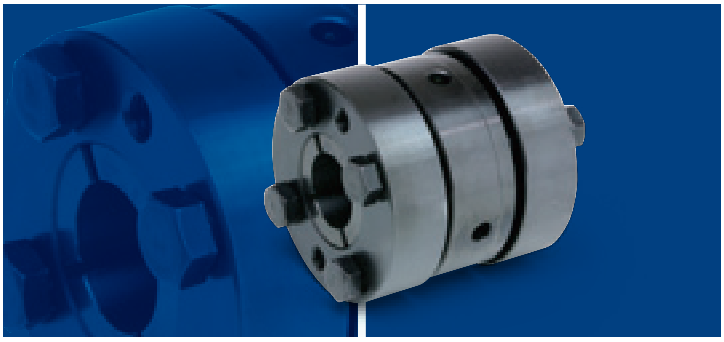
High-rigidity Couplings
SERVORIGID

Ultra-high stiffness | Low inertia | No backlash

Max. rated torque [N·m]	490
Bore ranges [mm]	ϕ16～48
Operating temperature [℃]	−30～120
Drive	Servo motor
Applications	Machine tools

Rigid Couplings with Ultra-high Torsional Stiffness

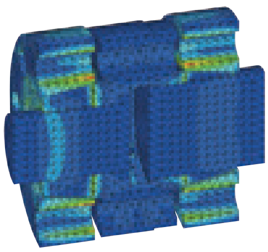


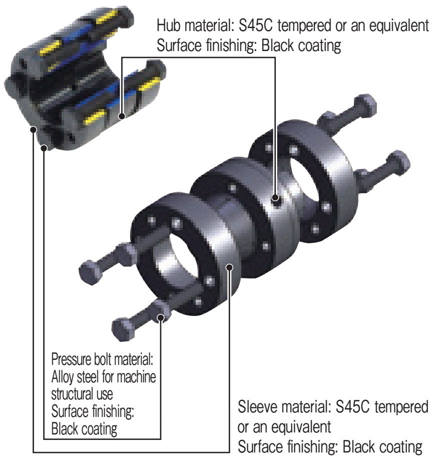
Rigid couplings with ultra-high torsional stiffness that were developed for servo motor applications. Unlike flexible couplings, they have no element to absorb differences between the centers of two shafts, so they have very high torsional stiffness. Since the outer diameter relative to torque can be reduced compared to flexible couplings, smaller couplings can be used, which helps reduce the moment of inertia.

RoHS

Structure and Materials

Modeling uses the latest CAE Systems and 3D-CAD. Shape and hardness was calculated using the support of the latest finite element method (FEM) analysis software for optimal designs.





Customization Examples

Through-bolt Construction

By using a through-bolt construction for the sleeve and hub on one side, the drive shaft and driven shaft can be engaged simply by tightening the pressure bolt on one side.

Taper Adapter

Allows coupling via friction when an optional taper adapter is mounted on the tapered shaft of a servo motor.

Clamp Type

A clamp-type high-rigidity coupling can also be manufactured.

*Couplings will be specially designed for the customer after meeting and consultation. Contact Miki Pulley for details.

SRG Models

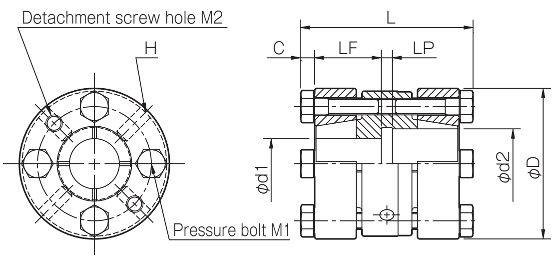
Specifications

Model	d1・d2 [mm]		Rated torque [N·m] compared to the standard bore diameters, d1 and d2 [mm]																		Max. rotation speed [min⁻¹]	Torsional stiffness [N·m/rad]	Moment of inertia [kg·m²]	Mass [kg]
	Min.	Max.	16	17	18	19	20	22	24	25	28	30	32	35	36	38	40	42	45	48				
SRG-050DS	16	22	90	100	110	120	130	140													15000	60000	0.16×10^{-3}	0.45
SRG-060DS	18	25			80	100	110	145	180	190											13000	115000	0.29×10^{-3}	0.67
SRG-070DS	22	35						150	200	220	290	340	390	460							12000	340000	0.55×10^{-3}	0.85
SRG-080DS	30	48										180	220	270	290	320	360	390	440	490	9500	1335000	1.21×10^{-3}	1.17

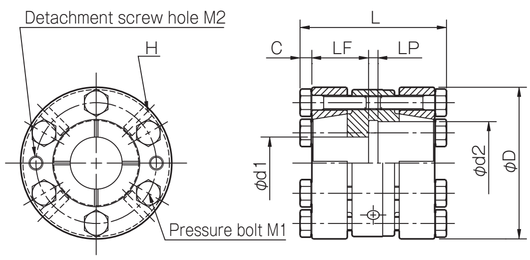
* The shaft coupling employs friction, so rated torque is determined by bore diameter. The rated torque of the side with the smallest diameter serves as the rated torque of the coupling.
* Max. rotation speed does not take into account dynamic balance.
* The torsional stiffness, moment of inertia, and mass are measured for the maximum bore diameter.

Dimensions

SRG-050, 060



SRG-070, 080

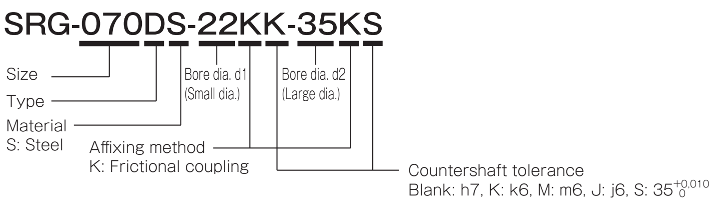


Unit [mm]

Model	Standard bore diameter d1, d2	D	L	LF	LP	C	H	M1	M2
SRG-050DS	16・17・18・19・20・22	48	52.8	20	4	4.4	4-5.1	4-M6	2-M6
SRG-060DS	18・19・20・22・24・25	54	62	24	4	5	4-5.1	4-M6	2-M6
SRG-070DS	22・24・25・28・30・32・35	64	62	24	4	5	4-5.1	6-M6	2-M6
SRG-080DS	30・32・35・36・38・40・42・45・48	78	63	25.5	4	4	4-5.1	6-M6	2-M6

* The nominal diameters of the pressure bolt M1 and detachment screw hole M2 are equal to the quantity minus the nominal diameter of the screw threads. Quantities are for a single side.

How to Place an Order



SRG Models

Items Checked for Design Purposes

Precautions for Handling

SERVORIGID SRG model is, as the name suggests, a high-rigidity coupling with no element to absorb differences between the centers of two shafts. For that reason, when mounting, the two shafts must be carefully centered. Please keep that in mind and take extra precautions when handling.

(1) Couplings are designed for use within an operating temperature from -30℃ to 120℃ . Although the couplings are designed to be waterproof and oilproof, do not subject them to excessive amounts of water and oil as it may cause part deterioration.

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

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

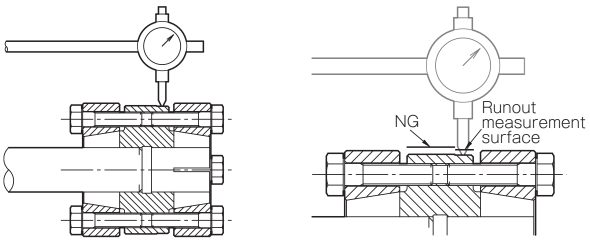
Mounting

(1) Check that coupling pressure bolts have been loosened and remove any rust, dust, oil residue, etc. from the 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 Insert each shaft for a length listed in the table below measured from the sleeve edge. However, be sure that mounting shafts do not come into contact with each other.

Coupling size	050	060	070	080
Insert length of shaft [mm]	20 or more	24 or more	24 or more	25.5 or more

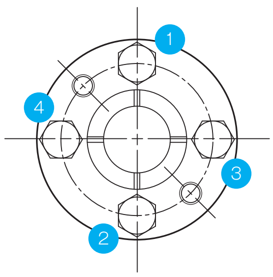
(3) After deciding the place to insert, hold a dial gauge against the outer diameter uneven surface of coupling as shown below.



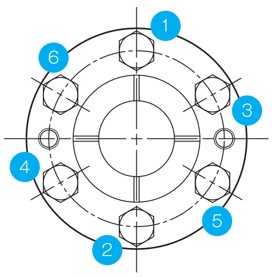
(4) Gently rotate the motor shaft manually and tighten the pressure bolt by adjusting it to make sure the value of dial gauge is zero.

Tighten the pressure bolts evenly, a little at a time, on the diagonal, guided by the tightening procedure of the figure below. However, there is sometimes no need to follow the procedure, depending on the value of dial gauge.

■ SRG-050・060



■ SRG-070・080



(5) Finally, use a calibrated torque wrench to tighten all the pressure bolts to the appropriate tightening torques of the table below, make sure that there is no bolts loosened and that the runout is small (the value almost near to zero), and tighten the driven shaft using the same procedure.

Coupling size	050	060	070	080
Pressure bolt size	M6	M6	M6	M6
Tightening torque [N·m]	14	14	14	14

■ Suitable Torque Wrench

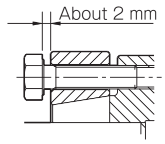
Torque wrench (Single-function)	Wrench attachment
N25SPCK × 14N・m	25SCK 10mm

(6)To protect against initial loosening of the pressure bolts, we recommend operating for a set period of time and then retightening to the appropriate tightening torque.

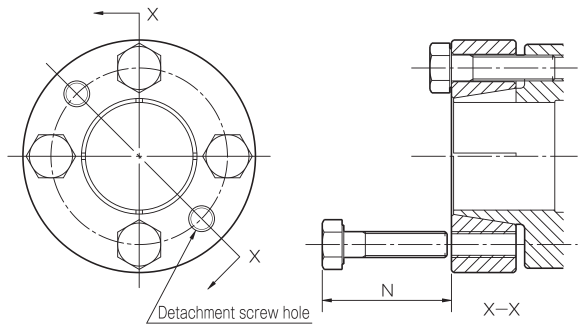
Removal

(1) Be sure to check that the main power of the equipment is off before removing to avoid incorrect operation of the drive. Take extra precautions if any of the components are damaged as it may be sharpened.

(2) Loosen all the pressure bolts placing pressure on the sleeve until the gap between bearing seat and sleeve is about 2 mm.



In the case of a tapered coupling system that tightens a pressure bolt from the axial direction, the sleeve will be self-locking, so the coupling between flange and shaft cannot be released simply by loosening the pressure bolt. (Note that in some cases, a coupling can be released by loosening a pressure bolt.)
For that reason, when designing devices, a space must be installed for inserting a detachment screw.



Coupling size	050	060	070	080
Nominal diameter of pressure bolt × Length	M6 × 20	M6 × 24	M6 × 24	M6 × 25
RecommendedN dimension [mm]	26	30	30	31.5

(3) Insert the bolt into detachment screw holes and tighten them alternately. The coupling will be released. It is recommended to use the bolt whose dimension is same as that of pressure bolt.

Note that if the bolt is too short, couplings may no be able to release.

Points to Consider Regarding the Feed Screw System

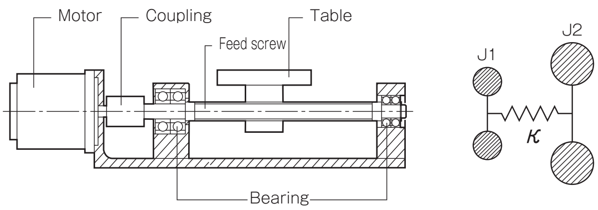
Gain adjustment in feed screw systems using a servo motor may cause the servo motor to oscillate. If oscillation occurs, adjustment will need to be made such as by using the filter function or other electrical control system to resolve this issue.

To handle issues such as 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. Please contact Miki Pulley with any questions regarding servo motor oscillation.

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]

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

κ : 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 κ [N·m/rad]

$$\frac{1}{\kappa}=\frac{1}{\kappa c}+\frac{1}{\kappa b}$$

κ c: Torsional spring constant of coupling [N·m/rad]
κ b: Torsional spring constant of feed screw [N·m/rad]

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]

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

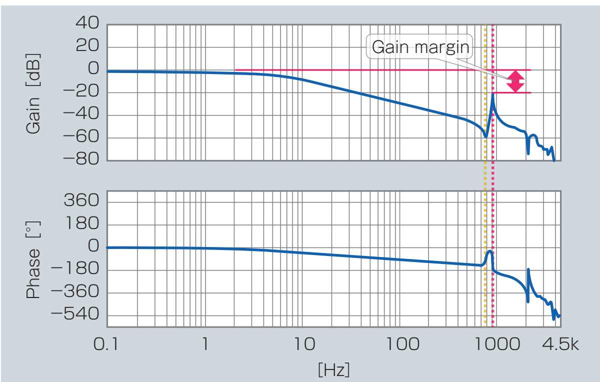
Jb: Moment of inertia of feedscrew [kg·m²]
Jt: Moment of inertia of table [kg·m²]
Jc: Moment of inertia of coupling [kg·m²]

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.



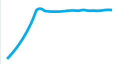
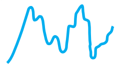
Selection Procedures

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

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

(2) Determine the factor κ from the load properties, and find the corrected torque, Td, applied to the coupling.

Td = Ta × K (Refer to the table below for values)

Load properties	Constant	Vibrations: Small	Vibrations: Medium	Vibrations: Large
				
K	1.0	1.25	1.75	2.25

■ Service factor based on operating time: K2

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

For servo motor drive, multiply the maximum torque, Ts, by the usage factor K = 1.2 to 1.5.

Td = Ts × (1.2 to 1.5)

(3) Set the size so that the rated coupling torque, Tn, is higher than the corrected torque, Td.

$$Tn \geqq Td$$

(4) Check that the mount shaft is no larger than the maximum bore diameter of the coupling.

Contact Miki Pulley for assistance with any device experiencing extreme periodic vibrations.