Allowable Stress for Tension Member

Check the belt that is selected for allowable stress, using the following procedures.

1. Calculating the Effective Tension

The effective tension of a belt can be calculated using Formula 1.

Formula1 $F=f(W_G+W_1+W_2)L+f(W_1+W_3)L\pm W_G \cdot H$

(Carrier Side) (Return Side) (Vertical Side)

F: Effective Tension

f: Rolling friction coefficient of rollers, or friction coefficient between belt and supports (Select from Table -1)

ωG: Weight of Carried Materials per Meter of Belt kg/m

ω1: Weight of belt per Meter kg/m

ω2: Carrier Roller Weight per 1m kg/m (Select from Table -2)

ω3: Return Roller Weight per 1m kg/m (Select from Table -2)

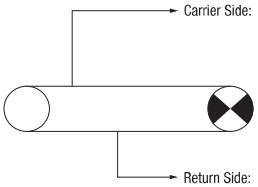
L: Conveyor Horizontal Length m

H: Vertical Height (+Up angle, -Down angle) m

Table of f Values(Table 1)

Belt Surface in Contact with Supports	Smooth	Cloth Surfaced
Roller Support	0.05	0.05
Roller+Steel Plate Support	0.2	0.3
Steel Supported (SUS·SS)	0.4	0.5
Plywood Support	0.5	0.6

(When knife edges are used, add 0.2 to the above values in Table -1.)



Carrier Side: As the back of the belt has a cloth surface, avoid using iron plate or plywood as support as much as possible.

Return Side: When the front side of the belt has a cloth surface, or is coated with silicon or fluorocarbon resin, avoid using iron plate or plywood as support as much as possible. (Some types of belts identified by specific product names are compatible with the roller, table.)

Table of Roller Weight (Table 2)

Roller Dia. (mm)	Single Roller (kg/roller)	Allowable Load (kg/roller)
28.6	0.2	50

Table-2 shows the weight of the revolving parts of a roller that meets (JISB8805-1965).
For accurate calculation, check the actual weight of the roller being used.

2. Power Requirement

Formula 2 $P=\dfrac{F \cdot V}{60000}$

P: Power Requirement kW
F: Effective Tension N
V: Belt Speed m/min
60000: 60×102 (Constant)

3. Motor Power

Formula 3 $Pm=\dfrac{P}{\eta}$

Pm: Motor Power kW
P: Power Requirement kW
η: Mechanical Efficiency
(Standard Mechanical Efficiency Range: 0.5~0.65)

For efficient operation, it is recommended to check the motor property if the motor for use has a power rating less than 0.1kW.

4. Using the Tension on the Loose Side to Calculate Maximum Tension

Formula 4 $F_{M1}=F \cdot K$

F_{M1}: Maximum Tension N
F: Effective Tension N
K: Coefficient

Using Value μ selected from Table-3 and the wrap angle (θ), select value K from Table-4.
(When the wrap angle (θ) is not listed in Table 4, Calculate from)

$K=\dfrac{e^{\mu\theta}}{e^{\mu\theta}-1}$

μ: Friction coefficient between driving pulley and belt (Select from Table-3)
e: Base of Natural Logarithm (2.718)
θ': Radian ($\theta=\theta\times\dfrac{2\pi}{360}$)

List of μ values (Table-3)

Pulley Surface \ Surface Shape in Contact with Pulley		Smooth	Cloth Surfaced
Bare Steel Pulley	Dry	0.2	0.3
	Wet	0.15	0.2
Rubber Ranking Pulley	Dry	0.3	0.35
	Wet	0.2	0.25

Table of Value K Based on Wrap Angle (θ) (Table-4)

θ° \ μ	0.1	0.15	0.2	0.25	0.3	0.35	0.5
180	3.8	2.7	2.2	1.9	1.7	1.5	1.3
190	3.6	2.6	2.1	1.8	1.6	1.5	1.3
200	3.4	2.5	2.0	1.8	1.6	1.5	1.3
210	3.3	2.4	2.0	1.7	1.5	1.4	1.2
220	3.2	2.3	1.9	1.7	1.5	1.4	1.2
230	3.1	2.3	1.9	1.6	1.4	1.4	1.2

5. Using Pretension to Calculate Maximum Tension

Formula 5 $F_{M2}=F+B \cdot Tc$

FM2: Maximum Tension N
B: Belt Width cm
TC: Initial Tension N/cm
(Select from Table-5)

Table of Tc Values (Table-5)

No. of Tension Members (No. of Plys)	1 Pc.
Initial Tension (N/cm)	1.5

Compare F_{M1} (Formula 4) and F_{M2} (Formula 5), and Make the larger as the Max. Tension FM.

6. Allowable Stress

Formula 6 $C\geq\dfrac{F_M}{B}$

C: Allowable Stress for Belt N/cm
FM: Effective Tension kg
B: Belt Width cm

When the allowable stress for the belt being used is equal to or higher than the maximum tension per 1cm width of the belt as expressed by Formula 6 above, the belt is suitable for use.