

Track Rollers/ Cam Followers

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Track Rollers / Cam Followers - Inch Nominal Dimensions

Outside Diameter

8 = $\frac{8}{16} = \frac{1}{2}$ "

16 = $\frac{16}{16} = 1$ "

32 = $\frac{32}{16} = 2$ "

36 = $\frac{36}{16} = 2\frac{1}{4}$ "

CR S B E - 16

Design Modifications

CR stud type

YCR yoke type

S seals

B hex wrench socket

C crowned o.d.

E eccentric stud (CR type only)



INTRODUCTION

Before selecting specific track rollers, the general Engineering section of this catalog should be reviewed for detailed information concerning:

- type selection
- life and load relationships
- life and reliability
- lubrication
- definition of load ratings
- limiting speeds

In addition to these general specifications, review the material which follows before selecting specific track rollers/cam followers.

IDENTIFICATION

The type, special construction features, and size are designated by an identification code consisting of prefix letters followed by a dash and suffix numbers.

The initial prefix letters denote the type of track roller/cam follower. Additional prefix letters are used when it is necessary to denote special construction features. The suffix numbers following the prefix letters denote the size of the track roller/cam follower. See Table 1.

The basic types are listed below:

- CR** – regular stud type, full complement of needle rollers
- YCR** – yoke type, full complement of needle rollers

Construction feature code letters are used as required, in the following order:

- S** – seals and internal thrust washers
- B** – hexagonal wrench socket in stud head [stud type only]
- C** – crowned outer ring
- E** – eccentric stud (stud type only)

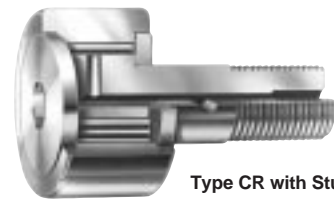
Descriptions of typical examples, with complete letter codes combining basic type of track roller and construction features follow. See Table 2.

Since the entire identification code might not appear on the track roller itself, the manufacturer's parts list or another reliable source should always be consulted when ordering for field or service replacement, to make certain that the correct track roller with the correct lubricant is specified.

Table 1

Identification Code

Prefix Letters		Suffix Numbers			Complete Designation	
type	plus	construction features	plus	o.d. size		equals
CR	plus	SBE	plus	-16	equals	CRSBE-16
CR	plus			-16	equals	CR-16



Type CR with Stud



Type YCR for Yoke Mounting

Table 2

Stud Types	
Description	Prefix Code
with seals and internal thrust washers	CRS
with seals and internal thrust washers and crowned outer ring	CRSC
with seals and internal thrust washers, hex socket and crowned outer ring	CRSBC
with seals and internal thrust washers, hex socket, crowned outer ring and eccentric stud	CRSBCE
Yoke Types	
Description	Prefix Code
with seals and internal thrust washers	YCRS
with seals and internal thrust washers and crowned outer ring	YCRSC



CONSTRUCTION

Torrington track rollers listed on the following pages have been designed for specific use as track rollers or cam followers. The outer ring has a large radial cross section to withstand heavy rolling and shock loads on track type or cam-controlled equipment.

Regular stud type (CR) are designed with integral studs for cantilever mounting. When a regular stud type track roller is used within the working load limit given in the tabular data, the ductile core of the stud provides the necessary toughness for and resistance to shock loads. A screwdriver slot or a hexagonal wrench socket in the head of the stud facilitates mounting.

Yoke type (YCR) are designed for straddle mounting.

Each type is available with a full complement of rollers. All external surfaces have a black oxide finish.

Sealed Track Rollers / Cam Followers

Seals are designed to prevent contamination from entering into the rolling elements and help in the retention of grease. Incorporated in the seals are thrust washer that fit between the shoulders of the outer ring and the inside faces of the steel retaining washer and the flange stud of the track rollers. These washers serve to increase the life of the track roller, particularly when it is infrequently relubricated or where misalignment occurs. In all cases, the external dimensions of the sealed track rollers are the same as the unsealed versions.

Crowned Track Rollers / Cam Followers

These units are available with cylindrical or crowned outer rings.

Crowned units are designed with a crowned outer ring to alleviate the uneven bearing loading resulting from deflection, bending or misalignment in mounting.

To specify a crowned ring for any track roller having a cylindrical outer ring, add the letter “C” at the end of the prefix code. For example:

prefix **CR-** = regular stud type, full complement of needle rollers and cylindrical outer ring

prefix **CR-C-** = same as above, but with crowned outer ring.

The o.d. tolerance of crowned rollers is +0.000, -0.002 inch (+0.000, -0.050mm).

The crown radii are listed in Table 3.

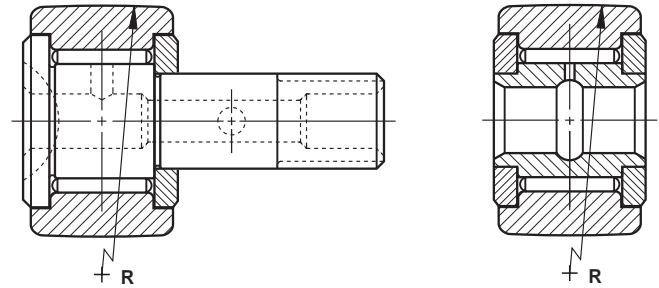


Table 3

Crown radius for types CRC, CRSC, CRSBC, YCRC, YCRSC

Size Designation		R Crown Radius (approx.)		Size Designation		R Crown Radius (approx.)	
(suffix)	inch	mm		(suffix)	inch	mm	
-8	6	150		-28	20	500	
-8-1	7	180		-30	20	500	
-10	7	180		-32	24	600	
-10-1	8	200		-36	24	600	
-12	10	250		-40	30	760	
-14	10	250		-44	30	760	
-16	12	300		-48	30	760	
-18	12	300		-52	30	760	
-20	14	360		-56	30	760	
-22	14	360		-64	30	760	
-24	20	500		-80	48	1200	
-26	20	500		-96	56	1400	

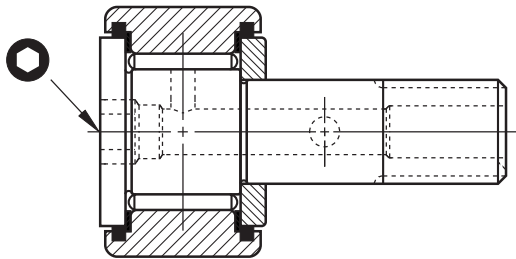


CONSTRUCTION (continued)

Hexagonal Sockets

Smaller sizes of regular stud type track rollers have a screwdriver slot or a hexagonal socket in the flanged end of the stud to facilitate mounting. Larger sizes have a socket to accommodate a hexagonal wrench. Wrench sizes are listed in Table 4.

Hexagonal Wrench Socket

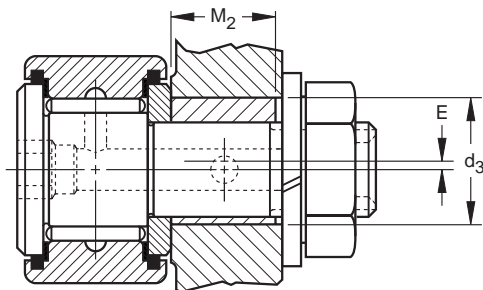


Eccentric Studs

To provide radial adjustment of the outer ring toward the track or cam surface at the time of installation, the regular stud types are available with eccentric studs which are specified by adding the letter "E" to the construction feature code:

prefix **CRSBE-** = regular stud type track roller with full complement of needle rollers, two seals with two internal thrust washers, hexagonal wrench socket in stud head, and eccentric stud.

Pertinent dimensions of the eccentric stud are listed in Table 5.



Since a track roller or cam follower with an eccentric stud is usually adjusted upon installation by turning the stud in the mounting hole, a close clearance fit between the outside diameter of the bushing and the mounting hole is necessary. For turning the stud, a hexagonal wrench is generally more convenient than a screwdriver, and the option for a hexagonal wrench socket in the head of the stud should be exercised.

Some applications may require more secure positioning than provided by the tightened stud nut. If so, it is recommended that the housing and eccentric bushing be drilled at the time of installation to accept a locating dowel pin.

Table 4

Hexagonal wrench sizes

Size Designation	Wrench Size	Size Designation	Wrench Size
(suffix)	inch	(suffix)	inch
-8	1/8	-28	5/16
-8-1	1/8	-30	3/16
-10	1/8	-32	1/16
-10-1	1/8	-36	1/16
-12	3/16	-40	1/2
-14	3/16	-44	1/2
-16	1/4	-48	3/4
-18	1/4	-52	3/4
-20	1/4	-56	3/4
-22	1/4	-64	3/4
-24	5/16	-80	7/8
-26	5/16	-96	1
		-112	1 1/4

Table 5

**Eccentric bushing dimensions
Regular stud type (type CR)**

Size Designation	d ₃ Bushing Outside Diameter		*M ₂ Bushing Width		E Eccentricity	
	+0.001 -0.001	+0.025 -0.025	+0.000 -0.01	+0.00 -0.25	in	mm
(suffix)	in.	mm	in	mm	in	mm
-8-1	0.250	6.350	0.375	9.52	0.010	0.25
-10-1	0.375	9.525	0.437	11.10	0.015	0.38
-12	0.500	12.700	0.500	12.70	0.015	0.38
-14	0.500	12.700	0.500	12.70	0.015	0.38
-16	0.625	15.875	0.500	12.70	0.030	0.76
-18	0.625	15.875	0.500	12.70	0.030	0.76
-20	0.687	17.450	0.625	15.88	0.030	0.76
-22	0.687	17.450	0.625	15.88	0.030	0.76
-24	0.875	22.225	0.750	19.05	0.030	0.76
-26	0.875	22.225	0.750	19.05	0.030	0.76
-28	1.000	25.400	0.875	22.22	0.030	0.76
-30	1.000	25.400	0.875	22.22	0.030	0.76
-32	1.187	30.150	1.000	25.40	0.030	0.76
-36	1.187	30.150	1.000	25.40	0.030	0.76
-40	1.375	34.925	1.125	28.58	0.030	0.76
-44	1.375	34.925	1.125	28.58	0.030	0.76
-48	1.750	44.450	1.250	31.75	0.060	1.52
-52	1.750	44.450	1.250	31.75	0.060	1.52
-56	1.812	46.025	1.375	34.92	0.060	1.52
-64	2.000	50.800	2.000	50.80	0.060	1.52

* To ensure proper clamping of the stud, the housing should be **slightly wider** than the maximum width of the eccentric bushing.



DESIGN CONSIDERATIONS

Even though the radial section of the outer ring is much greater than that of a bearing intended for mounting in a housing, contact (under load) with a track subjects the outer ring to bending stresses, and the needle rollers within the bearing to an abnormal load distribution. Therefore, the working load rating must not be exceeded. See sections on "basic load ratings" and "working load".

The stud (or shaft for yoke type) is also subject to bending stresses. Resultant deflections can cause uneven loading along the length of the needle rollers within the track roller, particularly if the

outer ring is not crowned. Refer to the section on "mounting" for mounting recommendations.

The stud (or shaft for yoke type) must be mounted in a supporting element that will withstand bending and crushing stresses.

The track itself is subjected to contact stresses which may be markedly increased by deflections and, especially, misalignment, if the track roller is not crowned. Consequently, the compressive strength of the track must be considered.

BASIC LOAD RATING

The tables of dimensions list the Basic Dynamic Load Rating (C_r) and the Maximum Working Load for each track roller. Even though a properly mounted track roller can be dynamically operated up to the

Maximum Working Load, the life nomograph is valid only for loads less than $C_r/4$. If the loads are greater, consult your Torrington Engineering Sales Office for life prediction.

WORKING LOAD

For the **stud type**, the maximum working loads listed in the tables are based on stud strength and should not be exceeded by either static or dynamic applied loads.

If the maximum working load is exceeded and a larger size cannot be accommodated, the regular stud type with a heat treated shank for greater stud strength may be made available. Consult your Torrington Engineering Sales Office for working load ratings for track rollers/cam followers with heat treated stud shanks.

For **yoke type**, the maximum working loads listed in the tables should not be exceeded by either static or dynamic applied loads. To withstand these loads, the track roller must be yoke or straddle mounted. Since shaft deflection is not as much of a problem with yoke or straddle mounting as stud deflection in cantilever mountings, the yoke type track rollers can sustain loads well in excess of those for comparable sizes of the regular stud type.

MOUNTING

The surface of the hole in the machine element which supports the stud or the mounting shaft must not deform under the expected load, and the support should be sufficiently rigid to resist bending loads. Deformation and bending will cause uneven loading of the outer ring.

In mounting the stud type, the retaining washer must be firmly backed up by a flat shoulder which is square with the stud center line. The shoulder diameter must be as large as, if not larger than, the minimum clamping diameter listed in the tabular data.

The maximum inherent strength of the stud is obtained when the track roller is supported as close as possible to the retaining washer, which minimizes the bending moment. For this reason, the edge of the housing which supports the stud shank should be kept as sharp as possible, but free from burrs.

To minimize deflection in mounted stud types, the stud shank should be housed with the fit (d_b) shown in the tabular data. The clamping nut should not be tightened with a torque value higher than the maximum listed. A screwdriver slot or hexagonal socket in the end of the stud is provided for a tool to prevent the stud from turning

when the nut is being tightened. Since the bottom of the screwdriver slot is not flat, it is helpful to put a radius on the tip of the screwdriver being used to hold the stud more securely.

When the stud shank is housed with an interference fit, installation force should be applied only to the center portion of the flanged end of the stud, preferably with an arbor press.

When the loads are high, the yoke type should be mounted on a high strength bolt or shaft with the tight transition fit listed in the tabular data. The track roller should be clamped between flat and parallel faces at right angles to the axis to prevent the retaining washers from coming off under load. If the track roller cannot be clamped, a close axial fit in the yoke is required.

When the applied loads are light to moderate, the inner ring of a yoke type may be mounted on an unhardened shaft or bolt with the loose transition fit listed in the tabular data. Again, the retaining washers should be backed up axially to prevent their coming off under load.



LUBRICATION

Except for a few of the smaller sizes, stud type track rollers with a screwdriver slot in the flanged end of the stud have provisions for relubrication through either end of the stud and through a cross-drilled hole in the stud shank. No cross hole is provided in the smaller sizes that have no lubrication hole in the threaded end of the stud. The ends of the axial holes are counterbored to take drive type grease lubrication fittings. Hole diameters for grease lubrication fittings are listed in the tables of dimensions.

Plugs are furnished with stud types to close off unused holes. If the cross-drilled hole in the stud shank is not used, it will be covered when the track roller is installed properly.

The four smallest sizes of stud type track rollers which have hexagonal sockets in the head end of the stud may not be relubricated.

Track rollers in the size range between -12 and -44 have provisions for relubrication through the threaded end of the stud and through a cross-drilled hole in the stud shank. The axial hole in the threaded end is counterbored to take a drive type grease lubrication fitting.

Track rollers in the size range between -48 and -96 can be lubricated through either end of the stud. The -48 through -64 sizes are

supplied with loose lubrication fittings which may be installed in the axial hole in the bottom of the hexagonal socket in the head end of the stud, at a depth which allows the hexagonal wrench to be inserted in the wrench socket without damaging the grease fitting. At the threaded end of the stud, the axial hole is counterbored to receive the supplied drive type grease fitting.

The -80 and -96 sizes are designed with a ¼ NPT in both ends of the stud. Pipe plugs are furnished to close off unused holes.

Most yoke types are produced with lubrication holes and grooves in the inner ring bores so they can be relubricated through axially and radially drilled holes in the supporting shaft or bolt.

Oil is the preferred lubricant for all types. Use continuous oil lubrication or frequent grease relubrication for steady rotating conditions. Applications involving slow, intermittent oscillation are not as critical, and longer intervals between relubrication are permissible. Both stud and yoke types are normally supplied with medium temperature grease lubrication. If special lubricants are required, please specify on order.

SPECIAL TRACK ROLLERS / CAM FOLLOWERS

Track rollers can be obtained with dimensions different from those in the tabular data, if the quantities permit economical production. For these and other modifications, such as special coatings, please consult your Torrington Engineering Sales Office. The Torrington Company also manufactures track rollers designed for aircraft applications, made in accordance with applicable military specifications. Popular sizes are normally available from stock.

Track Rollers with caged needle rollers

Certain sizes of stud and yoke type track rollers with caged needle rollers can be made available upon request. Caged needle rollers permit higher speeds and longer pre-greased life than the full complement of needle rollers in the standard track rollers. The outer ring stress under load is greater, however, due to increased spacing of the needle rollers.

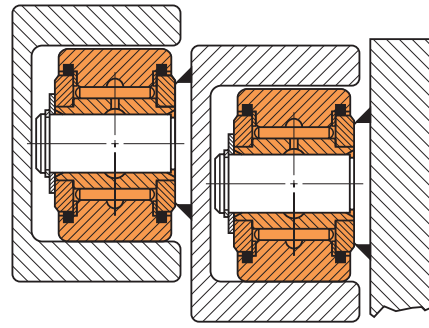
Nominal Metric Series

For stud and yoke types having metric nominal dimensions, with a full complement of needle rollers or caged needle rollers, please consult your nearest Torrington Engineering Sales Office.



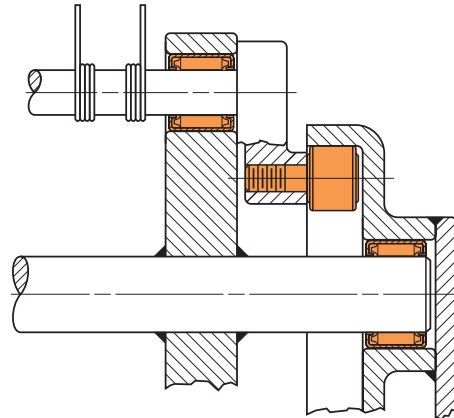
Forklift Truck

Yoke type sealed track rollers serve as high capacity and rugged guide rollers for lift trucks. Their design permits them to be mounted on studs welded to the structure. The seals exclude foreign matter and extend the time between relubrication periods.



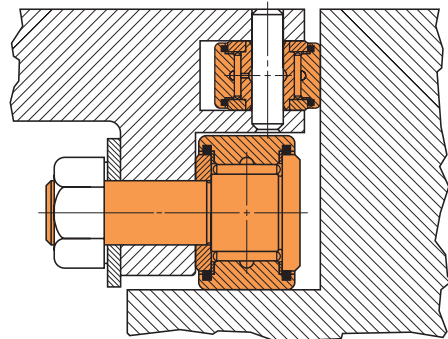
Hay Baler

Stud types are important components on many different types of farm equipment because of their required long service life under punishing loads and severe operating conditions. Needle bearings provide dependable and economical operation in the windrow pickup of hay balers.



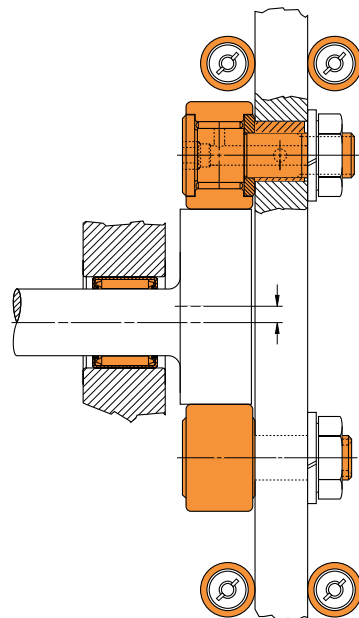
Machine Way

Heavily loaded machine tool tables must travel freely and accurately. Stud and yoke type sealed track rollers, in combination, support and guide such tables under the most severe conditions. The high capacity and the very low wear rate permit heavy loads to be carried without impairing the accuracy of the table's travel. The seals exclude dirt and chips and make the need for relubrication infrequent.



Reciprocating Slide

Stud types find wide application in feeding and advancing mechanisms on metalworking presses. The rotary motion of an eccentric cam rotating between two cam followers mounted on a slide imparts reciprocating linear motion to the slide. Dwell periods as well as accuracy in both rapid and slow linear actuations of the slide are possible.





Types CR, CRS

CONSTRUCTION

The regular stud type track roller is a non-separable unit consisting of an outer ring, a full complement of needle rollers, stud, and a retaining washer securely fastened to the stud. A screwdriver slot in the head of the stud facilitates mounting. Cross-drilled holes in the stud raceway and shank, and an axially drilled hole through the stud, are provided for relubrication. The recessed axial hole accepts a standard nominal inch drive-type grease lubrication fitting. Plugs are furnished to close off unused lubrication fitting holes. Sources for lubrication fittings are available upon request.

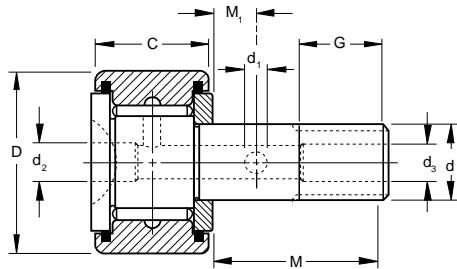
The seals on the type CRS are located in counterbores of the outer ring and seal against the stud flange and retaining washer, providing a good retention of lubricant and exclusion of foreign matter. The seals also have internal thrust washers made of self-lubricating resin.

DIMENSIONS

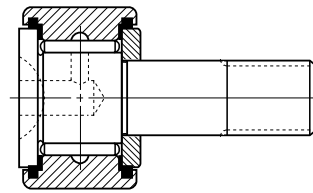
Dimensions given below are for the unplated finished track rollers. Upon request, track rollers may be obtained with chrome plate on the rolling surface and sides of the outer ring, and cadmium plate on the other exposed surfaces, as mounted. When plated, the outer ring outside diameter is a maximum of 0.002" (0.51mm) greater than listed.

Types CR and CRS are manufactured to inch nominal dimensions. Metric dimensions shown are for the convenience of the user. The controlling dimensions are in inches.

Tolerance limits for the outside diameters of the outer ring and the stud refer to the "single mean diameter" (the arithmetical mean of the largest and smallest diameters in a single radial plane).



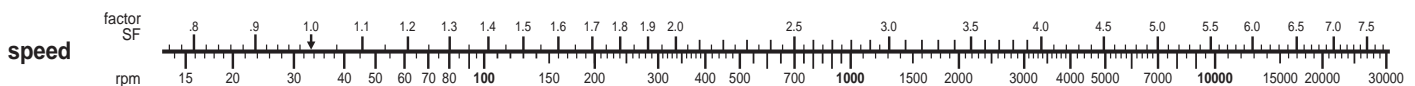
Type CR and CRS -12 to -64



Type CR and CRS -8 to -10-1

Track Roller Designation		D Outside Diameter		d Stud Diameter		C Outer ring Width		M Stud Length		G Perfect Thread Length min.		Threads UNF	M ₁ Cross hole Location	d ₁ Cross hole Diameter	d ₂ Grease Fitting Hole Dia.	d ₃ Grease Fitting Hole Dia.	
without seals	with seals and internal thrust washers	+0.000 -0.001	+0.000 -0.025	+0.0010 -0.0000	+0.025 -0.000	+0.000 -0.005	+0.00 -0.13	(nominal)									
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		inch	mm	inch	mm	
CR-8	CRS-8	0.500	12.700	0.1900	4.826	0.344	8.74	½	12.7	¼	6.4	10 - 32	NONE	NONE	⅜	3.2	NONE
CR-8-1	CRS-8-1	0.500	12.700	0.1900	4.826	0.375	9.52	⅝	15.9	¼	6.4	10 - 32	NONE	NONE	⅜	3.2	NONE
CR-10	CRS-10	0.625	15.875	0.2500	6.350	0.406	10.31	⅝	15.9	⅜	7.9	¼ - 28	NONE	NONE	⅜	3.2	NONE
CR-10-1	CRS-10-1	0.625	15.875	0.2500	6.350	0.438	11.13	⅜	19.0	⅜	7.9	¼ - 28	NONE	NONE	⅜	3.2	NONE
CR-12	CRS-12	0.750	19.050	0.3750	9.525	0.500	12.70	⅞	22.2	⅜	9.5	⅜ - 24	¼	6.4	⅜	4.8	⅜
CR-14	CRS-14	0.875	22.225	0.3750	9.525	0.500	12.70	⅞	22.2	⅜	9.5	⅜ - 24	¼	6.4	⅜	4.8	⅜
CR-16	CRS-16	1.000	25.400	0.4375	11.112	0.625	15.88	1	25.4	½	12.7	⅜ - 20	¼	6.4	⅜	4.8	⅜
CR-18	CRS-18	1.125	28.575	0.4375	11.112	0.625	15.88	1	25.4	½	12.7	⅜ - 20	¼	6.4	⅜	4.8	⅜
CR-20	CRS-20	1.250	31.750	0.5000	12.700	0.750	19.05	1 ¼	31.8	⅝	15.9	½ - 20	⅜	7.9	⅜	4.8	⅜
CR-22	CRS-22	1.375	34.925	0.5000	12.700	0.750	19.05	1 ¼	31.8	⅝	15.9	½ - 20	⅜	7.9	⅜	4.8	⅜
CR-24	CRS-24	1.500	38.100	0.6250	15.875	0.875	22.22	1 ½	38.1	¾	19.0	⅝ - 18	⅜	9.5	⅜	4.8	⅜
CR-26	CRS-26	1.625	41.275	0.6250	15.875	0.875	22.22	1 ½	38.1	¾	19.0	⅝ - 18	⅜	9.5	⅜	4.8	⅜
CR-28	CRS-28	1.750	44.450	0.7500	19.050	1.000	25.40	1 ¾	44.4	⅞	22.2	⅝ - 16	⅜	11.1	⅜	4.8	⅜
CR-30	CRS-30	1.875	47.625	0.7500	19.050	1.000	25.40	1 ¾	44.4	⅞	22.2	⅝ - 16	⅜	11.1	⅜	4.8	⅜
CR-32	CRS-32	2.000	50.800	0.8750	22.225	1.250	31.75	2	50.8	1	25.4	⅜ - 14	½	12.7	⅜	3.2	⅜
CR-36	CRS-36	2.250	57.150	0.8750	22.225	1.250	31.75	2	50.8	1	25.4	⅜ - 14	½	12.7	⅜	3.2	⅜
CR-40	CRS-40	2.500	63.500	1.0000	25.400	1.500	38.10	2 ¼	57.2	1 ⅜	28.6	1 - 14§	⅜	14.3	⅜	3.2	⅜
CR-44	CRS-44	2.750	69.850	1.0000	25.400	1.500	38.10	2 ¼	57.2	1 ⅜	28.6	1 - 14§	⅜	14.3	⅜	3.2	⅜
CR-48	CRS-48	3.000	76.200	1.2500	31.750	1.750	44.45	2 ½	63.5	1 ¼	31.8	1 ¼ - 12	⅝	15.9	⅜	3.2	¼
CR-52	CRS-52	3.250	82.550	1.2500	31.750	1.750	44.45	2 ½	63.5	1 ¼	31.8	1 ¼ - 12	⅝	15.9	⅜	3.2	¼
CR-56	CRS-56	3.500	88.900	1.3750	34.925	2.000	50.80	2 ¾	69.8	1 ⅝	34.9	1 ⅝ - 12	⅞	17.5	⅜	3.2	¼
CR-64	CRS-64	4.000	101.600	1.5000	38.100	2.250	57.15	3 ½	88.9	1 ½	38.1	1 ½ - 12	¾	19	⅜	3.2	¼
		5.000	127.000	} These sizes are manufactured only with hexagonal wrench sockets in the stud head. See pages 468-469.													
		6.000	152.400														

§ UNS instead of UNF thread.





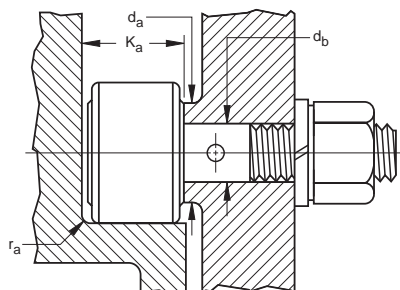
MOUNTING

In mounting stud type track rollers, a close fit between stud and hole is desirable. Bore dimensions given below result in a fit varying from 0.0010" (0.025 mm) tight to 0.0005" (0.013 mm) loose.

The retaining washer should be firmly backed up by a flat housing shoulder perpendicular to the stud axis. To provide sufficient support for the retaining washer, the shoulder diameter should be at least as large as the minimum clamping diameter listed.

Stud types may be mounted using either two thin lock nuts or one lock washer and one nut.

Note: Clamping torque is based on dry threads. If threads are lubricated, use half the torque value listed below.



LOAD RATINGS

The $\text{\textcircled{T}}$ Symbol denotes Torrington Basic Dynamic Load Rating which should be used in load-life calculations. The life nomograph is valid for loads up to $C_r/4$. For loads in excess of $C_r/4$, consult your Torrington Engineering Sales Office for life predictions.

Working loads are based on stud strength and should not be exceeded by either static or dynamic applied loads.

Load ratings are given in pounds-force: 1 lbf = 0.454kgf = 4.448N

EXAMPLE

A stud type track roller is required to operate at 1000 rpm under a load of 350 lbf for an L_{10} life of 2000 hours.

- (a) The selected track roller must have a Working Load Rating of at least 350 lbf.
- (b) The Basic Dynamic Load Rating (C_r) must be at least equal to $350 \cdot 4 = 1400$ lbf. See paragraph "basic load rating" on page 465.
- (c) Calculation: $C_r = \text{applied load} \cdot \text{speed factor} \cdot \text{life factor}$:
 speed factor (SF) = 2.77 (see speed nomograph)
 life factor (LF) = 1.52 (see life nomograph)
 required $C_r = 350 \cdot 2.77 \cdot 1.52 = 1474$ lbf

The CR-12 or (CRS-12) track roller is the smallest which will satisfy all the requirements:

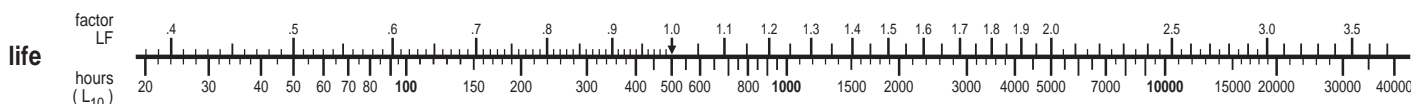
Basic Load Rating = 1510 lbf

Working Load Rating = 1320 lbf

Track Rollers Designation		d_b Bore Diameter for stud		r_a Fillet Radius		Clamping Torque	K_a Mounting Overhang Space		d_a Clamping Diameter		Basic Dynamic Load Rating C_r		Working Load ‡	Limiting Speed
without seals	with seals and internal thrust washers	+0.0005 -0.0000	+0.013 -0.000	max		max	min		min.		$\text{\textcircled{T}}$ ISO 281		max	rpm
		inch	mm	inch	mm	lbf · in	inch	mm	inch	mm	lbf	lbf	lbf	
CR-8	CRS-8	0.1900	4.826	0.010	0.25	15	0.41	10.3	$19/64$	7.5	662	999	306	7000
CR-8-1	CRS-8-1	0.1900	4.826	0.010	0.25	15	0.44	11.1	$19/64$	7.5	742	1120	306	7000
CR-10	CRS-10	0.2500	6.350	0.015	0.38	35	0.47	11.9	$23/64$	9.1	902	1360	562	5500
CR-10-1	CRS-10-1	0.2500	6.350	0.015	0.38	35	0.50	12.7	$23/64$	9.1	981	1480	562	5500
CR-12	CRS-12	0.3750	9.525	0.015	0.38	95	0.56	14.3	$1/2$	12.7	1520	2290	1320	3800
CR-14	CRS-14	0.3750	9.525	0.015	0.38	95	0.56	14.3	$1/2$	12.7	1520	2290	1320	3800
CR-16	CRS-16	0.4375	11.112	0.030	0.76	250	0.69	17.5	$41/64$	16.3	1950	2940	1730	2800
CR-18	CRS-18	0.4375	11.112	0.030	0.76	250	0.69	17.5	$41/64$	16.3	1950	2940	1730	2800
CR-20	CRS-20	0.5000	12.700	0.030	0.76	350	0.81	20.6	$49/64$	19.4	3510	5290	2280	2700
CR-22	CRS-22	0.5000	12.700	0.030	0.76	350	0.81	20.6	$49/64$	19.4	3510	5290	2280	2700
CR-24	CRS-24	0.6250	15.875	0.030	0.76	650	0.94	23.8	$57/64$	22.6	4230	6380	3620	2300
CR-26	CRS-26	0.6250	15.875	0.030	0.76	650	0.94	23.8	$57/64$	22.6	4230	6380	3620	2300
CR-28	CRS-28	0.7500	19.050	0.040	1.02	1250	1.06	27	$1\ 3/64$	26.6	5330	8040	5290	1900
CR-30	CRS-30	0.7500	19.050	0.040	1.02	1250	1.06	27	$1\ 3/64$	26.6	5330	8040	5290	1900
CR-32	CRS-32	0.8750	22.225	0.050	1.27	1500	1.33	33.7	$1\ 13/64$	30.6	6480	9770	7280	1700
CR-36	CRS-36	0.8750	22.225	0.050	1.27	1500	1.33	33.7	$1\ 13/64$	30.6	6480	9770	7280	1700
CR-40	CRS-40	1.0000	25.400	0.090	2.29	2250	1.58	40.1	$1\ 5/16$	33.3	8750	13200	9560	1400
CR-44	CRS-44	1.0000	25.400	0.090	2.29	2250	1.58	40.1	$1\ 5/16$	33.3	8750	13200	9560	1400
CR-48	CRS-48	1.2500	31.750	0.090	2.29	3450	1.83	46.4	$1\ 3/4$	44.4	11100	16800	15200	990
CR-52	CRS-52	1.2500	31.750	0.090	2.29	3450	1.83	46.4	$1\ 3/4$	44.4	11100	16800	15200	990
CR-56	CRS-56	1.3750	34.925	0.090	2.29	4200	2.08	52.8	$1\ 59/64$	48.8	16500	24900	18500	950
CR-64	CRS-64	1.5000	38.100	0.090	2.29	5000	2.33	59.1	$2\ 1/32$	57.9	20600	31100	22000	780

These sizes are manufactured only with hexagonal wrench sockets in the stud head. See pages 468-469.

‡ Maximum working load is based on strength of track roller stud.





Type CRSB

CONSTRUCTION

The sealed stud type track roller is a non-separable unit consisting of an outer ring, a full complement of needle rollers, stud, seals, internal thrust washers made of self-lubricating resin and a retaining washer securely fastened to the stud. A hexagonal wrench socket in the head of the stud facilitates mounting. Cross-drilled holes in the stud raceway and shank, and an axially drilled hole through the stud, are provided for relubrication. The recessed axial hole accepts a standard nominal inch drive-type grease lubrication fitting. Plugs are furnished to close off unused lubrication fitting holes. Sources for lubrication fittings are available upon request.

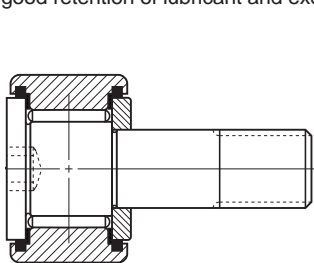
The seals on the type CRSB are located in counterbores of the outer ring and seal against the stud flange and retaining washer, providing a good retention of lubricant and exclusion of foreign matter.

DIMENSIONS

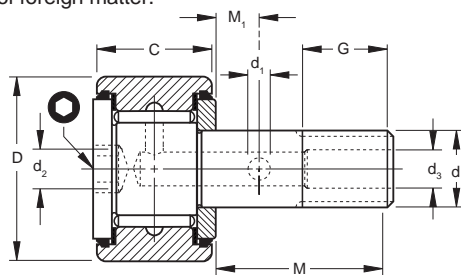
Dimensions given below are for the unplated finished unit. Upon request, track rollers may be obtained with chrome plate on the rolling surface and sides of the outer ring, and cadmium plate on the other exposed surfaces, as mounted. When plated, the outer ring outside diameter is a maximum of 0.002" (0.51mm) greater than listed.

Type CRSB are manufactured to inch nominal dimensions. Metric dimensions shown are for the convenience of the user. The controlling dimensions are in inches.

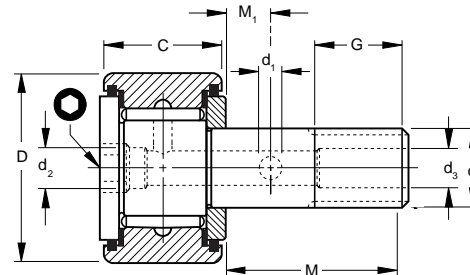
Tolerance limits for the outside diameters of the outer ring and the stud refer to the "single mean diameter" (the arithmetical mean of the largest and smallest diameters in a single radial plane).



Type CRSB -8 to -10 -1



Type CRSB -12 to -44



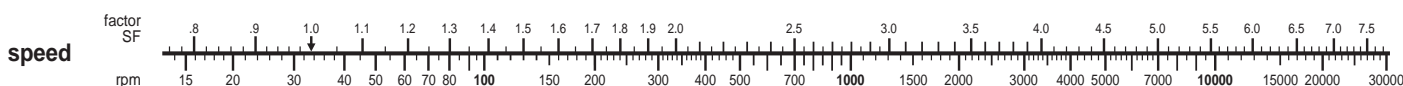
Type CRSB -48 to -96

Track Roller Designation with seals and internal thrust washers	D Outside Diameter		d Stud Diameter		C Outer ring Width		M Stud Length		G Perfect Thread Length		Threads UNF	M ₁ Cross Hole Location		d ₁ Cross Hole Diameter	d ₂ Grease Fitting Hole Dia.	d ₃ Grease Fitting Hole Dia.			
	+0.000 -0.001	+0.000 -0.025	+0.0010 -0.0000	+0.025 0.000	+0.000 -0.005	+0.00 -0.13	(nominal)	min.	inch	mm		inch	mm	inch	mm	inch	mm	inch	mm
CRSB-8	0.500	12.700	0.1900	4.826	0.344	8.74	1/2	12.7	1/4	6.4	10 - 32	NONE	NONE	NONE	NONE				
CRSB-8-1	0.500	12.700	0.1900	4.826	0.375	9.52	5/8	15.9	1/4	6.4	10 - 32	NONE	NONE	NONE	NONE				
CRSB-10	0.625	15.875	0.2500	6.350	0.406	10.31	5/8	15.9	5/16	7.9	1/4 - 28	NONE	NONE	NONE	NONE				
CRSB-10-1	0.625	15.875	0.2500	6.350	0.438	11.13	3/4	19	5/16	7.9	1/4 - 28	NONE	NONE	NONE	NONE				
CRSB-12	0.750	19.050	0.3750	9.525	0.500	12.70	3/8	22.2	3/8	9.5	3/8 - 24	1/4	6.4	7/32	2.4	NONE	3/16	4.8	
CRSB-14	0.875	22.225	0.3750	9.525	0.500	12.70	3/8	22.2	3/8	9.5	3/8 - 24	1/4	6.4	7/32	2.4	NONE	3/16	4.8	
CRSB-16	1.000	25.400	0.4375	11.112	0.625	15.88	1	25.4	1/2	12.7	7/16 - 20	1/4	6.4	7/32	2.4	NONE	3/16	4.8	
CRSB-18	1.125	28.575	0.4375	11.112	0.625	15.88	1	25.4	1/2	12.7	7/16 - 20	1/4	6.4	7/32	2.4	NONE	3/16	4.8	
CRSB-20	1.250	31.750	0.5000	12.700	0.750	19.05	1 1/4	31.8	5/8	15.9	1/2 - 20	3/16	7.9	7/32	2.4	NONE	3/16	4.8	
CRSB-22	1.375	34.925	0.5000	12.700	0.750	19.05	1 1/4	31.8	5/8	15.9	1/2 - 20	3/16	7.9	7/32	2.4	NONE	3/16	4.8	
CRSB-24	1.500	38.100	0.6250	15.875	0.875	22.22	1 1/2	38.1	3/4	19.0	5/8 - 18	3/8	9.5	7/32	2.4	NONE	3/16	4.8	
CRSB-26	1.625	41.275	0.6250	15.875	0.875	22.22	1 1/2	38.1	3/4	19.0	5/8 - 18	3/8	9.5	7/32	2.4	NONE	3/16	4.8	
CRSB-28	1.750	44.450	0.7500	19.050	1.000	25.40	1 3/4	44.4	7/8	22.2	3/4 - 16	3/16	11.1	7/32	2.4	NONE	3/16	4.8	
CRSB-30	1.875	47.625	0.7500	19.050	1.000	25.40	1 3/4	44.4	7/8	22.2	3/4 - 16	3/16	11.1	7/32	2.4	NONE	3/16	4.8	
CRSB-32	2.000	50.800	0.8750	22.225	1.250	31.75	2	50.8	1	25.4	7/8 - 14	1/2	12.7	1/8	3.2	NONE	3/16	4.8	
CRSB-36	2.250	57.150	0.8750	22.225	1.250	31.75	2	50.8	1	25.4	7/8 - 14	1/2	12.7	1/8	3.2	NONE	3/16	4.8	
CRSB-40	2.500	63.500	1.0000	25.400	1.500	38.10	2 1/4	57.2	1 1/8	28.6	1 - 14§	3/16	14.3	1/8	3.2	NONE	3/16	4.8	
CRSB-44	2.750	69.850	1.0000	25.400	1.500	38.10	2 1/4	57.2	1 1/8	28.6	1 - 14§	3/16	14.3	1/8	3.2	NONE	3/16	4.8	
•CRSB-48	3.000	76.200	1.2500	31.750	1.750	44.45	2 1/2	63.5	1 1/4	31.8	1 1/4 - 12	3/8	15.9	1/8	3.2	1/4	6.4	1/4	6.4
•CRSB-52	3.250	82.550	1.2500	31.750	1.750	44.45	2 1/2	63.5	1 1/4	31.8	1 1/4 - 12	3/8	15.9	1/8	3.2	1/4	6.4	1/4	6.4
•CRSB-56	3.500	88.900	1.3750	34.925	2.000	50.80	2 3/4	69.8	1 3/8	34.9	1 3/8 - 12	7/16	17.5	1/8	3.2	1/4	6.4	1/4	6.4
•CRSB-64	4.000	101.600	1.5000	38.100	2.250	57.15	3 1/2	88.9	1 1/2	38.1	1 1/2 - 12	3/4	19	1/8	3.2	1/4	6.4	1/4	6.4
CRSB-80	5.000	127.000	2.0000	50.800	2.750	69.85	5 1/8	128.6	2 3/16	65.1	2 - 12†	7/8	22.2	3/16	4.8	1/4	NPT	1/4	NPT
CRSB-96	6.000	152.400	2.5000	63.500	3.250	82.55	6	152.4	3	76.2	2 1/2 - 12†	1	25.4	3/16	4.8	1/4	NPT	1/4	NPT

§ UNS instead of UNF thread.

† UN instead of UNF thread.

• Furnished with lubrication hole in head end of stud and lubrication fitting loose in box.





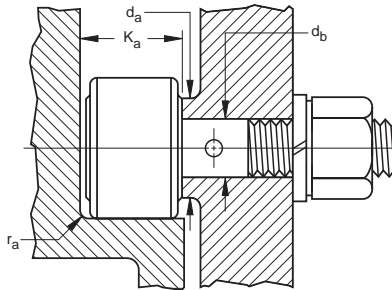
MOUNTING

In mounting stud type track rollers, a close fit between stud and hole is desirable. Bore dimensions given below result in a fit varying from 0.0010" (0.025 mm) tight to 0.0005" (0.013 mm) loose.

The retaining washer should be firmly backed up by a flat housing shoulder perpendicular to the stud axis. To provide sufficient support for the retaining washer, the shoulder diameter should be at least as large as the minimum clamping diameter listed.

Stud types may be mounted using either two thin lock nuts or one lock washer and one nut.

Note: Clamping torque is based on dry threads. If threads are lubricated, use half the torque values listed below.



LOAD RATINGS

Ⓣ Symbol denotes Torrington Basic Dynamic Load Rating which should be used in load-life calculations. The life nomograph is valid for loads up to C_r/4. For loads in excess of C_r/4, consult your Torrington Engineering Sales Office for life predictions.

Working loads are based on stud strength and should not be exceeded by either static or dynamic applied loads.

Load ratings are given in pounds-force: 1 lbf = 0.454kgf = 4.448N

EXAMPLE

A stud type is required to operate at 1000 rpm under a load of 350 lbf for an L₁₀ life of 2000 hours.

- (a) Unit selected must have a Working Load Rating of at least 350 lbf.
- (b) The Basic Dynamic Load Rating (C_r) must be at least equal to 350 • 4 = 1400 lbf. See paragraph "basic load rating" on page 465.
- (c) Calculation: **C_r = applied load • speed factor • life factor:**
 speed factor (SF) = 2.77 (see speed nomograph)
 life factor (LF) = 1.52 (see life nomograph)
 required C_r = 350 • 2.77 • 1.52 = 1474 lbf

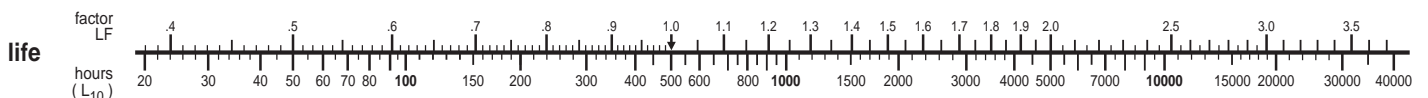
The CRSB-12 track roller is the smallest which will satisfy all the requirements:

Basic Load Rating = 1510 lbf
 Working Load Rating = 1320 lbf

Track Roller Designation with seals and internal thrust washers	d _b Bore Diameter for Stud		r _a Fillet Radius		Clamping Torque max	K _a Mounting Overhang Space min		d _a Clamping Diameter min		Basic Dynamic Load Rating C _r ISO 281		Working Load ‡ max	Limiting Speed rpm	
	+0.0005	+0.013	max	min		inch	mm	lbf • in	inch	mm	Ⓣ			ISO 281
	-0.0000	-0.000												
CRSB-8	0.1900	4.826	0.010	0.25	15	0.41	10.3	19/64	7.5	662	999	306	7000	
CRSB-8-1	0.1900	4.826	0.010	0.25	15	0.44	11.1	19/64	7.5	742	1120	306	7000	
CRSB-10	0.2500	6.350	0.015	0.38	35	0.47	11.9	23/64	9.1	902	1360	562	5500	
CRSB-10-1	0.2500	6.350	0.015	0.38	35	0.50	12.7	23/64	9.1	981	1480	562	5500	
CRSB-12	0.3750	9.525	0.015	0.38	95	0.56	14.3	1/2	12.7	1520	2290	1320	3800	
CRSB-14	0.3750	9.525	0.015	0.38	95	0.56	14.3	1/2	12.7	1520	2290	1320	3800	
CRSB-16	0.4375	11.112	0.030	0.76	250	0.69	17.5	41/64	16.3	1950	2940	1730	2800	
CRSB-18	0.4375	11.112	0.030	0.76	250	0.69	17.5	41/64	16.3	1950	2940	1730	2800	
CRSB-20	0.5000	12.700	0.030	0.76	350	0.81	20.6	49/64	19.4	3510	5290	2280	2700	
CRSB-22	0.5000	12.700	0.030	0.76	350	0.81	20.6	49/64	19.4	3510	5290	2280	2700	
CRSB-24	0.6250	15.875	0.030	0.76	650	0.94	23.8	49/64	22.6	4230	6380	3620	2300	
CRSB-26	0.6250	15.875	0.030	0.76	650	0.94	23.8	49/64	22.6	4230	6380	3620	2300	
CRSB-28	0.7500	19.050	0.040	1.02	1250	1.06	27.0	1 3/64	26.6	5330	8040	5290	1900	
CRSB-30	0.7500	19.050	0.040	1.02	1250	1.06	27.0	1 3/64	26.6	5330	8040	5290	1900	
CRSB-32	0.8750	22.225	0.050	1.27	1500	1.33	33.7	1 13/64	30.6	6480	9770	7280	1700	
CRSB-36	0.8750	22.225	0.050	1.27	1500	1.33	33.7	1 13/64	30.6	6480	9770	7280	1700	
CRSB-40	1.0000	25.400	0.090	2.29	2250	1.58	40.1	1 5/16	33.3	8750	13200	9560	1400	
CRSB-44	1.0000	25.400	0.090	2.29	2250	1.58	40.1	1 5/16	33.3	8750	13200	9560	1400	
•CRSB-48	1.2500	31.750	0.090	2.29	3450	1.83	46.4	1 3/4	44.4	11100	16800	15200	990	
•CRSB-52	1.2500	31.750	0.090	2.29	3450	1.83	46.4	1 3/4	44.4	11100	16800	15200	990	
•CRSB-56	1.3750	34.925	0.090	2.29	4200	2.08	52.8	1 59/64	48.8	16500	24900	18500	950	
•CRSB-64	1.5000	38.100	0.090	2.29	5000	2.33	59.1	2 7/32	57.9	20600	31100	22000	780	
CRSB-80	2.0000	50.800	0.160	4.06	5000	2.88	73.0	2 7/8	73.0	33800	51000	40000	700	
CRSB-96	2.5000	63.500	0.160	4.06	5000	3.38	85.7	3 7/8	85.7	48300	72800	62500	580	

‡ Maximum working load is based on strength of track roller stud.

• Furnished with lubrication hole in head end of stud and lubrication fitting loose in box.





Type YCR, YCRS

CONSTRUCTION

The yoke type track roller is a non-separable unit consisting of an outer ring, a full complement of needle rollers, an inner ring and two retaining washers securely fastened to the inner ring. Lubrication holes and a lubrication groove in the bore of the inner ring provide for relubrication when a cross-drilled bolt or shaft, which can be lubricated from the end, is used.

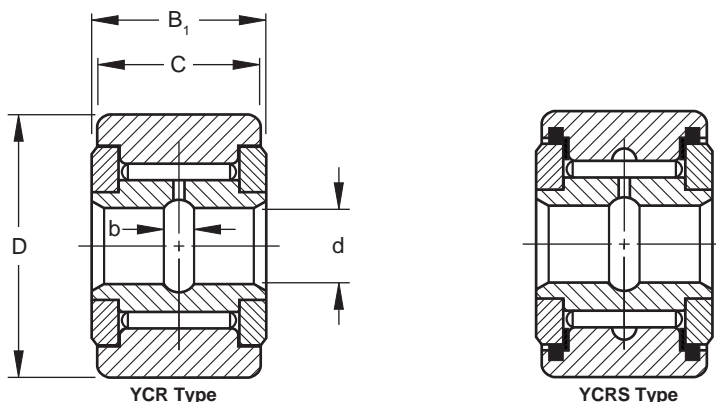
The seals on the type YCRS are located in counterbores of the outer ring and seal against the retaining washers, providing a good retention of lubricant and exclusion of foreign matter. The seals also have internal thrust washers made of self-lubricating resin.

DIMENSIONS

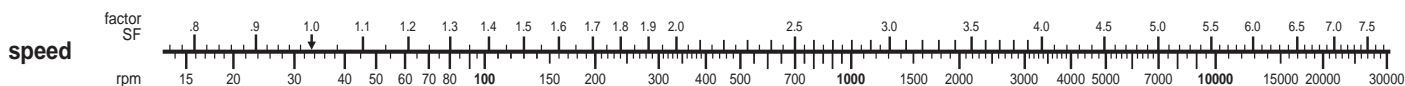
Dimensions given below are for the unplated finished unit. Upon request, track rollers may be obtained with chrome plate on the rolling surface and sides of the outer ring, and cadmium plate on the other exposed surfaces, as mounted. When plated, the outer ring outside diameter is a maximum of 0.002" (0.051 mm) greater than listed.

Types YCR and YCRS are manufactured to inch nominal dimensions. Metric dimensions shown are for the convenience of the user. The controlling dimensions are in inches.

Tolerance limits for the outside diameters of the outer ring refer to the "single mean diameter" (the arithmetical mean of the largest and smallest diameters in a single radial plane).



Track Roller Designation		D Outside Diameter		d Bore Diameter				C Outer ring Width		B ₁ Overall Width		b Groove Width	
without seals	with seals and internal thrust washers	+0.000 -0.001	+0.000 -0.025	inches		millimeters		+0.000 -0.005	+0.00 -0.13	+0.0050 -0.0100	+0.13 -0.25	(nominal)	
		inch	mm	max	min	max	min	inch	mm	inch	mm	inch	mm
YCR-12	YCRS-12	0.750	19.050	0.2502	0.2496	6.355	6.340	0.500	12.70	0.5625	14.29	1/8	3.2
YCR-14	YCRS-14	0.875	22.225	0.2502	0.2496	6.355	6.340	0.500	12.70	0.5625	14.29	1/8	3.2
YCR-16	YCRS-16	1.000	25.400	0.3127	0.3121	7.943	7.928	0.625	15.88	0.6875	17.46	1/8	3.2
YCR-18	YCRS-18	1.125	28.575	0.3127	0.3121	7.943	7.928	0.625	15.88	0.6875	17.46	1/8	3.2
YCR-20	YCRS-20	1.250	31.750	0.3752	0.3746	9.530	9.515	0.750	19.05	0.8125	20.64	3/16	4.8
YCR-22	YCRS-22	1.375	34.925	0.3752	0.3746	9.530	9.515	0.750	19.05	0.8125	20.64	3/16	4.8
YCR-24	YCRS-24	1.500	38.100	0.4377	0.4371	11.118	11.103	0.875	22.22	0.9375	23.81	3/16	4.8
YCR-26	YCRS-26	1.625	41.275	0.4377	0.4371	11.118	11.103	0.875	22.22	0.9375	23.81	3/16	4.8
YCR-28	YCRS-28	1.750	44.450	0.5002	0.4996	12.705	12.690	1.000	25.40	1.0625	26.99	3/16	4.8
YCR-30	YCRS-30	1.875	47.625	0.5002	0.4996	12.705	12.690	1.000	25.40	1.0625	26.99	3/16	4.8
YCR-32	YCRS-32	2.000	50.800	0.6252	0.6246	15.880	15.865	1.250	31.75	1.3125	33.34	1/4	6.4
YCR-36	YCRS-36	2.250	57.150	0.6252	0.6246	15.880	15.865	1.250	31.75	1.3125	33.34	1/4	6.4
YCR-40	YCRS-40	2.500	63.500	0.7502	0.7496	19.055	19.040	1.500	38.10	1.5625	39.69	1/4	6.4
YCR-44	YCRS-44	2.750	69.850	0.7502	0.7496	19.055	19.040	1.500	38.10	1.5625	39.69	1/4	6.4
YCR-48	YCRS-48	3.000	76.200	1.0001	0.9995	25.403	25.388	1.750	44.45	1.8125	46.04	3/8	9.5
YCR-52	YCRS-52	3.250	82.550	1.0001	0.9995	25.403	25.388	1.750	44.45	1.8125	46.04	3/8	9.5
YCR-56	YCRS-56	3.500	88.900	1.1251	1.1245	28.578	28.563	2.000	50.80	2.0625	52.39	3/8	9.5
YCR-64	YCRS-64	4.000	101.600	1.2501	1.2495	31.753	31.738	2.250	57.15	2.3125	58.74	3/8	9.5
—	YCRS-80	5.000	127.000	1.7501	1.7495	44.453	44.438	2.750	69.85	2.8750	73.02	3/8	9.5
—	YCRS-96	6.000	152.400	2.2501	2.2495	57.153	57.138	3.250	82.55	3.3750	85.72	3/8	9.5



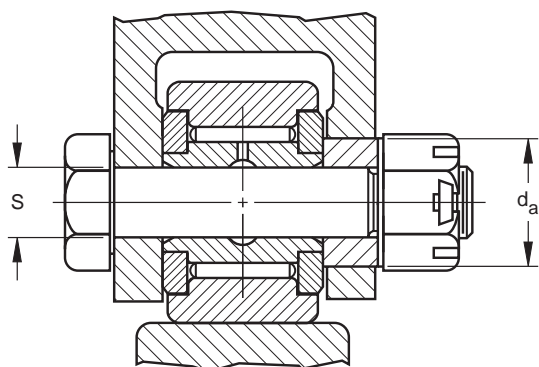


MOUNTING

The machine element with the holes in which the mounting bolt is supported must be sufficiently rigid to resist local crushing under the applied load and to resist bending which can cause uneven loading of the rollers.

When the applied loads are high, the tight transition fit should be used in conjunction with a high strength shaft or bolt. When loads are moderate, the loose transition fit may be used with a high strength shaft or bolt. For light loads, the loose transition fit may be used with an unhardened shaft or bolt.

The track roller should be clamped endwise between parallel faces perpendicular to the axis to prevent the retaining washers from coming off under load. If the unit cannot be clamped, a close axial fit in the yoke is required.



LOAD RATINGS

The $\text{\textcircled{T}}$ Symbol denotes Torrington Basic Dynamic Load Rating which should be used in load-life calculations. The life nomograph is valid for loads up to $C_r/4$. For loads in excess of $C_r/4$, consult your Torrington Engineering Sales Office for life predictions.

Working loads should not be exceeded by either static or dynamic applied loads.

Load ratings are given in pounds-force: 1 lbf = 0.454 kgf = 4.448 N

EXAMPLE

A yoke mounted track roller is required to operate at 700 rpm under a load of 900 lbf for an L_{10} life of 2500 hours.

- (a) Unit selected must have a Working Load Rating of at least 900 lbf.
- (b) The Basic Dynamic Load Rating (C_r) must be at least equal to $900 \cdot 4 = 3600$ lbf. See paragraph "basic load rating" on page 465.
- (c) Calculation: $C_r = \text{applied load} \cdot \text{speed factor} \cdot \text{life factor}$:

speed factor (SF) = 2.50 (see speed nomograph)

life factor (LF) = 1.62 (see life nomograph)

required $C_r = 900 \cdot 2.50 \cdot 1.62 = 3645$ lbf

The YCR-24 (or YCRS-24) unit is the smallest yoke type track roller which will satisfy all the requirements:

Basic Load Rating = 4200lbf

Working Load Rating = 5800 lbf

Track Roller Designation		S Shaft (Bolt) Diameter								d _a Clamping Diameter min.	Basic Dynamic Load Rating C _r		Working Load max	Limiting Speed rpm	
		Transition Fit, Loose - f7				Transition Fit, Tight - h6					lbf	ISO 281 $\text{\textcircled{T}}$ lbf			
		inches		millimeters		inches		millimeters							
without seals	with seals and internal thrust washers	max	min	max	min	max	min	max	min	inch	mm	lbf	lbf	lbf	rpm
YCR-12	YCRS-12	0.2497	0.2493	6.342	6.332	0.2505	0.2501	6.363	6.353	1/2	12.7	1520	2290	2090	3800
YCR-14	YCRS-14	0.2497	0.2493	6.342	6.332	0.2505	0.2501	6.363	6.353	1/2	12.7	1520	2290	2090	3800
YCR-16	YCRS-16	0.3122	0.3118	7.930	7.920	0.3130	0.3126	7.950	7.940	49/64	16.3	1950	2940	3100	2800
YCR-18	YCRS-18	0.3122	0.3118	7.930	7.920	0.3130	0.3126	7.950	7.940	49/64	16.3	1950	2940	3100	2800
YCR-20	YCRS-20	0.3747	0.3743	9.517	9.507	0.3755	0.3751	9.538	9.528	49/64	19.4	3510	5290	4300	2700
YCR-22	YCRS-22	0.3747	0.3743	9.517	9.507	0.3755	0.3751	9.538	9.528	49/64	19.4	3510	5290	4300	2700
YCR-24	YCRS-24	0.4372	0.4368	11.105	11.095	0.4380	0.4376	11.125	11.115	57/64	22.6	4230	6380	5700	2300
YCR-26	YCRS-26	0.4372	0.4368	11.105	11.095	0.4380	0.4376	11.125	11.115	57/64	22.6	4230	6380	5700	2300
YCR-28	YCRS-28	0.4997	0.4993	12.692	12.682	0.5007	0.5003	12.718	12.708	1 1/64	26.6	5330	8040	8000	1900
YCR-30	YCRS-30	0.4997	0.4993	12.692	12.682	0.5007	0.5003	12.718	12.708	1 1/64	26.6	5330	8040	8000	1900
YCR-32	YCRS-32	0.6247	0.6243	15.867	15.857	0.6257	0.6253	15.893	15.883	1 13/64	30.6	6480	9770	10700	1700
YCR-36	YCRS-36	0.6247	0.6243	15.867	15.857	0.6257	0.6253	15.893	15.883	1 13/64	30.6	6480	9770	10700	1700
YCR-40	YCRS-40	0.7497	0.7493	19.042	19.032	0.7507	0.7503	19.068	19.058	1 5/16	33.3	8750	13200	16600	1400
YCR-44	YCRS-44	0.7497	0.7493	19.042	19.032	0.7507	0.7503	19.068	19.058	1 5/16	33.3	8750	13200	16600	1400
YCR-48	YCRS-48	0.9996	0.9991	25.390	25.377	1.0008	1.0003	25.420	25.407	1 3/8	44.4	11100	16800	25100	990
YCR-52	YCRS-52	0.9996	0.9991	25.390	25.377	1.0008	1.0003	25.420	25.407	1 3/8	44.4	11100	16800	25100	990
YCR-56	YCRS-56	1.1246	1.1241	28.565	28.552	1.1258	1.1253	28.595	28.582	1 59/64	48.8	16500	24900	31900	950
YCR-64	YCRS-64	1.2496	1.2491	31.740	31.727	1.2508	1.2503	31.770	31.757	2 7/32	57.9	20600	31100	45000	780
—	YCRS-80	1.7496	1.7491	44.440	44.427	1.7508	1.7503	44.470	44.457	2 1/8	73.0	33800	51000	62700	700
—	YCRS-96	2.2496	2.2491	57.140	57.127	2.2508	2.2503	57.170	57.157	3 3/8	85.7	48300	72800	92700	580

