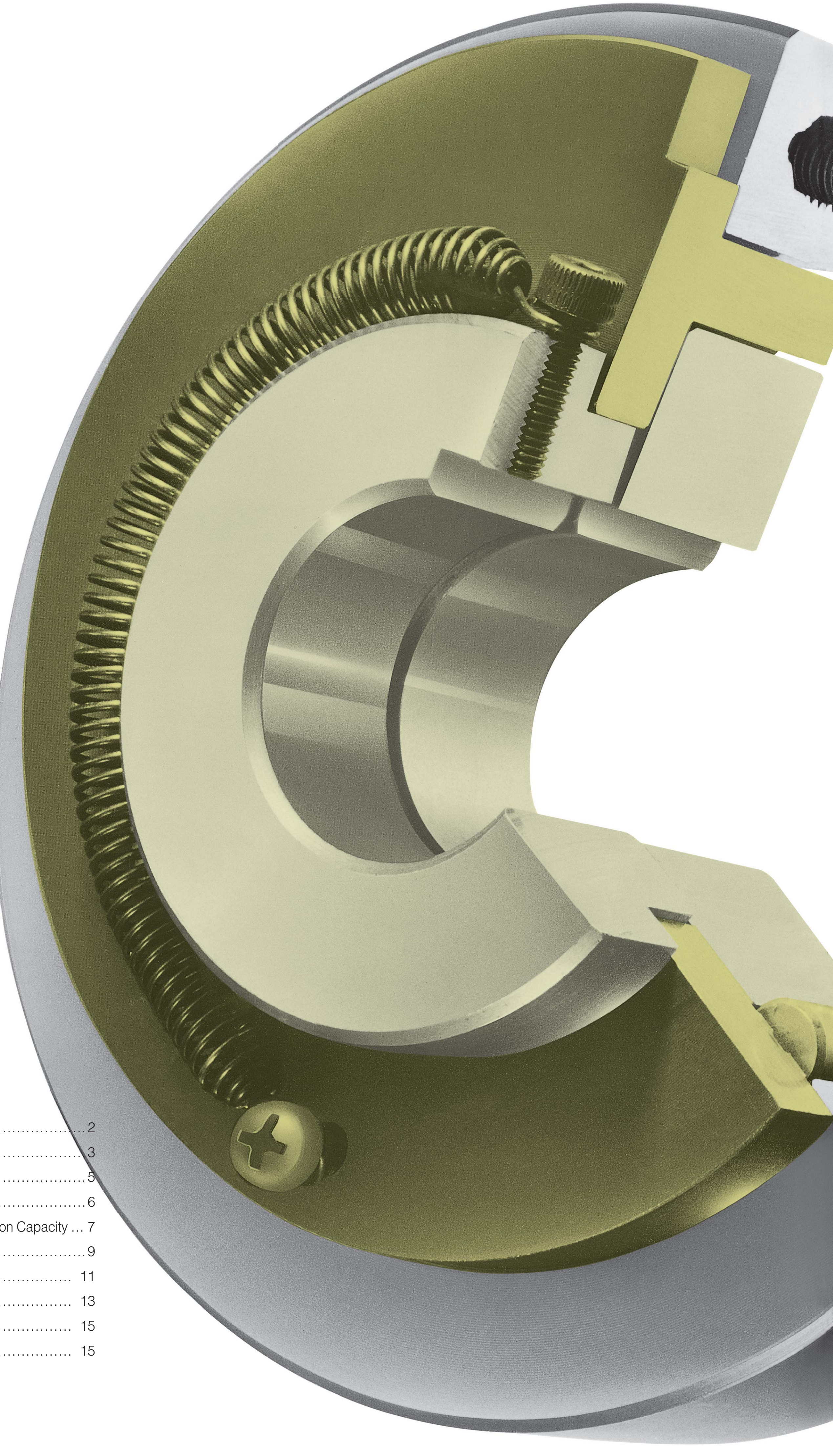
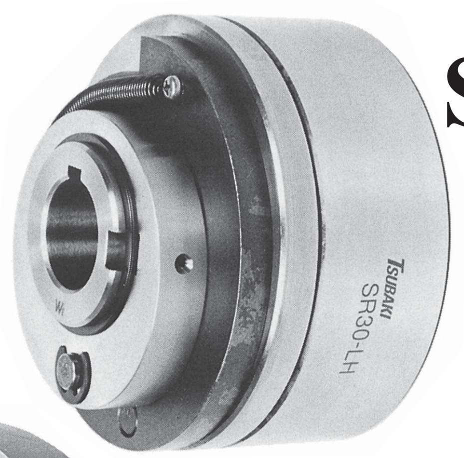
Tsubaki
SR Clutches
Single-Revolution Clutch



Contents

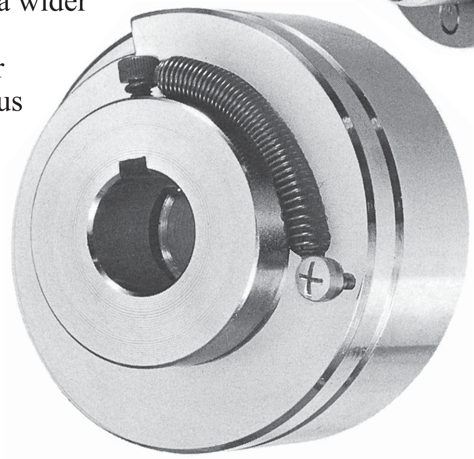
Tsubaki SR Clutches allow for accurately timed operations.

The SR Clutch is lever-operated to impart one turn or an integral number of turns from the continually rotating outer race (drive) to the inner race (load). Because the inner and outer races are designed to engage, the clutch transmits highly reliable and accurately timed drive motions not possible with clutches based on friction mechanisms, ratchet mechanisms, or pin and key mechanisms. We have expanded the SR Clutches and their superior functionality into a series based on different applications, allowing them to be used in a wider range of applications.
Use Tsubaki SR Clutches for intermittent feeding of various automatic machines.



SR Series
(Indirect type)

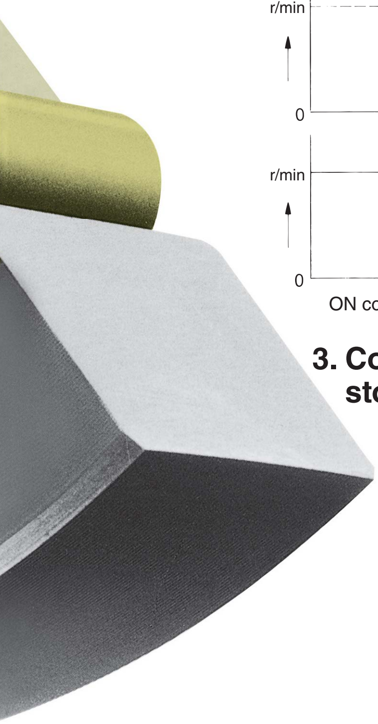
Compatible with a broad range of operating conditions.



SRD Series (Direct type)

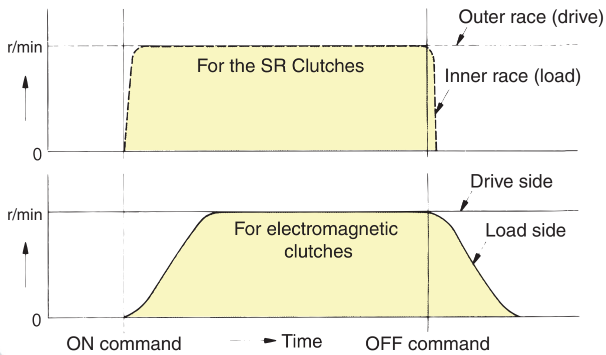
Economical model suitable for loads that have a flywheel effect, such as small power presses.

Features



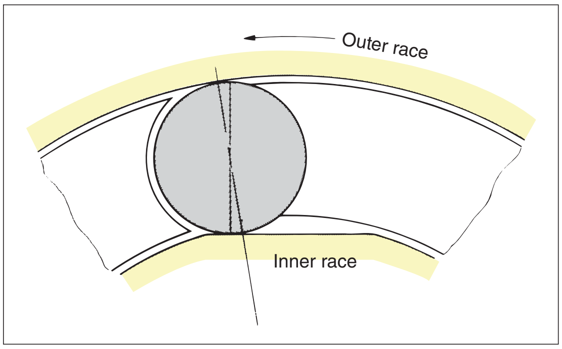
1. Excellent responsiveness

The inner surface of the outer race (drive) is perfectly cylindrical, which allows it to instantly engage or disengage with the inner race via a lever that provides the ON or OFF command. The structure allows it to be highly responsive.



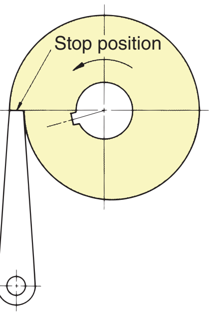
2. Secure engagement

When the rollers between the outer and inner races engage, the contact point creates a wedge shape that prevents slippage.



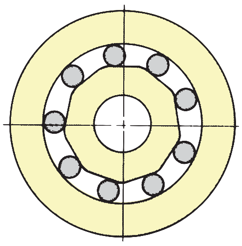
3. Consistent stopping position

The OFF (disengaged) position is always consistent, preventing errors to accumulate at the stop position.



4. Exceptional durability

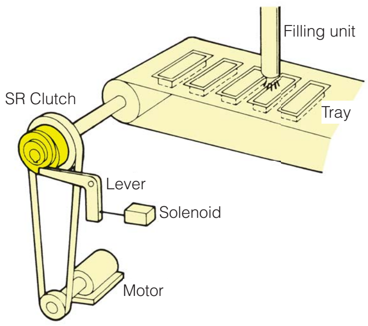
The large number of rollers distributes the torque and minimizes the number of wear points, and a high-precision finish further extends its service life.



Usage Examples

SR Series

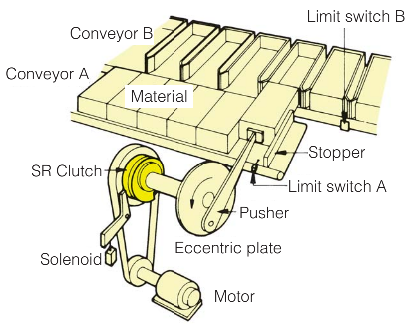
Food processing machinery



Clutch model number	SR30
Input rotation speed	25 r/min
ON-OFF frequency	10 times/min

When the solenoid receives a signal, it releases the lever and turns the SR Clutch on. One revolution of the SR Clutch moves the tray to the fill position and turns it off.

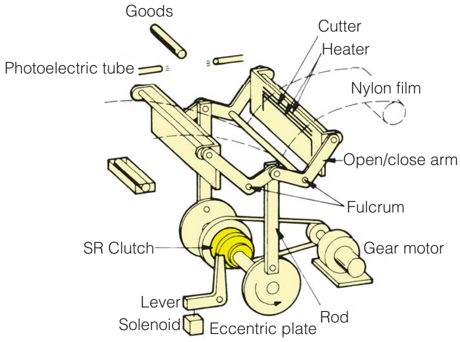
Transfer equipment



Clutch model number	SR40
Input rotation speed	60 r/min
ON-OFF frequency	10 to 20 times/day

The SR Clutch is always on. If the continuous flow of material from conveyor A to conveyor B stops, or if the timing between the pusher and conveyor B becomes out of sync, a limit switch is activated. This causes the solenoid to place the lever against the SR Clutch, turning it off.

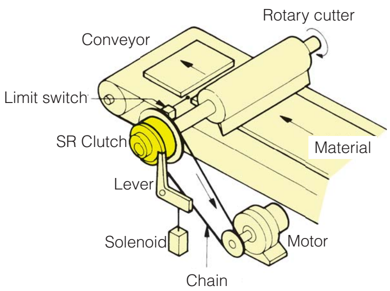
Packaging machinery



Clutch model number	SR15
Input rotation speed	60 r/min
ON-OFF frequency	30 times/min

When the solenoid receives a signal from the photoelectric tube, it releases the lever and turns the SR Clutch on. This moves the rod attached to the eccentric plate through one cycle, and turns the SR Clutch off.

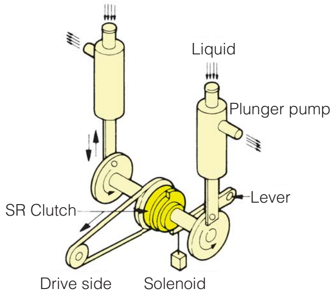
Rotary cutter



Clutch model number	SR30
Motor	0.75 kW
ON-OFF frequency	40 times/min

When the limit switch at the end of the material is activated, the solenoid and lever turn the SR Clutch on, causing the rotary cutter to make one revolution and cut the material.

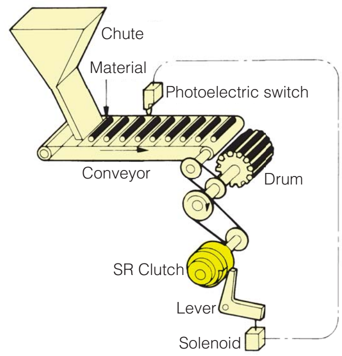
Filling machine



Clutch model number	SR20
Input rotation speed	60 r/min
ON-OFF frequency	20 times/min

When the solenoid receives a signal, it releases the lever. This moves the plunger pump attached to the eccentric plate through one cycle, and turns the SR Clutch off.

Specialized machine



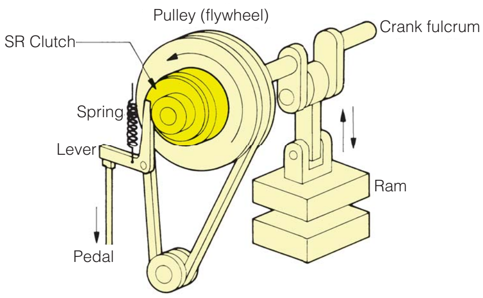
Clutch model number	SR20
Input rotation speed	200 r/min
ON-OFF frequency	5 to 10 times/day

A photoelectric switch detects a missed feed from the chute and sends a signal to the solenoid. This turns the SR Clutch off and brings the conveyor and drum to an emergency stop. (SR Clutch is always on)

SRD Series

Punching press

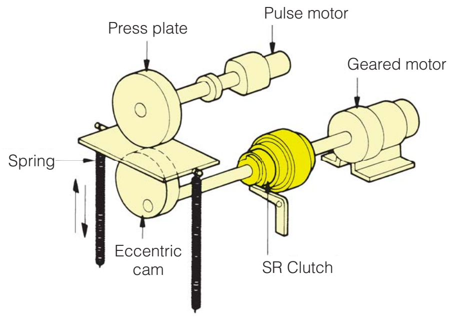
(Terminal crimping plate, power press, or eyelet punching machine)



Clutch model number	SRD30
Input rotation speed	250 r/min
Motor	0.75 kW
ON-OFF frequency	30 times/min

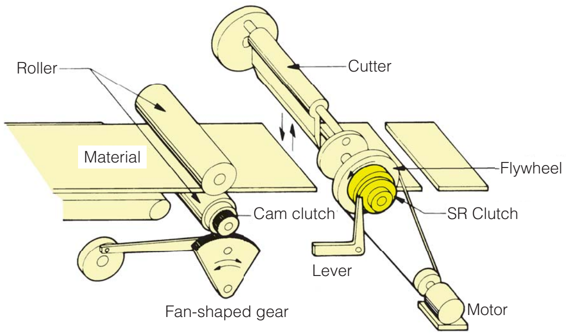
Mounted between the pulley and the crank shaft, the SR Clutch can be turned on and off in exactly one revolution by operating the lever.

Stamping press



Clutch model number	SRD15 Nylon chain coupling
Input rotation speed	420 r/min
ON-OFF frequency	300 times/min

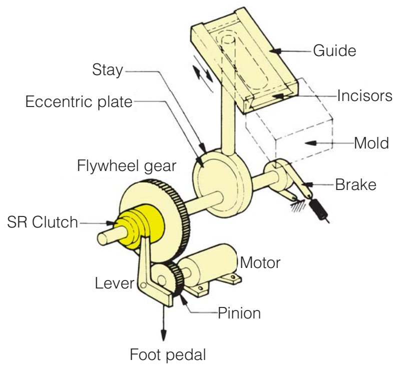
Linear cutter (sheet metal cutting machine)



Clutch model number	SRD30
Input rotation speed	100 r/min
ON-OFF frequency	40 to 60 times/min

When the cam clutch engages, it feeds the material and when it begins to idle, it releases the lever of the SR Clutch and the cutter completes one cycle.

Linear cutter (luggage tag cutting machine)



Clutch model number	SRD15
Input rotation speed	150 r/min
ON-OFF frequency	10 to 15 times/min

When the foot pedal is pressed, the SR Clutch turns on and the shaft moves one revolution while the outer circumference of the eccentric plate slides against the inner circumference of the stay. The stay moves up and down and stops after the incisors have moved one complete cycle in the direction of the arrows.

SR Series • SRD Series

1. Basic operations

1-1 At roller position I (Figure 1)
The rollers engage the cylindrical outer race and the polygonal inner race, and transmit power from the outer race to the inner race.
(This is known as the ON state.)

1-2 At roller position II (Figure 1)
The inner race and outer race are disengaged and the outer race is idling.
(This is known as the OFF state.)

1-3 Switching between ON and OFF (Figure 2)
A built-in trip cam cage holds the rollers to turn it on and off. The trip cam cage is pulled in the direction of the arrow (direction of rotation) by the coil spring to push the rollers to the ON state.
Next, the step unit of the trip cam cage is pushed in the direction of the arrow to move the rollers to the right and to the OFF state. (During the actual operation, when the lever comes into contact with the step unit, the inner race rotates slightly due to inertia and moves to the OFF state.)

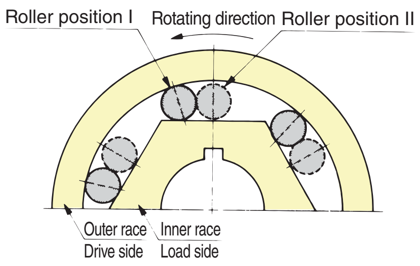


Figure 1. Roller position

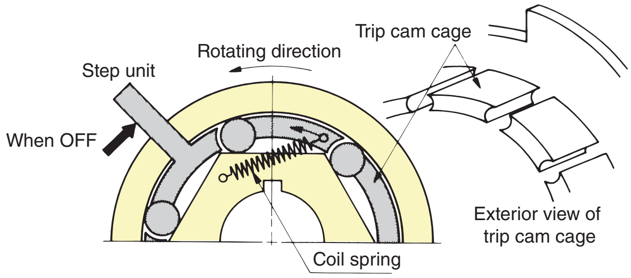


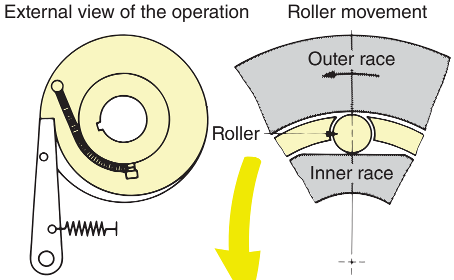
Figure 2. Switching between ON and OFF

2. Specific operations

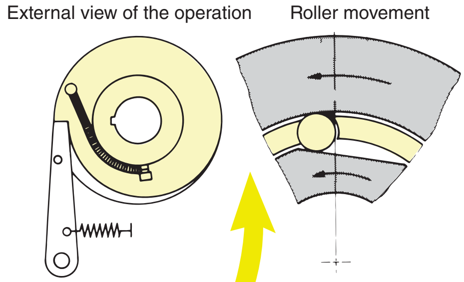
The SR Clutch consists of numerous rollers housed in a trip cam cage (a cage ring for the SR Series). These rollers are located between a cylindrical outer race (drive) and an inner race (load) that has many flat surfaces around its circumference. The basic operations are the same for both the SR Series and SRD Series.

When the rollers stop, the inner race (load) rotates slightly due to the load's inertia, and the rollers and inner/outer races completely disengage and return to the OFF state.

OFF state
There is a gap between the rollers and the inner and outer races, and only the outer race is idle.

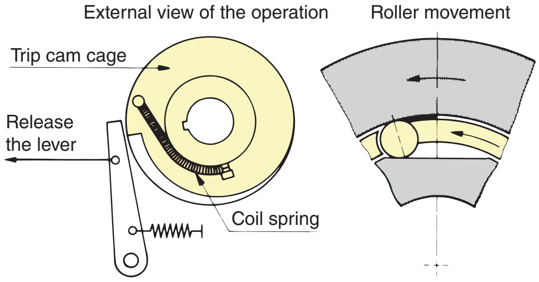


The moment the lever makes contact
When the load completes one revolution and the trip cam cage comes into contact with the lever again, the trip cam cage and rollers stop.

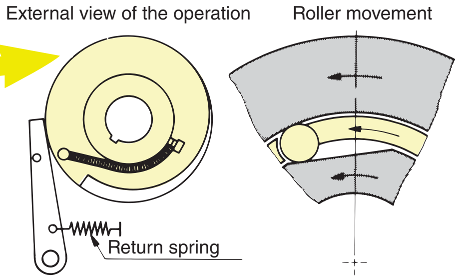


Repeating this operation allows for accurately timed clutch operations.

The moment the lever loses contact
When the solenoid or cylinder releases the lever, the force of the coil spring causes the trip cam cage to push the rollers into the engaged position. Here, the rollers create a wedge shape at the contact point between the inner and outer races, causing them to engage momentarily.



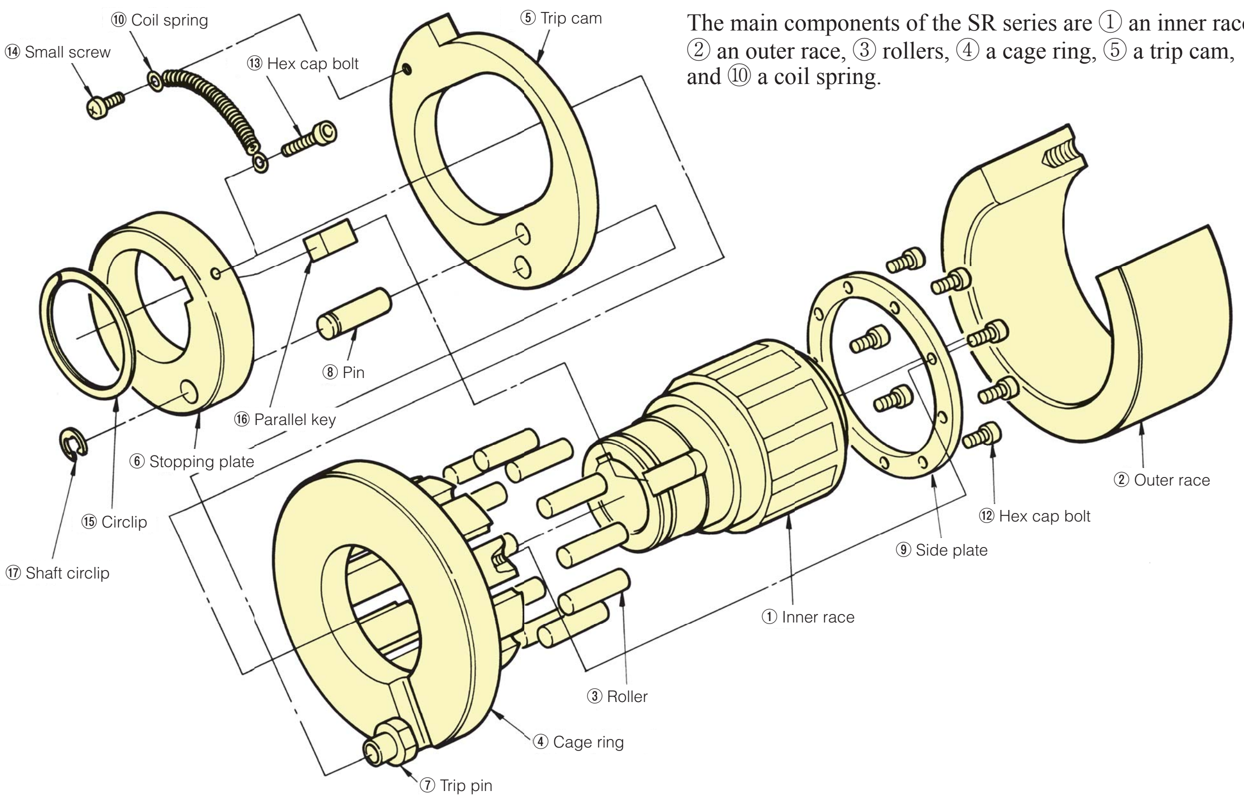
ON state
As soon as they engage, power is transmitted from the outer race to the inner race. Without the solenoid or cylinder, the force of the return spring pulls the lever, keeping it in contact with the outer circumference of the trip cam cage.



Structure

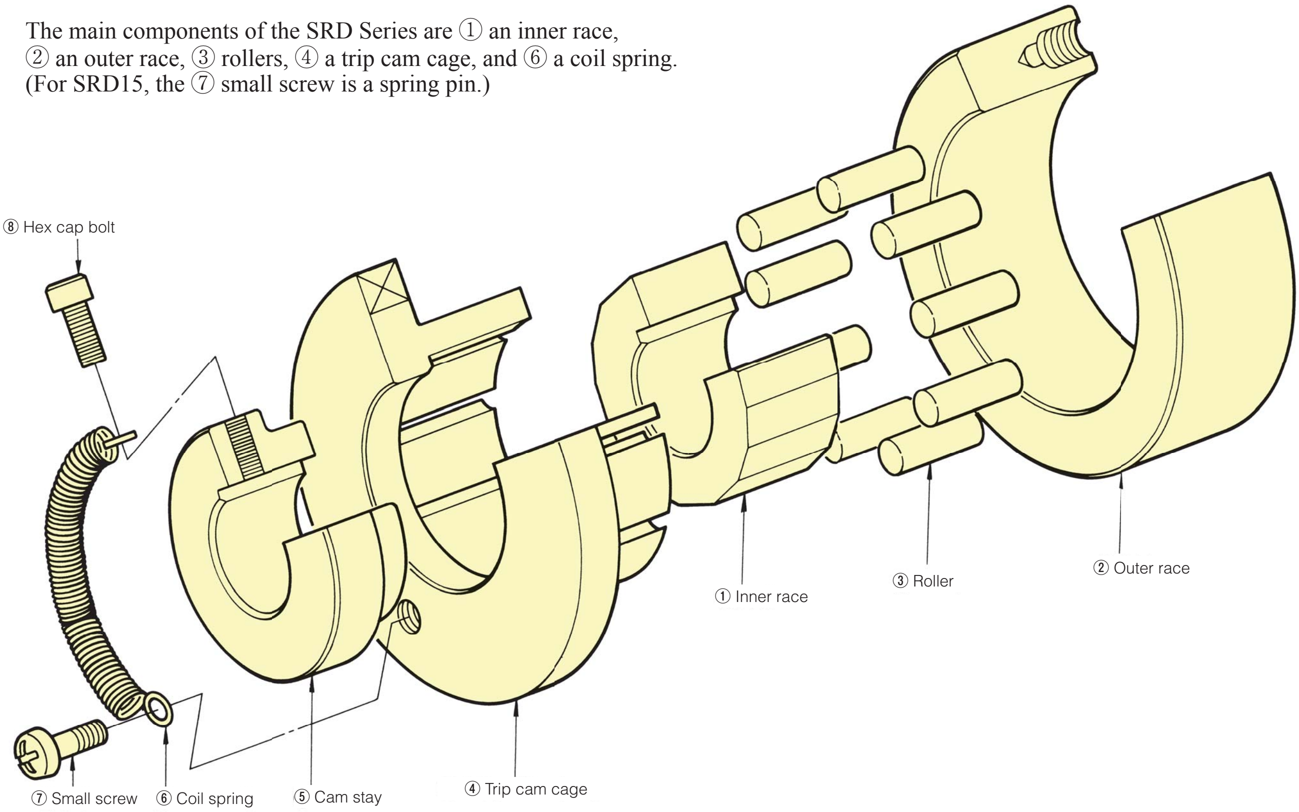
SR Series

The main components of the SR series are ① an inner race, ② an outer race, ③ rollers, ④ a cage ring, ⑤ a trip cam, and ⑩ a coil spring.



SRD Series

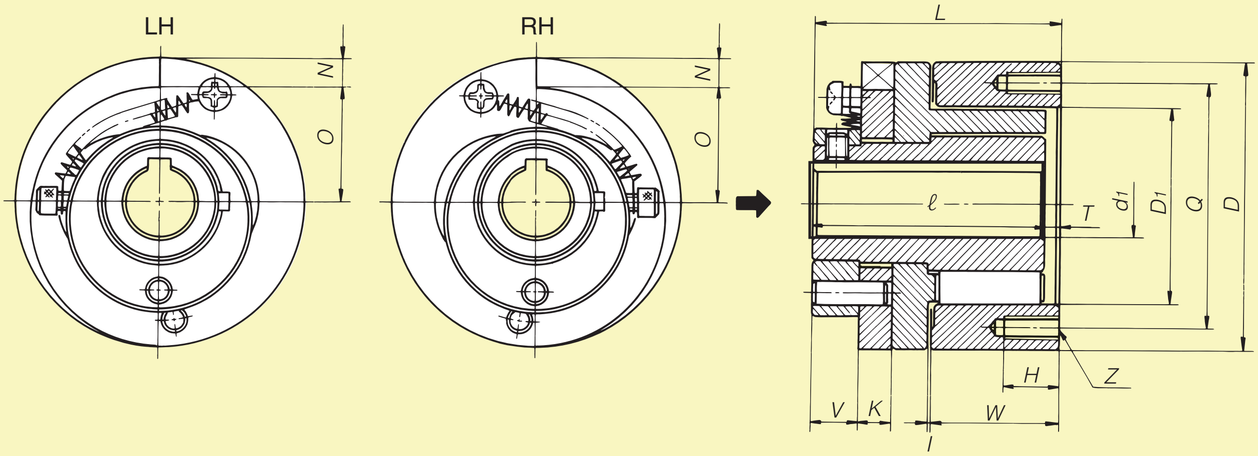
The main components of the SRD Series are ① an inner race, ② an outer race, ③ rollers, ④ a trip cam cage, and ⑥ a coil spring. (For SRD15, the ⑦ small screw is a spring pin.)



Dimensions / Transmission Capacity

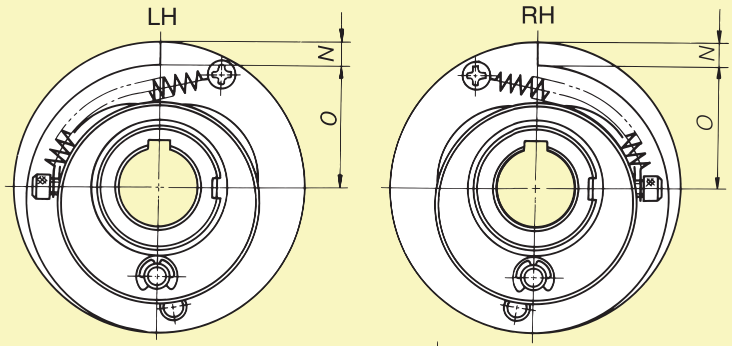
SR Series Compatible with a broad range of operating conditions.

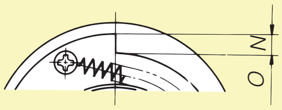
SR15



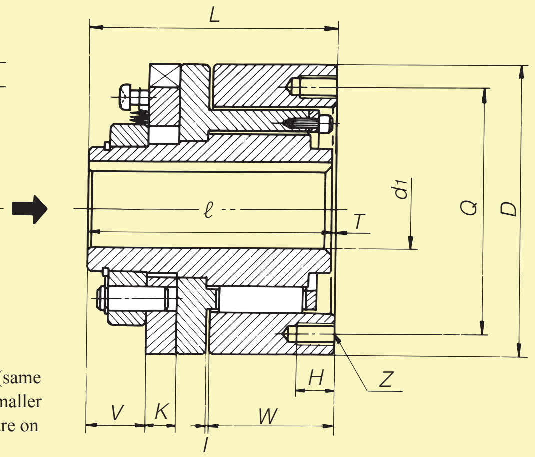
The rotation direction can be right (RH) or left (LH) as viewed from the direction of the arrow in the figures above. Specify the rotation direction when ordering.

SR20 to 40





For the SR30 and SR40 trip cam (same for both LH and RH), (O+N) is smaller than ($\frac{D}{2}$), as shown in the figure on the left.



The rotation direction can be right (RH) or left (LH) as viewed from the direction of the arrow in the figures above. Specify the rotation direction when ordering.

Unit: mm

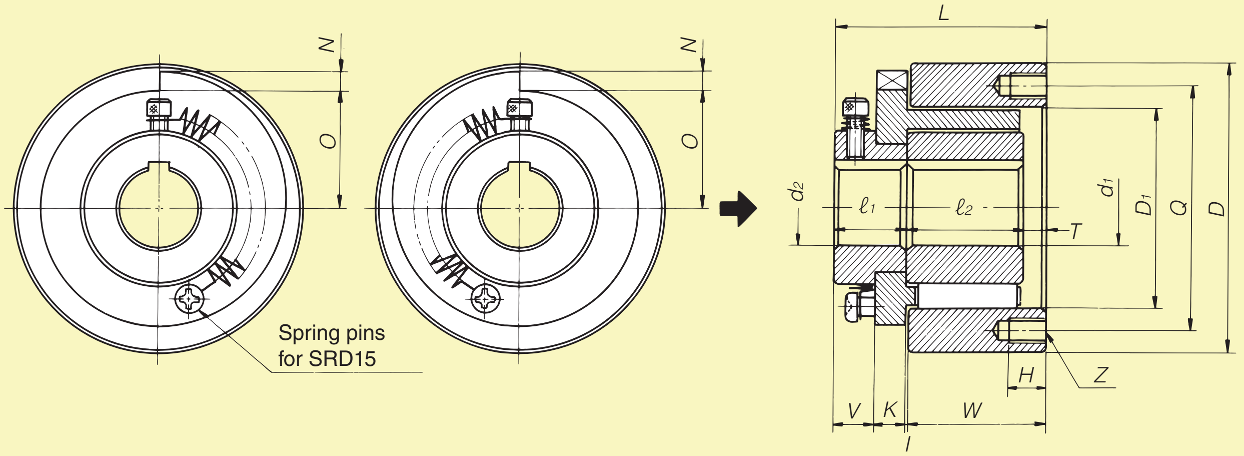
Clutch model number	Allowable maximum torque N·m{kgf·m}	Maximum rotation speed r/min	Shaft bore		*D*	*D₁*	*Q*	*L*	*ℓ*	*W*
			d₁ (H7)	Keyway						
SR15-LH **SR15-RH**	24.5{ 2.5}	500	15	5×2	63	42 (H7)	54	53	50	27.8
SR20-LH **SR20-RH**	49 { 5 }	500	20	5×2	75 (h7)	–	64	63	62	31
SR30-LH **SR30-RH**	147 {15 }	250	30	7×3	120 (h7)	–	102	85	83.5	42
SR40-LH **SR40-RH**	392 {40 }	150	40	10×3.5	155 (h7)	–	134	110	108	58

Clutch model number	*V*	*K*	*H*	*I*	*T*	*O*	Step width *N*	*Z* Quantity × diameter × pitch	Maximum oscillating angle ° (degrees)	Weight (kg)
SR15	10	7	10	0.2	3	25.5	6	4×M5×0.8	30	1.0
SR20	15	8	10	1	1	31.5	6	6×M6×1.0	25	1.5
SR30	20	10	15	1	1.5	44	10	6×M8×1.25	30	5.2
SR40	23	13	15	1	2	53	12	8×M8×1.25	35	10.4

Notes: 1. All models are in stock.
2. The maximum oscillating angle is the maximum angle at which the inner race (load) can rotate after the clutch is turned off.

The maximum allowable torque is the value that can withstand 10^7 or more engagements.

SRD Series Suitable for high speed and high inertia loads such as presses.



The rotation direction can be right (RH) or left (LH) as viewed from the direction of the arrow in the figures above. Specify the rotation direction when ordering.

Unit: mm

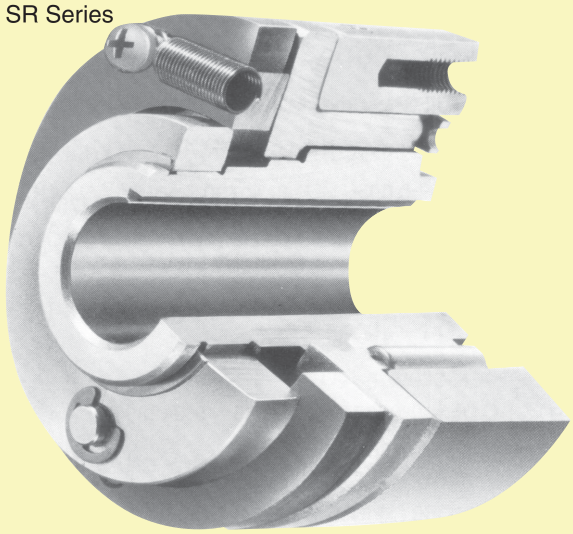
Clutch model number	Allowable maximum torque N·m{kgf·m}	Maximum rotation speed r/min	Shaft bore			D	D_1 (H7)	Q	L	ℓ_1	ℓ_2	W
			d_1 (H7)	d_2 (H8)	Keyway							
SRD15-LH **SRD15-RH**	24.5{ 2.5}	475	15	15	5×2	63	42	54	45	25	17	27.8
SRD20-LH **SRD20-RH**	49 { 5 }	350	20	20	5×2	75	52	64	45	22	18	26.8
SRD30-LH **SRD30-RH**	147 {15 }	250	30	30	7×3	120	85	102	47	22	20	26.8

Clutch model number	V	K	H	I	T	O	Step width N	Z Quantity × diameter × pitch	Maximum oscillating angle ° (degrees)	Weight (kg)
SRD15	10	7	10	0.2	3	24	6	4×M5×0.8	12	0.8
SRD20	10	8	10	0.2	5	30	6	6×M6×1.0	12	1.0
SRD30	12	8	15	0.2	5	46.5	9	6×M8×1.25	12	2.7

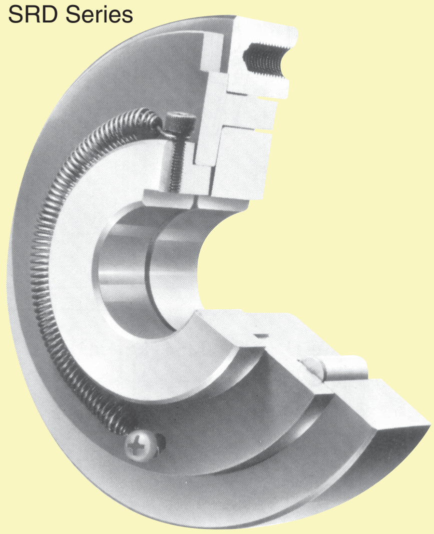
Notes: 1. All models are in stock.
2. The maximum oscillating angle is the maximum angle at which the inner race (load) can rotate after the clutch is turned off.
3. Tsubaki recommends the SR Series for applications where the clutch may fail to disengage due to low operating speed or small inertia loads.

The maximum allowable torque is the value that can withstand 10^7 or more engagements.

SR Series



SRD Series



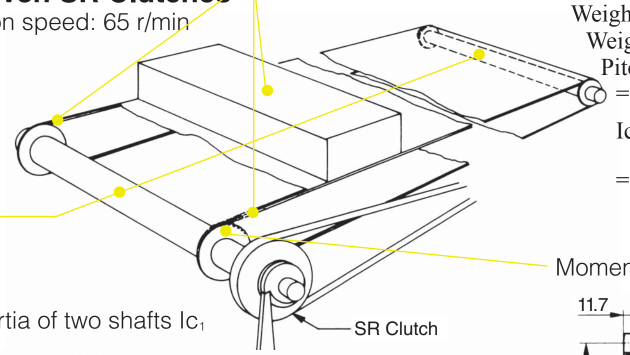
SR Series • SRD Series

When selecting an SR Clutch, select a model number that can withstand the impact torque (T) generated when the clutch engages due to load inertia.
The impact torque (T) is calculated using the formula to the right, based on the clutch shaft equivalent moment of inertia of load (Ic) and the rotation speed N.

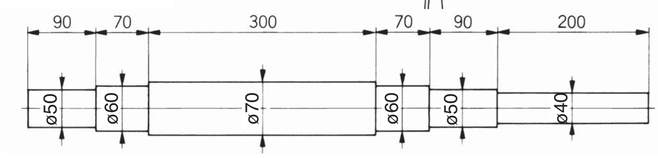
Impact torque $T = \dfrac{Ic \cdot N^2}{3}$ $\left\{ T = \dfrac{GD^2_C \times N^2}{120} \right\}$

Selection examples: SI Unit
Conveyor-driven SR Clutches

SR Clutch rotation speed: 65 r/min



Moment of inertia of two shafts Ic_1



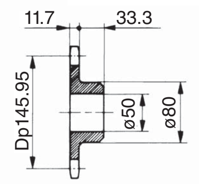
From the Moment of Inertia Quick Reference Chart, $IC_1 = 0.016415\ kg \cdot m^2$ (Total value for 2)

Moment of inertia for transported items and the chain Ic_3

Weight of transported items on conveyor $W_1 = 21$ kg
Weight of chain (RS60-315 links×2) $W_2 =$
Pitch (P)×Number of Links (L)×Unit Weight (W)
$= 0.01905 \times 315 \times 1.53 \times 2 = 18.362$ kg

$$Ic_3 = \frac{1}{4} \times (W_1 + W_2) \times D^2_P$$
$$= \frac{1}{4} \times (21 + 18.362) \times 0.14595^2 = 0.2096\ kg \cdot m^2$$

Moment of inertia of sprockets (RS60-24T×4) Ic_2



From the Moment of Inertia Quick Reference Chart, $IC_2 = 0.01973\ kg \cdot m^2$ (Total value for 4)

From the above conditions, **Ic on clutch shaft** $= Ic_1 + Ic_2 + Ic_3 = 0.245745\ kg \cdot m^2$

Impact torque $T = \dfrac{Ic \times N^2}{3} = \dfrac{0.245745 \times 65^2}{3} = 346\ N \cdot m$.

Selected SR Clutch model number: SR40, which satisfies the impact torque requirement of 346 N•m (allowable maximum torque: 392 N•m).

Gravitational unit

GD^2_1 for two shafts

From the GD^2 Quick Reference Chart, $GD^2_1 = 0.06566\ kgf \cdot m^2$ (Total value for 2)

GD^2_2 of sprockets (RS60-24T×4)

From the GD^2 Quick Reference Chart, $GD^2_2 = 0.07892\ kgf \cdot m^2$ (Total value for 4)

CD^2_3 of transported items and the chain

Weight of transported items on conveyor $W_1 = 21$ kgf
Weight of chain (RS60-315 links×2) $W_2 =$
Pitch (P)×Number of Links (L)×Unit Weight (W)
$= 0.01905 \times 315 \times 1.53 \times 2 = 18.362$ kgf
$GD^2_3 = (W_1 + W_2) \times D^2_P$
$= (21 + 18.362) \times 0.14595^2 = 0.83841\ kgf \cdot m^2$

From the above conditions, **clutch shaft** $GD^2_C = GD^2_1 + GD^2_2 + GD^2_3 = 0.98298\ kgf \cdot m^2$

Impact torque $T = \dfrac{GD^2_C \times N^2}{120} = \dfrac{0.98298 \times 65^2}{120} = 34.6\ kgf \cdot m$.

Selected SR Clutch model number: SR40, which satisfies the impact torque requirement of 34.6 kgf•m (allowable maximum torque: 40 kgf•m).

SI Unit

Moment of Inertia Quick Reference Chart (This table shows the moment of inertia of a steel cylinder with a diameter of D mm and a length of 10 mm.)

Diameter D (mm)	Moment of inertia (kg·m^2)	Diameter D (mm)	Moment of inertia (kg·m^2)	Diameter D (mm)	Moment of inertia (kg·m^2)	Diameter D (mm)	Moment of inertia (kg·m^2)
5	0.0000000048	140	0.002961	275	0.04408	410	0.2178
10	0.0000000771	145	0.003407	280	0.04737	415	0.2286
15	0.0000003902	150	0.003902	285	0.05085	420	0.2398
20	0.000001233	155	0.004448	290	0.05451	425	0.2514
25	0.000003010	160	0.005051	295	0.05837	430	0.2635
30	0.000006242	165	0.005712	300	0.06242	435	0.2759
35	0.00001156	170	0.006437	305	0.06669	440	0.2889
40	0.00001973	175	0.007228	310	0.07117	445	0.3022
45	0.00003160	180	0.008090	315	0.07588	450	0.3160
50	0.00004817	185	0.009027	320	0.08081	455	0.3303
55	0.00007052	190	0.01004	325	0.08598	460	0.3451
60	0.00009988	195	0.01114	330	0.09140	465	0.3603
65	0.0001376	200	0.01233	335	0.09706	470	0.3761
70	0.0001850	205	0.01361	340	0.1030	475	0.3923
75	0.0002438	210	0.01499	345	0.1092	480	0.4091
80	0.0003157	215	0.01647	350	0.1156	485	0.4264
85	0.0004023	220	0.01805	355	0.1224	490	0.4443
90	0.0005056	225	0.01975	360	0.1294	495	0.4627
95	0.0006277	230	0.02157	365	0.1368	500	0.4817
100	0.0007707	235	0.02350	370	0.1444	600	0.9988
105	0.0009368	240	0.02557	375	0.1524	700	1.850
110	0.001128	245	0.02777	380	0.1607	800	3.157
115	0.001348	250	0.03010	385	0.1693	900	5.056
120	0.001598	255	0.03259	390	0.1783	1000	7.707
125	0.001882	260	0.03522	395	0.1876		
130	0.002201	265	0.03801	400	0.1973		
135	0.002560	270	0.04096	405	0.2073		

Gravitational Unit

GD^2 Quick Reference Chart (This table shows the GD^2 of a steel cylinder with a diameter of D mm and a length of 10 mm.)

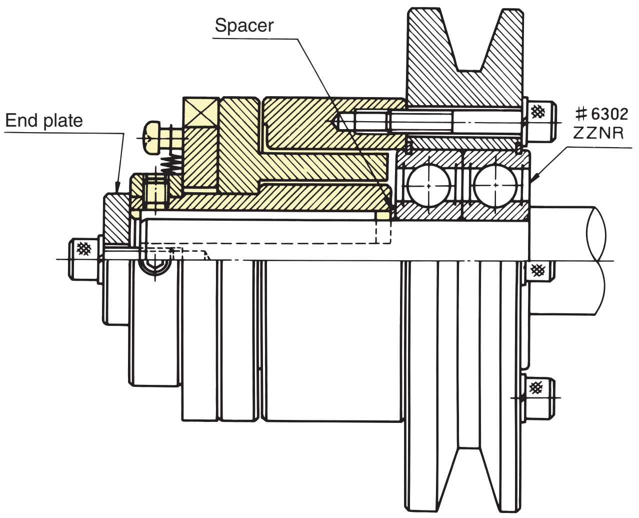
Diameter D (mm)	GD^2 {kgf·m^2}	Diameter D (mm)	GD^2 {kgf·m^2}	Diameter D (mm)	GD^2 {kgf·m^2}	Diameter D (mm)	GD^2 {kgf·m^2}
5	0.000000019	140	0.01183	275	0.17621	410	0.87065
10	0.000000308	145	0.01362	280	0.18938	415	0.91391
15	0.000001571	150	0.01560	285	0.20328	420	0.95875
20	0.000004930	155	0.01778	290	0.21792	425	1.00523
25	0.00001205	160	0.02019	295	0.23334	430	1.05338
30	0.00002496	165	0.02284	300	0.24957	435	1.10323
35	0.00004622	170	0.02573	305	0.26663	440	1.15484
40	0.00007888	175	0.02890	310	0.28455	445	1.20823
45	0.0001264	180	0.03234	315	0.30336	450	1.26345
50	0.0001926	185	0.03609	320	0.32308	455	1.32055
55	0.0002820	190	0.04015	325	0.34375	460	1.37956
60	0.0003993	195	0.04455	330	0.36540	465	1.44053
65	0.0005500	200	0.04930	335	0.38005	470	1.50349
70	0.0007398	205	0.05542	340	0.41174	475	1.56850
75	0.0009749	210	0.05992	345	0.43650	480	1.63559
80	0.001262	215	0.06584	350	0.46236	485	1.70481
85	0.001608	220	0.07218	355	0.48935	490	1.77621
90	0.002022	225	0.07897	360	0.51751	495	1.84982
95	0.002510	230	0.08622	365	0.54687	500	1.92570
100	0.003081	235	0.09397	370	0.57745	600	3.97
105	0.003745	240	0.10222	375	0.60930	700	7.354
110	0.004511	245	0.11101	380	0.64246	800	12.55
115	0.005389	250	0.12036	385	0.67694	900	20.10
120	0.006389	255	0.13028	390	0.71280	1000	30.63
125	0.007522	260	0.14080	395	0.75006		
130	0.008800	265	0.15195	400	0.78877		
135	0.01023	270	0.16374	405	0.82895		

Mounting Method

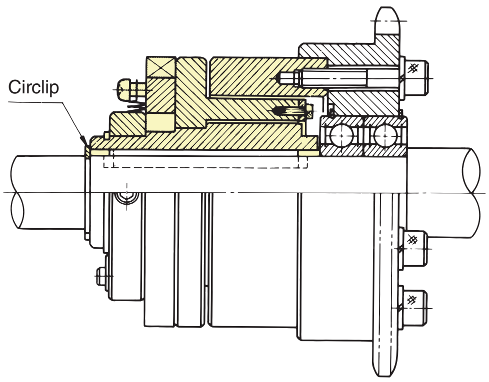
SR Series

1. Bearings are used between the shaft and the sprockets, pulleys, gears, flanges, and other components that are mounted on the outer race. The bearings support the radial load and also serve to align the inner and outer races of the SR Clutch over the shaft, sprocket, and other components.
2. To secure sprockets and other components to the SR Clutch, use the outer diameter (inner diameter for SR15) of the SR Clutch outer race as the socket, and use the screw holes and bolts on the outer race. A tolerance of H6 (h6) or H7 (h7) is recommended for each socket section.
3. To set the inner and outer races and sprockets in the axial direction, use circlips, spacers, end plates, or the stepped portions on the shaft. (Mounting examples 1, 2, and 3)
4. The shaft to which the SR Clutch is to be mounted should be held to an h6 or h7 tolerance.
5. If mounting the shaft center of the SR Clutch vertically, the trip cam should be above.
6. Note that if the outer race, top cam, cage ring, stopping plate, or side plate are pressed in the axial direction, the clutch operation will not be smooth.
   Design the shaft length so that it can be mounted with a clearance for the dimension (see dimensional drawings on page 7).
7. Use a parallel key only. Do not use a driving key. Align the key and keyway before mounting it.

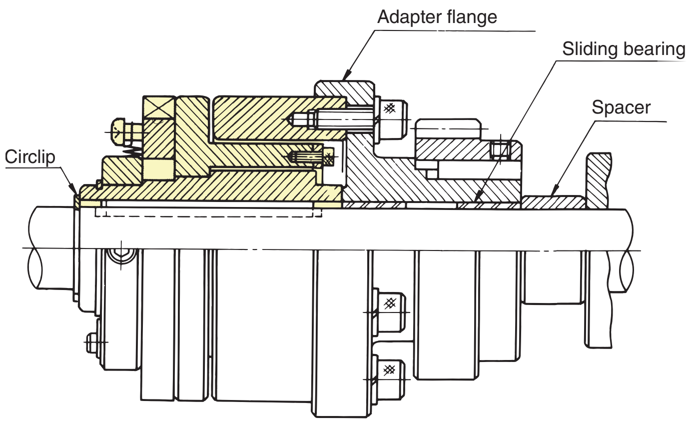
Mounting example 1　SR15



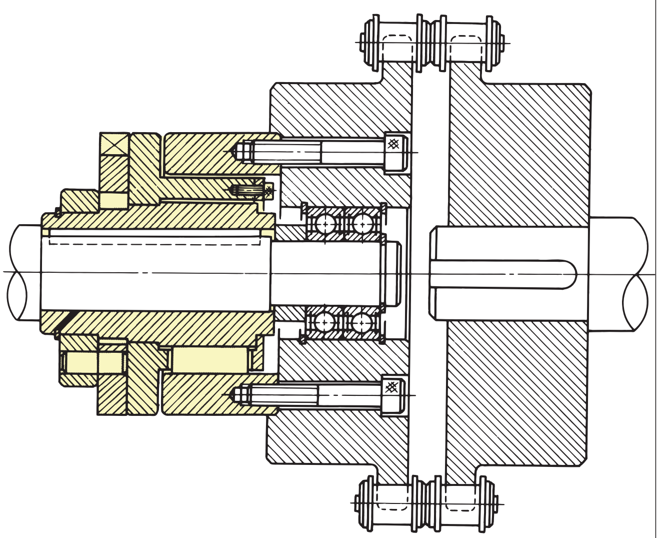
SR20, SR30, and SR40



Mounting example 2　SR20, SR30, and SR40



Mounting example 3　Coupling type



SRD Series

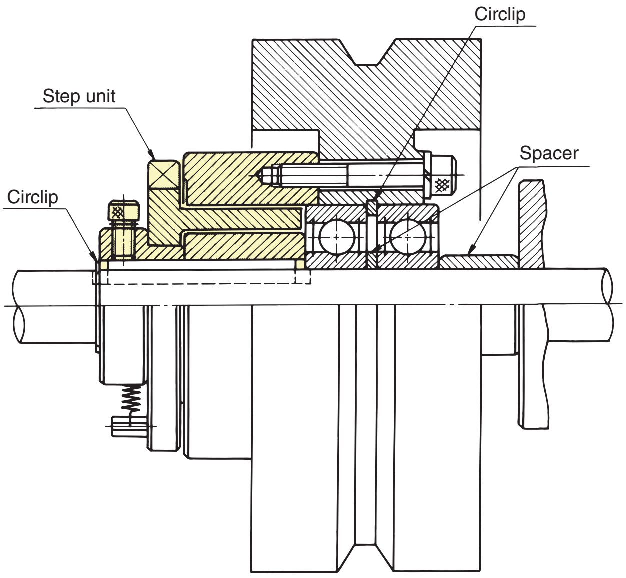
1. Bearings are used between the shaft and the sprockets, pulleys, gears, flanges, and other components that are mounted on the outer race. The bearings support the radial load and also serve to align the inner and outer races of the SR Clutch over the shaft, sprocket, and other components.
   ■ Mounting example 4
   This is an alignment method that uses the outer diameter of the bearing.
   ■ Mounting example 5
   This is an alignment method that uses the inner diameter of SR Clutch outer race as the socket.

Bearing number used

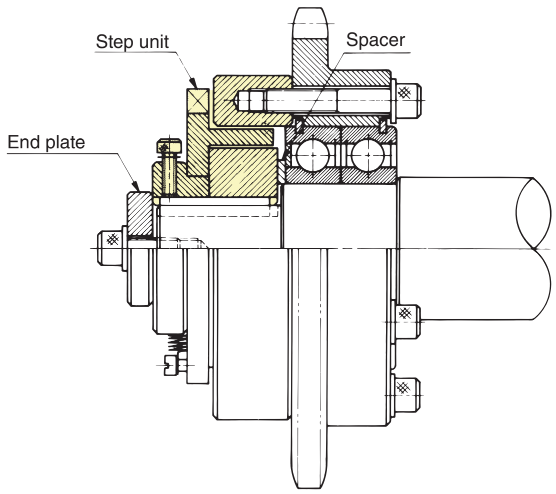
Clutch model number	Bearing number
SRD15	6302
SRD20	6304
SRD30	6209

2. To secure sprockets and other components to the SR Clutch, use the screw holes and bolts on the end sections of the SR Clutch outer race.
   A tolerance of h6 or h7 is recommended for each socket section.
3. To set the inner and outer races and sprockets in the axial direction, use circlips, spacers, end plates, or the stepped portions on the shaft. (Mounting examples 4 and 5)
4. The shaft to which the SR Clutch is to be mounted should be held to an h6 or h7 tolerance.
5. When mounting the SR Clutch on the shaft, ensure that the coil spring is oriented correctly (see dimensional drawings on page 8).
6. Note that if the outer race, trip cam cage, or cam stay are pressed in the axial direction, the clutch operation will not be smooth.
   Design the shaft length so that it can be mounted with a clearance for the dimension (refer to the dimensional drawings).
7. Mount the step unit so that it is above the keyway.
8. Use a parallel key only. Do not use a driving key. Align the key and keyway before mounting it.

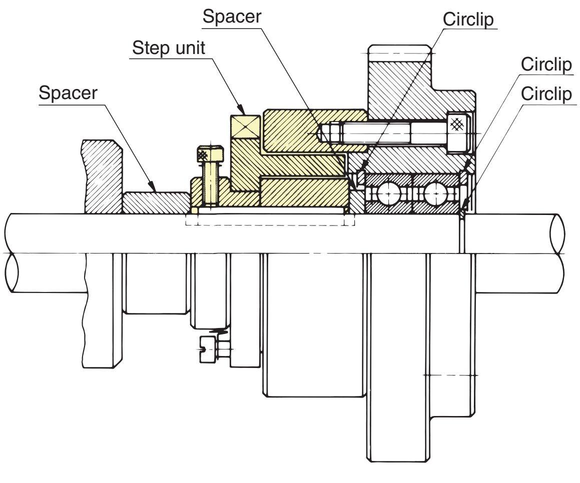
Mounting example 4 SRD15 and SRD20



SRD30



Mounting example 5 SRD15, SRD20, and SRD30



SR Series • SRD Series

The ON-OFF operation of the SR Clutch requires a lever, a return spring, and a mechanism to move the lever. Mechanisms for moving levers include electrical, pneumatic, and hydraulic methods such as solenoids and cylinders, and mechanical methods such as link mechanisms and cams.

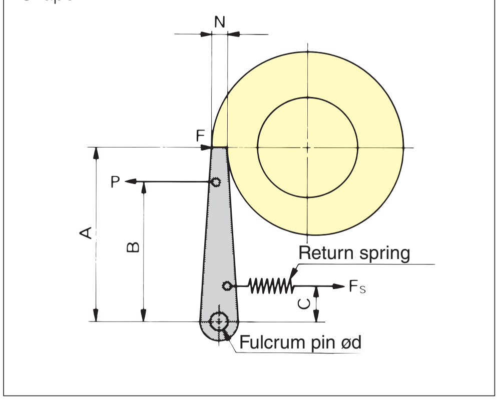
Lever shape and dimensions

Unit: mm

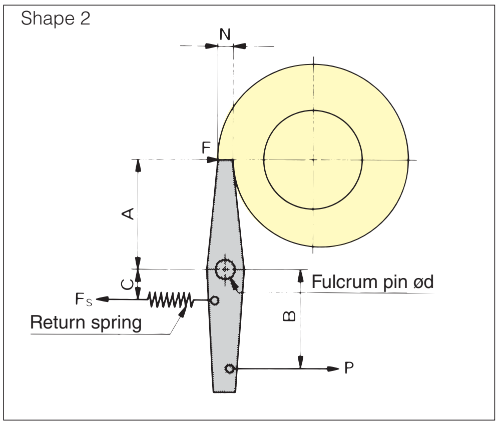
Clutch model number	A	B		C	Width	d (minimum)	Step width N
		Shapes 1 to 3	Shape 4				
SR15, SRD15	65	45	95	23	6.5	4	6
SR20, SRD20	75	50	105	25	7	5	6
SR30, SRD30	100	70	140	30	9	8	10
SR40	130	90	170	40	12	12	12

Note: The optimal clearance between the fulcrum pin and the hole is about 0.05 mm.

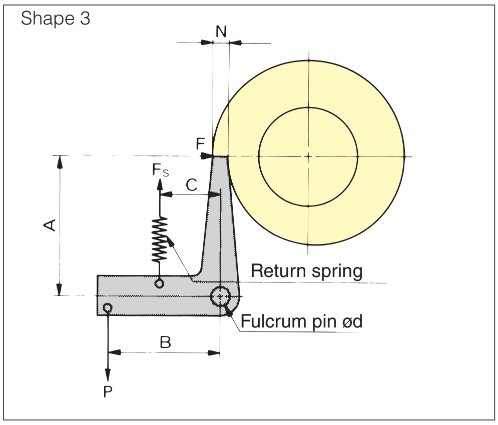
Shape 1



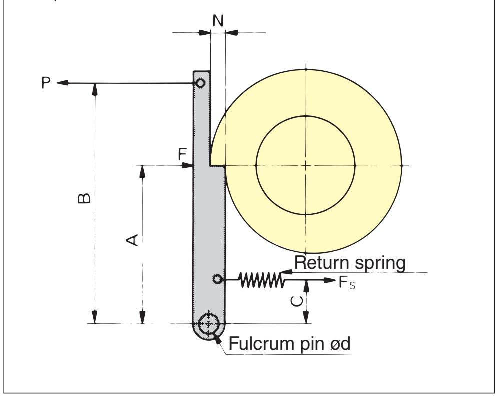
Shape 2



Shape 3



Shape 4



Lever material and hardness

Rotation speed	Material	Hardness
Below 100 r/min	SS400	–
100 r/min or above	S45C	The hardness of the area in contact with the trip cam should be HRC 30 to 40.

Return spring force (Fs)

If the lever is properly designed, manufactured, and mounted, the return spring strengths shown in the table will be sufficient.
If the force of the return spring is too strong, the clutch operation will be sluggish and the mechanism for moving the lever will be larger and more expensive.

Clutch model number	Return spring force Fs N{kgf}
SR15, SRD15	2{0.2}
SR20, SRD20	3{0.3}
SR30, SRD30	4{0.4}
SR40	5{0.5}

Lever operating force (Ps)

The lever operating forces shown in the table will be sufficient if the lever is properly designed, manufactured, and mounted, and if the return spring is suitable. To determine the operating force by calculation, refer to the selection example on the next page.

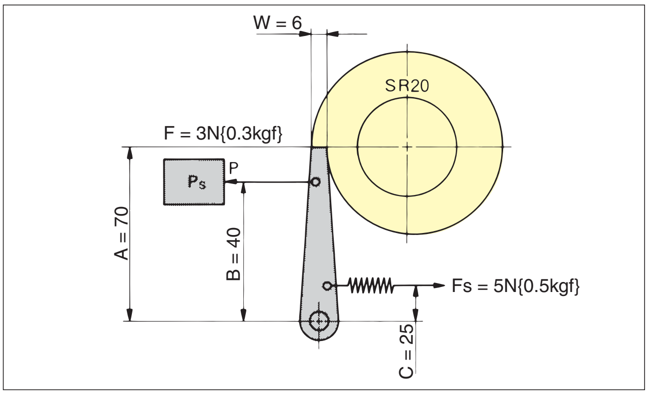
Clutch model number	Return spring force Ps N{kgf}
SR15, SRD15	10{1.0}
SR20, SRD20	15{1.5}
SR30, SRD30	30{3.0}
SR40	30{3.0}

■ When using solenoids
In general, the smaller the stroke of a solenoid, the greater the force.
During installation, the solenoid should be set to the minimum stroke required to release the lever.

■ Set the stroke of SR30 and 40 so that the lever is clear of the outer circumference of the outer race.

Calculating the lever operating force

The operating force (Ps) and required stroke (L) for the lever shape shown in the figure can be determined using the following formula.



$$P = \frac{(F\times A)+(Fs\times C)}{B} \quad \cdots\cdots\cdots \text{ Equation (1)}$$

$$Ps = P\times SF \quad \cdots\cdots\cdots \text{ Equation (2)}$$

$$L = N\times \frac{B}{A} \times \alpha \quad \cdots\cdots\cdots \text{ Equation (3)}$$

Ps : Lever operating force [N or kgf]
SF : Service factor (normally 1.5)
P : Force required to release the lever [N or kgf]
F : Frictional force at contact point between the lever and the trip cam [N or kgf]

Clutch number	F N{kgf}
SR15, SRD15	2{0.2}
SR20, SRD20	3{0.3}
SR30, SRD30	10{1.0}
SR40	16{1.6}

Fs : Force of return spring [N or kgf]
A : Distance from fulcrum to tip of lever [mm]
B : Distance from fulcrum to operating point P [mm]
C : Distance from fulcrum to operating point of return spring [mm]
N : Step width of trip cam [mm]
α : Correction factor (normally 1.2)
L : Required stroke [mm]

■ Selection examples

SR Clutch number: SR20
Lever shape: See figure above
F: 3N (or 0.3 kgf) Fs: 5N (or 0.5 kgf) N: 6 mm

From equation (1),

$$P = \frac{(F\times A)+(Fs\times C)}{B} = \frac{(3\{0.3\}\times 70)+(5\{0.5\}\times 25)}{40} = 8.4\text{N (or 0.84 kgf)}$$

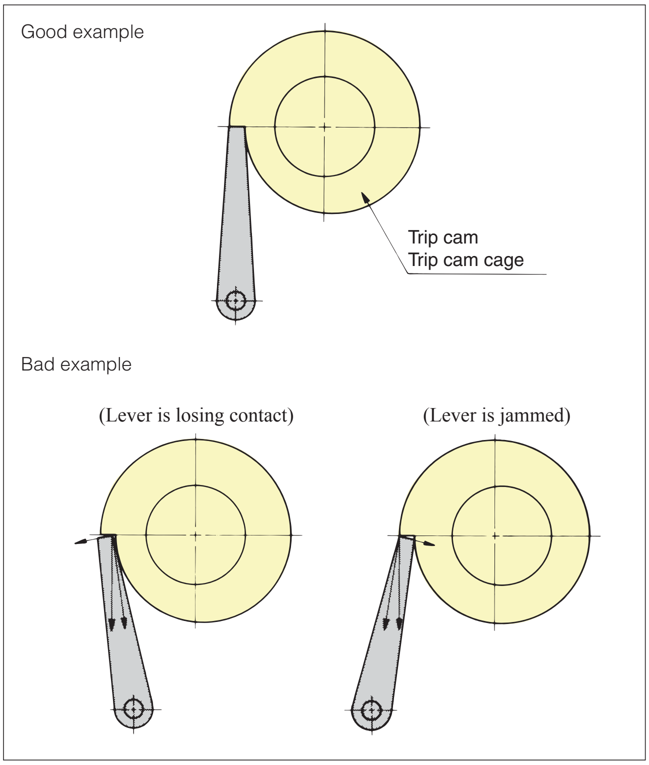
From equation (2), Ps = P×SF = 8.4 (or 0.84)×1.5 = 12.6N (or 1.26 kgf)

From equation (3), $L = N\times \frac{B}{A} \times\alpha = 6\times \frac{40}{70} \times 1.2 = 4.11$ mm

Therefore, operating force (Ps) = 12.6N (or 1.26 kgf)
A stroke of 4.11 mm is sufficient.

Mounting the lever

Mount the lever correctly. The lever must be mounted properly for the clutch to operate smoothly.



Lubrication

SR Series・SRD Series

1. Apply grease thinly on the inner race, outer race, and rollers.
2. The SR Series is pre-filled with grease.
3. Avoid using cup grease or greases containing extreme pressure additives.
4. Avoid using high viscosity greases.

■ Recommended grease

Manufacturer	Brand
JXTG Nippon Oil & Energy	MULTINOC Grease 2
Idemitsu Kosan	Daphne Eponex No. 2
Showa Shell	Alvania Grease 2 Sunlight Grease 2
COSMO Oil Lubricants	Dynamax Super No. 2

Auxiliary Devices

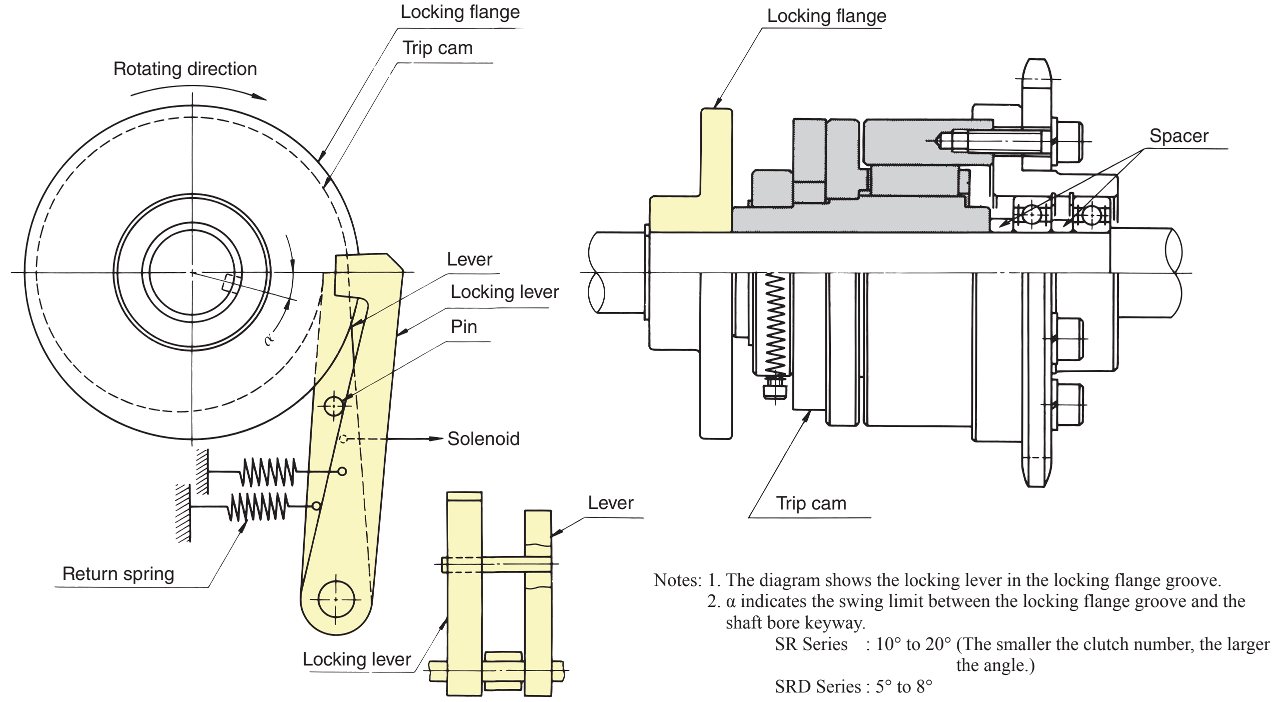
SR Series・SRD Series

Depending on the function and structure of the machine driven by the SR Clutch, the following auxiliary mechanisms may be required. Please use the appropriate device after considering each item.

1. Improved stopping accuracy

Load variations may cause the stop position to vary within the range of the maximum oscillating angle.
Use the locking flange and locking lever to stop the inner race from oscillating.

Locking flange and locking lever mounting diagrams



Notes: 1. The diagram shows the locking lever in the locking flange groove.
2. α indicates the swing limit between the locking flange groove and the shaft bore keyway.
SR Series : 10° to 20° (The smaller the clutch number, the larger the angle.)
SRD Series : 5° to 8°

After the SR Clutch trip cam and lever make contact, the load rotates an additional α°, at which point the locking lever enters the locking flange groove for precise positioning.
When the solenoid or similar device pulls the lever, the locking lever and the pin on the lever are pulled simultaneously to engage the clutch. At this point, you must allow the locking lever to disengage before the lever is released. The same process is repeated in subsequent cycles, ensuring very high stopping accuracy.

2. If it is difficult to turn the SR Clutch off

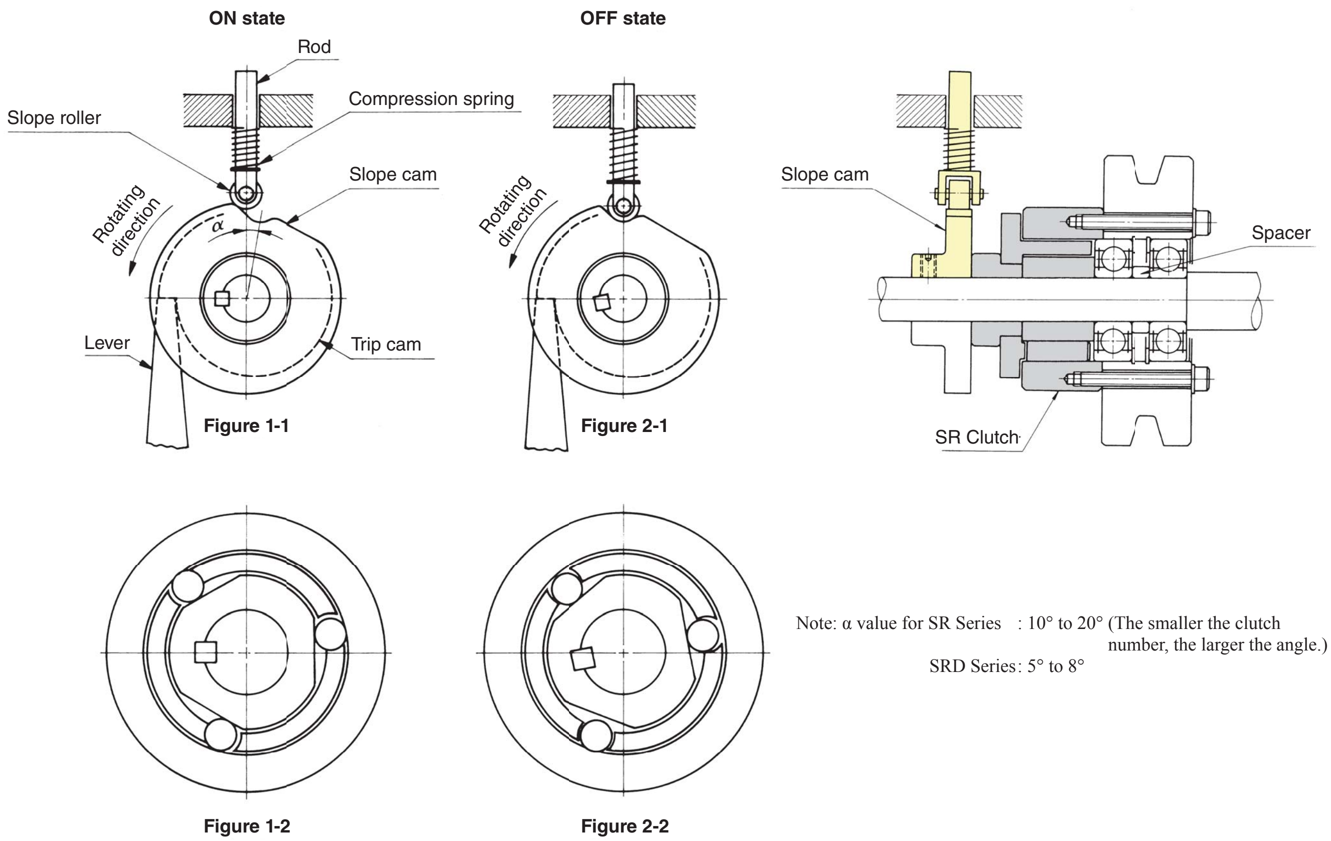
In order for the SR Clutch to turn off smoothly under load, it needs an inertia force to disengage the rollers and the inner/outer races.
Attach a device to apply an inertia force for the following types of loads.

Load type			Device to apply inertia force	Effect
SR Clutch rotation speed	Load inertia	Load frictional resistance		
Low speed	Low	Low	Slope cam device	Effective for SRD15
High speed	Low	High	Flywheel device	
Shifts gears at low speeds	—	High	Auxiliary flange + cam clutch	Stops in place even under load fluctuations

■ Slope cam device

Figures 1-1 and 1-2 show the moment when the trip cam and lever make contact with each other.
Next, the compression spring rotates the slope cam in the direction of the arrow, disengaging the inner and outer races. (Figure 2-1 and Figure 2-2)

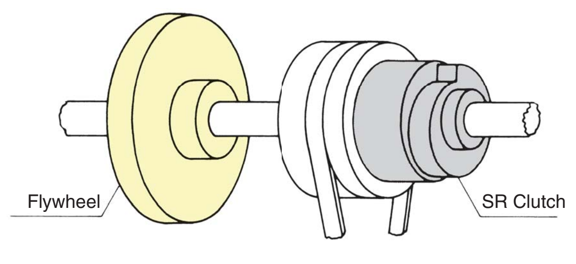
Slope cam mounting and operating diagrams



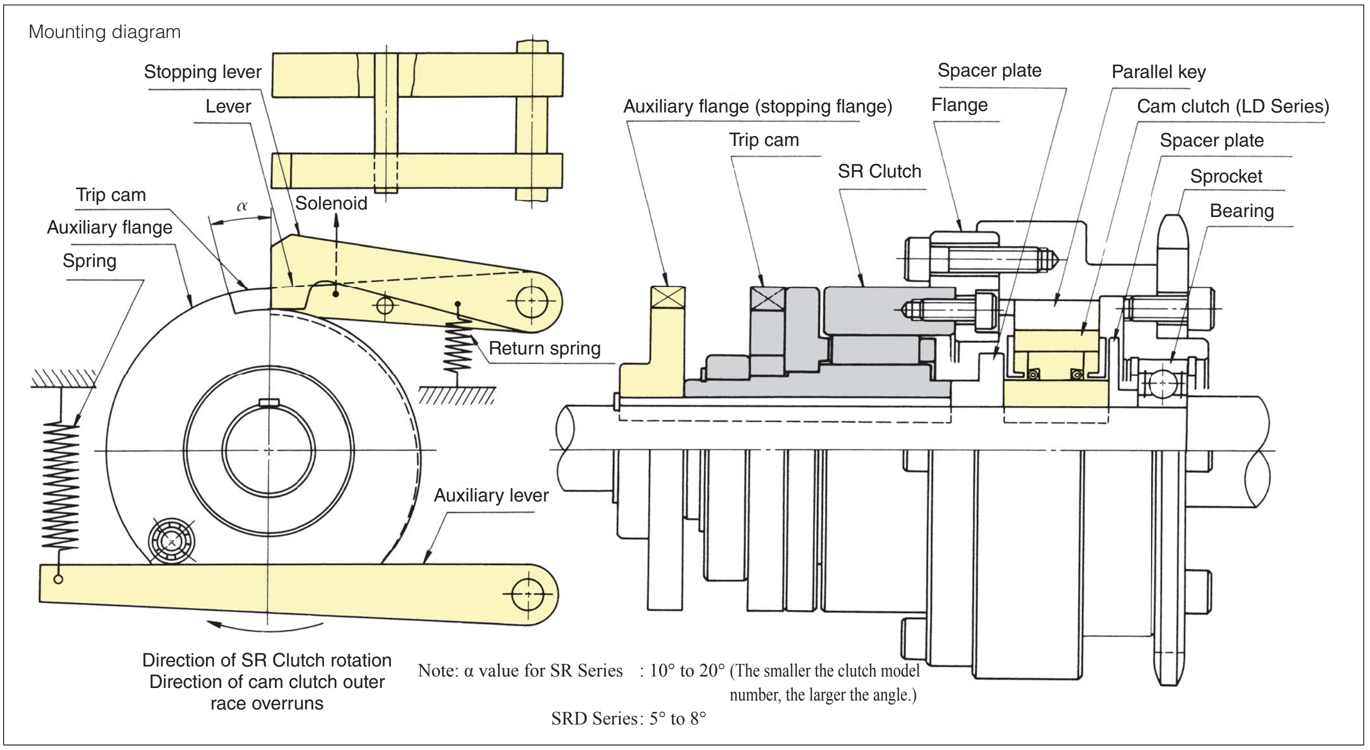
Note: α value for SR Series : 10° to 20° (The smaller the clutch number, the larger the angle.)
SRD Series: 5° to 8°

■ Flywheel device

If the load inertia is low, mount the flywheel on the shaft of the SR Clutch as shown in the figure on the right.



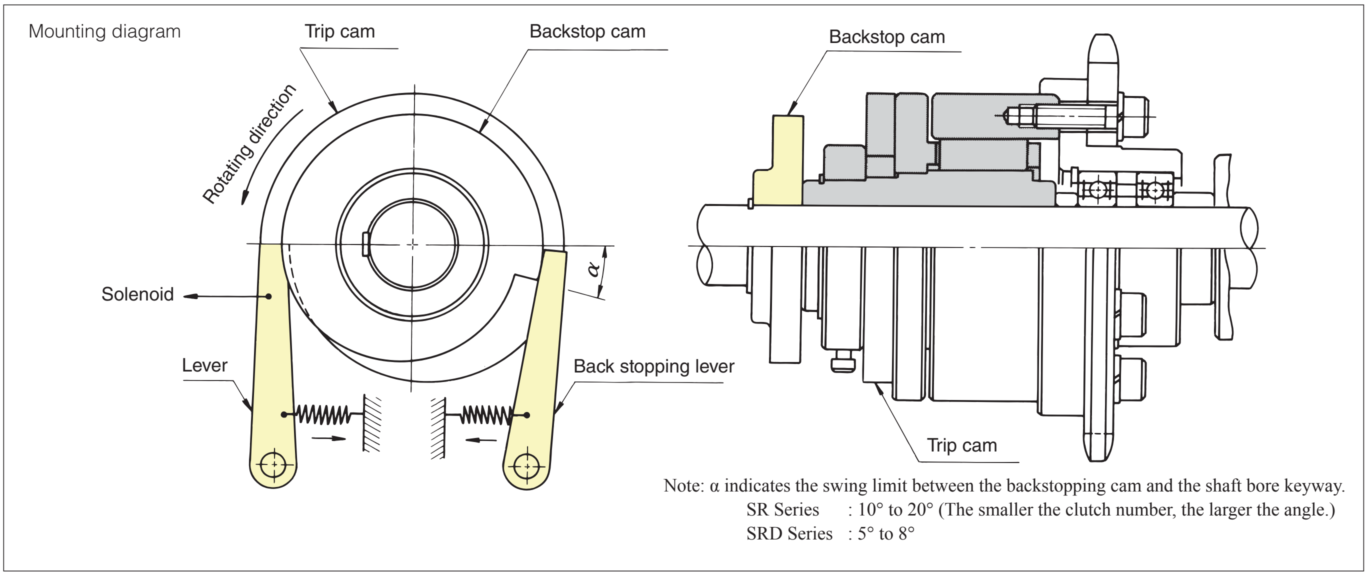
■ Auxiliary flange + cam clutch



To do this, attach the auxiliary flange to the shaft of the SR Clutch as shown in the mounting diagram. At the position where the trip cam and the lever meet, adjust the auxiliary lever so that the force of the spring rotates the auxiliary flange in the direction of rotation. This operation guarantees that the SR Clutch will turn off. In addition, using the auxiliary flange with the stopping flange achieves very high stopping accuracy. The stopping flange and stopping lever can also be used as a locking flange and locking lever (see the section on improving stopping accuracy on page 15). For cam clutches (Tsubaki cam clutches), see the section on preventing load overrun on the next page.

3. Backstopping

If a reverse torque is applied on the inner race after the SR Clutch turns off, install a backstopping cam and backstopping lever to prevent the inner race from moving in the reverse direction.



Example of the inner race reversing at the position where the SR Clutch is off

1. When the load frictional resistance is low and coil spring of the SR Clutch forces the inner race to move in the reverse direction.
2. When the SR Clutch turns off at the position where a reverse torque is applied to the inner race due to an unbalanced load such as a cam or crank.

Coil spring reverse torque

N･m{kgf･m}

Clutch model number	Reverse torque	Clutch model number	Reverse torque
SR15	0.10{0.01}	**SRD15**	0.10{0.01}
SR20	0.20{0.02}	**SRD20**	0.20{0.02}
SR30	0.50{0.05}	**SRD30**	0.60{0.06}
SR40	1.28{0.13}		

4. Preventing inertia

A constant brake capable of stopping the inner race within the maximum oscillating angle is effective for the following types of loads.

1. When the load frictional resistance is low and the operating speed is high.
2. When the load inertia is high compared to the low load frictional resistance.

The approximate value of the required braking torque when mounting the brake on the SR Clutch shaft is given by the following formula.

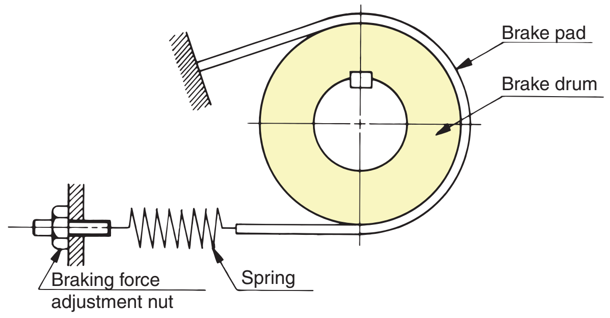
SR Series: $T_{BC} = 0.016\times\frac{I_C\times N^2}{4} - T_O$

$$\left\{T_{BC} = 0.016\times\frac{GD^2\times N^2}{16} - T_O\right\}$$

SRD Series: $T_{BD} = \left(0.016\times\frac{I_C\times N^2}{4} - T_O\right)\times 0.5$

$$\left\{T_{BD} = \left(0.016\times\frac{GD^2\times N^2}{16} - T_O\right)\times 0.5\right\}$$

T_{BC} : Required braking torque for SR Series [N・m or kgf・m]
T_{BD} : Required braking torque for SRD Series [N・m or kgf・m]
I_C : Load moment of inertia on SR Clutch shaft [kg・m²]
GD^2 : Load SR Clutch shaft GD^2 [kgf・m²]
N : SR Clutch rotation speed r/min
T_O : Load total frictional resistance torque on SR Clutch shaft [N・m (or kgf・m)]

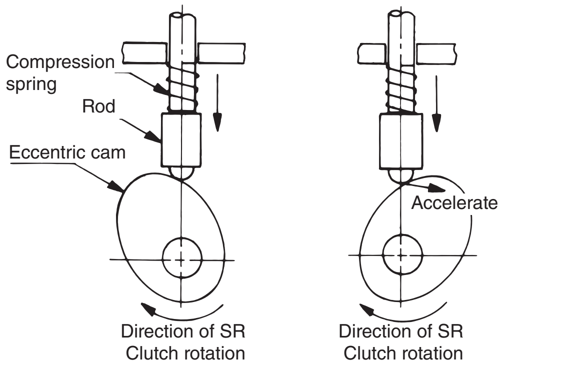


Note: A simple band brake is sufficient, but use a brake drum with low inertia. During the test run for the installation, increase the braking force until no impact noise is heard after the SR Clutch turns off.

5. Preventing load overrun

When the SR Clutch is used to drive an unbalanced load, such as a cam or crank wheel, uneven rotation may occur on the load side. This occurs when the speed of the load side (inner race) is greater than the speed of the drive side (outer race) while the SR Clutch is turned on (see the figure below).

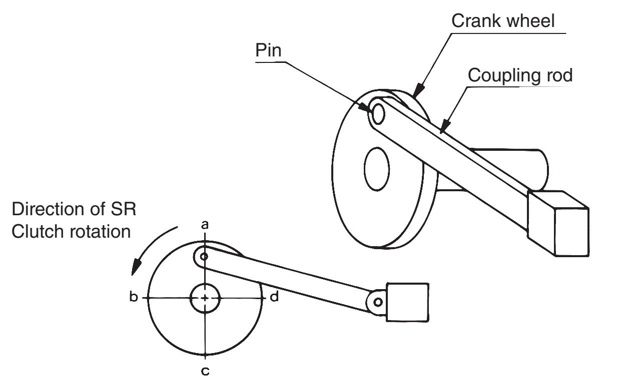
When the load is a cam



Eccentric cam position without overrunning

The compression spring accelerates the eccentric cam in the direction of the arrow, causing the inner race of the SR Clutch to overrun.

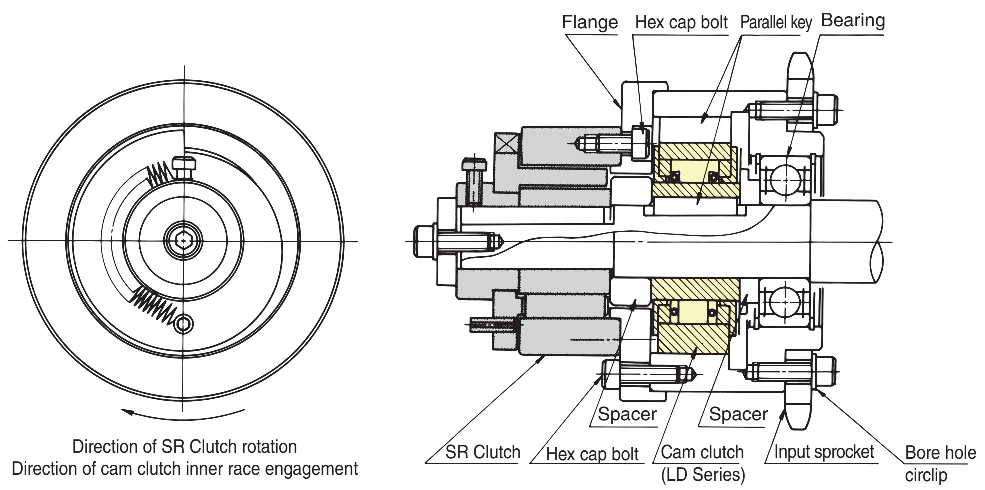
When the load is a crank wheel, such as a pusher transfer device



When the horizontal speed of the pin is decelerating (from a to b, and from c to d), the inner race of the SR Clutch overruns due to the inertia of the coupling rod.

In such cases, use a Tsubaki Cam Clutch to prevent overrunning. When the load side (inner race) of the SR Clutch tries to overrun, the cam clutch engages and the reducer on the drive side acts as a brake to prevent overrun.

Mounting diagram



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INDIAN OCEAN RIM

Singapore	Tsubakimoto Singapore Pte. Ltd.	https://tsubaki.sg/
Australia	Tsubaki Australia Pty. Limited	https://tsubaki.com.au/
India	Tsubaki India Power Transmission Private Limited	https://en.tsubaki.in/
Indonesia	PT. Tsubaki Indonesia Trading	https://tsubaki.id/
Malaysia	Tsubaki Power Transmission (Malaysia) Sdn. Bhd.	https://en.tsubaki.my/
New Zealand	Tsubaki Australia Pty. Limited - New Zealand Branch	https://tsubaki.com.au/
Philippines	Tsubakimoto Philippines Corporation	https://en.tsubaki.ph/
Thailand	Tsubakimoto (Thailand) Co., Ltd.	https://tsubaki.co.th/
Vietnam	Tsubakimoto Vietnam Co., Ltd.	https://tsubaki.net.vn/

EAST ASIA

Republic of Korea	Tsubakimoto Korea Co., Ltd.	https://tsubakimoto-tck.co.kr/
Taiwan	Taiwan Tsubakimoto Trading Co., Ltd.	https://tsubakimoto.tw/

CHINA

China	Tsubakimoto Chain (Shanghai) Co., Ltd.	https://www.tsubaki-sh.cn/

The Tsubaki Eco Link logo is used only on products that satisfy the standards for environmental friendliness set by the Tsubaki Group.

Note: In accordance with the policy of TSUBAKIMOTO CHAIN CO. to constantly improve its products, the specifications in this catalog are subject to change without notice.

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