Power Transmission Capacity Tables

Power Transmission capacities of the KCM products shown in this catalog are determined under the following conditions:

1) Operation at -10°C to +60°C in the atmosphere free from abrasive dirt.
2) No corrosive gas and high humidity.
3) Two sprockets on which roller chain is mounted are properly aligned on parallel , level shafts.
4) Use of lubricant and lubrication method.
5) Less loading variations.

Multiple strand factor (Table 1)

Power transmission capacity of multiple strand roller chain is not equal to the number of strands times that of single strand roller chain , because the load is not evenly distributed to respective strands of roller chains.Therefore, power transmission capacity of multiple strand roller chain is determined by multiplying that of single strand roller chain by multiple strand factor.

Service factor (Table 2)

Actual power transmission capacity is adjusted according to the degree of loading variations, because the power transmission capacity tables are prepared on condition that loading variations are small.

Quick Selection Chart (Table 3)

How to Use:

EXAMPLE: Single strand roller chain with 5kW compensated chain drive power.

1. When smaller sprocket speed is 100 rpm:
Find the intersection of 5kW horizontal line of the compensated chain drive power and 100 rpm vertical line of the smaller sprocket speed in the quick selection chart. You'll find that the chain is KCM 80, and number of sprocket teeth is between 16T and 20T, judging as 17T from the exact location of the intersection.

2. When smaller sprocket speed is 300 rpm:

1) Find the intersection in the same way as 1, you'll find that the chain is KCM 60, and number of sprocket teeth is 13T to 18T, judging as 15T from the exact location of the intersection. Also, you'll find that there is KCM 50/24T line (dotted) near this intersection. This means you can use either KCM 60/15T and KCM 50/24T. After making quick selection with this chart confirm the selected sprocket is appropriate with reference to the power transmission capacity tables.
2) For power transmission capacity lines of 20T, 24T and 30T, only its high speed portions are shown to simplify the quick selection chart. For lower speed portions, extend a line in parallel to the lines, just like a dotted line of KCM50/24T.
3) For chain speeds of 50 m/min or lower, it is economical to make selection by "Low speed selection method"described later.

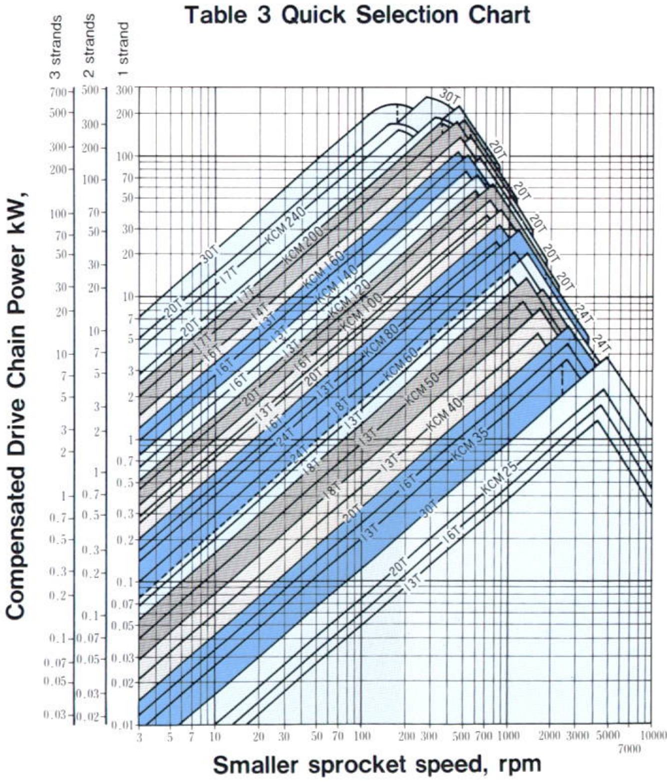
Table 1 Multiple strand factor

NO. of Chain Strands	Multiple Strand factor
2 strands	1.7
3 strands	2.5
4 strands	3.3
5 strands	3.9
6 strands	4.6

Table 2 Service factor

Load	Prime mover / Priven machine	Motor turbine	Combustion engine W/hyd. equipment	Combustion engine W/o hyd. equipment
Smooth loading	Belt conveyor subjected to small loading variations, chain conveyor, centrifugal pump, centrifugal blower, textile machine, and other machinery subjected to small loading variations.	1.0	1.0	1.2
With some shocks	Centrifugal compressor, marine propulsion system, conveyor subjected to some loading variations, automatic furnace, drier, crusher, machine tool, compressor.	1.3	1.2	1.4
With heavy shocks	construction machinery, and paper mill, press, crusher, mining machinery, vibrator, oil-well machinery, rubber mixer, roll, roll gang, and other machinery subjected to reversing loads or heavy shocks.	1.5	1.4	1.7

Table 3 Quick Selection Chart



Use in Severe Working Conditions

1. Application at High Temperature

If the chain is heated, its strength and wear resistance are decreased.

Table 5 Atmospheric temperature and strength

Atmospheric temp (°C)	Strength	
Up to -30	Allowable tensile force*	×0.25
-30 to -20	//	×0.30
-10 to 150	//	×1
150 to 200	//	×0.75
200 to 250	//	×0.5

2. Described in catalog

For use in alkalic or acidic environment, it is required to use the chain made of material having high corrosion resistance, for instance, stainless steel. Note that corrosion resistance of stainless steel may be decreased significantly according to kinds of liquid and gas, and operating temperatures.

Installation

(A) Arrangement of Shafts

Horizontal arrangement;
Even if both shafts are arranged horizontally, pay due attention to rotational direction of the shafts. In cases of Fig. (2) and (3), there is a fear that the chain is disengaged from the sprocket when the chain is eoingated. Particularly, in the case of Fig. (3), there is a fear that the upper and lower chain parts make contact: use an idler at midspan between shafts as shown.

Vertical arrangement:
The chain, if elongated, will be deflected as illustrated in Fig. (5). Particularly, if a smaller sprocket is located at the bottom side, there is a concern that the chain can disengage from the sprocket. To avoid disengagement, it is required the line linking centers of both shafts is at 60° or less to horizontal line, as illustrated in Fig. (4). If this arrangement is not allowed due to limitation of mechanism or space, it is recommended to arrange a larger sprocket at the lower side, and an idler inside or outside the chain as illustrated in Fig. (6).

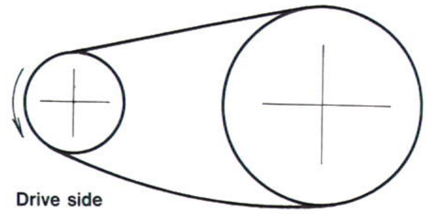
(B) Sag

Sag of the chain is approximately 4% of shaft-to-shaft distance, and approximately 2% of that in the following cases"
1) Vertical arrangement or similar arrangement.
2) Shaft-to-shaft distance is 1 m or longer.
3) Frequent starts and stops under heavy load.
4) Reversing operation

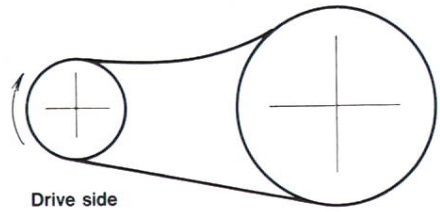
(C) Varying loads

It is required to place a tensioner on the tensed side or slackened side of the chain to give pre-tension. This eliminates vibration in operation and reduces noise.

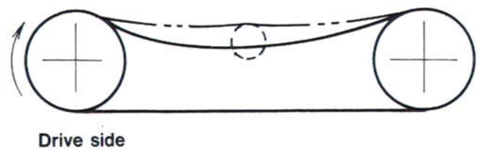
Horizontal arrangement:



(1) Good

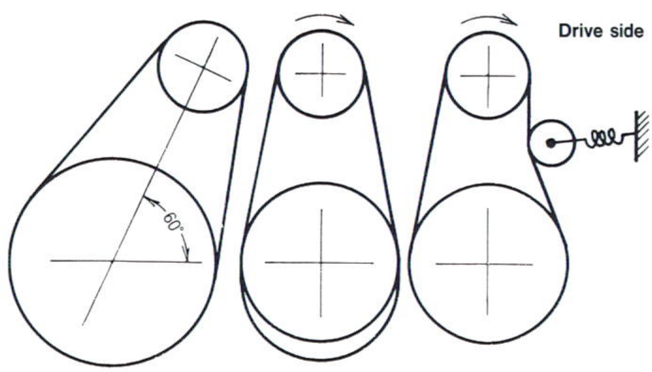


(2) Wrong



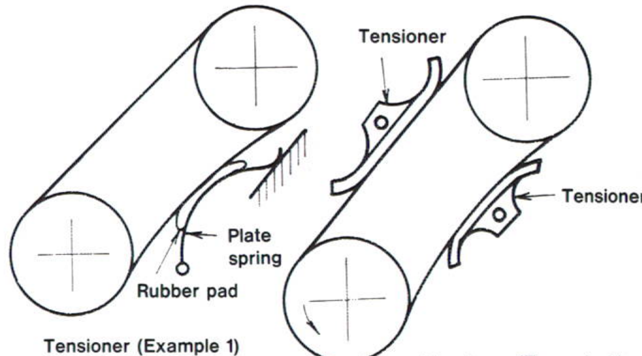
(3) Wrong (Change rotating direction or use an idler.)

Vertical arrangement:



(4) Good (5) (6)

Examples of Tensioners



Tensioner (Example 1)

Tensioner (Example 2)

Required Roller Chain Length

The required roller chain length (number of pitches) can be determined by the following equation, using center-to-center distance between shafts and number of teeth of sprocket.

$$L_P = \frac{N_1 + N_2}{2} + 2C_P + \frac{\{(N_2 - N_1)/2\pi\}^2}{C_P}$$

Lp: Overall roller chain length (no. of pitches)
N_1 = Number of teeth of smaller sprocket
N_2 = Number of teeth of larger sprocket
Cp = Center-to-center distance between shafts (no. of pitches)

$\{(N_2-N_1)/2\pi\}^2$ can be found from the table below.

N_2-N_1	$\{(N_2-N_1)/2\pi\}^2$	N_2-N_1	$\{(N_2-N_1)/2\pi\}^2$	N_2-N_1	$\{(N_2-N_1)/2\pi\}^2$
1	0.03	**35**	31.06	**69**	120.72
2	0.10	**36**	32.86	**70**	124.24
3	0.23	**37**	34.71	**71**	127.82
4	0.41	**38**	36.61	**72**	131.45
5	0.63	**39**	38.57	**73**	135.12
6	0.91	**40**	40.57	**74**	138.85
7	1.24	**41**	42.62	**75**	142.63
8	1.62	**42**	44.73	**76**	146.46
9	2.05	**43**	46.88	**77**	150.34
10	2.54	**44**	49.09	**78**	154.27
11	3.07	**45**	51.35	**79**	158.25
12	3.65	**46**	53.65	**80**	162.28
13	4.29	**47**	56.01	**81**	166.36
14	4.97	**48**	58.42	**82**	170.49
15	5.71	**49**	60.88	**83**	174.68
16	6.49	**50**	63.39	**84**	178.91
17	7.33	**51**	65.95	**85**	183.20
18	8.22	**52**	68.56	**86**	187.53
19	9.15	**53**	71.22	**87**	191.92
20	10.14	**54**	73.94	**88**	196.36
21	11.18	**55**	76.70	**89**	200.84
22	12.27	**56**	79.52	**90**	205.38
23	13.41	**57**	82.38	**91**	209.97
24	14.61	**58**	85.30	**92**	214.61
25	15.85	**59**	88.26	**93**	219.30
26	17.14	**60**	91.28	**94**	224.05
27	18.48	**61**	94.35	**95**	228.84
28	19.88	**62**	97.47	**96**	233.68
29	21.32	**63**	100.64	**97**	238.57
30	22.82	**64**	103.86	**98**	243.52
31	24.37	**65**	107.13	**99**	248.51
32	25.96	**66**	110.45	**100**	253.56
33	27.61	**67**	113.82		
34	29.31	**68**	117.25		

NOTE:
Lp (number of pitches), determined by the equation above, is not integer, almost having fraction part. Therefore, it is necessary to round up the function part to obtain integer. if the round-up integer is odd number, use an offset link, but even number is preferable.

Center-to-center Distance between Drive and Driven Shafts

The required roller chain length (number of pitches) determined at left is just approximation; which does not coincide with arbitrary center-to-center distance of drive and driven shafts. Therefore, it is required to obtain accurate center-to-center distance of drive and driven shafts. Therefore, it is reguired to obtain accurate center-to-center distance of drive and driven shafts by making calculation based on the required roller chain length equation.

$$C_P = \frac{1}{4}\left\{L_P - \frac{N_1+N_2}{2} + \sqrt{\left(L_P - \frac{N_1+N_2}{2}\right)^2 - \frac{2}{\pi^2}(N_2-N_1)^2}\right\}$$

Cp = Center-to-center distance between both drive and driven shafts (pitches)
Lp = Overall chain length (pitches)
N_1 = No. of teeth of smaller sprocket
N_2 = No. of teeth of larger sprocket

$\frac{2}{\pi^2}(N_2-N_1)^2$ can be found from the table below.

N_2-N_1	$\frac{2}{\pi^2}(N_2-N_1)^2$	N_2-N_1	$\frac{2}{\pi^2}(N_2-N_1)^2$	N_2-N_1	$\frac{2}{\pi^2}(N_2-N_1)^2$
1	0.20	**35**	248.49	**69**	9965.76
2	0.81	**36**	262.89	**70**	9993.95
3	1.83	**37**	277.70	**71**	1022.56
4	3.25	**38**	292.91	**72**	1051.56
5	5.07	**39**	308.53	**73**	1080.98
6	7.30	**40**	324.56	**74**	1110.80
7	9.94	**41**	340.99	**75**	1141.19
8	12.98	**42**	357.82	**76**	1171.65
9	16.43	**43**	375.07	**77**	1202.69
10	20.28	**44**	392.71	**78**	1234.13
11	24.54	**45**	410.77	**79**	1265.97
12	29.21	**46**	429.23	**80**	1298.23
13	34.28	**47**	448.09	**81**	1330.88
14	39.76	**48**	467.36	**82**	1363.95
15	45.64	**49**	487.04	**83**	1397.42
16	51.93	**50**	507.12	**84**	1431.29
17	58.62	**51**	527.61	**85**	1465.58
18	65.72	**52**	548.50	**86**	1500.26
19	73.23	**53**	569.80	**87**	1535.36
20	81.14	**54**	591.50	**88**	1570.85
21	89.46	**55**	613.61	**89**	1606.76
22	98.18	**56**	636.13	**90**	1643.07
23	107.31	**57**	659.05	**91**	1679.78
24	116.84	**58**	682.38	**92**	1716.90
25	126.78	**59**	706.11	**93**	1754.43
26	137.13	**60**	730.25	**94**	1792.36
27	147.88	**61**	754.80	**95**	1830.70
28	159.03	**62**	779.75	**96**	1869.45
29	170.60	**63**	805.10	**97**	1908.60
30	182.56	**64**	830.86	**98**	1948.15
31	194.94	**65**	857.03	**99**	1988.11
32	207.92	**66**	883.61	**100**	2028.48
33	220.90	**67**	910.58		
34	234.49	**68**	937.97		

SELECTING ROLLER CHAINS

General Roller Chain Selection Method

For roller chain transmission, it is important to select appropriate roller chain and sprockets.

① Compensated chain drive power

② Power to be transmitted

Determine the compensated chain drive power by multiplying the power to be transmitted by service factor shown in Table 2 according to the driven machine and prime mover. If the desired power transmission power cannot be achieved with single strand chain, select multiple strand chain. In this case, it is required to make compensation with multiple strand factor listed in Table 1 as follows.

○Single strand chain:
Compensated chain drive power
=Power to be transmitted×Service factor

○Multiple strand chain:
Compensated chain drive power

$$=\frac{\text{Power to be transmitted}\times\text{Service factor}}{\text{multiple strand factor}}$$

③ Speeds of drive and driven shafts:

Determine appropriate roller chain and number of teeth of smaller sprocket from Table 3 "Quick selection chart" according to the speed (rpm) of higher-speed shaft (drive shaft in case of deceleration and driven shaft in acceleration) and compensated chain drive power.

In this case, it is recommended to select a chain with pitches as small as possible for smooth, quiet operation.

④ Shaft diameter and boss diameter:

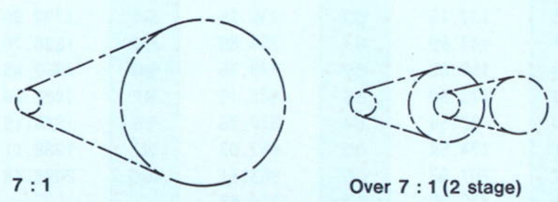
After determining the number of teeth of smaller sprocket, refer to Sprocket dimensions tables on pages 77 to 86 to find boss diameter and maximum bore diameter. If the bore diameter is less than the actual shaft diameter, reselect the increased number of teeth of smaller sprocket so that the bore diameter matches the actual shaft diameter.

⑤ Speed ratio of both shafts

Determine the number of teeth of larger sprocket by multiplying the number of teeth of smaller sprocket by the speed ratio of smaller sprocket to larger sprocket. Here, note that the number of teeth of smaller sprocket must be 17 or more, and that of larger sprocket must be 114 or less.

When uniform load is transferred at low speed, it is possible to select a sprocket whose number of teeth is down to 13.

In roller chain drive, the speed ratio of smaller sprocket to larger sprocket is normally 7 : 1 or less. If larger speed ratio is required, select two or more stages for speed change.



⑥ Shaft-to-shaft distance

It is ideal that shaft-to-shaft distance is 30 to 50 times chain pitch employed, although both shaft are positioned close to each other just before engagement of both sprockets. If subjected to pulsating load, shaft-to-shaft distance must be 20 or less times chain pitch employed.

Low Speed Roller Chain Selection Method

When the chain speed is 50 m/min or less, follow the "Low Speed Roller Chain Selection Method", rather than "General Roller Chain Selection Method", described above, for economical operation.

This low speed roller chain selection method is suitable for smooth power transmisson with less frequent starts and stops. Working conditions such as operating environment, arrangement and lubrication are similar to those of general roller chain selection method.

① Chain Speed

$$V=\frac{P \cdot N \cdot n}{1000}$$

V: Chain speed, m/min
P: Chain pitch, mm
N: No. of teeth of smaller sprocket
n: No. of speed of smaller sprocket. rpm

② Load acting on roller chain

$$F=\frac{6120 \cdot kW}{V}$$

F: Max. load acting on roller chain, kgf
kW: Transmission Power, kW

③ Max. acting load and max. allowable load

| Max. load acting on chain, kgf | × | Service factor Table 2 | × | Speed factor Table 4 | ≦ | Ma. allowable load of roller chain, kgf |

Table 4 Speed Factors

Chain speed	Speed factor
15 m/min or less	1.0
15～30m/min	1.2
30～50m/min	1.4

If the foregoing equation is not satisfied, change the size of roller chain and the number of teeth of sprocket, and try to recheck if the equation is satisfied or not.

④ For low-speed application subjected to frequent starts and stops or braking and shocks, contact us.