MIKI PULLEY

NEW

Resonance damping coupling

SERVOFLEX SFR

FLEX series
Servoflex®

MIKI PULLEY

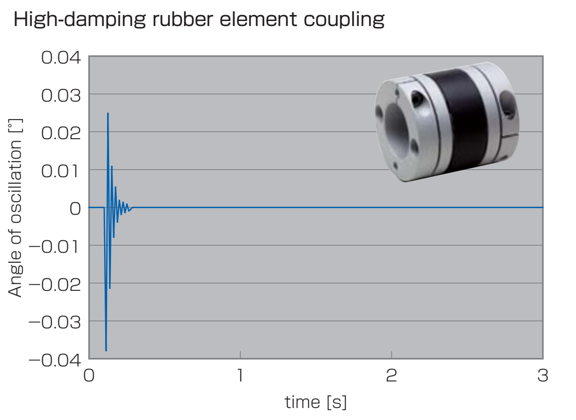
High-damping couplings

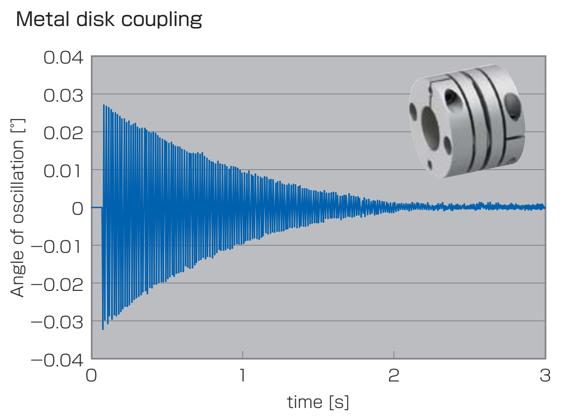
Newly developed rubber element achieves high damping performance. A coupling with high damping performance that can be used for high-speed, high-precision operation of servo motors, etc. No backlash due to frictional power transmission. By adopting HNBR for the element, vibration is quickly damped compared with flexible couplings that use metal elements. This suppresses the resonance phenomenon a concern in the drive system and provides stable high-speed control that can avoid resonance in a wide range of operating speeds.

RoHS

Excellent damping performance

The SERVOFLEX SFR rubber element couplings provide better damping performance than standard metal disc couplings.

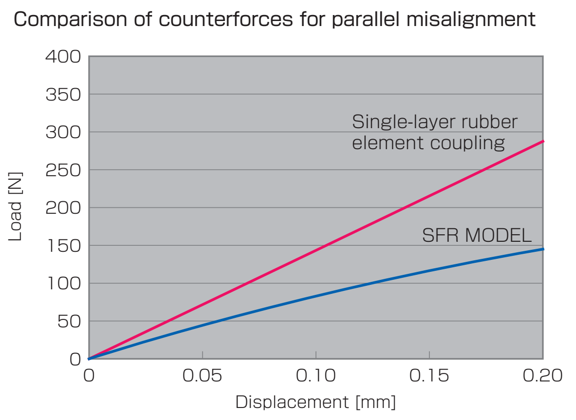


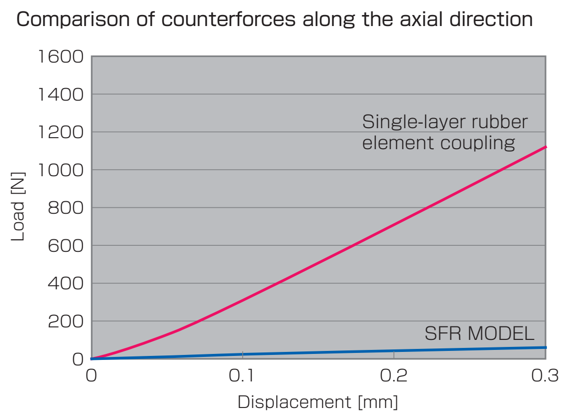


Shaft counterforce is also reduced

* Patent examination pending

Assembly structure with certain gap greatly reduce the reaction force in the eccentric and axial directions.





A wide range of variations and options available

Low inertia by suitable hub shape depends on bore size. You can also select various options.

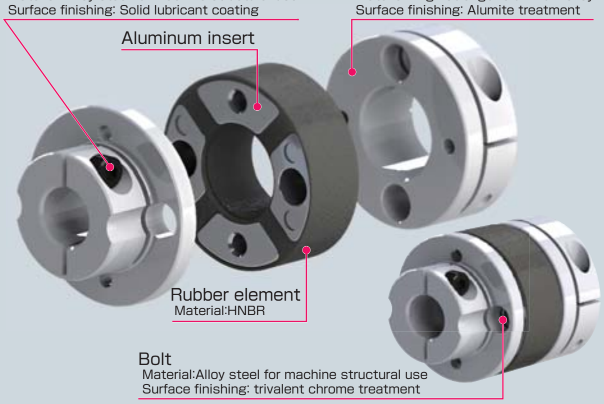
Low inertia contribute high speed operation.

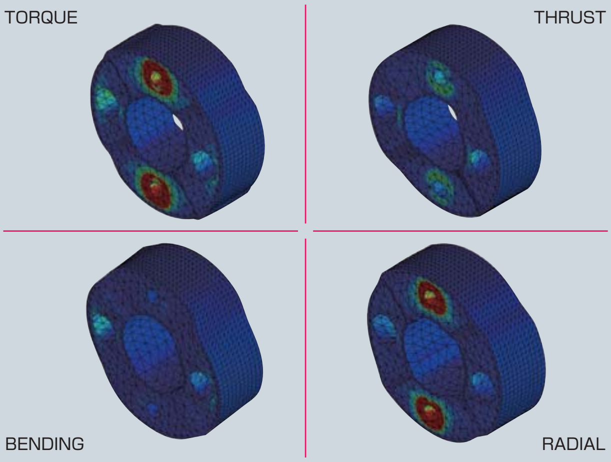
* Types A / B / C are automatically specified by Miki Pulley according to the combination of bore diameters you select, and cannot be specified by the customer.

Three kind of option available.

Integrated element structure of hard rubber and insert

Clamp hub and element is assembled by friction force of tightening bolts. Optimal design with the help of the latest CAE system, FEM (finite element method).





*These measurement results were calculated from actual experiments performed using MIKI PULLEY procedures and are not to be interpreted as guarantees of product performance.

SERVOFLEX SFR

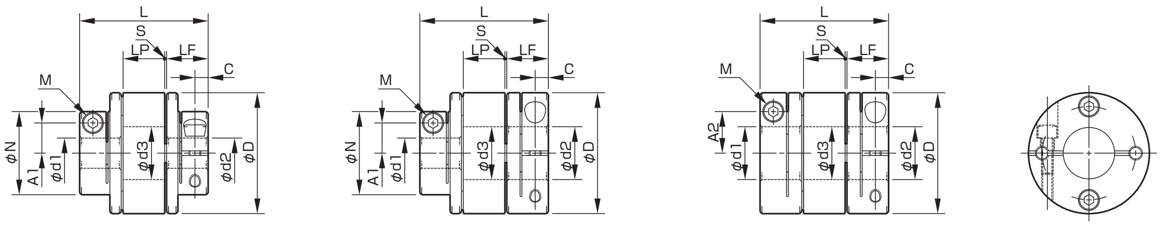
SFR MODEL

Specifications

Model	Shape type	Rated torque [N·m]	Misalignment: Parallel [mm]	Misalignment: Angular [°]	Misalignment: Axial [mm]	Max. rotation speed [min-1]	Torsional stiffness [N·m/rad]	Axial stiffness [N/mm]	Moment of inertia [kg·m2]	Mass [kg]
SFR-030SA1	A	5	0.2	1.5	±0.3	10000	396	413	6.62×10^{-6}	0.048
	B	5	0.2	1.5	±0.3	10000	396	413	8.65×10^{-6}	0.054
	C	5	0.2	1.5	±0.3	10000	396	413	10.76×10^{-6}	0.063
SFR-035SA1	C	10	0.2	1.5	±0.3	10000	607	416	26.98×10^{-6}	0.105
SFR-040SA1	A	12	0.2	1.5	±0.3	10000	1128	605	25.37×10^{-6}	0.103
	B	12	0.2	1.5	±0.3	10000	1128	605	31.96×10^{-6}	0.114
	C	12	0.2	1.5	±0.3	10000	1128	605	38.64×10^{-6}	0.128
SFR-050SA1	A	25	0.2	1.5	±0.3	10000	2775	658	85.36×10^{-6}	0.216
	B	25	0.2	1.5	±0.3	10000	2775	658	105.75×10^{-6}	0.234
	C	25	0.2	1.5	±0.3	10000	2775	658	128.36×10^{-6}	0.263

* Types A / B / C are automatically specified by Miki Pulley according to the combination of bore diameters you select, and cannot be specified by the customer. * Check the standard bore diameter list as rated torque may be restricted by the holding power of the shaft connection component. * Max. rotation speed does not take into account dynamic balance. * Torsional stiffness values are analysis values for the element taken at a temperature of 20℃. * The moment of inertia and mass are measured for the maximum bore diameter.

Dimensions



Shape TYPE A   Shape TYPE B   Shape TYPE C

Model	Shape type	d1 [mm] Min.	d1 [mm] Max.	d2 [mm] Min.	d2 [mm] Max.	D [mm]	N [mm]	L [mm]	LF [mm]	LP [mm]	S [mm]	A1 [mm]	A2 [mm]	C [mm]	d3 [mm]	M Quantity - Nominal dia.	Tightening torque [N·m]
SFR-030SA1	A	5	10	5	10	34	21.6	37.8	12.4	11	1	8	-	3.75	15.5	1-M3	1.5～1.9
	B	5	10	Over10	16	34	21.6	37.8	12.4	11	1	8	12.5	3.75	15.5	1-M3	1.5～1.9
	C	Over10	15	Over10	16	34	-	37.8	12.4	11	1	-	12.5	3.75	15.5	1-M3	1.5～1.9
SFR-035SA1	C	6	18	6	19	39	-	48	15.5	15	1	-	14	4.5	18.5	1-M4	3.4～4.1
SFR-040SA1	A	8	15	8	15	44	29.6	48	15.5	15	1	11	-	4.5	23.5	1-M4	3.4～4.1
	B	8	15	Over15	24	44	29.6	48	15.5	15	1	11	17	4.5	23.5	1-M4	3.4～4.1
	C	Over15	22	Over15	24	44	-	48	15.5	15	1	-	17	4.5	23.5	1-M4	3.4～4.1
SFR-050SA1	A	8	19	8	19	56	38	59.8	20.5	17.4	0.7	14.5	-	6	29.5	1-M5	7.0～8.5
	B	8	19	Over19	30	56	38	59.8	20.5	17.4	0.7	14.5	22	6	29.5	1-M5	7.0～8.5
	C	Over19	28	Over19	30	56	-	59.8	20.5	17.4	0.7	-	22	6	29.5	1-M5	7.0～8.5

* Types A / B / C are automatically specified by Miki Pulley according to the combination of bore diameters you select, and cannot be specified by the customer. * The d3 dimension is the inner diameter of the element. For d2 dimension exceeding this value, shaft can be inserted only up to LF dimension to the d2 side hub. * The nominal diameter for the clamping bolt M is equal to the quantity minus the nominal diameter of the screw threads, where the quantity is for a hub on one side.

Standard bore diameters

Standard (option) bore diameter, d1/d2 [mm] and restricted rated torque [N·m]																								
Nominal bore diameter		5	6	6.35	7	8	9	9.525	10	11	12	13	14	15	16	17	18	19	20	22	24	25	28	30
Shaft tolerance h7 (h6 · g6)	B	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Shaft tolerance j6 (Option)	J																	○		○	○		○	
Shaft tolerance k6 (Option)	K					○	○						○		○			○		○	○			
SFR-030SA1	d1	2.8	3.4	●	●	●	●	●	●	●	●	●	●	●										
	d2	2.8	3.4	●	●	●	●	●	●	●	●	●	●	●	●									
SFR-035SA1	d1		5	5	6.6	●	●	●	●	●	●	●	●	●	●	●	●							
	d2		5	5	6.6	●	●	●	●	●	●	●	●	●	●	●	●	●						
SFR-040SA1	d1					9	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
	d2					9	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
SFR-050SA1	d1					18	20	22	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	d2					18	20	22	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

* The shaft tolerance for standard bore diameter is h7 (h6 or g6): designation B. * Shaft tolerances j6/k6: designations J/K are optional, and are only supported for bore diameters marked with ○ .
* Bore diameters marked with ● or numbers are supported as the standard bore diameters. Consult Miki Pulley regarding special arrangements which may be possible for other bore diameters.
* Bore diameters whose fields contain numbers are restricted in their rated torque by the holding power of the shaft connection component because the bore diameter is small. The numbers indicate the rated torque [N•m].

How to Place an Order

SFR-030SA1-10B-14K

- Size: 030SA1
- Bore diameter d1 (Small diameter): 10
- Bore diameter d2 (Large diameter): 14
- Supported shaft tolerance: B, K
  B : h7(h6,g6)Shaft (Option J : j6Shaft , K : k6Shaft)

* For nominal bore diameter, select d1 (small diameter)-d2 (large diameter) in that order.
* If d1=d2 (same diameters), select B, J, and K in that order.

Option Tapered shaft supported

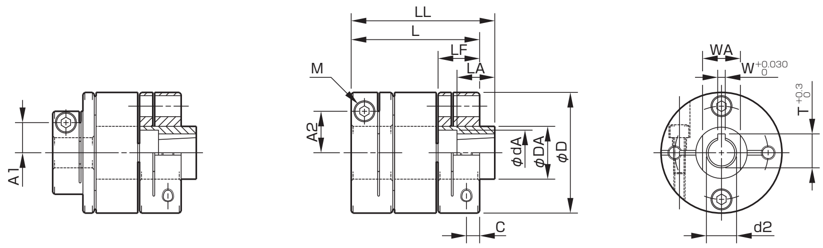
Allows coupling via a clamp hub when a taper adapter is mounted on the tapered shaft of a servo motor.

Specifications

Model	Shape type	Rated torque [N · m]	Misalignment			Max. rotation speed [min⁻¹]	Torsional stiffness [N·m/rad]	Axial stiffness [N/mm]	Moment of inertia [kg·m²]	Mass [kg]
			Parallel [mm]	Angular [°]	Axial [mm]					
SFR-040SA1-□B-11BC	B	12	0.15	1.5	±0.3	10000	1128	605	35.95×10^{-6}	0.162
	C	12	0.15	1.5	±0.3	10000	1128	605	42.24×10^{-6}	0.174
SFR-050SA1-□B-11BC	B	25	0.15	1.5	±0.3	10000	2775	658	111.04×10^{-6}	0.297
	C	25	0.15	1.5	±0.3	10000	2775	658	133.26×10^{-6}	0.325
SFR-050SA1-□B-14BC	B	25	0.15	1.5	±0.3	10000	2775	658	118.21×10^{-6}	0.328
	C	25	0.15	1.5	±0.3	10000	2775	658	141.08×10^{-6}	0.369
SFR-050SA1-□B-16BC	B	25	0.15	1.5	±0.3	10000	2775	658	124.92×10^{-6}	0.366
	C	25	0.15	1.5	±0.3	10000	2775	658	147.53×10^{-6}	0.395

* Types B / C are automatically specified by Miki Pulley according to the bore diameter you select, and cannot be specified by the customer. * Check the "Standard bore diameters" as rated torque may be restricted by the holding power of the shaft connection component. * Max. rotation speed does not take into account dynamic balance. * Torsional stiffness values given are measured values for the element alone. * The moment of inertia and mass are measured for the maximum bore diameter.

Dimensions



Shape TYPE B

Shape TYPE C

Model	d2 [mm]	W [mm]	T [mm]	WA [mm]	LA [mm]	dA [mm]	DA [mm]	LL [mm]	D [mm]	L [mm]	LF [mm]	C [mm]	A1 [mm]	A2 [mm]	M Quantity - Nominal dia.
SFR-040SA1-□B-11BC	11	4	12.2	18	16	17	22	58	44	48	15.5	4.5	11	17	1-M4
SFR-050SA1-□B-11BC	11	4	12.2	18	16	17	22	64.8	56	59.8	20.5	6	14.5	22	1-M5
SFR-050SA1-□B-14BC	14	4	15.1	24	19	22	28	69.8	56	59.8	20.5	6	14.5	22	1-M5
SFR-050SA1-□B-16BC	16	5	17.3	24	29	26	30	79.8	56	59.8	20.5	6	14.5	22	1-M5

* For other dimensions, see dimensions for SFR MODEL

Standard bore diameter

Standard (option) bore diameter, d1 [mm] and restricted rated torque [N · m]																				
Nominal bore diameter		8	9	9.525	10	11	12	13	14	15	16	17	18	19	20	22	24	25	28	30
Shaft tolerance h7(h6,g6)	B	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Shaft tolerance j6(option)	J													○		○	○		○	
Shaft tolerance k6(option)	K	○	○						○		○			○		○	○			
SFR-040SA1-□B-11BC		9	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
SFR-050SA1-□B-11BC		18	20	22	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SFR-050SA1-□B-14BC		18	20	22	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SFR-050SA1-□B-16BC		18	20	22	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

* The shaft tolerance for standard bore diameter is h7 (h6 or g6): designation B. * Shaft tolerances j6/k6: designations J/K are optional, and are only supported for bore diameters marked with ○ .
* Bore diameters marked with ● or numbers are supported as the standard bore diameters. Consult Miki Pulley regarding special arrangements which may be possible for other bore diameters.
* Bore diameters whose fields contain numbers are restricted in their rated torque by the holding power of the shaft connection component because the bore diameter is small. The numbers indicate the rated torque [N•m].

How to Place an Order

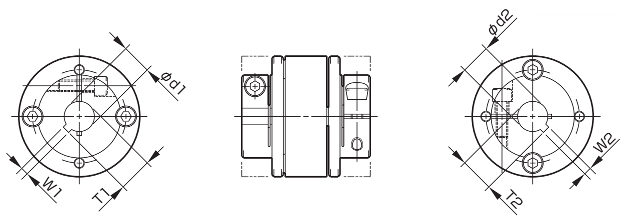
SFR-050SA1-12B-14BC

- Size (050)
- Bore diameter d1 (12)
- Supported shaft tolerance (B)
  B: h7 (h6,g6) , (Option K: k6 , J: j6)
- [d2]BC (14BC)
  BC: Taper adapter *Select d2 for BC.

Option For keyway milling applications

If you are using a keyed shaft, we can mill a keyway in the clamping hub to your specifications.

Keyway milling standard



H9 keyway width standards

Nominal bore dia. Shaft dia.	Shaft tolerance h7	j6	k6	Bore dia. d1·d2 [mm]	Keyway width W1·W2 [mm]	Keyway height T1·T2 [mm]	Nominal bore dia. Shaft dia.	Shaft tolerance h7	j6	k6	Bore dia. d1·d2 [mm]	Keyway width W1·W2 [mm]	Keyway height T1·T2 [mm]
8	BH	-	KH	8	$3^{+0.025}_{0}$	$9.4^{+0.3}_{0}$	17	BH	-	-	17	$5^{+0.030}_{0}$	$19.3^{+0.3}_{0}$
9	BH	-	KH	9	$3^{+0.025}_{0}$	$10.4^{+0.3}_{0}$	18	BH	-	-	18	$6^{+0.030}_{0}$	$20.8^{+0.3}_{0}$
10	BH	-	-	10	$3^{+0.025}_{0}$	$11.4^{+0.3}_{0}$	19	BH	JH	KH	19	$6^{+0.030}_{0}$	$21.8^{+0.3}_{0}$
11	BH	-	-	11	$4^{+0.030}_{0}$	$12.8^{+0.3}_{0}$	20	BH	-	-	20	$6^{+0.030}_{0}$	$22.8^{+0.3}_{0}$
12	BH	-	-	12	$4^{+0.030}_{0}$	$13.8^{+0.3}_{0}$	22	BH	JH	KH	22	$6^{+0.030}_{0}$	$24.8^{+0.3}_{0}$
13	BH	-	-	13	$5^{+0.030}_{0}$	$15.3^{+0.3}_{0}$	24	BH	JH	KH	24	$8^{+0.036}_{0}$	$27.3^{+0.3}_{0}$
14	BH	-	KH	14	$5^{+0.030}_{0}$	$16.3^{+0.3}_{0}$	25	BH	-	-	25	$8^{+0.036}_{0}$	$28.3^{+0.3}_{0}$
15	BH	-	-	15	$5^{+0.030}_{0}$	$17.3^{+0.3}_{0}$	28	BH	JH	-	28	$8^{+0.036}_{0}$	$31.3^{+0.3}_{0}$
16	BH	-	KH	16	$5^{+0.030}_{0}$	$18.3^{+0.3}_{0}$	30	BH	-	-	30	$8^{+0.036}_{0}$	$33.3^{+0.3}_{0}$

JS9 keyway width standards

Nominal bore dia. Shaft dia.	Shaft tolerance h7	j6	k6	Bore dia. d1·d2 [mm]	Keyway width W1·W2 [mm]	Keyway height T1·T2 [mm]	Nominal bore dia. Shaft dia.	Shaft tolerance h7	j6	k6	Bore dia. d1·d2 [mm]	Keyway width W1·W2 [mm]	Keyway height T1·T2 [mm]
8	BJ	-	KJ	8	3 ± 0.0125	$9.4^{+0.3}_{0}$	17	BJ	-	-	17	5 ± 0.0150	$19.3^{+0.3}_{0}$
9	BJ	-	KJ	9	3 ± 0.0125	$10.4^{+0.3}_{0}$	18	BJ	-	-	18	6 ± 0.0150	$20.8^{+0.3}_{0}$
10	BJ	-	-	10	3 ± 0.0125	$11.4^{+0.3}_{0}$	19	BJ	JJ	KJ	19	6 ± 0.0150	$21.8^{+0.3}_{0}$
11	BJ	-	-	11	4 ± 0.0150	$12.8^{+0.3}_{0}$	20	BJ	-	-	20	6 ± 0.0150	$22.8^{+0.3}_{0}$
12	BJ	-	-	12	4 ± 0.0150	$13.8^{+0.3}_{0}$	22	BJ	JJ	KJ	22	6 ± 0.0150	$24.8^{+0.3}_{0}$
13	BJ	-	-	13	5 ± 0.0150	$15.3^{+0.3}_{0}$	24	BJ	JJ	KJ	24	8 ± 0.0180	$27.3^{+0.3}_{0}$
14	BJ	-	KJ	14	5 ± 0.0150	$16.3^{+0.3}_{0}$	25	BJ	-	-	25	8 ± 0.0180	$28.3^{+0.3}_{0}$
15	BJ	-	-	15	5 ± 0.0150	$17.3^{+0.3}_{0}$	28	BJ	JJ	-	28	8 ± 0.0180	$31.3^{+0.3}_{0}$
16	BJ	-	KJ	16	5 ± 0.0150	$18.3^{+0.3}_{0}$	30	BJ	-	-	30	8 ± 0.0180	$33.3^{+0.3}_{0}$

* We can also handle standards not listed above. Consult MIKI PULLEY.

Standard bore diameters

Standard (option) bore diameter, d1/d2 [mm] and restricted rated torque [N·m]

Nominal bore dia.		8	9	10	11	12	13	14	15	16	17	18	19	20	22	24	25	28	30
Shaft tolerance h7 (h6 · g6)	B	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Shaft tolerance j6 (Option)	J												○		○	○		○	
Shaft tolerance k6 (Option)	K	○	○					○		○			○		○	○			
SFR-030SA1	d1	●	●	●	●	●	●	●	●										
	d2	●	●	●	●	●	●	●	●	●									
SFR-035SA1	d1	●	●	●	●	●	●	●	●	●	●	●							
	d2	●	●	●	●	●	●	●	●	●	●	●	●						
SFR-040SA1	d1	9	●	●	●	●	●	●	●	●	●	●	●	●	●				
	d2	9	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
SFR-050SA1	d1	18	20	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	d2	18	20	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

* The shaft tolerance for standard bore diameter is h7 (h6 or g6): designation B. * Shaft tolerances j6/k6: designations J/K are optional, and are only supported for bore diameters marked with ○ .
* Bore diameters marked with ● or numbers are supported as the standard bore diameters. Consult Miki Pulley regarding special arrangements which may be possible for other bore diameters.
* Bore diameters whose fields contain numbers are restricted in their rated torque by the holding power of the shaft connection component because the bore diameter is small. The numbers indicate the rated torque [N•m].

How to Place an Order

SFR-050SA1-12BH-14KJ

- Size (050SA1)
- Bore diameter d1 (Small diameter) (12)
- Affixing method (BH): BH: h7(h6,g6) shaft + H9 keyway
- Bore diameter d2 (Large diameter) (14)
- Affixing method (KJ): KJ: k6 shaft + JS9 keyway

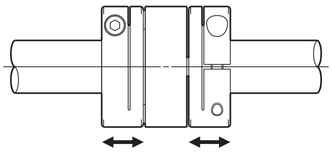
* For nominal bore diameter, select d1 (small diameter) -d2 (large diameter) in that order.
* If d1=d2 (same diameters), select B, J, and K in that order. B · J · K · BH · BJ · JH · JJ · KH · KJ

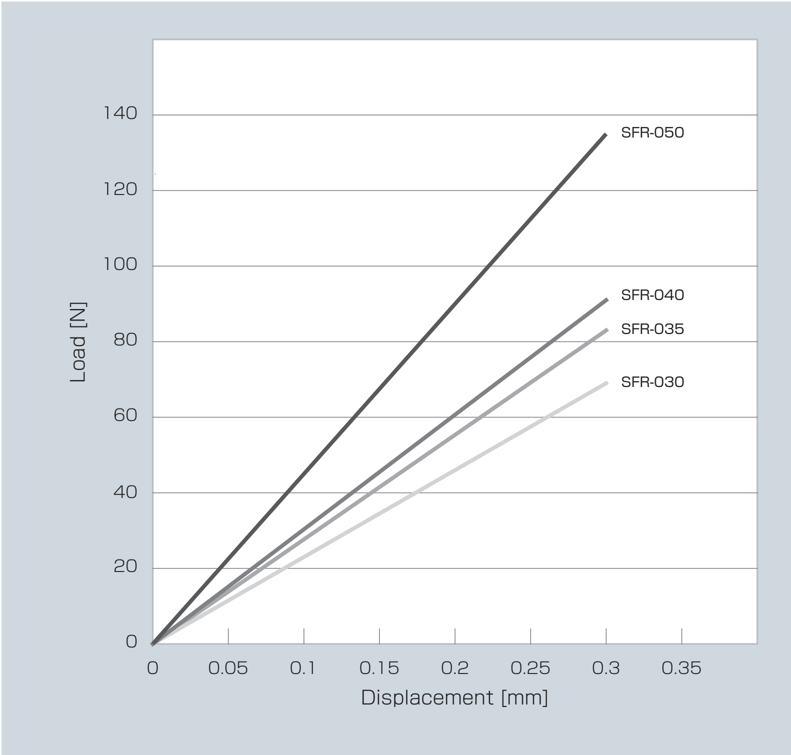
SERVOFLEX SFR

Items Checked for Design Purposes

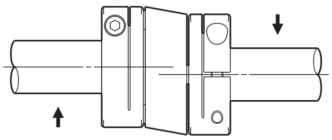
■ Spring characteristics

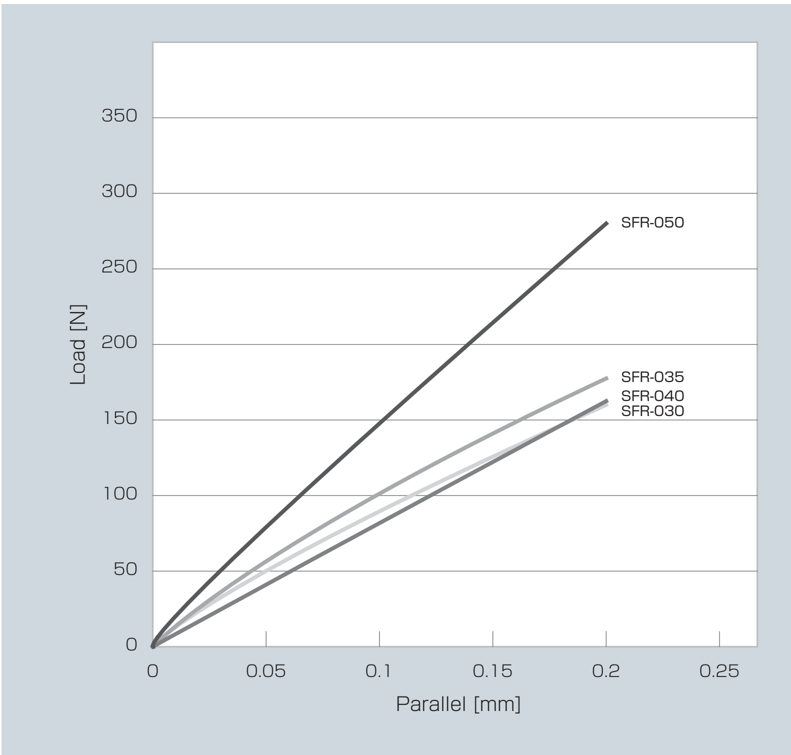
■ Axial load and amount of displacement





■ Parallel misalignment direction load and





Special items to take note of

You should note the following to prevent any problems.

(1) Always be careful of parallel, angular, and axial misalignment.

(2) Always tighten bolts with the specified torque.

Precautions for handling

(1) Couplings are designed for use within an operating temperature from -20℃ to 80℃. Avoid using it under the environment where water, oil, acid, alkali, ozone, chemical agent, etc. are used. Use and storage in direct sunlight may shorten element service life, so cover elements appropriately.

(2) Do not tighten up clamping bolts until after inserting the mounting shaft.

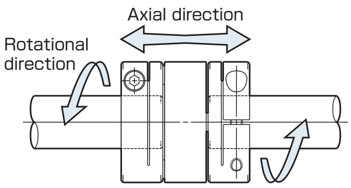
(3) Mounting shaft is assumed to be a round shaft.

Mounting

(1) Check that coupling clamping bolts have been loosened and remove any rust, dust, oil residue, etc. from inner diameter surfaces of the shaft and couplings. In particular, never allow oil or grease containing antifriction or other agent (molybdenum-, silicon-, or fluorine-based), which would dramatically affect the friction coefficient, to contact the surface.

(2) Be careful when inserting the couplings into the shaft so as not to apply excessive force of compression or tensile force to the element. Be particularly careful not to apply excessive compressing force needlessly when inserting couplings into the paired shaft after attaching the couplings to the motor.

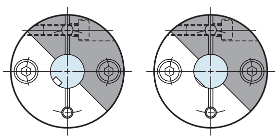
(3) With two of the clamping bolts loosened, make sure that couplings move gently along the axial and rotational directions.



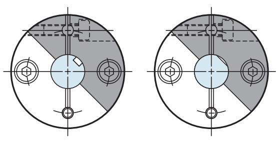
Readjust the centering of the two shafts if the couplings fail to move smoothly enough. This method is recommended as a way to easily check the concentricity of the left and right sides. If unable to use the same method, check the mounting accuracy using machine parts quality control procedures or an alternative method.

(4) As a general rule, round shafts are to be used for the paired mounting shaft. If needing to use a shaft with a different shape, be careful not to insert it into any of the locations indicated in the diagrams below. (Grayed areas ▭ indicate areas wherein clamping hub shifts when clamped. Do not allow keyways, D-shaped cuts, or other insertions in these areas.) Placing the shaft in an undesirable location may cause the couplings to break or lead to a loss in shaft holding power. It is recommended that you use only round shafts to ensure full utilization of the entire range of coupling performance.

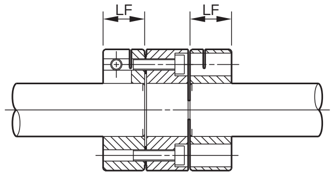
■ Proper mounting examples



■ Poor mounting examples



(5) Insert and mount each shaft far enough in that the paired mounting shaft touches the shaft along the entire length of the clamping hub of the coupling (LF dimension), as shown in the diagram below, and does not interfere with the elements or the other shaft.



Model	LF [mm]
SFR-030	12.4
SFR-035	15.5
SFR-040	15.5
SFR-050	20.5

(6) Check to make sure that no compression or tensile force is being applied along the axial direction before tightening up the two clamping bolts. Use a calibrated torque wrench to tighten the clamping bolts to within the tightening torque range listed below.

Model	Nominal Clamp bolt diameter	Tightening torque [N · m]
SFR-030	M3	1.5 ~ 1.9
SFR-035 · 040	M4	3.4 ~ 4.1
SFR-050	M5	7.0 ~ 8.5

* The start and end numbers for the tightening torque ranges are between the minimum and maximum values. Tighten bolts to a tightening torque within the specified range for the model used.

Suitable torque screwdriver

Nominal Clamp bolt diameter	Torque screwdriver / wrench	Hexagon bit / head
M3	CN200LTDK	SB 2.5mm
M4	CN500LTDK	SB 3mm
M5	N10LTDK	SB 4mm

* Torque driver (wrench) , Hexagon bit (head) models indicated above are the products of NAKAMURA SEISAKUSYO Co., Ltd.

Clamping bolts

Use Miki Pulley-specified clamping bolts because they are processed with solid lubrication films. Applying adhesives to prevent loosening, oil, or the like to a clamping bolt will alter torque coefficients due to those lubricating components, creating excessive axial forces and potentially damaging the clamping bolt or coupling. Be particularly careful to never use liquid anaerobic screw fixatives, as they have adverse effects on the rubber body.

Surface processing of coupling bore diameter

The bore diameters may or may not have surface processing in some components due to the circumstances of processing. This does not affect coupling performance. Consult Miki Pulley if your usage conditions require that bore diameters be surface processed or not.

SERVOFLEX SFR

Items Checked for Design Purposes

Options for keyway milling

Options for keyway milling are available on request. However, because they are designed such that torque is tranferred to the friction coupling by the clamp mechanism, care should be taken not to exceed the coupling's permitted torque during use. Note also the following issues:

(1) Only ever use keys that are no wider than the keyway. Using keys that are a tight fit could results in damage during mounting or operation.

(2) The positional accuracy of keyway milling is visual. If positional accuracy relative to keyway hubs is required, contact Miki Pulley.

(3) Using JS9 class tolerances provides a tight fit, so couplings may be compressed when mounted on shafts. Take care not to further compress the couplings.

(4) Setting the fit of the key and keyway too loosely may result in play that generates dust. Also take care that the key does not come loose.

(5) Adding a set screw over the keyway is not recommended as it may lower clamp performance, and the set screw may also become loose within the torque range you use or during forward/reverse operation. It may also impair the structural strength of the clamping hub or damage the coupling.

Selection order of nominal bore diameters when ordering

When specifying bore diameters, you should basically specify d1 (small diameter)-d2 (large diameter), and always specify d2 for taper adapters mounted on tapered shafts. However, where d1=d2 (same diameters), note the selection order below for each nominal bore diameter when ordering.

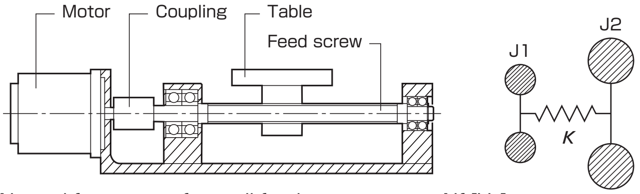
Nominal bore diameter symbol	Shaft tolerance	Keyway tolerance	Type	Selection diameter	Selection order
B	h7 (h6,g6)	-	Standerd	d1/d2	1
J	j6	-	Option	d1/d2	2
K	k6	-	Option	d1/d2	3
BH	h7 (h6,g6)	H9	Option	d1/d2	4
BJ	h7 (h6,g6)	JS9	Option	d1/d2	5
JH	j6	H9	Option	d1/d2	6
JJ	j6	JS9	Option	d1/d2	7
KH	k6	H9	Option	d1/d2	8
KJ	k6	JS9	Option	d1/d2	9
BC	Tapered shaft supported		Option	d2	10

Points to consider regarding the feed screw system

In feed screw systems using a stepper motor or servo motor, the pulsation natural frequency of the stepper motor and the torsional natural frequency of the system as a whole may cause the system to resonate, or the gain adjustment of the servo motor may cause the system to oscillate.
If resonance occurs, the resonant rotation speed must be skipped, or if oscillation occurs, adjustment will need to be made such as by using the filter function or other electrical control system to resolve the issue.
In either instance, to handle resonance and oscillation, it will be necessary to take into account the torsional natural frequency for the system overall during the design stage, including the torsional stiffness for the coupling and feed screw section and the moment of inertia and other characteristics.

How to find the natural frequency of a feed screw system

Select a coupling based on the standard torque or maximum torque of the servo motor.
Next, find the overall natural frequency, Nf, from the torsional stiffness of the coupling and feed screw, κ , the moment of inertia of driving side, J1, and the moment of inertia of driven side, J2, for the feed screw system shown below.



Natural frequency of overall feed screw system Nf [Hz]

$$Nf = \frac{1}{2\pi}\sqrt{K\left(\frac{1}{J1}+\frac{1}{J2}\right)}$$

K : Torsional stiffness of the coupling and feed screw [N・m/rad]
J1 : Moment of inertia of driving side [kg・m²]
J2 : Moment of inertia of driven side [kg・m²]

Torsional spring constant of coupling and feed screw K [N・m/rad]

$$\frac{1}{K} = \frac{1}{Kc} + \frac{1}{Kb}$$

Kc : Torsional spring constant of coupling [kg・m²]
Kb : Torsional spring constant of feed screw [kg・m²]

Driving moment of inertia J1 [kg・m²]

$$J1 = Jm + \frac{Jc}{2}$$

Jm : Moment of inertia of servomotor [kg・m²]
Jc : Moment of inertia of coupling [kg・m²]

Driven moment of inertia J2 [kg・m²]

$$J2 = Jb + Jt + \frac{Jc}{2}$$

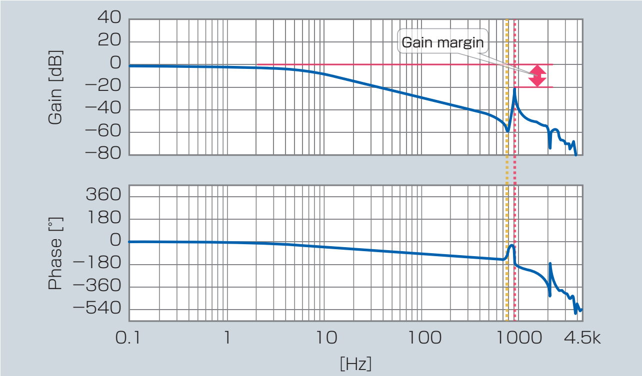
Jb : Moment of inertia of feedscrew [kg・m²]
Jt : Moment of inertia of table [kg・m²]
Jc : Moment of inertia of coupling [kg・m²]

Moment of inertia of table Jt [kg・m²]

$$Jt = \frac{M \times P^2}{4\pi^2}$$

M : Mass of table [kg]
P : Lead of feed screw [m]

Since it is easier for oscillation to occur when the gain margin with natural frequency is 10 dB or lower, it is necessary for the natural frequency to be set high with a therefore higher gain margin at the design stage, or to adjust the natural frequency using the servomotor's electric tuning function (filter function) so as to avoid oscillation.



Selection

(1) Find the torque, Ta, applied to the coupling using the output capacity, P, of the driver and the usage rotation speed, n.

$$T_a\,[\mathrm{N\cdot m}] = 9550 \times \frac{P\,[\mathrm{kW}]}{n\,[\mathrm{min}^{-1}]}$$

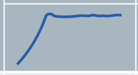
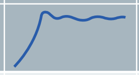
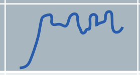
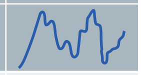
(2) Determine the service factor K from the usage and operating conditions, and find the corrected torque, Td, applied to the coupling.

$$T_d\,[\mathrm{N\cdot m}] = T_a\,[\mathrm{N\cdot m}] \times K1 \times K2 \times K3 \times K4$$

(3) The rated torque of the coupling may be limited by the bore diameter of the coupling. See the Specifications and Standard Bore Diameters tables.

(4) When the required shaft diameter exceeds the maximum bore diameter of the selected size, select a suitable coupling. When using a clamping hub, the bore diameter may restrict the transmission torque. For that reason, check that the clamping-hub shaft holding force of the selected coupling size is at least equal to the peak torque, Ts, applied to the coupling.

■ Service factor based on load property: K1

Load properties	Constant	Vibration : Small	Vibration : Medium	Vibration : Large
				
K1	1.0	1.25	1.75	2.25

■ Service factor based on operating time: K2

Hrs./day	to 8	to 16	to 24
K2	1.0	1.12	1.25

■ Service factor based on starting/braking frequency: K3

Times/min.	to 60	to 120	to 360	Over 360
K3	1.0	1.3	1.5	*

* Please consult MIKI PULLEY for assistance with items marked with [*].

■ Service factor based on operating temperature: K4

Temp. [℃]	−20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80
K4	1.0	1.1	1.2	1.4	1.6	1.8

Easy selection chart

Select a coupling size based on the rated output and the rated/maximum torque of the ordinary servo motor. The torque characteristics of servo motors vary between manufacturers, so check the specifications in the manufacturer catalog before finalizing a coupling size selection.

Servo motor specifications					Corresponding coupling specifications			
Rated output [W or kW]	Rated rotation speed [min^{-1}]	Rated torque [N·m]	Max. torque [N·m]	Shaft dia. [mm]	Model	Rated torque [N·m]	Max. bore dia. [mm]	Outer dia. [mm]
300W	3000～6000	0.95	3.72	14	SFR-030SA1	5	16	34
400W	3000～6000	1.3	5	14	SFR-035SA1	10	19	39
450W	1500	2.86	8.92	19	SFR-040SA1	12	24	44
500W	2000	2.4	7.2	24	SFR-040SA1	12	24	44
600W	3000～6000	1.91	5.73	19	SFR-035SA1	10	19	39
750W	3000～6000	2.387	9	19	SFR-040SA1	12	24	44
750W	2000	3.6	10.7	22	SFR-050SA1	25	30	56
850W	1500	5.39	13.8	19	SFR-050SA1	25	30	56
1kW	3000～6000	3.18	12.5	24	SFR-050SA1	25	30	56
1kW	2000	5	16.6	24	SFR-050SA1	25	30	56

World Wide Network

PARTNERS

- CENTA ANTRIEBE KIRSCHEY GmbH
- SCHMIDT-KUPPLUNG GmbH
- ETP TRANSMISSION AB.
- CENTA CORPORATION
- KENDRION INTORQ GmbH & Co. KG
- MOTOVARIO S. p. A.
- BAMATEC AG
- HELICAL PRODUCTS COMPANY, INC.
- MASCHINENFABRIK MOENNINGHOFF GmbH & CO KG
- CENTA TRANSMISSIONS FAR EAST PTE., LTD.
- ROSTA AG
- LOVEJOY, INC.

GROUP COMPANIES

- MIKI PULLEY (TIANJIN) CO., LTD.
- VERBINDUNGS-, MESS- UND ANTRIEBSTECHNIK GmbH
- MIKI PULLEY (KOREA) CO., LTD.
- MIKI PULLEY (THAI) CO., LTD.
- MIKI PULLEY (TIANJIN) CO., LTD. SHANGHAI BRANCH
- MIKI PULLEY (HONG KONG) CO., LTD.
- MIKI PULLEY (EUROPE) AG
- ZERO-MAX, INC.
- ZERO-MAX A/S
- MIKI PULLEY (INDIA) PVT. LTD.
- MIKI PULLEY (TAIWAN) CO., LTD.

DISTRIBUTORS

- NAISMITH ENGINEERING & MANUFACTURING CO. PTY. LTD.
- KAISHIN INDUSTRIA E COMERCIO LTDA.
- TIANJIN ACE PILLAR CO., LTD.
- ON GEAR E & M PRODUCTS LTD.
- NUTRON SYSTEM
- PT. HIMALAYA EVEREST JAYA.
- SING HUAT HARDWARE & MACHINERY(M) SDN BHD
- ELECTRO DRIVES AS
- RF PORTUGAL - ROLAMENTOS E COMPONENTES, LDA.
- SING HUAT HARDWARE & MACHINERY PTE. LTD.
- ACE PILLAR CO., LTD.
- ABSSAC LTD.
- R. R. FISHER & CO., LTD.
- NANJING ANSEN M & E EQUIPMENT CO., LTD.
- COROLL s.r.o.
- RK INDUSTRIAL AUTOMATION PRODUCTS.
- SVP TECHNO ENGINEERS PVT. LTD.,
- DOR DRIVE SYSTEM JAYA.
- AMMERTECH B. V.
- LEELENG COMMERCIAL, INC.
- PARCON FREIWALD
- RODAMIENTOS FEYC S.A.
- NAM SAE INTERNATIONAL TRADING CO., LTD.
- SMS MACHINES & AUTOMATION LTD.
- HA-CO GmbH
- SHANGHAI HUITONG AUTOMATIC TECHNOLOGY DEVELOPMENT CO., LTD.
- PRUD' HOMME TRANSMISSIONS
- PHEONIX ENGINEERING
- PD. CENTRAL TEHNIK
- BIANCHI INDUSTRIAL S. p. A. A SOCIO UNICO
- R. R. FISHER & CO., LTD.
- ADMECH
- ELSHIN INTERNATIONAL PTE. LTD.
- HAUDENSCHILD AG
- POLYMAK MUHENDISLIK-AHMET COMAK

MIKI PULLEY CO., LTD.
10-41 Imaiminami-cho, Nakahara-ku, Kawasaki-shi, Kanagawa-ken, 211-8577, JAPAN
https://www.mikipulley.co.jp/

'23.06-**-MP-SFR(en)-001A-J001