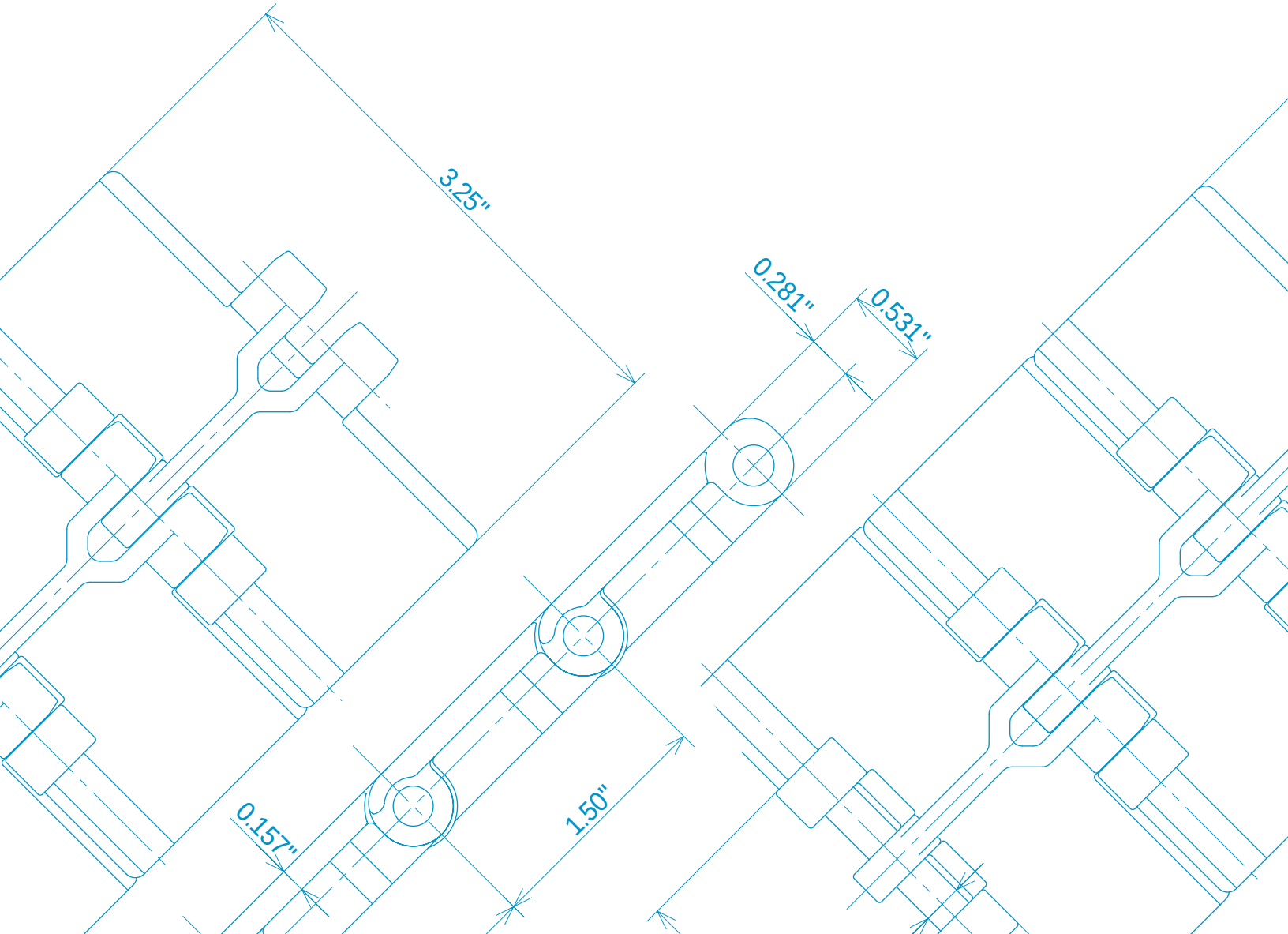
U.S. Tsubaki, Inc.

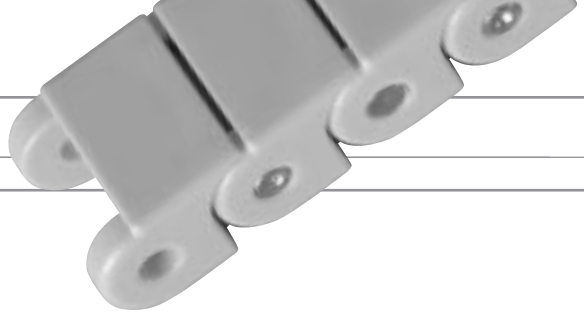
Roller Chain Division

Industrial Plastic Chains

Specifications and Selection Guidelines



This information is intended to provide general guidelines for conveyor chain selection. Consult U.S. Tsubaki for specific application problems.



Chain No.	Pitch	Max. Allowable Tension (lbs.)				
		Standard/MW	UMW	KV	E	Y
RS35P	.375	40	30	40	30	20
RS40P	.500	100	66	100	77	55
RSP40P	.500	55	—	—	—	—
RS50P	.625	154	110	—	110	90
RS60P	.750	200	—	—	—	—
RS60P-2	.750	286	200	—	—	—
RS60PU	.750	190	130	—	—	—
RS60PU-2	.750	242	176	—	—	—
RSP60P	.750	132	—	—	—	—
RSP60PU	.750	100	—	—	—	—
RS2040P	1.000	100	66	—	—	—

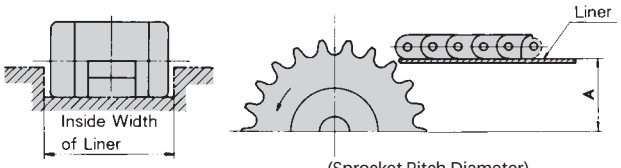
Operating Conditions

	Standard	KV180	KV250
Ambient Operating Temp. (°F)	176	356	482
Maximum Allowable Speed (ft./min.)	200	330	330

	Standard	MW	UMW	HF
Coefficient of Friction	0.25	0.17	0.14	0.30

Location of Guide Rails and Sprocket

RS35P ~ RS60P



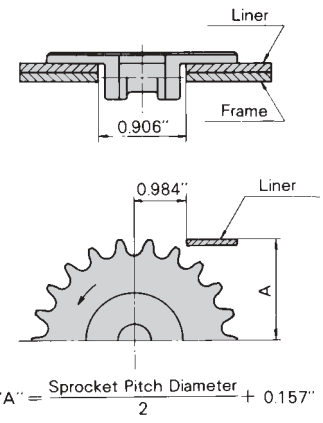
RS35P: 0.630" "A" of RS35P = $\frac{\text{(Sprocket Pitch Diameter)}}{2}$ − 0.157"

RS40P: 0.906" "A" of RS40P = $\frac{\text{(Sprocket Pitch Diameter)}}{2}$ − 0.236"

RS50P: 1.000" "A" of RS50P = $\frac{\text{(Sprocket Pitch Diameter)}}{2}$ − 0.276"

RS60P: 1.299" "A" of RS60P = $\frac{\text{(Sprocket Pitch Diameter)}}{2}$ − 0.335"

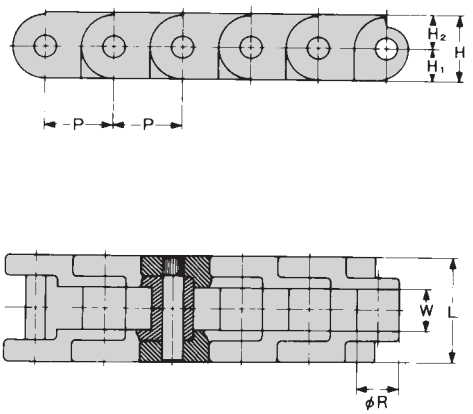
RS2040P



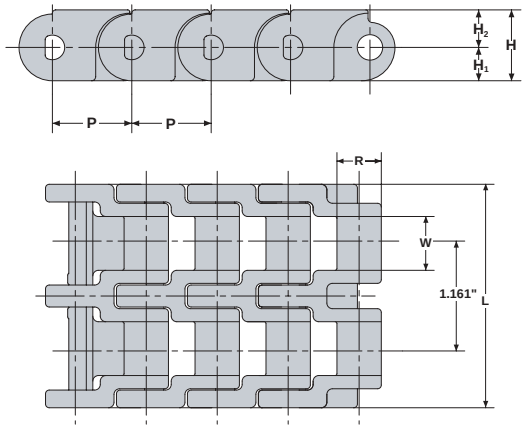
"A" = $\frac{\text{Sprocket Pitch Diameter}}{2}$ + 0.157"

RS SINGLE PITCH PLASTIC CHAIN

RS35P~RS60P



RS60P-2



All dimensions are in inches unless otherwise indicated.

Chain No.	Pitch P	R	W	L	H_1	H_2	H	Approx. Weight (lbs./ft.)
RS35P	.375	.200	.188	.512	.157	.197	.354	.10
RS40P	.500	.313	.313	.787	.236	.264	.500	.24
RSP40P	.500	.313	.313	.787	.236	.264	.500	.17
RS50P	.625	.400	.375	.886	.276	.315	.591	.31
RS60P	.750	.469	.500	1.181	.335	.346	.681	.48
RS60P-2	.750	.469	.570	2.362	.315	.354	.669	1.00
RS60PU	.750	.469	.500	1.181	.335	.346	.681	.48
RS60PU-2*	.750	.469	.570	2.480	.315	.354	.669	1.00
RSP60P	.750	.469	.500	1.181	.335	.346	.681	.35
RSP60PU	.750	.469	.500	1.181	.335	.346	.681	.33

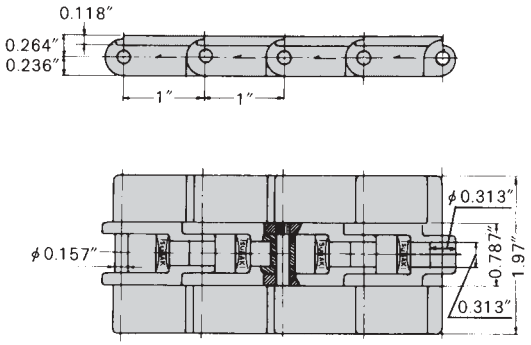
*RS60PU-2 measures 2.992 in. to the outside of the extension wings. Note: KV Series is clip-type construction and has a slightly longer pin.

RS DOUBLE PITCH PLASTIC CHAIN

All dimensions are in inches unless otherwise indicated.

Chain No.	Pitch P	Slat Width	Approx. Weight (lbs./ft.)
RS2040P	1.00	1.97	.28

Note: KV Series is clip-type construction and has a slightly longer pin.



Availability Matrix

Chain No.	Standard	Ultra Low Friction UMW	Low Friction MW/ MWG/ MWB	Anti-bacterial/ Anti-mold MWS	Heat Resistant /High Speed KV180	Heat Resistant /High Speed KV250	Super Corrosion Resistant SY	Corrosion Resistant Y	Acid Resistant AR	Electro-conductive Resistant E	Static Resistant SE	High Friction HF	Ultraviolet Resistant UVR
RS35P	•	•	•	•	•	✎	•	•	•	•	•	•	•
RS40P	•	•	•	•	•	✎	•	•	•	•	•	•	•
RS50P	•	•	•	•			•	•	•	•	•	•	•
RS60P	•	•	•	•	•	✎	•	•	•	•	•	•	•
RS60P-2	•	•	•	•			•	•	•	•	•	•	•
RS60PU	•	•	•	•				•	•	•	•	•	•
RS60PU-2	•	•	•	•				•	•	•	•	•	•
RS2040P	•	•	•	•			•	•	•	•	•	•	
RSP40P	•		•	•				•		•	•	•	•
RSP60P	•		•	•				•		•	•	•	•
RSP60PU	•		•	•									

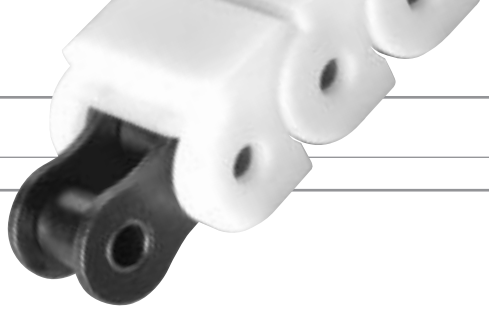
• = Available ✎ = Call U.S. Tsubaki for availability

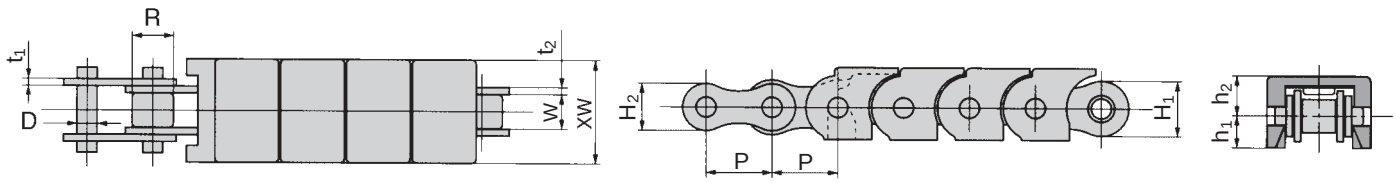
Corrosion Resistance Guide

Fluid	Standard RS Plastic
Acetone	F
Alcohol	F
Aldehyde Formate	F
Ammonia	F
Beer	F
Carbon Tetrachloride	P
Citric Acid	P
Fruit Juice	F
Gasoline	F
Lactic Acid	F
Milk	F
Oil (Vegetable)	F
Paraffin	F
Seawater	P
Soapy Water	F
Sodium Chloride	P
Soft Drinks	F
Vegetable Juice	F
Vinegar	P
Whiskey	F

F = Fully Resistant P = Partially Resistant

CLIP-TOP CHAIN





All dimensions are in inches unless otherwise indicated.

Chain No. Chain Type			Pitch			
Std.	NP	LAMBDA®	P	R	W	D
RF06B-CT	RF06B-NP-CT	RF06BLCT-A	.375	.250	.225	.130
RS40-CT	RS40NP-CT	RS40LCT-A	.500	.312	.312	.156
RS60-CT	RS60NP-CT	RS60LCT-A	.750	.469	.500	.234

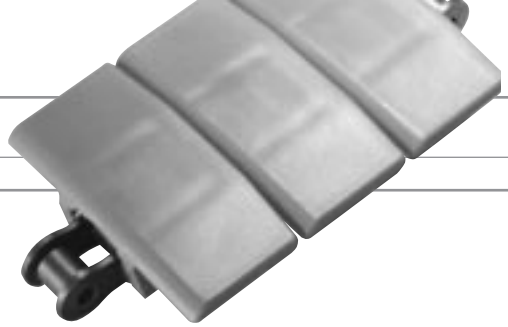
Chain No. Chain Type			Link Plate			
Std.	NP	LAMBDA®	t_1	t_2	H_1	H_2
RF06B-CT	RF06B-NP-CT	RF06BLCT-A	.040	.050	.323	.323
RS40-CT	RS40NP-CT	RS40LCT-A	.060	.060	.472	.410
RS60-CT	RS60NP-CT	RS60LCT-A	.094	.094	.713	.614

Chain No. Chain Type			Resin Cover			Max. Allowable Tension (lbs.)	Approx. Weight (lbs./ft.)	No. of Links Per Unit
Std.	NP	LAMBDA®	h_1	h_2	XW			
RF06B-CT	RF06B-NP-CT	RF06BLCT-A	.217	.295	.680	330	.37	320
RS40-CT	RS40NP-CT	RS40LCT-A	.275	.354	.925	590	.57	240
RS60-CT	RS60NP-CT	RS60LCT-A	.413	.532	1.400	1,400	1.31	160

Availability Matrix

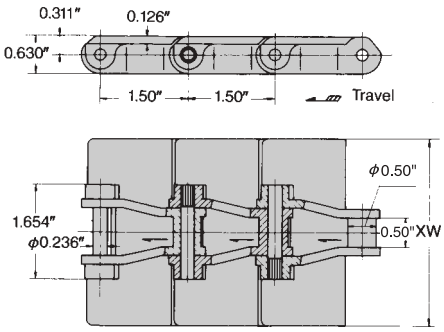
Chain No.	Standard	Ultra Low Friction UMW	Low Friction MW/ MWG/ MWB	Anti-bacterial/ Anti-mold MWS	Heat Resistant /High Speed KV180	Heat Resistant /High Speed KV250	Super Corrosion Resistant SY	Corrosion Resistant Y	Acid Resistant AR	Electro-conductive Resistant E	Static Resistant SE	High Friction HF	Ultraviolet Resistant UVR
RF06B-CT	•									•		•	
RS40-CT	•									•		•	
RS60-CT	•									•		•	
RF06B-NP-CT	•									•		•	
RS40NP-CT	•									•		•	
RS60NP-CT	•									•		•	
RF06BLCT-A	•									•		•	
RS40LCT-A	•									•		•	
RS60LCT-A	•									•		•	

• = Available ◆ = Call U.S. Tsubaki for availability



TP Top Chain Linear Movement

TP-I



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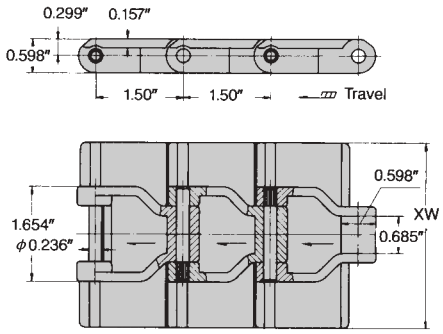
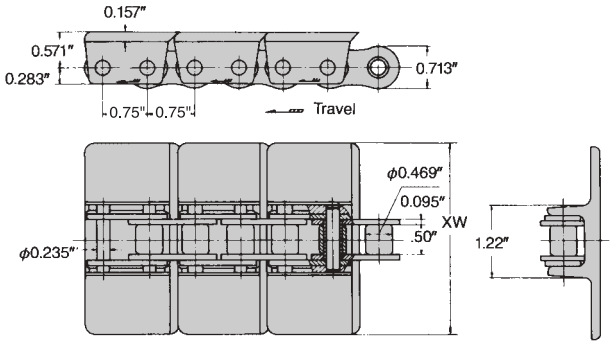
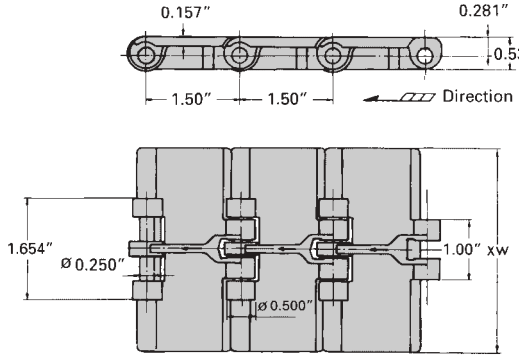


TN Top Chain Linear Movement



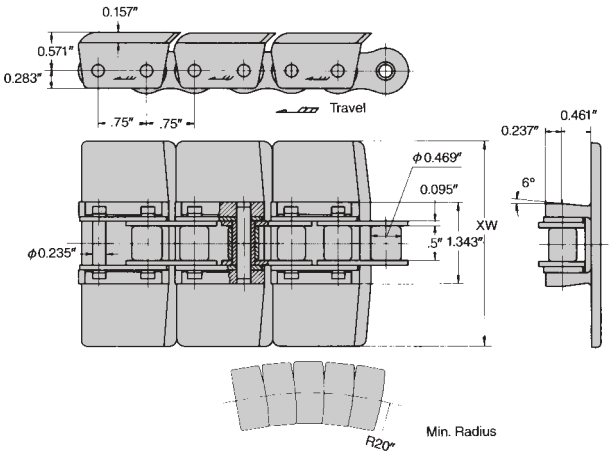
TTP Top Chain Linear Movement



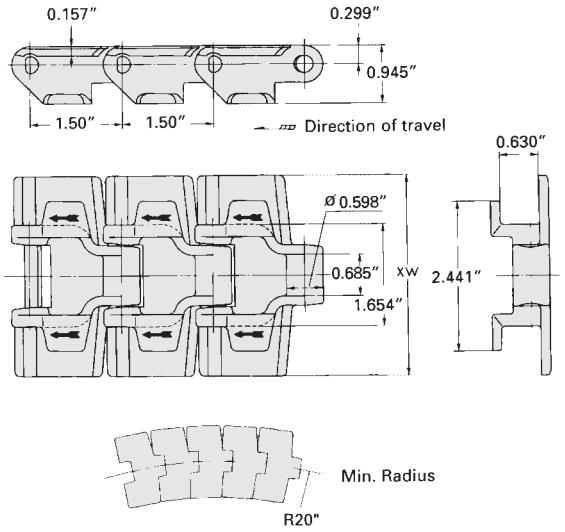
All dimensions are in inches unless otherwise indicated.

Chain No.	Slat Width XW	Approx. Weight (lbs./ft.)	Minimum Radius R
TTP826	3.25	0.60	—
TTP826P	3.25	0.44	—
TTP1143	4.50	0.67	—
TTP1905	7.50	0.94	—
TP762-I	3.00	0.57	—
TP826-I	3.25	0.57	—
TP826P-II	3.25	0.50	—
TP1016-II	4.00	0.70	—
TP1143-II	4.50	0.74	—
TP1270-II	5.00	0.80	—
TN826	3.25	1.41	—
TN826PC	3.25	1.00	—
TN1016	4.00	1.47	—
TN1143	4.50	1.54	—
TN1270	5.00	1.61	—
TN1905	7.50	1.88	—

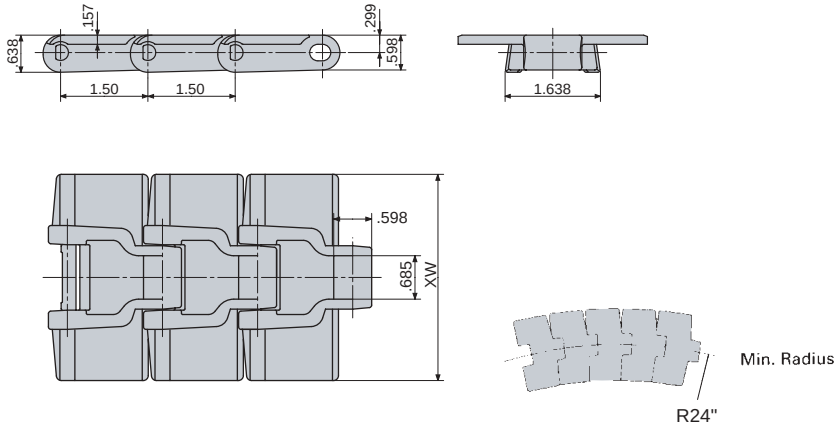
TNU Top Chain Curved Movement



TPU Top Chain Curved Movement



TTUP Top Chain Curved Movement



All dimensions are in inches unless otherwise indicated.

Chain No.	Slat Width XW	Approx. Weight (lbs./ft.)	Minimum Radius R
TTUP826	3.25	0.67	24
TTUP826P	3.25	0.47	24
TTUP1143	4.50	0.74	24
TTUP1143P	4.50	0.54	24
TTUP1905	7.50	1.07	24
TPU826	3.25	0.67	20
TPU826P	3.25	0.54	20
TNU826	3.25	1.47	20
TNU1143	4.50	1.54	20
TNU1270	5.00	1.68	20

Availability Matrix

Chain No.	Standard	Ultra Low Friction UMW	Low Friction MW/ MWG/ MWB	Anti-bacterial/ Anti-mold MWS	Heat Resistant /High Speed KV180	Heat Resistant /High Speed KV250	Super Corrosion Resistant SY	Corrosion Resistant Y	Acid Resistant AR	Electro-conductive Resistant E	Static Resistant SE	High Friction HF	Ultraviolet Resistant UVR
TTP826	•	•	•	•	•		•	•	•	•	•	•	•
TTP826P	•	•	•	•									
TTP1143	•	•	•	•	•		•	•	•	•	•	•	•
TTP1905	•	•	•	•	•		•	•	•	•	•	•	•
TP762-I	•		•	•			•	•	•		•		
TP826-I	•		•	•			•	•	•		•		
TP826P-II	•	◥	•	•				•		•	•	•	•
TP1016-II	•		•	•	•	•	•	•	•		•		
TP1143-II	•		•	•	•	•	•	•	•		•		
TP1270-II	•		•	•	•	•	•	•	•		•		
TN826	•		•								•		•
TN826PC	•		•								•		
TN1016	•		•								•		•
TN1143	•		•								•		•
TN1270	•		•								•		•
TN1905	•		•								•		•
TTUP826	•	•	•	•	•			•	•	•	•	•	•
TTUP826P	•	◥	•	•				•		•	•	•	•
TTUP1143	•	•	•	•	•			•	•	•	•	•	•
TTUP1143P	•	◥	•	•				•		•	•	•	•
TTUP1905	•	•	•	•	•			•	•	•	•	•	•
TPU826	•	•	•	•	•	•	•		•	•	•	•	•
TPU826P	•	◥	•	•				•		•	•	•	•
TNU826	•		•								•		•
TNU1143	•		•								•		•
TNU1270	•		•								•		•

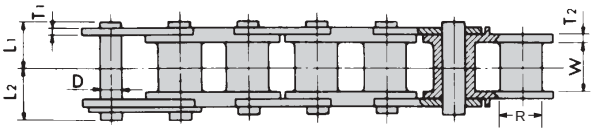
• = Available ◥ = Call U.S. Tsubaki for availability

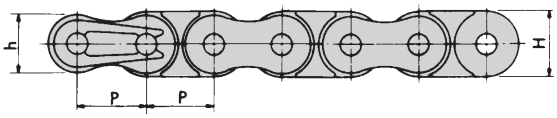
Corrosion Resistance Guide

Fluid	Steel	Polyacetal	304 Stainless Steel	Ultra-high Polymer Polyethylene
Acetic Acid (5%)	X	X	F	F
Acetone	X	F	F	F
Alcohol	F	F	F	F
Aqueous Ammonia	P	F	F	F
Beer	F	F	F	F
Benzene	F	F	F	P
Carbon Tetrachloride	P	F	P	P
Caustic Soda (25%)	X	X	F	F
Citric Acid	X	P	F	F
Formic Acid	X	X	X	F
Formic Acid Aldehyde	F	F	F	F
Fruit Juice	X	F	F	F
Gasoline	F	F	F	P
Hydrogen Peroxide	X	X	F	F
Hypochlorite Soda	X	X	X	F
Lactic Acid	X	F	F	F
Milk	F	F	F	F
Nitric Acid (5%)	X	X	F	P
Oils (Vegetable & Mineral)	F	F	F	F
Paraffin	F	F	F	F
Phosphoric Acid	X	X	P	F
Rice Vinegar (5%)	X	F	P	F
Seawater	X	P	P	F
Soapy Water	P	F	F	F
Sodium Chloride	X	F	P	F
Soft Drinks	F	F	F	F
Vegetable Juice	P	F	F	F
Water	X	F	F	F
Whiskey	F	F	F	F
Wine	F	F	F	F

F = Fully Resistant P = Partially Resistant X = Not Recommended

The above Corrosion Resistance Guide should be used for reference only and does not state or imply any warranty conditions. The table shows results of lab tests at 68° F. Humidity and other conditions must also be considered when selecting Top Chain and liner materials.





All dimensions are in inches unless otherwise indicated.

Chain No.	Pitch P	R	W	Pin D	Pin L_1	Pin L_2
RF25PC	.250	.130	.125	.091	.177	.217
RF35PC	.375	.200	.188	.141	.270	.309
RF40PC	.500	.312	.312	.156	.325	.392
RF50PC	.625	.400	.375	.200	.406	.472
RF60PC	.750	.469	.500	.234	.506	.581

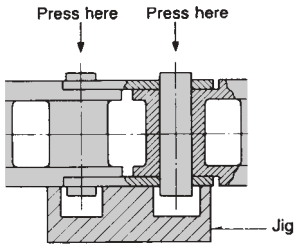
Chain No.	Link Plate T_1	Link Plate T_2	Link Plate H	Link Plate h	Max. Allowable Load (lbs.)	Approx. Weight (lbs./ft.)	Color
RF25PC	.030	.051	.236	.199	18	.06	Brown
RF35PC	.050	.087	.354	.307	40	.15	Brown
RF40PC	.060	.060	.472	.409	99	.26	Brown
RF50PC	.080	.080	.591	.512	154	.39	Brown
RF60PC	.094	.094	.713	.614	198	.55	Brown

Additional Information

1. Offset links are not available. Please use an even number of links.
2. Existing RS standard sprockets can be used.
3. RF40PC to RF60PC use the same connecting links as stainless steel chain. RF25PC and RF35PC use special connecting links.
4. When replacing stainless steel chain with Poly-Steel Chain, check the chain tension. Chain tension should be less than the maximum allowable tension.
5. Ambient temperature range is -14˚F ~ 176˚F (-10˚C ~ 80˚C).
6. Maximum chain speed is less than 230 ft./min.
7. Coefficient of sliding friction between chain and guide rail is 0.25 (without lubrication).
8. The guide rail should support the bottom side of the links.
9. The color of the inner links is brown.

Connecting and Disconnecting

1. Disconnect as follows:
   As shown in the drawing, place the pin link plate on the jig and press down on the pin heads. Be careful not to apply too much pressure to the plastic portion as breakage may occur.

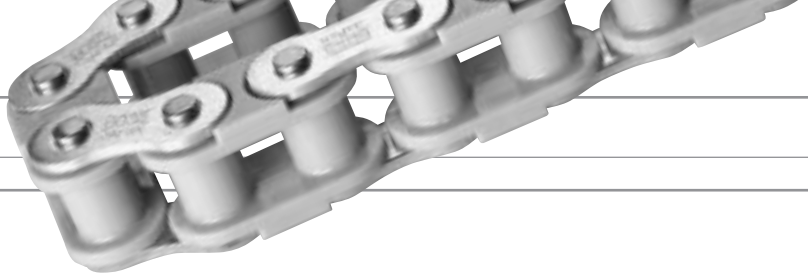


2. For connecting, use a connecting link.

Availability Matrix

Chain No.	Standard	Ultra Low Friction UMW	Low Friction MW/ MWG/ MWB	Anti-bacterial/ Anti-mold MWS	Heat Resistant /High Speed KV180	Heat Resistant /High Speed KV250	Super Corrosion Resistant SY	Corrosion Resistant Y	Acid Resistant AR	Electro-conductive Resistant E	Static Resistant SE	High Friction HF	Ultraviolet Resistant UVR
RF25PC	•		•							•	•		•
RF35PC	•		•							•	•		•
RF40PC	•		•	•			•	•		•	•		•
RF50PC	•		•	•			•	•		•	•		•
RF60PC	•		•	•			•	•		•	•		•

• = Available ◆ = Call U.S. Tsubaki for availability



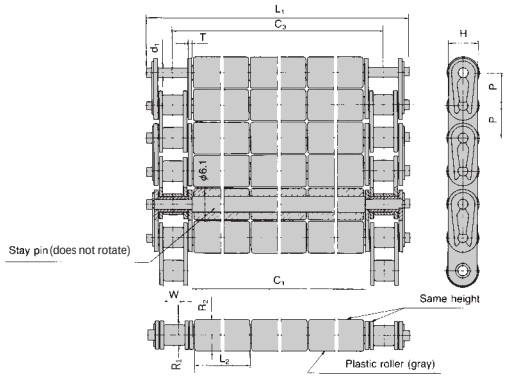
Corrosion Resistance Guide

Substance	Concentration	Temperature (°F)	PC Chain	PC-SY Chain
Acetic Acid	10%	68	H	H
Alcohol			H	H
Ammonia Water		68	H	H
Ammonium Nitrate		Boiling	P	H
Beer		68	H	H
Benzene		68	H	H
Butyric Acid		68	H	X
Calcium Chloride		68	P	H
Calcium Hydroxide	20%	Boiling	H	H
Calcium Hypochlorite	11-14%	68	X	H
Carbolic Acid			X	H
Carbon Tetrachlorite (dry)		68	H	H
Chlorine Gas (dry)		68	X	H
Chlorine Gas (moist)		68	X	H
Chromic Acid	5%	68	X	H
Citric Acid	50%	68	X	H
Coffee		Boiling	H	H
Developing Solution		68	H	H
Ethyl Ether		68	H	H
Ferric Acid	50%	68	X	H
Formic Acid	50%	68	X	H
Fruit Juice		68	H	H
Gasoline		68	H	H
Glycerol		68	H	H
Honey			H	H
Hydrochloric Acid	2%	68	X	H
Hydrogen Peroxide	30%	68	X	H
Hydrogen Sulfide (dry)			H	H
Ketchup		68	H	H
Lactic Acid	10%	68	H	H
Linseed Oil		68	H	X
Malic Acid	50%	Boiling	H	H
Mayonnaise		68	H	H
Milk		68	H	H
Nitric Acid	5%	68	X	H
Nitric Acid	65%	68	X	H
Oil (Plant, Mineral)		68	H	H
Oleic Acid		68	H	X
Oxalic Acid	10%	68	X	H
Paraffin		68	H	X
Petroleum		68	H	H
Phosphoric Acid	5%	68	X	H
Phosphoric Acid	10%	68	X	H
Potassium Bichromate	10%	68	H	X
Potassium Hydroxide	20%	68	H	H
Potassium Nitrate	25%	68	H	X
Potassium Permanganate	Saturation	68	X	H
Seawater		68	P	H
Soap-and-water Solution		68	H	X
Sodium Chloride	5%	68	H	H
Sodium Hydrocarbonate		68	H	H
Sodium Hydroxide	25%	68	H	X
Sodium Hypochlorite	10%	68	X	H
Soft Drinks		68	H	H
Sugar Solution		68	H	H
Sulfuric Acid	5%	68	X	H
Synthetic Detergent			H	H
Syrup			H	H
Tartaric Acid	10%	68	H	H
Vegetable Juice		68	H	H
Vinegar		68	P	H
Water			H	H
Whiskey		68	H	H
Wine		68	H	H
Zinc Chloride	50%	68	P	H
Zinc Sulfate	25%	68	X	H

H = Highly corrosion resistant P = Partially corrosion resistant X = Not Recommended

RT TYPE ROLLER TABLE CHAIN

Both sides of chain: Stainless Steel



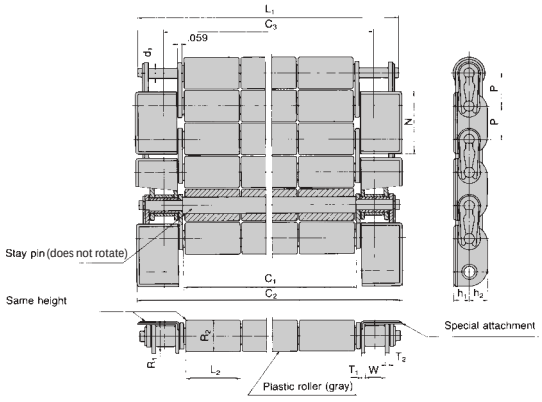
All dimensions are in inches unless otherwise indicated.

Chain No.	Pitch P	R_1	W	Pin		Link Plate	
				d_1	L_1	H	T
RT404SS	.500	.313	.313	.154	5.339	.437	.059
RT408SS	.500	.313	.313	.154	9.276	.437	.059
RT412SS	.500	.313	.313	.154	13.213	.437	.059
RT416SS	.500	.313	.313	.154	17.150	.437	.059
RT504SS	.625	.400	.375	.200	5.622	.547	.079
RT508SS	.625	.400	.375	.200	9.559	.547	.079
RT512SS	.625	.400	.375	.200	13.496	.547	.079
RT516SS	.625	.400	.375	.200	17.433	.547	.079
RT520SS	.625	.400	.375	.200	21.370	.547	.079
RT524SS	.625	.400	.375	.200	25.307	.547	.079
RT604SS	.750	.469	.500	.235	6.047	.661	.094
RT608SS	.750	.469	.500	.235	9.984	.661	.094
RT612SS	.750	.469	.500	.235	13.921	.661	.094
RT616SS	.750	.469	.500	.235	17.858	.661	.094
RT620SS	.750	.469	.500	.235	21.795	.661	.094
RT624SS	.750	.469	.500	.235	25.732	.661	.094

Chain No.	Plastic Roller		Effective Width	Center Distance Between Chains	Max. Allowable Load (lbs./ft.^{2})	Approx. Weight (lbs./ft.)
	R_2	L_2	C_1	C_3		
RT404SS	.480	1.969	3.984	4.551	41	2.71
RT408SS	.480	1.969	7.921	8.488	41	4.54
RT412SS	.480	1.969	11.858	12.425	41	6.37
RT416SS	.480	1.969	15.795	16.362	41	8.21
RT504SS	.598	1.969	3.984	4.685	61	3.90
RT508SS	.598	1.969	7.921	8.622	61	6.37
RT512SS	.598	1.969	11.858	12.559	61	8.85
RT516SS	.598	1.969	15.796	16.496	61	11.35
RT520SS	.598	1.969	19.732	20.433	61	13.80
RT524SS	.598	1.969	23.669	24.370	61	16.28
RT604SS	.720	1.969	3.984	4.882	61	4.52
RT608SS	.720	1.969	7.921	8.819	61	6.98
RT612SS	.720	1.969	11.858	12.756	61	9.43
RT616SS	.720	1.969	15.795	16.693	61	11.88
RT620SS	.720	1.969	19.732	20.630	61	14.33
RT624SS	.720	1.969	23.669	24.567	61	16.78

ST TYPE ROLLER TABLE CHAIN

Special attachment is bent to height of roller. Both sides of chain: Stainless Steel



All dimensions are in inches unless otherwise indicated.

Chain Series	Pitch P	R_1	W	Attach. Height h_1	Link Plate Height h_2	Attach. Width N
ST400	.500	.313	.313	.224	.276	.961
ST500	.625	.400	.375	.280	.335	1.201

Chain Series	Attach. Plate Thickness T_1	Link Plate Thickness T_2	Pin Dia. d_1	Plastic Roller Dia. R_2	Plastic Roller Length L_2	Max. Allowable Load (lbs./ft.^{2})
ST400	.047	.059	.154	.472	.984	51
ST500	.059	.079	.200	.591	.984	72

Notes: 1. Maximum allowable load varies with the length and width of the machine.
2. Use sprockets with more than 23 teeth.

Chain No.	Effective Width C_1	Overall Width C_2	Center Distance Between Two Chains C_3	Overall Pin Length L_1	Approx. Weight (lbs./ft.)
ST404SS	3.984	5.433	4.551	5.339	2.97
ST406SS	5.953	7.402	6.520	7.307	3.88
ST408SS	7.921	9.370	8.488	9.276	4.79
ST410SS	9.890	11.339	10.457	11.244	5.70
ST412SS	11.858	13.307	12.425	13.213	6.60
ST414SS	13.827	15.276	14.393	15.181	7.51
ST416SS	15.795	17.244	16.362	17.150	8.41
ST504SS	3.984	5.717	4.685	5.622	4.14
ST506SS	5.953	7.658	6.654	7.591	5.43
ST508SS	7.921	9.654	8.622	9.559	6.64
ST510SS	9.890	11.622	10.591	11.528	7.89
ST512SS	11.858	13.591	12.559	13.496	9.14
ST514SS	13.827	15.559	14.528	15.465	10.39
ST516SS	15.795	17.528	16.496	17.433	11.63
ST518SS	17.764	19.496	18.465	19.402	12.89
ST520SS	19.732	21.465	20.433	21.370	14.14
ST522SS	21.701	23.433	22.402	23.339	15.39
ST524SS	23.669	25.402	24.370	25.307	16.64

AVAILABILITY

RT Type and ST Type Roller Table Chains are available in standard polyacetal only.

STEP 1 CONFIRM THE OPERATING CONDITIONS OF THE CONVEYOR

1. Type of conveyor (slat conveyor, bucket elevator, etc.)
2. Method of chain travel (horizontal, inclined, or vertical)
3. Type, weight, and size of conveyed materials
4. Weight of conveyed materials per foot of conveyor length
5. Conveyor speed
6. Conveyor length
7. Method of lubrication
8. Considerations for special environments

STEP 2 SELECT THE APPROXIMATE CHAIN SIZE

Use the following formula to estimate the chain tension (T). Select a chain with an allowable load equal to or above the result.

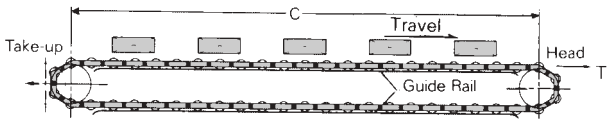
T (lbs.) = $M_T \bullet f \bullet k_1$
M_T = Total weight of conveyed material (lbs.)
f = = Coefficient of friction, sliding and/or rolling (f_1 and/or f_2 of Table I and II).
k_1 = Chain speed coefficient (Table III)

STEP 3 CALCULATE THE DESIGN CHAIN TENSION

Calculate the chain tension using the actual weight of the conveyor chain and material conveyed, as shown.

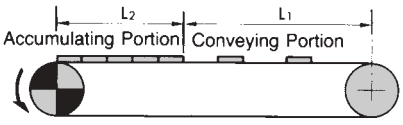
Chain Rolling

■ Horizontal Conveyor



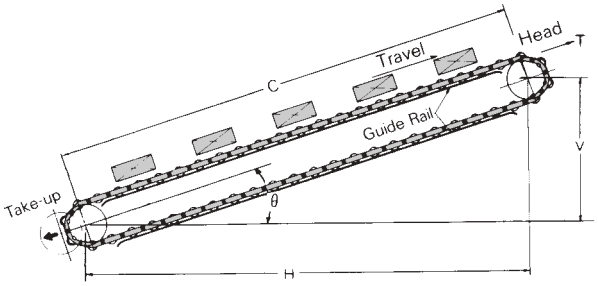
$T = (M + 2.1\ w)\ f_1\ C$

■ Horizontal Accumulating Conveyor



$T = (W_1 + M)\ L_1\ f_1 + W_2\ L_2\ f_2 + (W_2 + M)\ L_2\ f_3 + 1.1\ M\ (L_1 + L_2)\ f_1$

■ Inclined Conveyor



$T = (M + w)\ (f_1\ C\cos\theta + C\sin\theta) + 1.1\ w\ (f_1\ C\cos\theta - C\sin\theta)$

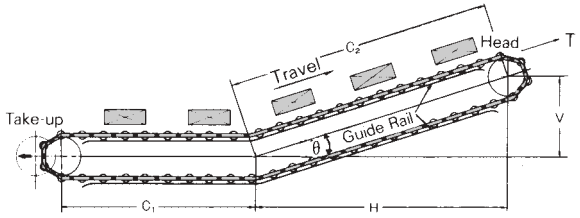
When $(f_1\ C\cos\theta - C\sin\theta) < 0$, $1.1\ w\ (f_1\ C\cos\theta - C\sin\theta) = 0$

or

$T = (M + w)\ (V + f_1\ H) + 1.1\ w\ (f_1\ H - V)$

When $(f_1\ H - V) < 0$, $1.1\ w\ (f_1\ H - V) = 0$

■ Horizontal Plus Inclined Conveyor



$T = (M + 2.1\ w)\ f_1\ C_1 + (M + w)\ (f_1\ C_2\cos\theta + C_2\sin\theta) + 1.1\ w\ (f_1\ C2\cos\theta - C_2\sin\theta)$

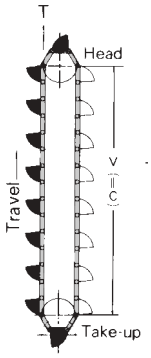
When $(f_1\ C_2\cos\theta - C_2\sin\theta) < 0$, $1.1\ w\ (f_1\ C_2\cos\theta - C_2\sin\theta) = 0$

or

$T = (M + 2.1\ w)\ f_1\ C_1 + (M + w)\ (V + f_1\ H) + 1.1\ w\ (f_1\ H - V)$

When $(f_1\ H - V) < 0$, $1.1\ w\ (f_1\ H - V) = 0$

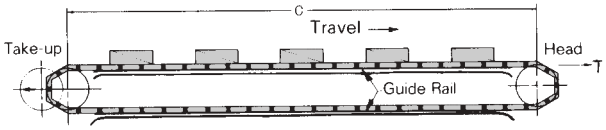
■ Vertical Conveyor



$T = (M + w)\ V$

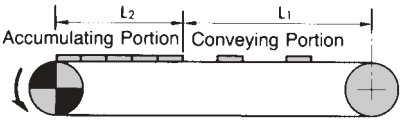
Chain Sliding

■ Horizontal Conveyor



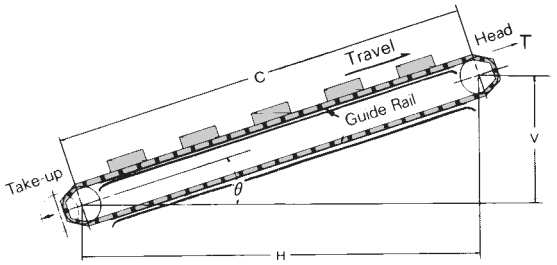
$T = (M + 2.1\ w)\ f_2\ C$

■ Horizontal Accumulating Conveyor



$T = (M + w)\ L_1\ f_2 + M_2\ L_2\ f_2 + (M_2 + w)\ L_2\ f_3 + 1.1\ w\ (L_1 + L_2)\ f_2$

■ Inclined Conveyor



$T = (M + w)\ (f_2\ C\cos\theta + C\sin\theta) + 1.1\ w\ (f_2\ C\cos\theta - C\sin\theta)$

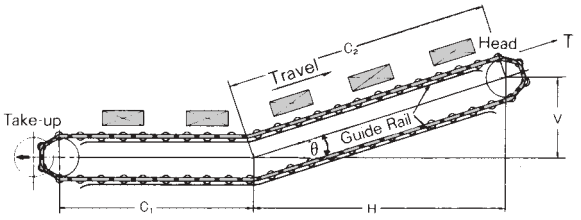
When $(f_2\ C\cos\theta - C\sin\theta) < 0$, $1.1\ w\ (f_2\ C\cos\theta - C\sin\theta) = 0$

or

$T = (M + w)\ (V + f_2\ H) + 1.1\ w\ (f_2\ H - V)$

When $(f_2\ H - V) < 0$, $1.1\ w\ (f_2\ H - V) = 0$

■ Horizontal Plus Inclined Conveyor



$T = (M + 2.1\ w)\ f_2\ C_1 + (M + w)\ (f_2\ C_2\cos\theta + C_2\sin\theta) + 1.1\ w\ (f_2\ C_2\cos\theta - C_2\sin\theta)$

When $(f_2\ C_2\cos\theta - C_2\sin\theta) < 0$, $1.1\ w\ (f_2\ C_2\cos\theta - C_2\sin\theta) = 0$

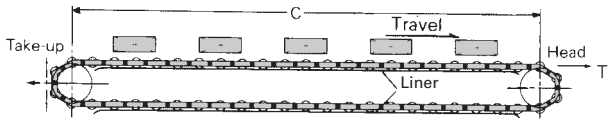
or

$T = (M + 2.1\ w)\ f_2\ C_1 + (M + w)\ (V + f_2\ H) + 1.1\ w\ (f_2\ H - V)$

When $(f_2\ H - V) < 0$, $1.1\ w\ (f_2\ H - V) = 0$

■ Top Chain Linear Movement

(Use this formula for TP, TN, TTP, RSP and Clip-Top Chain)

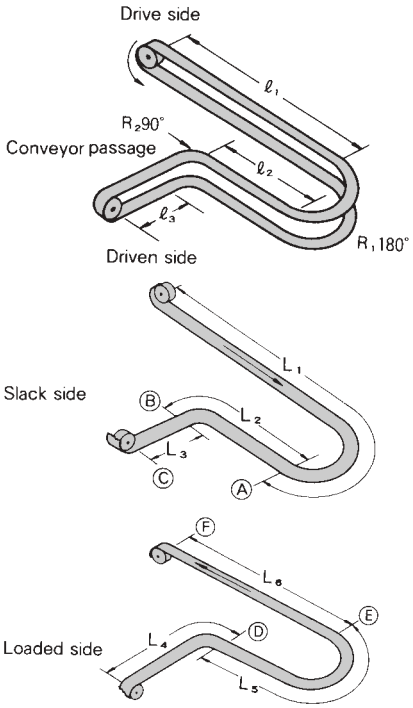


$T = (M + 2.1\ w)\ f_2\ C + M\ L_2\ f_3$

■ Curved Movement

(Use this formula for TPU and TNU Chain)

Chain tension for curved movement is calculated similarly to that for linear movement. The tension at corners is compensated for by angle factor (K_2) and length factor (K_3).



Calculate chain tension for each part ABC…F. The tension at F is the greatest acting on the chain.

$T = T(F)$

Slack side:

Chain tension at Ⓐ: TⒶ

$T(A) = L_1\ w\ f_2\ k_2$, $L_1 = \ell_1 + R_1\ k_3$ (k_2 and k_3 at 180°)

Chain tension at Ⓑ: TⒷ

$T(B) = \{T(A) + L_2\ w\ f_2\}\ k_2$, $L_2 = \ell_2 + R_2\ k_3$ (k_2 and k_3 at 90°)

Chain tension at Ⓒ: TⒸ

$T(C) = T(B) + L_3\ w\ f_2$, $L_3 = \ell_3$

Loaded side:

Chain tension at Ⓓ: TⒹ

$T\text{Ⓓ} = \{T\text{Ⓒ} + (M + w)\, L_4\, f_2 + M\, L'_4\, f_3\}\, k_2$,

$L_4 = \ell_3 + R_2\, k_3$

(k_2 and k_3 at 90°)

Chain tension at Ⓔ: TⒺ

$T\text{Ⓔ} = \{T\text{Ⓓ} + (M + w)\, L_5\, f_2 + M\, L'_5\, f_3\}\, k_2$,

$L_5 = \ell_2 + R_1\, k_3$

(k_2 and k_3 at 180°)

Chain tension at Ⓕ: TⒻ

$T\text{Ⓕ} = T\text{Ⓔ} + (M + w)\, L_6\, f_2 + M\, L'_6\, f_3$

Table I: Coefficient of Rolling Friction (f_1)

Type of Roller	Dry	Lubricated
Standard "S" roller type	.21	.14

Table II: Coefficient of Sliding Friction (f_2)

	Dry	Lubricated
Chain and rail	.30	.20
Top plate and liner	.25	.15

Table III: Coefficient of Friction between Material Conveyed and Top Plate (f_3)

Conveyed Material	Lubrication	Coefficient of Dynamic Friction
Plastic and paper containers and film packages	Dry	0.25
	Soapy water	0.10
Metal cans	Dry	0.25
	Soapy water	0.15
Bottles and ceramics	Dry	0.40
	Soapy water	0.20
Metal industrial parts	Dry	0.25
	Oil	0.15

Table IV: Angle Factor and Length Factor (k_2 and k_3)

Turning Angle	Length Factor (k_3)	Angle Factor (k_2) TPU and TNU Chains Dry	Angle Factor (k_2) TPU and TNU Chains Lubricated
30°	0.5	1.15	1.10
60°	1.0	1.30	1.15
90°	1.6	1.50	1.25
120°	2.1	1.70	1.35
150°	2.6	1.90	1.50
180°	3.1	2.20	1.60

STEP 4 VERIFY THE CHAIN SELECTION

Multiply the chain tension (T) by the chain speed coefficient (K_1) listed in Table V and verify the following formula.

$T \bullet K_1 <$ Maximum allowable load of the chain

Table V: Chain Speed Coefficient (K_1)

Chain Speed (ft./min.)	Speed Factor (K_1)
0 ~ 50	1.0
50 ~ 100	1.2
100 ~ 160	1.4
160 ~ 230	1.6
230 ~ 300	2.2
300 ~ 360	2.8
360 ~ 400	3.2

When the design chain tension ($T \bullet K_1$) is more than the allowable load or significantly less than it, retry the same steps for the next larger or smaller chain size.

STEP 5 VERIFY THE ALLOWABLE ROLLER LOAD

When the load is carried on the rollers, the total weight of the chain and the load per roller should not exceed the allowable roller load shown in Table VI.

Table VI: Allowable Roller Load

Chain No.	Allowable Roller Load (lbs./roller) AS and SS Stainless Roller	Allowable Roller Load (lbs./roller) Standard Roller
RS40	44	33
RS60	110	66
C2040	44	33

T = Chain tension (lbs.)
w = Weight of chain and attachments (lbs./ft.)
M = Weight of conveyed material (lbs./ft.)
M_2 = Weight of accumulating material (lbs./ft.)
V = Vertical center distance of conveyor (ft.)
H = Horizontal center distance of conveyor (ft.)
C = Center distance between sprockets (ft.)
L_1 = Length of conveying section (ft.)
L_2 = Length of accumulating section (ft.)
L´ = Length of accumulating section for curved movement chain (ft.)
ℓ = Length of conveyor not loaded (ft.)
f_1 = Coefficient of rolling friction between chain and guide rail
f_2 = Coefficient of sliding friction
f_3 = Coefficient of friction between material conveyed and top plate
η = Transmission efficiency
S = Speed = P N n/12 (ft./min.)
P = Chain pitch (in.)
N = Number of sprocket teeth
n = Sprocket speed (rpm)

STEP 6 CALCULATE THE REQUIRED POWER (HP)

■ Horizontal and/or Inclined Conveyor

$$HP = \frac{T \bullet S}{33{,}000 \bullet \eta}$$

■ Vertical Conveyor

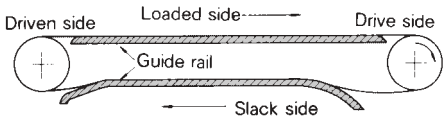
$$HP = \frac{M \bullet V \bullet S}{33{,}000 \bullet \eta}$$

CONVEYOR DESIGN

The layout of a conveyor varies with the type of chain used. A typical layout is shown below. Goods should be conveyed on the tension side of the chain, and the slack (return) side should be supported by guide rails with sloped ends to prevent chain vibration and conveyor pulsation.

Guide rail selection

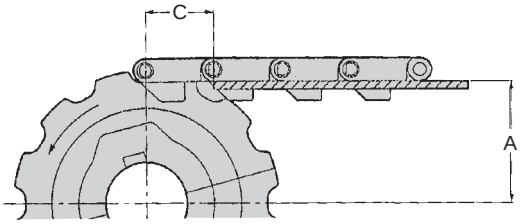
The guide rail consists of the conveyor frame and liner. The top chain slides along the liner to minimize frictional resistance and wear to protect the chain and minimize the driving power.



Location of guide rails and sprocket

When the chain engages with the sprocket, the chain moves up and down slightly due to the sprocket's polygonal effect. Therefore, the guide rail on the loaded side must be positioned so that the chain is horizontal when at the highest level. Use the following equation to determine guide rail installation dimension (A).

$$A = \frac{\text{Pitch diameter of sprocket}}{2} + B \text{ (in.)}$$



Dimensions are in inches

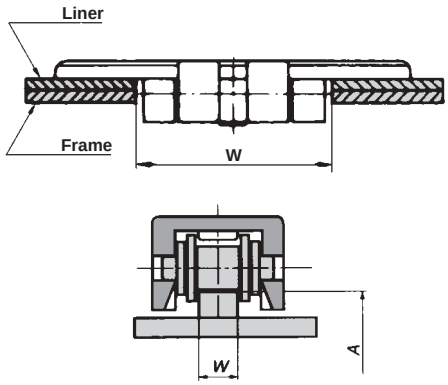
Chain Type	B	C
TN • TNU	.433	1.496
TP-I	.197	1.496
TP-II • TPU • TTP	.157	1.496

Note: Refer to page 3 for RS Plastic Chain.

■ Guide rail inside width

Linear Movement Chain

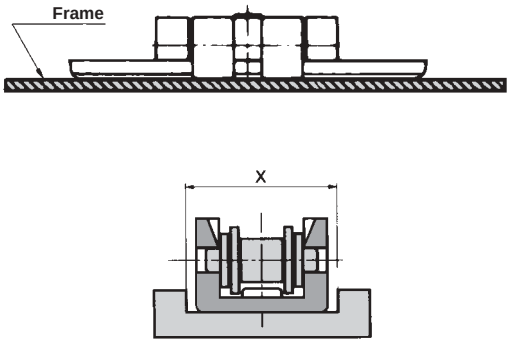
Conveying Side



"A" = Sprocket Pitch Diameter - Roller Diameter / 2

Dimension "A" applies to Clip-Top Chain only.

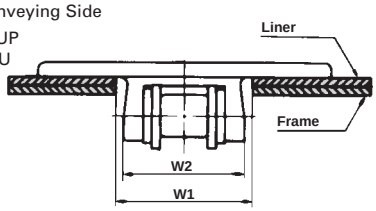
Return Side (Top Plate Sliding)



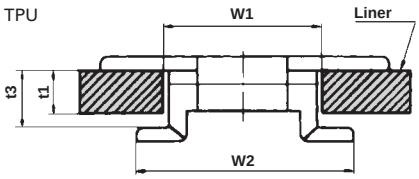
Curved Movement Chain

Straight Section

Conveying Side
TTUP
TNU

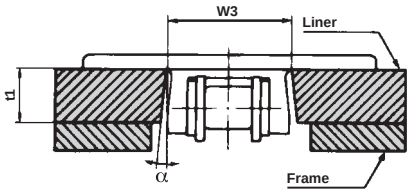


Conveying Side
TPU

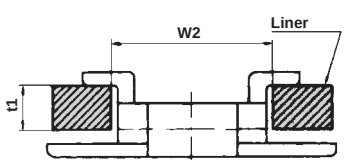


Curved Section

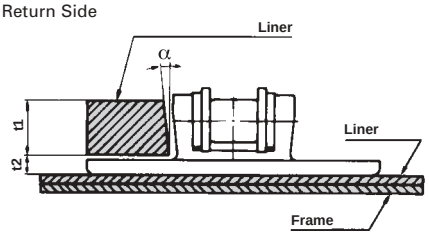
Conveying Side



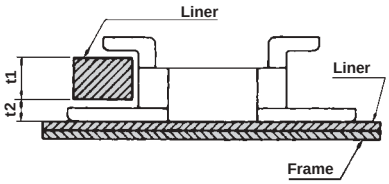
Return Side



Return Side



Return Side



Linear Movement Chain (in.)

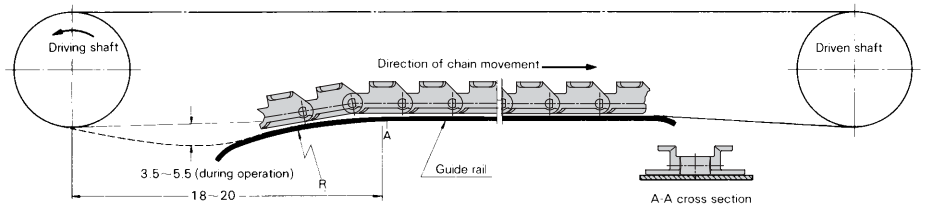
Chain Type	X	W
RF06B-CT	0.780	0.750
RS40-CT	1.025	1.000
RS60-CT	1.500	1.500
TP	—	1.772
TTP	—	1.772
TN	—	1.496

Curved Movement Chain (in.)

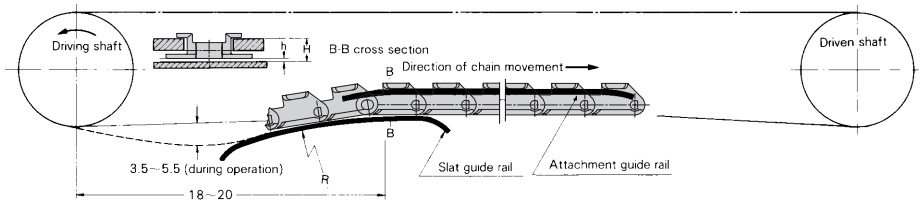
Chain Type	W1	W2	W3	W4	W5	t1	t2	t3
TPU	1.772	1.772	1.772	1.890	1.890	.472	.472	.472
TNU	1.496	1.496	1.496	—	—	.709	.709	—

■ Slack side guide rail arrangement

Top plate sliding (applicable for all Top Chains)



Attachment sliding (TPU type)



Chain Type	h	H
TPU	.236	1.024

1. Allow 3.5 to 5.5 inches of slack under the drive sprocket during operation.
2. An engagement angle of more than 150° must be between the drive sprocket and the chain.
3. The guide rail radius R (in.) must be larger than the radius of chain backbend listed in the table below.

Minimum Radius of Chain Backbend (in.)

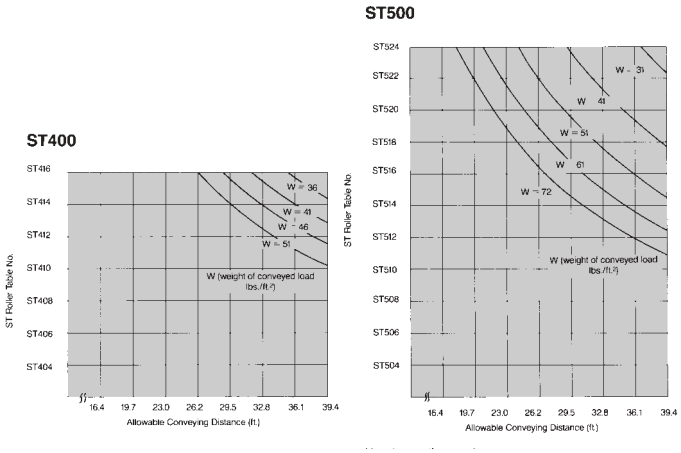
Chain Type	Min. Backbend Radius
RS40P	5
RS60P	18
RS2040P	18
RF06B-CT	12
RS40-CT	8.25
RS60-CT	14
TP•TTP•TPU	2
TN•TNU	4

4. Guide rails must have sloped ends to prevent interference with the chain.

SELECTION PROCEDURE FOR ROLLER TABLE CHAIN

Use the following capability graphs to determine Roller Table size;

■ ST Roller Table Conveyor Capability Graph

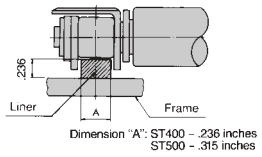


How to use the graph:
If W equals 61 lbs./ft.^{2} and the conveyor length equals 32.8 ft., select Roller Table numbers ST514 to ST504.
W = Weight of conveyed load (lbs./ft.^{2})

$$= \frac{\text{Weight of conveyed object (lbs.)}}{\text{Base area of conveyed object (ft.}^2\text{)}}$$

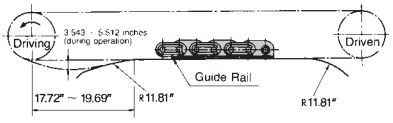
■ Guide for ST Roller Table

■ Conveying Side (reference only)

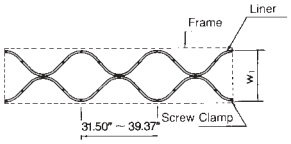


Dimension "A": ST400 – .236 inches
ST500 – .315 inches

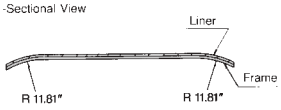
■ Return Side



1) Top View of Return Side



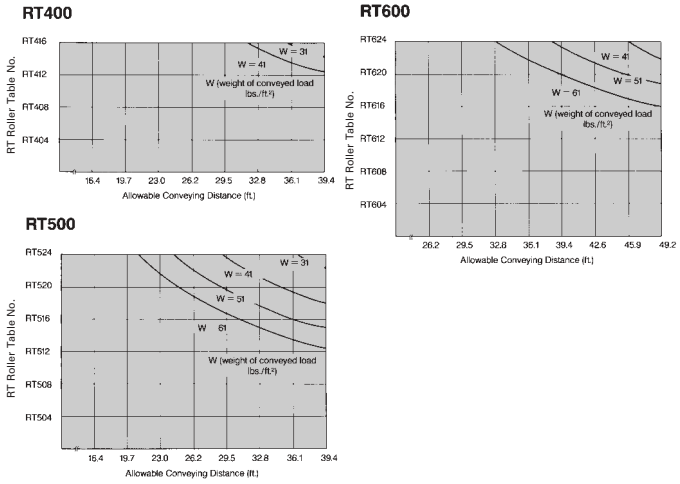
2) Cross -Sectional View



- Liner should be shaped to avoid plastic roller wear.
- To determine liner width (W_1) subtract 0.394 in. from C_1 (effective width).
- Liner material should be high polymer polyethylene.

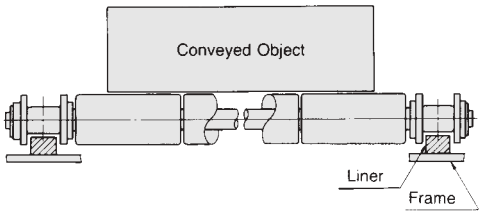
ST Roller Table speed should not exceed 160 ft./min.

■ RT Roller Table Conveyor Capability Graph

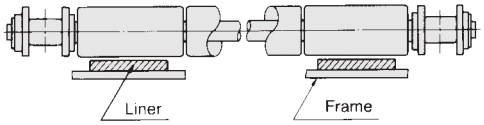


■ Guide for RT Roller Table

■ Conveying Side



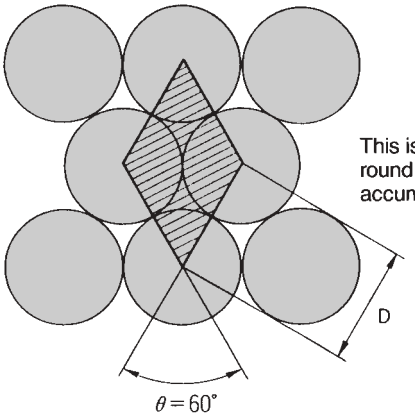
■ Return Side



RT Roller Table speed should not exceed 160 ft./min.

How to Calculate the Carrying Capacity

Round Container Accumulation

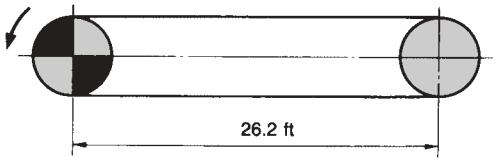


This is a sketch of the round containers accumulating

$W = (\omega \bullet 144 \bullet 10^2) / (D^2 \sin 60°)$ (lbs./ft.^{2})
W = Carrying capacity (lbs./ft.^{2})
ω = Weight of material (lbs./p)
D = Diameter of conveyed material (in.)

Selection Procedure Example

Specifications



Conveyor length: 26.2 ft.
Weight of conveyed object: 44 lbs.
Dimensions of conveyed object:
0.98 ft. • 0.66 ft. • 0.33 ft.

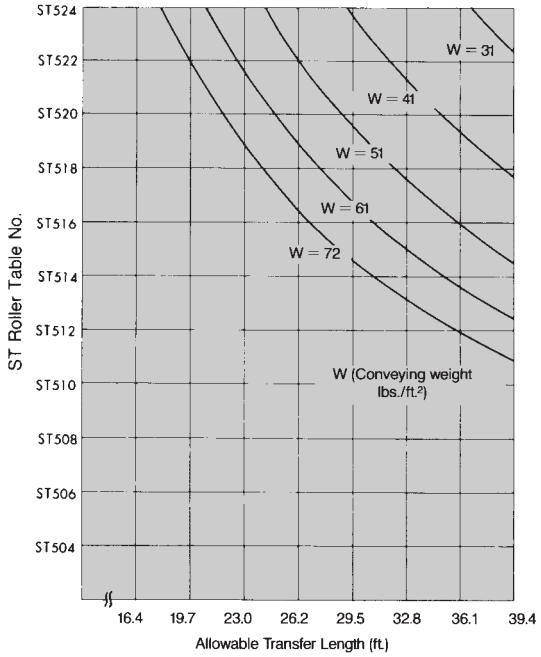
Selection

Select ST type for smooth conveying and to provide "side-through" transfer lines.

From the ST Roller Table Capability Graph:
$W = 44/(0.98 \bullet 0.66) = 68$ lbs./ft.^{2}

According to the following table, if $W = 68$ lbs./ft.^{2} and the conveyor length is 26.2 ft., ST504~ST516 is the appropriate selection.

ST500

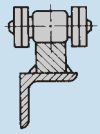
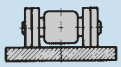


Determine the chain width (C_1) using the dimension diagrams on pages 12 and 13.

In this example, ST510SS Roller Table Chain with width (C_1) of 9.890 in. was selected for objects with the above dimensions.

General Engineering Information

Method of Chain Travel and Type of Rollers

Method of Chain Travel	Type of Roller	Features
Chain Rolling 	Standard "S" roller type • Lightweight • Lower allowable roller load	Generally used for: • Conveyor lengths less than 35 ft. • Conveyor speeds less than 70 ft./min.
Chain Sliding (Double Pitch Chain) 		• Suitable for impact and harsh conditions • Economical • Impact resistant • Greater power required

Points to consider:

1. Use take-up devices to eliminate chain slack on long conveyors.
   Take-up stroke = (Center distance between sprocket • 0.02) + Catenary sag allowance.
2. Always engage chain with at least three sprocket teeth.
3. All sprocket teeth on the head shaft should be aligned when two or more strands of conveyor chain are in operation. Chain may be matched at the factory for uniform length and accurate multiple-strand operation.

Considerations for use in special environments:

1. Under very low or high temperatures:
   Special consideration must be taken when chain is to operate in freezing chambers, cold areas, when it passes through a heat-treatment furnace, or when it will be affected by heat from conveyed material.
2. In wet conditions:
   When chain is exposed to water, as in a sterilizer or water screen, excessive wear due to insufficient lubrication and rust may shorten chain life.
3. In corrosive conditions:
   When chain is exposed to an acidic or alkaline solution or operated in a corrosive atmosphere, chemical corrosion may cause excessive wear. Hydrogen embrittlement may also occur in an acidic environment. Exposure to sea or mine water may cause electrochemical corrosion.

4. In dusty conditions:
Chain wears quickly in dusty conditions, such as in the presence of coke, metal powder, and sand, because foreign material gets between chain parts and in the engaging surfaces of the chain and sprocket teeth.

This information is intended to provide general guidelines for conveyor chain selection. Consult U.S. Tsubaki for specific application problems.

Top Plate Selection and Engineering Information

	Chain Type	Materials		Maximum Speed (ft./min.)		Ambient Temperature (°F)	Maximum Allowable Load (lbs.)
		Top Plate	Chain/Pin	Lubricated	Dry		
LINEAR MOVEMENT	TP	Plastic	304 Stainless Steel	330	160	-4~176	264
	TTP	Plastic	304 Stainless Steel	330	160	-4~176	187
	TTP-P	Plastic	Plastic	330	160	-4~176	187
	TN	Plastic	Carbon Steel	390	200	15~176	1,628
	TN-NP	Plastic	Nickel-plated Carbon Steel	390	200	15~176	1,628
	TN-NP-LAMBDA	Plastic	Nickel-plated Carbon Steel	390	200	15~176	1,628
	TN-SS	Plastic	304 Stainless Steel	230	150	-4~176	231
	RS-P	Plastic	304 Stainless Steel	200	200	-4~176	Refer to page 3.
CURVED MOVEMENT	TTUP	Plastic	304 Stainless Steel	330	160	-4~176	240
	TTUP-P	Plastic	Plastic	330	160	-4~176	195
	TPU	Plastic	304 Stainless Steel	260	160	-4~176	220
	TNU	Plastic	Carbon Steel	330	200	15~176	902
	TNU-NP	Plastic	Nickel-plated Carbon Steel	330	200	15~176	902
	TNU-AS	Plastic	600 Stainless Steel	330	150	-4~176	180

	Chain Type	Feature	Application
LINEAR MOVEMENT	TP	Self-lubrication, quiet operation. Anti-corrosive, suitable for transportation of small-sized goods due to clearance between top plates.	Conveying steel, cans, finished parts, paper-packages, etc.
	TTP		
	TTP-P		
	TN	Damage-free, quiet operation. Smooth transportation, easy removal of top plate. Easy repair.	
	TN-NP		
	TN-NP-LAMBDA		
	TN-SS		
	RS-P	Quiet and trouble-free operation with anti-corrosive protection.	Conveying electronic parts and small items.
CURVED MOVEMENT	TTUP	Self-lubrication, quiet operation. Anti-corrosive, suitable for transportation of small-sized goods due to clearance between top plates.	Curved operation for TTUP.
	TTUP-P		
	TPU		Curved operation for TP.
	TNU	Used for simple curved operation. TN type side bow feature.	Curved operation for TN.
	TNU-NP		
	TNU-AS		

Top Plate Selection

■ Establish general conveyor conditions.

A) Materials conveyed
   1) Container material
   2) Weight
   3) Dimensions

B) Conveyor arrangement
   1) Linear or curved movement
   2) Conveyor length
   3) Layout
   4) Space limitations

C) Other conditions
   1) Conveyor capacity
   2) Interval
   3) Conveyor speed
   4) Lubrication requirements
   5) Material conveyance regularity

D) Environment
   1) Temperature
   2) Corrosive conditions (See page 9)
   3) Wear-causing agents

■ Top Plate Material Application

Select top plate material according to the type of goods to be moved.

Conveyed Material	Top Plate Material	Abrasive Atmosphere			
		Dry		Lubricated	
		No	Yes	No	Yes
Tin cans, aluminum cans, metal containers	Polyacetal	★	×	★	
Plastics and plastic-covered containers, paper containers			×		
Glass jars, glass products, ceramics			×		×

★ Suggested ■ Good ■ Limited use × Not suggested

■ Select the appropriate liner material.

Top Plate Material	Liner Material	Abrasive Atmosphere			
		Dry		Lubricated	
		No	Yes	No	Yes
Polyacetal	Stainless Steel			★	★
	Steel	★	★		
	Ultra-high Polymer Polyethylene		×		

★ Suggested ■ Good ■ Limited use × Not suggested

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