

F Series

D / DK Series

FC Series

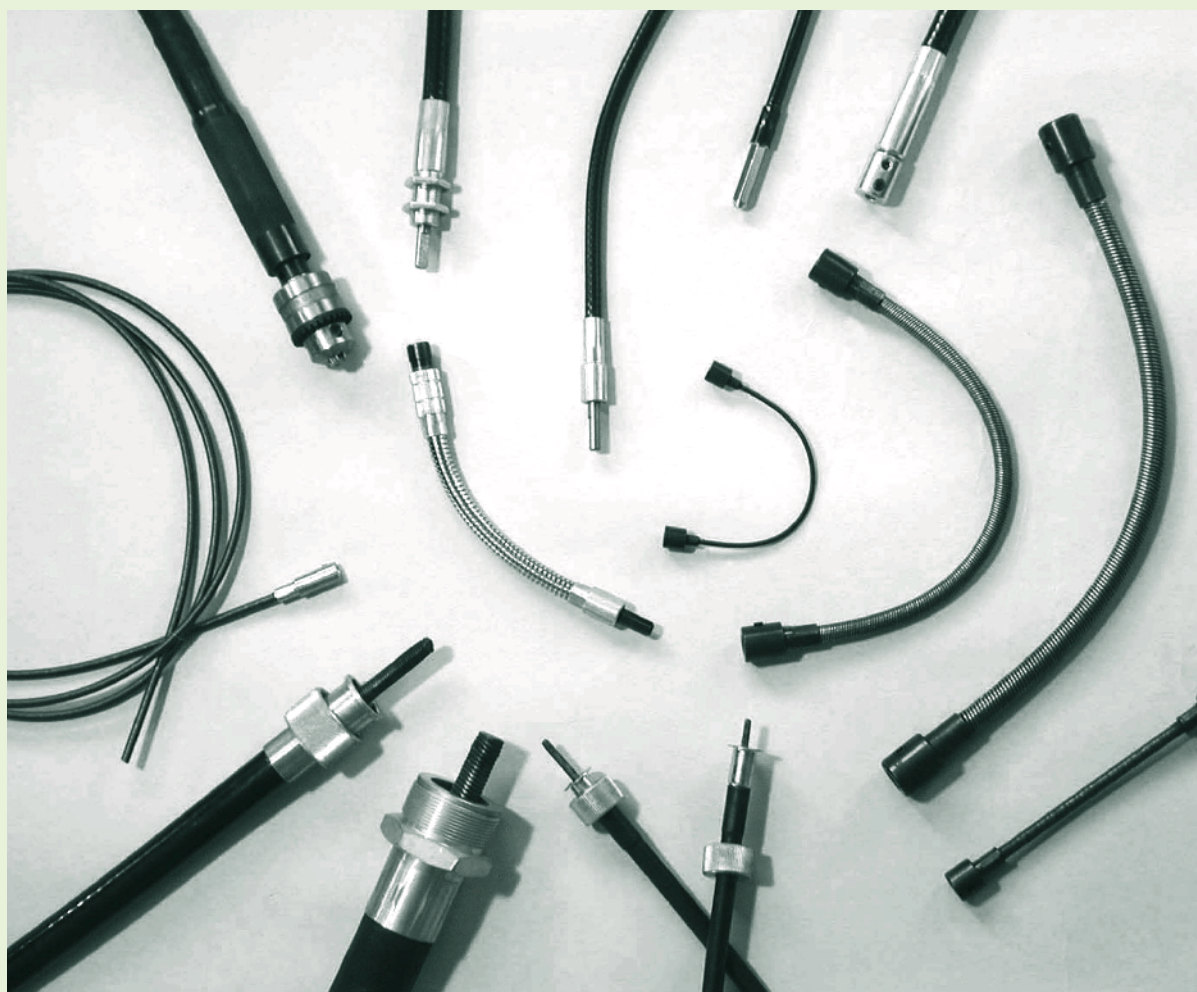
FCP / FCK Series

Sumflex[®]

Power Drive Flexible Shaft

Flexible Shafts for Rotary Motion

Simple and Flexible Power Transmission Shafts



Sumflex Co.,Ltd.

What are flexible shafts?

A flexible shaft is the basic mechanical element for power transmission, recently adopted by all industries as the easiest way to transmit rotational motion.

Features

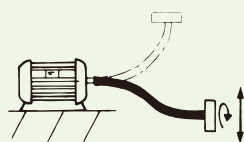
- Can be arranged freely
- No need for accurate centering of equipment
- The relative position of the drive side and the driven side can be changed even during rotation
- High transmission efficiency
- Absorbs vibration
- Generate power to multiple areas from one power source
- Dustproof
- Easy maintenance
- Can be designed in small sizes

We supply more than 1000 types of flexible shafts for:

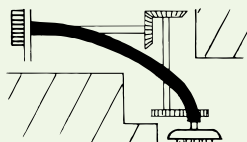
Aircraft	Nuclear Power	Agriculture
Fisheries	Medical	Ships
Machine Tools	Food	Automotive
Video	OA Equipment	Toys
Packing / Packaging	Polishing Tools	Woodworking
Civil Engineering	Air Conditioning	Cleaning
Conveyance	Scientific Equipment	

Flexible shafts are classified into the following groups according to the purpose of use:

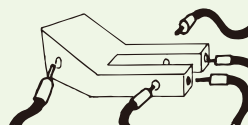
1. **F Series** for power transmission
Transmission of motor power to any position
2. **D Series** for coupling
Power transmission or remote control with an inter-axis distance of 350 millimeters or less
3. **FC Series** for remote control
Manual or mechanical remote control
4. **Hand Operated Series** for manual work for polishing tools
Manual work with mounted point, paper, etc. attached to the tip



In any position
for transmission rotation



In gear / belt transmission
Design difficulty remedy

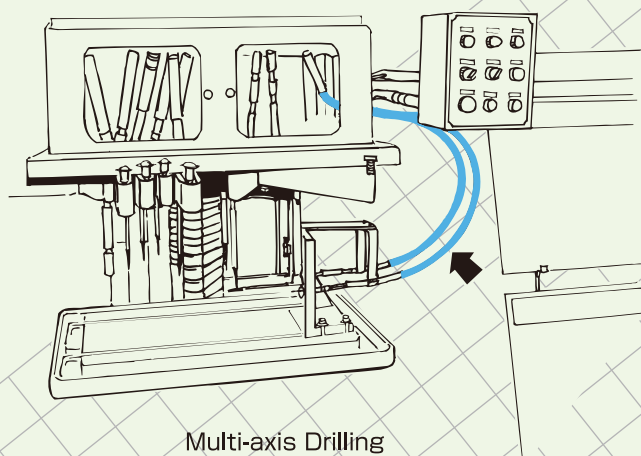


For various machine types
(Drilling, polishing, cutting, etc.)

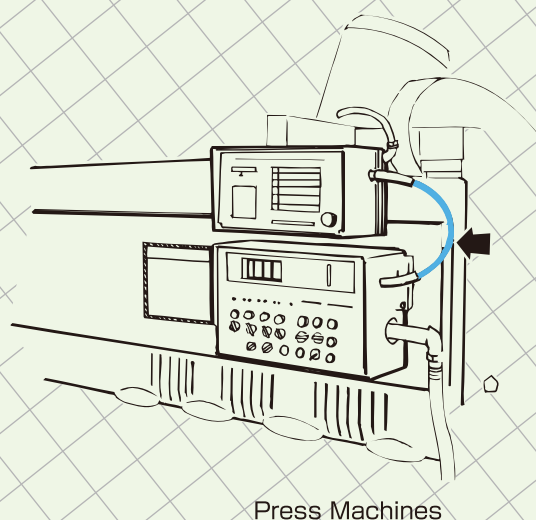


For remote control of variable transmissions,
valve openings and closing, etc.

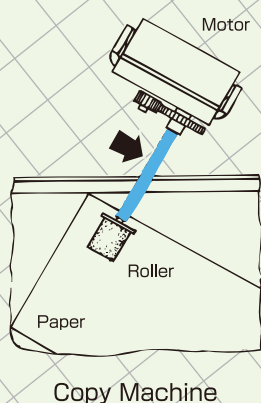
Endless application possibilities. Flexible shaft for sophisticated power transmission systems:



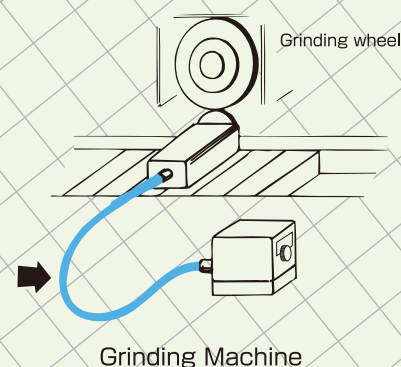
Multi-axis Drilling



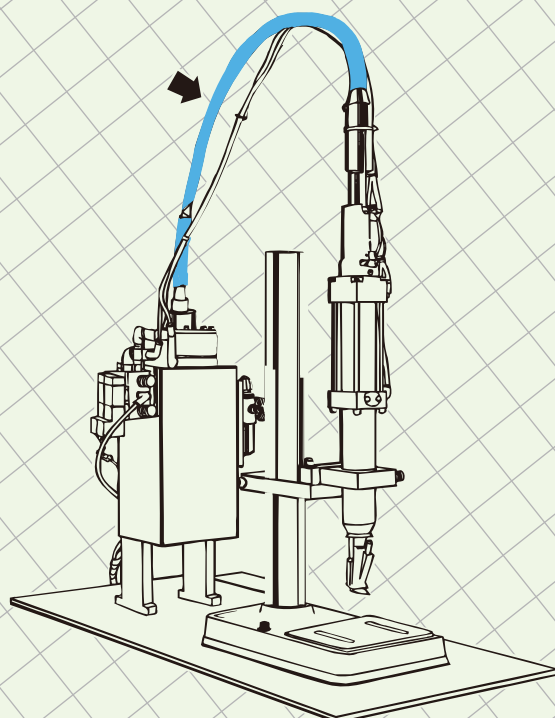
Press Machines



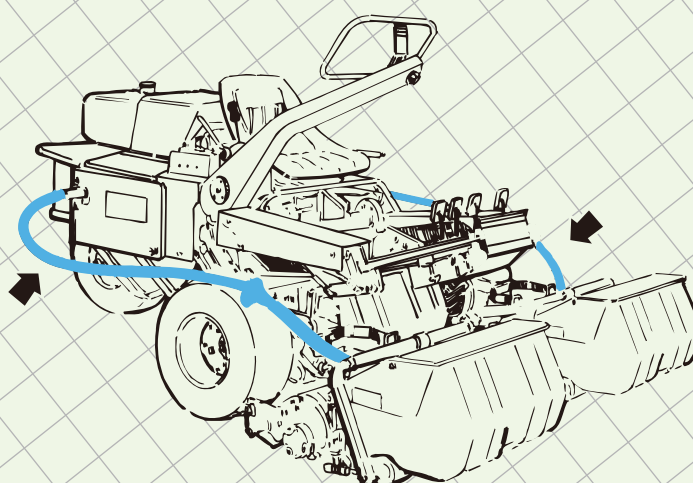
Copy Machine



Grinding Machine



Screw Tightener



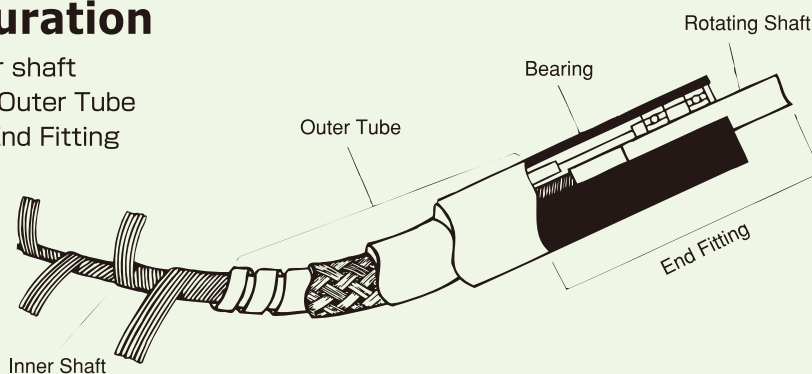
For Lawn Mowers

Flexible shaft

Flexible shafts can be incorporated into various devices and applicable to all industries. The reason for this is because there are so many requests for user-specific specifications. We can handle everything from prototypes to mass-produced products. On top of that, we will readily supply prototypes when needed.

Flexible shaft configuration

The flexible shaft consists of an inner shaft (sometimes called an inner wire), an Outer Tube (sometimes called a casing), and an End Fitting (sometimes called a Shaft End).



Inner Shaft



Basic Structure

Make up:

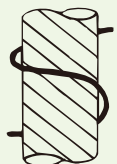
The inner shaft is the most important part of the flexible shaft. Manufactured by winding several layers of wire around one wire. Each layer consists of several wires, and each layer is wound in the opposite direction of the preceding wire. The basic characteristics of a flexible shaft for power transmission vary greatly depending on the structure of the inner shaft. Even if the diameter is the same, the characteristics will change depending on the number of wires per layer of the inner shaft, the number of wire layers, the diameter of the wires, the material, the spacing between the wires, and so on.

Material:

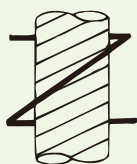
We use hard steel wire class C (JIS G3521), which has high tensile strength, torsional stress and excellent wear resistance. It can also be made of stainless steel wire for heat resistance, chemical resistance, radiation resistance, corrosion resistance, and vacuum resistance.

Winding and rotation direction:

Depending on the winding direction of the inner shaft, there are two types, one for clockwise rotation and the other for counterclockwise rotation. When used in the opposite direction, functionality will be reduced by between 30 and 50% when compared to normal use.



Clockwise Rotation
Winding downward and to the right (S pattern)

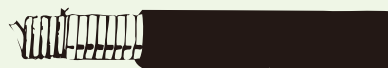


Counter Clockwise Rotation
Winding upward and to the right (Z pattern)

Outer Tube

The outer tube supports the inner shaft that rotates and prevents the inner shaft from forming a loop. In addition, grease is sealed between the outer tube and the inner shaft which functions as a bearing for the inner shaft. In addition, the outer tube protects the inner shaft from moisture and dust.

Standard Type



A combination of hard steel wire and mild steel wire that is wound up, or a flat steel wire that is wound up and covered with resin (vinyl chloride, polyethylene, synthetic rubber, etc.) for general use.

High Torque Type



A combination of hard steel wire and medium hard steel wire, a steel wire blade that is single or double covered with a steel wire blade on the outer surface of the wound flat steel wire, and further covered with resin (vinyl chloride, synthetic rubber, etc.). Withstands high-speed rotation work, has excellent water resistance and vibration resistance. Less flexibility when compared to the standard type.

End Fitting

There are various shapes for the part that connects to the drive side and the driven side. The standard material is general steel, but stainless steel can also be manufactured. Of course, different types and shapes not listed in the catalog can also be manufactured.

Power Drive Flexible Shaft

F Series

Necessary elements for selection

(1) Transmission torque
 $T \text{ N}\cdot\text{m}$

(2) Rotation Speed $N \text{ min}^{-1}$

(3) Rotation Direction

(4) Bending Radius

(5) Length

(6) Transmission Efficiency

(7) Lubrication

(8) Backlash

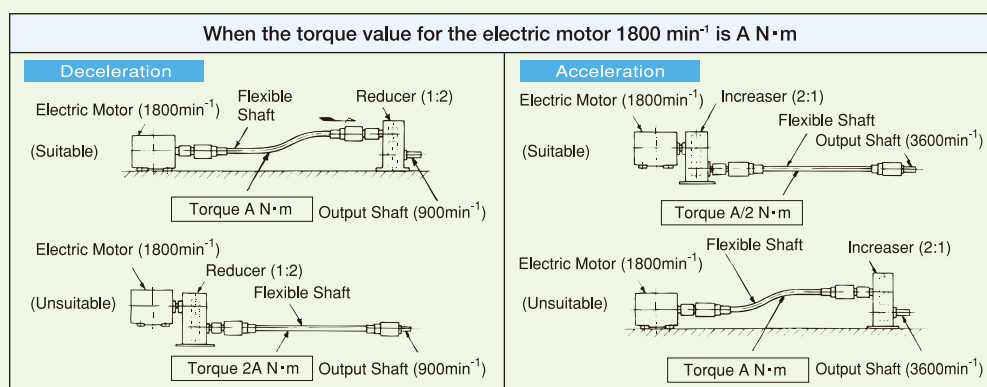
(9) Environment

Main use:

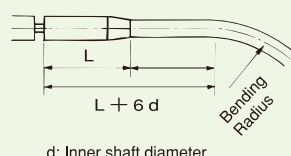
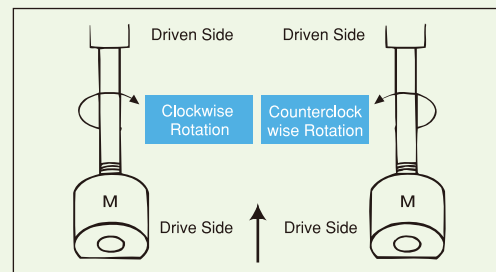
Long inter-axis distance, small to large power transmission

- Flexible shafts are vulnerable to shock loads and are not suitable for mechanisms with large sudden start-ups, stops and load fluctuations. However, this can be remedied by installing a device that has a margin in the allowable transmission torque and absorbs the overload. When determining the safety transmission torque, consider the load coefficient at startup, the coefficient of intermediate support, etc.
- Understanding the torque on the driven side is the most important, but if it is not possible to actually measure it, calculate it from the relational expression of torque and power.

When transmitting the same power, it is advantageous for the flexible shaft to rotate as fast as possible within its tolerance. With the reducer mechanism → before deceleration
With the increaser mechanism → after acceleration



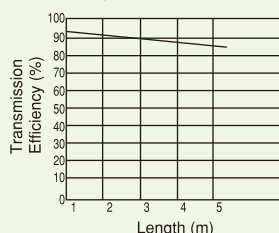
If used in the wrong direction of rotation, the transmission torque will be reduced by 30 to 50% during normal use. If it is 100 min^{-1} or less, there may be almost no difference whether it is used for clockwise or counterclockwise rotation. Determine the direction of rotation from the figure on the right.



(Minimum bend radius if there are many bends)

Please plan to have as large a bending radius as possible. If the radius is at a minimum, the transmission efficiency may decrease, heat may be generated due to friction, and the inner shaft may be damaged. Depending on the flexible shaft type, if it is a short or acute bend, it may only be installed in a straight line.

There are no specific standard lengths. We have adopted a method that allows users to specify the length needed. The length that can be manufactured varies depending on the model, but it can be up to 10 m.



The transmission efficiency of flexible shafts is generally high, around 80-90% when used in a straight line with minimal bending. However, this percentage will be reduced depending on the length and bending radius.

Grease is sealed between the inner shaft and the outer tube. Since it has a sealed structure, it can be used for a long time without worry.

Due to the structure of the flexible shaft, the backlash cannot be reduced to zero. The backlash varies depending on the configuration of the inner shaft and outer tube, the gap between the two, the length, the bending radius, and the torque and load of the flexible shaft itself. See Table 10 when used for remote control.

Generally used at room temperature, but it is also possible to manufacture flexible shafts that meet the conditions for use in special environments. Special environment are as follows: In a vacuum / high temperature / low temperature / seawater (or water) / radiation / chemical scattering, etc.

F Series with Outer Tube

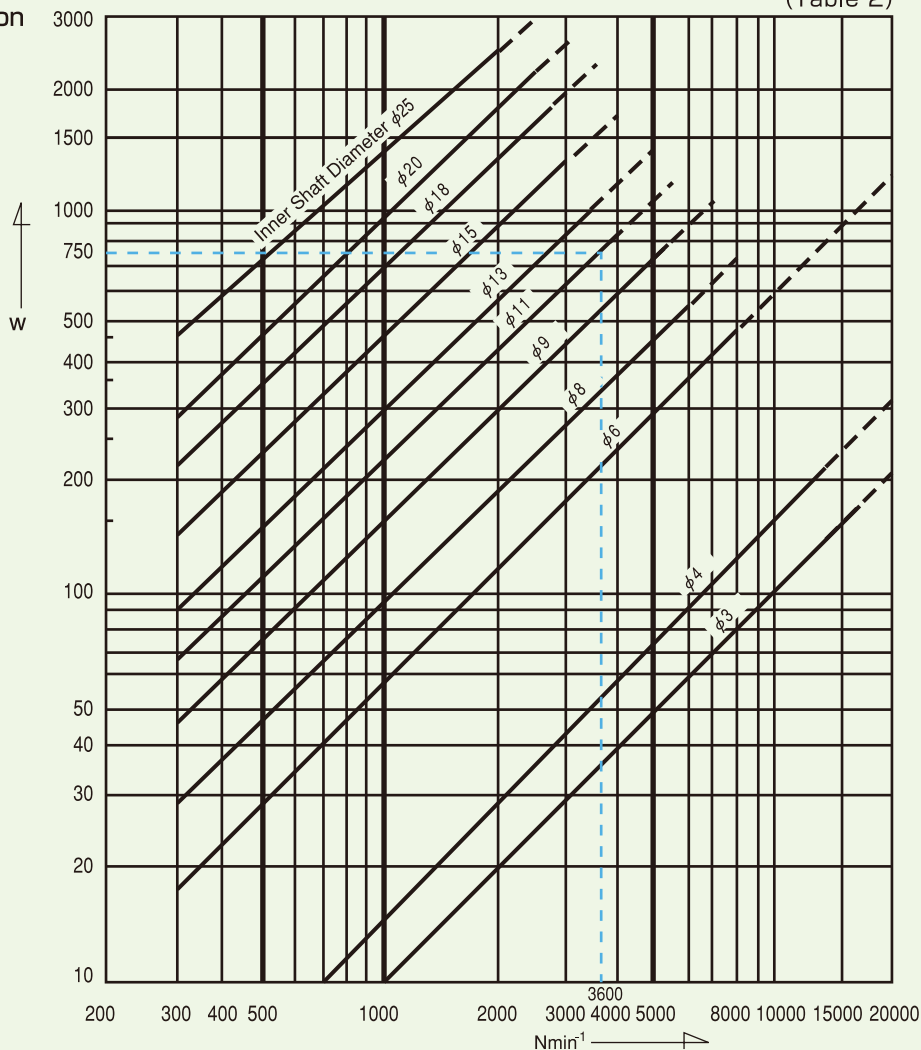
■ F Series Characteristic Table

(Table 1)

Flexible Shaft Model Number	Inner Shaft		Outer Tube		Minimum Bending Radius (mm)	Maximum Torque N·m (kg·cm)		Radius min ¹ (r.p.m)	
	Diameter (mm)	Weight (kg / m)	Diameter (mm)	Weight (kg / m)		Straight Line	Bending	Maximum	Reasonable
F31	3.2	0.04	8	0.12	75	0.2(2)	0.1(1)	20,000	Less than 16,000
F41	4	0.06	8	0.12	100	0.39(4)	0.2(2)	20,000	Less than 12,000
F61(F62)	6	0.16	12	0.3(0.28)	150	1.47(15)	0.78(8)	20,000	Less than 8,000
F81(F82)	8	0.28	19	0.78(0.68)	175	2.45(25)	1.27(13)	8,000	Less than 6,000
F92	9	0.36	19	0.68	200	3.43(35)	1.96(20)	7,000	Less than 5,400
F112	11	0.5	26	1.1	250	5.39(55)	2.94(30)	5,500	Less than 4,400
F132	13	0.7	33	1.56	300	6.86(70)	3.92(40)	5,000	Less than 3,700
F152	15	1.1	33	1.56	350	10.78(110)	5.88(60)	4,000	Less than 3,200
F182	18	1.4	40	2.2	400	17.64(180)	8.82(90)	3,500	Less than 2,700
F202	20	1.9	40	2.2	450	21.56(220)	11.76(120)	3,000	Less than 2,400
F252	25	2.8	48	3.45	500	39.2(400)	19.6(200)	2,500	Less than 1,900

■ Safety Transmission Power Chart

(Table 2)



This chart is calculated based on actual results under the following conditions, taking the safety factor into consideration.

Conditions:

- No sudden load fluctuation
- Flexible shaft length $\ell = 200d$ or less
- Bending radius $R = 35d$ or more (d : inner shaft diameter)
- With intermediate support

Torque Power-related Type

$$T(N \cdot m) = \frac{9.54 \times W}{\text{min}^{-1}}$$

$$T(N \cdot m) = \frac{7018.8 \times PS}{\text{min}^{-1}}$$

T: Torque on the driven side N·m

W or PS: Drive side power

min⁻¹: Rotation speed

Safety Factor

Articles	K ₁	Articles	K ₂
No Load Fluctuation	1.2	Sufficient Intermediate Support	1.2
Some Load Fluctuation	1.6	Some Intermediate Support	1.5
Load Fluctuation	2.0	No Intermediate Support	1.7

Calculation Formulas and Examples

T₁.....Calculation formula torque (N·m)

T₂.....Safety transmission torque

K₁.....Safety factor against load, overload, etc. at startup

K₂.....Safety factor for the presence or absence of intermediate support of the outer tube

(Example) Power 750W

Rotation Speed 3600min⁻¹

Bend Radius 300mm

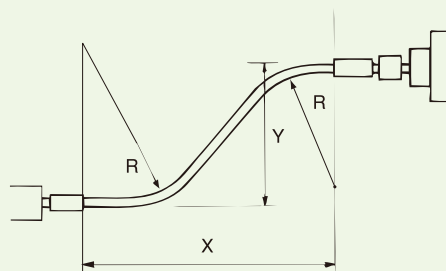
With Intermediate Support

$$T_1 = \frac{9.54 \times W}{\text{min}^{-1}} = \frac{9.54 \times 750}{3600} \approx 1.99 \text{ N} \cdot \text{m}$$

$$T_2 = T_1 \times K_1 \times K_2 = 1.99 \times 1.2 \times 1.2 \approx 2.87 \text{ N} \cdot \text{m}$$

When finding the intersection of 3600min⁻¹ to 750W from Table 2, select the inner shaft of $\phi 11$ or more, and therefore F112 from Table 1. When selecting a flexible shaft, it is necessary to overestimate the transmission torque in consideration of the possibility of overload and start-up

Torque Power-related Type



$$R = \frac{X^2 + Y^2}{4Y}$$

Check if the bend radius (R) obtained by the above formula is larger than the minimum bend radius of the selected flexible shaft. If it is smaller, change the X or Y dimension and adjust so that the R dimension is greater than or equal to the minimum bending radius.

Reference Materials

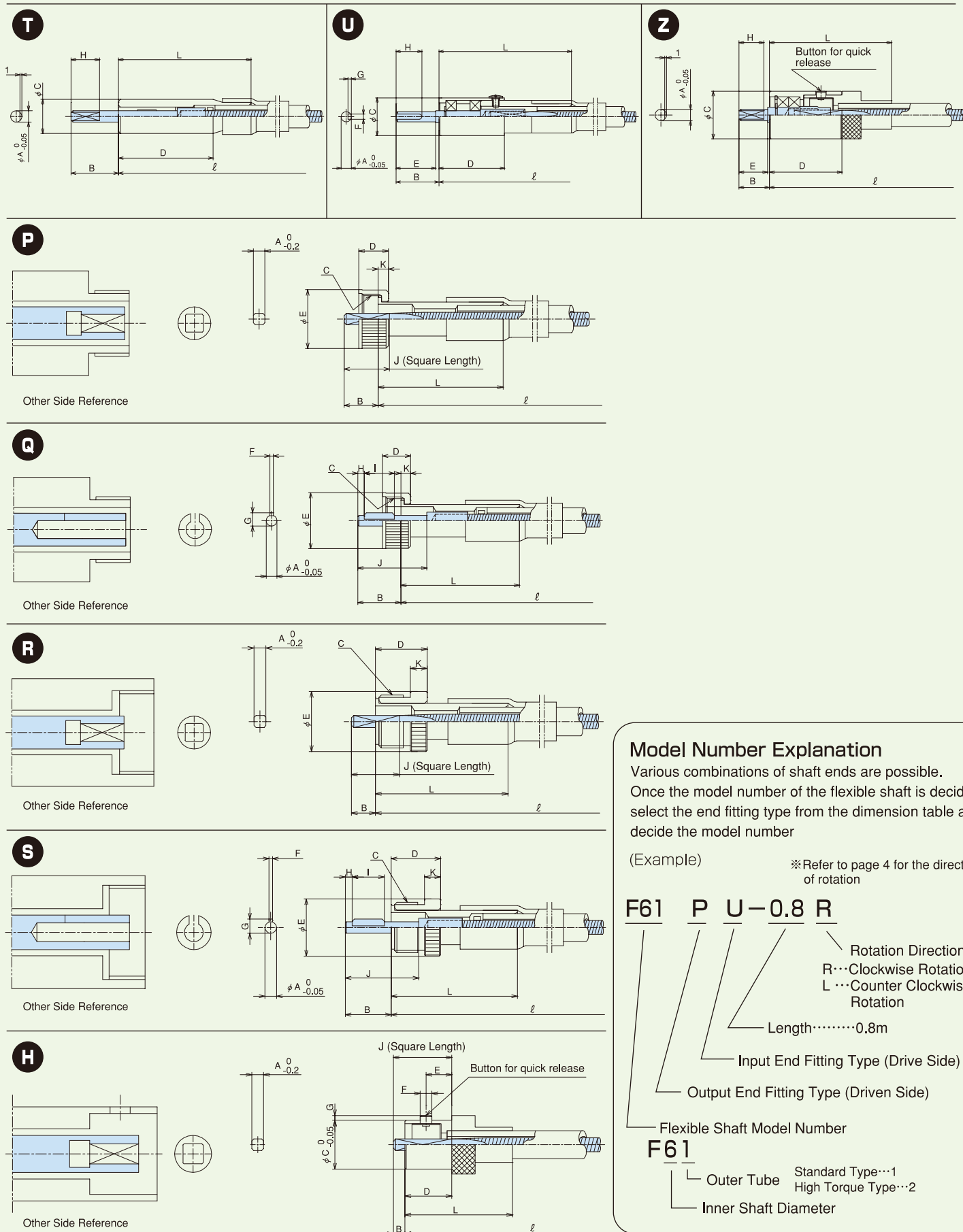
(Table 3)

Power W	Torque (N·m)														
	$T(N \cdot m) = \frac{9.54 \times W(\text{Power})}{\text{min}^{-1}(\text{rpm})}$														
	Rotation Speed min ⁻¹ (r.p.m)														
	200	300	600	900	1,200	1,500	1,800	2,400	3,600	5,000	6,000	8,000	10,000	15,000	20,000
5	0.239	0.159	0.080	0.053	0.040	0.032	0.027	0.020	0.013	0.010	0.008	0.006	0.005	0.003	0.002
10	0.477	0.318	0.159	0.106	0.080	0.064	0.053	0.040	0.027	0.019	0.016	0.012	0.010	0.006	0.005
25	1.193	0.795	0.398	0.265	0.199	0.159	0.133	0.099	0.066	0.048	0.040	0.030	0.024	0.016	0.012
40	1.908	1.272	0.636	0.424	0.318	0.254	0.212	0.159	0.106	0.076	0.064	0.048	0.038	0.025	0.019
60	2.862	1.908	0.954	0.636	0.477	0.382	0.318	0.239	0.159	0.114	0.095	0.072	0.057	0.038	0.029
80	3.816	2.544	1.272	0.848	0.636	0.509	0.424	0.318	0.212	0.153	0.127	0.095	0.076	0.051	0.038
100	4.770	3.180	1.590	1.060	0.795	0.636	0.530	0.398	0.265	0.191	0.159	0.119	0.095	0.064	0.048
150	7.155	4.770	2.385	1.590	1.193	0.954	0.795	0.596	0.398	0.286	0.239	0.179	0.143	0.095	0.072
200	9.540	6.360	3.180	2.120	1.590	1.272	1.060	0.795	0.530	0.382	0.318	0.239	0.191	0.127	0.095
300	14.310	9.540	4.770	3.180	2.385	1.908	1.590	1.193	0.795	0.572	0.477	0.358	0.286	0.191	0.143
400	19.080	12.720	6.360	4.240	3.180	2.544	2.120	1.590	1.060	0.763	0.636	0.477	0.382	0.254	0.191
550	26.235	17.490	8.745	5.830	4.373	3.498	2.915	2.186	1.458	1.049	0.875	0.656	0.525	0.350	0.262
750	35.775	23.850	11.925	7.950	5.963	4.770	3.975	2.981	1.988	1.431	1.193	0.894	0.716	0.477	0.358
1,000	47.700	31.800	15.900	10.600	7.950	6.360	5.300	3.975	2.650	1.908	1.590	1.193	0.954	0.636	0.477
1,500	71.550	47.700	23.850	15.900	11.925	9.540	7.950	5.963	3.975	2.862	2.385	1.789	1.431	0.954	0.716
2,200	104.940	69.960	34.980	23.320	17.490	13.992	11.660	8.745	5.830	4.198	3.498	2.624	2.099	1.399	1.049
3,000	143.100	95.400	47.700	31.800	23.850	19.080	15.900	11.925	7.950	5.724	4.770	3.578	2.862	1.908	1.431
3,750	178.875	119.250	59.625	39.750	29.813	23.850	19.875	14.906	9.938	7.155	5.963	4.472	3.578	2.385	1.789

Note: When considering the unit of torque in kg · cm, consider the value in Table 3 multiplied by 10.2 (about 10 times)

The end fitting can be selected from the figures below

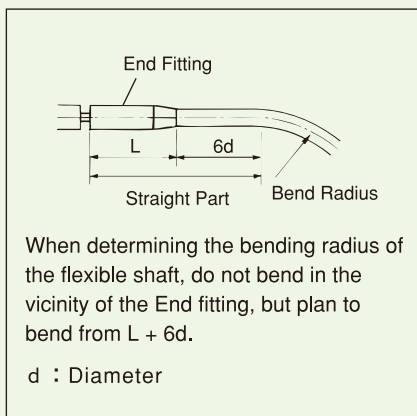
End Fitting (the portion colored rotates)



F Series Dimensions

(Table 4)

End Fitting Type	Bearing	Flexible Shaft Model Number	Dimensions																																																																																																																																																																																																																																																																																																																																																																																																																		
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		F41						5.5		18																																																																																																																																																																																																																																																																																																																																																																																																											
		F61,F62		20	M22X1.5		ϕ 26	1.6	3	14	32	4.5	55																																																																																																																																																																																																																																																																																																																																																																																																								
R	-	F31	□2.6	10	M19X1.25	21.2	ϕ 18					20	8	38																																																																																																																																																																																																																																																																																																																																																																																																							
		F41	□3.2		M22X1.5	21.5	ϕ 25							55																																																																																																																																																																																																																																																																																																																																																																																																							
		F61,F62	□5		5	M27X1.5	22						ϕ 28	25	50																																																																																																																																																																																																																																																																																																																																																																																																						
		F81,F82	□7	10		M39X1.5	31					Hexagon Opposite Side 41																																																																																																																																																																																																																																																																																																																																																																																																									
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S	-	F31	ϕ 5	15	M19X1.25	21.2	ϕ 18	1.5	6.2	3.5	5.5	16	8	38																																																																																																																																																																																																																																																																																																																																																																																																							
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		F61,F62		20	M22X1.5	21.5	ϕ 25	1.6	3	14	32	7	55																																																																																																																																																																																																																																																																																																																																																																																																								
H	-	F61,F62	□5	5	21	20	11	ϕ 5	2.3				25	46																																																																																																																																																																																																																																																																																																																																																																																																							
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- Note: 1. Shaft end types other than the above dimensions can also be manufactured. Please see the example on Page 10.
 2. Please request separately for F152, F182, F202 and F252.
 3. For Shaft end types (P)(Q)(R)(S)(H), please make a separate request for the reference dimensions of the other side.
 4. Shafts F31, F41, F62 and F81 are chamfered

Various Couplings

Fig. 1

Fig. 2

Various Couplings Dimensions Table

(Table 5)

Part Number	Dimensions										Reference	Compatible Flexible Shaft Model Number	
	A	A1	B	C	D	E	F	G	H	I			
757	φ 6	φ 6	20	5	5	20			φ 16	M5	Fig. 1	F31T/U,F41T/U F61T/U,F62T/U	
758	φ 9	φ 10	30	7	7	16			φ 20	M6		F81T/U/Z,F82T/U/Z F92Z	
759C	φ 12	φ 16	40	10	10	21			φ 25			F112U,F132U	
760	φ 14	φ 14	40	10	10	22	5	16.3	φ 30	Fig. 2		F92U,F112Z,F132Z	
769	φ 10	φ 19	55	15	10	33	6	21.8	φ 36			F81U/Z,F92Z	

Main application: Transmission of minimal power with a short distance between axes

D Series Characteristic Table 1

(Table 6)

Flexible Shaft Model Number	Diameter (mm)	Minimum Bend Radius (mm)	Maximum Torque N·m (kg·cm)	ℓ Maximum Dimension (mm)	Appropriate rotation speed min ⁻¹ (r.p.m)
D03,DK3	3.2	75	0.1(1)	150	Less than 3600
D04,DK4	4	100	0.2(2)	150	Less than 3600
D06,DK6	6	150	0.69(7)	200	Less than 3600
D08,DK8	8	175	1.27(13)	250	Less than 3600
D09,DK9	9	200	1.96(20)	300	Less than 3600
D11,DK11	11	225	2.94(30)	350	Less than 3600
D13,DK13	13	250	3.92(40)	350	Less than 3600

We are able to manufacture products that exceed the maximum length of each product number, but please note the following points.

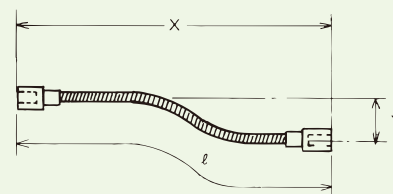
- ① : Torque transmission efficiency is significantly reduced as no protective tube will be used.
- ② : Cannot be used at high speed because it can be very dangerous as it will rotate in an arc, kind of like skipping rope.

D Series Characteristic Table 2

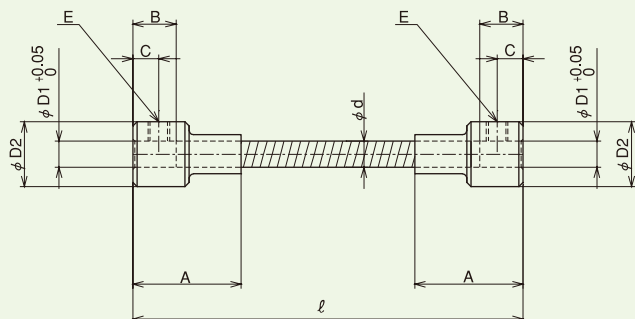
(Table 7)

Model Number	100		150		200		250		300		350	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
D03,DK3	99.5	7	148.5	20								
D04,DK4	99.7	5	148.5	15								
D06,DK6	99.8	2	149	10	197.5	25						
D08,DK8			149.5	8	199	15	248	25				
D09,DK9			149.5	6	199	15	248	25	298	30		
D11,DK11					199.2	10	249	17	299	20	348	30
D13,DK13					199.5	7	249	13	299	15	348.5	25

Indicates the amount of eccentricity that can be mounted.
Plan to be below the indicated dimensions



D Series

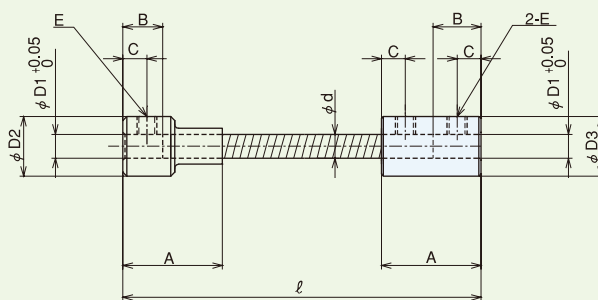


(Table 8)

Flexible Shaft Model Number	Diameter φ d(mm)	A	B	C	φ D1	φ D2	E	Minimum Bend Radius (mm)	ℓ Maximum Dimension (mm)
D03	3.2	20	8	4	4	10	M3	75	150
D04	4	20	8	4	4	10	M3	100	150
D06	6	25	12	6	6	15	M5	150	200
D08	8	33	16	8	8	16	M5	175	250
D09	9	38	20	10	10	20	M6	200	300
D11	11	40	20	10	10	20	M6	225	350
D13	13	43	20	10	10	20	M6	250	350

DK Series

Useful when difficult to determine the length for trial use.
(Depending on E, can be removed)



(Table 9)

Flexible Shaft Model Number	Diameter φ d(mm)	A	B	C	φ D1	φ D2	φ D3	E	Minimum Bend Radius (mm)	ℓ Maximum Dimension (mm)
DK3	3.2	20	8	4	4	10	10	M3	75	150
DK4	4	20	8	4	4	10	10	M3	100	150
DK6	6	25	12	6	6	15	15	M5	150	200
DK8	8	33	16	8	8	16	16	M5	175	250
DK9	9	38	20	10	10	20	20	M6	200	300
DK11	11	40	20	10	10	20	24	M6	225	350
DK13	13	43	20	10	10	20	24	M6	250	350

Model Number Explanation D 06 — 150 R

※ Please refer to page 4 for direction of rotation

Rotation Direction R...Clockwise Rotation
 L...Counter Clockwise Rotation

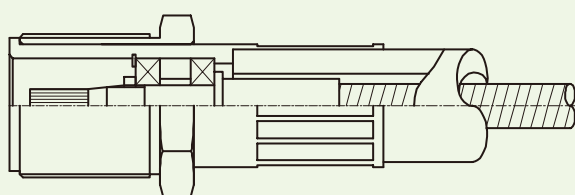
Length.....150mm
Flexible Shaft Model Number

Here are some examples of flexible shaft shapes for reference.
By considering the connection method of the drive side and the driven side, the device can be simplified, reduce costs, be easy to maintain and allow you to design something that has never been designed. Our 70 years of knowledge and know-how, passed onto you.

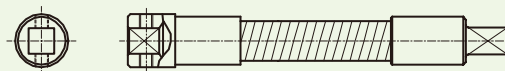
Flexible shafts made according to customer specifications



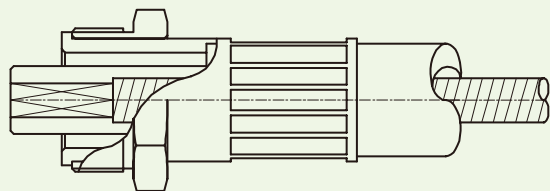
Hexagon Hole / Hexagon Shaft



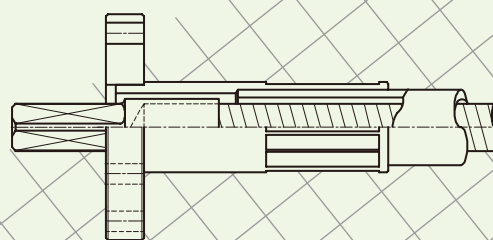
Spline Shaft / Male Nut Type



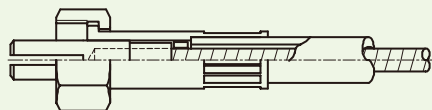
Square Hole / Square Shaft



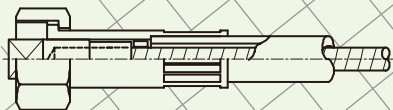
Square Hole / Male Nut Type



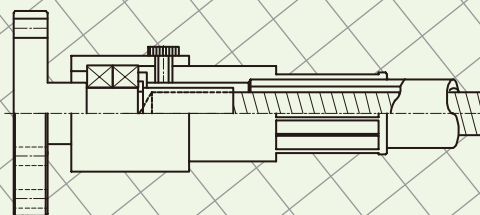
Fixed by Square Shaft / Flange Method



Slit Shaft / Female Nut Type

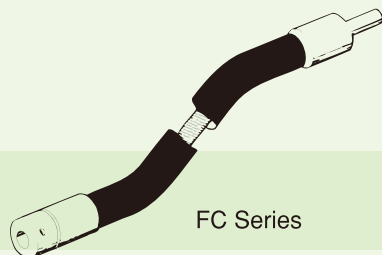


Flat shaft / Female Nut Type

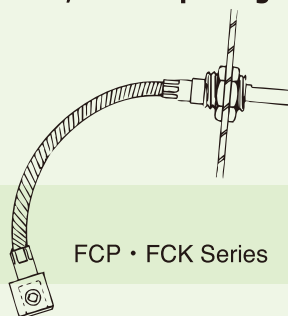


Rotating Flange Type

Main applications: Remote control of variable motor transmission, valve openings and closings, etc.



FC Series



FCP • FCK Series

Necessary elements for selection

(1) Drive Method / Rotation Speed

Please use manually or at 100min⁻¹ or less when driven by a motor

(2) Torque

Torque is an important factor. The unit of torque is displayed in N·m.
Please Confirm the actual torque.

(3) Twist Angle (backlash)

Due to its structure, backlash cannot be reduced to zero. In addition, the twist angle changes depending on the tightening direction (forward) and the loosening direction (reverse). Select by considering the allowable accuracy of the controlled mechanism such as torsion angle coefficient (K₃) x load torque x length and maximum torque, bending radius, etc. for each product number shown in the characteristic table. (Refer to the calculation example). If there is a difference between the clockwise rotation and counter clockwise rotation load torques when using for both rotations, select so that the side with the larger torque is the tightening direction of the flexible shaft.

(4) Length

Please decide on the length you would like. We can manufacture shafts of up to 10m. The longer it is, the more support is needed for the outer tube.

(5) Bending radius

Plan for the largest bend radius possible. If the bend radius is minimal, the torque will decrease, so avoid using outside of the minimum bending radius specifications.

(6) Usage Environment

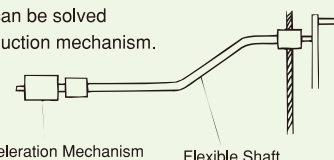
Generally used at room temperature, but it is also possible to change the material and structure to meet the conditions for use in special environments.

(7) Precautions when installing

Since the flexible shaft has its own weight depending on its thickness and length, a load may be applied to the shaft end depending on the mounting condition, and a twisting phenomenon may occur during torque transmission. This can be solved by supporting the outer tube at intervals of 0.5 to 1 m. The support method is relatively flexible as long as the tube does not swing. Please be sure to plan ahead for any peripheral devices.

(8) Other

If the size of the selected flexible shaft is too large after considering backlash and torque, that can be solved by installing a reduction mechanism.



■ Calculation Example

- Transmission Torque (T) = 1N·m
- Length (ℓ) = 1.5m
- Maximum Twist Angle (θ) = 45°
- Bend radius (R) = 300mm
- Twist angle coefficient (K₃)

$$\text{Calculated Twist Angle Coefficient}(K_4) = \frac{\theta}{T \cdot \ell} = \frac{45}{1 \times 1.5} = 30$$

$$\text{Twist angle coefficient}(K_3) = K_4 \times 0.1 = 30 \times 0.1 = 3$$

From K₃ ≤ 3, change the model number of the flexible shaft from Table 10 below ... FC11 type

For the FC11 type

Maximum torque (when the minimum bending radius is 250 mm) 2.94 N·m

As shown above, the product number that satisfies the allowable twist angle and transmission torque ... FC11

■ FC Series Characteristic Table

(Table 10)

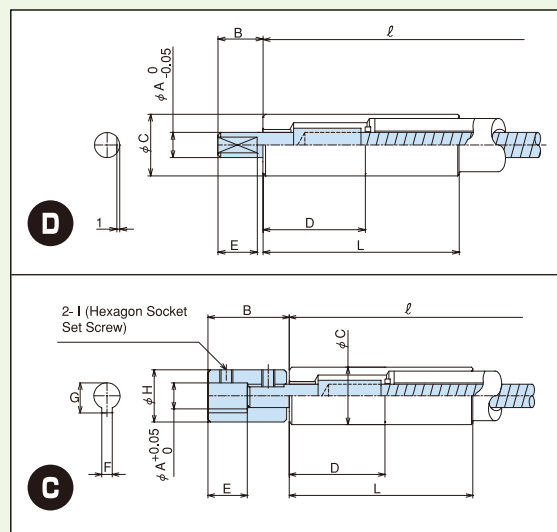
Flexible Shaft Model Number	Twist angle coefficient (K ₃) Top: (degree/0.1N·m·m), Bottom: (degree/kg·cm·m)		Maximum Torque Top : N·m, Bottom : kg·cm		Inner Shaft		Outer Tube		Maximum Bend Radius(mm)
	Tightening Direction	Loosening Direction	When Straight	When at Bending Radius	Diameter(mm)	Weight(kg/m)	Diameter(mm)	Weight(kg/m)	
FC04/FCP04/FCK04	46.92~96.9 46~95	46.92~117.3 46~115	0.39 4	0.2 2	4	0.06	8	0.12	100
FC06/FCP06/FCK06	7.14~13.26 7~13	13.77~16.32 13.5~16	1.47 15	0.78 8	6	0.16	12	0.3	150
FC07	3.92~5.88 4~6	7.84~9.81 8~10	2.25 23	0.98 10	7	0.24	16	0.54	170
FC08	3.57~5.61 3.5~5.5	7.65~8.67 7.5~8.5	2.45 25	1.27 13	8	0.28	19	0.78	175
FC09	2.55~3.67 2.5~3.6	6.32~7.96 6.2~7.8	3.43 35	1.96 20	9	0.36	19	0.68	200
FC11	1.84~2.24 1.8~2.2	2.04~2.65 2.0~2.6	5.39 55	2.94 30	11	0.5	26	1.1	250
FC13	0.71~0.92 0.7~0.9	0.82~1.12 0.8~1.1	6.86 70	3.92 40	13	0.7	33	1.56	300
FC15	0.61~0.71 0.6~0.7	0.82~0.92 0.8~0.9	10.78 110	5.88 60	15	1.1	33	1.56	350
FC18	0.19~0.20 0.19~0.20	0.22~0.30 0.22~0.29	17.64 180	8.82 90	18	1.4	34	1.34	400
FC20	0.13~0.15 0.13~0.15	0.16~0.20 0.16~0.20	21.56 220	11.76 120	20	1.9	40	1.65	450
FC25	0.08~0.12 0.08~0.12	0.14~0.18 0.14~0.18	39.2 400	19.6 200	25	2.8	44	1.76	500

Note: 1) Generally, the value of the torsion angle coefficient is proportional to the increase in load torque.
2) There is not a big difference in the torsion angle coefficient even if the flexible shaft is used in the U shape or the L shape.

End Fitting (the portion colored rotates)

FC Series Dimension Table

(Table 11)



End fitting Type	Bearing	Flexible Shaft Model Number	Dimensions (mm)									
			A	B	C	D	E	F	G	H	I	L
D	Oilless Bearing	FC04	φ 6	11	φ 12	16	8					38
		FC06	φ 6	15	φ 15	52						52
		FC07	φ 8	15	φ 19		10					
		FC08	φ 9	16	φ 22		14					70
		FC09										
		FC11	φ 12	21(18)	φ 30	35	15					85
		FC13	φ 14	23(19)								
		FC15	φ 14	23(19)	φ 40	50	20					95
		FC18	φ 18	29(24)	φ 40	50	30					110
		FC20	φ 18	29(24)	φ 45	60	24					
C	Oilless Bearing	FC25	φ 25	38(32)	φ 45	60	24					38
		FC04	φ 6	21	φ 12	16	10			φ 16	M5	52
		FC06	φ 6	21	φ 15	52						
		FC07	φ 8	29	φ 19		14					70
		FC08	φ 10	31	φ 22		15					
		FC09										
		FC11	φ 12	43	φ 30	35	21			φ 25	M6	85
		FC13	φ 14	44				5	16.3	φ 30		95
		FC15	φ 14	44								
		FC18	φ 18	59	φ 40	50	30	6	20.8	φ 35		110
		FC20	φ 18	59	φ 40	50	30	6	20.8	φ 35		
		FC25	φ 25	74	φ 45	60	36	8	28.3	φ 45		

(Caution) 1. The dimensions in the () indicate the effective length of shaft diameter A

Model Number
Explanation

FC11 C C-2.5 R

※Please refer to page 4 for direction of rotation

RClockwise rotation when load torque is larger than the opposite direction
LCounterclockwise rotation when load torque is larger than the opposite direction

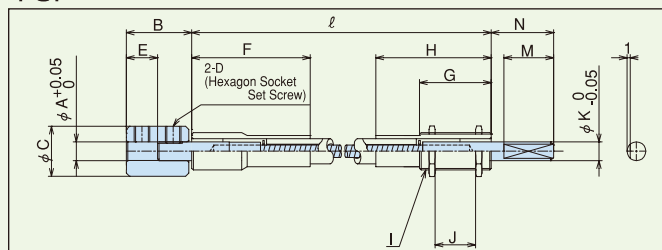
Length..... Measure unit is m
End fitting output format
End fitting input format
Flexible Shaft Model Number

Panel Mounting Type
for Remote Control

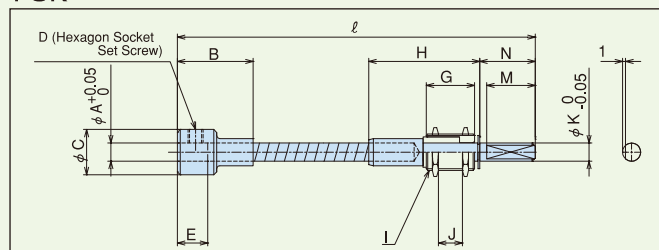
FCP•FCK Series

Main application: Remote control in limited spaces, such as for opening and closing dampers
Refer to Table 10 for transmission torque

FCP



FCK



FCP / FCK Series Dimension Table

(Table 12)

Flexible Shaft Model Number	A	B	C	D	E	F	G	H	I	J	K	M	N	Minimum Bend Radius
FCP 04						38		37	M12X1	Max 13	6	15	20	100
FCP 06	6	20	16	M5	10	52		58	M14X1			16		150
FCK 04	4	20	10	M3	8			Approx. 32	M12X1	Max 8	6	16	18	100
FCK 06	6	25	15	M5	13			Approx. 37						150

Model Number
Explanation

※Please refer to page 4 for direction of rotation

FCK06-150 R

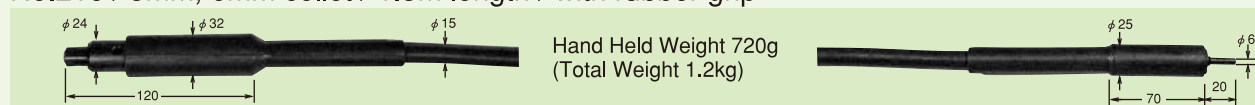
RClockwise rotation when load torque is larger than the opposite direction
LCounterclockwise rotation when load torque is larger than the opposite direction

Length.....Measure unit is mm
Flexible Shaft Model Number

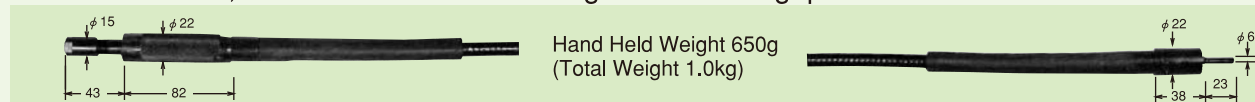
Flexible Shaft Series for Manual Work (representative models are listed)

Main Application: Polishing, Grinding, Deburring by attaching to motors, tabletop drilling machines, etc.

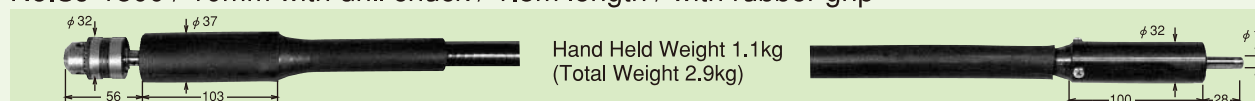
No.216 / 3mm, 6mm collet / 1.3m length / with rubber grip



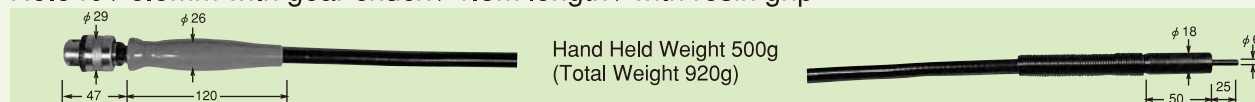
No.CB-20 / 3mm, with 6mm collet / 1.5m length / thin steel grip



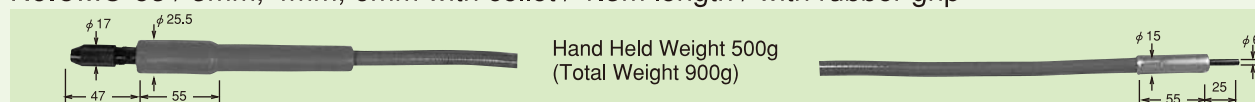
No.SJ-1800 / 10mm with drill chuck / 1.8m length / with rubber grip



No.540 / 6.5mm with gear chuck / 1.3m length / with resin grip



No.CMO-53 / 3mm, 4mm, 6mm with collet / 1.3m length / with rubber grip



Selection Table by Application

(Table 13)

Model Number		Attachable Tool Tip		Appropriate Rotation Speed (min ⁻¹)	Bearing Type	Power Source					Reference
		Shaft Diameter	Maximum Outer Diameter × Thickness mm			Electric Drill	Drill Press	General Purpose Motor	Disk Grinder	Hand Grinder	
High Speed Type	216	3mm, 6mm	Mounted point 32X32	3,600~20,000 (Intermittent Use 23,000)	Ball Bearing				○	◎	●Replaceable Inner Shaft
	CB-20		Mounted point 50X10 Wire Brush 75X10 Buff 75X10 Paper 60X25	1,200~10,000 (Intermittent Use 12,000)		◎	◎	◎	◎		●Replaceable Inner Shaft
Powerful Type	SJ-1800	1.5~10mm	Grinding wheel 150X13 Wire Brush 150X13 Buff 150X13	1,200~5,000 (Intermittent Use 7,000)		○	◎	◎			●Heavy Polishing / Grinding ●Replaceable Inner Shaft
General Work Type	540	1.5~6.5mm	Mounted point 50X10	1,200~3,600	Oilless Bearing	◎	○	○			●Inner Shaft Not Replaceable
	CMO-53	3±0.2mm	Wire Brush 75X10			◎	○	○			
		4±0.2mm 6±0.2mm	Paper 60X25			◎	○	○			

※Special coupling (sold separately) is required to attach to a general-purpose motor, desktop grinder, or disc grinder.

※The length of the standard product is fixed, but it is possible to manufacture desired length.

No.H-027

Electronic circuit that does not reduce torque even at low speeds.

Stepless speed change with volume-like switch.

One-touch tool-free replacement of tool tip.

○ Thin hand-held part (22mm in diameter) and the flexible shaft enables flexible processing.



Flexible Shaft Length: 100cm

Rotary Head (H-035 type) Weight: 85g

Chucking Ability: 0.5~3.2mm

Motor: AC100V / 90W

Rotation Speed 5,000 to 14,000min⁻¹ (rpm)

Continuous variable transmission

Continuous use time: 30 minutes

Dimensions: 145mm (D) × 105mm (W) × 98mm (H)

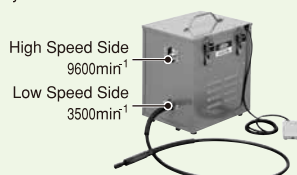
Weight: Approx. 1.3kg

No.201-PM

○ Number of rotations can be taken out in two stages, making it a polishing tool.

○ 3mm and 6mm shaft tools can be attached.

○ Grip made of steel with a diameter of 22mm, making it easy to work with.



Flexible Shaft Length: 1.5m / 6mm, 3mm collet included

Motor: AC100V / 200W

60Hz (9600min⁻¹ / 3500min⁻¹)

50Hz (8000min⁻¹ / 2900min⁻¹)

Foot switch included

Dimensions: 240mm (D) × 300mm (W) × 340mm (H)

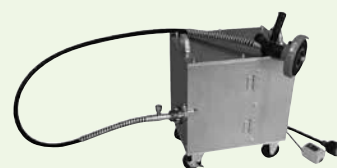
Weight: Approx. 10kg

Flexible Shaft with Motor

Various polishing functions

Variable speed / high speed and powerful.

Manufactured motor based on request.



(Reference Specifications)

Flexible Shaft Length: 3m

Motor: AC200V Three-phase 1.5kw

Rotation Speed 7,000min⁻¹ (Inverter Control)

External ON / OFF switch

Dimensions: 300mm (D) × 440mm (W) × 505mm (H)

Weight: Approx. 45kg

Please contact us for more details

Flexible Shaft Usage Guide

Please input the following information to decide the model number

●For Power Drive Type

- Drive Side Power KW
Rotation Speed min⁻¹
- Transmission Max. kg · cm or N · m
Torque Normal kg · cm or N · m
- Flexible Shaft Rotation min⁻¹
- Flexible Shaft Rotation Direction
- Bend Radius mm
- Length m or mm m or mm
- Environment Temp. °C ~ °C
Conditions
Vacuum
Under Water
Water Droplets / Chemical Scattering
Radiation
Others
- Usage Hr/Day

●For Remote Control Type

- Hand-cranked Powered
Rotation Speed min⁻¹
- Transmission Max. kg · cm or N · m
Torque Normal kg · cm or N · m
- Max Twist Angle
- Length m
- Rotation Direction
- Bend Radius mm
- Environment Temp. °C ~ °C
Conditions
Vacuum
Under Water
Water Droplets / Chemical Scattering
Radiation
Others
- Usage Hr/Day

Schematic Diagram of Installation

Precautions for Mounting

1. Consider mounting with as large a bending radius as possible.

With a small bending radius, the transmission efficiency will decrease, heat will be generated due to friction, and the inner shaft will be damaged, resulting in reduced durability.

2. If the length is short, it may be only possible to install in a straight line depending on the shaft end type.

3. Do not fix the bearing part.

Due to the concentricity, the bearing and the rotating shaft will be damaged by a slight eccentricity between the bearing and the center of the rotating shaft.

When ordering, please specify the model number.

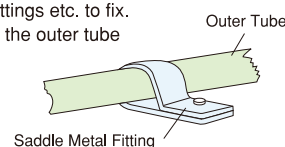
Specification and other information are subject to change without notice.

Please be sure to inquire when ordering.

4. Outer tube support.

Overload, load fluctuations, and long flexible shafts can cause overall twisting (also seen when the flexible shaft is under-selected for the load). In such cases, you can reduce the twist to some extent by fixing the outer tube in several places. Also, please note that if the flexible shaft hangs down due to its own weight, or if it is short, the outer tube may rotate with it. Please use saddle metal fittings etc. to fix.

Be careful not to fix it so tight that the outer tube becomes deformed.



Sumflex Product Group

Rubberized Ceramic Abrasive
(Cerapoint, Ceradisc, etc.)



Tip Tools (Wire Brush, Whetstone etc.)



<https://sumflex.jp/>

SUMFLEX Co.,Ltd.

1-5-11 OIMAZATO,HIGASHINARI-KU,OSAKA,537-0012 JAPAN

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