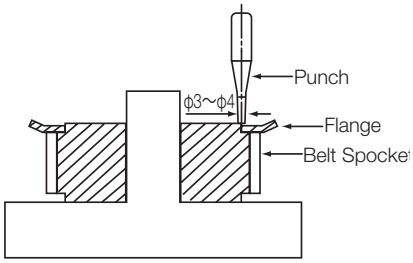


Caulking the flange

Caulking the flange

Normally, pressed flanges and turning flanges are secured by caulking using a punch as shown below.The number of places to caulk is as follows:

Outer dia. mm	30 or below.	Over 30, 50 or below.	Over 50, 120 or below.	Over 120, 250 or below.
No. of places to caulk	4	8	12	16

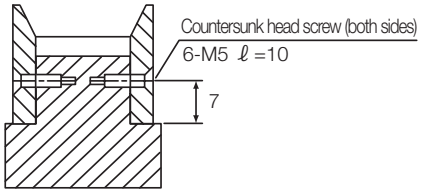


Precautions:

- Place a belt sprocket on a flat table and caulk the flange using a punch.
- When caulking a place opposite the hub, inset the hub to a cylindrical jig placed on the table to ensure it is stable.

Other fixation methods

The turning flanges for the belt sprockets with a large number of teeth, such as P8M and P14M, may be attached to the main belt sprocket unit with flathead screws depending on the application.
Minimum number of flathead screws are as follows:



Outer dia. mm	120 or below.	Over 120, 250 or below.	Over 250, 450 or below.	Over 450, 650 or below.
No. of screws	4	6	8	12

Caulking by knurling

Another method often used for caulking is knurling created with a lathe.

Handling Precautions

The synchronous belt wraps around the tooth surface of the belt sprockets and transmits power, so the tooth surface is also an important component.
When handling the belt sprockets, be careful not to scratch the tooth surface.

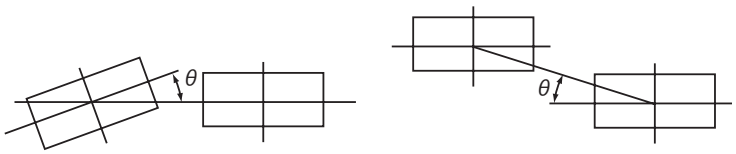
Machining and Assembly of the Belt sprockets

Alignment of belt sprocket

Tsubaki synchronous belt does not turn at belt sprocket center even when belt sprocket-alignment is correctly made, and it is liable to deviate on either side. Although the force is very small, the belt will be pressed hard against the flange when the belt sprocket-alignment is poor, resulting in premature failure of belt or falling off of flange. Therefore adjust the alignment of belt sprocket within the allowable range listed below.

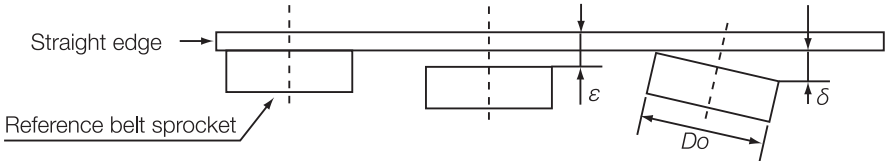
Allowable range of belt sprocket alignment

Belt Size	All			
Belt width mm	30 or below	Over 30, 50 or below	Over 50, 100 or below	Over 100
Allowable degree of parallelization	$\frac{5}{1000}$ or below	$\frac{4}{1000}$ or below	$\frac{3}{1000}$ or below	$\frac{2}{1000}$ or below
θmin	17 or below	13 or below	10 or below	6 or below



How to adjust the belt sprocket:

As shown in the figure, the belt sprocket can be aligned in the correct position by placing the straight edge on the reference belt sprocket and then bringing the other belt sprockets into contact with the straight edge over the entire surface. ($\varepsilon=0$). It is possible to obtain axial degree of parallelization simultaneously by making δ in the figure to be lower than Do x allowable degree of parallelization.



$\delta \leq Do \times$ Allowable degree of parallelization

Lock Belt Sprocket S Type

Installation

1) **S Type Model:**
   Wipe off the dirt on the shaft surface and apply a small amount of oil or grease. (Avoid using the oil or grease that contains molybdenum-based antifriction agent.)
   Remove the locking bolt of the sleeve, wipe the contact surfaces of the belt sprocket and sleeve clean, and apply oil or grease. Also, apply it to the thread and seat parts of the locking bolt. (Avoid using oil or grease that contains molybdenum-based antifriction agent.)
2) **S Type Plated Model:** Remove the locking bolt of the sleeve and wipe the contact surfaces of the belt sprocket and sleeve clean. Do not use oil or grease because it does not need to be applied.
3) Tighten the locking bolt lightly to assemble the sleeve temporarily.
4) Push the Lock Belt Sprocket that was assembled temporarily in the step 3 to the predetermined position gently with the hand.
5) Tighten the bolts uniformly in the diagonal order at the torque that is one-fourth of the rated tightening torque M_A.
6) Increase the tightening torque to the half of M_A and tighten in the same manner as the step 5.
7) Increase the tightening torque to the rated value and tighten in the same manner as the steps 5 and 6.
8) Tighten all the locking bolts at the rated tightening torque sequentially in a circumferential direction. Repeat this procedure several times. When all the locking bolts are tightened at the rated tightening torque, the installation is completed.

Precautions for installation

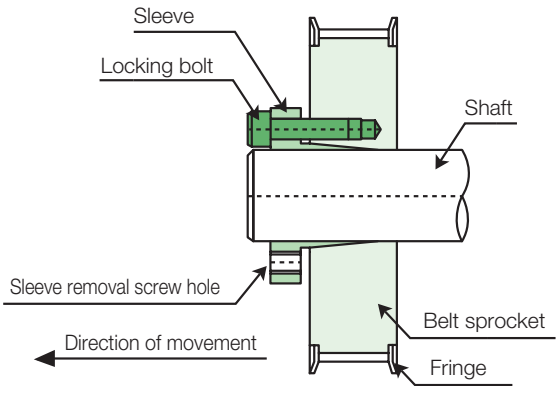
1) Be sure to use a torque wrench when tightening the locking bolts. Observe the tightening procedure and the tightening torque M_A when tightening them. Using any wrench other than a torque wrench and tightening manually are not recommended, which could result in slippage and deformation.
2) Tightening the bolts at a torque higher than the tightening torque could result in breakage of the bolts. In addition, tightening the bolts at a torque lower could cause loosening of the bolts. Therefore, be sure to tighten at the appropriate tightening torque M_A.
3) Do not use any locking bolt other than the ones provided with this product, or it could cause an accident, such as breakage of the bolt. If you need new bolts due to loss, replacement, etc. Please contact a Tsubaki representative.

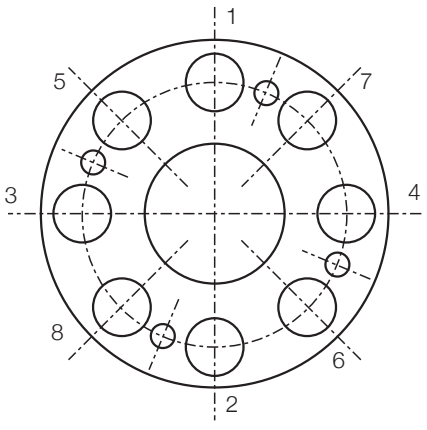
Removal

1) After confirming that no load, such as torque, is applied to the belt sprocket and shaft, loosen the locking bolts sequentially to remove them.
2) By inserting the removed bolts into the removal screw holes and tightening them uniformly, the locked state is released.

Movement of the belt sprocket when tighten bolts

In the installation of the Lock Series S Type, the sprockets are moved by 0.5 to 1.0 mm in the shaft direction between the initial fixation and the final tightening. Therefore, when centering the product, consider the amount of movement of the belt sprocket in advance. For the direction of movement of the belt sprocket, refer to the figure on the right.





Example of order for tightening bolts

Lock Belt Sprocket S Type

General precautions

1) Allowable transmission torque: Be sure to choose a load torque that is equal to or lower than the transmission torque shown in the dimension table.
2) Shaft diameter tolerance and surface roughness: The shaft diameter tolerance and shaft surface roughness shall be h8 and *Ra* 3.2, respectively.
3) Installation to a shaft with a keyway and D-shaped shaft
   If the product is installed onto a shaft on which a keyway has already been machined, such as a motor shaft, or a D-shaped shaft, the allowable transmission torque decreases by 10%.
4) Installation to a cold-finished steel bar
   If the product is installed onto a cold-finished steel bar whose mechanical properties are guaranteed (allowable radius of drawing materials: Grades 8 to 10), the allowable transmission torque decreases by 10%.
5) As the shaft material, use a solid shaft material of S35C or higher.
6) Operating temperature range: - 15° to 80°C (Aluminum: 0° to 50°C)
7) When tightening the bolts, be sure to use a torque wrench.
   (Use the torque wrench properly in accordance with the instruction manual of the torque wrench used.)

【Non-surface treated and aluminum】 Bolt and Tightening Torque M_A

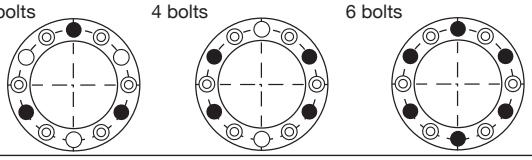
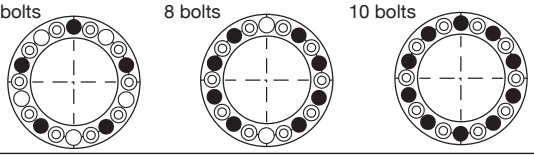
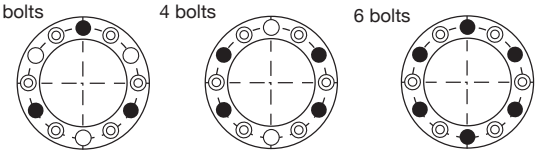
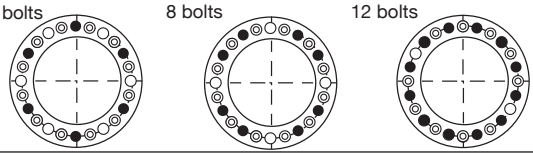
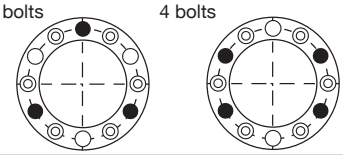
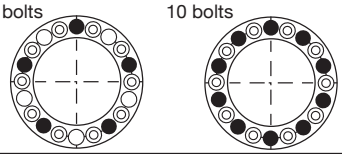
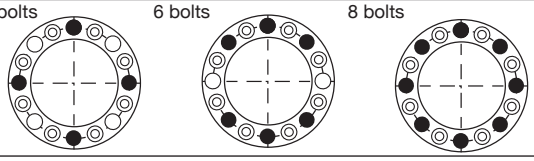
Sleeve frame No.	Bolt size	Bolt tightening torque N・m {kgf・m}
S1	M4×16	4.2 {0.43}
S2	M5×18	8.3 {0.85}
S3, S4	M5×20	
S5	M5×22	
S6	M6×25	16.8 {1.71}
S7	M8×30	40.5 {4.13}

【surface coated】 Bolt and Tightening Torque M_A

Sleeve frame No.	Bolt size	Bolt tightening torque N・m {kgf・m}
S1	M4×16	3.4 {0.35}
S2, S3, S4	M5×20	6.8 {0.69}
S5	M5×25	
S6	M6×25	13.6 {1.39}
S7	M8×30	32.8 {3.35}

Locking bolts position

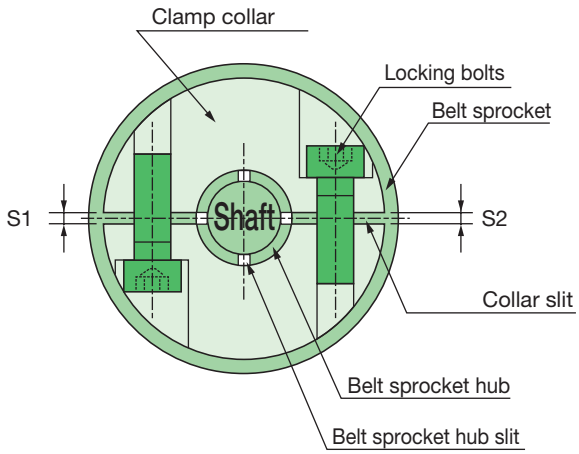
● Locking bolts position ○ Vacant hole ◎Tap hole (Tap hole for removal)

Sleeve frame No.	Locking bolts position	Sleeve frame No.	Locking bolts position
S1	3 bolts, 4 bolts, 6 bolts 	S5	5 bolts, 8 bolts, 10 bolts 
S2	3 bolts, 4 bolts, 6 bolts 	S6	6 bolts, 8 bolts, 12 bolts 
S3	3 bolts, 4 bolts 	S7	5 bolts, 10 bolts 
S4	4 bolts, 6 bolts, 8 bolts 		

Lock Belt Sprocket C Type

Installation

1) If there is any dust or dirt on the shaft surface, wipe clean with a cloth. If there is also any dust or dirt on the belt sprocket hub or clamp collar, wipe clean.
2) Because a solid lubricant is applied to the seat and thread surfaces of the locking bolts in advance, do not wipe it off or apply oil or grease.
3) For belt sprocket with four slits in the hub section, place the clamp collar in such a way that its slits come to almost the same position as the slits of the collar.
4) After confirming the position, alternately tighten the right and left bolts at an approximately half of the specified tightening torque (the bolt tightening torque M_A shown in the table below) . In doing so, tighten them while making an adjustment visually so that the widths S1 and S2 of the right and left collar slits become almost uniform.
5) Alternately tighten the right and left bolts at the rated tightening torque M_A. When the bolts rotate no more, the installation is completed.



■ Locking bolts tightening torque

Clamp collar model No.	Locking Bolts		
	Size	Tightening torque M_A	
		N・m	kgf・m
C1	M4×12	3.8	0.39
C2	M4×12	3.8	0.39
C3	M5×15	7.5	0.77
C4	M5×20	7.5	0.77
C5	M5×20	7.5	0.77
C6	M6×20	12.6	1.3

Precautions for installation

1) Be sure to use a torque wrench when tightening the locking bolts. Observe the tightening procedure and the tightening torque M_A when tightening them. Using any wrench other than a torque wrench and tightening manually are not recommended, which could result in an accident, such as slippage and deformation.
2) Locking the bolts at a torque higher than the tightening torque could result in breakage of the bolts. In addition, locking the bolts at a torque lower could cause loosening of the bolts. Therefore, be sure to tighten at the appropriate tightening torque M_A.
3) Do not use any locking bolt other than the ones provided with this product, or it could cause an accident, such as breakage of the bolt. Contact a Tsubaki representative. if you need new bolts due to loss, replacement, etc.

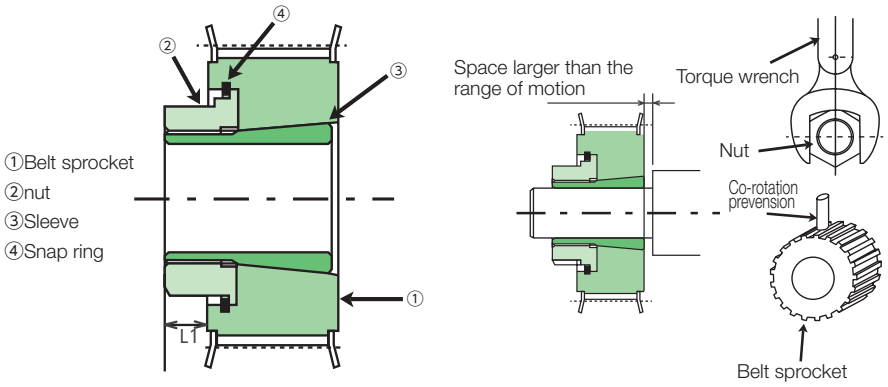
Removal

After confirming that no load, such as torque and thrust, is applied to the belt sprocket and shaft, loosen the right and left bolts uniformly to remove them.

Lock Belt Sprocket N Type

Installation

1) Wipe off the dirt on the shaft surface and apply a small amount of oil or grease.(Avoid using the oil or grease that contains molybdenum-based antifriction agent.)
2) Because the sleeve, nut, and retaining ring are assembled in the main belt sprocket unit, install it directly onto the shaft. If it is difficult to install, rotate the nut in the loosening direction. It makes installation easier.
   If the product is used after it is stored for over a month, remove the sleeve, wipe off the dust on the circumference of the sleeve, and apply oil or grease. (Avoid using oil or grease that contains molybdenum-based antifriction agents.)
3) By preventing the rotation of the main belt sprocket unit and tighten the nut manually, the lock belt sprocket can be attached temporarily at the predetermined position on the shaft or at the predetermined phase position.
4) Using a torque wrench, tighten the nut at the specified tightening torque M_A (above table).
5) When tightening the nut, be sure to prevent the rotation of the shaft or the main belt sprocket unit. One of the methods for preventing the rotation of the main belt sprocket unit is to create a hole on the outer circumference of the belt sprocket and put a rotation prevention rod into the hole (remove burrs sufficiently after creating the hole).
6) Because the main belt sprocket unit moves 0.2 to 2.0mm in the direction opposite to the nut during tightening, pay attention to the alignment of the belt sprocket, as well as the step on the shaft.



Removal

1) Loosen the nut after confirming that no torque and thrust load are applied to the belt sprocket and shaft.
2) When loosening the nut, be sure to prevent rotation of the shaft and main belt sprocket unit.
3) By loosening the nut, the tightening between the shaft and belt sprocket is released.

General precautions

1) Always use a torque wrench when tightening nuts. Please avoid improper tightening methods such as hand tightening or using pipe extensions, as these inaccurate tightening methods can cause problems.
2) Operating temperature range: -15° to 80°C (Aluminum: 0° to 50°C)
3) Use the torque wrench properly in accordance with the instruction manual of the torque wrench used.
4) Shaft diameter tolerance and surface roughness: The shaft diameter tolerance and shaft surface roughness shall be h8 and *Ra* 3.2, respectively.

■ Nut tightening torque M_A

Sleeve frame No.	Widths across flats mm	Nut tightening torque M_A N・m {kgf・m}
N1	18	18 {1.84}
N2	22	28 {2.86}
N3	30	65 {6.63}
N4	36	100 {10.20}
N5	41	130 {13.27}
N6	46	200 {20.41}

Installing the belt

Installing the belt

Before installing the belt, either reduce the shaft center distance or loosen the idler. Although the belt is flexible, it stretches very little. Therefore, it cannot be stretched to mount on the belt sprockets. Forcing it over the flange can cause failure.

Belt installation tension

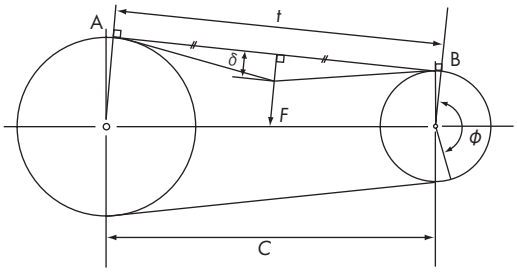
Belt installation tension

Synchronous Belt drive requires an adequate installation tension to prevent jumping teeth and to ensure smooth drive. A small installation tension tends to cause mismatching of tooth meshing and a large tension tends to cause noises, both of which shorten the service life. A sound sonic Belt Tension Meter T-ACE that can measure the tension accurately is available.

How to apply an installation tension

1.Accurately establish the parallelism of all shafts including the idler shaft and belt sprocket alignment.
2.Apply a force (*F*) to the center of the span of the belt.
3.Apply a tension that makes the deflection (δ) of the belt 1.6 mm per 100 mm of span.

How to obtain the push force (F)



$$F = \frac{Ti + \frac{t \times Y}{L}}{16}$$

F : Push force required for deflection (δ) at the center of the span N {kgf}
Ti : Installation tension N {kgf}
Y : Correction factor
δ : Deflection mm=0.016 t
t : Span length mm

$$t = \sqrt{C^2 - \frac{(Dp-dp)^2}{4}}$$

C : Center distance mm
Dp : Pitch circle diameter of large belt sprocket mm
dp : Pitch circle diameter of small belt sprocket mm
L : Belt length mm

Axial load

The axial load is obtained by the following equation:

$$\text{Axial load} = 2Ti \times \sin\frac{\phi}{2}$$

Ti : Installation tension N {kgf}
ϕ : Winding angle of small belt sprocket degrees

List of installation tension

List of installation tension

● Ultra PX belts HC Type

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended		Max. Value		Correction Factor Y N {kgf}	
UP3M-HC	6	29	{3.0}	40	{4.1}	38.5	{3.9}
	10	52	{5.3}	72	{7.3}	61.8	{6.3}
	15	82	{8.4}	114	{11.6}	90.0	{9.2}
UP5M-HC	10	108	{11.0}	147	{15.0}	102.7	{10.5}
	15	171	{17.4}	232	{23.7}	152.0	{15.5}
	20	238	{24.3}	323	{32.9}	200.7	{20.5}
	25	307	{31.3}	418	{42.6}	249.1	{25.4}
	30	377	{38.4}	513	{52.3}	297.2	{30.3}
	35	450	{45.9}	613	{62.5}	344.9	{35.2}
	40	524	{53.4}	713	{72.7}	392.5	{40.0}
UP8M-HC	15	177	{18.0}	235	{24.0}	190.6	{19.4}
	20	244	{24.9}	324	{33.0}	246.0	{25.1}
	25	317	{32.3}	421	{42.9}	299.9	{30.6}
	30	389	{39.7}	517	{52.7}	352.6	{36.0}
	35	464	{47.3}	616	{62.8}	404.3	{41.2}
	40	540	{55.1}	717	{73.1}	455.1	{46.4}
	45	618	{63.0}	820	{83.6}	505.2	{51.5}
	50	697	{71.1}	926	{94.4}	554.7	{56.6}
	55	777	{79.2}	1032	{105.2}	603.7	{61.6}
	60	859	{87.6}	1140	{116.2}	652.2	{66.5}
UP14M-HC	40	794	{81.0}	1050	{107.1}	834.0	{85.0}
	60	1255	{128.0}	1659	{169.2}	1242.7	{126.7}
	80	1747	{178.1}	2310	{235.6}	1649.0	{168.2}
	100	2255	{229.9}	2982	{304.1}	2053.6	{209.4}
	120	2771	{282.6}	3665	{373.7}	2456.9	{250.5}

● Ultra PX belts HA Type

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended		Max. Value		Correction Factor Y N {kgf}	
UP5M-HA	10	108	{11.0}	147	{15.0}	102.7	{10.5}
	15	171	{17.4}	232	{23.7}	152.0	{15.5}
	20	238	{24.3}	323	{32.9}	200.7	{20.5}
	25	307	{31.3}	418	{42.6}	249.1	{25.4}
	30	377	{38.4}	513	{52.3}	297.2	{30.3}
	35	450	{45.9}	613	{62.5}	344.9	{35.2}
	40	524	{53.4}	713	{72.7}	392.5	{40.0}
UP8M-HA	15	177	{18.0}	235	{24.0}	190.6	{19.4}
	20	244	{24.9}	324	{33.0}	246.0	{25.1}
	25	317	{32.3}	421	{42.9}	299.9	{30.6}
	30	389	{39.7}	517	{52.7}	352.6	{36.0}
	35	464	{47.3}	616	{62.8}	404.3	{41.2}
	40	540	{55.1}	717	{73.1}	455.1	{46.4}
	45	618	{63.0}	820	{83.6}	505.2	{51.5}
	50	697	{71.1}	926	{94.4}	554.7	{56.6}
	55	777	{79.2}	1032	{105.2}	603.7	{61.6}
	60	859	{87.6}	1140	{116.2}	652.2	{66.5}
UP14M-HA	40	794	{81.0}	1050	{107.1}	834.0	{85.0}
	60	1255	{128.0}	1659	{169.2}	1242.7	{126.7}
	80	1747	{178.1}	2310	{235.6}	1649.0	{168.2}
	100	2255	{229.9}	2982	{304.1}	2053.6	{209.4}
	120	2771	{282.6}	3665	{373.7}	2456.9	{250.5}

Installing the belt

● Ultra PX belts HY Type

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended	Max. Value	Correction Factor Y N {kgf}
UP3M-HY	6	39 {4.0}	47 {4.8}	76.0 {7.7}
	10	68 {6.9}	82 {8.4}	118.2 {12.1}
	15	105 {10.7}	127 {13.0}	167.7 {17.1}
UP5M-HY	10	125 {12.7}	165 {16.8}	152.5 {15.6}
	15	194 {19.8}	256 {26.1}	223.7 {22.8}
	20	265 {27.0}	350 {35.7}	293.6 {29.9}
	25	338 {34.5}	446 {45.5}	362.6 {37.0}
	30	413 {42.1}	545 {55.6}	430.8 {43.9}
	35	488 {49.8}	644 {65.7}	498.4 {50.8}
	40	564 {57.5}	744 {75.9}	565.4 {57.7}
UP8M-HY	15	255 {26.0}	290 {29.6}	272.0 {27.7}
	20	347 {35.4}	394 {40.2}	341.3 {34.8}
	25	444 {45.3}	505 {51.5}	406.9 {41.5}
	30	541 {55.2}	615 {62.7}	469.9 {47.9}
	35	640 {65.3}	728 {74.2}	530.6 {54.1}
	40	740 {75.5}	841 {85.8}	589.6 {60.1}
	45	842 {85.9}	957 {97.6}	647.0 {66.0}
	50	944 {96.3}	1073 {109.4}	703.0 {71.7}
	55	1048 {106.9}	1192 {121.6}	757.9 {77.3}
	60	1150 {117.3}	1308 {133.4}	811.8 {82.8}
UP14M-HY	40	1020 {104.0}	1225 {124.9}	1044.3 {106.5}
	60	1581 {161.2}	1899 {193.6}	1537.5 {156.8}
	80	2162 {220.5}	2597 {264.8}	2023.1 {206.3}
	100	2754 {280.8}	3308 {337.3}	2053.1 {209.4}
	120	3366 {343.2}	4043 {412.3}	2978.6 {303.7}

● PX belts RC Type

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended	Max. Value	Correction Factor Y N {kgf}
P2M-RC	4	5.9 {0.6}	7.8 {0.8}	10.0 {1.0}
	6	9.4 {1.0}	12 {1.2}	16.1 {1.6}
	10	17 {1.7}	22 {2.2}	28.2 {2.9}
P3M-RC	6	20 {2.0}	26 {2.7}	17.6 {1.8}
	10	36 {3.7}	47 {4.8}	29.0 {3.0}
	15	57 {5.8}	74 {7.5}	43.1 {4.4}
P5M-RC	10	97 {9.9}	132 {13.5}	56.9 {5.8}
	15	154 {15.7}	209 {21.3}	82.4 {8.4}
	20	214 {21.8}	291 {29.6}	139.0 {14.2}
	25	276 {28.2}	376 {38.4}	201.0 {20.5}
P8M-RC	15	203 {20.6}	265 {27.0}	151.3 {15.4}
	20	280 {28.5}	365 {37.3}	193.0 {19.7}
	25	363 {37.0}	473 {48.3}	233.0 {23.8}
	40	617 {63.0}	807 {82.3}	346.6 {35.3}
	60	982 {100.1}	1283 {130.9}	488.3 {49.8}
P14M-RC	40	990 {101.0}	1310 {133.6}	635.5 {64.8}
	60	1564 {159.5}	2070 {211.1}	973.2 {99.2}
	80	2178 {222.1}	2882 {293.9}	1316.8 {134.3}
	100	2812 {286.7}	3720 {379.3}	1664.9 {169.8}
	120	3455 {352.3}	4572 {466.2}	2016.6 {205.6}

● PX belts (Water resistant type)

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended	Max. Value	Correction Factor Y N {kgf}
P5M-W	10	108 {11.0}	147 {15.0}	50.1 {5.1}
	15	171 {17.4}	232 {23.7}	74.2 {7.6}
	25	307 {31.3}	418 {42.6}	184.9 {18.9}
P8M-W	15	225 {22.9}	294 {30.0}	147.2 {15.0}
	25	403 {41.1}	526 {53.6}	226.7 {23.1}
	40	686 {70.0}	897 {91.5}	337.3 {34.4}
	60	1091 {111.3}	1426 {145.4}	475.2 {48.5}

● PX Belts SHINAYAKA 530 (for Endless Belts)

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended	Max. Value	Correction Factor Y N {kgf}
P2M-530	4	5.9 {0.6}	7.8 {0.8}	10.0 {1.0}
	6	9.4 {1.0}	12 {1.2}	16.1 {1.6}
	10	17 {1.7}	22 {2.2}	28.2 {2.9}
P3M-530	6	20 {2.0}	26 {2.7}	17.6 {1.8}
	10	36 {3.7}	47 {4.8}	29.0 {3.0}
	15	57 {5.8}	74 {7.5}	43.1 {4.4}

● PX Belts (for Open-ended Belts)

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended	Max. Value	Correction Factor Y N {kgf}
P2M	4	5.9 {0.6}	7.8 {0.8}	10.0 {1.0}
	6	9.4 {1.0}	12 {1.2}	16.1 {1.6}
	10	17 {1.7}	22 {2.2}	28.2 {2.9}
P3M	6	20 {2.0}	26 {2.7}	17.6 {1.8}
	10	36 {3.7}	47 {4.8}	29.0 {3.0}
	15	57 {5.8}	74 {7.5}	43.1 {4.4}

● PX Belts

Type	Belt Width mm	Installation Tension *Ti* N {kgf} Recommended	Max. Value	Correction Factor Y N {kgf}
P5M	10	108 {11.0}	147 {15.0}	56.9 {5.8}
	15	171 {17.4}	232 {23.7}	82.4 {8.4}
	20	238 {24.3}	323 {32.9}	139.0 {14.2}
	25	307 {31.3}	418 {42.6}	201.0 {20.5}
P8M	15	225 {22.9}	294 {30.0}	151.3 {15.4}
	20	311 {31.7}	406 {41.4}	193.0 {19.7}
	25	403 {41.1}	526 {53.6}	233.0 {23.8}
	40	686 {70.0}	897 {91.5}	346.6 {35.3}
	60	1091 {111.3}	1426 {145.4}	488.3 {49.8}
P14M	40	990 {101.0}	1310 {133.6}	635.5 {64.8}
	60	1564 {159.5}	2070 {211.1}	973.2 {99.2}
	80	2178 {222.1}	2882 {293.9}	1316.8 {134.3}
	100	2812 {286.7}	3720 {379.3}	1664.9 {169.8}
	120	3455 {352.3}	4572 {466.2}	2016.6 {205.6}

Periodic Inspections

Procedure for periodic inspections

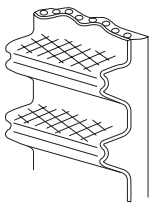
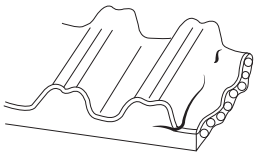
Installation tension

Check the Installation tension. The belt may elongate approximately 0.1% of the distance between the shafts in the early period of use (initial elongation), which could cause a reduction in the installation tension. Since the belt stretch settles into stable after this initial elongation, readjusting the installation tension one month after the start of use allows you to keep the belt in optimal condition.

When disassembling the equipment and removing the belt temporarily, clearly mark the direction of travel used on the belt. Make sure that it is installed in the same direction when reassembled. In order to readjust the tension of the belt, it is desirable to set it at around 70% of the initial tension, considering that the cord and fabric of the belt has already settled.

Inspection procedure (one month or approximately 100 hours of operation after starting the use)

<table>
<tr><th>Timing</th><th>Item</th></tr>
<tr><td>One month
or
approx. 100 hours
of operation
after the start of
use</td><td>
①. Inspect the initial tension and adjust it to the appropriate tension.
The belt may elongate approximately 0.1% of the distance between the shafts in the early period of use (initial elongation), which could cause a reduction in the installation tension. After initial elongation is settled, elongation due to regular operation is quite small. Therefore, readjusting the installation tension one month or approximately 100 hours after the start of use allows to keep the belt in optimal condition.
②. Inspect the appearance, and if any of the following problems are found, reconsider the selection.
Also, Inspect for abnormalities in installation and load.
<table>
<tr><th>Problem</th><th>Appearance</th></tr>
<tr><td>Abnormal wear of teeth
(early period)</td><td>The facing fabric has worn out. → Replacement is required.

Fuzz has formed on the fabric surface, the rubber material has worn off and turned to a lighter color, and the fabric texture pattern has become blurred.
  </td></tr>
<tr><td>Crack in the tooth root</td><td>Crack
 
  </td></tr>
</table>
</td></tr>
</table>

The photo show the Ultra PX Belt HC Type UP8M–HC or the UP14M-HC.
The belts of another series/pitch have the facing fabric and rubber in different colors.

Periodic Inspections

Procedure for periodic inspections (once every three months)

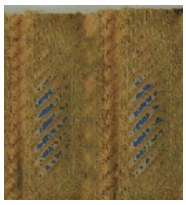
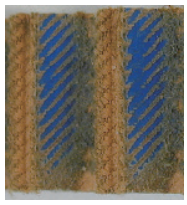
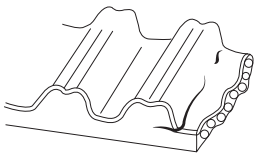
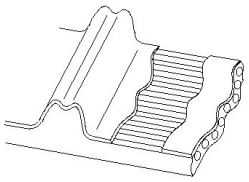
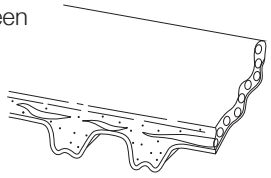
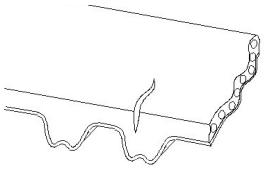
<table>
<tr><th>Timing</th><th>Item</th></tr>
<tr><td>Once every three months</td><td>
Check the appearance and replace the part if any of the following problems are found.
<table>
<tr><th>Problem</th><th>Appearance</th></tr>
<tr><td>Wear of teeth</td><td>
<table>
<tr><td colspan="4">Progress of flank wear</td></tr>
<tr><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Unused belt</td><td>The facing fabric is worn, and the tooth rubber comes to be exposed.</td><td>The tooth rubber appears on approximately 30% to 40% of the flank surface.</td><td>The tooth rubber constitutes a large part, and the facing fabric is lost.</td></tr>
<tr><td></td><td>Inspect the belt more frequently.</td><td colspan="2">Replace the belt.</td></tr>
</table>
</td></tr>
<tr><td>Crack in the tooth root</td><td>Crack
   </td></tr>
<tr><td>Missing tooth</td><td>When a crack progresses at the tooth’s core, the tooth may chip and become flat.
The cords may be exposed at the missing part of the tooth.
  </td></tr>
<tr><td>Abnormal wear</td><td>Note: The cut of side surface looks like it was made with a keen blade, it is considered normal.
・Rounded corners.
・Abnormal wear.
(The cords come apart from the belt body.)
  </td></tr>
<tr><td>Split in a belt side</td><td>Foreign objects become lodged in the belt’s tooth surface, causing abnormal tension and resulting in damage.
  </td></tr>
<tr><td>Belt sprocket</td><td>The teeth of the belt sprocket engaged with the belt are worn and creating a gap with the not engaged part.
The surface become rough.
  </td></tr>
</table>
</td></tr>
</table>

Photo: Ultra PX Belt HC Type UP8M–HC or the UP14M-HC.
The color of facing fabric and rubber differs depending on the series/ pitch.

Troubleshooting

Damage and Remedy

Symptom	Possible causes	Remedy
1. Breakage of synchronous belt (a), (b), (c)	Excessive load	Check the inertia of the driven object, motor, conditions of use, etc.
	Excessive shock load	Increase the belt size or install a shock absorber device.
	Bent belt	Transport, store, and install belts with care.
	Belt sprocket diameter is too small	Increase the number of belt sprocket teeth above the allowable minimum number of teeth.
	Application	Check the operating conditions (in particular, the peak torque during acceleration).
	Deterioration of the cords due to exposure to water	Install a waterproof cover. Change the belt to a water resistant type.
	Getting stuck of the foreign matter	Improve environment or install a cover.
	Belt is riding up on flange	Apply an adequate belt installation tension and correct the shafts parallel accurately.
2. Premature wear of belt teeth (d)	Excessive load	Modify the design.
	Too high installation tension	Apply an adequate installation tension.
	Improper belt sprocket tooth profile or incorrect dimensions of the tooth part	Use a belt sprocket having the correct tooth profile and dimensions.
	Use in dusty environment	Improve the environment or install a cover.
	Too small belt installation tension	Apply an adequate installation tension.
	Inadequate outside diameter of belt sprocket	Use a belt sprocket having the correct tooth profile and dimensions.
	Jumping of belt tooth	Refer to the same measures as for "4. Jumping of belt tooth"
	Insufficient synchronous belt capacity	Check the operating conditions and select the optimum size synchronous belt / belt sprocket.
3. Wear of belt bottom tooth (e)	Too high installation tension	Apply an adequate installation tension.
	Insufficient synchronous belt capacity	Check the operating conditions and select the optimum size synchronous belt / belt sprocket.
4. Jumping of belt tooth	Excessive shock load	Increase the belt size or install a shock absorber device.
	Insufficient is belt installation tension	Apply an adequate installation tension.
	Insufficient is number of meshed teeth	Increase the number of belt sprocket teeth or the number of meshed teeth by using an idler.
	Insufficient rigidity of equipment on which belt is used	Use equipment with sufficient rigidity.
5. Shear fracture of belt teeth (f)	Excessive load,shock load	Check motor specifications, inertia of driven unit, and operating conditions to eliminate the cause of overload, or increase the size of synchronous belt / belt sprocket.
	Too high installation tension	Apply an adequate installation tension.
	Insufficient installation tension	Apply an adequate installation tension.
	Insufficient synchronous belt capacity	Check the operation conditions and select the optimum size synchronous belt / belt sprocket.
	Incorrect belt sprocket tooth profile or incorrect dimensions of the tooth part	Replace with a belt sprocket of the correct tooth profile and dimensions.
	Use in dusty environment	Improve the environment or install a cover.
	Insufficient number of meshed teeth with the belt sprocket	Check the operating conditions and select the optimum size synchronous belt / belt sprocket.
	Insufficient rigidity of equipment on which belt is used	Use equipment with sufficient rigidity.

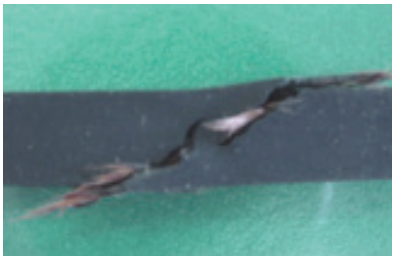
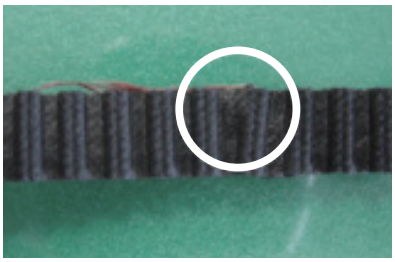
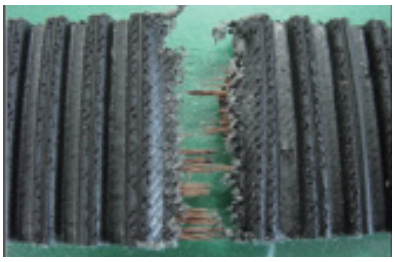
Troubleshooting

Damage and Remedy

Symptom	Possible causes	Remedy
6. Tear and wear on side of belt (g)	Poor parallelism of the shafts	Correct the shafts parallel.
	Poor belt sprocket alignment	Align the belt sprockets accurately.
	Insufficient rigidity of equipment on which belt is used	Use equipment with sufficient rigidity.
	Bent flange	Replace the bent flange.
	Poor belt sprocket alignment	Adjust the belt sprocket alignment.
	Belt sprocket diameter is too small	Change the belt sprocket with proper dia.
7. Longitudinal scratches on belt tooth surface (h)	Belt is running on edges of belt sprocket	Align the belt sprockets and correct the shafts parallel.
	Belt is riding up on flange	Apply an adequate belt installation tension and correct the shafts parallel accurately.
	Insufficient installation tension	Apply an adequate installation tension.
	Forcible installation of the belt	Handle with care.
8. Rubber wear on back of belt	Poor parallelism of back side idler shaft	Correct the idler shaft parallel.
	Poor rotation of back side idler	Improve idler rotation.
	Poor alignment of the belt sprocket in contact with the back of the belt	Adjust the belt sprocket alignment.
9. Hardening of back of belt rubber	Thermal degradation of the belt rubber due to high temperatures	Lower the environment temperature.
	Heat generation caused by contact with obstructions	Remove the obstructions.
	Heat generation due to malfunction in the external idler belt sprocket rotation.	Repair and ensure proper rotation.
10. Crack on rubber on back of synchronous belt (i)	Belt sprocket diameter is too small	Increase the belt sprocket diameter.
	Use in low temperature environment	Change environment temperature.
	Degradation of the rubber due to ozone	Insulate it from the ozone source.
	Belt sprocket or idler diameter being used is too small.	Change to belt sprocket or idler with the appropriate diameter.
	Operating atmosphere temperature is too high.	Improve atmosphere temperature.
11. Belt looks like its elongated	Shafts (of belt sprockets) move closer to each other	Secure the bearing rigidly. If shock is strong, use a stopper to prevent the bearing from moving.
12.Sticky or softened rubber on back of belt (j)	Slipping of back side idler	Improve idler rotation.
	Adhesion of oil	Either improve environment so that the belt is not wetted by oil or install a cover.
	Use in high temperature environment	Lower the environment temperature.
13. Swelling of synchronous belt (k)	Swelling due to oil	Improve environment to prevent oil splattering or install a cover.
14. Excessive Wear of belt sprocket teeth (l)	Inadequate belt sprocket material	Improve wear resistance to the belt sprocket by using harder material, having the tooth hardened or surface treatment.
	Use in dusty environment	Improve the environment or install a cover.
	Excessive load	Modify the design.
	Excessive belt tension or looseness	Apply an adequate installation tension.
15. Noise	Too high installation tension	Apply an adequate installation tension.
	Excessive load	Increase the belt size.
	Poor shaft parallelism or poor belt sprocket alignment	Make the shafts parallel and align the belt sprockets.
	Over-design	Change to a narrower belt.

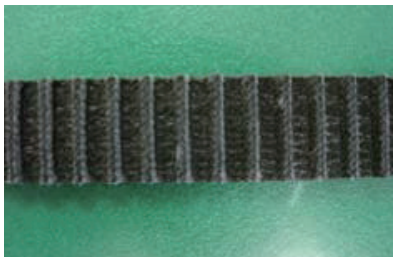
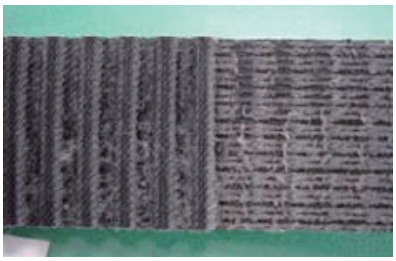
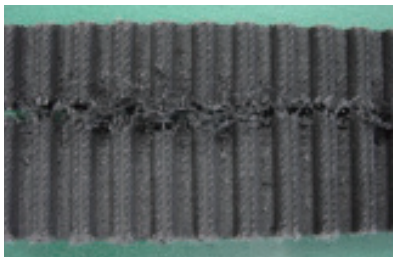
Troubleshooting

Forms of damage

Symptom	Appearance	Content
(a) Breakage of belt		**＜ Symptom ＞** The cord breakage is relatively long, extending across several teeth. **＜ Possible causes ＞** ・Poor belt sprocket alignment. ・Riding up on the guide flange of belt sprocket. ・Stuck with foreign matter.
(b) Partial cut of belt		**＜ Symptom ＞** ・Partial breakage. ・Scratches may be observed on the tooth surface other than the breakage part. **＜ Possible causes ＞** ・Riding up on the guide flange of belt sprocket. ・Stuck with foreign matter.
(c) Premature breakage of belt		**＜ Symptom ＞** ・Breakage is parallel to the belt teeth. ・Core wires are also cut at the same length. **＜ Possible causes ＞** ・The cords were broken due to excessive bending during storage and assembly. ・The cords were broken because the belt sprocket diameter was too small.
(d) Premature wear of belt teeth		**＜ Symptom ＞** ・Fraying of the tooth fabric, whitish discoloration, and unclear fabric pattern. ・Tooth fabric is worn and rubber is exposed. ・Belt teeth become thinner. ・Tooth fabric on the bottom of belt tooth is worn and cord is exposed. **＜ Possible causes ＞** ・Overloaded. ・Too high installation tension. ・Insufficient installation tension. ・Insufficient synchronous belt capacity. ・Incorrect belt sprocket tooth profile or incorrect dimensions of the tooth. ・Usage in a dusty environment.

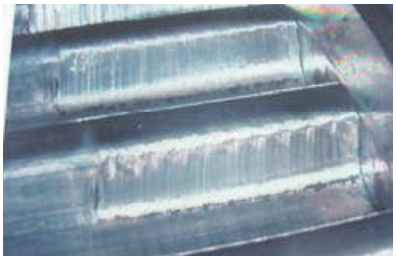
Troubleshooting

Forms of damage

Symptom	Appearance	Content
(e) Wear of belt tooth root		**＜ Symptom ＞** ・Tooth fabric on the bottom of belt tooth is worn and cord is exposed. **＜ Possible causes ＞** ・Accelerated wear of the belt tooth root fabric due to excessive installation tension. ・Wrong selection of the belt (lack of capacity)
(f) Shear fracture of belt teeth		**＜ Symptom ＞** ・Cracks occur at the base of belt teeth. ・Belt teeth are missing. **＜ Possible causes ＞** ・Overloaded. ・Too high installation tension. ・Insufficient installation tension. ・Insufficient synchronous belt capacity. ・Incorrect belt sprocket tooth profile or incorrect dimensions of the tooth. ・Insufficient number of meshed teeth with the belt sprocket. ・Insufficient rigidity of equipment. ・Usage in a dusty environment.
(g) Tear and wear on side of belt		**＜ Symptom ＞** ・The corners on the side faces are rounded. ・The rubber on the side face looks like it is being peeled off. ・The cord is frayed and exposed. **＜ Possible causes ＞** ・Poor parallelism between shafts. ・Poor belt sprocket alignment. ・Insufficient rigidity of equipment. ・Deformation of the guide flange of belt sprocket.
(h) Longitudinal scratches on belt tooth surface		**＜ Symptom ＞** ・There are vertical scratches on the belt teeth. **＜ Possible causes ＞** ・Running beyond the edge of belt sprocket. ・Riding up on the guide flange of belt sprocket.

Troubleshooting

Forms of damage

Symptom	Appearance	Content
(i) Rubber crack on back of belt		**< Symptom >** ・There are cracks on the back of synchronous belt parallel to the teeth. **< Possible causes >** ・Belt sprocket or idler diameter being used is too small. ・Operating atmosphere temperature is too high or too low.
(j) Sticky or softened rubber on back of belt		**< Symptom >** ・Softened rubber is adhered to the back of synchronous belt. ・Synchronous belt's rubber is sticky or softened. **< Possible causes >** ・Oil adhered to synchronous belt, and rubber absorbed it. ・Usage in high temperature. ・Poor rotation of outside idler.
(k) Swelling of belt		**< Symptom >** ・Rubber is swollen. **< Possible causes >** ・Rubber absorbed oil and water adhering to synchronous belt.
(l) Excessive Wear of belt sprocket teeth		**< Symptom >** ・Area where synchronous belt is engaged is worn, and there is a step between area not engaged. ・Tooth surface is rough. **< Possible causes >** ・Inappropriate belt sprocket material. ・Synchronous belts and belt sprockets were operated with abrasive dust adhering on them. ・Installation tension of synchronous belt is too high.

Inquiry form for synchronous belts

Tel +81-120-251-664 Fax +81-120-252-665

Please fill in the items listed below to request for the selection and survey of synchronous belts.

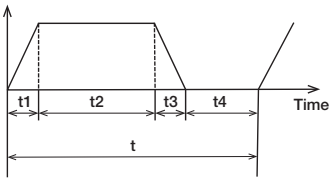
		Date of entry	(MM/DD/YYYY)
Company name		Department name	
Name		E-mail address	
Phone number		Fax number	
Address			

Important: We check the following items from the standpoint of the observation of safe work.

If there is any relevant item, be sure to check the appropriate box(es).

☐ Related to nuclear power ☐ Amusement machine ☐ Hanging application ☐ Vehicles for human use ☐ For food industry ☐ For medical use ☐ For military use

Machine used					☐	← Check in the case of suspension	
Load type	☐	Almost smooth transmission	☐	Transmission with mild impact	☐	Transmission with major impact	
Motor type	☐ Induction motor ☐ Servomotor or others ( )			Actual load applied to the drive belt sprocket			N·m
Motor output		kW		Drive belt sproket Usual RPM			r/min
Rated torque of motor		N·m		Facility operating time per day			hour(s)/day
Maximum torque of motor		N·m		Annual operating days			day(s)/year
Drive belt sprocket	No. of teeth	teeth		Start-stop frequency			ime(s)/day
	Outer dia.	mm					
Drive belt sprocket rpm		r/min		Operation pattern cycle time (Acceleration, constant speed, and speed reduction cycle time)			sec/cycle
Driven belt sprocket	No. of teeth	teeth		Belt operation time/cycle (Time during which the belt operates in the cycle time)			sec/cycle
	Outer dia.	mm					
Driven belt sprocket rpm		r/min		Acceleration (Speed reduction) time			sec
Speed reducer of motor section	☐ Absent Check in the case of internal reduction Present (Speed reduction ratio /) ☐	--		Constant speed time			sec
Rotation direction of motor	☐ Unidirectional rotation ☐ Bidirectional rotation	--		Belt operation time			hour(s)/day
Restriction on the size of belt sprocket dia.	Dia. on the drive side Dia. on the driven side	mm		With/ Without idler	☐ Without ☐ With Outside Inside		--
Restriction on shaft dia.	Dia. on the drive side Dia. on the driven side	mm		Usage environment	to °C		Others and chemicals
				Exposure to water	Large amount / Small amount / None	Exposure to oil	Large amount / Small amount / None
Restriction on belt width	max	mm or less		Weight of rotating/ transferred body			kg
Distance between shafts	to	mm		Application of belt to multiple rows			Application of rows
Optional comment field	Please draw a simplified figure, explain the mechanism, describe your request, etc.						



t: Cycle time
t1: Acceleration time
t2: Constant speed time
t3: Speed reduction time
t4: Stop time

TSUBAKIMOTO CHAIN CO.

Website https://www.tsubakimoto.com

Nakanoshima Mitsui Building, 3-3-3 Nakanoshima, Kita-ku, Osaka 530-0005 Japan

TSUBAKI GLOBAL NETWORKS ▶▶