DRAWN CUP ROLLER CLUTCHES

Overview: Drawn cup needle roller clutches are similar to drawn cup needle roller bearings in design; however, they allow free rotation in only one direction while transmitting torque in the opposite direction. These designs use the same small radial section as drawn cup needle roller bearings and are offered as clutch-only units or as clutch and bearing assemblies.

- **Sizes:** 3.2 mm – 35 mm bore (0.1250 in. – 1.3780 in.) bore.
- **Markets:** Office equipment, paper-towel dispensers, exercise equipment, appliances and two-speed gearboxes.
- **Features:** Compact, lightweight and operate directly on a hardened shaft.
- **Benefits:** Installation is easily accomplished with a simple press fit.

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.

B

Drawn Cup Roller Clutches

B

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.

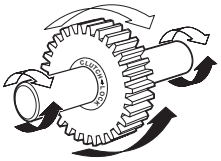


Fig. B-18.
Lock function: shaft drives gear clockwise (white arrows) or gear can drive shaft counterclockwise (black arrows)

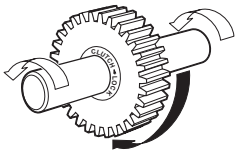


Fig. B-19.
Overrun function: shaft overruns in gear counter-clockwise (white arrows) or gear overruns on shaft clockwise (black arrow)

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.

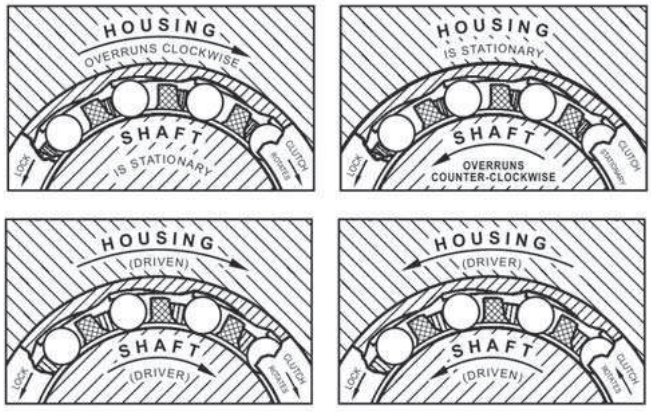
Fig. B-22. Clutch only

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

APPLICATION

Clutches and clutch and bearing assemblies are successfully applied in a wide range of commercial products where indexing, backstopping and overrunning operations must be performed reliably. The sketches on these pages illustrate some of the many possible uses.

When applying the clutch-only unit, separate bearings on each side of the clutch are required to position the shaft concentrically with the housing, and to carry the radial loads during overrun. Drawn cup needle roller bearings, with the same radial section as the clutch, should be used in the through-bored housings for simplicity and economy. Two clutches can be used side by side for greater torque capacity.

Where the radial loads are light, the clutch and bearing assembly can be used without additional support bearings. This reduces the overall assembly width, the number of stocked and ordered parts and assembly costs, as well.

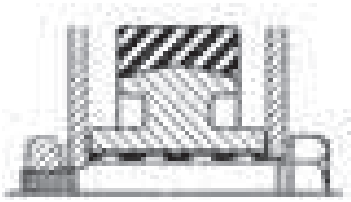


Fig. B-24. Clutch and bearing arrangement for heavy loads

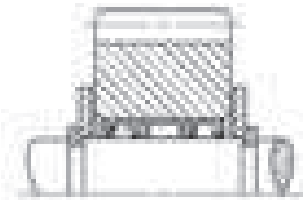


Fig. B-25. Clutch and bearing assembly for light loads

Drawn cup roller clutches are manufactured to commercial hardware standards and are used extensively in appliances, business machines, industrial and recreation equipment and a wide range of other applications.

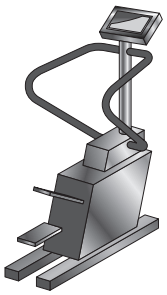
In any application where our clutch may be considered, it will be part of a system in which the operating conditions and the clutch mounting will affect its function. Before any clutch selection is made, it is important that the following catalog section be carefully studied to understand the effects of these factors. Consideration should be given to operating conditions such as:

- Magnitude of externally applied torque, as well as inertial torque.
- Magnitude of applied radial loads during overrunning.
- Potential for vibration or axial shaft movement within the clutch during engagement.
- Engagement rate, as it pertains to the selection of stainless steel or plastic leaf springs.
- Oil lubricant supply during high overrunning speeds.
- External and internal environmental temperatures that can affect clutch performance.
- Lubricant selection effect on clutch engagement.
- Indexing inaccuracies resulting from backlash (lost motion).

Consideration should be given to the shaft and housing design requirements such as:

- Shaft hardness and strength particularly when approaching torque rating limits.
- Shaft roundness, taper and surface finish necessary to ensure sufficient fatigue life and torque-carrying ability.
- Housing strength (hardness and cross section) to support the applied torque loads.
- Housing roundness, taper and surface finish necessary to ensure uniform torque and load distribution.

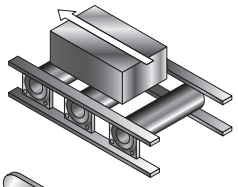
A test program under all expected operating conditions should be carried out before putting a new application into production. Customer engineers are constantly working with and testing new applications, and their experience can be of great help to the designer considering the use of a drawn cup roller clutch.



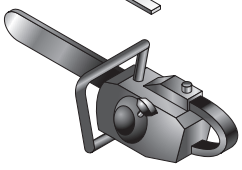
Stair steppers and other athletic equipment

Lawnmower differential

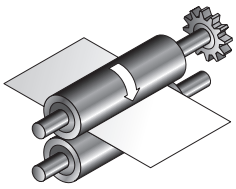
Towel dispensers and similar web roll feed mechanisms



Conveyor rollers



Chainsaw starters



Paper feed rolls in business machines

Fig. B-26(1). Drawn cup clutches and clutch and bearing assembly applications

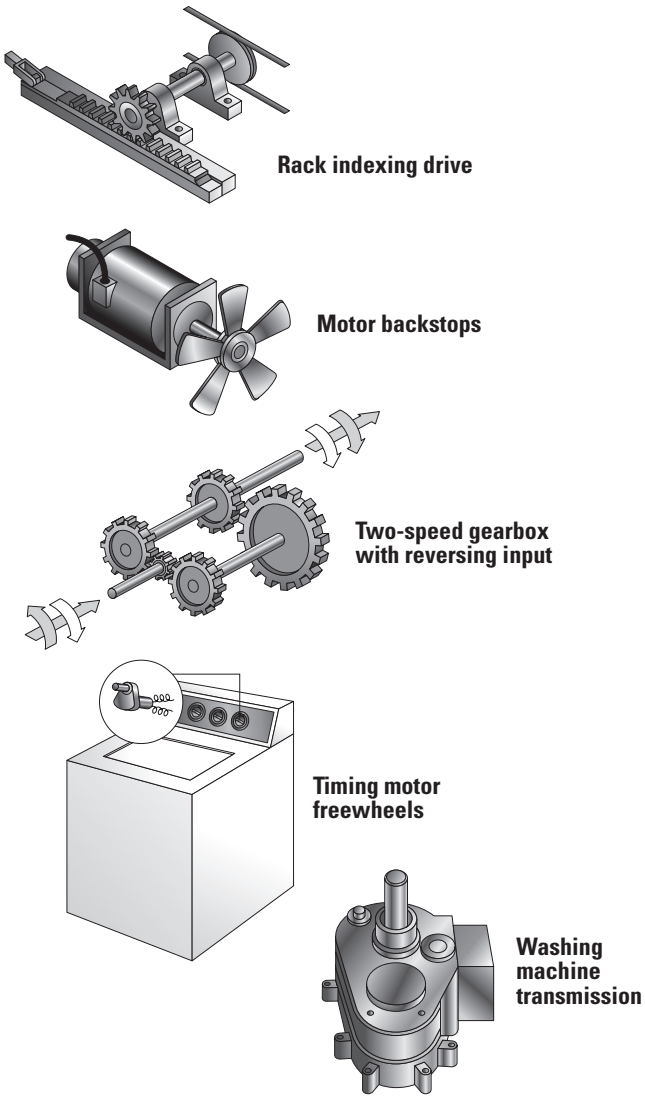


Fig. B-26(2). Drawn cup clutches and clutch and bearing assembly applications

HOUSING DESIGN

Drawn cup clutches and clutch and bearing assemblies are mounted with a simple press fit in their housings. Through-bored and chamfered housings are preferred. A 30 degree angle is suggested and care should be taken to round the edge where the chamfer meets the housing bore. A sharp edge at this location can greatly increase installation forces. Provisions for axial location, such as shoulders or snap rings, are not required. The case hardened cups must be properly supported. Steel housings are preferred and must be used for applications involving high-torque loads to prevent radial expansion of the clutch cups. The suggested minimum housing outer diameters in the tables of dimensions are for steel.

The housing bore should be round within one-half of the diameter tolerance.

The taper within the length of the outer ring should not exceed 0.013 mm (0.0005 in.).

The surface finish of the housing bore should not exceed 1.6 µm R_a (63 µin. R_a).

The torque ratings, given in the clutch tables, are based on a steel housing of a large section. When other housing material must be used (such as aluminum, powdered metal and plastics), the torque rating of the clutch will be reduced. Such housings may be satisfactory for lightly torqued applications. But, your representative should be consulted for appropriate housing and shaft suggestions. Otherwise, an insufficient press fit and use of a lower strength housing material can result in more internal clearance and reduced performance of the clutch.

When using non-steel housings, thorough testing of the design is suggested.

Adhesive compounds can be used to prevent creeping rotation of the clutch in plastic housings with low friction properties. Adhesives will not provide proper support in oversized metal housings. When using adhesives, care must be taken to keep the adhesive out of the clutches and bearings.

SHAFT DESIGN

The clutch or clutch and bearing assembly operates directly on the shaft whose specifications of dimension, hardness and surface finish are well within standard manufacturing limits.

Either case-hardening or through-hardening grades of good bearing-quality steel are satisfactory for raceways. Steels modified for free machining, such as those high in sulfur content and particularly those containing lead, are seldom satisfactory for raceways.

For long fatigue life, the shaft raceway must have a hardness equivalent to 58 HRC minimum and must be ground to the suggested diameter shown in the tables of dimensions. It may be through-hardened, or it may be case hardened with an effective case depth of 0.40 mm (0.015 in.). Effective case depth is defined as the distance from the surface inward to the equivalent of 50 HRC hardness level after grinding.

Taper within the length of the raceway should not exceed 0.008 mm (0.0003 in.), or one-half the diameter tolerance – whichever is smaller. The radial deviation from true circular form of the raceway should not exceed 0.0025 mm (0.0001 in.) for diameters up to and including 25 mm (1.0 in.). For raceways greater than 25 mm (1.0 in.), the allowable radial deviation should not exceed 0.0025 mm (0.0001 in.) multiplied by a factor of the raceway diameter divided by 25 (1.0 in.). Surface finish on the raceway should not exceed 0.4 µm (16 µin.) R_a. Deviations will reduce the load capacity and fatigue life of the shaft.

INSTALLATION

Simplicity of installation promotes additional cost savings. The drawn cup roller clutch or the clutch and bearing assembly must be pressed into its housing. Procedures are virtually identical with those for installing drawn cup bearings, as detailed on pages B-50 and B-92. The unit is pressed into the bore of a gear or pulley hub or housing of the proper size. No shoulders, splines, keys, screws or snap rings are required.

Installation procedures are summarized in the following sketches:

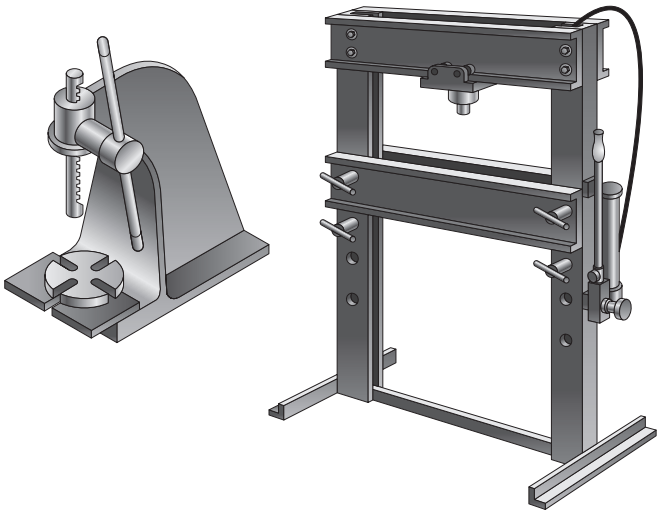


Fig. B-27. Arbor press and hydraulic ram press

Use an arbor press or hydraulic ram press to exert steady pressure. Never use a hammer, or other tool requiring pounding to drive the clutch into its housing.

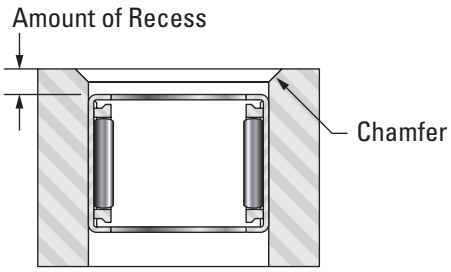


Fig. B-28. Chamfered housing bore

Make sure that the housing bore is chamfered to permit easy introduction of the clutch and bearing or the clutch unit. Press unit slightly beyond the chamfer in the housing bore to assure full seating. Through-bored housings are always preferred. If the housing has a shoulder, never seat the clutch against the shoulder. For further details, see pages B-50 and B-92.

Fig. B-29. Lock marking

IMPORTANT: The mounted clutch or clutch and bearing assembly engages when the housing is rotated relative to the shaft in the direction of the arrow and lock marking (◄– LOCK) stamped on the cup. Make sure that the unit is oriented properly before pressing it into its housing.

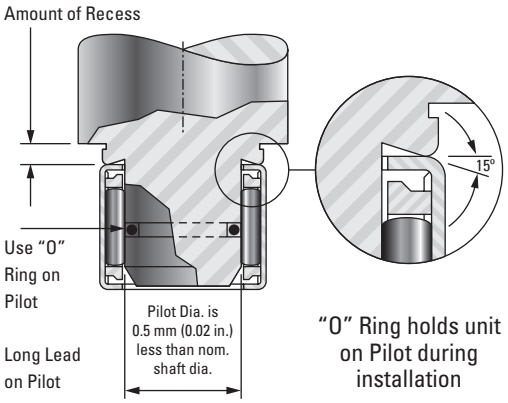


Fig. B-30. Installation tool

Use an installation tool as shown in Fig. B-30. If the clutch is straddled by needle roller bearings, press units into position – in proper sequence – and preferably leave a small clearance between units.

When assembling the shaft, it should be rotated in the overrun direction during insertion. The end of the shaft should have a large chamfer or rounding.

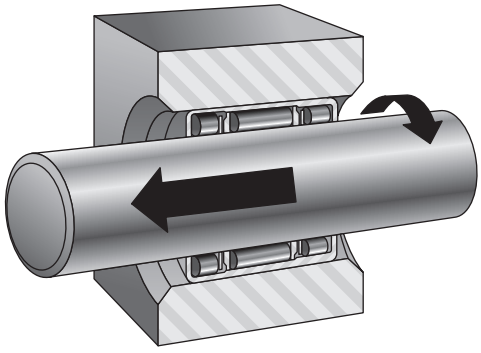


Fig. B-31. Rotate shaft in the overrun direction during insertion

APPLIED LOADS

The clutch-only unit is designed to transmit purely torque loads. Applied torque should not exceed the catalog ratings, which are based on the compressive strength of well-aligned clutch components. Bearings on either side of the clutch are to assure concentricity between the shaft and the housing to support radial loads during clutch overrun. Integral clutch and bearing assemblies are available for this purpose, especially where the radial loads are light. The total maximum dynamic radial load that may be shared by the two needle roller and cage radial bearing assemblies should not be greater than C/3.

In determining the total torque load on a clutch, it is essential to consider the torque, due to inertial forces developed in the mechanism, in addition to the externally applied torque. The larger the clutch, and the greater the mass of the mechanism controlled by it, the more important this consideration becomes.

Clutch lockup depends on friction. For this reason, applications involving severe vibrations or axial motion of the shaft within the clutch are to be avoided. Applications where overhanging or overturning loads occur should incorporate bearings that will maintain alignment between the shaft and the clutch housing. Consult your representative for suggestions.

LUBRICATION

Oil is the preferred lubricant; it minimizes wear and heat generation. For those applications where oil is not practical, clutches are packed with a soft grease containing mineral oil. Thick grease will retard roller engagement and can cause individual rollers to slip, possibly overloading any engaged rollers.

TEMPERATURE

Temperature extremes can cause clutch malfunctions and failure. The molded plastic cage with integral springs holds its necessary resiliency and strength when the operating temperature within the clutch is kept below 90° C (200° F). The clutch with reinforced nylon cage and separate steel springs operates well at temperatures up to 120° C (250° F) continuously and to 150° C (300° F) intermittently. Excessive thickening of the lubricant at low temperatures may prevent some, or all, of the rollers from engaging. New applications should be tested under expected operating conditions to determine whether or not temperature problems exist.

BACKLASH

Backlash, or lost motion, prior to engagement is minimal. The variation in backlash from one cycle to another is extremely low. Grease lubrication, or improper fit (housing bore and shaft diameter), may increase backlash. Angular displacement between the shaft and housing increases as an applied torque load is increased.

RATE OF ENGAGEMENT

Clutch lockup depends upon static friction. Axial motion between shaft and clutch rollers prevents lockup.

Clutches with integral springs engage satisfactorily at cyclic rates up to 200 engagements per minute. Intermittent operation at higher rates has been successful. The steel spring type clutches have proven dependability at rates up to 6000 or 7000 engagements per minute. Even higher cyclic rates may be practical. Because grease may impair engagement at high cyclic rates, a light oil should be used.

OVERRUN LIMIT SPEED RATING

Exact limiting speed ratings are not easily predictable. The value for each clutch given in the bearing tables is not absolute but serves as a guide for the designer. Oil lubrication is absolutely necessary for high speed operations. Consult your representative when overrunning speeds are high.

INSPECTION

Although the outer cup of the clutch is accurately drawn from strip steel, it can go slightly out of round during heat treat. When the assembly is pressed into a ring gage, or properly prepared housing of correct size and wall thickness, it becomes round and properly sized. Direct measurement of the outer diameter of a drawn cup assembly is an incorrect procedure. The proper inspection procedure is as follows:

1. Press the assembly into a ring gage of the proper size, as given in the tables.
2. Gage the bore with the specified plug gages of the proper size, as given in the tables of dimensions.
   a. The locking plug is rotated to ensure lockup when the clutch is operated on a low-limit shaft and is mounted in a high-limit housing, strong enough to properly size the clutch.
   b. The overrun plug is rotated to ensure free overrunning when the clutch is operated on a high-limit shaft and is mounted in a low-limit housing.
   c. The “go” plug and “no go” plug ensure proper size of the bearings in the clutch and bearing assemblies.

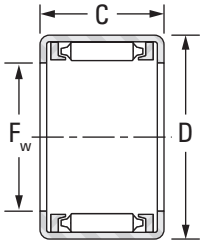
Gage sizes are listed in the tables of dimensions. Plug gage sizes reflect adjustment for the loose and tight conditions resulting from high or low housings or shafts.

DRAWN CUP ROLLER CLUTCHES

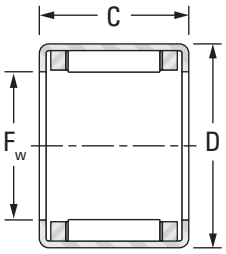
METRIC SERIES

- 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.
- Types FC, FCS, FC-K and FCL-K clutches have stainless steel springs inserted in molded cage to position rollers for lockup.

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



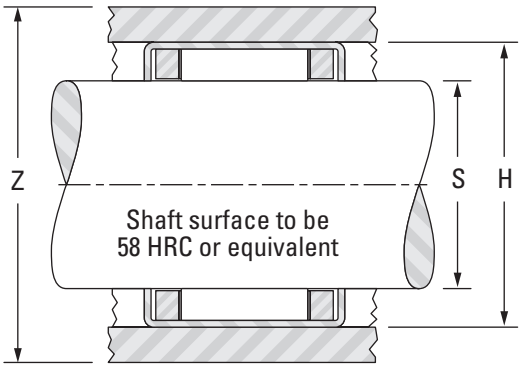
FC



FCS, FCL-K and FC-K

Shaft Diameter	F_w	D	C	Clutch Designation	Torque Rating	Z	Overrun Limiting Speed Rating for Rotating Shaft	Suitable Drawn Cup Bearing[1]
			-0.30 mm -0.012 in.			Minimum O.D. of Steel Housing for Rated Torque		
mm in.	mm in.	mm in.	mm in.		N-m lbf-in.	mm in.	min^{-1}	
4 0.1575	4 0.1575	8 0.3150	6 0.236	FC-4-K	0.349 3.09	11 0.433	26000	HK0408
6 0.2362	6 0.2362	10 0.3937	12 0.472	FCS-6	2.15 19.0	14 0.551	22000	HK0608
	6 0.2362	10 0.3937	12 0.472	FC-6	2.63 23.3	14 0.551	22000	HK0608
8 0.3150	8 0.3150	12 0.4724	12 0.472	FCL-8-K	3.39 30.0	17 0.669	21000	HK0808
	8 0.3150	14 0.5512	12 0.472	FC-8	4.42 39.1	20 0.787	21000	—
10 0.3937	10 0.3937	14 0.5512	12 0.472	FCL-10-K	4.60 40.7	20 0.787	19000	HK1010
	10 0.3937	16 0.6299	12 0.472	FC-10	5.82 51.5	25 0.984	19000	—
12 0.4724	12 0.4724	18 0.7087	16 0.630	FC-12	14.0 124	27 1.063	19000	HK1212
14 0.5512	14 0.5512	20 0.7874	16 0.630	FC-14-K	14.8 131	29 1.142	16000	HK1412
16 0.6299	16 0.6299	22 0.8661	16 0.630	FC-16	21.7 192	31 1.22	14000	HK1612
20 0.7874	20 0.7874	26 1.0236	16 0.630	FC-20	32.6 289	38 1.496	11000	HK2012
	20 0.7874	26 1.0236	16 0.630	FC-20-K	30.0 266	38 1.496	11000	HK2012
25 0.9843	25 0.9843	32 1.2598	20 0.787	FC-25-K	66.4 588	46 1.811	8700	HK2512
	25 0.9843	32 1.2598	20 0.787	FC-25	71.0 628	46 1.811	8700	HK2512
30 1.1811	30 1.1811	37 1.4567	20 0.787	FC-30	99.1 877	51 2.008	7300	HK3012
35 1.3780	35 1.3780	42 1.6535	20 0.787	FCS-35	107.0 947	56 2.205	6100	HK3512

[1] See pages B-52 to B-61 for suitable bearing types and sizes.



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.
7.984 0.3143	**3.980** 0.1567	**4.004** 0.1576	**4.000** 0.1575	**3.995** 0.1573	**7.993** 0.3147	**7.984** 0.3143	**0.001** 0.002
9.984 0.3931	**5.980** 0.2354	**6.004** 0.2364	**6.000** 0.2362	**5.995** 0.2360	**9.993** 0.3934	**9.984** 0.3931	**0.003** 0.007
9.984 0.3931	**5.980** 0.2354	**6.004** 0.2364	**6.000** 0.2362	**5.995** 0.2360	**9.993** 0.3934	**9.984** 0.3931	**0.004** 0.009
11.980 0.4717	**7.976** 0.3140	**8.005** 0.3152	**8.000** 0.3150	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	**0.003** 0.007
13.980 0.5504	**7.976** 0.3140	**8.005** 0.3152	**8.000** 0.3150	**7.994** 0.3147	**13.991** 0.5508	**13.980** 0.5504	**0.007** 0.015
13.980 0.5504	**9.976** 0.3928	**10.005** 0.3939	**10.000** 0.3937	**9.994** 0.3935	**13.991** 0.5508	**13.980** 0.5504	**0.004** 0.009
15.980 0.6291	**9.976** 0.3928	**10.005** 0.3939	**10.000** 0.3937	**9.994** 0.3935	**15.991** 0.6296	**15.980** 0.6291	**0.009** 0.020
17.980 0.7079	**11.974** 0.4714	**12.006** 0.4727	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	**0.012** 0.026
19.976 0.7865	**13.972** 0.5501	**14.006** 0.5514	**14.000** 0.5512	**13.992** 0.5509	**19.989** 0.7870	**19.976** 0.7865	**0.016** 0.035
21.976 0.8652	**15.972** 0.6288	**16.006** 0.6302	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	**0.018** 0.040
25.976 1.0227	**19.970** 0.7862	**20.007** 0.7877	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	**0.021** 0.046
25.976 1.0227	**19.970** 0.7862	**20.007** 0.7877	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	**0.016** 0.035
31.972 1.2587	**24.967** 0.9830	**25.007** 0.9845	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	**0.026** 0.057
31.972 1.2587	**24.967** 0.9830	**25.007** 0.9845	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	**0.034** 0.075
36.972 1.4556	**29.967** 1.1798	**30.007** 1.1814	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	**0.042** 0.093
41.972 1.6524	**34.964** 1.3765	**34.009** 1.3389	**35.000** 1.3780	**34.989** 1.3775	**41.988** 1.6531	**41.972** 1.6524	**0.048** 0.106

DRAWN CUP ROLLER CLUTCHES AND BEARING ASSEMBLIES

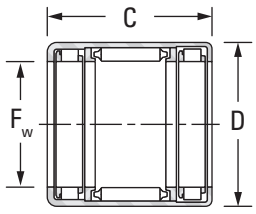
METRIC SERIES

B

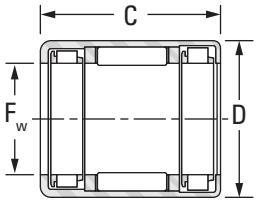
- The clutch and bearing assembly engages when the housing is rotated relative to shaft in direction of arrow marking (← LOCK), as labeled on cup.
- Shaft raceway and housing bore diameters that are necessary for proper mounting and operation are listed on the opposite page.
- Proper inspection requires 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.
- Types FCB, FCBL-L and FCBN-K clutch and bearing assemblies have stainless steel springs inserted in molded cage to position rollers for lockup.

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

Clutch and bearing assemblies



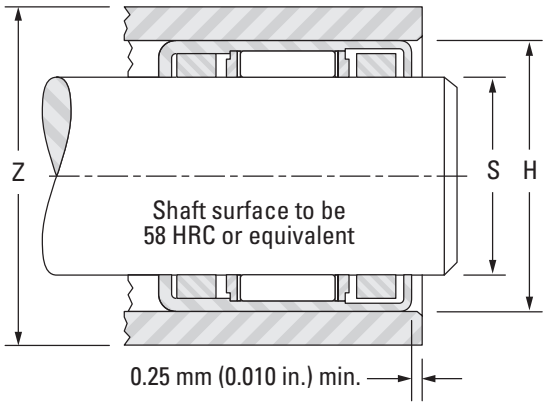
FCB



FCBL-K and FCBN-K

Shaft Diameter	F_w	D	C	Clutch and Bearing Assembly Designation	Torque Rating	Z	Load Ratings[1]		Overrun Limiting Speed Rating for Rotating Shaft
						Minimum O.D. of Steel Housing for Rated Torque	C	C_0	
			-0.30 mm -0.012 in.				Dynamic	Static	
mm in.	**mm** in.	**mm** in.	**mm** in.		**N-m** lbf-in.		**kN** lbf.	**kN** lbf.	min^{-1}
4 0.1575	**4** 0.1575	**10** 0.3937	**9** 0.354	FCBN-4-K	**0.19** 1.68	**16** 0.630	**1.86** 418	**0.99** 223	26000
6 0.2362	**6** 0.2362	**12** 0.4724	**10** 0.394	FCBN-6-K	**0.56** 4.96	**18** 0.709	**2.48** 558	**1.48** 333	22000
8 0.3150	**8** 0.3150	**12** 0.4724	**22** 0.866	FCBL-8-K	**3.39** 30.0	**17** 0.669	**3.62** 814	**3.28** 737	21000
	8 0.3150	**14** 0.5512	**20** 0.787	FCB-8	**4.42** 39.1	**20** 0.787	**4.22** 949	**3.04** 683	21000
10 0.3937	**10** 0.3937	**16** 0.6299	**20** 0.787	FCB-10	**5.82** 51.5	**25** 0.984	**4.84** 1090	**3.80** 854	19000
12 0.4724	**12** 0.4724	**18** 0.7087	**26** 1.024	FCB-12	**14.0** 124	**27** 1.063	**6.30** 1420	**5.84** 1310	19000
16 0.6299	**16** 0.6299	**22** 0.8661	**26** 1.024	FCB-16	**21.7** 192	**31** 1.220	**6.64** 1490	**7.12** 1600	14000
20 0.7874	**20** 0.7874	**26** 1.0236	**26** 1.024	FCB-20	**32.6** 289	**38** 1.496	**8.16** 1830	**9.46** 2130	11000
25 0.9843	**25** 0.9843	**32** 1.2598	**30** 1.181	FCB-25	**71.0** 628	**46** 1.811	**11.3** 2540	**13.1** 2940	8700
30 1.1811	**30** 1.1811	**37** 1.4567	**30** 1.181	FCB-30	**99.1** 877	**51** 2.008	**11.5** 2590	**14.9** 3350	7300

[1] Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.



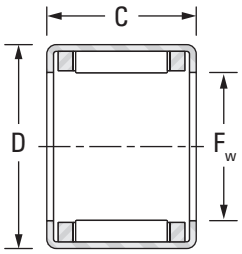
Gaging				S		H		Approx. Wt.
				Mounting				
Ring Gage	Clutch Locking Plug	Clutch Overrun and Bearing Go Plug	Bearing No Go Plug	Max.	Min.	Max.	Min.	
mm in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**kg** lbs.
9.984 0.3931	**3.980** 0.1567	**4.004** 0.1576	**4.030** 0.1587	**4.000** 0.1575	**3.995** 0.1573	**9.993** 0.3934	**9.984** 0.3931	**0.003** 0.007
11.980 0.4717	**5.977** 0.2353	**6.004** 0.2364	**6.030** 0.2374	**6.000** 0.2362	**5.995** 0.2360	**11.991** 0.4721	**11.980** 0.4717	**0.004** 0.009
11.980 0.4717	**7.976** 0.3140	**8.005** 0.3152	**8.033** 0.3163	**8.000** 0.3150	**7.994** 0.3147	**11.991** 0.4721	**11.980** 0.4717	**0.005** 0.011
13.980 0.5504	**7.976** 0.3140	**8.005** 0.3152	**8.033** 0.3163	**8.000** 0.3150	**7.994** 0.3147	**13.991** 0.5508	**13.980** 0.5504	**0.011** 0.024
15.980 0.6291	**9.976** 0.3928	**10.005** 0.3939	**10.033** 0.3950	**10.000** 0.3937	**9.994** 0.3935	**15.991** 0.6296	**15.980** 0.6291	**0.013** 0.029
17.980 0.7079	**11.974** 0.4714	**12.006** 0.4727	**12.036** 0.4739	**12.000** 0.4724	**11.992** 0.4721	**17.991** 0.7083	**17.980** 0.7079	**0.018** 0.040
21.976 0.8652	**15.972** 0.6288	**16.006** 0.6302	**16.036** 0.6313	**16.000** 0.6299	**15.992** 0.6296	**21.989** 0.8657	**21.976** 0.8652	**0.024** 0.053
25.976 1.0227	**19.970** 0.7862	**20.007** 0.7877	**20.043** 0.7891	**20.000** 0.7874	**19.991** 0.7870	**25.989** 1.0232	**25.976** 1.0227	**0.028** 0.062
31.972 1.2587	**24.967** 0.9830	**25.007** 0.9845	**25.043** 0.9859	**25.000** 0.9843	**24.991** 0.9839	**31.988** 1.2594	**31.972** 1.2587	**0.048** 0.106
36.972 1.4556	**29.967** 1.1798	**30.007** 1.1814	**30.043** 1.1828	**30.000** 1.1811	**29.991** 1.1807	**36.988** 1.4562	**36.972** 1.4556	**0.054** 0.119

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.

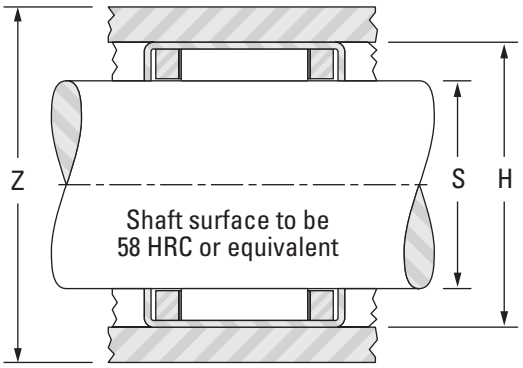
The mounted clutch engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.



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

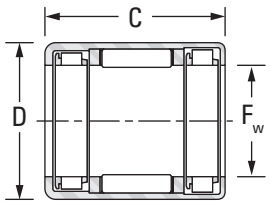
DRAWN CUP ROLLER CLUTCH AND BEARING ASSEMBLIES

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.

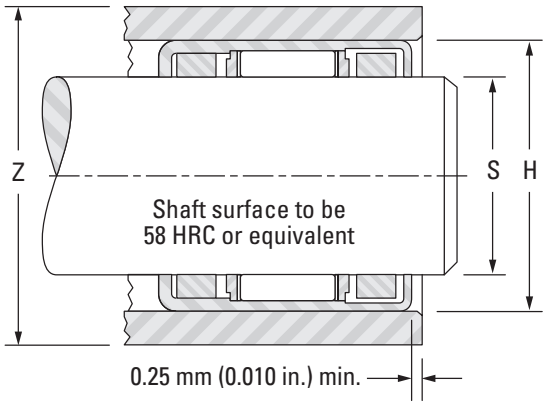
The mounted clutch and bearing assemblies engages when the housing is rotated relative to the shaft in the direction of the arrow marking (← LOCK) stamped on the cup.



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	C_0	
								Dynamic	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

B

INTRODUCTION

OTHER AVAILABLE CLUTCHES

In addition to the metric and inch sizes of drawn cup clutches and clutch and bearing assemblies already discussed, JTEKT offers other types of drawn cup clutches to address special customer needs:

DRAWN CUP ROLLER CLUTCHES FOR USE IN PLASTIC HOUSINGS

FCP AND DF TYPES

Types **FCP** and **DF** clutches feature axial grooves in the outside surface of the clutch cup. It is important that these grooves align with similar protrusions in the housing bore to prevent the clutch from slipping relative to the housing.

Types **FCP** and **DF** clutches are available with bore diameters of 4, 6, 8 and 10 mm.

These clutches may be made available already mounted in a plastic housing such as a gear or a pulley to meet the customer's design specifications.

Please contact your representative for details and availability.

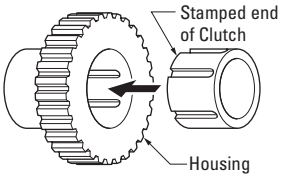


Fig. B-32. Clutch installation into housing

CHARACTERISTICS

- Easily unitized – they can be unitized with plastic parts such as gears, pulleys, rollers, etc. as needed.
- Creep preventing structure – creep is prevented by mating a thin cross section roller clutch, which has special grooves on O.D. formed by a precision press, with a plastic part that has an equal number of bosses on the bore of the housing.
- High precision and good durability – high precision and good durability is obtained because cam surfaces are formed by precision deep drawing.
- Small and compact – this series satisfies the need for a lighter compact product.

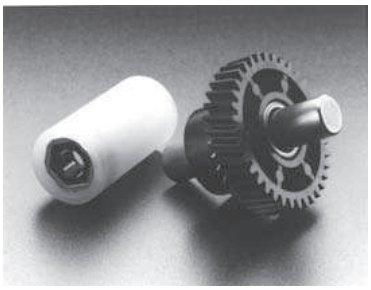


Fig. B-33. Sample DF and FCP clutches

STRUCTURE

Drawn cup roller clutches for plastic housings are composed of a drawn cup with internal cam surfaces and creep preventing grooves on O.D., rollers, and a retainer with either integral plastic or stainless steel springs.

The plastic housings can be a plastic gear, a pulley, a roller, etc., so it is possible to design the housing to meet any customers' needs.

ROLLER CLUTCH UNITS WITH PLASTIC HOUSINGS

FCU TYPES

Type **FCU** clutches were developed for office equipment and similar applications.

The **FCU** clutches are available with bore diameters of 6 and 8 mm.

They can be supplied with housings of various shapes to meet customer needs.

Please contact your representative for details and availability.

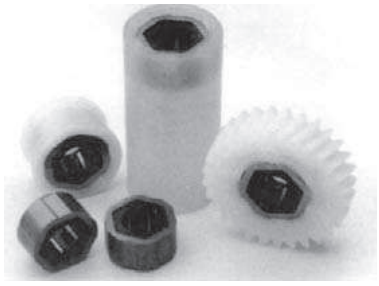


Fig. B-34. Sample of FCU clutch

RECOMMENDED FIT FOR SHAFT AND HOUSING

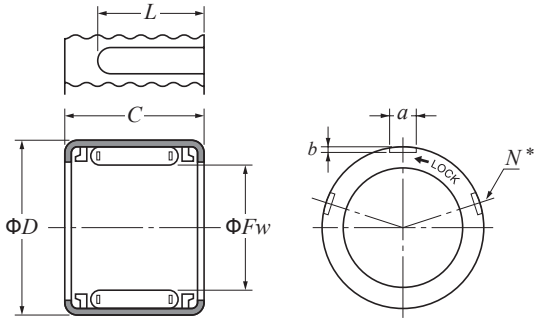
Drawn cup roller clutches for plastic housings are at their designed dimensions and tolerances only when they are installed in plastic housings.

- Shaft Material:
  - Carbon steel for machine structural use
  - Rolled steel for general use
  - Stainless steel
- Shaft Tolerance: h9 class
- Shaft surface finish: 0.4 micrometers
- Housing: Please consult your representative for housing bore sizes if purchasing roller clutches without housings. These roller clutches can be used with cylindrical steel or aluminum housings. In this case, please consult your representative for proper fit.

Specially designed clutches for use with plastic housings. Available in bores from 4 to 10 mm and ¼" and 3/8" bores. Grooves drawn into cup O.D. mate with protrusions molded into plastic housing bore to prevent clutch from moving relative to plastic housing. JTEKT can supply molded plastic housing and clutch assemblies.

JTEKT also has low cost FCU clutches available in 6 and 8 mm and 0.2362 in. to 0.3150 in. bores.

Can be designed and supplied with housings of various shapes to meet customer needs.



* Number of equally spaced grooves

Fig. B-35. Nominal clutch dimensions

Table B-15. Drawn cup roller clutches for plastic housings

Fw	D	C	a	b	L	N	Clutch Designation	Locking[1] Direction	Torque Rating (N-m)	Overrunning Drag (mN-m)	Type of Spring
mm in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.				**N-m**	**mN-m**	
4 0.1575	**8** 0.3150	**6** 0.2362	**1.0** 0.0394	**0.25** 0.0098	**4** 0.1575	5	DF-500401	CCW	**0.13**	**1.96**	Stainless Steel
	8 0.3150	**6** 0.2362	**1.0** 0.0394	**0.25** 0.0098	**4** 0.1575	5	DF-500408	CW	**0.13**	**1.96**	Stainless Steel
6 0.2362	**10** 0.3937	**8** 0.3150	**1.2** 0.0472	**0.25** 0.0098	**5.5** 0.2165	3	DF-500609	CCW	**0.44**	**2.94**	Integral Plastic
	10 0.3937	**8** 0.3150	**1.2** 0.0472	**0.25** 0.0098	**5.5** 0.2165	3	DF-500610	CW	**0.44**	**2.94**	Integral Plastic
	12 0.4724	**11** 0.4331	**1.5** 0.0591	**0.25** 0.0098	**8.5** 0.3346	5	FCP-6	CCW	**0.10**	**2.94**	Integral Plastic
	12 0.4724	**11** 0.4331	**1.5** 0.0591	**0.25** 0.0098	**8.5** 0.3346	5	FCPC-6	CW	**0.10**	**2.94**	Integral Plastic
	12 0.4724	**11** 0.4331	**1.5** 0.0591	**0.25** 0.0098	**8.5** 0.3346	5	FCP-6H	CCW	**0.90**	**2.94**	Integral Plastic
	12 0.4724	**11** 0.4331	**1.5** 0.0591	**0.25** 0.0098	**8.5** 0.3346	5	FCPC-6H	CW	**0.90**	**2.94**	Integral Plastic
8 0.3150	**12** 0.4724	**8** 0.3150	**1.2** 0.0472	**0.25** 0.0098	**5.5** 0.2165	9	DF-500808	CCW	**0.50**	**2.94**	Integral Plastic
	12 0.4724	**8** 0.3150	**1.2** 0.0472	**0.25** 0.0098	**5.5** 0.2165	9	DF-500809	CW	**0.50**	**2.94**	Integral Plastic
	12 0.4724	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	9	FCP-8	CCW	**0.21**	**2.94**	Integral Plastic
	12 0.4724	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	9	FCPC-8	CW	**0.21**	**2.94**	Integral Plastic
	12 0.4724	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	9	FCP-8H	CCW	**1.67**	**2.94**	Integral Plastic
	12 0.4724	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	9	FCPC-8H	CW	**1.67**	**2.94**	Integral Plastic
	12 0.4724	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	9	DF-500804	CCW	**1.67**	**2.94**	Integral Plastic
10 0.3937	**14** 0.5512	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	5	FCP-10	CCW	**0.28**	**3.92**	Integral Plastic
	14 0.5512	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	5	FCPC-10	CW	**0.28**	**3.92**	Integral Plastic
	14 0.5512	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	5	FCP-10H	CCW	**2.26**	**3.92**	Integral Plastic
	14 0.5512	**12** 0.4724	**1.2** 0.0472	**0.25** 0.0098	**9.5** 0.3740	5	FCPC-10H	CW	**2.26**	**3.92**	Integral Plastic

[1] Locking direction = Direction clutch must be rotated relative to shaft for clutch to lock as seen from staped end.

NOTES