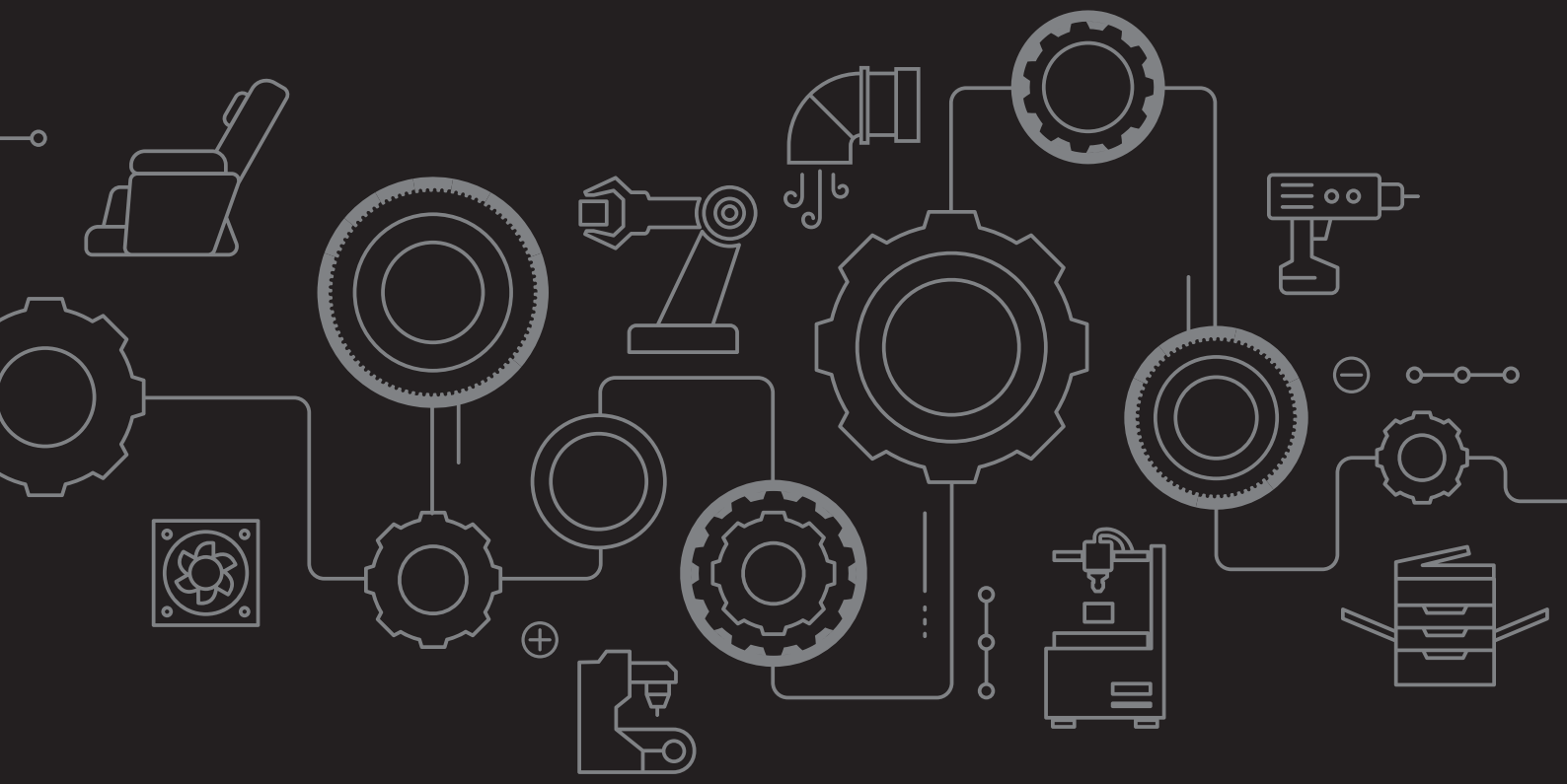
BANDO

Bando Power Transmission Belts
Product Design Manual

(Latest Version for 2018)



T-TFS-0020-01

Bando Power Transmission Belts Product Design Manual

Greetings for the "Issuance of Bando Power Transmission Belts Product Design Manual"

Bando Chemical Industries was founded as a power transmission belt manufacturer in Kobe in 1906 and has met expectations of users through development of new technology and new products always ahead of the times and with reliable quality. We would like to express our heartfelt gratitude to you as it is all thanks to your long-standing favor and support.

In recent years, we have met the advanced and diversified needs of industry, advanced the development of various power transmission belts and related systems, and issued guides and design materials for each product unit. We would like to announce that we have decided to combine these materials and issue the "Bando Power Transmission Belts Product Design Manual" for you to be able to choose and design most suitable power transmission belts with ease from a comprehensive point of view. We would like to ask you to keep this Manual at hand and utilize it.

Bando Chemical Industries, Ltd.

Bando Chemical Industries is aiming to become the leading company across the world in the fields of rubber and plastics, including industrial belts.

Production Bases in Japan

Nankai Plant—Power transmission belts, power transmission systems, resin products, chemical products
Wakayama Plant—Power transmission belts, power transmission systems, polyurethane power transmission belts, resin products
Ashikaga Plant—OA/FA/Precision machinery and components, Rubber/polyurethane industrial products
Kakogawa Plant—Conveyor belts, rubber/polyurethane industrial products

Research Laboratories

R&D Center—Research of fundamental technologies and applications
Power Transmission Technical Research Center
—Research and development of power transmission belts and power transmission systems

"Worldwide Network of Trust"

Bando Chemical Industries gathers all employees' ingenuity and power to keep on taking on challenges toward the future, pursues technological and product development that is friendly to people in the world and environment at all times, and works hard to achieve them.

North America

① **Bando USA, Inc.** (U.S.A.)
② **Bando Belting de Mexico, S.A. de C.V.** (Mexico)

Europe

③ **Bando Europe GmbH** (Germany)
④ **Bando Iberica, S. A.** (Spain)
⑤ **Bando Belt Manufacturing (Turkey), Inc.** (Turkey)

Asia

⑥ **Bando Jungkong Ltd.** (Korea)
⑦ **Bando Korea Co., Ltd.** (Korea)
⑧ **Bando Belt (Tianjin) Co., Ltd.** (China)
⑨ **Bando (Shanghai) Management Co., Ltd.** (China)

Asia

⑩ **Bando (Shanghai) Industry Equipment Element Co., Ltd.** (China)
⑪ **BL Autotec (Shanghai), Ltd.** (China)
⑫ **Bando Manufacturing (Dongguan) Co., Ltd.** (China)
⑬ **Bando Siix Ltd.** (Hong Kong)
⑭ **Sanwu Bando Inc.** (Taiwan)
⑮ **Philippine Belt Manufacturing Corp.** (Philippines)
⑯ **Bando Manufacturing (Thailand) Ltd.** (Thailand)
⑰ **Bando Asia & Pacific Co., Ltd.** (Thailand)
⑱ **Kee Fatt Industries Sdn. Bhd.** (Malaysia)
⑲ **Bando (Singapore) Pte. Ltd.** (Singapore)
⑳ **P.T. Bando Indonesia** (Indonesia)
㉑ **Bando (India) Private Ltd.** (India)
㉒ **Bando Manufacturing (Vietnam) Co., Ltd.** (Vietnam)

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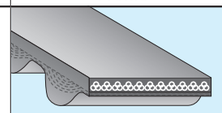
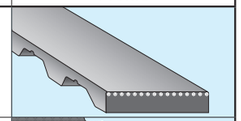
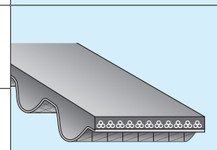
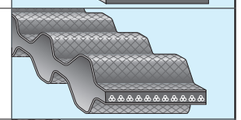
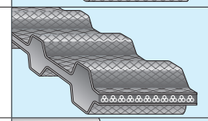
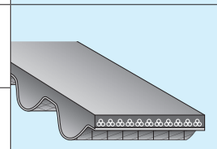
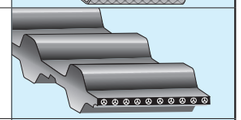
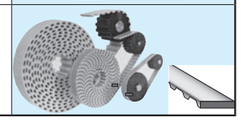
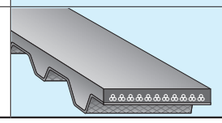
KPS II (King Power Synchronous Belt)	29		Bancollan Synchronous Belt	65	
Ceptor-X	42		Double-Sided STS	59	
Ceptor-VI	44		Double-Sided Synchronous Belt	76	
HP-STS (High-Performance Super-Torque Synchronous Belt) HP-HTS (High-Performance High-Torque Synchronous Belt)	48		Bancollan Double-Sided Synchronous Belt	76	
STS (Super-Torque Synchronous Belt)	52 53		Long Synchronous Belt Bancollan Long Synchronous Belt	199 200	
Synchronous Belt	64 65				

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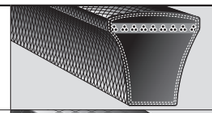
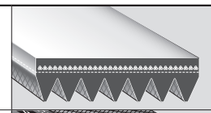
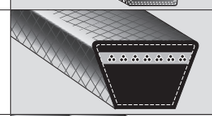
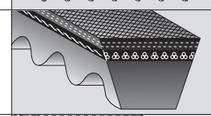
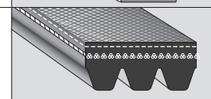
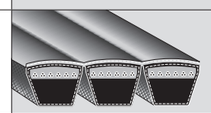
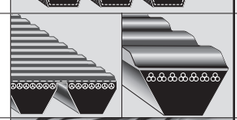
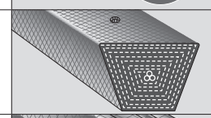
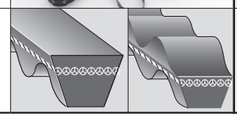
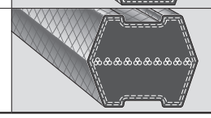
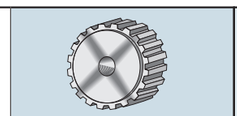
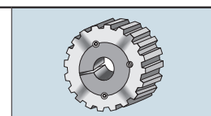
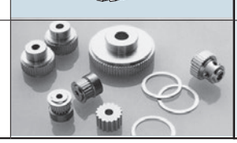
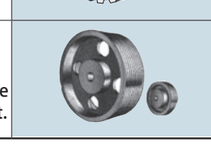
Power Ace Energy-Saving Power Ace	225 224		Bancollan Polybanrope	274	
V-Belt Red Standard Energy-Saving Red	231 224		Power Ace Cog	227	
Power Scrum (Power Ace type)	228		Rib Ace 2	236	
Power Ace Aramid Combo	229		Power Scrum (V-belt type)	234	
Banflescrum Banflex	279		Bancollan round belt Bancord round belt	297 302	
PS Belt	318		Sunrope (open end)	-	
Bancollan V-Belt (VC-DC)	293		Double-sided V-belt	-	

Pulleys for General-Purpose Power Transmission Belts

STS pulley Synchronous Pulleys (shaft-hole-machined type) (rod-shaped pulley) HTS pulley (shaft-hole-machined type)	131 167		TL-STS pulley TL synchronous pulley With BAN-LOCK	143 169	
Synchronous pulley (Type XL) (molded product / sintered alloy)	178		TL Power Ace pulley (bushing type) Power Ace pulley (shaft-hole-machined type)	Refer to the separate booklet.	

Required Quality Communication Form for Power Transmission Belt (Information Necessary for Belt Design)

When you need calculation for power transmission belt design, please check the following listed items and contact us.

Machinery name		Section where the belt is to be used	
Driving machine characteristics	1. Standard motor [AC motor (normal torque / squirrel-cage type / synchronous transmission) / DC motor (shunt-wound)] Engine with two or more cylinders		
	2. Special motor [AC motor (high torque / single-phase / series-wound) / DC motor (series-wound / shunt-wound)] Single-cylinder engine / line shaft / clutch		
Driven power (If unclear, enter driving power)	Normal _____ [kW, W, kgf•m, kgf•cm / PS, N•m, N•cm] Max. _____		
Driving pulley dia.	Outside dia. _____ ± _____ mm Pitch dia. No. of teeth of pulley _____		
Driving pulley revolution	_____ rpm		
Driven pulley dia.	Outside dia. _____ ± _____ mm Pitch dia. No. of teeth of pulley _____		
Driven pulley revolution	_____ rpm ± _____ rpm		
Allowable pulley width	_____ mm		
Center distance	_____ mm ± _____ mm		
Operating time	1. Intermittent use (3 to 5 hours/day) 2. Normal use (8 to 10 hours/day) 3. Continuous use (16 to 24 hours/day)	Use of idler pulley	Use / Not use (inside / outside) (slack side / tight side)
Requirement characteristics	Vertical shaft power transmission / Fixed pulley diameter / Static electricity prevention / Electrical insulation / Water resistance Humidity resistance / Oil resistance (mist form / liquid form) / Dust particle resistance / Low noise Low speed / For positioning / With reciprocating motions / For food conveyance / For conveyance For high load / Multi-axis power transmission / With idler pulley / Fixed center distance Long span (power transmission / conveyance) / Special profile (back face processing etc.) Others		
Sudden stop and sudden acceleration	1. Sudden stop Braking on the (driving / driven side) Sum total of GD^2 _____ $kgf•m^2$ (opposite side to the brake) Deceleration from revolution n_1 _____ to n_2 _____ Time to change from n1 to n_2 _____ s Frequency of sudden stop _____ times/day		
	1. Sudden acceleration Sum total of GD^2 _____ $kgf•m^2$ Acceleration from revolution n_1 _____ to n_2 _____ Time to change from n1 to n_2 _____ s Frequency of sudden acceleration _____ times/day		
Other requirements			

Functional Selection Table

Belt type			Load (kW) 0.75 or less	Load (kW) 0.75 to 7.5	Load (kW) 7.5 to 75	Load (kW) 75 or more	Belt speed (m/s) 20 or less	Belt speed (m/s) 20 to 30	Belt speed (m/s) 30 or more	Driving machine characteristics *1 Standard driving machine	Driving machine characteristics *2 Special driving machine	Permanent elongation (%)	Center distance (m) 0.5 or less	Center distance (m) 0.5 to 2	Center distance (m) 2 or more	Speed ratio 1:5 or less	Speed ratio 1:5 to 1:10
Synchronous Belts	KPSII (King Power Synchronous Belt)				[S8M]	[S14M]		30				0.1 or less					1:10
	Ceptor-X Ceptor-VI HP-STS (High-Performance Super-Torque Synchronous Belt) STS (Super-Torque Synchronous Belt) Double-Sided STS HP-HTS (High-Performance High-Torque Synchronous Belt)		[S1.5M] [S2M]	[S3M] [S4.5M] [S5M]	[S8M] [8M]	[S14M]			33			0.15 or less					1:10
	Synchronous Belt Double-Sided Synchronous Belt		[MXL] [XL]	[L]	[H] [XH]	[XXH]			30			0.15 or less					1:10
	Bancollan Synchronous Belt Bancollan Double-Sided Synchronous Belt		[XL] [T5] [TN15]	[L] [T10]			20					0.25 or less					1:10
	Bancollan STS		[S2M]	[S3M]			20					0.25 or less					1:10
	Long Synchronous Belt						10					0.15 or less					1:10
	Bancollan Long Synchronous Belt						10					0.25 or less					1:10
Frictional Transmission Belts	V-belt	Red Scrum	[M]	[A]	[B,C]	[D,E]	[M]15	[A~E] 30				1.5~2		[M]	[A~E]		
		Standard		[A]	[B,C]	[D,E]		[A~E] 30				1.5~2			[A~E]		
		Red S II		[SA]	[SB,SC]			30				1.5~2					
	Power Ace Scrum Power Ace Aramid Combo				[3V]	[5V,8V] [5VK,8VK]			40			1.0 or less		[3V]	[5V,8V] [5VK,8VK]		1:10
	Power Ace Cog				[3VX]	[5VX]			40			1.0 or less		[3VX] [5VX]			1:10
	Sunrope (open-ended)		[M]	[A,B,C]			[M]15 [A~C]20					2~3					
	Double-sided V-belt			[AA]	[BB] [CC]			30				1.5~2		[AA]	[BB] [CC]		
	Banflescrum			[5MS]	[7MS]	[11MS]			60			0.8 or less					1:10
	Bancollan V-Belt		[J]				10					1.5~2					
	Rib Ace 2 (for general industry)		[PJ]	[PK] [PL]					50			1~1.5					
	Bancollan Polybanrope		[H]	[J]				25				2~2.5					
	Bancollan round belt		ϕ2 ~ϕ5				10					0.5~1					
	Bancord round belt		ϕ1.5 ~ϕ12				10					3~5					
	PS Belt		[A series B series C series E series]				[C series] 20	[B series] 30	[A series] 60			2.0 or less		[A series B series C series E series]			1:10
	Flat belt (cotton)				San Special San Atlas		20					2~3					
	Banbelt			[Light]	[Medium] [Heavy]			30				1.5~2					

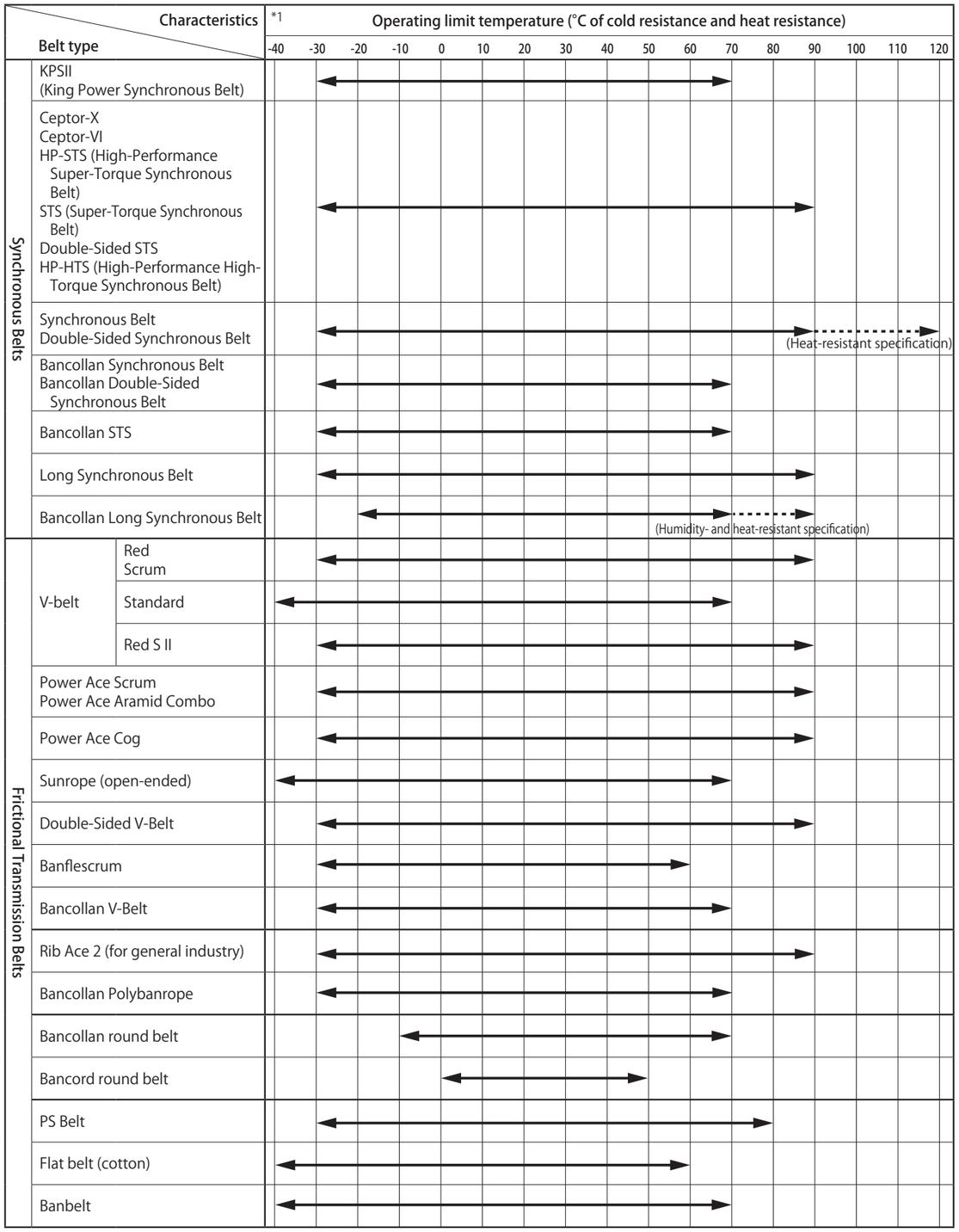
Values in the table indicate general allowable values of belt characteristics.
However, the permanent elongation indicates a normal range.
The brackets [ ] indicate belt type.

Color-coded indication
- Can be used sufficiently.
- Can be used conditionally.
- Avoid use.

Belt type			Minimum pulley diameter (mm) 50 or less	50 to 100	100 to 200	200 or more	*3 Back face tension Pulley dia.	Low initial tension	Miniaturized	Sudden stop	Vertical-shaft power transmission	Cross application	Back face tension	Back face drive
Synchronous Belts	KPSII (King Power Synchronous Belt)		[S8M] 18 teeth	[S14M] 22 teeth										
	Ceptor-X Ceptor-VI HP-STS (High-Performance Super-Torque Synchronous Belt) STS (Super-Torque Synchronous Belt) Double-Sided STS HP-HTS (High-Performance High-Torque Synchronous Belt)		[S1.5M] 16 teeth [S2M] 14 teeth [S3M] 14 teeth [S4.5M] 12 teeth [S5M] 14 teeth [S8M] 22 teeth [8M] 22 teeth		[HP-STS S14M] 28 teeth [STS S14M] 34 teeth		1.2x							
	Synchronous Belt Double-Sided Synchronous Belt		[MXL] 12 teeth [XL] 10 teeth [L] 12 teeth	[H] 14 teeth	[XH] 22 teeth [XXH] 22 teeth		1.2x							
	Bancollan Synchronous Belt Bancollan Double-Sided Synchronous Belt		[TN15] 20 teeth [XL,L,T5] 10 teeth [T10] 12 teeth				1.2x							
	Bancollan STS		[S2M] 14 teeth [S3M] 14 teeth				1.4x							
	Long Synchronous Belt		MXL,XL,L S4.5M,S5M	S8M H	XH S14M	XXH	1.2x							
	Bancollan Long Synchronous Belt		S2M,S3M XL,L T5,T10	S8M H			1.4x							
Frictional Transmission Belts	V-belt	Red Scrum	[M] 40	[A] 67	[B] 118 [C] 180	[D] 300 [E] 450	1.3x							
		Standard		[A] 67	[B] 118 [C] 180	[D] 300 [E] 450	1.3x							
		Red S II		[SA] 60 [SB] 80	[SC] 100		[SA] 35 [SB] 45 [SC] 60							
	Power Ace Scrum Power Ace Aramid Combo			[3V] 67	[5V] 150 [5VK] 150	[8V] 300 [8VK] 300	1.3x							
	Power Ace Cog			[3VX] 56	[5VX] 112		1.3x							
	Sunrope (open-ended)			[M80]	[A] 100 [B] 150	[C] 250								
	Double-Sided V-Belt				[AA] 100 [BB] 180	[CC] 260	-							
	Banflescrum		[5MS] 26 [7MS] 40	[11MS] 63										
	Bancollan V-Belt		16				1.3x							
	Rib Ace 2 (for general industry)		[PJ] 20	[PK] 50 [PL] 70			1.5x							
	Bancollan Polybanrope		[H] 14 [J] 24											
	Bancollan round belt		[3ϕ] 18 [5ϕ] 30				-							
	Bancord round belt		[3ϕ] 23	[10ϕ] 80			-							
	PS Belt		[A] 5 [B] 11 [C] 5											
	Flat belt (cotton)			[3P] 80	[4P] 130 [5P] 180		-							
	Banbelt				[Spinning] 150	[Light] 225 [Medium] 375 [Heavy] 500	-							

*1 Standard driving machines refer to AC motors (normal torque, squirrel-cage type, synchronous power transmission), DC motors (shunt-wound), and engines with two or more cylinders.
*2 Special driving machines refer to AC motors (high torque, single-phase series-wound), DC motors (series-wound, compound-wound), single-cylinder engines, line shafts, and clutches.
*3 Back face tension pulley diameters are expressed by multiples of minimum pulley diameters.

Characteristics Selection Table (Reference)



Belt type \ Characteristics	*2 Oil resistance	Acid resistance	Alkali resistance	Weather resistance	Water and humidity resistance	Flame resistance	Noise	Vibration
Synchronous Belts								
KPSII (King Power Synchronous Belt)	■	□	□	■	□	□		■
Ceptor-X Ceptor-VI HP-STS (High-Performance Super-Torque Synchronous Belt) STS (Super-Torque Synchronous Belt) Double-Sided STS HP-HTS (High-Performance High-Torque Synchronous Belt)				■		■	■	■
Synchronous Belt Double-Sided Synchronous Belt	*3	*4		■	*4	■	*5	■
Bancollan Synchronous Belt Bancollan Double-Sided Synchronous Belt	■	□	□	■	□	□		■
Bancollan STS	■	□	□	■	□	□		■
Long Synchronous Belt				■		■		■
Bancollan Long Synchronous Belt	■	□	□	■	□	□		■
Frictional Transmission Belts								
V-belt: Red Scrum				■		■	■	■
V-belt: Standard	□	□		■		□	■	■
V-belt: Red S II				■		■	■	■
Power Ace Scrum Power Ace Aramid Combo				■		■	■	■
Power Ace Cog				■		■	■	■
Sunrope (open-ended)	□	□	□	■		□	■	
Double-Sided V-Belt				■		■	■	■
Banflescrum		□	□	■	□	□		■
Bancollan V-Belt		□	□	■	□	□		■
Rib Ace 2 (for general industry)				■		■	■	■
Bancollan Polybanrope		□	□	■	□	□	■	■
Bancollan round belt		□	□	■	□	□	■	
Bancord round belt		□	□	■	□	□	■	
PS Belt			■	■		■	■	■
Flat belt (cotton)	□	□	□	■	□	□	■	
Banbelt	□	□		■		□	■	■

Color-coded indication
■ Very high
■ High
□ Slightly problematic
□ Better not to use

*1 The operating limit temperature indicates ambient temperature.
*2 For material quality, oil resistance evaluation takes belt slip into consideration.
*3 Very high with oil-resistant specification products.
*4 Low-noise specification products should not be used.
*5 High with low-noise specification products.