

TSUBAKI

Roller Chain & Sprocket

Maintenance Manual

- **Drive Chains & Sprockets**
- **Small Size Conveyor Chains & Sprockets**
- **Large Size Conveyor Chains & Sprockets**



Thank you for your purchase of a Tsubaki chain or sprocket.

Be sure to thoroughly read this instruction manual before handling your chain or sprocket to ensure that you cut, connect, install, and maintain your product properly.

This manual should be kept handy for persons handling the chain, or for persons operating the equipment using the chain, to reference at any time.

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For Safe Use



Warning

Observe the following points to prevent hazardous situations.

- Do not use chains or accessories (peripheral devices and parts) for anything other than their original purpose.
- Never perform additional work on the chain.
 - Do not anneal the various parts of the chain.
 - Do not clean the chain with acids or alkalis, as they may cause cracking.
 - Never electroplate the chain or its parts, as this may cause cracking due to hydrogen embrittlement.
 - Do not weld the chain, as the heat may cause cracking or a reduction in strength.
 - When heating or cutting the chain with a torch, remove the links immediately adjacent and do not use them again.
- When there is a need to replace a damaged (fractured) portion of a chain, always replace the whole chain with a new product rather than replacing only the damaged or fractured portion.
- When using a chain and sprocket on suspension equipment, establish a safety fence and strictly prevent entry to the area directly below the suspended object.
- Always install hazard protection devices (safety covers, etc.) for the chain and sprocket.
- Immediately stop using the chain if it comes into contact with a substance that can cause embrittlement cracking (acid, strong alkali, battery fluid, etc.) and replace with a new chain.
- When installing, removing, inspecting, maintaining, and lubricating the chain:
 - Perform the work according to the instruction manual or this catalog.
 - Always turn off the power switch to the equipment beforehand and make sure that it cannot be turned on accidentally.
 - Secure the chain and sprocket so that they cannot move freely.
 - Use a press or other special tool to cut and connect chain, and cut and connect using the proper procedures.
 - Wear clothing and protective gear (safety glasses, gloves, safety shoes, etc.) that are appropriate for the work.
 - Only experienced personnel should replace chains and sprockets.
- Install hazard protection devices (safety equipment, etc.) on suspension equipment using Leaf Chain to prevent hazard or injury in the event of chain failure.
- Install protection equipment for safety on the equipment side when using chain on personnel transport devices or lifting equipment.



Caution

Observe the following points to prevent accidents.

- Only handle chains and sprockets after thoroughly understanding their structure and specifications.
- When installing chains and sprockets, inspect them in advance to confirm that they have not been damaged in transport.
- Always regularly inspect and maintain your chains and sprockets.
- Chain strength varies according to manufacturer. When selecting a chain based on a Tsubaki catalog always use the corresponding Tsubaki product.
- Minimum tensile strength refers to the failure point when a load is applied to the chain once and does not refer to the allowable operational load.
- Lubricate connecting links (JL/OL) before assembling onto the base chain.
- Always ensure that the final customer receives the instruction manual.
 - If you do not have the instruction manual, contact a Tsubaki representative with the product name, series name, and chain/model number to receive the appropriate manual.
- The product information given in this catalog is mainly for selection purposes. Thoroughly read the instruction manual before actually using this product, and use the product properly.

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.
(Example: Use of the Products with a worn sprocket, drum, rail, or the like.)
- (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

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1 Roller Chain & Sprocket Maintenance

1. Before Use

NOTE

With the exception of end-less chains, the transmission power tables in this catalog are based on use with connecting parts (connecting links or offset links).

See page 5 for details on connecting parts.

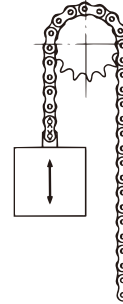
This drive chain catalog explains how to select, install and maintain all listed Tsubaki Roller Chains. Numerical figures are indicated in both SI and gravimetric units.

Read through this catalog before use to ensure proper selection and usage. Also, carefully inform persons involved in installation and maintenance of all pertinent matters.

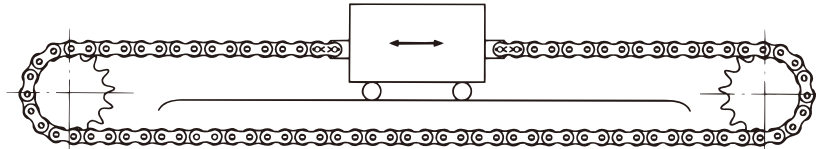
Ordinary Transmission



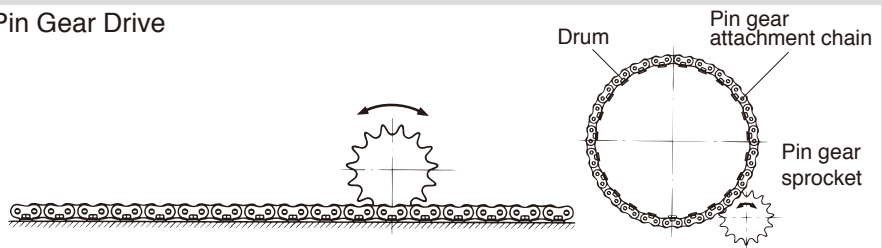
Lifting Applications



Shuttle Traction



Pin Gear Drive



⚠ Notes on Using Roller Chains

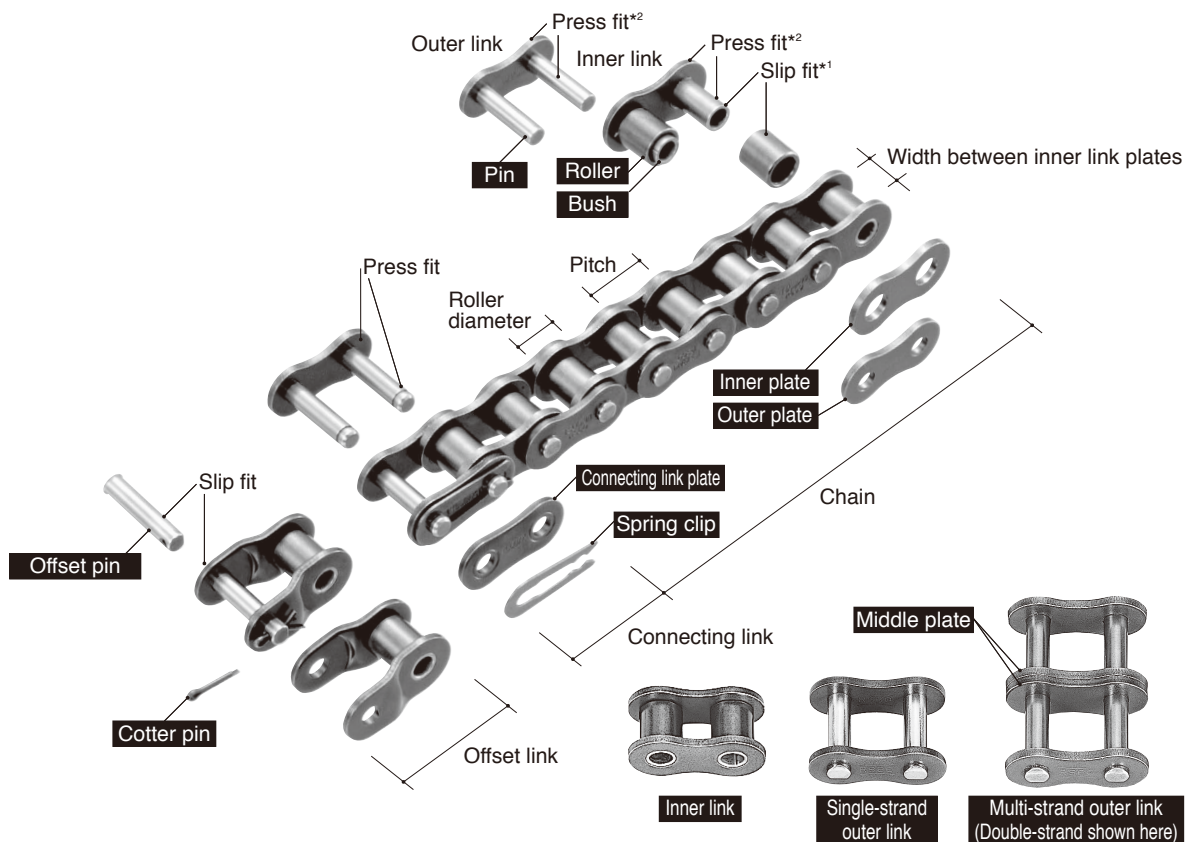
NOTE



- When using a roller chain in lifting applications, keep clear from underneath the load.
- If there is the possibility of serious accident or death in the event of roller chain breakage during lifting or other applications, install reliable safety devices to prevent accidents.
- Inspect and replace worn roller chain periodically.
- Roller chains can break and climb up on the sprocket from wear elongation. (Lubrication can extend service life against wear elongation. Tsubaki also offers lube-free drive chains that deliver long-lasting service without lubrication.)
- Overload may cause roller chain to break. (Avoid breakage by properly selecting products with consideration of inertia, etc. Tsubaki offers heavy-duty drive chains in identical sizes that deliver the high strength of larger chains.)
- Roller chains can break due to corrosion and other environmental conditions. (Avoid breakage by preventing exposure to corrosive liquids, atmospheres, etc. Tsubaki offers excellent corrosion-resistant drive chains.)
- Correctly install roller chain to avoid misalignment or uneven wear and possible breakage.

2. Roller Chain Construction

1. Basic Structure (Photo: RS Roller Chain)



Basic Three Dimensions

The pitch, roller diameter, and width between inner link plates are considered the basic three dimensions of a roller chain. When these dimensions are identical, a roller chain and sprocket are dimensionally compatible.



Spring clips, cotter pins and spring pins are essential parts that prevent connecting plates from falling off, maintaining the strength of the chain itself. Always install these parts.

*¹Slip Fit

When the shafts (pins and bushes) and holes are fitted together, there is a continuous loose fit. This is a fit where the range of tolerance for the hole is larger than the range of tolerance for the shaft.

*²Press Fit

When the shafts (pins and bushes) and holes are fitted together, there is a continuous interferential fit. This is a fit where the range of tolerance for the hole is smaller than the range of tolerance for the shaft.

■ Plate

The plate bears the tension placed on the chain. Usually this is a repetitive load, but sometimes it is accompanied by shock. Therefore, the plate must have not only great static tensile strength, but also must hold up to the dynamic forces of load and shock.

■ Pin

The pin is subject to shearing and bending forces transmitted by the plate. At the same time, it forms a load-bearing part, together with the bush, when the chain flexes during sprocket engagement. Therefore, the pin needs high tensile and shear strength, resistance to bending, and sufficient endurance against shock and wear.

■ Bush

The bush is subject to complex forces from all parts, especially from the repetition of shock loads when the chain engages the sprocket. Therefore, the bush needs extremely high shock resistance. In addition, the bush forms a load-bearing part together with the pin, and as such requires great wear resistance.

■ Roller

The roller is subject to impact load as it strikes the sprocket teeth during chain engagement with the sprocket. After engagement, the roller changes its point of contact and balance. It is held between the sprocket teeth and bush, and moves on the tooth face while receiving a compression load. Therefore, it must be resistant to wear and still have strength against shock, fatigue and compression. RS11 / 15 / 25 / 35 do not have rollers.

■ Inner Link

Two bushes are press fit into two inner plates, and rollers are inserted to allow rotation around the outside of the bush. This is the same for single-strand and multi-strand chain.

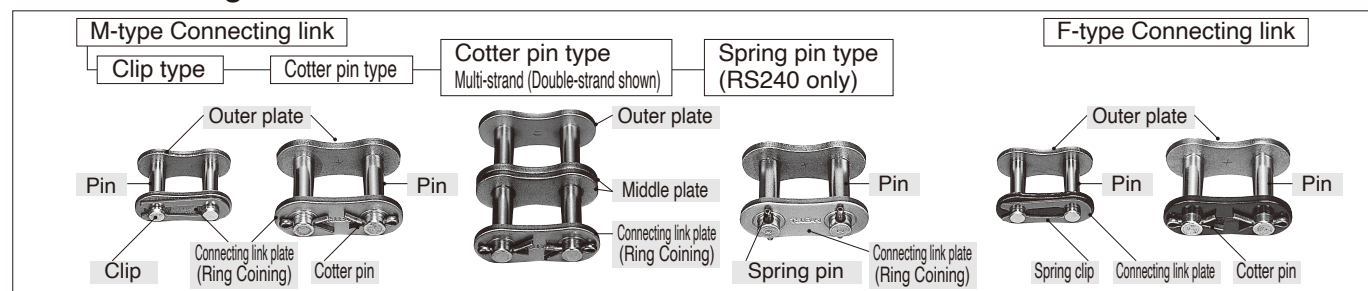
■ Outer Link and Middle Plate

The pin link consists of two pins that have been press fit into two outer plates. With multi-strand roller chain, a middle plate is added to the pin link. The middle plate is slip fit for standard RS Roller Chain and press fit for Super Roller Chain.

2. Assembly Parts

Roller Chains are usually made up of a number of connected links in an endless formation, or used by fixing the chain ends, but the need for connecting links will eventually arise. Although offset links can be used when there are an odd number of links in the roller chain, please use a design that requires an even number of links as much as possible. Please note that connecting links and offset links are normally coated with an anti-rust agent only. Always thoroughly lubricate pin and bush when assembling.

2. 1 Connecting Links



Chain type	Connecting link type	Pin / Connecting link plate fitting	Connecting link plate fastening	Note
RS Roller Chain	M-type connecting link Code: JL	Slip fit (M)	Spring clip Cotter pin Spring pin	- For multi-strand chain, make sure the plate with *Ring Coining is on the outermost side when assembling. - Operating speed is indicated by the white area in the kW ratings table.
	F-type connecting link * Code: FJL	Press fit	Spring clip Cotter pin Spring pin T-pin	Always use the chain according to the application specified per the Tsubaki Drive Chains and Sprockets catalog selection guide, and within the speed range of the colored area of the kilowatt ratings table.
Lambda Chain	M-type connecting link Code: JL	Slip fit (M)	Spring clip Cotter pin	- Can be used in all areas of the kW ratings table for Lambda Chain. - Connecting plates are ring coined.
Super Roller Chain	M-type connecting link Code: MJL	Slip fit (M)	Spring pin	Connecting link plates and middle link plates used in multi-strand chain are ring coined.
	F-type connecting link Code: FJL	Press fit	Spring pin	- Use under extreme conditions (e.g., high shock, very high load, possible side force, etc.). - Connecting link plates used in multi-strand chain are not ring-coined. Assemble connecting link plates (press-fit) on the very outside link.
Super-H Chain	F-type connecting link Code: JL	Press fit (F)	Spring pin	Use the Super-H Chain exclusive connecting link plate.
Ultra Super Chain	F-type connecting link Code: JL	Press fit (F)	Spring pin	Use the Ultra Super Chain exclusive connecting link plate.
RS-HT Chain	M-type connecting link Code: MJL	Slip fit (M)	Cotter pin Spring pin	Connecting link plates are ring coined. Use exclusive connecting link.
	F-type connecting link Code: FJL	Press fit	Cotter pin Spring pin	Use exclusive connecting link
Other roller chains in catalog	M-type connecting link Code: JL	Slip fit (M)	Cotter pin, Spring clip Spring pin T-pin, Z-pin	Refer to individual dimension diagrams. Only NP, NEP and Low Noise Roller Chains use ring coined connecting link plates.

Note 1. The connecting link plate fastening method for each chain size is indicated in the dimension tables and the table notes.

2. The color of F-type connecting links for RS Roller Chain and RS-HT Roller Chain marked with * is black.

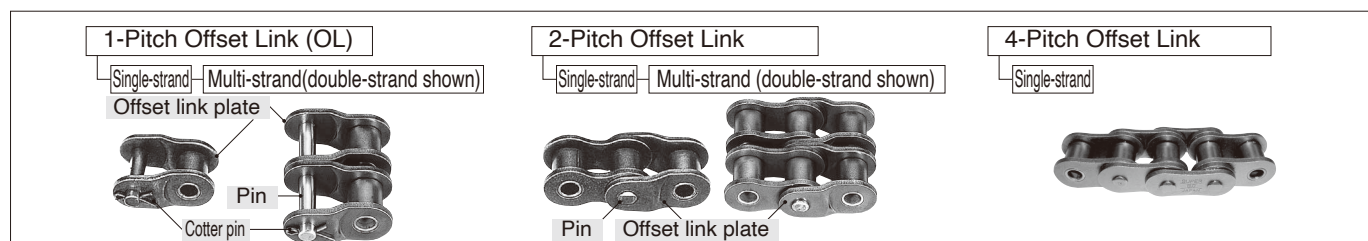
Remark: Ring Coining (RC)

This Tsubaki original processing adds an area of plastic deformation around pin holes to generate residual stress around the holes.



Ring Coining

2. 2 Offset Link

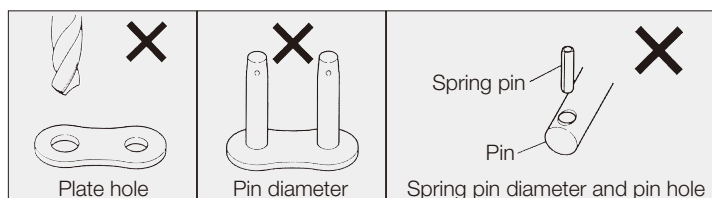


Note : 1. See the dimensional tables for roller chain types and sizes suitable for offset links.

2. Offset links may have lower kW ratings and a lower allowable load than the base chain. See the individual product page for details.

⚠ Caution when handling connecting link plates

- When placing the connecting link plate onto the pin, never widen the plate hole or narrow the diameter of the pin to facilitate installation, as doing so will reduce chain strength.
- Similarly, never perform additional work on the spring pins or pin holes.
- Never perform additional work on the roller chain itself.



Never perform additional work as shown above.

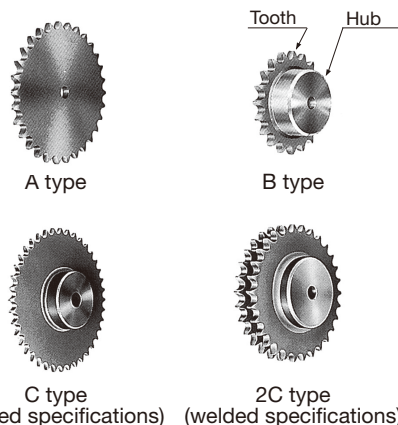
3. Sprockets

3.1 Specifications

Standard Tsubaki RS Sprocket tooth profiles are precisely finished to JIS standards. Tsubaki uses S-type tooth profiles in JIS standards. (Some U-type teeth are also used.)

3.2 Construction

1) Models and material



Model	Material
1A type	Carbon steel for machine structural use
1B & 2B types (machined)	
1B & 2B types (welded)	Carbon steel for machine structural use, rolled steel for general structural use
1C & 2C types (welded)	

Note 1: In addition to standard sprockets with pilot bores (unfinished bores), we also offer Fit Bore Sprockets with bores can be used as is (bore finished, keyway processed, two set screws included).

2: Refer to the Tsubaki Drive Chains & Sprockets catalog and various instruction manuals regarding lock sprockets (with integrated keyless friction type integrated couplings).

2) Induction hardened teeth

RS35 – RS160 1B type sprockets (machined) and RS40 – RS100 2B type sprockets (machined) with small numbers of teeth use induction hardened teeth. Other sprockets with induction hardened teeth available on a made-to-order basis. (See the Tsubaki Drive Chains & Sprockets catalog for more information.)

⚠ Cautions regarding additional processing

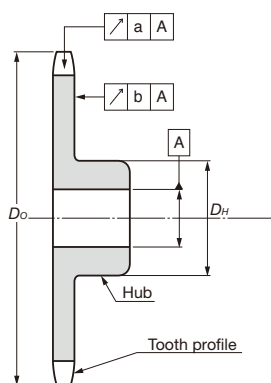
(1) Bore finishing

- Maximum bore finishing dimensions

The maximum bore finishing dimensions should be less than the maximum bore diameter as shown in the model dimensional tables. Contact a Tsubaki representative regarding use of non-JIS standard keys.

- Finishing standards

Chuck the tooth profile outer diameter (D_o in the diagram) and hub outer diameter (D_H in the diagram) according to standards before finishing. Ensure that the tooth root radial runout (a in the diagram) and the radial runout of the tooth edge (b in the diagram) are less than the values shown in the table below.



With machined specifications

Root diameter (d_f)	Less than 90	More than 90, less than 190	More than 190, less than 850	More than 850, less than 1180	More than 1180
Root runout a	0.15	$0.0008d_f + 0.08$		0.76	
Lateral runout	0.25		$0.0009d_f + 0.08$		1.14

(2) A type sprocket welding

When using A type sprockets with welded hubs, distortion from welding may make it impossible to maintain product quality to within the above runout values. Further, welding A type sprockets with hardened teeth may decrease tooth strength. Avoid welding A type sprockets for these reasons.

(3) Hub outer diameter finishing

Do not finish the outer diameter of hubs, as this will reduce hub strength. Always contact a Tsubaki representative before attempting any hub outer diameter finishing.

(4) Sprocket surface treatments

Always observe the following when plating, providing a black finish, or otherwise surface treating standard sprockets.

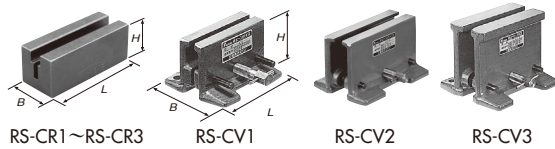
- Anti-rust lube/coating has been applied to the sprocket. Be sure to remove this first.
- Take measures to prevent hydrogen embrittlement when electroplating sprockets with hardened teeth.

3. Accessories

1. Chain Cutting Tools

Tsubaki provides roller chains in either unit lengths (3048 mm) or reels. The following tools are available for cutting the chain to a desired length. See "Roller Chain and Sprocket Handling" for use.

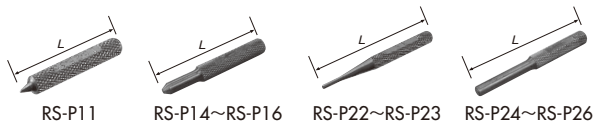
1 Chain Vises



Model Number	Applicable Chain			Dimensions		
	Single-strand	Double-strand	Triple-strand	L	H	B
RS-CR1	RS15	—	—	50	16.4	20
RS-CR2	RS25	—	—	50	19	20
RS-CR3	RS35	—	—	60	30	30
RS-CV1	RS40 ~ 80	RS40	—	100	65	94 ~ 115
RS-CV2	RS40 ~ 160	RS40 ~ 100	RS40 ~ 100	180	110	120 ~ 151
RS-CV3	RS80 ~ 240	RS80 ~ 160	RS80 ~ 100	200	170	180 ~ 220

Note: All models stocked.

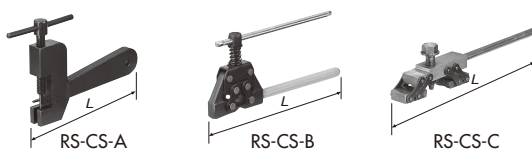
2 Punches



Primary punch		Secondary punch		Applicable Chain
Model Number	L	Model Number	L	
RS-P11	52	RS-P21	65	RS15
		RS-P22	70	RS25
		RS-P23	80	RS35
RS-P14	60	RS-P24	80	RS40 ~ 60
RS-P15	70	RS-P25	90	RS80 ~ 120
RS-P16	80	RS-P26	120	RS140 ~ 240

Note: 1. All models stocked
2. RS-P11 is for RS15, RS25, and RS35 chains.

3 Chain Breakers



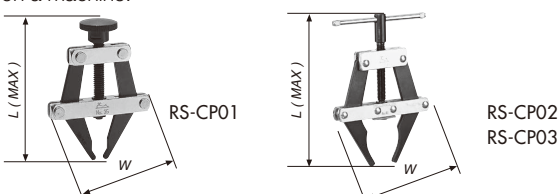
Model Number	L	Applicable Chain (Single-strand)	Model Number	L	Applicable Chain (Single-strand & Double-strand)
RS-CS-A1	116	RS25	RS-CS-B1	185	RS40~60
RS-CS-A2	119	RS35	RS-CS-C1	222	RS80 • 100
RS-CS-A3	119	RS41	RS-CS-C2	290	RS120 • 140
RS-CS-A4	119	RF06B	RS-CS-C3	708	RS160~240

Note: 1. All models stocked. Chain breakers for BS/DIN Roller Chain also available.
2. Not for use with RS35-LMC, RF05B chain.

2. Chain Connecting Tool

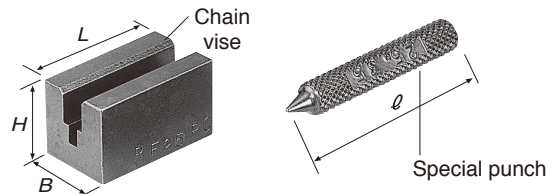
1 Chain Puller

This tool pulls the two ends of the chain together when installing the chain on a machine.



4 Poly Steel Chain Cutting Tools

Standard chain cutting tools cannot be used on Poly Steel Chains. A special punch and vise for Poly Steel Chains are required.



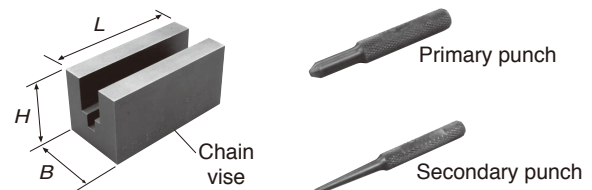
<Cutting Tools>

Model Number	L	H	B	l	Applicable Chain
RS-PC01-AST	35	20	20	52	RS25-PC-1
RS-PC02-AST	50	30	30	52	RS35-PC-1
RS-PC03-AST	65	35	35	56	RS40-PC-1
RS-PC04-AST	80	40	35	56	RS50-PC-1
RS-PC05-AST	100	45	40	56	RS60-PC-1

Note: 1. All models stocked.
2. Special punch and vise are included as a set.

5 Lambda Chain Cutting Tools

A special vise and a primary and secondary punch are required to disassemble Lambda Chains.



<Cutting Tools>

Model Number	L	H	B	Applicable Chain
RS-LMD01-AST	65	32	32	RS40-LMD-1
RS-LMD02-AST	80	40	40	RS50-LMD-1
RS-LMD03-AST	95	48	48	RS60-LMD-1
RS-LMD04-AST	130	60	60	RS80-LMD-1
RS-LMD05-AST	160	73	73	RS100-LMD-1
RS-LMD06-AST	160	88	88	RS120-LMD-1
RS-LMD07-AST	180	98	98	RS140-LMD-1
RS-LMD08-AST	200	114	114	RS160-LMD-1

Note: 1. All models stocked.
2. Special punch and vise are included as a set.
Punch dimensions are the same as for punches in 2. above.

<Cutting Tools>

Model Number	L	H	Applicable Chain (Single-strand)
RS-CP01	118	70	RS35 ~ 60
RS-CP02	185	112	RS60 ~ 100
RS-CP03	250	145	RS80 ~ 240

Note: All models stocked.

4. Handling

1. How to Cut Roller Chain

If the chain you purchased is either a unit length (3,048 mm) or on a reel, it is necessary for you to cut the chain to the necessary length.

How to cut a roller chain — Using a chain vise and punch
Using a chain breaker

1. 1 Using a chain vise and punch

- 1) For riveted type roller chain, grind down one end of the outer plate's two pins (same side) to the surface of the plate. Be careful of the chain overheating during the grinding process. This process is unnecessary for Poly Steel Chain as there are no rivets. As RS08B-1 to RS16B-1 use easy cutting pins, the rivets do not need to be ground.
- 2) Remove the cotter pin for cotter pin type roller chain.

(Grind the rivets of the pins until they are flush with the plate.)

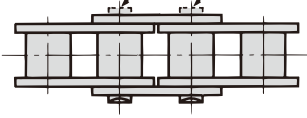


Fig. 1 Rivet-type roller chain



Fig. 2 Grinding the pin ends

- 3) Place the roller chain into the groove of the chain vise (see Accessories Section) and tighten the vise to secure the roller to be disassembled.
 - ① Follow 1.3 and 1.4 for Poly Steel Chain and Lambda chain.
 - ② For multi-strand Super Roller Chain, place the lowest roller into the groove of the chain vise.

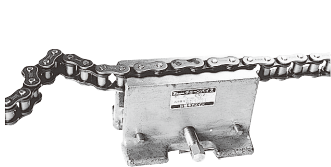
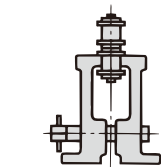


Fig. 3 Setting the roller chain in the chain vise



Setting Super Roller Chain

- 4) Place a primary punch (see Accessories Section), according to chain size, on the head of the ground pin, and then hit the head of the primary punch with a hammer. Make sure to hit the pins alternatively to ensure the pins are removed evenly and at the same time. Continue to tap the pin until just before the pin is removed from the outer plate.
- 5) Use a secondary punch (see Accessories Section) to remove the pin completely from the outer link plate. Check to make sure that the bush where the pin was

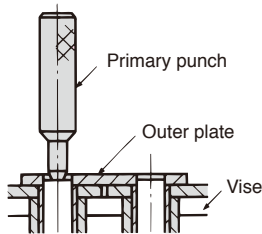


Fig. 4 Tapping the pin with the primary punch

removed has not come loose or deformed. Do not use if loose or deformed.

⚠ Safety precautions

- 1) Make sure to use a grinder when grinding the riveted portion of one end of the rivet-type pin.
If it is extracted without being ground first, more time and effort will be spent, and will damage the chain.
- 2) Do not reuse any removed parts.

1. 2 Using a chain breaker

- 1) For riveted type roller chain, grind down one end of the outer plate's two pins (same side) to the surface of the link plate. (Same as 1.1) Remove the cotter pin for cotter pin type roller chain.

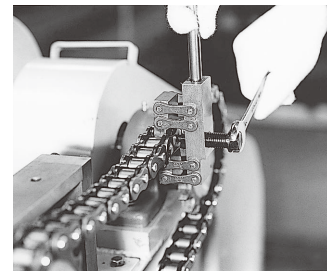


Fig. 5 How to cut a chain using a chain screw

- 2) Remove the two pins from the same outer plate. Check to make sure that the bush where the pin was removed has not come loose or deformed. Do not use if loose or deformed.

Using RS-CS-A Chain Breakers

- 1) Rotate the tommy bar (handle on top) to the left to raise the breaker and ensure there is sufficient space above the roller cradle so that the roller chain can be set. The side with the pin that has been grounded (or the cotter pin side) should face up. Insert the roller onto the roller cradle (or bush for RS25 and RS35 chains) and support the roller chain. (See Fig. 6 & 7.)
- 2) Rotate the tommy bar to the right so that the break pin tip is over the center of the pin face.
- 3) Gently rotate the tommy bar to the right and extract the pin. Ensure that the outer plate and pin are generally level with each other, and alternate work on both pins.
- 4) Once the pins have been removed from the outer plate, remove the chain breaker from the chain and take out the pin-sashi.

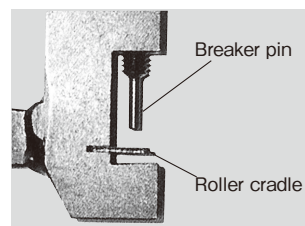


Fig. 6 Part nomenclature (RS-CS-A chain breaker)

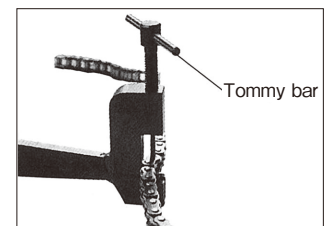


Fig. 7 Roller chain support (RS-CS-A chain breaker)

Using RS-CS-B Chain Breakers

- 1) Ensure the tommy bar and grip are on the same side.
Grip them so that they touch to spread the jaws. (See Fig. 8.)
- 2) With the side of the chain with the ground pins (or cotter pins) facing up, clamp the roller between the two jaws and support the roller chain. (See Fig. 9.)
- 3) Then, follow steps 2 – 4 for using RS-CS-A chain breakers.

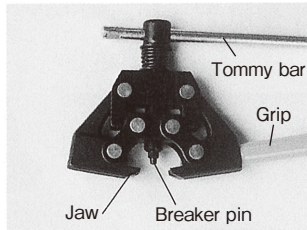


Fig. 8 Part nomenclature
(RS-CS-B Chain Breakers)

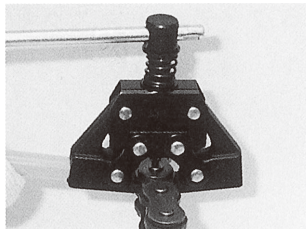


Fig. 9 Roller chain support
(RS-CS-B Chain Breakers)

Using RS-CS-C Chain Breakers

- 1) With the side of the chain with the ground pins (or cotter pins) facing up, clamp the roller between the two jaws and support the roller chain. Ensure the tip of the upper break pin is centered over the roller chain pin and secure the roller chain. (See Fig.10 & 11.)
- 2) Use a wrench to turn the breaker bolt to the right and extract the pin. Ensure that the outer plate and pin are generally level with each other, and alternate work on both pins.

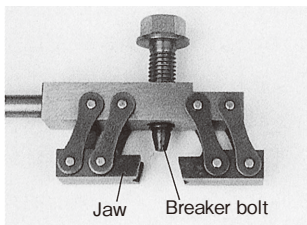


Fig. 10 Part nomenclature
(RS-CS-C Chain Breakers)

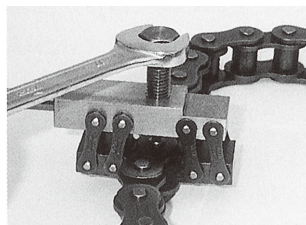


Fig. 11 Roller chain support
(RS-CS-B Chain Breakers)

Safety precautions

- 1) A chain breaker (See 7.1.3) is a tool specialized for disconnecting roller chain. It can be used to disconnect roller chains while they are still mounted on the equipment. In this situation, both the load on the roller chain and the weight of the roller chain itself should be supported to prevent the chain from falling off the equipment when it is disassembled.
- 2) Continuing to push the breaker pin through after removing the outer plate will cause removal of the inner plate as well, which can damage the chain breaker.
- 3) Check whether the bush in the disconnected area is missing. If it is, do not use that section of chain.

1. 3 How to cut Poly Steel Chain

- 1) Support the outer plate of the chain in the cradle and push down on the pinhead with the exclusive punch. Then lightly hit the head of the punch using a hammer.
- 2) Avoid using excess force on the engineering plastic part, as there is a possibility of causing damage.

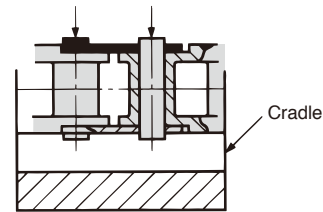


Fig. 12 Poly Steel Chain set in a cradle

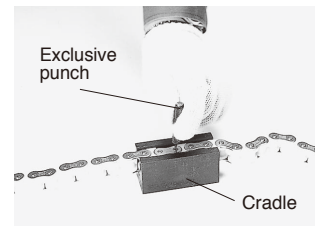


Fig. 13 Cutting Poly Steel Chain

1. 4 How to cut Lambda Chain

- 1) Support the chain with a chain vise and grind down one end of the outer link plate's two pins (same side) to the surface of the link plate. Be careful of the chain overheating during the grinding process. Grinding should be carried out slowly so as not to overheat the bushes in particular.
- 2) Then cut the chain using an exclusive cradle (see Accessories section) and an RS Roller Chain punch. Important points for cutting are outlined in 4) and 5) in 1.1. However, use an exclusive cradle instead of a vise.
- 3) Hit the pins alternatively when removing the pins with a punch. Take extra care not to remove or cause any damage to the bush. Do not use bush if it has come loose or been damaged.

2. Roller Chain Connection (using connecting links)

2.1 Connecting an Endless Roller Chain

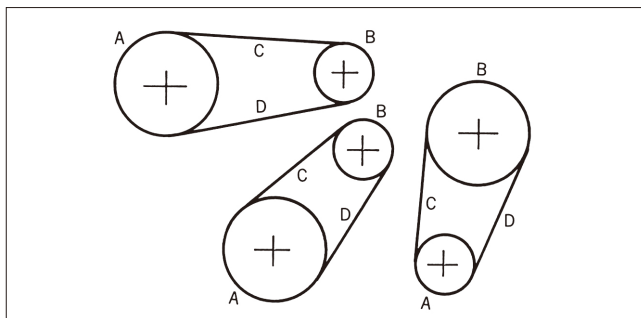


Fig. 14. Connecting an endless roller chain

2.1.1 Connecting an endless roller chain in the A or B position (general connecting method)

- 1) Wrap the roller chain around the sprocket so that the inner links on both ends are engaged with the sprocket teeth in either the A or B position. (Fig. 14) With large roller chains, pull the ends of the roller chains with wire to prevent the chain from falling off.
- 2) Insert a connecting pin-sashi into the inner links on both ends. Insert two middle plates if using a multi-strand chain, then insert the inner link onto the pins. (Fig. 15)

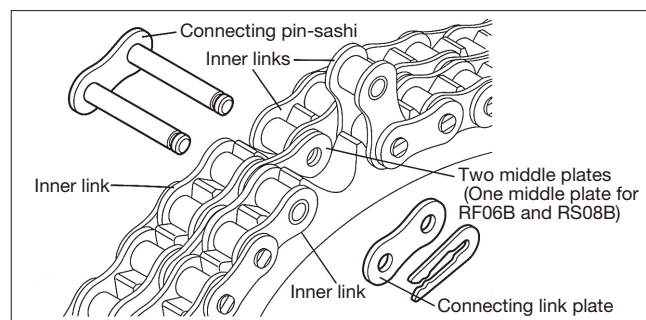


Fig. 15 Inserting connecting pin-sashi

- 3) Insert two connecting link plates onto the pins at a right angle.

● M-type connecting link plates

The connecting link plate holes and pins will have a slip-fit. This will make it easier to insert the plate, but you will need to tap the connecting plate lightly with a hammer to fully insert it.

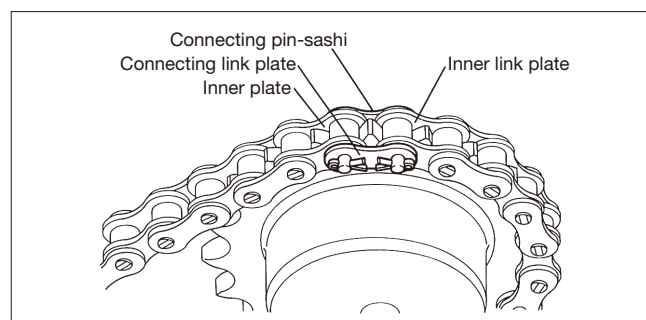


Fig. 16 Connecting the chain while mounted on a sprocket (shows connected chain)

● F-type connecting link plates

The connecting link plate holes and pins will have a tight fit. Place a weighty spacer over the two pins of the connecting pin-sashi, place the connecting link plate in a jig, and tap to insert. (Fig. 17)

(Alternate tapping A and B.)

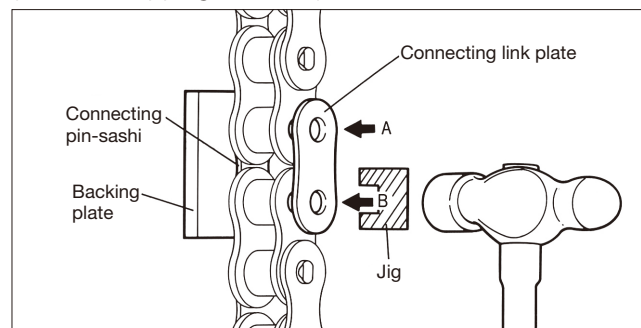


Fig. 17 Tight fit connecting link plates

Insert the pins of the connecting link plate through to where the outer link plate rests. (Fig. 18)

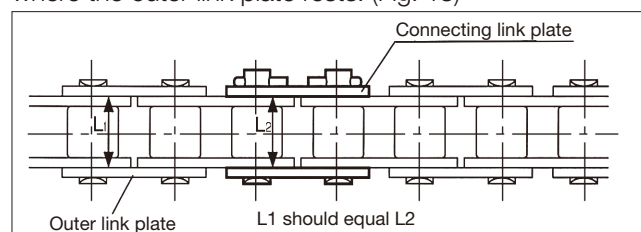


Fig. 18 Connecting link plate position

- 4) When tapping with a hammer, be sure not to accidentally damage the sprocket teeth (especially with cast iron sprockets).
- 5) Next, attach the clip, cotter pin, or spring clip as appropriate. (See 11.2.3 of the assembly guidelines for details.)

2.1.2 Connecting an endless roller chain in the C or D position

- 1) Connect the chain in the C or D position when the space around the A and B positions is too narrow due to layout constraints.
- 2) Pull both ends of the chain with rope or wire and insert the connecting pin-sashi into the inner links on both ends. Using a chain puller when you have both ends in rough position will make fine adjustments easier.
- 3) Follow steps 2) – 5) for connecting chains in the A and B positions.
- 4) For multi-strand chain, be sure to insert the middle plates too.

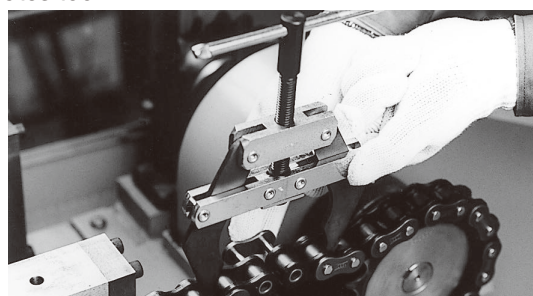


Fig. 19 Connecting within the chain span

2.2 Connecting chain to previously specified lengths

The following is an easy method for connecting chain in the following situations.

- Adding chain to make it longer.
 - Connecting an endless chain to two shafts.
 - For tight fits between connecting link plates and pins.
- 1) Work on a flat, sturdy work table or bench.
 - 2) Follow the connection instructions for A or B positions described in 10.2.1.1, but because you will be working on a table or bench top you will not have to pull the two ends with wire, making work easier.
 - 3) And with tight fit connecting plates, you can stably, securely work just by placing a backing plate on the table or bench top.

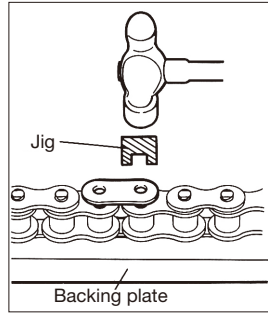


Fig. 20 Inserting a tight fit connecting link plate while working on a table or bench

2.3 Connecting clips, cotter pins, and spring pins

● Clips

Clips are used on connecting links for roller chain sizes RS60/RS16B and under. When connecting these chains, after inserting the pins through the connecting link plate holes securely attach the clips to the two pins of the connecting link.

You will not be able to properly install the clip if you spread it too widely, causing it to fall off and lead to unforeseen accidents. Clips are generally installed in the chain's direction of running as show in the figure on the right.

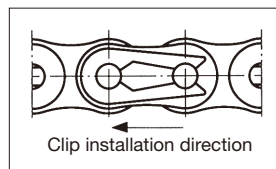


Fig. 21 Clip installation direction

● Cotter pins

Tsubaki heat treats the cotter pins used on our general use, heavy duty, and lube-free drive chains. Cotter pin tines should be spread to 60°. Never reuse cotter pins or use commercially available cotter pins.

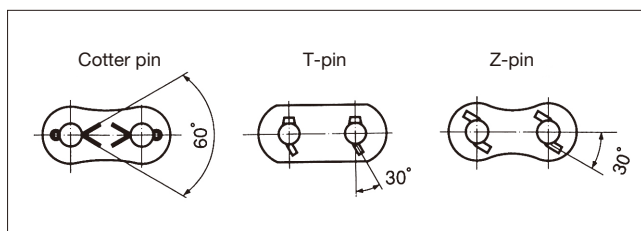


Fig. 22 Cotter pin angle of spread

2.3.1 Fastening clips

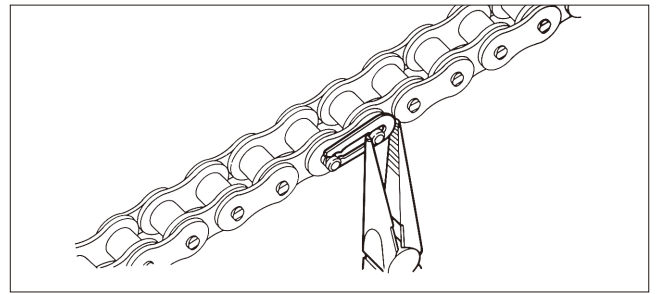
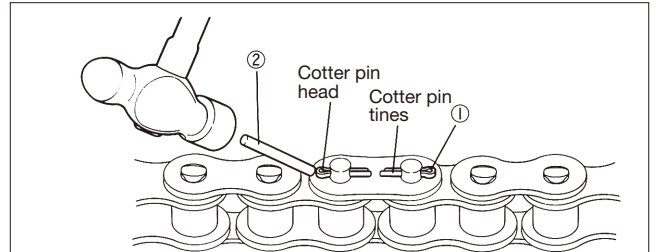
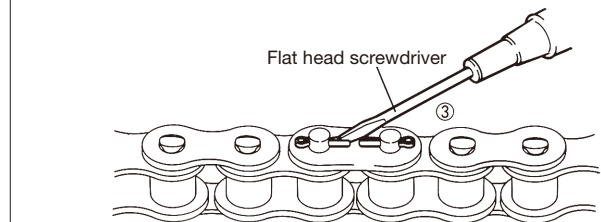


Fig. 23 Fastening clips

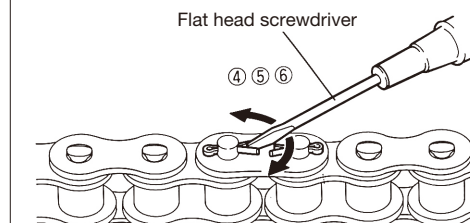
2.3.2 Fastening cotter pins



- 1) Insert the cotter pin into the cotter pin hole.
- 2) Use a slightly thicker pin than the cotter pin to gently tap the cotter pin head. The tines of the cotter pins will open slightly.



- 3) Insert the tip of a flat head screwdriver between the slightly spread tines.

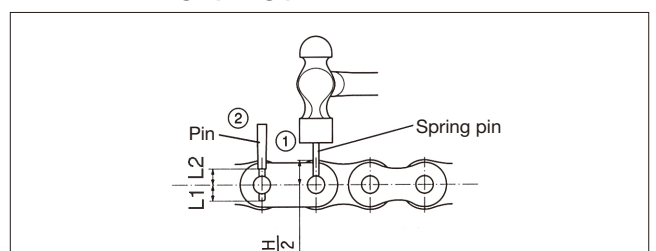


⚠ Caution
Be careful that the tip of the screwdriver does not slip and injure your hand.

- 4) With the screwdriver held diagonally, move the screwdriver back and forth to spread the tines of the cotter pin.
- 5) Press against the head of the cotter pin while doing so to prevent the cotter pin from being pushed out of the hole.
- 6) See Fig.22 for cotter pin tine angle.

Fig. 24 Fastening cotter pins

2.3.3 Fastening spring pins



- 1) Use a hammer to tap the spring pin into the pin hole to a depth of $H/2$.
- 2) Use a slightly thicker pin than the spring pin to tap the spring pin in to a depth of $L1=L2$.

Fig. 25 Fastening spring pins

⚠ Safety precautions

- 1) Avoid use of an offset link as much as possible by adjusting the distance between shafts or using an idler.
- 2) With F-type connecting links and other connecting links, the pins and connecting link plate may form a tight fit. Never enlarge the connecting link plate holes or grind the diameters of the pins to facilitate connecting, as doing so will decrease the strength of the roller chain and lead to accidents.
- 3) The outer link plate of a roller chain that uses cotter pins can be used in place of a connecting link plate, but the outer pin will need to be tapped onto the pin because of the interference fit. When tapping the pin, ensure the pin is parallel to the outer link plate. If the pin is not parallel when the plate is tapped on the pin may deform and reduce the interference fit. Otherwise, observe the cautions in (2) above.
- 4) Do not reuse plates that have been attached with a tight fit. Removing these plates will cause the strength of the plate to drop.
- 5) Connecting link plates and offset link plates are normally coated with an anti-rust agent. Be sure to thoroughly lubricate between pins and bushes when actually inserting the pins.

3. Roller Chain & Sprocket Lubrication

Lubrication is extremely important in roller chain drives. Especially, the more demanding the application is of chain performance, the more necessary lubrication becomes.

Even on sophisticated drive equipment, insufficient lubrication will eventually shorten its service life. Further, depending on the operating conditions, insufficient lubrication will cause your chain to wear remarkably quickly, so careful attention must be paid to lubrication.

- 1) The ultimate purpose of lubrication and greasing is to minimize roller chain and sprocket wear, and to prevent corrosion. Roller chain wear elongation occurs from wear in the joints between pins and bushes.
- 2) Roller chains (except for stainless steel drive chains) are pre-lubricated before being packaged. This lubricant is a high grade oil that prevents rust and provides lubrication, and prevents wear that frequently occurs with initial operation. It works well with other lubricants to maintain its wear resistant properties.
- 3) Avoid wiping the pre-lubrication off your roller chain, and avoid washing the chain with detergent or other cleaning agents.

3.1 Oil application locations

- 1) Roller chain wear elongation occurs from wear between pins and bushes, and these areas must thus be lubricated.
- 2) On the slack side of the chain, lubricate the gap between each outer and inner plate. At the same time, lubricate between bushes and rollers.

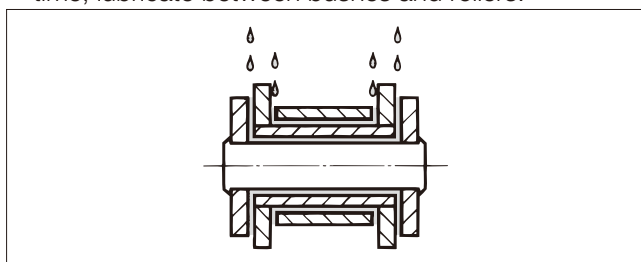


Fig. 26 Lubrication positions

3.2 Chains used for lifting

- 1) In general, the chain will not have a slack side. If possible, remove the load that acts on the roller chain before lubing the chain.
- 2) For sections of roller chain that do not articulate, lube the chain sufficiently and then apply a thick layer of grease around the roller chain to prevent corrosion. Sufficiently lube end fitting connections, even if these do not move.

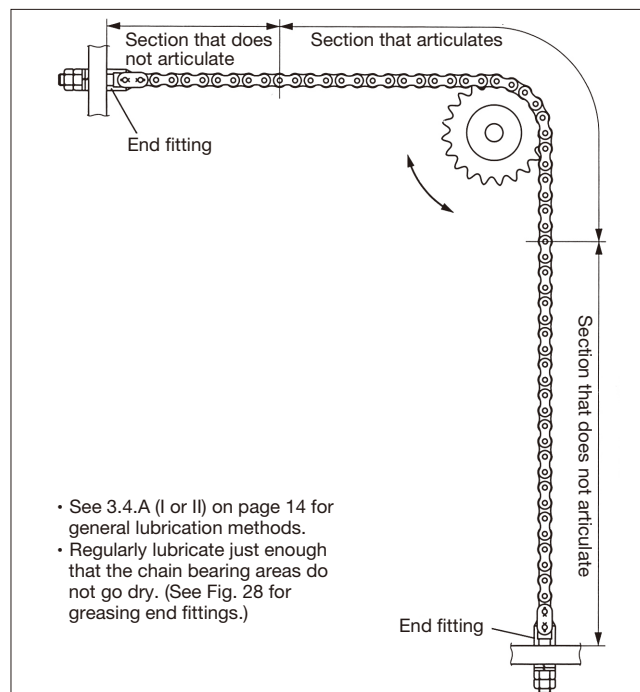


Fig. 27 Lubricating positions

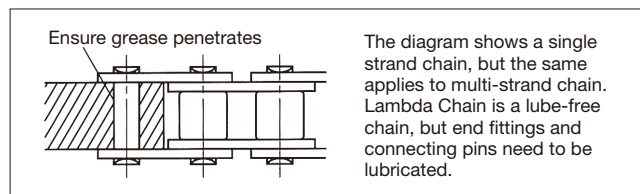


Fig. 28 Lubricating end fittings

- 3) When roller chain is used outdoors, rain and snow will wash away any lubrication and cause harmful corrosion. Install a cover to protect the chain. If rain or snow gets on your chain, remove any water from the chain, immediately re-lubricate it, and then apply a thick layer of grease.

3.3 Recommended lubricants

1) SAE numbers (Table 1)

Lubricant type	A I · A II · B				C			
Ambient temperature	−10°C to 0°C	0°C to 40°C	40°C to 50°C	50°C to 60°C	−10°C to 0°C	0°C to 40°C	40°C to 50°C	50°C to 60°C
Chain number								
RS50 or lower small pitch chain	SAE10W	SAE20	SAE30	SAE40	SAE10W	SAE20	SAE30	SAE40
RS60 / 80	SAE20	SAE30	SAE40	SAE50				
RS100					SAE20	SAE30	SAE40	SAE50
RS120 or higher large pitch chain	SAE30	SAE40	SAE50					

2) Commercially available lubricants (Table 2)

(As of 10/1/2018)

SAE	SAE10W	SAE20	SAE30	SAE40	SAE50
ISOVG(cSt40°C)					
Manufacturer name	32	68	100	150	220
Idemitsu Kosan	Daphne Mechanic Oil 32	◇ 68	◇ 100	◇ 150	◇ 220
EMG Lubricants	DTE Oil Light	◇ Heavy Medium	◇ Heavy	Vacuoline 528	◇ 533
JXTG Energy	Super Mulpus DX32	◇ 68	◇ 100	◇ 150	◇ 220
	FBK Oil RO32	◇ 68	◇ 100	◇ 150	◇ 220

Manufacturer names are shown in no particular order

3) Examples of lubrication at low and high temperatures (Table 3)

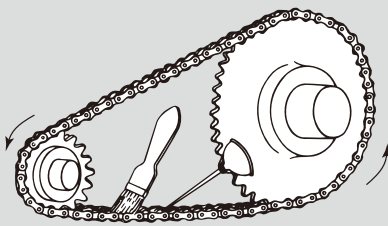
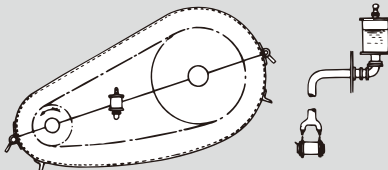
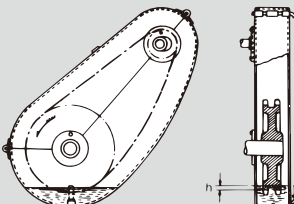
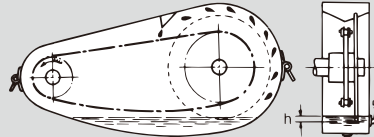
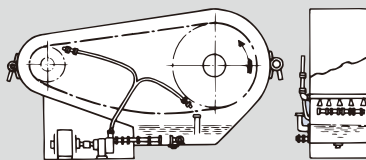
The following lubricants are available when roller chain is used at low or high temperatures. Regarding other brands, use an equivalent.

Ambient and operating temperature	−50°C to −25°C	−25°C to 0°C	−10°C to 60°C	60°C to 200°C	150°C to 250°C
Manufacturer name Lubricant name	Toray Dow Corning SH510 Shin-Etsu Chemical KF50 Momentive Performance Materials Japan TSF 431	Sunoco Suniso 4GS Showa Shell Sekiyu Shell Refrigerator Oil 68K	See above	EMG Lubricants Mobil Vacuoline 546 MORESCO Moresco Hilube L-150	MORESCO Moresco Hilube R-220 Sumico Lubricant Hightemp Oil ES Sato Special Oil Hot Oil No.75

Lubrication methods are drip, manual, and brush.

Manufacturer names are listed in no particular order.

3.4 Lubrication systems and methods (Table 4)

Lubrication system		Method	Quantity																															
A	I	 Apply oil to the gaps in the pins and inner links on the slack side of the chain. A brush can also be used. ⚠ Stop operation before oiling.	Oil with sufficient frequency (in general about once every 8 hours) so that the roller chain bearings do not dry out.																															
	II	Drip Lubrication  Using a simple case, this method drips oil supplied from an oil cup.	For one strand of chain, drip about 5 to 20 drops of oil each minute. Drip more oil on higher speed chains.																															
B	Oil Bath	 The chain is run through oil in a leak-free casing.	If depth h from the surface of the oil to the lowest point the chain reaches is too deep, the oil may heat up (80°C or higher) and deteriorate. The depth to which the chain descends in the oil should be about 6 to 12 mm.																															
	Lubrication using a Slinger Disc	 Use a slinger disc attached to a leak free case to splash oil on the chain. The peripheral velocity of the disc should be 200 m/min or higher. If the width of the chain is greater than 125 mm, attach discs to both sides.	The lowest point h reached by the slinger disc should be about 12 to 25 mm below the surface of the oil. The roller chain should not enter the oil.																															
C	Forced Lubrication	 The oil is circulated in a leak-free case and cooled by a pump. When there are n strands of chain, $n+1$ oiling holes are required, targeting the gaps between each part.	Approximate oiling quantity per oiling hole (L/min) <table><tr><th rowspan="2">Name</th><th>Chain number</th><th rowspan="2">RS60 or smaller</th><th rowspan="2">#80 #100</th><th rowspan="2">#120 #140</th><th rowspan="2">#160 larger</th></tr><tr><th>Chain speed (m/min)</th></tr><tr><td>RS</td><td>500 -800</td><td rowspan="2">1.0</td><td rowspan="2">1.5</td><td rowspan="2">2.5</td><td rowspan="2">4.0</td></tr><tr><td>SUP</td><td>Less than 300</td></tr><tr><td>RS</td><td>800 -1,100</td><td rowspan="2">2.0</td><td rowspan="2">2.5</td><td rowspan="2">3.5</td><td rowspan="2">5.0</td></tr><tr><td>SUP</td><td>300 -500</td></tr><tr><td>RS</td><td>1,100 -1,400</td><td rowspan="2">3.0</td><td rowspan="2">3.5</td><td rowspan="2">4.5</td><td rowspan="2">6.0</td></tr><tr><td>SUP</td><td>500 or more</td></tr></table>	Name	Chain number	RS60 or smaller	#80 #100	#120 #140	#160 larger	Chain speed (m/min)	RS	500 -800	1.0	1.5	2.5	4.0	SUP	Less than 300	RS	800 -1,100	2.0	2.5	3.5	5.0	SUP	300 -500	RS	1,100 -1,400	3.0	3.5	4.5	6.0	SUP	500 or more
Name	Chain number	RS60 or smaller	#80 #100		#120 #140					#160 larger																								
	Chain speed (m/min)																																	
RS	500 -800	1.0	1.5	2.5	4.0																													
SUP	Less than 300																																	
RS	800 -1,100	2.0	2.5	3.5	5.0																													
SUP	300 -500																																	
RS	1,100 -1,400	3.0	3.5	4.5	6.0																													
SUP	500 or more																																	

To verify sufficient lubrication is taking place, remove the chain and inspect the connecting pins and bushes. If the contact surfaces of the pins or bushes show tearing or a red or dark brown color, lubrication is generally not sufficient.

4. Layout and Installation of Roller Chain

4.1 Speed ratio and chain wrap

A roller chain transmission speed ratio up to 7:1 is normally suitable; however, at very slow speeds a ratio up to about 10:1 is possible. The chain wrap between the small sprocket and chain must be 120° or more. For lifting applications, the angle must be 90° or more.

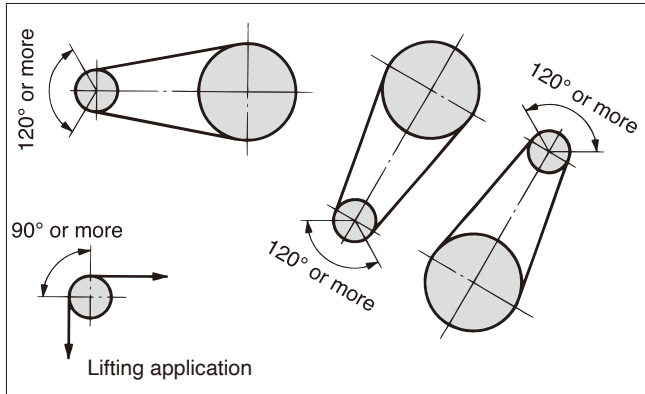


Fig. 29 Chain wrap

4.2 Distance between shafts

The minimum distance can be as short as desired as long as the teeth of the two sprockets are not in contact. The optimum center-to-center distance between the shafts is 30 to 50 times the pitch of the roller chain. However, if the load is variable, a distance of 20 times or less is suitable.

4.3 Amount of slack

- 1) Unlike V or flat-belt transmission, there is no need to apply an initial tension in roller chain transmission; roller chain is normally used with a suitable amount of slack. If too much tension is applied to roller chain, the oil film between the pins and bushes will break, causing increased wear and damage on the roller chain and bearings. If there is too much slack in the roller chain, the chain will vibrate and ride up the sprocket, damaging both chain and sprocket.

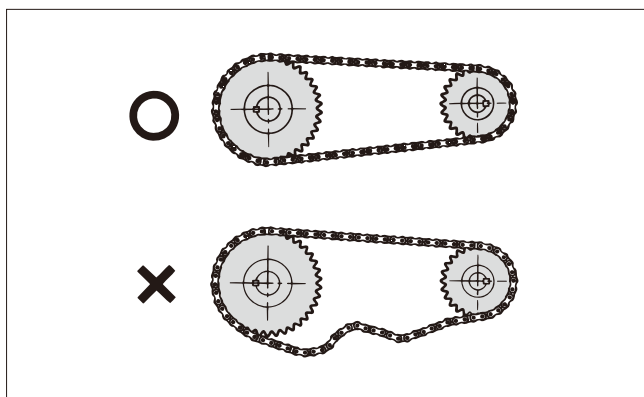


Fig. 30 Example of wrapping transmission

- 2) If possible, the lower side should be the slack side in roller chain transmission. The amount of slack is appropriate when the distance (SS') that the chain can be moved perpendicular by hand at the center of the slack side is 4% of the span (AB). (For example, when the span is 800 mm, the amount of slack should be $800 \text{ mm} \times 0.04 = 32 \text{ mm}$.)

In the following situations, this should be 2%:

- 1) When the transmission is vertical or close to vertical (a tensioner is required).
- 2) When the distance between the shafts is more than 1 m.
- 3) When frequent starts are made with a heavy load.
- 4) When sudden reverse motion takes place.

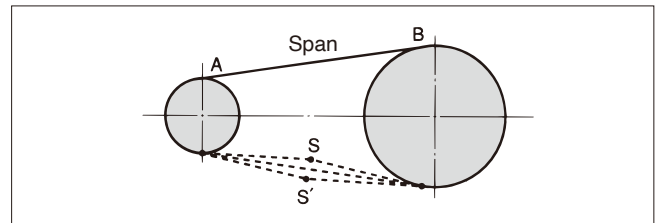


Fig. 31 Amount of slack

- 3) Roller chain will stretch slightly during the first few dozen hours of use as the contact surfaces wear in (about 0.05%). This may result in too much slack in the roller chain and may require adjustment of the slack.

A tensioner can be used if the layout is designed for it. If you do not have a tensioner, move the shafts to adjust the amount of slack. Once the chain is worn in, very little stretching will occur.

4.4 Horizon precision and parallelism of the shafts

The installation precision of the sprocket has a large effect on the smoothness of roller chain transmission. It also affects roller chain life.

Install the sprockets correctly as described below.

- 1) Verify Horizontal precision with a level.
Adjust the precision to within $\pm 1/300$.

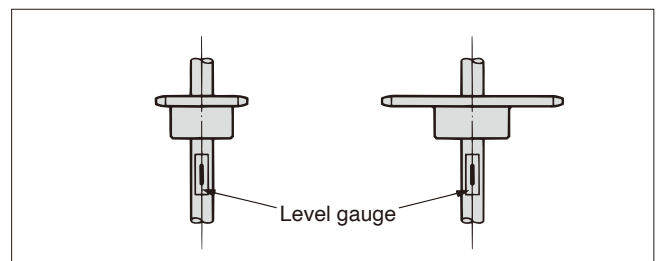


Fig. 32 Horizontal precision

- 2) Use a scale to correct the degree of parallelism of the shafts.

Adjust the shafts so that they are parallel to within $\pm 1/300 \geq (A-B/L)$.

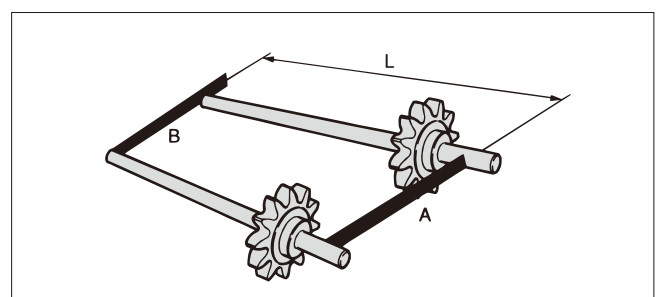


Fig. 33 Degree of parallelism of the shafts

- 3) Using a straightedge (or a scale), adjust the two sprockets so that they are parallel. Adjust to within the following values based on the distance between the shafts.

Up to 1 m	: ± 1 mm
1 m to 10m	: $\pm \frac{\text{Distance between shafts(mm)}}{1,000}$
10m or more	: ± 10 mm

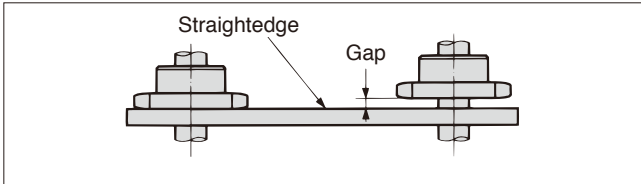


Fig. 34 Sprocket misalignment

- 4) Secure each sprocket to the shaft with a power lock, lock sprocket, or key (if needed use a collar, set bolt, etc.).

4.5 Layout

(☛ indicates the driver side in the illustrations)

1) General layout

Ideally, the line connecting the sprocket centers in the roller chain transmission equipment should be close to level. In a layout that is close to vertical, the roller chain may stretch and fall off the sprocket. Thus, an idler or tensioner should be used. If possible keep the angle of inclination within 60° .

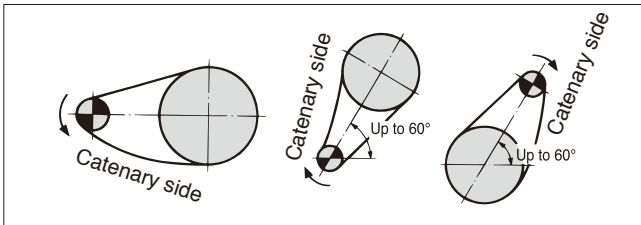


Fig. 35 General layout

2) Layouts requiring caution

(1) When the slack is on the upper side

When the center-to-center distance between the shafts is short, move the shafts to adjust the distance and slightly increase the tension.

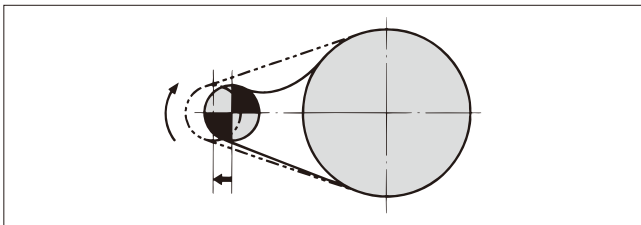


Fig. 36 Layout when the center-to-center distance is short

When the center-to-center distance is long, insert an intermediate idler under the slack part to support the roller chain.

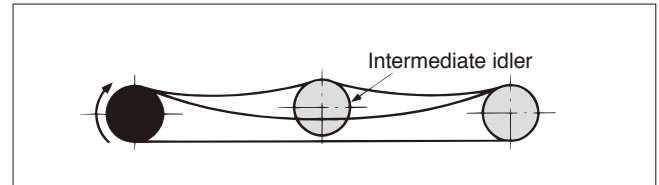


Fig. 37 Layout when the center-to-center distance is long

(2) When the chain speed is fast and the load varies

Roller chain may vibrate if the natural vibration frequency of the chain, shock frequency of the driven machine, or chordal action of the chain (vertical pulsation of the chain due to the polygon effect) synchronize. In this event, use a guide shoe (made of NBR or ultra-high polymer polyethylene) or other device to stop the vibration.

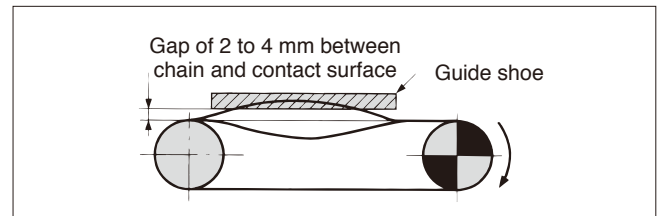


Fig. 38 Guide shoe to prevent vibration

(3) When the centerline is vertical

Install a tensioner that can automatically eliminate excess slack. This is particularly necessary when the drive shaft is on the bottom.

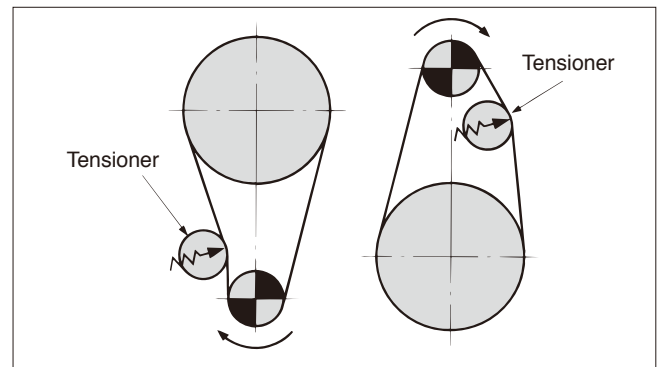
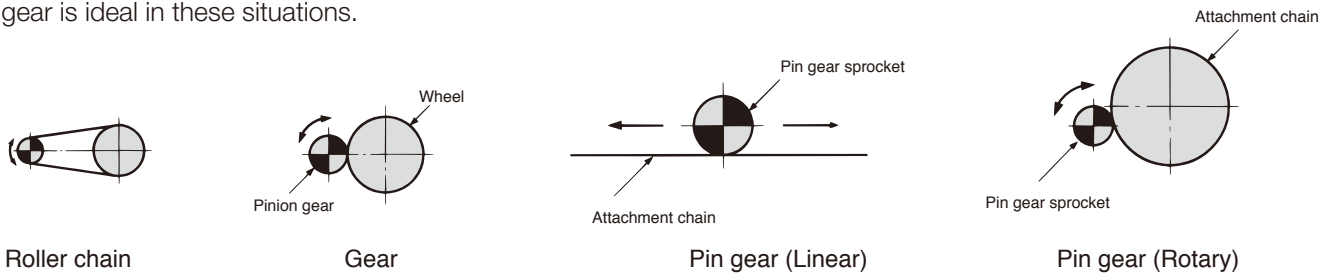


Fig. 39 Vertical transmission

5. Chain type pin gear drive selection method

Generally, linear movement or large radius rotation is made possible by a roller chain and gear through a transmission source (motor, etc.) via a reducer.

A roller chain, however, needs a lot of space, and gears require precision machining, which increases the cost. A pin gear is ideal in these situations.



For pin gear drives, a roller chain is wrapped around the perimeter of a drum to make a wheel, and special sprockets are used instead of pinion gears. For linear motion, a roller chain is attached and used linearly instead of a rack.

Table 5

Item	Pin gear drive	Roller chain transmission	Gear transmission
Restrictions on distance between shafts	Yes	No	Yes
Number of engaged teeth	Low	High	Low
Speed ratio range	No limit	Up to 1:7	No limit
Tooth shape	Special teeth	Sprocket teeth	Involute
Engagement accuracy	Normal	Normal	Precise

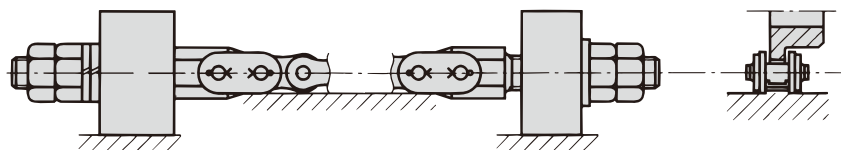
5.1 Characteristics of pin gears

- 1) Economical at large speed ratios (1:5 or larger), especially when the drum has a large diameter.
 - 2) Roller chain attachments are bolted onto the drum for easy installation and maintenance.
 - 3) Design freedom in drum diameter, linear length, etc.
 - 4) Rough installation accuracy and no precision machining required for gears.
 - 5) Grease lubrication can be used.
- ▲ A pin gear is not suitable for ultra precise drives, and the noise level is high compared to gears.

5.2 Chain installation and precautions

- 1) When used linearly (rack) with rollers facing up:

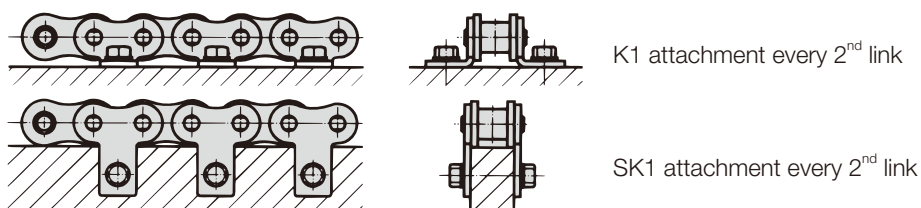
- Use standard roller chain.



Connecting links are used on both ends, and fittings are attached and bolts and nuts are fastened to remove any slack. (Both ends need to be secured snugly with double nuts.) Note: This is not recommended as tooth slipping and interference can occur.

Note: Do not use a rail for the rollers, as the teeth of the pin gear sprocket may interfere with the rail.

- Use an attachment roller chain.



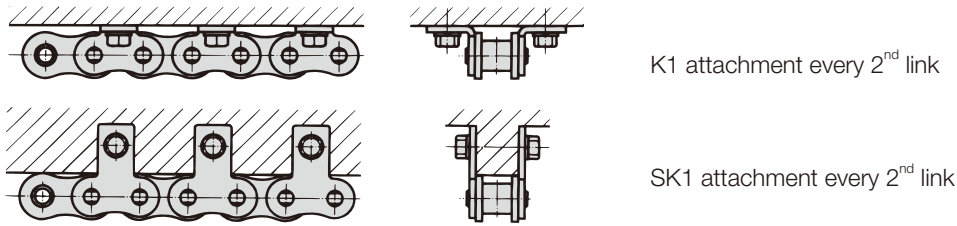
Attach K1 or SK1 attachments every 2nd link and fasten with bolts and nuts every 2nd or 4th link with chain pulled taut so there is no slack or meandering. (K attachments are recommended.) The attachment holes are usually processed on-site.

Note: Do not use a rail for the rollers when using SK1 attachments, as the teeth of the pin gear sprocket may interfere with the rail.

Use bolts with a strength class 8.8 or higher (JIS1051-2000, tensile strength 800 N/mm² or higher). (SCM435 heat treated bolts, etc.)

- The length of the chain should be the travel distance plus α .
- α : The distance of overrun based on usage conditions.

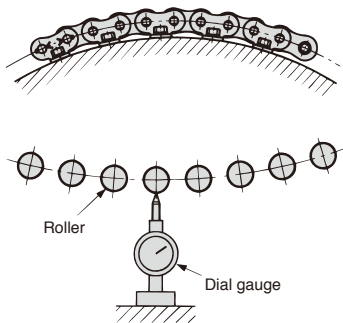
2) When used linearly (rack) with rollers facing down:



Attach K1 or SK1 attachments every 2nd link and fasten with bolts and nuts every 2nd or 4th link with chain pulled taut so there is no slack or meandering.

Note: When using SK1 attachments, be sure the rack touches the link plate, as the pin gear sprocket may interfere with the rail.

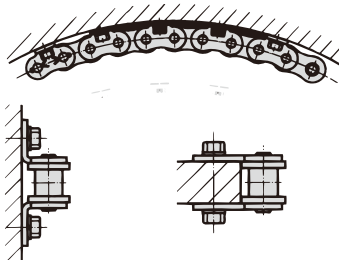
3) When wrapped partially or totally around the outside of a drum:



- Attachment chain length is in the range of -0.05 to 0.15% of standard length (nominal pitch x number of links). When the chain is wrapped around a drum, shims need to be used between the drum and the chain attachments to eliminate slack.
- Since K attachments can be adjusted with shims, they can be attached onto the drum more easily than SK attachments.
- When the drum is not perfectly round, the thickness of the shims needs to be adjusted while the chain is wrapped around the drum so the radius is circular. As shown below, a dial gauge or a surface gauge can be used for adjustment.
- Process tap holes to fit the holes of the chain attachments.

4) When wrapped partially or totally around the inside of a drum:

- Contact a Tsubaki representative.



5) When used for lateral wrapping (horizontal drive)

- See section 3).
- Contact a Tsubaki representative for internal fits.

6) Sprocket attachment

- Adjust the shaft of the sprocket so that the sprocket engages the chain straight.
- Note: Curved chains do not contact the sprocket straight on and are not suitable for use with pin gears.
- The clearance (α) between the rollers and the bottom of the sprocket teeth should be less than the dimensions shown in the following table. The bottom of the teeth and rollers should not touch each other.

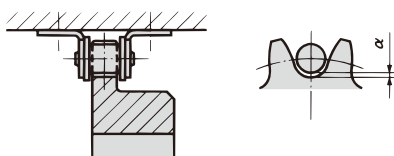


Table 6

Chain size	α
RS80 or less	1.0mm
RS100 to RS180	1.5mm
RS200 or more	2.0mm

- When the bottom of the teeth and rollers touch each other in the clearance described above, the tooth form needs to be pre-designed with larger clearance α . Contact a Tsubaki representative for details.

6. Chain Test Run

After installing the chain, carry out a test run and check the following items before you actually start running the chain.

6.1 Pre-test Run

- 1) Connecting link plates, clips, and cotter pins are installed correctly.
- 2) Chain slack has been properly adjusted.
- 3) Adequate lubrication is available.
- 4) The chain is not touching the chain case.
- 5) The roller chain path is clean and free from obstructions.

6.2 Test Run

- 1) There should be no strange noises. Make sure the chain does not touch the case.
- 2) Look for excessive chain vibration.
- 3) Make sure the chain does not run up on the sprockets.
- 4) Ensure that the chain is not jammed into the sprockets.
- 5) The chain should articulate smoothly.

Check the inspection checklist if there are any problems, and ensure roller chain and sprocket are correctly installed.

7. Roller Chain Inspection

- 1) In general, roller chain life is said to be reached when parts are damaged or when 1.5% wear elongation occurs. See 6) in 7.3. Try to replace the chain before these conditions occur.
- 2) If roller chain selection and operating conditions are suitable, you can expect rather long life with no unexpected trouble from the chain. However, wear will progress between the pins and bushes after long periods. The following should be noted and inspected.

7.1 Inspection Checklist (Table 7)

Procedures	Method	Inspection items	Reference page for details
Step I	Visually check the chain during operation and look for any abnormalities.	1. There should be no strange noises. 2. Look for excessive chain vibration. 3. Make sure the chain does not run up on the sprockets. 4. The chain is not jammed into the sprockets. 5. There are no stiff areas during articulation. 6. Adequate lubrication is available (lubricating system and quantity of oil). 7. Make sure the chain doesn't touch the case.	Inspection points are on the following pages and on the troubleshooting pages.
Step II	Stop the chain and carefully inspect each part of the chain and sprocket.	1. Check the external cleanliness, corrosion, and lubrication conditions; also, look for scratches or other damage to the plate side and edge surfaces, pin edges, and roller surfaces. 2. Inspect for pin rotation and inspect the clearance between plates and pins. 3. Inspect the sprocket teeth surfaces and teeth side surfaces for scratches or marks. 4. Measure the wear elongation of the chain. 5. Check the articulation of the chain and rotation of the rollers. 6. When using an end fitting for lifting applications, inspect the wear of the end bolts and the wear of the connecting plate pins. Also, check for proper installation at the same time.	
Step III	In order to investigate in more detail, remove the roller chain and inspect it visually or check it with measuring instruments.	1. The inspection items are identical to those in Step II except in more detail.	

To prevent accidents

- 1) When replacing an existing chain with a new roller chain, there are numerous roller chains that have the same look and size but will have different levels of performance and specifications. When replacing roller chain, always contact your original equipment manufacturer and confirm which chain to use.
- 2) Always conduct preventive maintenance on your equipment to ensure safe, long-term use. Create a maintenance and inspection manual for roller chains used in drive and hanging applications, sprockets, and other related components.
- 3) When there are regulatory requirements and industry practices regarding inspection and maintenance, as well as guidelines and use, allow these to take precedence first insofar as they are safer.

7.2 Inspection intervals

Regular inspection of roller chain is recommended at one month intervals. Inspection should be carried out at shorter intervals in:

- 1) Special or corrosive environments.
- 2) High speeds with sudden stoppage.
- 3) Lifting or indexing operations.

7.3 Inspection requirements for ordinary transmission

1) Inspection lubrication conditions

- ① During operation, check to see if there is lubrication in the clearance between the outer plate and inner plate. Also, check if the chain or rotating disc is immersed in lubricating oil.
- ② When the chain is stationary, the chain surface will generally appear dirty from wear dust if lubrication is unsatisfactory. This is especially the case between the link plates.
- When the chain is removed, connecting link pins and the
- ③ edge of the inside of the bushes should be checked. If there are any scratches, or red or reddish-brown coloration, lubrication is improper or insufficient.

2) Inspecting link plates

- ① If repeat loads over the maximum allowable load are put on the chain, there is a strong possibility of fatigue breakage of the link plates. It is difficult to notice initial cracking from fatigue breakage simply from external observation.
- ② Usually, a crack develops at the edge of a hole or at the side of the link plate, as shown in the illustrations below. The presence of cracks should be checked carefully. Fatigue breakage progresses little by little, so it can be noticed with close attention.

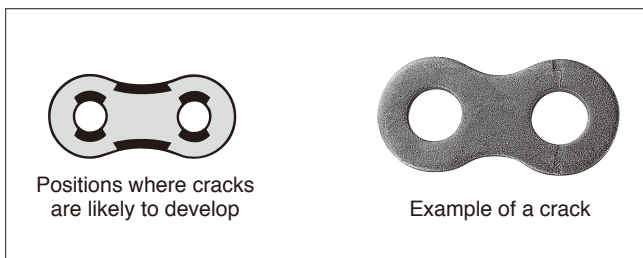


Fig. 40 Cracks on the link plates

- ③ When wear occurs from sliding between the edges of the plates and the guides, it is necessary to adjust the position of either the chain or the guides. The allowable wear on the link plates is limited to 5% of their height.

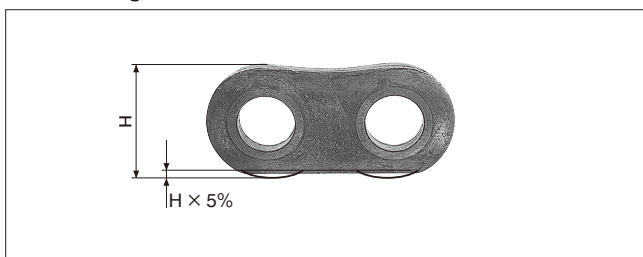


Fig. 41 Wear on the edges of the link plates

3) Inspecting Pins

When the pins rotate, the roller chain must be completely replaced with new chain. This also applies to the connecting pins. By removing the connecting parts it is possible to see the conditions of wear and rust on the surfaces of the pins.

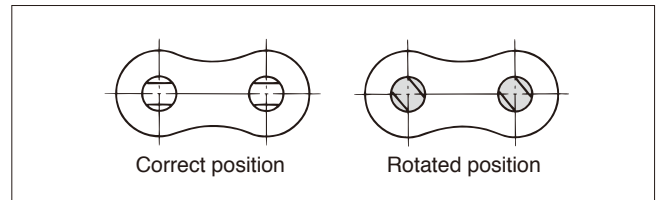


Fig. 42 Rotation of the pins

4) Inspecting rollers

- ① As with the link plates, if rollers are also subjected to loads over the maximum allowable load, the repeated impact load between the chain and the sprockets may cause fatigue breakage to occur. The roller should be checked in the same way as the link plate.
- ② If foreign objects interfere with the engagement of the roller and sprocket, the roller may be damaged and a crack may develop. Careful attention should be paid to the above. Furthermore, with high-speed operations, even if foreign objects do not interfere with engagement, cracks may appear from the impact with the sprocket teeth.

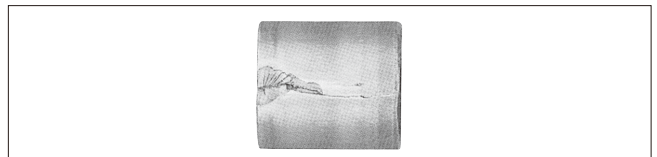


Fig. 43 Cracks on the rollers

- ③ Chains damaged by fatigue breakage from the rollers must be completely replaced, as each part has received the same amount of repeated load.
- ④ Also check for poor roller rotation.

5) Inspecting sprockets

- ① Chain and sprocket engagement can be checked by observing the roller and teeth surface. Proper engagement is when the contact area is uniform with point A in the illustration. If the contact area is lopsided or the sides of the teeth are wearing away (point B), this may have been caused from improper installation of the sprockets or twisting of the roller chain. In this case, rechecking/readjustment is necessary.
- ② The normal point of impact is slightly up from the tooth root. However, when initial tension is applied to the chain and tension remains on the slack side, the roller will slightly touch the tooth root. However, point A receives the strongest impact.

- ③ When idlers or tensioners are used, the contact area will be the center of the tooth root.

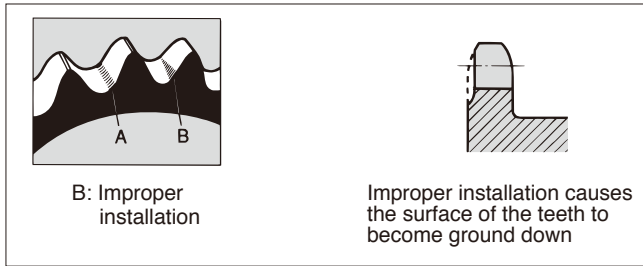
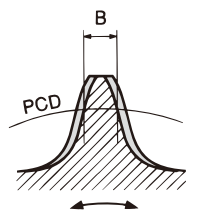


Fig. 44 Contact area of the sprocket teeth

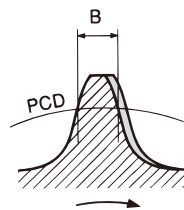
- ④ When wear on the teeth reaches the values in the following table, the lifespan of the sprocket has been reached. For a sprocket with induction hardened teeth, the lifespan is reached when the hardened layer has been removed.

Limit of usage based on tooth thickness/Dimension B (Table 8)

Size of RS Roller Chain	Dimension B		Size of BS Roller Chain	Dimension B Normal
	Normal	Pin-Gear		
RS 11-SS-1	0.6	—	RF06B-1	1.6
◇ 15-1	1.1	—	RS08B-1	2.1
◇ 25-1	1.5	—	◇ 10B-1	2.9
◇ 35-1	2.5	—	◇ 12B-1	3.6
◇ 41-1	2.6	—	◇ 16B-1	5.0
◇ 40-1	2.5	3.1	◇ 20B-1	6.8
◇ 50-1	2.9	3.6	◇ 24B-1	7.2
◇ 60-1	3.7	4.6	◇ 28B-1	8.6
◇ 80-1	5.0	6.3	◇ 32B-1	11.9
◇ 100-1	6.9	8.6	◇ 40B-1	12.7
◇ 120-1	8.7	10.9		
◇ 140-1	10.6	13.3		
◇ 160-1	12.4	15.5		
◇ 180-1	11.3	14.1		
◇ 200-1	12.6	15.8		
◇ 240-1	15.1	18.9		
RF320-T-1	19.9	24.9		
RF400-T-1	24.9	31.2		



Forward and reverse



One direction

- ⑤ If a new roller chain is run on a worn sprocket, the chain will wear at a faster rate than normal. In this case, when replacing the chain, replacement of the sprocket is also recommended.

6) Inspection of chain elongation

- ① Chain elongation is caused not by deformation of the link plate, but by wear on the pin and bush. Therefore, the remaining chain life can be estimated by periodically measuring the chain elongation.

Measuring chain elongation

- ②
- (1) The chain should be measured whilst stretching it slightly to eliminate any slack.
 - (2) Measure the distance of the inside (L1) and outside (L2) of the rollers at both ends of the measured links using a vernier caliper to get measurement (L).

$$L = \frac{L_1 + L_2}{2}$$

- (3) When measuring, use at least 6 to 10 links to help keep any measuring error down to a minimum.

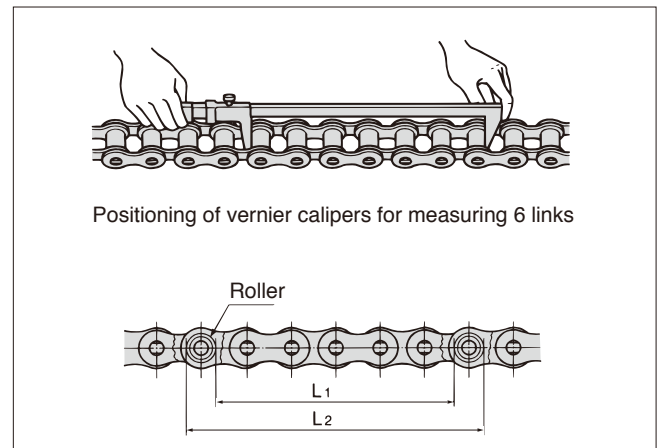


Fig. 45 Measuring length

- (4) Finding chain elongation

$$\text{Chain elongation (\%)} = \frac{\text{Measured length} - \text{Standard length}}{\text{Standard length}} \times 100$$

$$\text{Standard length} = \text{Chain pitch} \times \text{Number of links}$$

- (5) For multi-strand roller chain, the measurement is carried out in the same way as for single strand roller chain of the same pitch.
- (6) The limit of usage based on roller chain elongation for a smooth transmission is as follows.

Limit of usage based on elongation (table 9)

Large sprocket with up to 60 teeth	Chain elongation 1.5%
Large sprocket with between 61 - 80 teeth	Chain elongation 1.2%
Large sprocket with between 81 - 100 teeth	Chain elongation 1.0%
Large sprocket with between 101 - 110 teeth	Chain elongation 0.8%

- (7) Dimensions for evaluating standard length (chain pitch x number of links) and 1.5% elongation are shown in Table 10 below.
- (8) When the length of the roller chain cannot be measured with calipers, a tape measure may be used; however, measurements need to be taken over as many links as possible to reduce measuring error.
- (9) When chain elongation of Lambda/X-Lambda Roller Chain reaches about 0.5% it may be losing its lubricating properties. This may be determined by the adhesion of red wear particles between the plates and the occurrence of articulation stiffness. When this occurs, the life of the chain has been reached.

Standard Length and 1.5% Elongation (Table 10)

Chain No.		RS25	RS35	RS41	RS40
6 links measured	Standard length	38.10	57.15	76.20	76.20
	1.5% elongation	38.67	58.01	77.34	77.34
10 links measured	Standard length	63.50	95.25	127.00	127.00
	1.5% elongation	64.45	96.68	128.91	128.91

Chain No.		RS50	RS60	RS80	RS100
6 links measured	Standard length	95.25	114.30	152.40	190.50
	1.5% elongation	96.68	116.01	154.69	193.36
10 links measured	Standard length	158.75	190.50	254.00	317.50
	1.5% elongation	161.13	193.36	257.81	322.26

Chain No.		RS120	RS140	RS160	RS180
6 links measured	Standard length	228.60	266.70	304.80	342.90
	1.5% elongation	232.03	270.70	309.37	348.04
10 links measured	Standard length	381.00	444.50	508.00	571.50
	1.5% elongation	386.72	451.17	515.62	580.07

Chain No.		RS200	RS240
6 links measured	Standard length	381.00	457.20
	1.5% elongation	386.72	464.06
10 links measured	Standard length	635.00	762.00
	1.5% elongation	644.53	773.43

- 4) Inspect for twisting and side bending of the roller chain. If partial twisting or side bending of the chain occurs, the complete roller chain should be replaced. (Fig. 46)

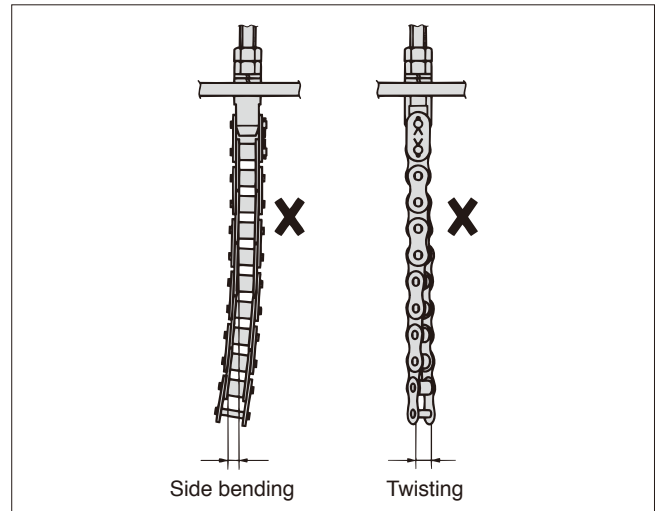


Fig. 46 Twisting of the roller chain

- 5) End fittings

Check for damage by deformation of the hole due to wear. If the hole is damaged or deformed, replace the end bracket immediately. The clearance on the pinhole of the bracket affects the life of the roller chain and should be kept to a minimum

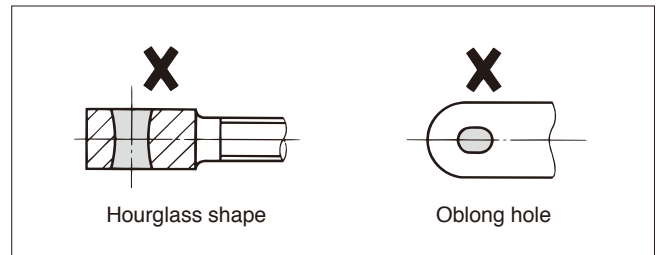


Fig. 47 Wear on the end fitting hole

7.4 Inspection of lifting and shuttle traction

- 1) This should be carried out with the same requirements as for ordinary transmission shown in item 6.3.
- 2) It is important to check the lubrication of the connecting parts between the roller chain and end brackets where end brackets are installed, as well as the parts where the roller chain winds around the sprocket. (Refer to item 3.2 on page 192.)
- 3) The parts where the roller chain bends around the sprocket should be checked when inspecting the wear elongation of the roller chain.

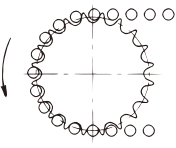
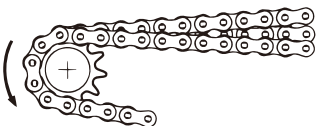
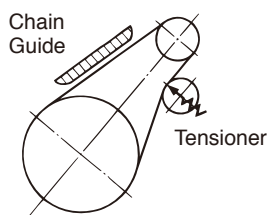
7.5 Storage

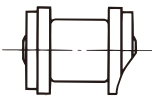
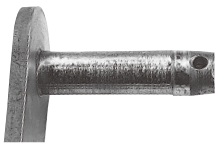
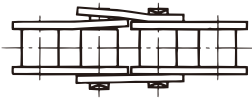
Avoid storing spare parts, such as roller chains, sprockets, and end brackets, in high temperature/high humidity and dusty environments. Also, when storing roller chain that has been removed, wash the roller chain and then apply lubrication. After the roller chain clearances have been supplied with a sufficient amount of lubricant, wrap the chain in grease paper completely before storing away.

5. Troubleshooting

When there is significant damage and breakage to the roller chain and sprockets, please carry out the following remedies and replace with new chain and sprockets as necessary.

1. General

Problem	Possible Causes	Solution
 Chain is riding up on the sprocket.	The roller chain and sprocket do not match.	Replace the chain or sprocket with the correct size.
	Excessive load.	Decrease the load, or increase the number of strands or size of the chain.
	Elongation of the chain due to wear or excessively worn sprocket teeth.	Replace with new chain and sprockets.
Unusual noises.	Improper installation of the sprocket or shaft.	Inspect and correct.
	Chain casing or bearings are loose.	Tighten all bolts and nuts.
	Excessive or insufficient slack in the chain.	Adjust the distance between shafts to obtain the proper amount of slack.
	Excessively worn chain or sprocket.	Replace the chain and sprocket with new chain and sprocket.
	Lack of or unsuitable lubrication.	Provide proper lubrication according to the operating conditions.
 Excessive vibrations in chain.	Chain is resonating with periodic external force.	Change the chain's mode of vibration. 1. Preventing resonance. a. Change the natural frequency of the chain. - Alter the effective tension either by applying an initial tension or adjusting the existing one. - Install a tensioner to change the chain span. - Replace the chain. Choose a different mass and spring coefficient. b. Change the vibration frequency. - Change the speed of rotation of the sprocket. - Re-evaluate the device set-up. 2. Mechanically reducing the vibrations. - Install a guide shoe. - Install a self-adjusting tensioner on the slack side. 
	Load fluctuations are excessively large.	Reduce fluctuations with a fluid coupling or similar technique.
 The chain winds onto the sprocket. (Poor separation from the sprocket teeth)	Span between shafts is too large.	Install an idler.
	Excessive slack in chain.	Adjust the chain length or distance between shafts. Install a tensioner.
	Elongation of the chain due to chain wear or excessively worn sprocket teeth.	Replace with new chain and sprocket.

Problem	Possible Causes	Solution
Rusting of the chain.	Improper lubrication or poor environment.	Replace chain and protect it from the environment with chain casing or proper lubrication.
Excessive wear on the inside surface of the link plates and sides of the sprocket teeth.	Improper installation. 	Correct sprocket and shaft installation.
Excessive wear on the link plate side surfaces and pin heads.	Improper installation of guides, etc. 	Check the condition of the guides, and increase the gap between the guides and the chain.
 Improper flex or bending of chain, tight joints.	Chain is not installed correctly.	Inspect the installation and correct as necessary.
	Contamination from wear debris or dirt because of improper lubrication.	Remove the chain, clean it thoroughly, and provide proper lubrication.
	Excessive load, pin bending, or bush cracking.	Reduce the load or increase the number of or size of chains. Replace chain with a larger size.
	Corrosion or rusting.	Install a chain casing to protect the chain.
	Seizing from improper lubrication.	Provide proper lubrication according to the operating conditions.
	Seizing of pin and bush.  Pins and bushes may seize due to high speed operation, causing poor articulation and leading to chain breakage.	Provide the proper operating conditions.
Spreading of link plates.	Uneven or excessive loading caused by improper installation. 	Replace with new chain and correct installation.

2. Link Plate Related

Problem	Possible Causes	Solution
Breakage of link plate.	Excessively large shock load.	Reduce shock loads by making the start-up, stopping, and other actions smoother (installing a shock absorber, etc.). Increase the size or number of chains.
	Vibration in the chain.	Install an anti-vibration device (for example, a tensioner or idler). Refer to the section on excessive chain vibration.
	Large inertia in the driven machine. (excessive load)	Increase the size or number of chains.
	Corrosion.	Replace with a new chain. Install a casing to protect the chain. Periodically clean the chain.



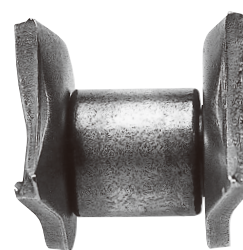
① Static fracture

Pulling the link plate with a tensile load beyond its breaking load will cause it to stretch and then break.



② Fatigue fracture

By repeatedly applying a load past its fatigue limit (fatigue strength), the fatigue will start at holes and then cause sudden chain breakage.



③ Offset link plate fatigue

Offset link plates are bent at the center, and the resulting concentration of stress at the bend can cause a fatigue break. Avoid using offset links in high-stress applications.

Crackes in the link plates (fatigue), which are perpendicular to the direction of pull.	Load is are greater than the allowable load.	Remove all large or excessive repeat loads. Otherwise, increase the size or number of chains. Replace with a new chain.
Deformation of link plate holes. 	Excessive load.	Remove the cause of the excessive load. Replace with a new chain.
Corrosion stress cracks appear, usually as bow-shaped cracks in the link plate. 	The chain is being used in an acidic or alkaline enviroment. (This is not caused by a repetitive load.)	• Replace with a new chain. Install a casing to protect the chain from the environment. • Consider a chain with a high resistance to corrosion stress cracks. (Please contact a Tsubaki representative.)

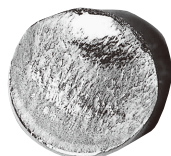
3. Pin Related

Problem	Possible Causes	Solution
Breakage of pin.	Large shock loads.	Reduce shock loads by making the start-up, stopping, and other actions smoother.
	Subject to a repetitive load greater than the fatigue limit of the pin.	Remove the large repetitive load. Otherwise, increase the size or number of chains.
	Corrosion.	Install a casing to protect the chain. Periodically clean and lubricate the chains.



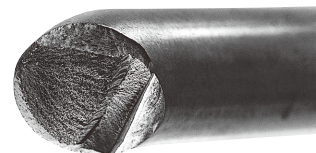
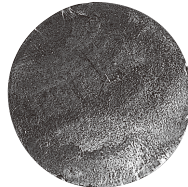
① Static fracture

The type of fracture found when subjecting the chain to the breakage test. Occurs when chain is subjected to a load greater than its breakage strength.



② Fatigue fracture

Occurs when the pin is repetitively subjected to loads greater than its fatigue limit. Re-check the size of the peak load and formulate a countermeasure.



③ Shock-induced bending fracture

The pin is subjected to a large shock load and breaks. The side with the initiating point receives tensile load, and the fracture progresses from this point. A pin is especially susceptible to becoming weak with regard to bending when the surface of the pin has corroded. This type of phenomenon occurs quite easily.

Pin rotates or begins to stick out.	Excessive load or improper lubrication.	Replace with new chain. Improve the lubrication or loading conditions.
 Normal	Operating a chain at high load without proper lubrication can create friction between the pin and bush, causing the pin to rotate. In this situation, the pin may come out, leading to chain breakage.	Replace with new chain immediately. Do not weld or reuse the pins. (Dispose of the old chain to be sure that it is not used again by mistake.) Also, if the pin head or link plate surface is worn, check the installation.
Wear or rust occurs only at the connecting pin in a lifting application or similar operation.	Improper initial lubrication during installation.	Replace the connecting link. If pin wear is excessive, replace the chain also. Take special care to properly install the connecting section for devices such as end brackets used for lifting applications, etc.

4. Bush / Roller Related

Problem	Possible Causes	Solution
Roller and/or bush splits (falls off).	Excessive load or speed of rotation.	Choose a different chain according to the kW ratings table.
	Inadequate lubrication.	Replace the chain. Provide adequate lubrication according to the operating conditions.
	 Fatigue fracture. Reached the point of fatigue during operation and eventually broke. Occurs when there is impact with the sprocket teeth at a force exceeding the chain's transmission capacity.	
Roller does not rotate.	RS11-SS-1, RS15-1, RS25-1, RS35-1	A bushed chain and not a roller chain is being used.
	The inner link plate is moving inward, or the bush is cracked.	Replace with a new chain. Re-inspect the installation and load conditions.
	Foreign particles have gotten between the bush and roller.	Periodically clean the chain. Install a casing to protect the chain.
Roller is opening up.	Excessive load. 	Reduce the load. Provide adequate lubrication.
Roller is becoming hourglass shaped.	Excessive load or inadequate lubrication.	Replace with new chain. Improve the lubrication or loading conditions.

2 Small Size Conveyor Chain Maintenance

1. Before Use

Precautions Before Use

Be sure to read this entire Small Size Conveyor Chain catalog to make the proper chain selection for your application. In addition, be sure to indicate the relevant section to the persons who will actually be maintaining the conveyor chain.

The dimensions shown in this catalog are nominal dimensions and may differ from actual dimensions.

Small Size Conveyor Chain is a convenient, compact mechanical device that can transport goods and materials while taking up a minimal amount of space. However, it does not have an unlimited service life.



1. Conveyor chain must be inspected on a regular basis and replaced as necessary. It is subject to wear and should be regarded as an expendable item.
2. Elongation resulting from wear may cause conveyor chain to ride up on a sprocket or break. Proper lubrication or the use of a lube free chain such as the Lambda Series can minimize chain elongation and extend service life.
3. Wear between the bushes and the rollers will cause interference between the link plates and guide rails, increasing tension on the chain. This may lead to an increase in motor power consumption, or may cause chain breakage. This situation can be avoided with proper lubrication or by using Lambda Chain or plastic roller chain.
4. Excessive tension may cause chain breakage. This can be avoided through proper selection that anticipates the inertial force the chain will be subject to.
5. Environmental conditions, such as the presence of corrosive liquids or gases, may cause chain breakage. This can be avoided by selecting a chain material appropriate to the usage conditions.
6. Improper centering, or problems with layout or design, can shorten chain life or cause chain breakage. This can be avoided by proper positioning and alignment.
7. Wear on chain parts will generate debris (wear debris).
8. When restrictions by law or guidelines exist in selecting chain, select the chain based on those laws and guidelines, and on allowable tension. Choose a chain with an ample margin.
9. When link plate holes are enlarged or pin diameters made smaller to make it easier to insert and remove the pin, chain performance may decrease and cause accidents.

Features and Important Points of Conveyor Chains

Features

1. Can move conveyed goods or materials with almost any shape or form.
2. Wide operational range, including conveyor length, transport direction, usage environment, etc.
3. Can reliably convey goods or materials with no slippage.
4. Highly durable, highly efficient.

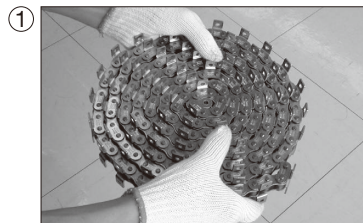
Important Points

1. No slippage is a strong advantage of conveyor chain, but consideration must be given in selection when impact resistance is considered.
2. The mechanical nature of the chain engaging the sprocket will cause speed variations.

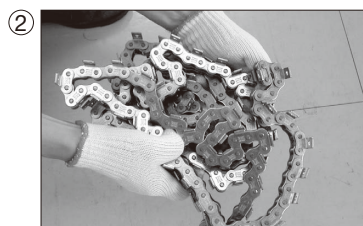
Handling Precautions

1. Mishandling the chain may cause a loss of accuracy. Never handle the chain as shown in the photographs to the right.
2. Rough handling such as throwing or dropping the chain will cause twisting deformation and/or a loss of accuracy.
3. Stainless steel chain, in particular, must be handled with care.

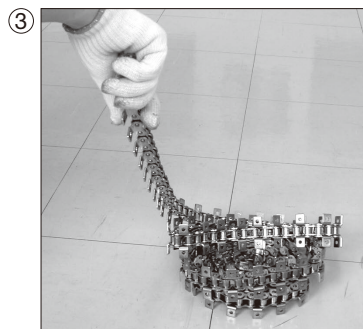
Chain Handling



Hold the chain so that it does not become tangled or twisted.



Handling the chain in such a way that it becomes tangled or looped around itself will cause it to become twisted and lead to a loss of accuracy.

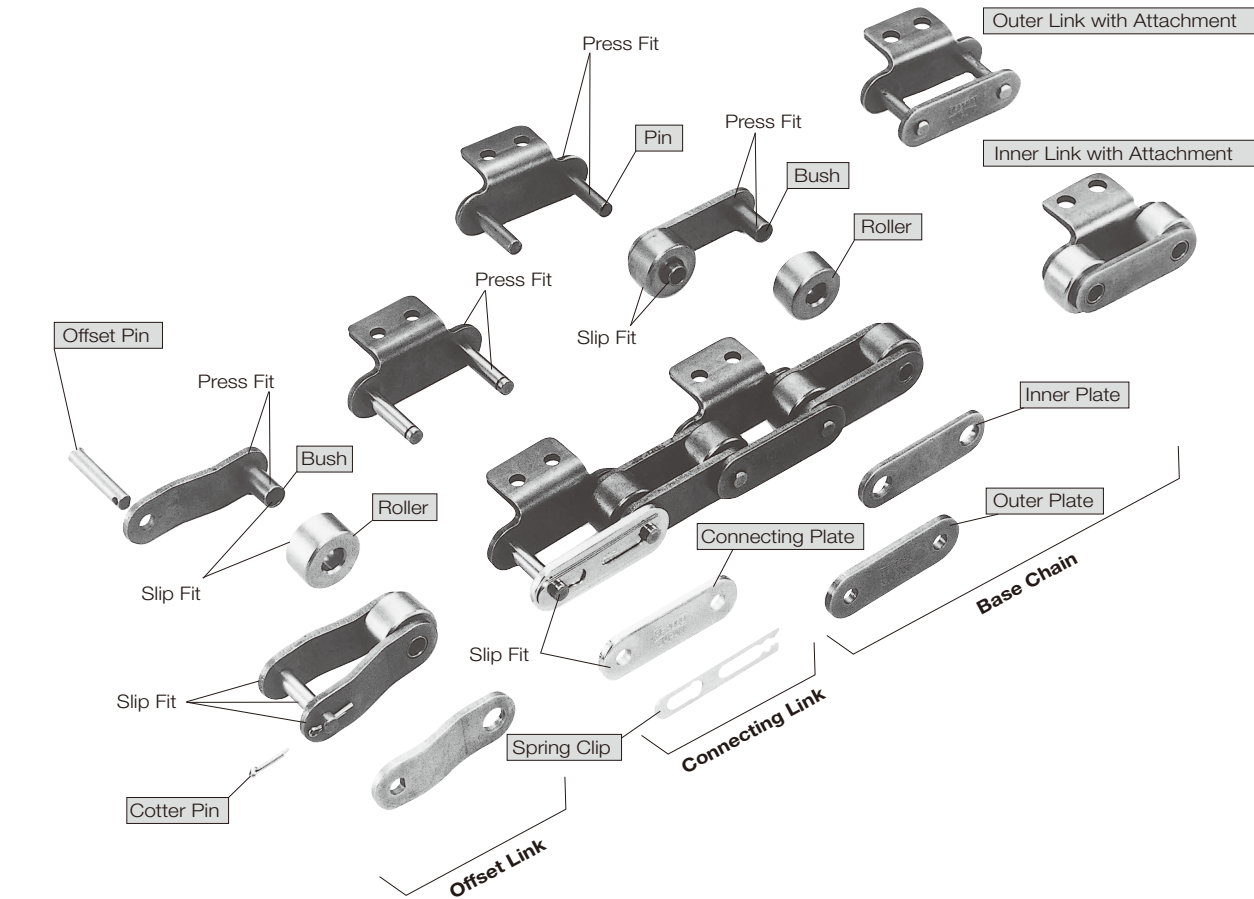


Applying excessive load in the direction that the chain is twisted will cause torsion and lead to a loss of accuracy.

2. Small Size Conveyor Chain Construction

Double Pitch Chain Construction

- Double Pitch Roller Chain has the same basic construction as standard roller chain, but chain pitch is twice as long, and the chain has flat-shaped link plates with longer attachments.
- R rollers and S rollers are available, with usage depending on application. (See “Roller Type” on page 31.)
- Can be used with double pitch sprockets or RS Roller Chain sprockets (with S rollers, when the number of sprocket teeth is 30 or more).
- Ideal for applications where the conveying distance is relatively long or the speed is low.



1. Plate

The plate bears the tension placed on the chain. Because the accuracy of the holes into which pins or bushes are fit affects chain quality, plates are manufactured with particular precision and finished into tough plates with high fatigue strength and impact resistance.



2. Pin

The two ends of the pin are inserted into holes in the outer plates and riveted in place. For Hollow Pin Chain and Poly Steel Chain, they are inserted only. Because the pins are subject to shearing and bending forces via the plates, and because the bushes rotate and slide along the pins as the chain articulates, they are manufactured with an emphasis on strength and wear resistance.



3. Bush

The two ends of the bushes are inserted into the inner plate and function as bearings for the pins and rollers. They are subject to complex forces through the various parts, and are finished to specifications having high wear resistance.



4. Roller

Rollers are slip fit onto the bushes, and lighten mechanical shock when the chain engages the sprocket. In addition, they serve to reduce running resistance by turning while the chain is in motion, making the chain run smoothly. Wear resistance is important.

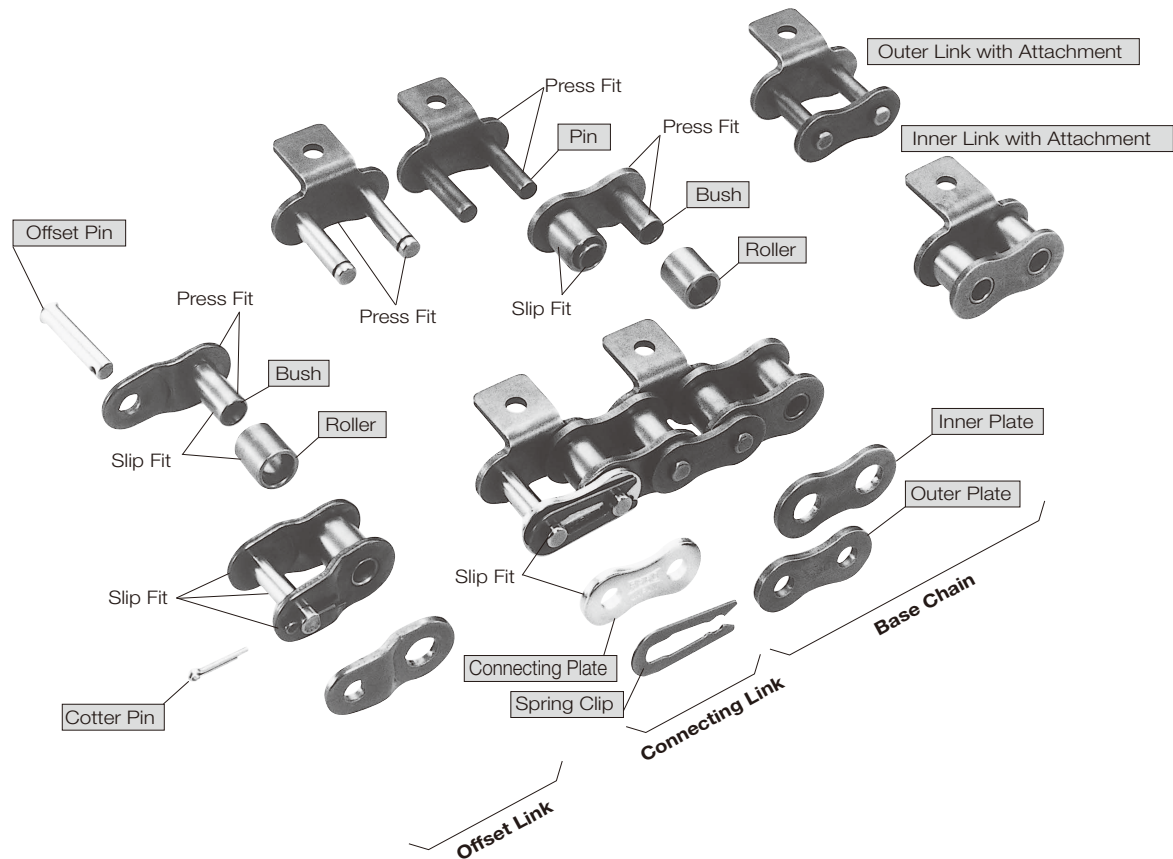


5. Attachment

Bolt holes are drilled for attachments. (For details, see page 32: “Standard Attachments”.)

RS® Attachment Chain Construction

- This chain is a standard RS Roller Chain with added attachments.
- Because the chain pitch is smaller, it can transport small objects using a small pitch, and is ideal for general applications where conveying distance is short.
- Runs quietly, smoothly and can travel at high speeds.
- RS Roller Chain sprockets can be used in almost all cases.



6. Spring Clip/Cotter Pin



Spring clips and cotter pins prevent the connecting plates from detaching and are important components to maintain the intrinsic strength of the chain. Always install these parts.

7. Inner Link



The ends of the two bushes are inserted into the inner plate to form the inner link. Rollers are slip fit over the outside of the bushes.

8. Outer Link



The ends of the two pins are inserted into the outer plate. The ends of the pins other than those on the connecting links are riveted in place to prevent detachment. For Hollow Pin Chain and Poly Steel Chain, they are inserted only.

The pitch, roller diameter, and inner width of the inner link are considered the basic three dimensions of a roller chain. When these dimensions are identical, a roller chain and sprocket are dimensionally compatible.

Note:

Slip Fit

When the shafts and holes are fitted together, there is a continuous loose fit. This is a fit where the range of tolerance for the hole is larger than the range of tolerance for the shaft (pin or bush).

Press Fit

When the shafts and holes are fitted together, there is a continuous interferential fit. This is a fit where the range of tolerance for the hole is smaller than the range of tolerance for the shaft (pin or bush).

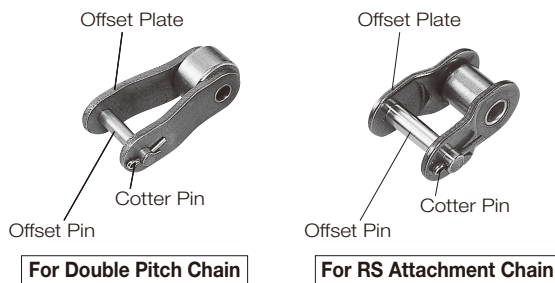
Connecting Parts

1. Connecting Links (symbol: JL)

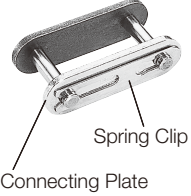
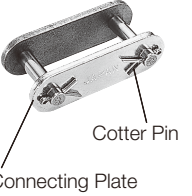
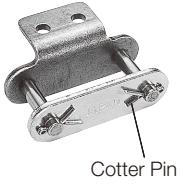
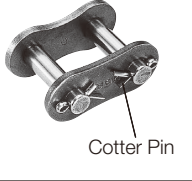
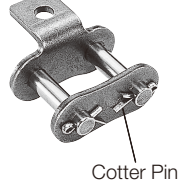
- 1) A chain normally consists of multiple interconnected links and so requires a connecting link. Connecting links are available with attachments or without attachments.
- 2) Connecting links are available with either spring clips or cotter pins to prevent the connecting plate from detaching. See chart at right.

2. Offset Links (symbol: OL)

- 1) An offset link is used when a strand of chain has an odd number of links.
- 2) Attachment offset links are not available.



■ Connecting Link Application Table

Form		Clip Type	Cotter Pin Type
Chain Size		RF2060 or Smaller R60 or Smaller	RF2080 or Larger R80 or Larger
Double Pitch	Plain JL		
	Attachment JL		
RS	Plain JL		
	Attachment JL		

Note: NS specifications use a cotter pin on the connecting link regardless of size. Please contact a Tsubaki representative if a clip is needed.

Roller Type

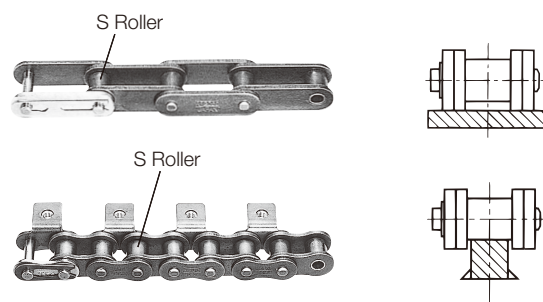
1. R Roller

The roller diameter is larger than the plate height, and the roller is used in Double Pitch Chain. R rollers are the most basic and feature high load carrying capacity and low frictional resistance.



2. S Roller

The roller diameter is smaller than the plate height. Effectively reduces shock and wear when the chain engages the sprocket.



Standard Attachments

1. A1, A2 Attachments

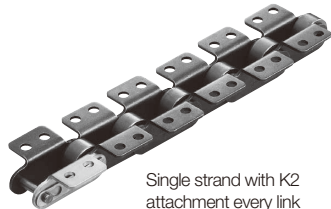
An A attachment has a bent link plate that extends out on one side of the chain, forming an L-shape. The attachment comes with one or two bolt holes and is designated as A1 or A2, respectively (A1 only for RS type).



Single strand with A2 attachment every link

2. K1, K2 Attachments

A K attachment has a bent link plate that extends out on both sides of the chain. The attachment comes with one or two bolt holes and is designated as K1 or K2, respectively (K1 only for RS type).



Single strand with K2 attachment every link

3. SA1, SA2 Attachments

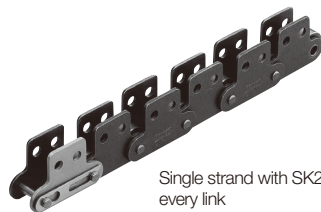
With an SA attachment, the link plate is extended vertically on one side of the chain. The attachment comes with one or two bolt holes and is designated as SA1 or SA2, respectively (SA1 only for RS type).



Single strand with SA2 attachment every link

4. SK1, SK2 Attachments

With an SK attachment, the link plate is extended vertically on both sides of the chain. The attachment comes with one or two bolt holes and is designated as SK1 or SK2, respectively (SK1 only for RS type).



Single strand with SK2 attachment every link

5. GNK1 Attachment

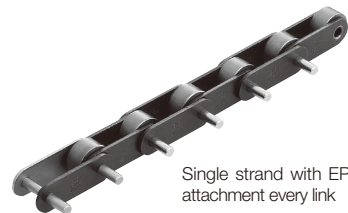
The GNK1 attachment indicates a chain with a bolt hole drilled into the center of the link plates on both sides of the chain. (Available only for S rollers on Double Pitch Chains.)



Single strand with GNK1 attachment every link

6. EP Attachment (Extended Pin)

One end of the pins is extended on one side of the chain.



Single strand with EP attachment every link

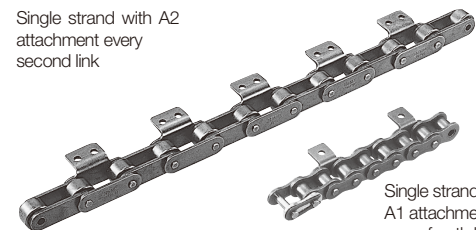
7. Hollow Pin Chain

In Hollow Pin Chain, the pins have a hole, allowing for installation of various attachments.



Chain Formation

Chains can be assembled with an attachment on every link plate or at intervals of two or more links. However, placing an attachment on an outside link at an interval of an even number of links is convenient for maintenance purposes.



Single strand with A2 attachment every second link

Single strand with A1 attachment every fourth link

Special Attachments

Speedy Delivery

TSUBAKI maintains a stock of parts with special dimensions and a proven track record of performance, and can handle stock orders and quick deliveries.

- Speedy delivery service is ideal for situations in which standard dimension products are not an exact fit.
- Lube Free Lambda Chain is also available.
- Please contact a Tsubaki representative regarding delivery.

Stock Designs

TSUBAKI has a portfolio of reliable designs with a track record of success. Selecting from among these designs will lead to better design efficiency for your application as a whole.

3. Engineering Manual

Installation

1. Sprocket Installation

Proper installation of the sprockets is critical to smooth operation of a conveyor, and it also affects chain life. The installation should be properly carried out in accordance with the procedures described below.

- 1) Check the levelness of the shafts with a level.
Adjust to within a tolerance of $\pm \frac{1}{300}$

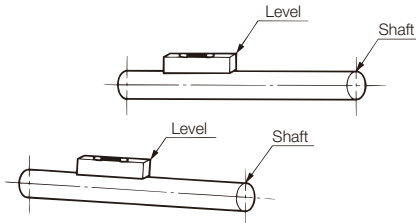


Fig.1 Levelness of Shafts

- 2) Check the parallelism of the shafts with a scale.
Adjust the shafts so that the parallelism as calculated with formula $\frac{A-B}{L}$ is to within $\pm \frac{1}{100}$.

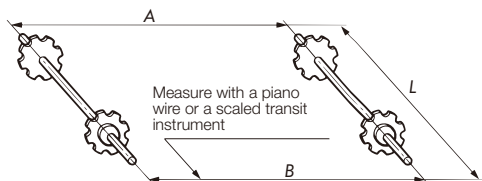


Fig.2 Parallelism of Shafts

- 3) Align the sprocket axis to match.

Tolerance relative to center distance:

Up to 1 m: within 1 mm

1 to 10 m: within $\frac{\text{Distance between shafts (mm)}}{1000}$

10 m or longer: within 10 mm

Measure misalignment with:
 • A straight edge when the distance is short
 • A piano wire when the distance is long
 • A leveling string or a piano wire when the sprocket positions are different from each other in terms of height

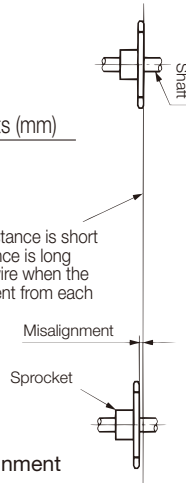


Fig.3 Sprocket Misalignment

- 4) After processes 1) to 3) have been completed, lock each of the sprockets to the shaft(s) by means of keys or Tsubaki POWER-LOCKS. Lock the sprockets that are installed and used on the same shaft so that the teeth of both sprockets align in terms of phase.

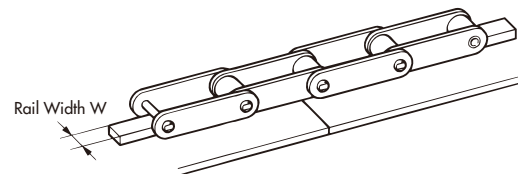
2. Centering

Because the conveyor chain runs on a guide rail, the precision of the guide rail must be especially high and the conveyor properly centered. In cases like vertical bucket elevators where there are no guide rails, if the conveyor is not precisely centered, the chain will wobble and weave. This will have a significant impact on the life of the conveyor chain.

3. Rails

In general, rails wear faster than chain. While it is important that the rail material be matched to the chain material, in general, rolled steel for general structures (SS400) or plastic material (ultra-high molecular weight polyethylene) is recommended.

- 1) Wear is a complex phenomenon and is influenced by a variety of factors, including corrosion, lubrication, load speed, and operating time. Deducing the precise relationship between chain life and rail material is difficult.
- 2) Chain life is influenced by the rail. For new installations, verify the wear state by selecting rail material that is slightly softer than the chain. The smoother the finish on the rail surface, the better.
- 3) Operating conditions must be taken into consideration when selecting materials. In environments involving mechanical impact and other special conditions, there may be cases when plastic should not be used.
- 4) Precautions before putting rails into operation
 1. Lubricate all rail connecting parts, chamfer edges, and eliminate uneven levels and gaps. (See Fig.4)
 2. After welding rail, remove spatter or scale.
 3. During the trial run, run the conveyor unloaded. Lubricate the chain and check the condition of chain and rails.



Rail width W is generally the sprocket tooth width.

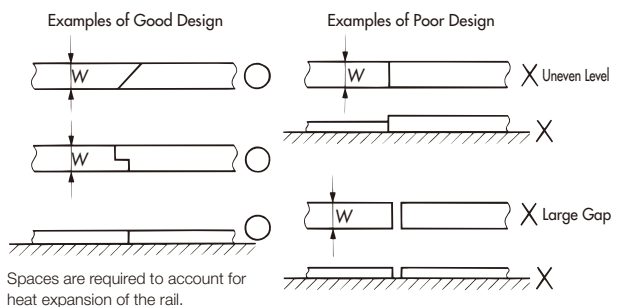


Fig.4 Rail Joints

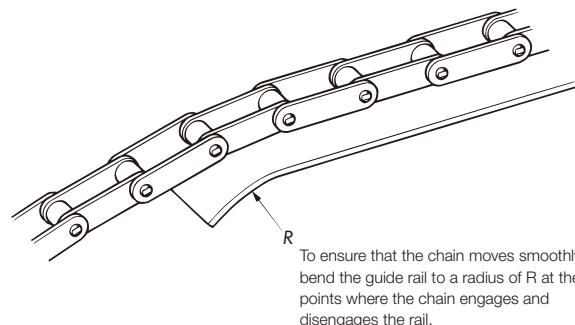


Fig.5 Chain Entrance/Exit from Guide Rail

How to Cut Chain

Attachment chains are generally sold in unit sections (1 unit = 10 ft/3,048 mm). Configuring chain to a specific length will require cutting units.

1. Grind Pin Rivets

Using a grinder, grind down the ends of the two pins on the outer link (on the attachment side) until they are level with the outer plate. Take care that the chain does not overheat (see Fig.6 and 7). Particularly with Lambda Chain, work on the chain slowly so that the oil-impregnated bushes do not become too hot.

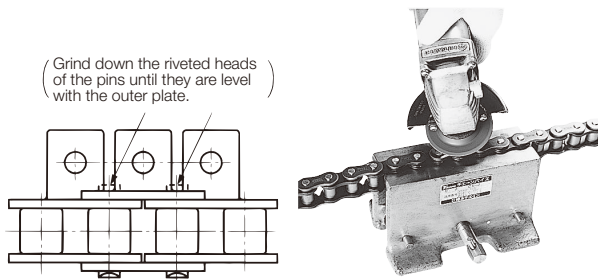


Fig.6 Attachment Chain

Fig.7 Grinding Down Pin Ends

2. Set Chain in a Vise and Cradle

1) S Roller (A, SA, EP, GNK1 attachments)

Place the chain in the jaws of a vise with the attachment side facing up and gently tighten the vise to secure the chain (Fig.8 and 9).

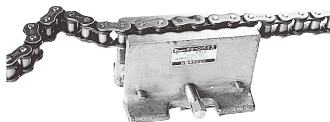


Fig.8 Setting Chain in Chain Vise

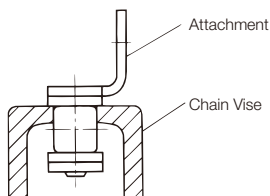


Fig.9 Cross Section of Chain Set in Chain Vise

2) S Roller (K, SK attachments), R Roller (K, SK attachments), Plastic R Roller, Poly Steel Chain (with attachments)

For these types, set the chain in a cradle (Fig.11-1). Another method, used only with steel S rollers (Fig.11-2), is to set the pin to be removed on the edge of the chain vise.

Whichever method is used, support blocks should be placed under the chain on either side of the vise to ensure that the chain remains stable (Fig.10). Any attachment can be cut using this method. However more force will be required to remove the pin as mentioned in "3. Pin Removal" on the next page.

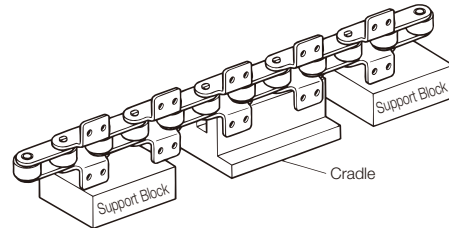


Fig.10 Cradle and Support Blocks

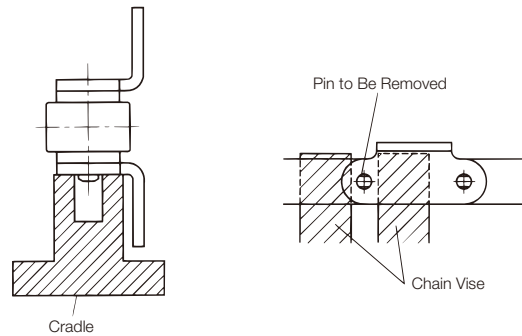


Fig.11-1 Cradle Cross Section

Fig.11-2 Chain Vise Usage

3) R Roller (A, SA, EP attachments)

This method cannot be used with plastic rollers.

Secure the non-attachment side plate of the chain in the vise and support the R rollers on the vise (Fig.13). Ensure that the chain is supported on both sides of the vise (Fig.12).

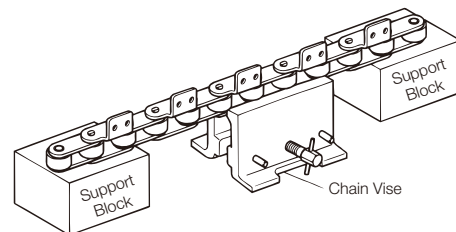


Fig.12 Chain Vise and Support Blocks

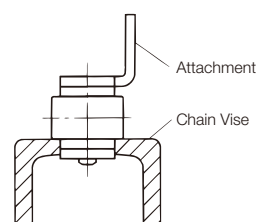


Fig.13 Cross Section of Chain Set in Chain Vise

3. Pin Removal

- 1) Using a primary punch suitable for the chain size (refer to the Tsubaki Drive Chain Accessories section in a separate catalog), place the punch on the head of the pin that was ground down and strike with a hammer. Be sure to strike the pins on the outer link alternately to remove them evenly and at the same time. Strike the pins until they are just about to release from the outer plate (Fig.14).

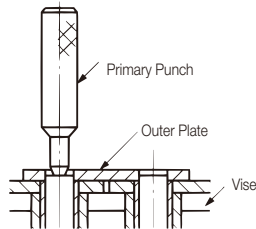


Fig. 14 Tapping Pin with Primary Punch

- 2) Using a secondary punch (refer to the Tsubaki Drive Chain Accessories section in a separate catalog) and a hammer, completely remove the pair of pins from the outer link. Check that the bush of the removed pins has not come loose from the inner plate, and that the bush has not become deformed in the process. If the bush has come loose or is deformed, do not continue to use it.

4. Poly Steel Chain (Without Attachments)

- 1) Place the outer plate of the chain in a cradle, position a special punch on the head of the pin (see photo in Fig.16 below), and lightly strike with a hammer (Fig.15).
- 2) Work carefully, as there is a risk of damage if excessive force is applied to engineering plastic components in this process.

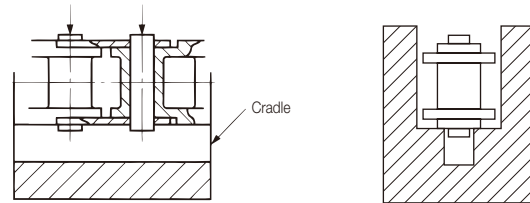


Fig. 15 Cross Section Showing Poly Steel Chain Set in Cradle

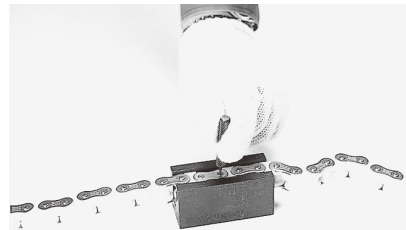


Fig. 16 Disconnecting Poly Steel Chain

Safety Points

1. Use a grinder to grind down only the riveted portion of the pin head. Removing the pin without grinding the riveted head off will require additional time and effort, and may damage the chain.
2. Do not re-use parts removed from the chain.

How to Connect Chain

1. Assembling with a Connecting Link

- 1) Insert the pins of the connecting link into the bushes of the free inner links. Place the free link plate over the pin ends and secure using a spring clip or cotter pins.
- 2) The pins are slip-fit into the connecting plate, meaning the pins can be inserted manually.

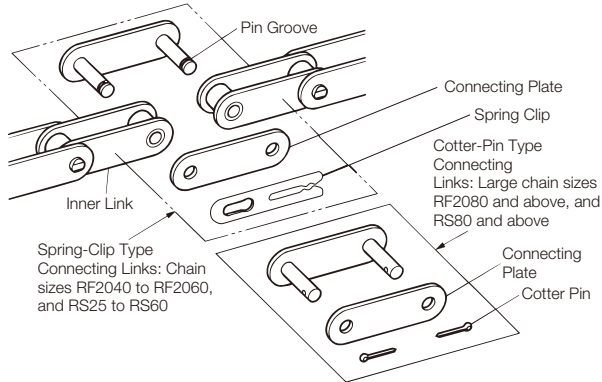


Fig.17 How to Connect Attachment Chain

2. Installing Spring Clips

Check that the spring clip is securely attached. Failure to install the spring clip or improper installation may result in an accident.

- 1) Spring clips are used to secure the connecting link of chain sizes smaller than RF2060 and RS60. Insert the pins of the connecting link into the bushes of the free inner links, place the link plate over the pin ends, and slide the spring clip over the ends of the pins so that the slot and the fingers of the clip engage the grooves securely (Fig.18 and 19).
- 2) Pay careful attention to ensure that the fingers of the spring clip are not spread too wide. If the spring clip does not fit securely, it could become detached without warning, leading to an accident (Fig.19 and 20).

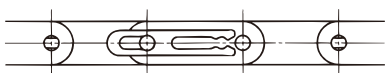


Fig.18 Slide Spring Clip Over Grooves in Pin Ends

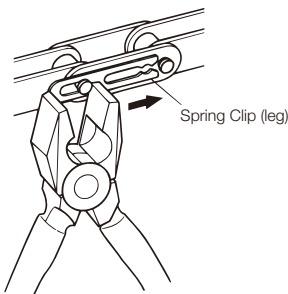


Fig.19 Use a Pair of Pliers to Secure Spring Clip

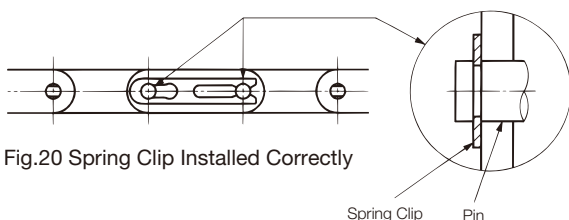


Fig.20 Spring Clip Installed Correctly

- 3) In general, the spring clip should be installed in the direction opposite to chain travel, as shown in the drawing below (Fig.21).

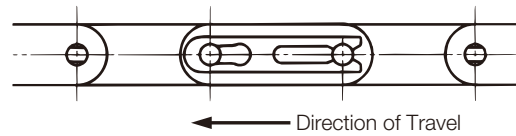


Fig.21 Spring Clip Installation

3. Installing Cotter Pins

Securely install the cotter pins in the holes provided on the ends of the pins. Failure to install the cotter pins or improper installation may result in an accident.

- 1) After the cotter pin has been fully inserted into the hole on the end of the pin, open the legs of the cotter pin to an angle of around 60° (Fig.22). Do not re-use cotter pins. Do not use commercially available cotter pins.

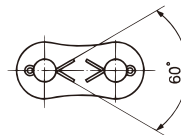


Fig.22 Open Legs of Cotter Pin

- 2) How to Open the Legs of the Cotter Pin

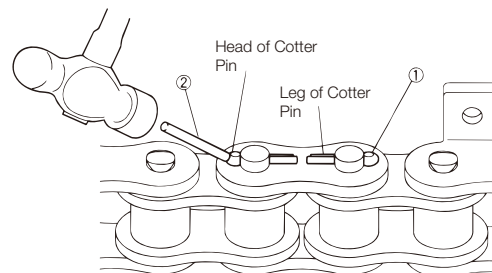


Fig.23

- (1) Insert the cotter pin into the cotter pin hole.
- (2) Use a pin that is somewhat larger in diameter than the cotter pin to lightly tap the head of the cotter pin. The legs of the pin will open slightly.

⊖ Flathead screwdriver

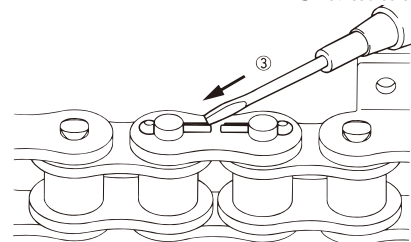


Fig.24

- (3) Insert the blade of a flathead screwdriver at the point where the legs of the cotter pin have opened slightly.

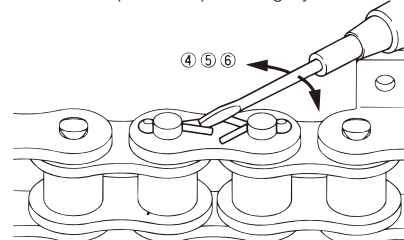


Fig.25

- (4) Insert the blade of the flathead screwdriver at an angle and move the screwdriver back and forth to open the legs of the cotter pin.
- (5) Press down the head of the cotter pin tightly so that the cotter pin will not disengage from the cotter pin hole.
- (6) Bend the cotter pin legs to the 60° angle mentioned above.

⚠ Caution

Perform this operation with extreme care! If the end of the screwdriver slips, it could puncture the hand or cause other injury.

Lubrication

Proper lubrication of roller chain is essential for peak performance and full chain life. In particular, the greater the level of performance demanded of the chain, the more the need for lubrication increases.

- 1) The purpose of lubrication is to reduce wear on chain parts, prevent corrosion (rust), and economize on power demands.
- 2) Lubricate the chain periodically (about once a week) so that the chain always remains damp with oil. Drip lubricate (using lube listed below) or apply lube with a brush.

3) Lubrication locations

Since wear between pins and bushes causes chain elongation, lubrication must be maintained on all contact surfaces. Also, areas where chain parts (plates, etc.) come into contact with guide rails must be lubricated (see Fig. 26).

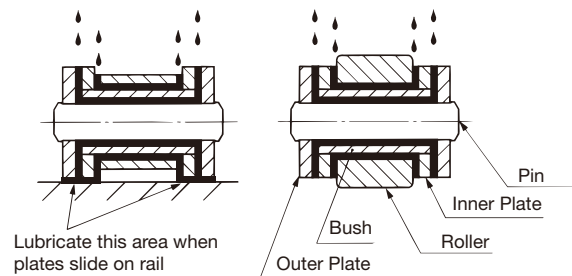


Fig.26 Lubrication points

Lubricants: SAE Numbers (Table 1)

Lubrication Method	Drip or Brush			
Ambient Temperature Tsubaki Chain No.	-10°C to 0°C	0°C to 40°C	40°C to 50°C	50°C to 60°C
RS50 or lower small-pitch chain	SAE10W	SAE20	SAE30	SAE40
RS60/80	SAE20	SAE30	SAE40	SAE50
RS100				
RS120 or higher large-pitch chain	SAE30	SAE40	SAE50	

Commercially Available Lubricants (Table 2)

(As of 10/1/2018)

SAE	SAE10W	SAE20	SAE30	SAE40	SAE50
ISOVG (CST40°C)	32	68	100	150	220
Manufacturer					
Idemitsu Kosan	Daphne Mechanic Oil 32	“ 68	“ 100	“ 150	“ 220
EMG Lubricants	DTE Oil Light	“ Heavy medium	“ Heavy	Vacuoline 528	“ 533
JXTG Energy	Super MUPUS DX32	“ 68	“ 100	“ 150	“ 220
	Eneos FBK Oil RO32	“ 68	“ 100	“ 150	“ 220

Examples of Low and High Temperature Lubricants (Table 3)

The following lubricants can be applied when conveyor chain is used at low or high temperatures.

Use an equivalent if using another brand.

Ambient and Operating Temperature	-50°C to -25°C	-25°C to 0°C	-10°C to 60°C	60°C to 200°C	150°C to 250°C
Manufacturer/ Lubricant	Dow Corning Toray SH510 Shin-Etsu Chemical KF50 Momentive Performance Materials TSF431	Sunoco Suniso 4GS Showa Shell Sekiyu Shell Refrigerator Oil 68K	See above	EMG Lubricants Mobil Vacuoline 546 MORESCO Moresco Hilube L-150	MORESCO Moresco Hilube R-220 Sumico Lubricant Hightemp Oil ES Sato Special Oil Hot Oil No.75

Manufacturer names are listed in no particular order.

Tension Adjustment

The correct amount of chain slack is essential for proper operation of the chain. When the chain is too tight, working parts such as chain, sprocket wheel, shaft, bearings, etc., carry a much heavier load, accelerating chain wear. On the other hand, too much slack is also harmful and causes the chain to ride up on the sprocket teeth.

1. Frequency of Adjustment

The chain has a tendency to stretch a certain amount at the beginning of operation due to slight distortion of its components. After such initial elongation, the chain stretches slightly, but constantly, as a result of normal wear. To maintain proper chain tension, adjustments, if necessary, should be made at regular intervals.

Assuming eight hours of operation a day, the frequency schedule for inspection and adjustment is given in the table below. When working hours are increased, the frequency of adjustment should be increased accordingly. Neglecting careful inspection increases the chances of an accident.

1st week after start of operation	Once a day
2nd to 4th week after start of operation	Twice a week
Thereafter	Twice a month

2. Insufficient Take-Up Adjustment

If there is still excessive slack in the chain even after the take-up adjustment is fully tightened, shorten the chain by removing two links. See page 34, "How to Cut Chain" for the steps involved.

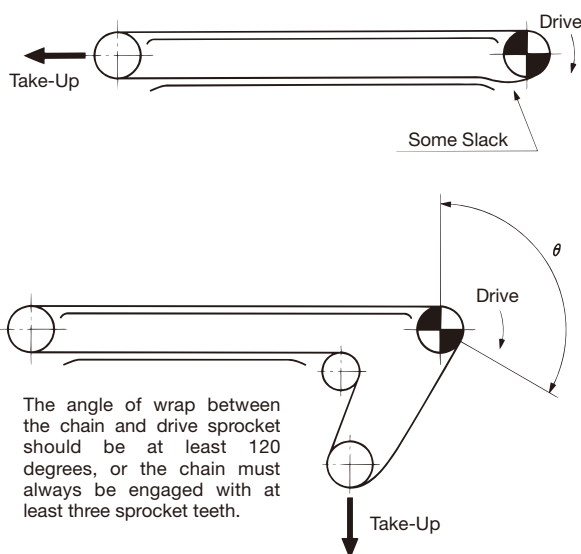


Fig.27 Adjusting Chain Slack

3. Even Adjustment of Take-Up on Both Sides

Where two parallel chains are adjusted by two independently operated take-ups, care must be taken to ensure even stroke on both the left and right side (not needed when the take-ups are cooperating screw type or counterweight type). An uneven adjustment will cause the link plate and the side of the sprocket teeth to interfere with each other and result in an overload condition. When the right and left sides are uneven, the two chains should be made even by replacing a portion of the right and left chains.

Trial Run

After installing the chain, carry out a trial run and check the following items before you actually start running the chain.

1. Before Trial Run

- 1) Connecting spring clips and cotter pins are installed correctly.
- 2) Chain slack is adjusted properly.
- 3) Lubrication is adequate.
- 4) The chain does not come into contact with casing or covers.

2. Trial Run

- 1) There are no strange noises.
- 2) There is no excessive chain vibration.
- 3) The chain does not ride up on the sprockets.
- 4) The chain is not jammed into the sprockets.
- 5) The rails and sprockets are installed correctly.
- 6) The rollers rotate smoothly.
- 7) There are no stiff areas during chain articulation.

Caution

An unloaded trial run should be conducted after installation by intermittently switching the system on and off several times. After inspection, a continuous unloaded trial run should be conducted. Prior to the trial run, be sure to lubricate the chain to allow lubricant to work into various components.

Inspection

Frequently inspect the chain during the initial operating period in order to carry out necessary adjustment. Inspect the following items.

- 1) Unusual wear of chain.
- 2) Slack in chain.
- 3) Vibration and jerking of chain.
- 4) Unusual wear of sprocket, unusual contact of sprocket with other components due to eccentricity, debris accumulation in teeth valleys.

When the sprocket properly engages with the chain, even contact is represented by the trace of contact shown as A in the illustration, while uneven trace of contact shown as B in the illustration represents improper installation of the sprocket or a twisted chain.

Rechecking is needed.

Proper contact should be traced a little above the valley. However, when initial tension remains in the slacked side of the chain, the chain slightly contacts the valley. However, even in this case, strong contact should be traced around A. With idlers and tighteners, contact happens at the middle of the valley.

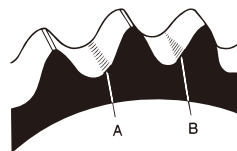


Fig.28 Trace of Contact

■ Causes of Vibration, Jerking, and Unusual Wear

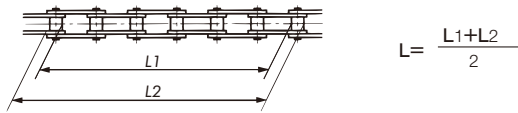
- 1) Overload, glass fragments caught between components.
- 2) Warping of the chain on the return side.
- 3) Insufficient lubrication or no lubrication.
- 4) Wear of the sprocket.
- 5) Unusual wear or breakage of the chain.

- 5) Too much guide rail wear.
- 6) Any abnormality in the lubricating system.

Usage Limits

1. Chain Wear Elongation

The chain should be measured by stretching it slightly to remove any backlash or looseness. Measure the distance of the inside (L_1) and outside (L_2) of rollers at both ends of the measured links to obtain measurement (L). When measuring, use at least 6 to 10 links to help keep any measuring error to a minimum.



$$\text{Chain wear elongation (\%)} = \frac{\text{Measured length (L)} - \text{Standard length}}{\text{Standard length}} \times 100\%$$

Standard length = Chain pitch X No. of links

The chain should be replaced when wear elongation is greater than 2% of the chain pitch.

A chain wear measurement scale that allows easy checking of pitch stretch is available from Tsubaki.

For Lambda Chain, if the chain elongation reaches around 0.5%, then its oil has run out. Indicators of this condition are red wear dust between the plates and occurrence of poor chain articulation. In this situation the chain is no longer usable and should be replaced.

2. R Rollers

When wear between the bush and roller causes the under surface of the link plate to contact the guide rail, the chain has usually reached the end of its usable service life. When the link plate starts contacting the guide rail, rolling contact suddenly turns into sliding contact between the link plate and rail, resulting in greater wear, an increase in chain load, and a reduction in transmitted power.

3. S Rollers

The chain has reached the end of its service life as soon as holes or cracks appear on the rollers due to wear.

4. Link Plates

For conveyor configurations in which link plates move directly on the material to be conveyed or on a guide rail, the service life has come to an end when the worn section equals $H/8$, as shown in the drawing.

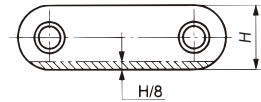


Fig.30 Plate Width Wear

5. Sprockets

When the sprocket is worn as illustrated below (to the left), the chain is prone to being caught by the tips of the teeth (A), making the disengagement of the chain from the sprocket difficult, hence resulting in vibration of the chain. Though wear allowance depends on the type of conveyor and the size of the chain to a certain extent, if the sprocket is replaced when the wear reaches 0.3 to 1.0 mm, damage to the chain can be avoided. When the sprocket is worn in the direction of the tooth width as illustrated below (to the right), the shaft may not be properly aligned and should be corrected.

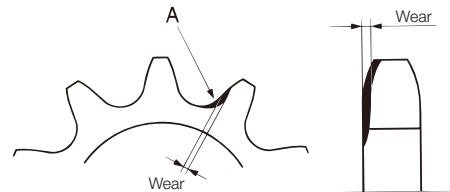


Fig.32 Wear of Sprocket Teeth

Other Precautions

1. Shutdown/Restart

Stop the conveyor under unloaded conditions to prevent remaining material from overloading the system when the conveyor starts again. Also, if the conveyor system has been shut down for a long period of time, be sure to inspect the chain before restarting.

2. Securing Conveyor Parts

Parts fastened to the conveyor such as buckets, aprons, slats, etc., tend to loosen as a result of vibration. Pay careful attention to fastening nuts and bolts, and check periodically that they are tightly fastened.

3. Temperature and Prevention of Freezing

Conveyor damage may occur when differences in temperatures (between day and night in winter) are extreme. Under these circumstances, operate the conveyor carefully, taking into account any variations in temperature as well as appropriate lubrication, the moisture content of the conveyed material, inspections, etc.

4. Spare Chain Storage

We recommend that a spare chain be prepared in advance in the unlikely event of a failure or accident. This spare chain should be stored in a dry space. Also, if the chain is to be stored for a long period of time, it should be coated with a rust-preventive oil. For convenience, attach

a tag noting the product name, chain number, date of purchase, and equipment it is intended to be used on.

5. Record of Use and Maintenance

Beyond the maintenance and inspection items mentioned above, after installing the conveyor, prepare a record of the expected capacity to be conveyed, conveying speed, rpm of main shaft, electric current, voltage, power, working hours, actual conveying capacity, inspection dates, lubrication dates, details of problems, and the like. This will serve as protection against unexpected accidents. When updated on a regular basis, this record will also be convenient for maintenance and repairs.

6. Cleaning

The chain should be cleaned periodically to remove contamination or particles of conveyed material from the chain and rail.

7. Storage of Chain and Sprockets

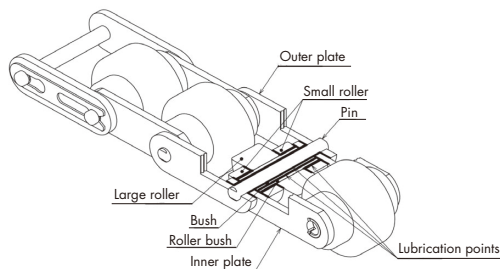
Chain and sprockets should be stored in a place free of dust and dirt and where they will not be exposed to rain. To prevent rust, use a brush to coat sprockets with oil. No rust-prevention treatment is applied at the time chain is shipped. Therefore, when storing chain, coat with a rust-preventative oil and inspect periodically for corrosion.

4.Engineering Manual Free Flow Chain

Guidelines for Use

1. Double Plus Chain (Common with Double Plus Chain with Snap Cover)

- 1) Recommended conveyor length is 15 m or less.
- 2) Avoid using a chain with engineering plastic rollers in an environment where it will be exposed to oil or water. (Use in such an environment may cause the double-speed capability to deteriorate.)
- 3) Use caution not to drop pallets or conveyed objects on the chain and avoid any operation that may expose the chain to impact and pressure by pressing it down.
- 4) Double Plus chain with plastic rollers should be used without lubrication. If the expected life is not achieved, please consider using a Lambda chain.
- 5) Steel rollers must be lubricated to prevent an abnormal increase in the coefficient of friction. If abnormal noise occurs at a curved section around a sprocket or between the large and small rollers on the conveying section due to aging, apply SAE10 to 20 oil between the pins and bushes and between the large and small rollers. Use a spraytype lubricator or brush to ensure the oil reaches the point where lubrication is necessary. If the transfer of oil to conveyed objects causes a problem, wipe off the oil adhering to the outer surface of the rollers.

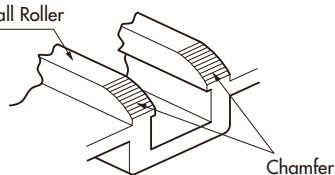


Note: Since Lambda chain can suppress noise between pins and bushes, it is suitable for use where lubrication is not possible or should be avoided.

6) Finishing the Ends on the Conveying Side

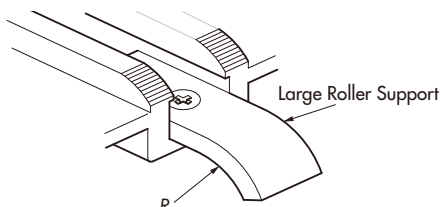
Put a chamfer on the ends of the upper rail that the chain's small rollers travel on.

Running Surface of Small Roller



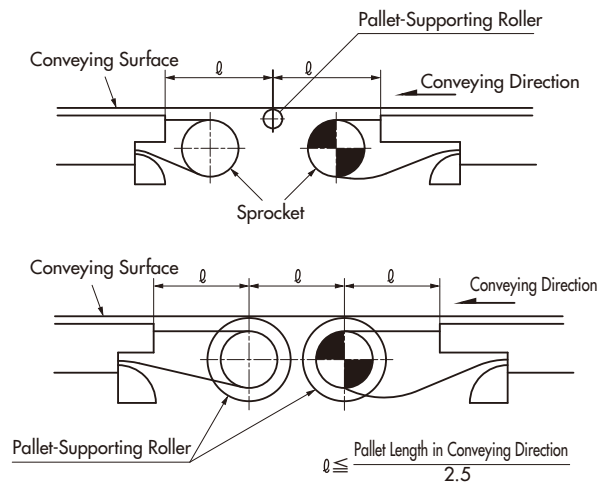
7) Large Roller Support

It is possible to prevent the chain's large roller from dipping at the chamfered portion by installing a support for the large roller on the ends of the rail on the driven side.

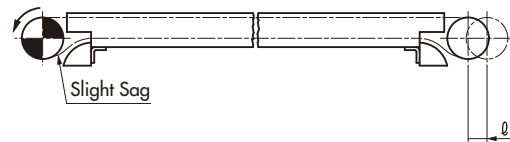


8) Transferring Objects Between Conveyors (straight line transfer)

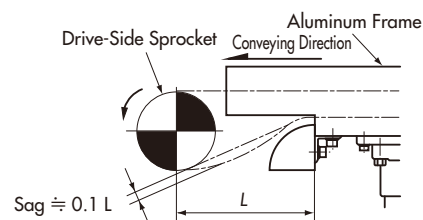
To convey pallets in a stable condition at the transfer portion of the conveyor, install a roller between the two conveyors or the shafts of sprockets. Be sure that the distance (ℓ) from the ends of the rail to the roller that supports the pallets is less than 1/2.5 times the pallet's length in the conveying direction.



9) Take-Up (1)



Take-up amount $L = \text{Chain pitch} \times 2 + \text{Allowance length}$
 Allow for a little sag up to 10% of span on the chain under the drive-side sprocket during operation. When the amount of sagging increases, adjust the take-up or cut the chain.



Chain Sag

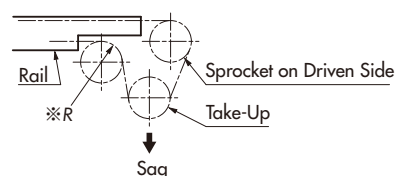
Unit: mm

Chain Size	Normal Sag	Max. Sag
RF2030	25	75
RF2040	35	105
RF2050	40	120
RF2060	50	150
RF2080	65	190

The sag in the table above is given on the basis of the conveyor design information on page 148.

10) Take-Up (2)

Where take-up configuration shown above is not allowed because of the presence of conveyors, design the take-up configuration referring to the diagram below. With Double Plus Chain with snap cover, make the dimension $\times R$ larger than the dimension R of the return guide (see the dimensional diagram).



11) Sprocket and Shaft

Drive sprocket --- Should be keyed, with both left and right sprockets aligned.

Take-up sprocket --- Should be keyless (free), with separate shafts on the left and right sprockets.

Other sprockets --- Keyless (free)

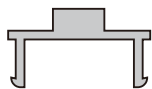


If a conveyed object is placed directly on the chain, the large roller may leave a mark on the conveyed object.

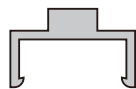
RF2030VRPUA and RF2030VRPUB (urethane-lined rollers) are designed so that the large roller is less likely to leave a mark on conveyed objects.

2. Double Plus Chain with Snap Cover

- 1) Handle the chain with care, as the snap cover is made of engineering plastic.
- 2) There are two types of snap covers; one for the outer link and another for the inner link. Use caution to avoid installing the wrong type of snap cover. (See the diagram below.) (The snap cover is fitted on the chain at time of shipment.)

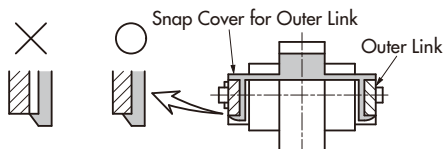
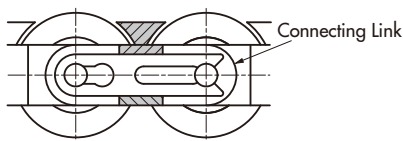


For Outer Link



For Inner Link

- 3) When connecting chains, connect them via a special connecting link and then fit the snap cover for the outer link correctly at the notch of the plate. (See the diagram below.)

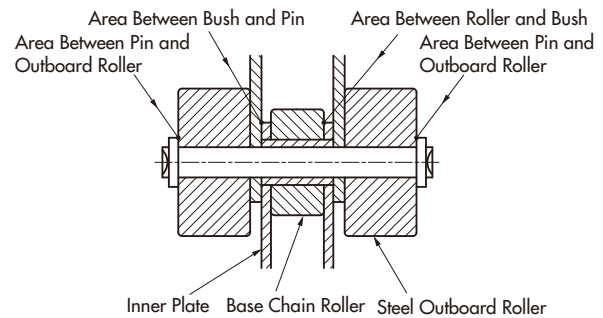


- 4) If a snap cover is damaged in handling, replace it with a new snap cover.

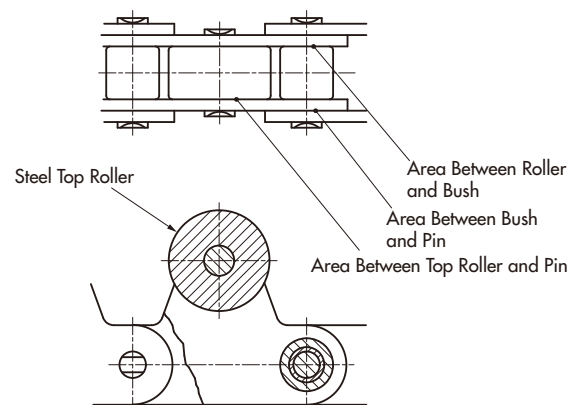
3. Outboard Roller Chain and Top Roller Chain

- 1) If parts making up the chain are made of steel, lubrication is generally required. (See the diagram below.) There is no need for lubrication on the base chain and engineering plastic rollers of Lambda chain.

• Lubrication Positions on Outboard Roller Chain



• Lubrication Positions on Top Roller Chain



- 2) Lubricate these parts regularly (about once a week) to avoid running out of lubrication. Perform drip lubrication (using lube listed below) or apply lube with a brush.

Lubrication (SAE No.)

Tsubaki Chain No.	Drip or Brush			
	Ambient Temperature -10°C to 0°C	0°C to 40°C	40°C to 50°C	50°C to 60°C
RS50 or smaller pitch	SAE10W	SAE20	SAE30	SAE40
RS60-80-100	SAE20	SAE30	SAE40	SAE50
RS120 or larger pitch	SAE30	SAE40	SAE50	

ISOVG: Please refer to page 37

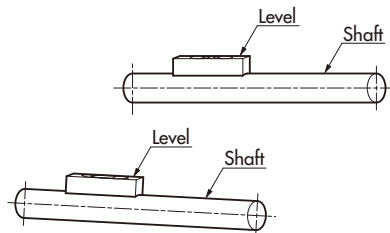
4. Installation

4.1 Sprocket Installation

Proper installation of the sprockets is critical to smooth operation of a conveyor, and it also affects chain life. The installation should be properly carried out in accordance with the procedures described below.

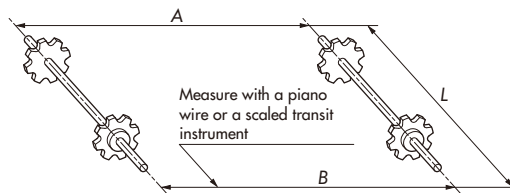
- 1) Check the levelness of the shafts with a level.

Adjust to within a tolerance of $\pm \frac{1}{300}$



- 2) Check the parallelism of the shafts with a scale.

Adjust the shafts so that the parallelism as calculated with formula $\frac{A-B}{L}$ is to within $\pm \frac{1}{100}$.



- 3) Align the sprocket axis to match.

Tolerance relative to center distance:

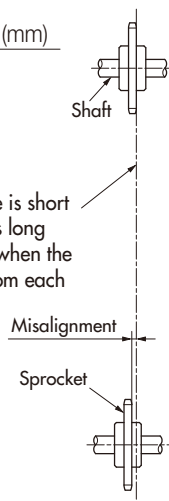
Up to 1 m: within 1 mm

1 to 10 m: within $\frac{\text{Distance between shafts (mm)}}{1000}$

10 m or longer: within 10 mm

Measure misalignment with:

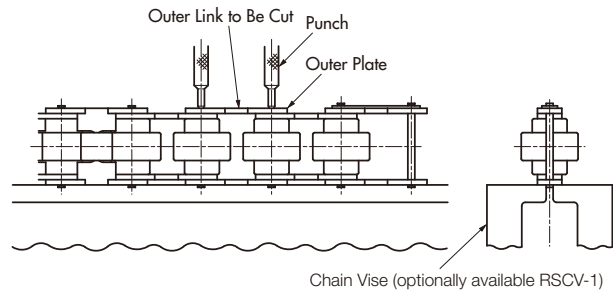
- A straight edge when the distance is short
- A piano wire when the distance is long
- A leveling string or a piano wire when the sprocket positions are different from each other in terms of height



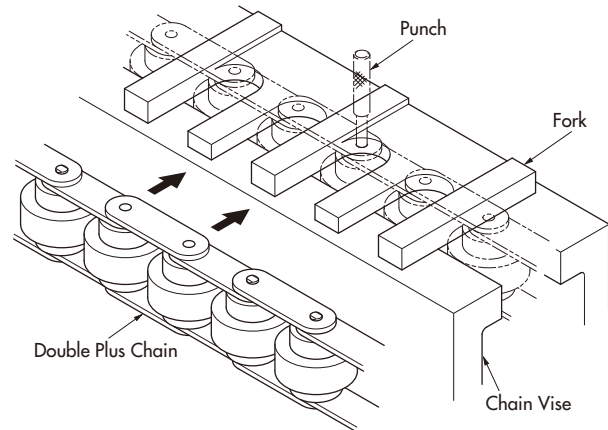
- 4) After processes 1) to 3) have been completed, lock each of the sprockets to the shaft(s) by means of keys or Tsubaki POWER-LOCKS. Lock the sprockets that are installed and used on the same shaft so that the teeth of both sprockets align in terms of phase.

5. Cutting and Connecting Double Plus Chain

5.1 Cutting Double Plus Chain



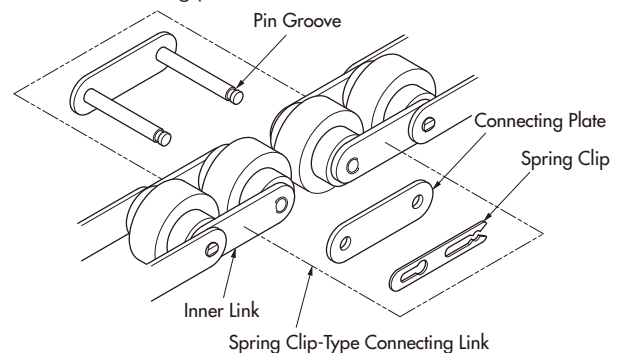
- (1) Shear off the rivet on the pin end of the outer link to be cut using a hand grinder.
- (2) Set the Double Plus Chain (for chain with snap cover, remove the snap covers from about three links of the area to be cut) on a chain vise (or its equivalent) and drive in the pin using a punch or other means until the outer plate on the upper side is removed.
- (3) The chain can be cut by using a chain vise and a fork-shaped tool.



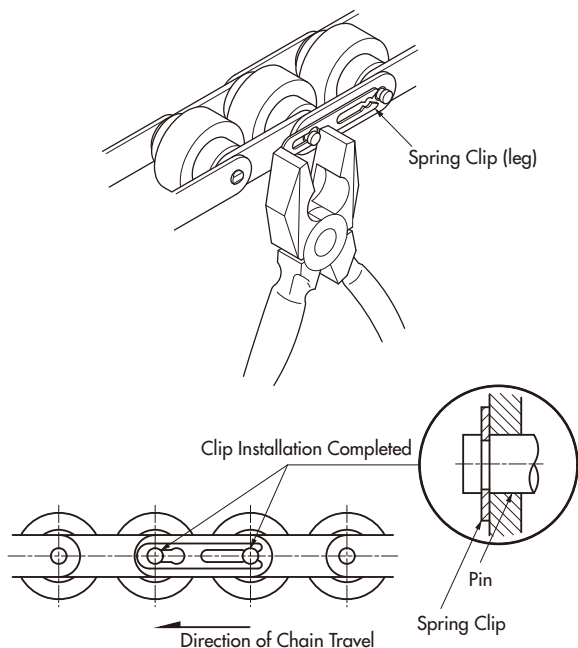
5.2 Connecting Double Plus Chain (using a connecting link)

- 1) Connecting Using a Spring Clip (RF2060 or smaller)

- (1) Pass the two pins of the connecting link through the bushes of the inner link and then through the holes of the connecting plate.

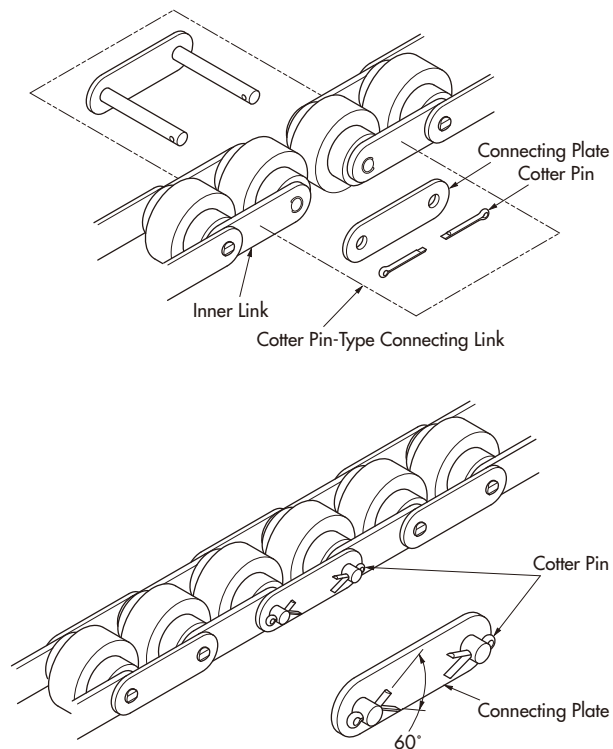


- (2) Fit the spring clip securely into the pin groove.



2) Connecting Using a Cotter Pin (for RF2080)

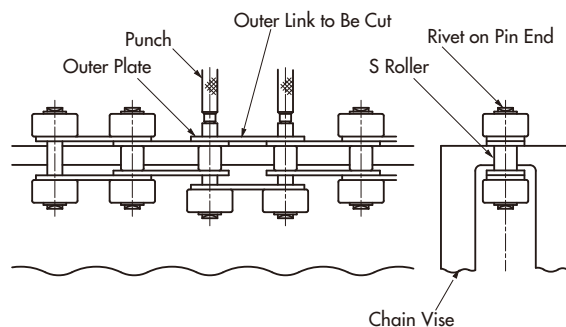
- (1) Pass the two pins of the connecting link through the bushes of the inner link and then through the holes of the connecting plate.
- (2) Pass the cotter pin through the hole of the pin and open the legs of the cotter pin to an angle of about 60°.



6. Cutting and Connecting Outboard Roller Chain

6.1 Cutting Chain When the Base Chain Roller Is an S Roller

For cutting Poly Steel Chain with outboard rollers, refer to 6. 3.



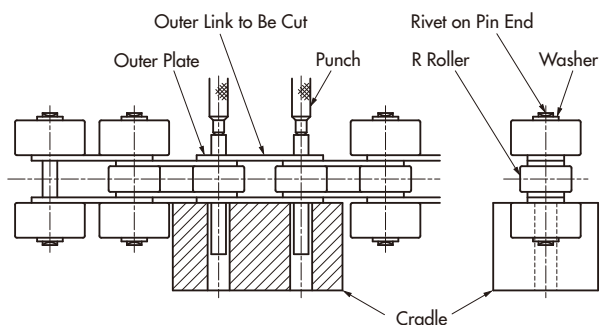
- (1) Determine the outer link to be cut and mark the link for identification.
- (2) Set the chain on a chain vise (sold separately) as shown above and shear off the rivets on the pin ends (two rivets on one side) using a hand grinder.
- (3) Remove the two pins using a pin with a diameter slightly smaller than the pin diameter of the chain (using a Tsubaki Punch or its equivalent). When the pins are pulled out a little, the two outboard rollers on the upper side can be removed.
(The diagram above shows the outboard rollers being removed.)
- (4) Directly tap the pin with a small hammer until the end of the pin reaches the upper face of the outer plate to remove. Tap the two pins alternately to ensure they come off evenly.
Use caution not to damage the outboard rollers on the right and left.
- (5) Tap and pull out the two pins using a punch until the outer plate on the upper side can be removed.

Chain Vise (Optionally Available)

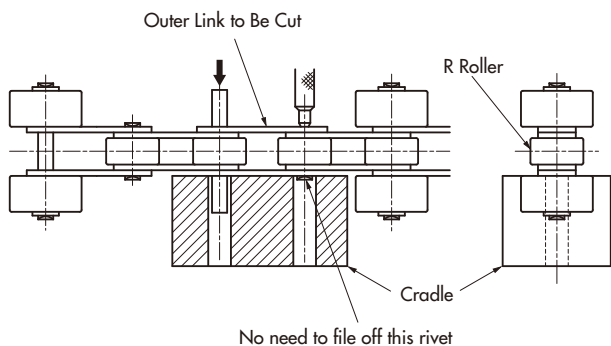
Chain Vise No.	Applicable OR Chain Size (Base Chain Roller: S Type)
RS-CV1	RS40, RF2040
RS-CV2	RS40 to 80, RF2040 to 2080
RS-CV3	RS80 to 100, RF2080 to 2100

OR: Outboard Roller

6.2 Cutting Chain When the Base Chain Roller Is an R Roller

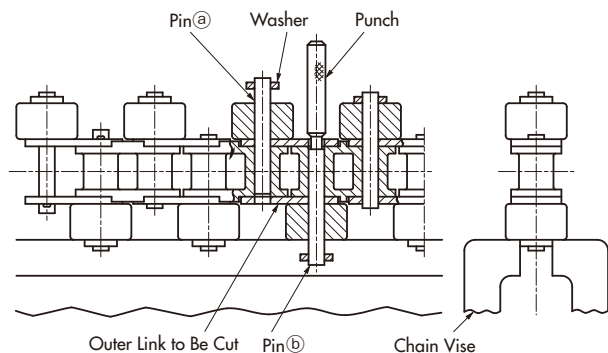


- (1) Determine the outer link to be cut and mark the link for identification.
- (2) Shear off the rivets on the pin ends (four rivets) using a hand grinder so as to remove the four outboard rollers. In doing so, shear down to the washers with the grinder to remove the washers.
- (3) Remove the four outboard rollers. (Receive the outboard roller on the cradle, apply the punch on the pin end face, and tap the pin out until the washer is removed. Follow the same procedure to remove the washers on the other side.)
- (4) Set the chain on the cradle as shown above and remove the two pins by tapping the punch with a hammer. Prepare a cradle yourself as appropriate.
- (5) Follow steps (4) and (5) of 6. 1.
- (6) If outboard rollers are spaced every two or more links, the rivet parts to be sheared off will differ from those shown in the above diagram. (See the diagram below.)

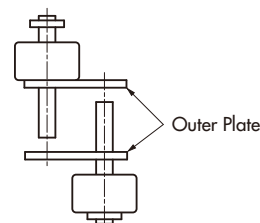


6.3 Cutting Poly Steel Chain with Outboard Rollers

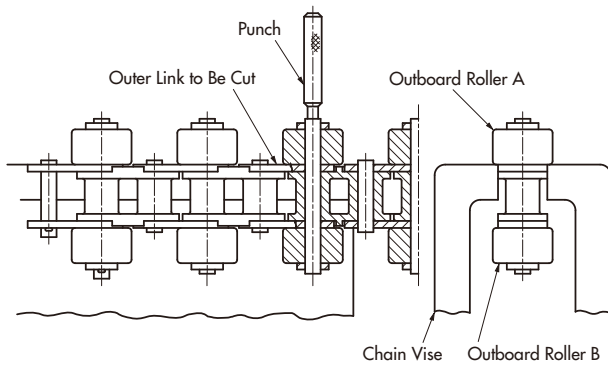
1) When the Outboard Rollers Are Arranged in a Staggered Installation



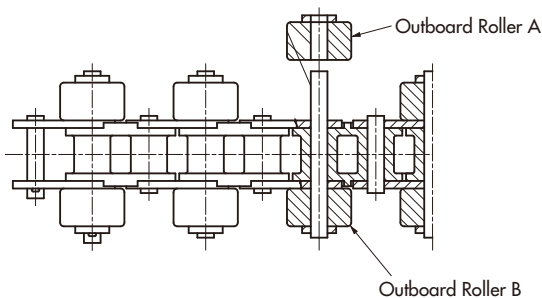
- (1) Determine the outer link to be cut and mark the link for identification.
- (2) Although the chain can be set in a chain vise in the same manner as shown in 6. 1) (with S type), this setting damages the chain because the inner link is made of engineering plastic. For this reason this cutting method cannot be used.
- (3) Lightly tighten the washer on the pin end with a chain vise. Since no rivet is provided on the pin end on this chain, proceed to cutting the chain.
- (4) Use a pin with a diameter slightly smaller than the pin diameter of the chain (using a Tsubaki Punch or its equivalent), tap the punch lightly with a hammer, and pull out the pin of the chain gradually (see the above diagram). When the pin is removed from the upper outer plate as shown above, stop tapping the pin.
- (5) When pins (a) and (b) are pulled out in the same procedure, the chain can be cut. The diagram above shows the state whereby pin (a) has been pulled out to the specified position and pin (b) has already been pulled out.
- (6) Discard the cut outer links (shown below).



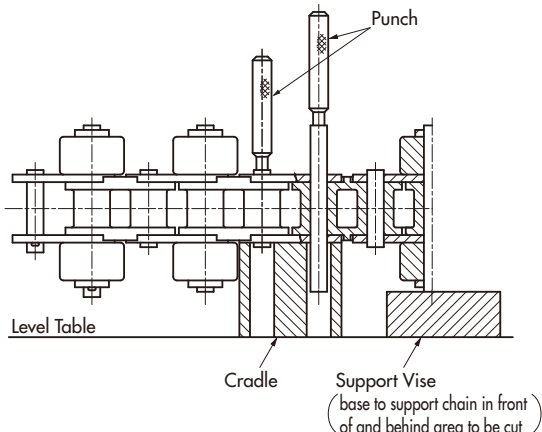
2) When the Outboard Rollers Are Arranged in a Crosswise Installation



- (1) Determine the outer link to be cut and mark the link for identification.
- (2) Although the chain can be set in a chain vise in the same manner as shown in 6. 1) (with S type), this setting damages the chain because the inner link is made of engineering plastic. For this reason this cutting method cannot be used.
- (3) Support outboard roller "A" on the upper side with a chain vise as shown above and lightly tighten the chain vise. Bring the outer link to be cut to the end of the chain vise, as shown above.
- (4) Apply the punch to the pin end of outboard roller "A" and lightly tap the punch with a light hammer. Outboard roller "A" will be removed as shown below.



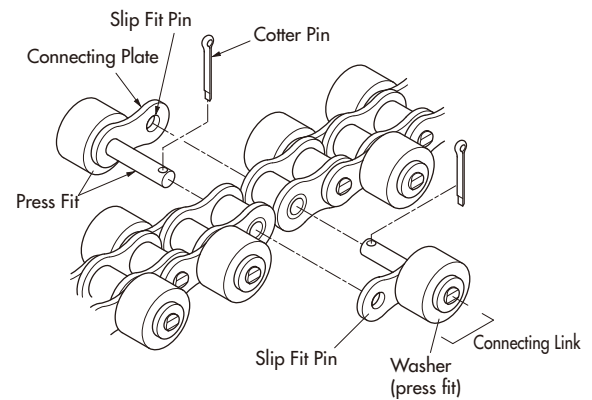
- (5) Turn the chain upside down and remove outboard roller "B" by following the same procedure for removing outboard roller "A."
- (6) Set the chain after removing outboard rollers "A" and "B" on the cradle as shown below, tap the punch lightly with a hammer, and remove the two pins. Pull out the pins up to a position where the upper outer link is removed.
(Prepare a cradle yourself as appropriate.)



6.4 Connecting Chain with Outboard Rollers

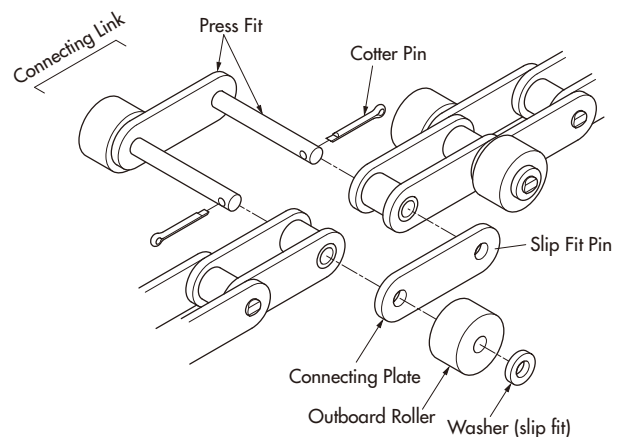
Chains are connected using connecting links.

1) When the Outboard Rollers Are Arranged in a Staggered Installation



- (1) Pass the two pins of the connecting link through the holes of the inner link and then through the slip fit connecting plate.
- (2) Insert a cotter pin through each pin and open the legs of the cotter pin to an angle of about 60 degrees.

2) When the Outboard Rollers Are Arranged in a Crosswise Installation

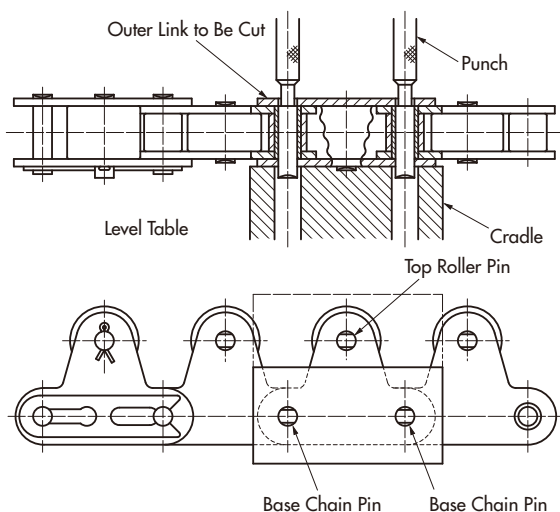


- (1) Pass the two pins of the connecting link through the holes of the inner link and then through the slip fit connecting plate.
- (2) When installing outboard rollers on both sides of a pin as shown above, pass the pin through the outboard rollers and washer, and attach cotter pins in two places. Open the legs of the cotter pins to an angle of about 60 degrees.

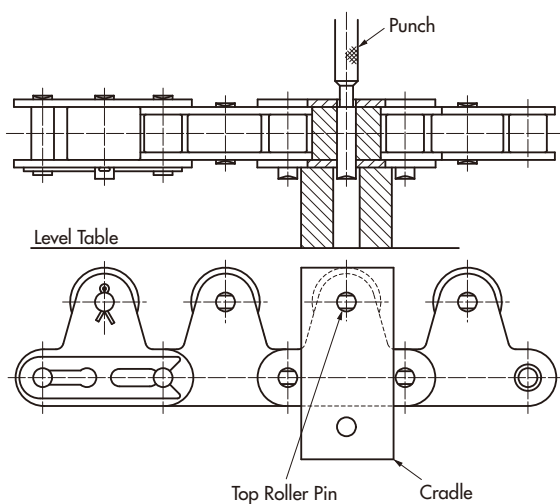
7. Cutting and Connecting Top Roller Chain

7.1 Cutting Chain When the Base Chain Roller Is an S Roller

- (1) Mark the outer link to be cut for identification.



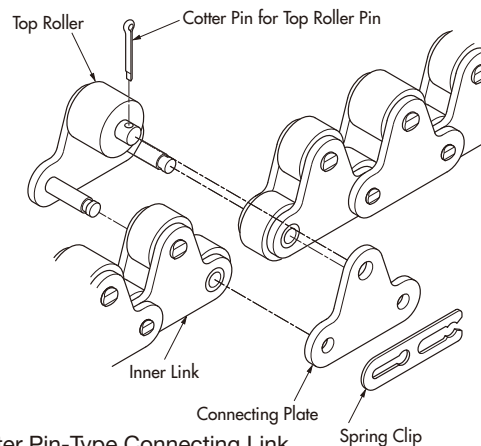
- (1) Shear off the rivets on the base chain pin ends and top roller pin ends using a hand grinder or other means (three rivets on one side of the chain).
- (2) Turn the chain side ground by the grinder upward and set the chain on a cradle, as shown above. Prepare a cradle yourself as appropriate. To remove the three pins including the top roller pin at the same time, prepare a cradle integrating the part shown by the phantom line.
- (3) Tap the punch (or its equivalent) with a hammer until the two (three) pins are removed from the outer plate (up to the position shown in the diagram).
- (4) Change the setting of the cradle as shown below to remove the top roller pin. (When top rollers are not attached to the outer link, this procedure is not necessary.)
- (5) Remove the top roller pin by repeating Step <4>.



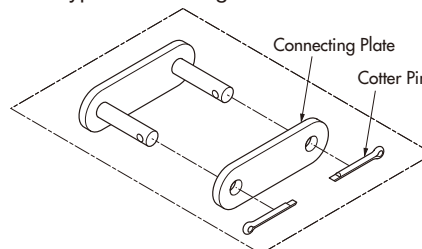
7.2 Connecting Top Roller Chain

- (1) Chains are connected using connecting links.
- (2) Pass the two pins of the connecting link through the bushes of the inner link and then through the holes of the connecting plate (the connecting plate is slip fit).

Spring Clip-Type Connecting Link



Cotter Pin-Type Connecting Link



- (3) Fit a cotter pin or spring clip securely on the pin. Open the legs of the cotter pin to an angle of about 60°. Refer to the description of Double Plus Chain for detailed information on fitting the spring clip.

Top Roller Chain Connecting Links

- 1) There are two types of connecting links. Use caution when placing an order for connecting links to ensure correct order placement.
- 2) The outer diameter of the top roller differs in chain with top rollers installed on every link and in chain with top rollers installed on every second link. Refer to the dimensional drawing for the dimensions of these top roller chains. (The diameter of double pitch rollers is the same in both these installation types.)
- 3) When an attachment other than top rollers is attached to the connecting link, please diagram it. (Symbol for the connecting link: JL)

- For chain with top rollers installed on every link

Chain Numbering

RS40-TRPS-JL

Base Chain

- For chain with top rollers installed on every second link

Chain Numbering

RS40-TRP-JL

Base Chain

Drive Chain and Small Size Conveyor Chain Inquiry Sheet

Please give us the following information when placing an order for or inquiring about a chain:

Machine Used		Minimum Tensile Strength	kN {kgf}
Object to be Conveyed		Chain Pitch	mm
Corrosiveness		Attachments	Installed on every links
Abrasiveness		Conveyance Method	Pushed by dog, Directly placed, Other
Temperature of Conveyed Object	Normal Temperature °C	Operating Time	hours/day
Dims. of Conveyed Object		Operating Method	Continuous, Intermittent, Reverse running (Yes / No)
Mass of Conveyed Object	Max. kg/piece	Lubrication	Permitted / Not Permitted
Conveyance Amount	Max. ton/hour (bulk) kg/piece (countable object)	Motor Used	AC/DC kW × r/min × (no. of motors)
		No. of Sprocket Teeth	NT (PCD mm)
Conveyor Length	m	Hole Dia. of Sprocket Shaft	Dia. H8 · H7
Lifting Height	m	Hub	Type () Dia. × L
No. of Strands of Chain	Strands (Spacing: m)	Key Groove	Not required () JIS · b × t Parallel / Driving
Chain Speed	m/min	Finishing of Teeth	Machine-cut Induction hardening

Brief description of machine used and chain:

Configuration of conveyor, method for loading and unloading of objects to be conveyed, rail configuration, method of receiving on return side, and other remarks.

Company Name

Division/Title

Name

Tel:

Date _____

Fax:

3 Large Size Conveyor Chain Maintenance

1. Large Size Conveyor Chain Construction

The Three Basic Chain Dimensions

The three basic dimensions of conveyor chain are pitch, roller diameter, and inner link inner width. When these dimensions are the same, the chain and sprocket are compatible. (1 pitch = 1 link)

1. C-Pin (CP)

The most important role of the c-pin is connecting the inner link to the outer link. Along with the plate, it receives chain tension along the direction of travel while receiving vertical reactive forces from the conveyed items. The outer diameter of the c-pin suffers wear from sliding against the bush inner diameter when the chain articulates. The c-pin is an essential strength-bearing part and requires high wear resistance.

2. Bush (B)

The bush is a strength-bearing part, receiving tension from the chain during sprocket engagement, but its major role is as a bearing part. The outer diameter of the bush suffers wear from sliding against the roller inner diameter during roller rotation, while the bush inner diameter suffers wear from sliding against the outer diameter of the c-pin when the chain articulates. Bush inner diameter wear is directly expressible as pitch elongation.

3. Roller (R-R, F-R, S-R, M-R, N-R)

Forms a slip fit with the bush. Rotates when engaging with the sprocket, while alleviating the shock and wear from the teeth. Rotation also lowers running resistance.

Note: () denotes codes for part names as found on drawings.

4. Plate (PLP-A, PLP-B, BLP)

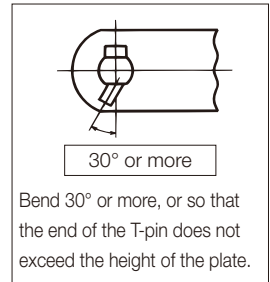
The plate mainly receives the tensile load along the chain's direction of travel while receiving vertical reactive forces while supporting the conveyed item. The outer plate and inner plate slide against each other during chain articulation, as well as against the sides of the sprocket teeth during sprocket engagement. Plate holes are either round or flat.

5. Attachments

For attaching items to the chain.

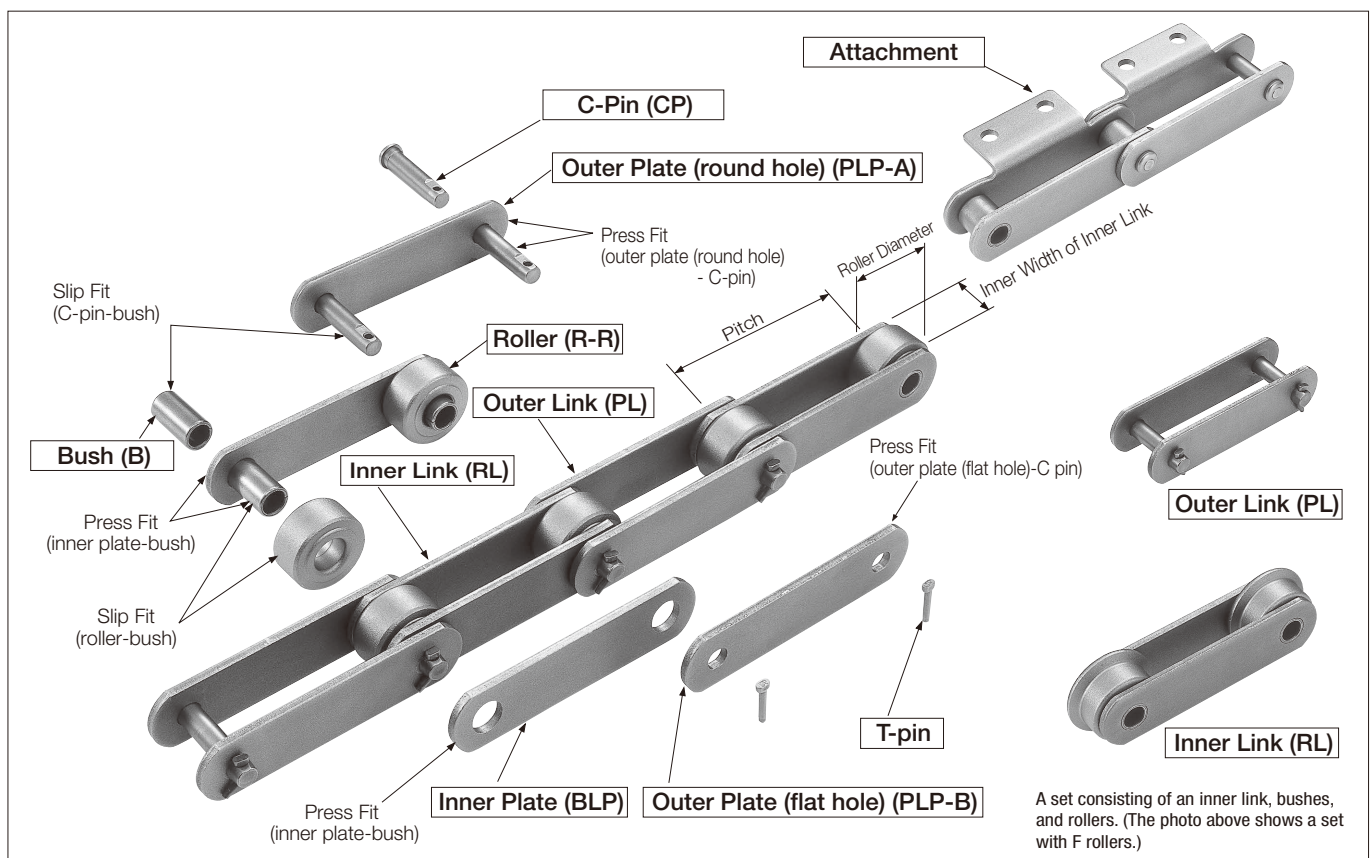
6. T-pin

After the outer plate is press-fitted to the c-pin, a T-pin is inserted and bent to prevent the c-pin from falling out.



For Safety

Never weld additional parts onto an assembled chain. Doing so may cause chain kinking or twisting due to plate deformation, further reducing part hardness and leading to embrittlement fracture from the welding heat.



Slip Fit

There is a continuous loose fit between the shafts and holes when fitted together.

Press Fit

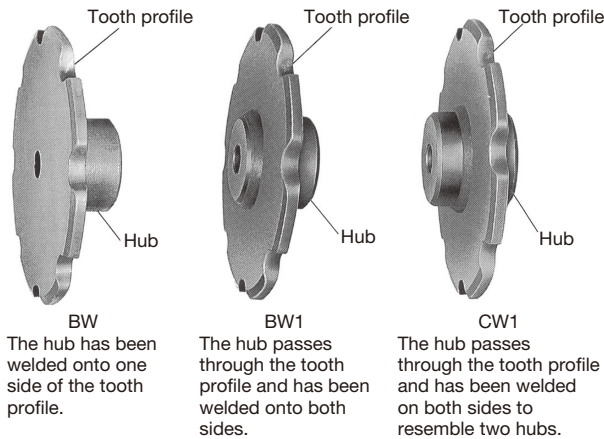
There is a continuous interferential fit between the shafts and holes when fitted together.

Note: Total large size conveyor chain length tolerance is $\pm 0.25\%$.

The dimensions given in this catalog are nominal dimensions and may differ from actual dimensions.

Sprocket design

- 1) RF standard sprockets are made up of teeth and a hub, which are welded together to form a single unit.
- 2) The teeth have been precisely flame cut, with a profile that minimizes wear on the chain and allows for smooth engagement.
- 3) Three types of hubs are available standard: BW, BW1, and CW1



1. Bore and keyway processing

1) Ordering bore finishing

Place your sprocket order to include any directions regarding bore finishing dimensions. Be sure to indicate if the sprockets will be used in parallel. We will stamp a set mark as shown in 2) below if so.

2) Phase alignment of keyway and teeth

Be sure to align the tooth and keyway phases when finishing the keyway and using the sprocket in parallel. When using more than two sets of sprockets, a set mark can help prevent errors during installation.

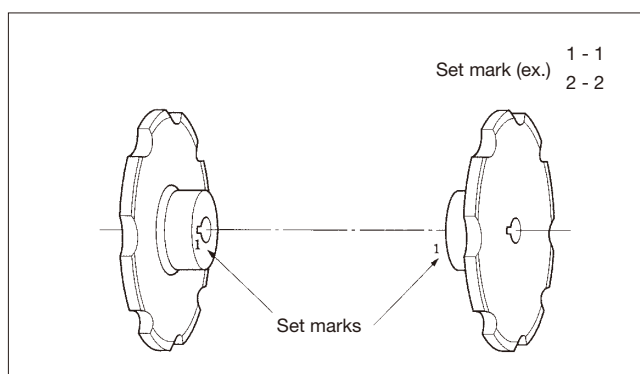


Fig. 1 Keyway set mark

- 3) When you will be finishing the bore yourself, finish the hub as per standards.

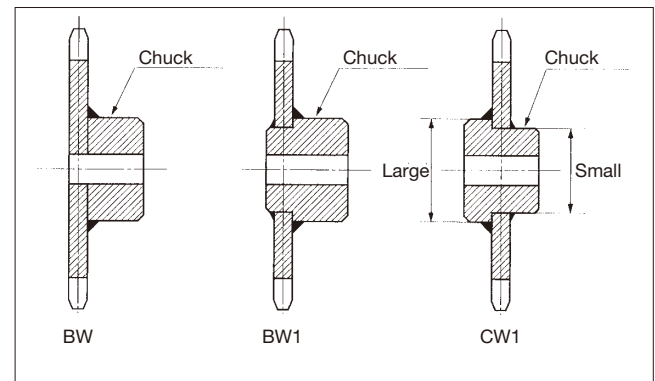


Fig. 2 Bore finishing standards

4) Face runout precision with tooth profile

The precision of the face runout with welded teeth (standard RF sprockets) is as per the following table. We will machine the teeth when the conveyor requires higher precision.

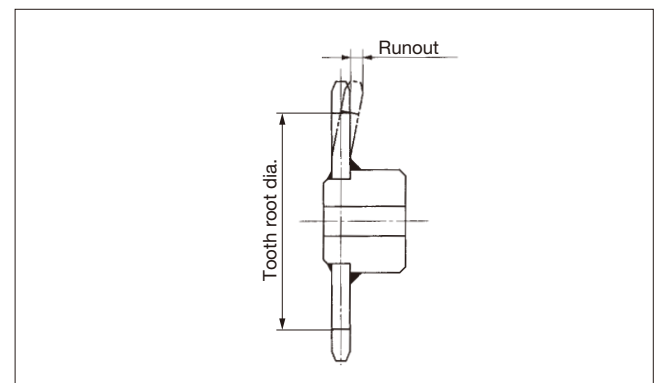


Fig. 3 Face runout with tooth profile

Tooth root dia. (mm)	Face runout (mm)
~ 200	<1.0
200~ 630	<1.5
630~1250	<2.5

2.Engineering Manual

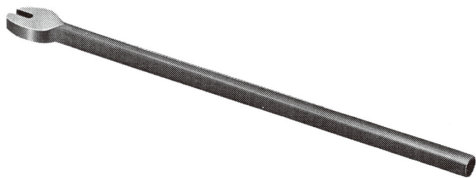
Cutting

1. Cutting Tools

① T-Pin Bending Tool

Be sure to inform your TSUBAKI representative of the chain number.

Applicable chain numbering in the chart below indicates the  part of RFQ3100S.



T Pin Nominal Diameter	Applicable Chain
φ 3 (2.6) × 15ℓ	RF03
φ 4 (3.6) × 20ℓ	RF05・RF08・RF430・RF204・RF450・RF650
φ 4 (3.6) × 25ℓ	RF10・RF12・RF205・RF6205・RF214
φ 6 (5.6) × 33ℓ	RF17・RF212・RF26・RF26N
φ 8.5 (8.1) × 45ℓ	RF36
φ 8.5 (8.1) × 50ℓ	RF36N・RF52
φ 8.5 (8.1) × 55ℓ	RF60N
φ 10 (9.7) × 65ℓ	RF90N
φ 10 (9.7) × 70ℓ	RF120N

Note:

1. Bending tools for T-pin diameters not listed above are also available.
2. The () next to the nominal diameter indicates actual diameter.
3. N is for N rollers.

② Holding Tool

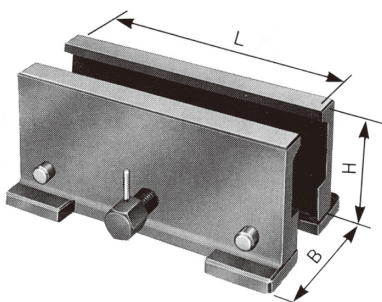
Contact a Tsubaki representative with chain size.



③ Chain Vice

Product Number	Applicable Chain	Dimensions		
		L	H	B
CV-4	RF03-RF17	300	135	120-180

Note: The above dimensions are nominal dimensions and may differ from actual dimensions.



2. Connection/Disconnection

- (1) When connecting or disconnecting the chain, always begin by attaching or removing the outer plate on the T-pin side.
- (2) Loosen the take-up so that there is no tension on the chain.

⚠ Caution on Handling

Whether the conveyor is parallel, slanted, or vertical, always attach a chain block or piano wire to the area to be connected/disconnected to ensure there is no tension on the chain.

3. Disconnecting Chain

3.1 Remove the T-pin

Use a T-pin tool or monkey wrench to bend the T-pin straight before removal. Always use a new T-pin—never reuse straightened T-pins.

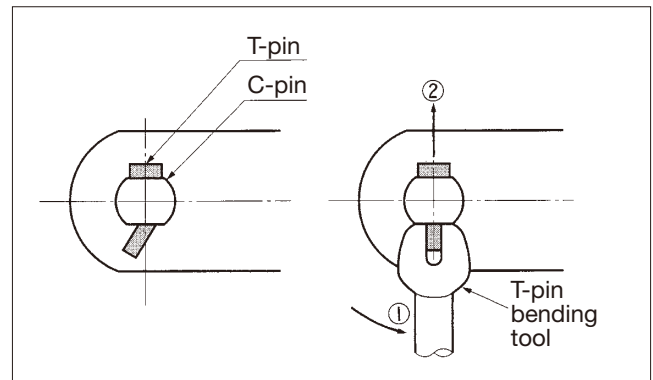
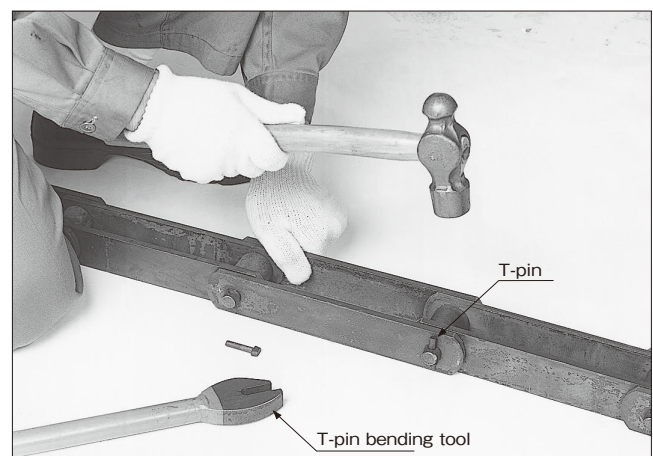


Fig. 4 Straightening T-pins

A monkey wrench can be used to bend T-pins on small chains.



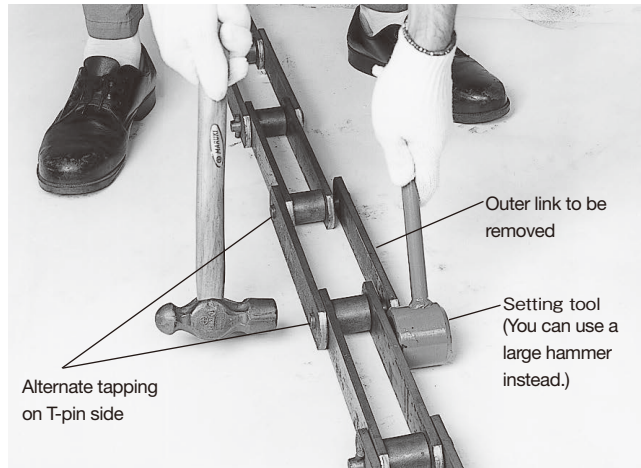
The photo shows a T-pin being removed after being straightened.

⚠ Safety precautions

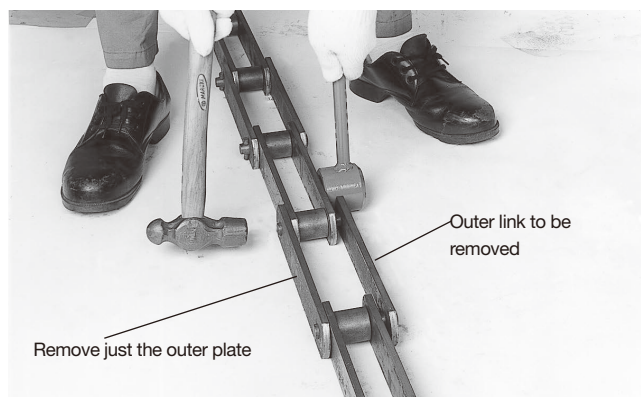
- When connecting and disconnecting chain, prepare new T-pins before you start working.
- Do not reuse straightened T-pins.

3.2 Alternate Hitting Two C-Pins

- 1) Remove just the outer plate on the T-pin side.
- 2) Next, remove the other outer plate with the two C-pins still attached (this part is called a “pin-sashi”).
- 3) Place a pin tool (see pages on connecting and disconnecting tools) against the inner link at the front and back of the removed outer link as shown in the photo. Alternate tapping the C-pins on the T-pin side with a hammer.



The photo shows tapping a pin.



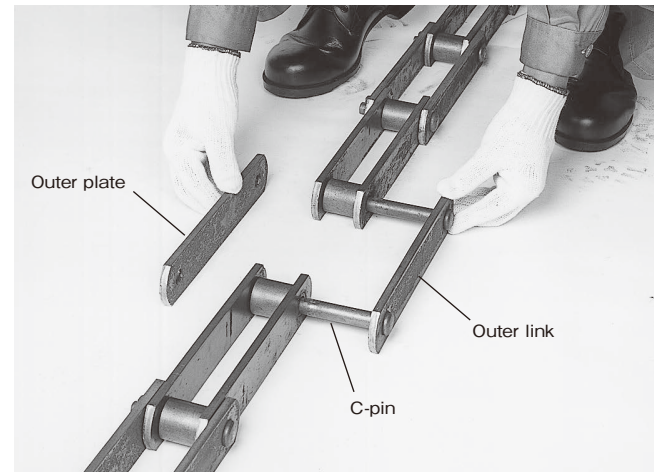
The photo shows tapping the other pin.

Safety precautions

Be sure to tap the C-pins straight on with a hammer. Tapping them at an angle may cause chips to fly. Always wear safety goggles.

3.3 Remove the Outer Link

Remove the outer plate along with the two C-pins as shown in the photo below.



3.4 Specialty Tools

- 1) Pins can be safely and quickly inserted and removed without affecting chain performance by using a chain breaker. The photos below show a chain being disconnected using specialty tools.
- 2) C-pins are easy to remove with a chain vise (see pages on connecting and disconnecting tools).



The photo shows a chain vise being used to remove a C-pin.

3.5 Using pin extraction tools

● Disconnecting chain (removing C-pins)

- 1) Use a T-pin bending tool or monkey wrench to straighten and remove the T-pins.
- 2) Set the chain in the jig as shown in Fig 5.
- 3) Press out the C-pin until the end of the C-pin is flush with the plate.
- 4) Remove the C-pin by hand. If you cannot remove it by hand, place a screwdriver or the like against the edge of the C-pin and tap out with a hammer.

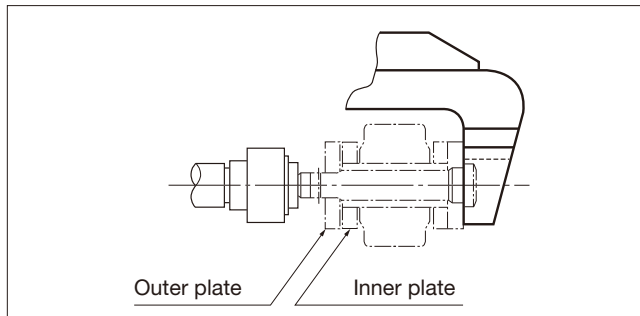


Fig. 5 Position of chain removal tool and chain

● Connecting a chain

See 4.5 on the following page for details.

4. Connection

4.1 Preparation

Conveyor chain is normally delivered in easy to handle 3m lengths (standard length). One end has an outer link, the other an inner link, and other sections of chain can be connected to either end.

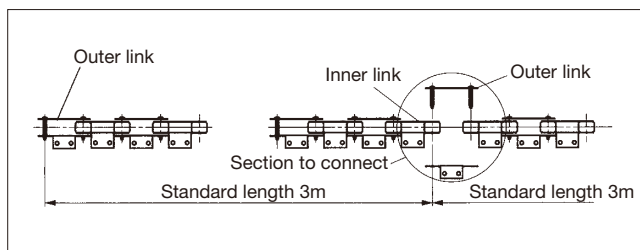
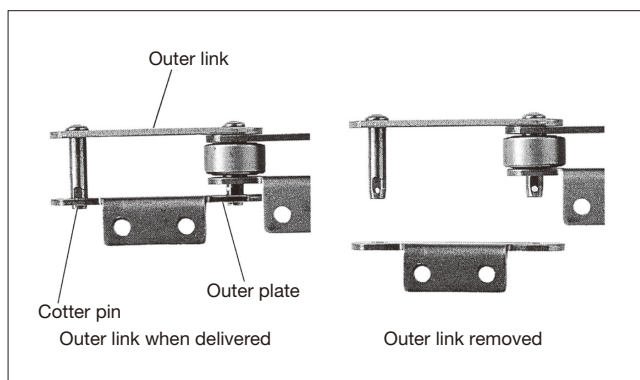


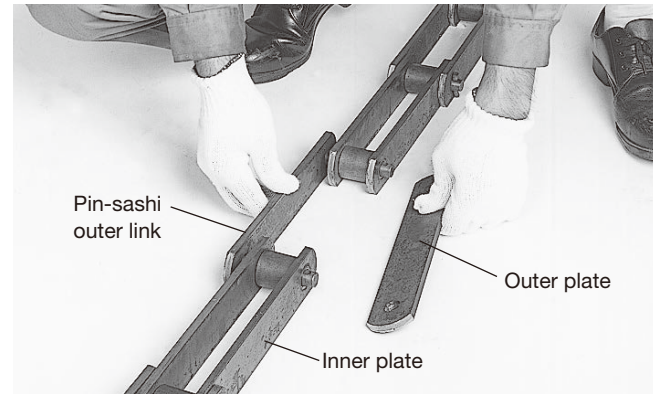
Fig. 6 Both ends of standard length chain

The outer plate on the outer link on one end (T-pin side) will have a C-pin lightly press fit when delivered. Refer to previous pages on cutting chain to remove the outer plate.



4.2 Connecting two chains

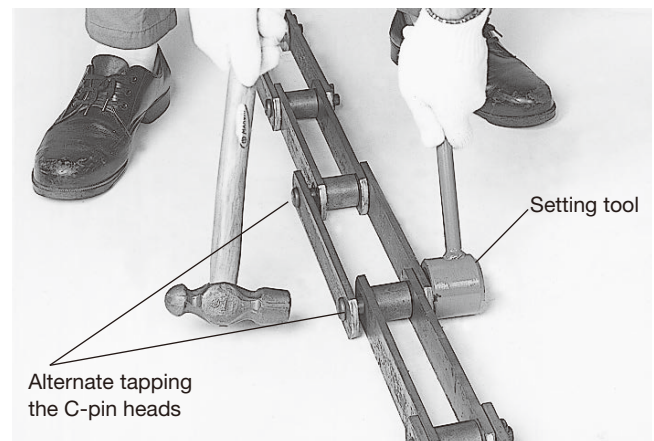
Pull both ends of the chains together and insert the pin-sashi outer link (C-pin) into the bushes on the inner link.



The photo shows an outer link being inserted into an inner link.

4.3 Press fitting the outer plate

- 1) First insert the two pins of the pin-sashi outer link into the outer plate by hand as far as they will go.
- 2) Cover the T-pin side with the concave portion of the setting tool and tap the C-pin head with a hammer to press fit the C-pin into the outer plate. It is important to hold the two C-pins and outer plate at a right angle when press fitting, so alternate tapping the C-pin heads.



The photo shows an outer plate being press fit.

- 3) The point where you can no longer tap in the pins should be the same dimensions as the outer width of the outer link in other areas. If you have tapped the pin in too far, refer to the guidelines described in 3.2 3) to tap the pin out a little.
- 4) Ensure that chain articulation is smooth.

⚠ Safety precautions

- 1) Never additionally process the plate holes or the outer diameter of the C-pins to facilitate C-pin insertion. This will drastically reduce the performance of the chain and lead to accidents (chain failure).
- 2) When tapping the C-pins with a hammer, be sure to tap them straight on with a hammer. Tapping them at an angle may cause chips to fly. Always wear safety goggles.

4.4 Bending T-pins

- 1) Insert a T-pin into the C-pin and use a T-pin bending tool to bend it 30° or more so that it will not fall out.
- 2) See pages on connecting and disconnecting tools for T-pin sizes appropriate for each chain.

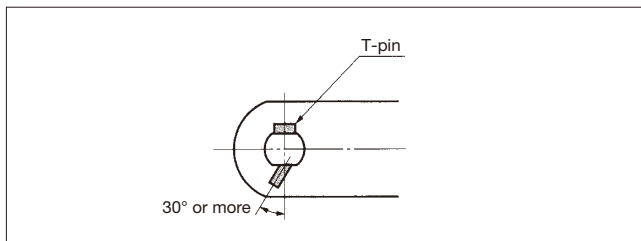


Fig. 7 T-pin bending angle



The photo shows a T-pin being bent.

- 3) Never reuse T-pins (even after straightening them).

4.5 Tools for pin extraction and press fitting

●When connecting pin-sashi

- 1) Insert the inner link of the chain you will be connecting into the outer link. Place an outer plate over this area and tap in lightly with a hammer.
- 2) Set the chain in a jig and alternate press fitting the C-pins. The point where you can no longer tap in the pins should be the same dimensions as the outer width of the outer link in other areas.
- 3) When connecting pin-sashi, do not use additional fillers.

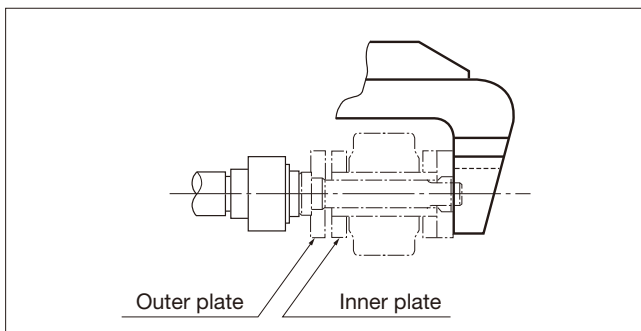


Fig. 8 Chain position in pin extraction and press fitting tools

- 4) Ensure that the chain articulates smoothly.

●Press fitting C-pins on just one side

- 1) Set the jig and filler on the chain as shown in Fig. 9. The thickness of the filler will vary slightly depending on the variation in chain plate thickness, so consider the gap between adjoining plates when selecting which of the two thicknesses (included) you will use.
- 2) Press fit the C-pin, stopping when the outer plate is at the same outer width as the other outer plates. Ensure that the chain articulates smoothly.

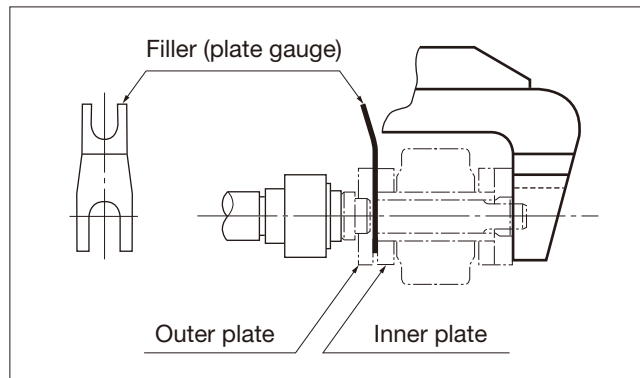


Fig. 9 Press fitting C-pins on one side

⚠ Safety precautions

- Ensure conveyor chain is not twisted when installing.
- When the chain is secured on one end, with the other end hanging off a work bench, the chain may twist due to its own weight and cause a major accident.

3. Handling Conveyor Chain

1. Installation

Proper attachment of the sprocket has a major influence on smooth conveyance and will affect chain life as well. Follow the instructions below for proper sprocket attachment.

1 Attaching the Sprocket

1.1 Find the levelness of the shaft using a level.

Adjust precision to within $\pm 1/300$.

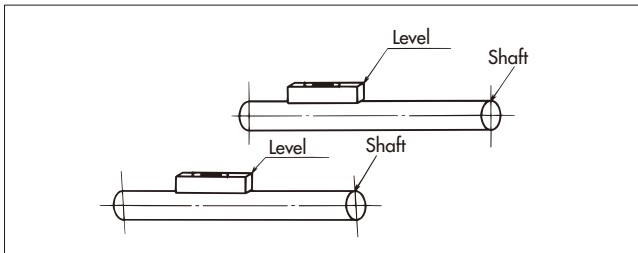


Fig. 1 Measuring shaft parallelism

1.2 Find the levelness of the shaft.

Use a scale to adjust the levelness of the shaft to $\pm 1\text{mm}$.

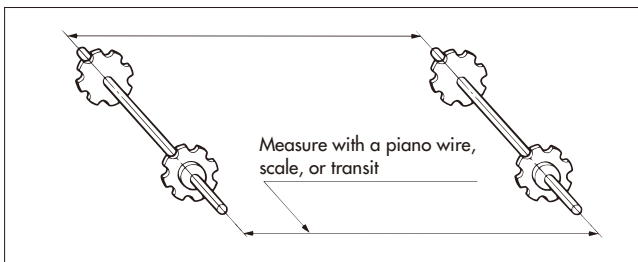


Fig. 2 Measuring shaft parallelism

1.3 Correct the difference in sprockets.

Distance between shafts

up to 1m:

$\pm 1\text{mm}$

Distance between shafts

from 1m–10m:

$\pm \frac{\text{Distance between shafts (mm)}}{1000}$

Distance between shafts

over 10m:

$\pm 10\text{mm}$

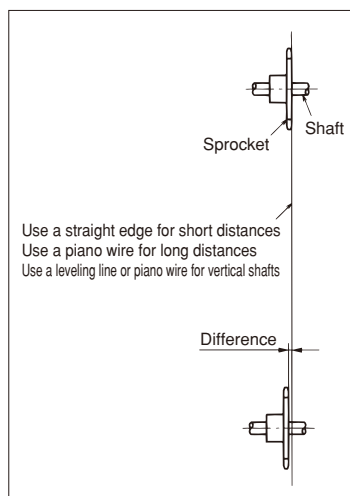


Fig. 3 Measuring sprocket difference

1.4 Attaching sprockets

Attach the properly installed sprocket to the shaft with a key. Sprockets used in parallel strands should be fixed so that two teeth above the shaft center are in phase. Tsubaki can also supply keyless locking sprockets.

2 Rails for Conveyor Chains

- 1) Rail connecting areas should be smooth and free of any edges, clearances, or gaps. (See diagram below.)
- 2) Remove any welding spatter or scales.
- 3) Test operation with a lubed chain with no load, and check condition of chain and rail.

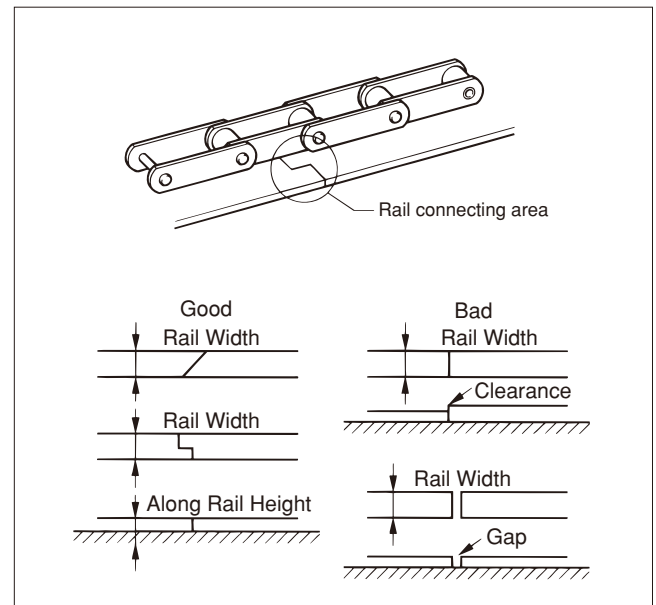


Fig. 4 Rail connecting area

4) Chain enter/exit point

Ensure there is a curve to the guide rail for smooth chain running.

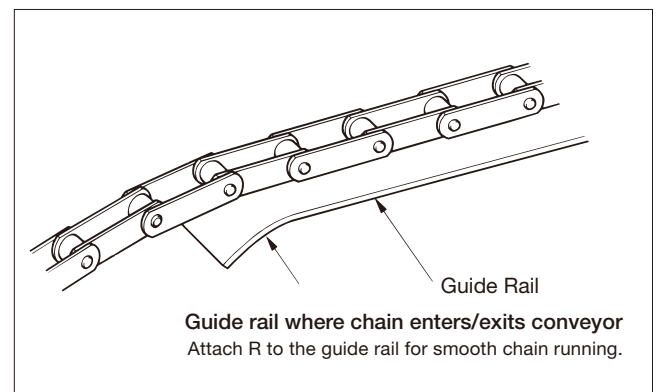


Fig. 5 Guide rail where chain enters/exits conveyor

2. Test Operation

Perform a test operation after attaching the chain and before actual operation. Use the following checkpoints as a guide.

1 Before Beginning Test Operation

- 1) Is the T-pin on the connecting link properly attached?
- 2) Does the chain have the proper amount of catenary?
- 3) Does the chain have the proper amount of lubrication?
- 4) Does the chain hit the case or cover?
- 5) Have all the bolts and nuts been tightened?

2 Test Operation

- 1) Are there any abnormal noises?
- 2) Does the chain vibrate?
- 3) Does the chain ride up on the sprocket?
- 4) Does the chain wind up on the sprocket?
- 5) Are the rail(s) and sprocket(s) properly installed?
- 6) Are the rollers rotating smoothly?
- 7) Does the entire chain articulate smoothly?
- 8) Does the chain list or snake when viewed from above?

Caution: Test operation after installation should consist of repeatedly starting and stopping the conveyor with no load, followed by continuous operation with no load. Lubricate chain before test operation so that parts wear in.

3. Adjust Chain Tension

Take-up the chain to ensure proper operation of the conveyor. As a guide, chain should be adjusted 1.5–2 pitches.

The correct amount of slack is essential. Wear will advance on chains with too much tension, while chains with too much slack will ride up on the sprocket, causing accidents.

1 Chain Slack

In a basic layout, a small amount of slack (δ) is needed on the return side as shown in the diagram below. Too much tension will promote chain wear, and too much slack will cause the chain to ride up on the sprocket teeth and cause damage.

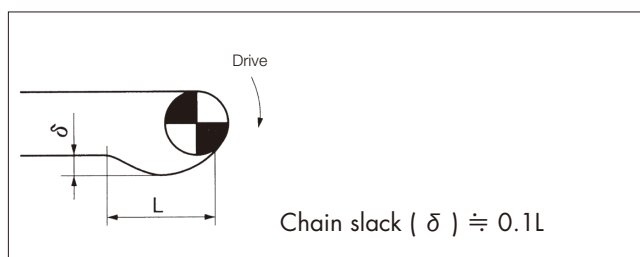


Fig. 6 Chain slack

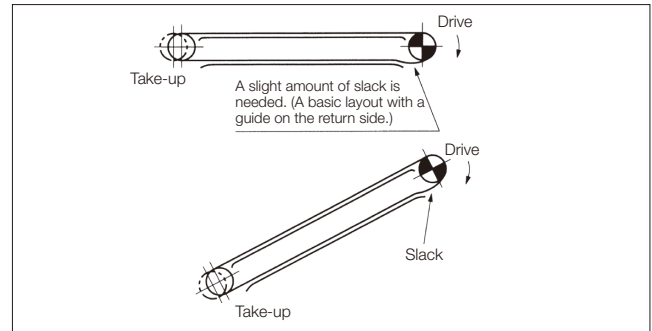


Fig. 7 Slack

2 Frequency of Adjustment

The chain will undergo initial elongation when first used, as well as elongation resulting from wear between pin and bush after operation. Therefore, it is necessary to regularly adjust the chain through take-up to ensure proper chain tension. A chain operated for eight hours per day should be checked and adjusted as per the following chart. It becomes easier to neglect take-ups the longer the chain is used, which leads to chain catenary and accidents. Thus, performing regular checks is essential.

Within one week after initial operation	Once/day	Shorten interval between checks if chain speed is fast or chain operating time per day is over eight hours.
Within one month after initial operation	Twice/week	
Over one month after initial operation	Twice/month	

3 Adjustment Frequency

3.1. When Chain Cannot Be Adjusted by Take-up Alone

If there is still some slack in the chain, despite taking up the chain as much as possible, remove two (2) links from the chain and shorten the overall length. See our guide to connecting and disconnecting chain.

3.2 Even Adjustment of Take-up on Both Sides

When two parallel chains are adjusted by two independently operated take-ups, care must be taken to ensure even stroke on both the left and right sides. For this, we will assume that the length of the left and right chains is roughly equal.

Therefore, it may be necessary to insert chain lengths at times to align the two lengths.

(This is unnecessary with continuous or balance take-up.)

An uneven adjustment will cause the link plate and the side of the sprocket teeth to interfere with each other and result in an overload condition.

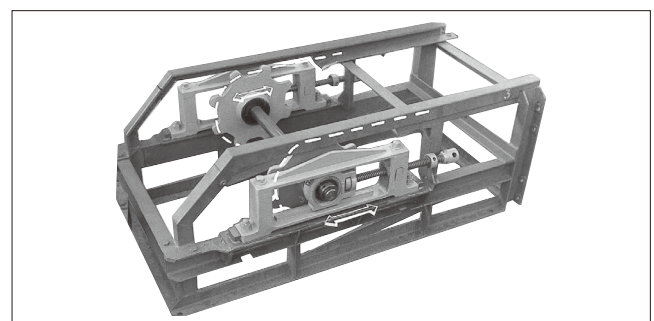


Fig. 8 Take-up

4. Lubrication

Lubrication is essential to ensure long life for your chain.

1 Lubricating

Lubricating your chain will reduce the wear on all chain parts as well as reduce required drive. Generally, lubricate once per week with ISO VG100 – VG150 (SAE30 – 40) oil by drip method or brush. Lubrication points are indicated by the diagram below. Ensure that chain is clean for maximum lubrication effectiveness.

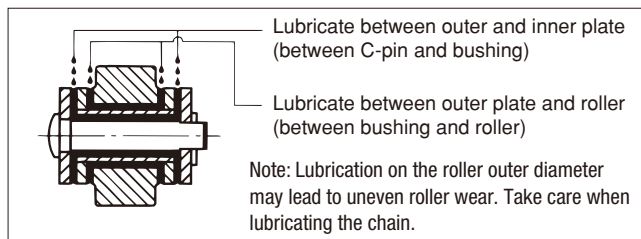


Fig. 9 Lubrication points

2 When to Avoid Lubrication

- When chain is buried within the items conveyed.
- When conveying powders in pan conveyors, apron conveyors, etc, or when powders may adhere to the chain and cause problems during lubrication.
- When the chain is used in high temperature environments.

3 Commercially Available Lubricants

(As of 10/1/2018)

Lubricant	Lubricant		
	ISOVG100 (SAE30)	ISOVG150 (SAE40)	ISOVG220 (SAE50)
Idemitsu Kosan	Daphne Mechanics Oil 100	150	220
EMG Lubricants	DTE Oil Heavy	Vacuoline 528	533
JXTG Energy	Super MUPUS DX 100	150	220
	Eneos FBK Oil RO 100	150	220

Manufacturer names are listed in no particular order.

5. Storage

Do not store chains or sprockets in areas where they will be exposed to, or risk exposure to, dust or water. Carefully brush lubrication on the edge face of the boss and sprocket holes especially to prevent rusting.

Chains are not treated with an anti-rust treatment when delivered. Apply an anti-rust treatment when storing and check periodically.

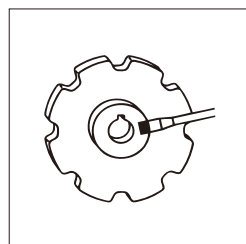


Fig. 10 Sprocket anti-rust treatment

6. Limits of Conveyor Chain Use

The following details the limits of conveyor chain parts. Check regularly for part wear.

1 Part Usage Limit

1.1 R Roller, F Roller

The plate has reached its limit when the bottom of the plate begins to touch the rail due to wear on the contact surface or the sliding area with the bush.

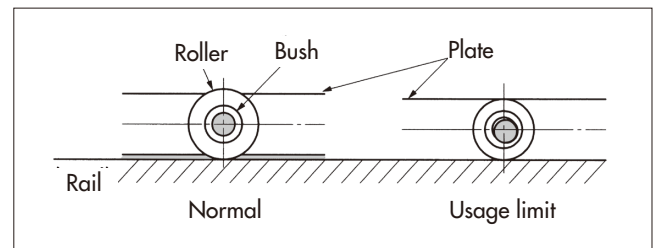


Fig. 11 R and F roller limits

If there is a curve in the rail then there will be less wear allowance for the corresponding S dimension only as per the diagram below. Special care is needed compared to flat conveyance.

1.2 S, M, and N Rollers

When roller thickness wears to 40%.

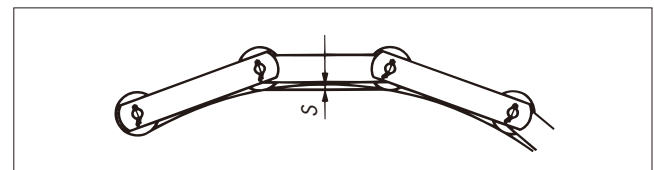


Fig. 12 Roller wear

1.3 Bush

When bush thickness wears to 40%.

1.4 Measuring Plate Width or Height Wear

Wear will develop from abrasion between plates and roller and plate contact at (A) and (B) below. Chain strength will be insufficient when wear exceeds 1/3 of the plate's normal thickness. If items are conveyed directly on the plate as with flow conveyors, or if they slide on top of steel plates, then chain life will have been reached when plate height is worn by 1/8 as per the diagram below.

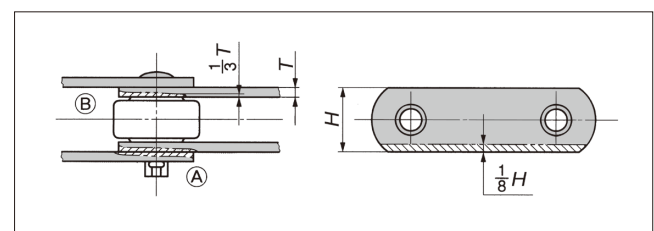


Fig.13 Plate wear

1.5 Measuring Chain Wear Elongation

A chain articulates when it engages the sprocket or along the curved portion of a rail, at which time a chain will elongate due to sliding wear between the bush and pin. The chain elongation limit is 2% (2mm of elongation on one link if pitch is 100mm) of a standard basic length (pitch × no. of links).

1) Measuring chain length (measured dimensions)

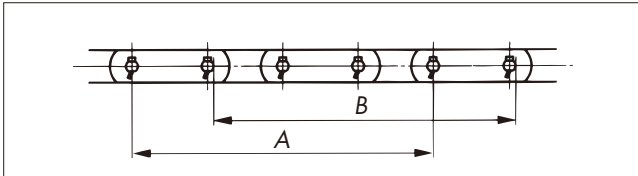


Fig. 14 Measuring dimensions

Measure as many links as possible (at least four links) as per the diagram above. Measure from:

(A) center of pin to center of pin

(B) end of pin to end of pin

2) Chain elongation (%)

Measure chain using one of the above methods, compare to standard length, and determine chain elongation (%).

$$\text{Chain Elongation} = \frac{\text{Measuring method} - \text{Standard length}}{\text{Standard length}} \times 100(\%)$$

1.6 Wear on Sprocket Teeth Face or Sides

Worn sprocket teeth may accelerate chain wear during engagement. Regularly inspect both sprockets and chains.

1) Wear limits for sprocket teeth surfaces are roughly shown in the diagram below.

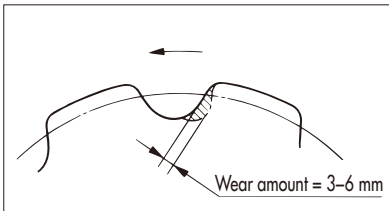


Fig. 15 Tooth surface wear

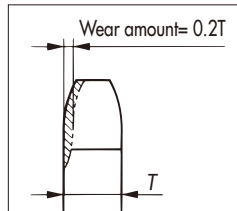


Fig. 16 Tooth side surface wear

2) Tsubaki recommends replacing the sprocket when teeth are worn. Avoid flipping the sprocket over and continuing to use sprockets with worn teeth bottoms.

When performing welding repairs, use a tooth gauge to check the tooth profile.

7. Other Points to Remember

1) Conveyor Downtime

Always remove load from conveyors before stopping. Starting with load may cause overloading. Inspect chain before starting a conveyor that has been stopped for extended periods.

2) Lubrication

Always regularly lubricate the chain.

3) Fixing Parts

The nuts of buckets, aprons, slats, and other items that are bolted to the chain can come loose and fall off due to chain vibration during operation. Spot weld them or take other action to ensure they do not loosen.

4) Amount of Chain Slack

Regularly inspect and adjust chain slack.

5) Temperature and Freezing

Conveyors may freeze when there is a difference in temperature, such as between day and night temperatures in winter. Lubricate chain and inspect often while paying attention to temperature changes when conveying liquid items. Condensation may form when conveying high temperature items in a case conveyor.

6) Storing Extra Chain

Tsubaki recommends having extra chain on hand in the event of chain failure. Store extra chain indoors where there is low humidity. Apply an anti-rust oil when storing for extended periods.

It may be convenient to attach a tag to the chain with the chain name, drawing number, date of purchase, equipment name, and other pertinent information.

7) Preventative Maintenance for the Conveyor

In addition to the above maintenance and inspection, create a conveyor history log and periodically record conveyor capacity, conveyor speed, main shaft rotation speed, current, voltage, power, actual operating time, actual conveyance load, inspection/lubrication days, accidents, etc. This can help prevent unexpected accidents and facilitate repairs.

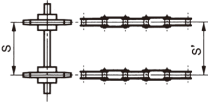
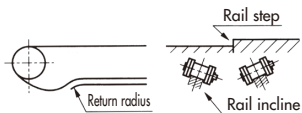
8) Cleaning

Periodically clean chain and rail if in contact with foreign matter or conveyed items.

4. Troubleshooting

Refer to the table below if you experience problems with your conveyor chain or sprocket, which should be replaced with new products as necessary.

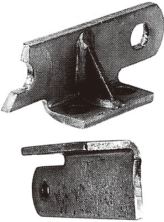
1. Chain and Sprocket

Problem	Possible Cause	Solution
Chain rides up on sprocket 	Chain and sprocket do not match.	Replace chain or sprocket with the correct size.
	Total arc of contact with the chain on the sprocket is insufficient.	Have total arc of contact be at least three teeth on the sprocket.
	Excessive load.	Reduce the load (ex. install a shock absorber).
	Inadequate back tension.	Adjust the catenary of take-up idler, or install a tensioner.
	Excessive chain elongation due to wear.	Replace with a new chain.
	Distance between the center of the chain and sprocket do not match $S \neq S'$.	Inspect and correct.
Chain winds on sprocket	Too much slack in chain.	Adjust the chain length or distance between axles, or install a tensioner.
	Excessively worn sprocket, or chain and sprocket do not match.	Replace chain and/or sprocket with the correct sized part.
Unusual noises	Inadequate lubrication to the contacting portions of the pin and bush.	Provide sufficient lubrication.
	Inadequate lubrication to the contacting portions of the bushing and roller.	Provide sufficient lubrication. Use a bearing roller or plastic roller.
	Winding or riding on the sprocket.	See above.
	Loose chain casing or axle bearing.	Tighten all nuts and bolts.
	Interference of the casing with the chain or other moving part.	Inspect and correct.
	Excessive wear in the chain or sprocket.	Replace the chain or sprocket (replace all connect chains).
	Improper setting of the guide rail. 	Inspect and correct.
Excessive wear at the inside of the chain's link plates or the teeth surfaces 	Improper centering of the sprocket.	Remove the chain and correct the centering of the drive and driven sprockets.
	Chain is being pushed to the side.	Remove the cause of the push and/or install a guide roller.
	Vibration caused by the inaccurate finishing of the sprocket's shaft hole.	Check and correct the faulty locations and replace the sprocket with a new part.
Excessive wear of the sprocket teeth valleys and drive sides	Excessively worn chain.	Replace both the chain and the sprocket.
	Insufficient number of teeth.	Increase the number of teeth.
	BF Chain being used (no rollers).	Change to an RF Chain (w/rollers).
	Tooth hardness is insufficient with respect to the load and conveyed materials or foreign particles.	Use a sprocket with hardened or changeable teeth.
	Chain and sprocket do not match.	Replace chain or sprocket with correct sized parts.
Poor articulation	Rusting or corrosion.	● Install a partition to protect the chain. ● Select a suitable chain (GS series, etc.).
	Particles of conveyed material have contaminated the pins, rollers, or bushes, or contamination from foreign particles.	● Install a partition to protect the chain. ● Select a chain with large clearance between pin, bush, and roller. ● Use Chesterton #601 or #610.
	Deformation of the chain from improper installation.	Inspect and correct installation of the sprockets and shafts.
	Inadequate lubrication.	Inspect the lubrication or look into wear resistant chain (CT/BT specifications, etc.).
	Operation in extremely high temperatures (over 400°C).	Provide adequate clearance.
	Seizure from excessive loads.	Lubricate regularly, reduce load.
	Pin bending due to excessively high loading.	Reduce load.

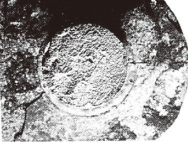
Problem	Possible Cause	Solution
The chain sticks and slips (This can be caused by a combination of many problems; therefore, the listed remedies may not solve the problem.)	Change the rolling friction coefficient of the chain.	● Clean and lubricate moving parts with Tsubaki oil. ● Replace sprocket. ● Switch to Bearing Roller Chain.
	The conveyor speed is too slow.	Increase conveyor speed.
	Insufficient rigidity in the frame.	● Increase the frame rigidity; increase the chain model number.
	The conveyor chain is small compared to the device.	● Decrease the slack in the drive roller chain.
	The force of friction is excessively large.	● Lubricate between the guide rail and chain. ● Switch to Bearing Roller Chain.
	The machine is too long.	Divide the conveyor system into sections to decrease the length.
Excessive wear on the inside link and pin on one side of an NF Block Chain or BF Chain (no roller)	Increased internal tension when engaging the sprocket.	● Attach a supporting block to the sprocket. ● Reduce load, and lubricate the chain and sprocket.
Chain is rusting	Inappropriate selection of material.	Select a more suitable chain material. Protect the chain from the environment. Apply a rust inhibitor.
	Condensation	Eliminate the temperature difference between the inside and outside of the conveyor (using insulation, etc.).
Excessive wear caused by the conveyed material 	The chain is contaminated with especially abrasive materials, such as mineral powders, etc., and the chain surface is being worn away.	● Prevent material from falling onto the chain. ● Use a wear-resistant chain. → Contact a Tsubaki representative.
Excessive wear from corrosion 	The chain is exposed to acidic or alkaline substances and therefore becomes more susceptible to machine wear, which then progresses much faster.	● Use a chemical-resistant material. ● Use a wear-resistant material for the machine-worn parts. → Contact a Tsubaki representative.
Excessive wear from electro-chemical corrosion 	When the chain is covered with water or passes through a solvent, the portions in contact suffer galvanic corrosion.	● Use a chemical-resistant material. ● Use a wear-resistant material for the machine-worn parts. → Contact a Tsubaki representative.

2. Plate

Problem	Possible Cause	Solution
Sudden fracture of link plate	Excessive load, too much tension on take-up.	● Eliminate the cause of overloading. ● Install a safety device (e.g. a Tsubaki Shock Relay). ● Increase chain size.
	Weakening of chain caused by excessive wear or corrosion.	● Replace with a new part. Install a cover to protect the chain. ● Lubricate regularly. ● Select a chain with the proper specs for the application.
	The link plates are pressed outward by the sprocket. 	● Check and correct the installation ● Check for excessively worn chain or sprocket, and replace as necessary. ● Check if the chain and sprocket match, and correct as necessary.
Deformed link plate holes and poor pin rotation (The pin is shifted from its normal position) 	Excessive load.	Eliminate the cause of overloading and replace chain with a larger size.
	Improper installation of the connecting link.	Replace connecting link with a new one.
	Excessive load and inadequate lubrication.	Replace with a new chain and improve the lubrication and loading conditions.
	Seizure of the pin and bush, poor articulation.	● Increase the chain size. ● Use a chain with a larger clearance between pin and bush.

Problem	Possible Cause	Solution
Crack in the link plate ① Fatigue breakage 	Excessive load, or excessive take-up tension. Excessively large repetitive load. Insufficient safety factor. Repetitive load on attachment.	Eliminate overloading or large repetitive loads. ● Increase the size or specs of the chain to increase the safety factor. ● Replace with a new chain. ● Eliminate overloading or large repetitive loads. ● Increase the chain size to increase the allowable load of the attachment.
② Corrosion stress crack  (Bow-shaped crack in heat treated metal plates)	The chain is being used in an acidic or alkaline environment. (Crack not caused by a repetitive load.)	● Install a cover to protect the chain from the environment. Replace with a new part. ● Use a chain with a high resistance to corrosion stress cracks.
Red pattern found on plates	There is scale on the base plate material.	● Can continue to be used as is (DT, DTA, AT, etc.).

3. Pin

Problem	Possible Cause	Solution
① Pin fatigue fracture 	The factor of safety used for calculation of the peak load versus the breakage load was too small. The peak load acted like a repetitive load on the chain.	Recheck the size of the peak load and eliminate its cause. Replace the chain with a larger size (larger pin diameter).
② Pin corrosive fatigue	The pin was subjected to a tensile load at the side of the fracture origin, from whence the break then progresses. Chain is especially susceptible to this when the pin surface is corroded and weak against bending stresses.	● Recheck the size of the peak load, and eliminate its cause. Replace the chain with a larger size (larger pin diameter). Use a cover to protect the chain. ● Use a pin made of an anti-corrosion material.
③ Pin brittle fracture	Poor environment.	Use an appropriate pin material.
④ Pin sudden fracture	Excessive load.	Eliminate the cause of overloading and replace the chain with a larger size.

4. Roller, Bush

Problem	Possible Cause	Solution
Improper roller rotation and uneven roller wear	Excessive load on roller.	Provide sufficient lubrication. Consider bearing roller or GT Series.
	Particles of conveyed material, or other foreign particles, have gotten between bush and roller.	Clean regularly, and install a partition to protect the chain.
	Particles of conveyed material, or other foreign particles, have built up on the rail.	Clean regularly, and install a partition to protect the chain.
	Lubricant is falling on the roller surface and rail without entering between the bush and roller or between roller and link plate.	Select an appropriate lubricant and lubrication method.
	Roller/bush rust.	Select an appropriate specification (RT, etc.).
	Inner plate is moving sideways.	Replace with a new chain. Re-inspect the installation and load conditions.
	Bush is cracked.	Reduce the load and lower the speed of rotation.
	The side surface of the roller is contacting the side of the link plate due to a thrust load.	Eliminate the cause of the thrust load.
	The chain and sprocket do not match, or excessively worn teeth.	Check for tooth deformation.
Roller is opening up	Excessive load.	Reduce the load, provide adequate lubrication, and remove any large steps in the rail.
Roller or bush is split (falling off)	Excessive load.	Reduce the load and provide adequate lubrication.
	Too few teeth with respect to conveyor speed.	Increase the number of teeth or decrease the speed.
The roller is becoming hourglass-shaped	Excessive load or inadequate lubrication.	Increase the lubrication, improve the loading conditions, and replace the chain with a new one.
	Excessively worn rail.	Correct or replace the rail.

5.Repair Parts

Indicate the following when inquiring about or ordering repair parts.

1 Conveyor Chains

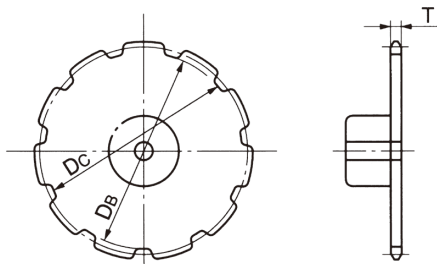
- 1) Chain size. (e.g. RF03075R)
- 2) Attachment type and spacing.
(e.g. A2 attachment every 2 links)
- 3) Total chain length. (e.g. 250 links)
- 4) Specification name (Standard, Heavy Duty, Corrosion Resistant).
(e.g. AT Heavy Duty Conveyor Chain)
- 5) Once the above is known, it can be referred to as follows.
RF03075R-AT-2LA2·····250 links
- 6) Indicate differences from standard chain for special specifications.
Provide the Tsubaki drawing number when known.
- 7) If chain size or chain drawing number are unknown, please provide the following information.
 - A. Chain pitch
 - B. Roller diameter and type
 - C. Inner link inner width
 - D. Plate width and height
 - E. Pin type
 - F. Attachment type and dimensions
 - G. Material and hardness if used in special applications

2 Sprockets

- 1) Chain size. (e.g. RF03075R)
- 2) Roller type and dimensions.
(e.g. R roller, ϕ 31.8 diameter, 15.5 contact width)
- 3) Number of sprocket teeth. (e.g. 6)
- 4) Type. (BW, CW, BW1, CW1)
- 5) Tooth tip hardness. (e.g. Normal N specs, Wear Resistant Q specs)
- 6) Shaft hole diameter and key dimensions. (e.g. ϕ 40H8, Js9)
- 7) Parallel use.
- 8) Once the above is known, it can be referred to as follows.
RF03075R6T-BWQH40J
Parallel use.
- 9) Indicate differences from standard sprockets for special specifications.
- 10) Provide the Tsubaki drawing number when known.

When chain size is unknown

In addition to information 2) – 10) above, indicate tooth width (T), radius of tooth valley (D_B), and distance between tooth valleys (D_C) if there are an odd number of teeth.



Large Size Conveyor Chain Inquiry Sheet

Specify the following when ordering Large Size Conveyor Chain.

Conveyor Name				KN{kgf}
Items Conveyed		Chain Pitch	mm	
Corrosion Resistance		Attachment	every link	
Wear Resistance		Conveyance Method	Pushed by Dog	Direct Conveyance Other
Temp. of Items	Temp. °C	Operating Time	h/d	
Dimensions of Items		Running Method	Continuous, Intermittent, Reverse (yes/no)	
Mass of Items	MAX kg/each	Lubrication	Can/cannot use	
Amt. Conveyed	MAX t/h (loose items) kg/conveyor (individual items)	Motor	AC/DC	kW × r/min × motor(s)
		Sprocket No. of Teeth	NT	(PCD mm)
Conveyor Length	m	Sprocket Shaft Hole Dia.	φ	H8 · H7
Lifting Height	m	Hub	Type () φ	× L
No. of Strands	strands (spacing m)	Keyway	No () JIS · b	× t parallel
Chain Speed	m/min	Tooth Finishing	Precision fused	Machine cut Induction hardened

Simple diagram of conveyor and chain: Include conveyor configuration, intake, discharge methods, rail configuration, return side uptake, etc.

Co. Name:	Division or Department:
Name:	Tel:
Date:	Fax:



TSUBAKIMOTO CHAIN CO.

Japan

Tsubakimoto Chain Co.

<https://tsubakimoto.com/>

Global Group Companies

AMERICAS

United States

U.S. Tsubaki Power Transmission, LLC

<https://www.ustsubaki.com/>

Brazil

Tsubaki Brasil Equipamentos Industriais Ltda.

<https://tsubaki.ind.br/>

Canada

Tsubaki of Canada Limited

<https://tsubaki.ca/>

EUROPE

Netherlands

Tsubakimoto Europe B.V.

<https://tsubaki.eu/>

France

Kabelschlepp France S.A.R.L.

<https://tsubaki-kabelschlepp.com/fr-fr/>

Germany

Tsubaki Deutschland GmbH

<https://tsubaki.de/>

Tsubaki Kabelschlepp GmbH

<https://tsubaki-kabelschlepp.com/de-de/>

Italy

Kabelschlepp Italia S.R.L.

<https://tsubaki-kabelschlepp.com/it-it/>

Spain

Tsubaki Ibérica Power Transmission S.L.

<https://tsubaki.es/>

United Kingdom

Tsubakimoto UK Ltd.

<https://tsubaki.eu/>

Slovakia

Kabelschlepp-Systemtechnik, spol. s r.o.

<https://tsubaki-kabelschlepp.com/sk-sk/>

Poland

Kabelschlepp Sp. z o.o.

<https://kabelschlepp.pl/>

INDIAN OCEAN RIM

Singapore

Tsubakimoto Singapore Pte. Ltd.

<https://tsubaki.sg/>

Australia

Tsubaki Australia Pty. Limited

<https://tsubaki.com.au/>

India

Tsubaki India Power Transmission Private Limited

<https://en.tsubaki.in/>

Indonesia

PT. Tsubaki Indonesia Trading

<https://tsubaki.id/>

Malaysia

Tsubaki Power Transmission (Malaysia) Sdn. Bhd.

<https://en.tsubaki.my/>

New Zealand

Tsubaki Australia Pty. Limited - New Zealand Branch

<https://tsubaki.com.au/>

Philippines

Tsubakimoto Philippines Corporation

<https://en.tsubaki.ph/>

Thailand

Tsubakimoto (Thailand) Co., Ltd.

<https://tsubaki.co.th/>

Vietnam

Tsubakimoto Vietnam Co., Ltd.

<https://tsubaki.net.vn/>

EAST ASIA

Republic of Korea

Tsubakimoto Korea Co., Ltd.

<https://tsubakimoto-tck.co.kr/>

Taiwan

Taiwan Tsubakimoto Trading Co., Ltd.

<https://tsubakimoto.tw/>

CHINA

China

Tsubakimoto Chain (Shanghai) Co., Ltd.

<https://www.tsubaki-sh.cn/>
