Drawn Cup Roller Clutches

Metric Series

FCS, FC-K	regular clutch, single roller per stainless steel spring
FC	regular clutch, multi-roller per stainless steel spring
FCL-K	light series clutch, single roller per stainless steel spring
FCB	regular clutch and bearing assembly, multi-roller per stainless steel spring
FCBL-K, FCBN-K	light series clutch and bearing assembly, single roller per stainless steel spring

FCL - 10 - K

Bore, in millimeters

Inch Series

RC	regular clutch, single roller per integral spring
RC-FS	regular clutch, single roller per stainless steel spring
RCB	regular clutch and bearing assembly, single roller per integral spring
RCB-FS	regular clutch and bearing assembly, single roller per stainless steel spring

Outer Diameter
14 = $^{14}/_{16}$ = $^{7}/_{8}$ in.

RC - 10 14 10 - FS

Bore
10 = $^{10}/_{16}$ = $^{5}/_{8}$ in.

Width
10 = $^{10}/_{16}$ = $^{5}/_{8}$ in.

DRAWN CUP ROLLER CLUTCHES

METRIC AND INCH SERIES

Drawn cup roller clutch transmits torque between shaft and housing in one direction and allows free overrun in the opposite direction. When transmitting torque, either the shaft or the housing can be the input member. Applications are generally described as indexing, backstopping or overrunning.

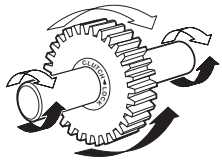


Fig. B-18.
Lock function: shaft drives gear clockwise (white arrows) or gear can drive shaft counterclockwise (black arrows)

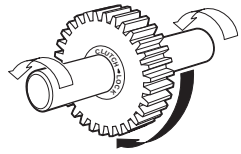


Fig. B-19.
Overrun function: shaft overruns in gear counter-clockwise (white arrows) or gear overruns on shaft clockwise (black arrow)

IDENTIFICATION

The prefix letters in the designation of the drawn cup roller clutches and drawn cup roller clutch and bearing assemblies denote whether these are manufactured to metric or inch nominal dimensions. Designation codes for clutches and clutch and bearing assemblies with metric nominal dimensions begin with the letter "F." Designation codes for clutches and clutch and bearing assemblies with inch nominal dimensions begin with the letter "R."

The basic types of clutches and clutch and bearing assemblies are listed below:

METRIC SERIES TYPES

FCS, FC-K Regular clutch, single roller per stainless steel spring.

FC Regular clutch, multi-roller per stainless steel spring.

FCB Regular clutch and bearing assembly, multi-roller per stainless steel spring.

FCL-K Light series clutch, single roller per stainless steel spring.

FCBL-K, FCBN-K Light series clutch and bearing assembly. Single roller per stainless steel spring.

INCH SERIES TYPES

RC Regular clutch, single roller per integral spring.

RC-FS Regular clutch, single roller per stainless steel spring.

RCB Regular clutch and bearing assembly, single roller per integral spring.

RCB-FS Regular clutch and bearing assembly, single roller per stainless steel spring.

Drawn cup roller clutch type FC with stainless steel springs

Drawn cup clutch and bearing assembly type FCB with stainless steel springs

Drawn cup roller clutch, types FCS, FC-K, FCL-K, and RC-FS with stainless steel springs

Drawn cup clutch and bearing assembly types FCBL-K, FCBN-K and RCB-FS with stainless steel springs

Drawn cup roller clutch, type RC with integral springs

Drawn cup clutch and bearing assembly type RCB with integral springs

Fig. B-20. Types of clutches and clutch and bearing assemblies

CONSTRUCTION

In many respects, construction is similar to that of drawn cup bearings. Design and manufacture of drawn cup clutches – just as with drawn cup bearings – was pioneered and developed by The Torrington Company. The well-established design utilizes the same low-profile radial section as drawn cup bearings. The precisely formed interior ramps provide surfaces against which the needle rollers wedge. These positively lock the clutch with the shaft when rotated in the proper direction. These ramps, formed during the operation of drawing the cup, are case hardened for wear resistance. The incorporation of ramp forming into the cup drawing operation is a manufacturing innovation that contributes to the low cost of the unit.

Two designs of precision molded clutch cages are employed. Clutch and clutch and bearing assembly types – FC, FC-K, FCS, FCL-K, RC-FS, FCB, FCBN-K, FCBL-K and RCB-FS – use a glass fiber, reinforced nylon cage, equipped with inserted stainless steel leaf springs. The stainless steel springs permit higher rates of clutch engagement and achieve greater spring life. The nylon cage permits operation at higher temperatures. Clutch types RC and RCB utilize a one-piece cage of acetyl resin polymer with integral leaf style springs. They are used for lower temperatures than permitted for the units with nylon cages.

Types FCB, FCBL-K, FCBN-K, RCB and RCB-FS clutch and bearing assemblies have cages, for retention and guidance of the needle rollers in the bearings, located on both sides of the clutch unit.

Fig. B-21. Clutch and bearing assembly

Types FC, FC-K, FCS, FCL-K, RC and RC-FS are of clutch-only configurations for use with external radial support (usually two drawn cup needle roller bearings). Separate bearings position the shaft and housing concentrically and carry the radial load during overrun.

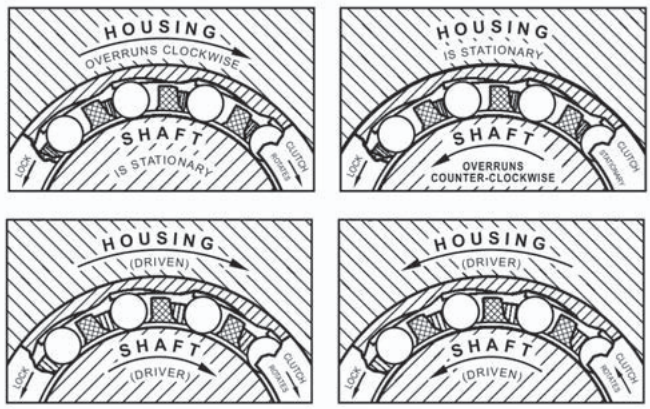
Fig. B-22. Clutch only

OPERATION

Operation is in two modes: the overrun mode and the lock mode. Operational mode is controlled by the direction of the clutch or shaft rotation with respect to the locking ramps.

In the overrun mode, shown in the drawings below, the relative rotation between the housed clutch and the shaft causes the rollers to move away from their locking position against the locking ramps in the drawn cup. The housing and the clutch are then free to overrun in one direction, or the shaft is free to overrun in the other direction.

In the lock mode, shown in the drawings below, the relative rotation between the housed clutch and the shaft is opposite to that in the overrun mode. The rollers, assisted by the leaf-type springs, become wedged between the locking ramps and the shaft to transmit torque between the two members. Either the member housing the clutch drives the shaft in one direction, or the shaft can drive the clutch and its housing member in the other direction.



Clearance between the rollers and cup ramps is exaggerated in these drawings.

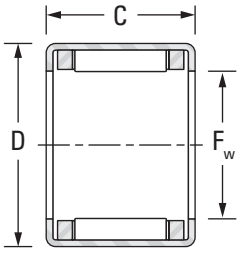
Fig. B-23. Overrun mode and lock mode

DRAWN CUP ROLLER CLUTCHES

INCH SERIES

- For proper application, separate bearings are suggested (adjacent to clutch) to carry radial loads and assure concentricity between shaft and housing.
- The clutch engages when housing is rotated relative to the shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-133.
- Full details on installation are given on page B-132.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Type RCFS clutches have stainless steel springs inserted in molded cage to position rollers for lockup.

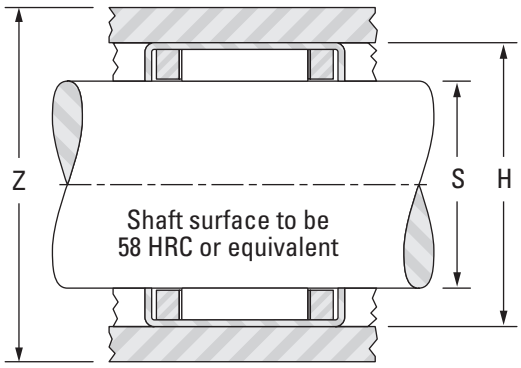
The mounted clutch engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.



RC and RC-FS

Shaft Diameter	F_w	D	C	Clutch and Bearing Designations		Torque Rating	Z	Overrun Limiting Speed Rating for Rotating Shaft
			-0.25 mm -0.010 in.	With Stainless Steel Springs	With Integral Springs		Minimum O.D. of Steel Housing for Rated Torque	
mm in.	**mm** in.	**mm** in.	**mm** in.			**N-m** lbs-in.		min^{-1}
3.175 0.1250	**3.18** 0.125	**7.14** 0.281	**6.35** 0.250	—	RC-02	**0.323** 2.86	**11.2** 0.44	34000
6.350 0.2500	**6.35** 0.250	**11.13** 0.438	**12.70** 0.500	RC-040708-FS(1)	RC-040708	**1.94** 17.2	**15.7** 0.62	20000
9.525 0.3750	**9.53** 0.375	**15.88** 0.625	**12.70** 0.500	RC-061008-FS(1)	RC-061008	**5.45** 48.2	**22.4** 0.88	18000
12.700 0.5000	**12.70** 0.500	**19.05** 0.750	**12.70** 0.500	RC-081208-FS(1)	RC-081208	**8.85** 78.3	**27.9** 1.10	17000
15.875 0.6250	**15.88** 0.625	**22.23** 0.875	**15.88** 0.625	RC-101410-FS(1)	RC-101410	**16.8** 149	**30.5** 1.20	14000
19.050 0.7500	**19.05** 0.750	**25.40** 1.000	**15.88** 0.625	RC-121610-FS(1)	RC-121610	**23.3** 206	**35.6** 1.40	12000
25.400 1.0000	**25.40** 1.000	**33.35** 1.313	**15.88** 0.625	RC-162110-FS(1)	RC-162110	**49.6** 439	**48.3** 1.90	8700

(1) Suffix "-FS" is not always stamped on the clutch cup. Type RC-FS with stainless steel springs is always readily identified by RED clutch cage.
(2) See pages B-112 to B-119 for other suitable bearing types and sizes.



Suitable Drawn Cup Bearing[2]	Gaging			S		H		Approx. Wt.
				Shaft Raceway Diameter		Housing Bore		
	Ring Gage	Clutch Locking Plug	Clutch Overrun Plug	Mounting				
				Max.	Min.	Max.	Min.	
	mm in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**kg** lbs.
—	**7.155** 0.2817	**3.160** 0.1244	**3.195** 0.1258	**3.175** 0.1250	**3.167** 0.1247	**7.155** 0.2817	**7.142** 0.2812	**0.001** 0.002
J-45	**11.125** 0.4380	**6.337** 0.2495	**6.383** 0.2513	**6.350** 0.2500	**6.337** 0.2495	**11.125** 0.4380	**11.100** 0.4370	**0.004** 0.008
JH-68	**15.888** 0.6255	**9.512** 0.3745	**9.558** 0.3763	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	**0.008** 0.017
JH-87	**19.063** 0.7505	**12.687** 0.4995	**12.733** 0.5013	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	**0.009** 0.020
JH-1010	**22.238** 0.8755	**15.862** 0.6245	**15.908** 0.6263	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	**0.014** 0.030
J-126	**25.387** 0.9995	**19.012** 0.7485	**19.058** 0.7503	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**0.015** 0.034
JH-1612	**33.325** 1.3120	**25.362** 0.9985	**25.408** 1.0003	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	**0.026** 0.058

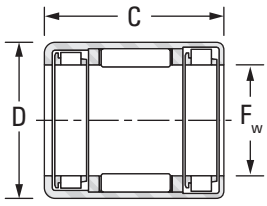
DRAWN CUP ROLLER CLUTCH AND BEARING ASSEMBLIES

INCH SERIES

B

- Clutch and bearing assembly engages when the housing is rotated relative to shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Proper inspection requires use of ring gage and bore plug gage(s). See the inspection section on page B-133.
- Full details on installation are given on page B-132.
- Clutch and bearing assemblies have spring integrally molded (type RCB) stainless steel springs inserted (type RCB-FS) in molded cage to position rollers for lockup.

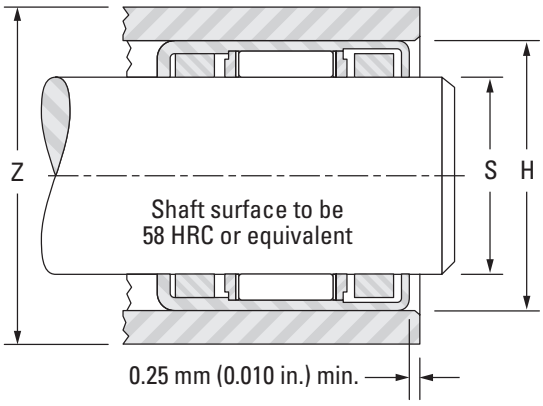
The mounted clutch and bearing assemblies engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.



RCB and RCB-FS

Shaft Diameter	F_w	D	C	Clutch and Bearing Designations		Torque Rating	Z	Load Ratings[1]		Overrun Limiting Speed Rating for Rotating Shaft
			-0.25 mm -0.010 in.	With Stainless Steel Springs	With Integral Springs		Minimum O.D. of Steel Housing for Rated Torque	C Dynamic	C_0 Static	
mm in.	**mm** in.	**mm** in.	**mm** in.			**N-m** lbf-in.		**kN** lbf.	**kN** lbf.	min^{-1}
9.525 0.3750	**9.53** 0.375	**15.88** 0.625	**22.23** 0.875	RCB-061014-FS[1]	RCB-061014	**5.45** 48.2	**22.4** 0.88	**6.01** 1350	**4.89** 1100	18000
12.700 0.5000	**12.70** 0.500	**19.05** 0.750	**22.23** 0.875	RCB-081214-FS[1]	RCB-081214	**8.85** 78.3	**27.9** 1.1	**7.12** 1600	**6.49** 1460	17000
15.875 0.6250	**15.88** 0.625	**22.23** 0.875	**25.40** 1.000	RCB-101416-FS[1]	RCB-101416	**16.8** 149	**30.5** 1.2	**8.05** 1810	**8.14** 1830	14000
19.050 0.7500	**19.05** 0.750	**25.40** 1.000	**25.40** 1.000	RCB-121616-FS[1]	RCB-121616	**23.3** 206	**35.6** 1.4	**8.90** 2000	**9.79** 2200	12000
25.400 1.0000	**25.40** 1.000	**33.35** 1.313	**27.00** 1.063	RCB-162117-FS[1]	RCB-162117	**49.6** 439	**48.3** 1.9	**15.4** 3460	**17.6** 3960	8700

[1] Suffix "-FS" is not always stamped on the clutch cup. Type RC-FS with stainless steel springs is always readily identified by RED clutch cage.



Gaging				S		H		Approx. Wt.
				Shaft Raceway Diameter		Housing Bore		
				Mounting				
Ring Gage	Clutch Locking Plug	Clutch Overrun and Bearing Go Plug	Bearing No Go Plug	Max.	Min.	Max.	Min.	
mm in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**kg** lbs.
15.888 0.6255	**9.512** 0.3745	**9.553** 0.3761	**9.589** 0.3775	**9.525** 0.3750	**9.512** 0.3745	**15.888** 0.6255	**15.862** 0.6245	**0.014** 0.030
19.063 0.7505	**12.687** 0.4995	**12.728** 0.5011	**12.764** 0.5025	**12.700** 0.5000	**12.687** 0.4995	**19.063** 0.7505	**19.037** 0.7495	**0.016** 0.036
22.238 0.8755	**15.862** 0.6245	**15.903** 0.6261	**15.939** 0.6275	**15.875** 0.6250	**15.862** 0.6245	**22.238** 0.8755	**22.212** 0.8745	**0.023** 0.050
25.387 0.9995	**19.012** 0.7485	**19.053** 0.7501	**19.088** 0.7515	**19.050** 0.7500	**19.037** 0.7495	**25.413** 1.0005	**25.387** 0.9995	**0.026** 0.057
33.325 1.3120	**25.362** 0.9985	**25.403** 1.0001	**25.438** 1.0015	**25.400** 1.0000	**25.387** 0.9995	**33.350** 1.3130	**33.325** 1.3120	**0.045** 0.100