[Technical Data]
Selection of Transmission Timing Belts 1

Selection is easy with Timing Pulleys and Belts automatic calculation tool available at:
http://fawos.misumi.jp/FA_WEB/pulley_sea/

[Step 1] Setting the Required Design Conditions

(1) Machine Type (2) Power Transmission (3) Load Variances (4) Operation Duration per Day (5) Small Pulley Rotational Speed
(6) Rotation Ratio (Lg. Pulley # of Teeth / Small Pulley # of Teeth) (7) Shaft Center Distance (Interim) (8) Pulley Diameter Limitation (9) Other Usage Conditions

[Step 2-a] Calculating Design Power……MXL/XL/L/H/S_M/MTS_M/T Series

•Design Power (Pd) =Transmission Power (Pt) x Overload Factor (Ks)
· Calculate Transmission Power at Motor Rated Power Output. (It is ideal to calculate from the actual load applied to the belt.)
· Overload Factor (Ks)=Ko+Kr+Ki
Overload Factor (Ks)=Lo+Kr+Ki

Ko : Overload Correction Factor (Table 1)
Kr : Rotation Ratio Correction Factor (Table 2)
Ki : Idler Correction Factor (Table 3)

* When converting the torque (Tq) into transmission power (Pd), calculate the applicable values by using the following expressions.
Torque (Tq) = tqxKs
Transmitting Power (Pd) = Tqxn/9550

Tq : Design Torque (N·m)
tq : Transmission Torque
Ks : Overload Factor
Pd : Design Power (kW)
n : Speed (rpm)

i. If the maximum torque is used once or twice per day,
calculate the design power by assigning "the load correction factor (Ko) = 1.0" to the expression for the overload factor and then, by multiplying the maximum torque by the overload factor (Ks) derived from the said expression.

ii. If the maximum torque is used very often,
calculate the design power by multiplying the maximum torque by the applicable overload factor (Ks).

<For Timing Belts based on Spindle Motor>
Calculate the design power by calculating the transmission power from the basic rotation speed and then, by multiplying it by the applicable overload factor (Ks).

<For Timing Belts based on Linear Drive>
Calculate the design power by using the following expressions.
Te=mxα
Pt=TexV/1000
Pd=PtxKs

Te : Effective Tension (N)
m : Mass (g)
α : Acceleration (m/sec^2)
V : Belt Speed (m/sec)
Pt : Transmission Power (KW)
Pd : Design Power (kW)
Ks : Overload Factor

Table 1. Load Correction Factor (Ko)

Typical Machines Using a Belt	Motor					
	Max. Output not Exceeding 300% of Rated Value			Max. Output Exceeding 300% of Rated Value		
	AC Motor (Standard Motor, Synchronous Motor) DC Motor (Shunt), Engine with 2 or More Cylinders			Special Motor (High torque), Single-Cylinder Engine DC Motor (Series), Operation with Lye Shaft or Clutch		
	Operation Hours			Operation Hours		
	Intermittent use 1 Day 3 to 5 hrs	Regular Use 1 Day 8 to 12 hrs	Continuous Use 1 Day 8 to 12 hrs	Intermittent use 1 Day 3 to 5 hrs	Regular Use 1 Day 8 to 12 hrs	Continuous Use 1 Day 8 to 12 hrs
Exhibit Instrument, Projector, Measuring Instrument, Medical Machine	1.0	1.2	1.4	1.2	1.4	1.6
Cleaner, Sewing Machine, Office Machine, Carpentry Lathe, Belt Sawing Machine	1.2	1.4	1.6	1.4	1.6	1.8
Light Load Belt Conveyor, Packer, Sifter	1.3	1.5	1.7	1.5	1.7	1.9
Liquid Mixer, Drill Press, Lathe, Screw Machine, (Circular Sawing) Machine, Planer, Washing Machine, Paper Manufacturing Machine (Excluding Pulp Manufacturing Machine), Printing Machine	1.4	1.6	1.8	1.6	1.8	2.0
Mixer (Cement and Viscous Matter), Belt Conveyor (Ore, Coal and Sand), Grinder, Shaping Machine, Boring Machine, Milling Machine, Compressor (Centrifugal), Vibration Sifter, Textile Machine (Warper and Winder), Rotary Compressor, Compressor (Reciprocal)	1.5	1.7	1.9	1.7	1.9	2.1
Conveyor (Apron, Pan, Bucket and Elevator), Extraction, Fan, Blower (Centrifugal, Suction and Discharge), Power Generator, Exciter, Hoist, Elevator, Rubber Processor (Calender, Roll and Extruder), Textile Machine (Weaving Machine, Fine Spinning Machine, Twisting Machine and Weft Winding Machine)	1.6	1.8	2.0	1.8	2.0	2.2
Centrifugal Separator, Conveyor (Feed and Screw), Hammer Mill, Paper Manufacturing Machine (Pulpapitor)	1.7	1.9	2.1	1.9	2.1	2.3

Typical machines using a belt are listed above. For other machines using a belt, a load correction coefficient should be determined by reference to this table.
In the case of starts / stops over 100 times per day or rapid acceleration / deceleration, check the above values multiplied by 1.3. (MTS_M only)

Table 2. Speed Ratio Correction Coefficient (Kr)

Speed Ratio	Coefficient (Kr)
1.00 to 1.25	0
1.25 to 1.75	0.1
1.75 to 2.50	0.2
2.50 to 3.50	0.3
3.50 or more	0.4

Table 3. Idlers Correction Coefficient (Ki)

Position of Idler	Coefficient (Ki)
Outside the loose side of the belt	0
Inside the loose side of the belt	0.1
Outside the tensioned side of the belt	0.1
Inside the tensioned side of the belt	0.2

[Step 2-b] Calculating Design Power ……For P_M/UP_M Series

•Design Power (Pd) =Transmission Power (Pt) x Overload Factor (Ks)
· Calculate Transmission Power at Motor Rated Power Output. (It is ideal to calculate from the actual load applied to the belt.)
· Normal Motor Load Factor (Ks)=Ko+Ki+Kr+Kh

Ko : Application Coefficient (Table 4)
Ki : Idler Correction Factor (Table 5)
Kr : Speed Multiplication Correction Factor (Table 6)
Kh : Operation Time Correction Factor (Table 7)

Table 4. Service Coefficient (Ko)

Type of Driven machine \ Type of Motor (Peak Output/Basic Output)				Ⅰ 200% or Less	Ⅱ 200 to 300	Ⅲ 300% or More
A	Extremely Smooth Transmission			1.0	1.2	1.4
B	Fairly Smooth Transmission			1.3	1.5	1.7
C	Transmission with Moderate Impact			1.6	1.8	2.0
D	Transmission with Considerable Impact			1.8	2.0	2.2
E	Transmission with Large Impact			2.0	2.2	2.5
Motor	AC Motor	Single-Phase		–	–	All Types
		Squirrel-Cage Induction	2 Poles	100kW or More	90~3.7kW	2.2kW or Less
			4 Poles	55kW or More	45kW or Less	–
			6 Poles	37kW or More	30kW or Less	–
			8 Poles	15kW or More	11kW or Less	–
		Wire-Wound	4 Poles	–	15kW or Less	11kW or Less
			6 Poles	–	11kW or Less	7.5kW or Less
			8 Poles	–	5.5kW or Less	3.7kW or Less
		Synchronous Motor		–	Average Torque	High Torque
	DC Motor			Shunt	Compound	Series
	Internal Combustion Engine			8 or More Cylinders	7 ~ 5 Cylinders	4 ~ 2 Cylinders
	Hydraulic Motor			–	–	All Types

Note) For transmission involving forward/reverse operation, a large moment of inertia, extremely large impact, etc., the basic service coefficient may be 2.5 or more.

Type	Typical Driven Machines
A	Measuring Instrument, Camera Device, Radar, Medical Machine, Projector
B	Belt Conveyor (For Light Load) Chain Conveyor (For Light Load) Driller Press, Lathe, Screw Machine Electric Typewriter, Calculator, Duplicator, Printing Press, Cutter, Paper Folder, Printer, Mixer, Calender-Dryer, Lathe, Belt Sawing Machine, Plane, Circular Sawing Machine, Planer, Mixer (Liquid), Bread Baking Machine, Flour Kneading Machine, Sifter (Drum and Cone), Sawing Machine
C	Belt Conveyor (Ore, Coal, Sand), Elevator, Boring Mill, Grinder, Milling Machine, Shaper, Metal Sawing Machine, Wind Hoist, Dryer, Washing Machine (Including a Wringer), Excavator, Mixer, Granulating Machine, Pump (Centrifugal, Gear and Rotary), Compressor (High-Speed Center), Stirrer, Mixer (Viscous Matter), Centrifugal Forced Blower, General Rubber Handling Machine, Power Generator, Sifter (Electric)
D	Conveyor (Apron, Bucket, Flight, Screw), Hoist, Cutting Press, Shattering Machine, Pulp Manufacturing Machine, Weaving Machine, Spinning Machine, Twisting Machine, Blender, Centrifugal Separator, Blower (Axial Flow, for Mining and Roots), General Construction Equipment, Hammer Mill, Rollgang
E	Crank Press, Pump (Reciprocal), Compressor (Reciprocating), Civil Engineering, Mining Equipment Including Crushing Machine (Ball, Rod, Gravel), Rubber Mixer

Table 5. Correction Coefficient when Idler is Used (Ki)

Location of Idler in Use	Inside	Outside
Loose Side of the Belt	0	+0.1
Tense Side of the Belt	+0.1	+0.2

Should be applied for each idler.

Table 6. Speed Increase Correction Coefficient (Kr)

Speed Increase Ratio	Correction Coefficient
1 to 1.25	0
1.25 to 1.75	+0.1
1.75 to 2.5	+0.2
2.5 to 3.5	+0.3
3.5 or more	+0.4

Table 7. Operating time Correction Coefficient (Kh)

Operation Hours	Correction Coefficient
Operated 10 or More Hours a Day	+0.1
Operated 20 or More Hours a Day	+0.2
Operated 500 Hours or Less (For Seasonal Operation)	–0.2