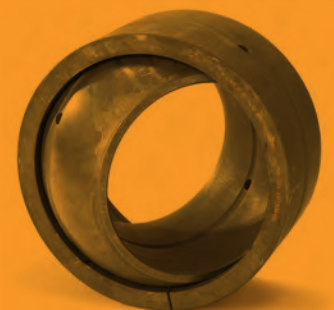


**TIMKEN**  
Where You Turn



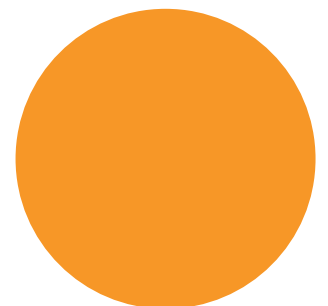
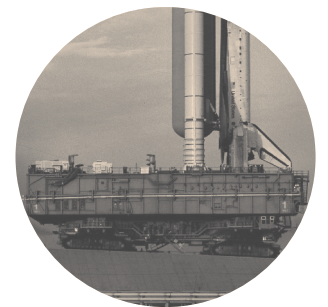
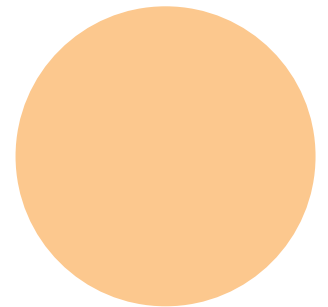
**TIMKEN THRUST AND PLAIN BEARINGS CATALOG**



## SPHERICAL PLAIN

**Overview:** Timken's spherical plain bearings consist of a spherically ground inner ring housed in a mating outer ring without any rolling elements.

- **Sizes:** 12.7 mm - 600 mm bore (0.5 in. - 23.622 in.).
- **Markets:** Construction, mining, metals, power generation, oils and gas, aggregate, paper and forest products.
- **Applications:** Articulation joints, A-frames, cylinders (steering, lift, tilt, dump), struts, traction bars.
- **Features:** Lubrication grooves and holes, seals to retain lubricant and prevent contamination, special materials available.
- **Benefits:** Can carry radial and axial loads in a small envelope and can accommodate moderate misalignment.



B



## Spherical Plain Bearings

One, two, or three digit "Series" number.  
*For inch series*, the number indicates the nominal bore size (e.g., 10 is 1.00 in.) or an approximate bore size (e.g., 17 is 1.75 in.).  
*For metric series*, the number indicates the exact bore size (e.g., 40 is 40 mm).

7

SF

**SF** spherical plain type (radial inch); single fractured outer ring  
**SFH** spherical plain type (radial inch); single fractured outer ring, wide inner ring  
**SBB** spherical plain type (radial inch); double fractured outer ring  
**SBT** spherical plain angular contact type (radial inch)  
**FS** spherical plain type (radial metric); single fractured outer ring  
**FSH** spherical plain type (radial metric); single fractured outer ring, wide inner ring

### Seal Designator:

**TT** reinforced rubber seals  
**SS** synthetic resin seals

12 - SS

One, two, or three digit number.  
*For inch series*, the number indicates the exact bore size in  $\frac{1}{16}$ ths of an inch (e.g., 12 refers to  $\frac{12}{16}$  in. which is a  $\frac{3}{4}$  in. bore).  
*For metric series*, the number indicates the exact outside diameter size (e.g., 62 is 62 mm).

# Spherical Plain Bearings

	<i>Page</i>
Introduction .....	B418
General Features .....	B418
 <i>BEARING TYPES</i>	
SF & FS .....	B418
SF...TT, SF...SS, FS...TT, FS...SS .....	B418
SBT & SBDT .....	B418
Internal Clearances .....	B419
Load Ratings .....	B419
Misalignment .....	B420
Housing Design .....	B421
Shaft Design .....	B421
Lubrication (SF, FS, SBT) .....	B421
Temperature .....	B422
Shaft Fits .....	B422
Tolerances .....	B423
Radial Bearings, Type SF .....	B424
Radial Bearings, Type FS .....	B426
Radial Bearings, FSH .....	B428
Radial Bearings, Type SFH .....	B430
Angular Contact Bearings, Type SBT .....	B432





# SPHERICAL PLAIN BEARINGS

## INTRODUCTION

The spherical plain bearing has a spherically shaped inner ring with a ground cylindrical bore for shaft mounting. The cylindrical outer surface of the outer ring permits convenient mounting in a housing.

Spherical plain bearings offer the following advantages:

- High capacity
- Ability to accommodate misalignment
- Superior performance in low frequency oscillating applications
- Simplified housing and shaft design
- Easy installation
- Radial types available with seals

For all types of spherical plain bearings, both the inner and outer rings are manufactured from through-hardened steel and are precision ground.

The dimensional data lists spherical plain bearings successively by larger bore sizes.

Timken also supplies spherical plain bearings made to special designs. These include standard design bearings made with special materials, clearances, and finishes or bearings with special configurations, such as extended inner rings.

B

## GENERAL FEATURES

### METAL ON METAL BEARINGS

Rings are phosphate treated and coated with molybdenum disulfide (MoS<sub>2</sub>) to minimize friction of contacting surfaces.

These bearings are available as radial types (SF Series and FS Series) and angular contact thrust (SBT Series).

SF and FS Series include lubrication holes and grooves in both inner and the outer rings to permit relubrication through either the shaft or housing.

SBT angular contact bearings have lubricating holes and grooves in the outer ring for relubrication through the housing.

SF and FS Series are available with integral seals as SF...TT, SF...SS, FS...TT and FS...SS, and incorporate lip seals designed to retain lubricant and protect the spherical surfaces from external contamination.

## BEARING TYPES

### SF & FS

These bearings are designed primarily to carry radial loads and handle moderate misalignment. The outer ring is usually fractured axially in one place, parallel to its axis, to permit assembly of the bearing rings, which do not have loading slots.

These types can also be supplied with double-fractured outer rings (designation SBB) when this feature is desired for easier assembly in an application.



SF and FS

### SF...TT, SF...SS, FS...TT, FS...SS

These bearings are dimensionally interchangeable with the SF and FS Series, and have the same general characteristics. However, they also incorporate lip seals.

The seals are securely retained in the outer ring and will withstand high grease pressures during relubrication. Positive retention of the seals assures full distribution of the lubricant to all bearing surfaces. SF...TT and FS...TT incorporate two reinforced nitrile rubber seals. SF...SS and FS...SS are assembled with synthetic resin seals; Operating temperatures of the seals should not exceed 212° F (100° C).



SF and FS

### SBT & SBDT

These bearings are designed for single direction thrust loading and some misalignment. Inner and outer rings are separable. The raceways are essentially hemispherical, and the rings are designed to provide maximum spherical raceway contact in the axial direction.

The SBDT style is designed for single direction thrust loading while the SBDT style is designed for thrust loading in two directions



SBT

SBDT

## INTERNAL CLEARANCES

Radial internal clearance is defined as the total possible movement of the inner ring relative to the outer ring in a radial direction. Axial internal clearance is the total possible movement of the inner relative to the outer ring in an axial direction.

Radial internal clearances listed for the SF and FS Series are for finish ground, unmounted bearings prior to fracture of the outer ring. The molybdenum disulfide coating reduces this clearance by a maximum of .05 mm (.002 in.). The maximum interference fits using suggested housing and shaft dimensions will maintain a satisfactory minimum internal clearance in the mounted condition, accommodating coating thickness, outer ring compression, and inner ring expansion.

## LOAD RATINGS

### DYNAMIC LOAD RATINGS

#### SF & FS

The dynamic load rating listed in the tables of dimensions is based on a maximum stress level of 85 megapascals (approximately 12,300 psi) between the sliding contact surfaces. It is the maximum load suggested for bearings subjected to intermittent operation with periodic lubrication.

The dynamic load rating is based on the radially projected area of the inner ring bore under the condition where, with the suggested fitting practice and periodic lubrication, rotation normally takes place.

For intermittent loading and operation, the applied radial load should not exceed the dynamic load rating. For constant loading and continuous operation, the applied radial load should not exceed 75 percent of the dynamic load rating. For dynamic or static thrust loading, use 25 percent of the respective radial load rating value should be used. For combined radial and thrust ratings, consult your Timken representative.

#### SBT

The dynamic load rating is based on the same stress levels as SF shown above and is the maximum thrust load suggested for extended life with periodic lubrication. It is based on the axially projected area of the spherical surfaces in contact. Where the shaft shoulder supports high thrust loads, it is suggested that hardened shafts be employed.

### EQUIVALENT THRUST LOAD

#### SBT

For combined radial and thrust loading under intermittent dynamic conditions, the equivalent thrust load ( $T_e$ ) must not exceed the dynamic load rating. For constant loading and continuous operation, the equivalent load ( $T_e$ ), or the axial load ( $T$ ) when the radial load ( $R$ ) is zero, must not exceed 70 percent of the dynamic load rating:

$$T_e = T + 1.4R$$

$T_e$  = Equivalent thrust load per bearing

$T$  = Applied thrust load and/or preload

$R$  = Applied radial load per bearing

The limit load rating of all spherical plain bearings listed is the maximum static load that can be applied to the bearing. This load should not be exceeded. The ultimate, or static fracture rating of the bearing is at least 1.5 times the limit load rating.

Shaft and housing stresses should be checked when the applied load approaches the limit load rating since the shaft or housing may then become the critical factor.



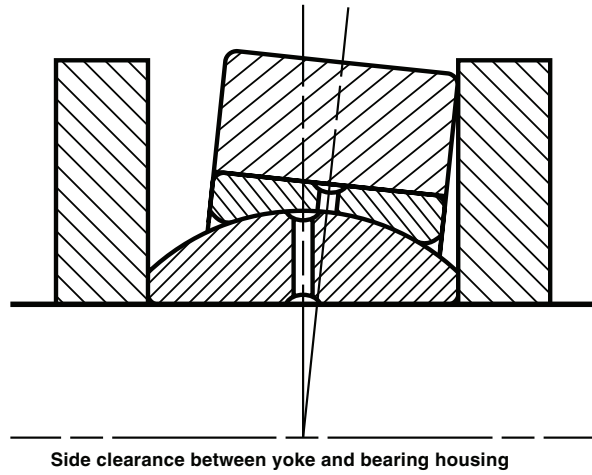
## MISALIGNMENT

In many applications, the degree of misalignment of the radial types of spherical plain bearings is determined by the side clearance between the yoke and the bearing housing as illustrated.

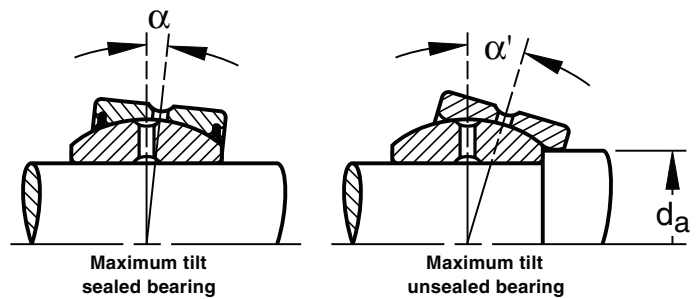
When the bearing is mounted without such restrictions, a larger misalignment can be accommodated:  $\alpha$  is the maximum angle of misalignment for sealed bearings as illustrated. If  $\alpha$  is exceeded, the seal lips will slide off the spherical surface. Seal effectiveness is then lost and damage to the seal lip will occur if contact is made between the seal lip and shaft shoulder.

Greater misalignment under light to medium loads is possible with unsealed plain radial bearings as shown by angle  $\alpha'$ . This requires limiting the shaft shoulder diameter to the suggested dimension ( $d_a$ ) and also requires sufficient side clearance for the outer ring and housing.

Misalignment greater than  $\alpha'$  reduces the load carrying ability of the radial plain spherical bearings. When extreme misalignment is present, the strength of the shaft in shear and bending should be carefully checked, since the shaft support may be some distance away from the bearing.



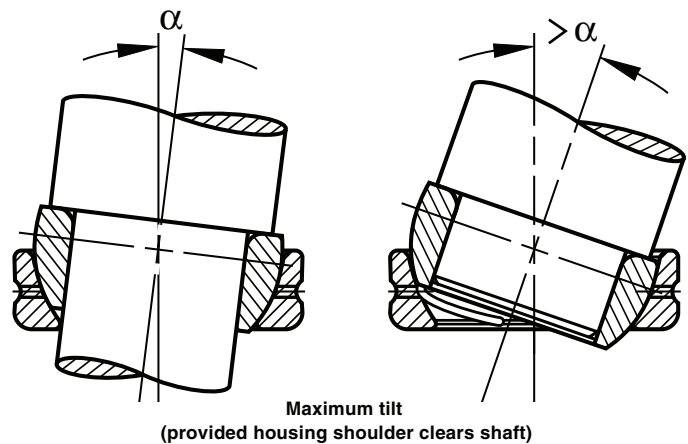
Side clearance between yoke and bearing housing



Maximum tilt sealed bearing

Maximum tilt unsealed bearing

Type SBT angular contact bearing permits a tilting angle  $\alpha$  provided the housing shoulder clears the shaft. Such misalignment is limited by the bore of the outer ring touching the through shaft, as shown. A larger angle of misalignment is possible where a stub shaft is used. If the tilting angle exceeds  $\alpha$ , your Timken representative should be consulted for suggestions.



Maximum tilt (provided housing shoulder clears shaft)

## HOUSING DESIGN

The housing should be strong enough to support the loads applied to the bearings without distortion or risk of fatigue damage.

When using a housing of the type illustrated, with a load applied in directions "X" or "Y", the compressive yield strength of the housing material should be greater than the applied load divided by ( $B_a \cdot D$ ).

When the load is applied in direction "Y", the yield strength of the housing in tension should be greater than the applied load times  $K/B_a(D_a-D)$ , where K is a stress concentration factor from Table 1.

The suggested housing bore tolerances closely approximate N7 tolerances. This produces an interference fit that ensures proper rounding of the outer ring. Light metal housings or housings with thin cross sections may require a tighter fit. An interference fit in the housing is also necessary to prevent creeping by the outer ring with resultant wear of the housing bore and shoulder. Split housings should be avoided.

To resist thrust loads, the bearing should be mounted as shown in the mounting details above the table dimensions.

When plain angular contact bearings (SBT) are axially loaded, the housing expands. For proper and safe bearing function, it is vital to provide a substantial section for the housing. If the thrust limit load ratings are applied for these bearings, not only should the section of the housing be generous, but the housing bore diameter ( $d_b$ ) must not be exceeded. This not only supports the thrust load, but strengthens the housing in the radial direction as well.

The suggested housing bore for the Type SBT angular contact bearing produces a tight transition fit.

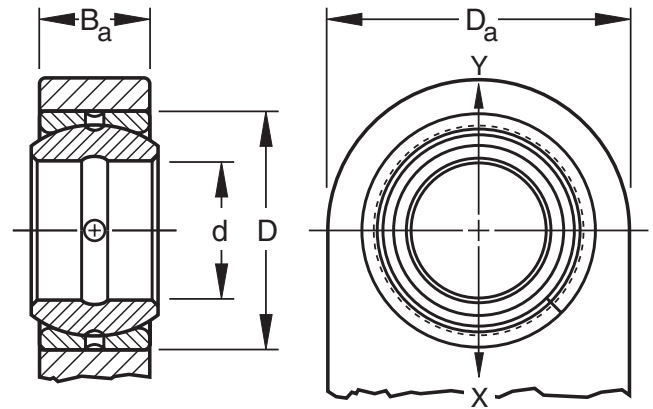
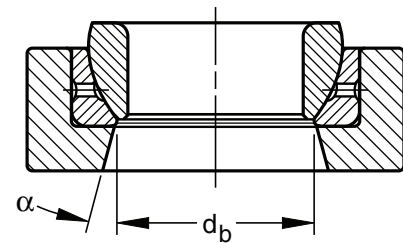


TABLE 1 – STRESS CONCENTRATION FACTOR

$D_a/D$	K	$D_a/D$	K	$D_a/D$	K
1.2	1.8	1.8	2.4	3	3.7
1.4	2	2	2.7	4	4.7
1.6	2.2	2.5	3.2	5	5.5



Housing section - angular contact bearing

## SHAFT DESIGN

In applications with heavy radial loads, although alignment takes place at the spherical bearing surface, rotation or oscillation normally occurs between the bore of the inner ring and the shaft even though an interference fit may have been used. For this reason, and to facilitate assembly, the shaft dimensions listed in the tables should be used.

To obtain satisfactory performance with heavy loads or under abrasive conditions, the shaft should be hardened to 655 VPN or 58 HRC minimum. Additionally, the shaft should have sufficient strength to withstand the applied loads in both shear and bending. The surface finish of the bearing seat should not exceed 0.8 micrometers or 32 microinches (on the Ra scale). The shaft should always be supported as close to the inner ring as possible to minimize bending.

When the loads are light, it is possible to prevent rotation between the inner ring and shaft by using an ISO m6 shaft tolerance or by clamping across the inner ring. Under these conditions, a fully hardened shaft is not necessary.

When the bearing is loaded axially, the load is transmitted between the end face of the inner ring and the adjacent shaft shoulder. The shoulder surface must be of sufficient strength and hardness not to deform permanently under load. If the inner ring is to rotate, the finish of this surface should not exceed 0.8 micrometers or 32 microinches (on the Ra scale).





# SPHERICAL PLAIN BEARINGS

## LUBRICATION (SF, FS, SBT)

The dry film lubricant (MoS<sub>2</sub>) is sufficient for static applications and for relatively short periods of dynamic operation.

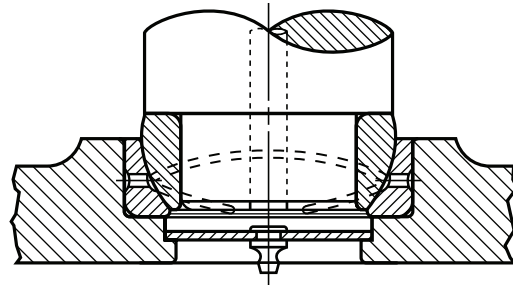
The bonds between the rings and MoS<sub>2</sub> coating may be destroyed by any fluid including oils, greases and water. Any abrasive material present on the dynamic bearing surfaces will ruin the MoS<sub>2</sub> coating. If the bearing is subjected to such operating or environmental conditions, it is necessary to relubricate frequently.

The radial bearings, both with and without seals, have lubricating holes and grooves in both the inner and outer rings, permitting relubrication through either the shaft or the housing.

The angular contact bearings have lubricating holes and grooves in the outer ring for relubrication through the bearing housing. The lubrication grooves in the spherical bore of the outer ring traverse a pattern designed to provide effective lubrication. These grooves extend into the small bore of the ring, permitting relubrication through the end of the housing as illustrated.

The relubrication cycle will depend on the magnitude of the load, frequency and amplitude of oscillation, environmental conditions and the effectiveness of the sealing used to exclude foreign materials from the bearing surfaces.

If bearings are relubricated, the dynamic load rating depends on the film strength of the added lubricant. High quality EP greases are suggested for best results.



SBT - Relubricatable mounting

## TEMPERATURE

Spherical plain bearings without seals will operate satisfactorily up to temperatures of 392° F (200° C). For operation at greater temperatures, special materials and lubricants will be required. Operating temperatures for sealed bearings should not exceed 212° F (100° C).

## SHAFT FITS

- The shaft diameters listed in the dimension tables show the suggested fits for normal service.
- The table below is to be used only for applications where a shaft interference fit is required. Consult your Timken representative for suggestions.

(SF, SFH, FS, FSH, SBT) BEARINGS,

Shaft Diameter Tolerance for Interference Fit for Inch and Metric Series

Bore Diameter, d				Shaft Tolerance m6			
mm		inch		mm		inch	
over	incl.	over	incl.	high	low	high	low
10	18	0.3937	0.7087	+0.018	+0.007	+0.0007	+0.0003
18	30	0.7087	1.1811	+0.021	+0.008	+0.0008	+0.0003
30	50	1.1811	1.9685	+0.025	+0.009	+0.0010	+0.0004
50	80	1.9685	3.1496	+0.030	+0.011	+0.0012	+0.0005
80	120	3.1496	4.7244	+0.035	+0.013	+0.0014	+0.0005
120	180	4.7244	7.0866	+0.040	+0.015	+0.0016	+0.0006
180	250	7.0866	9.8425	+0.046	+0.017	+0.0018	+0.0007

**TOLERANCES**

- Tolerances on pages B412-B420 list the nominal bearing dimensions.
- Tolerances for these dimensions are listed in Tables 1 through 4. They are expressed as variances from nominal.
- Metric-inch conversions are shown in the following tables.

**TABLE 1 INNER RING (FS, FSH) BEARINGS, METRIC SERIES**

Bore Diameter, d				Single Mean Bore Diameter, $d_{mp}^{(1)}$				Width, B1			
mm		inch		mm		inch		mm		in.	
over	incl.	over	incl.	high	low	high	low	high	low	high	low
10	18	0.3937	0.7087	+0	-0.008	+0	-0.0003	+0	-0.12	+0	-0.005
18	30	0.7087	1.1811	+0	-0.010	+0	-0.0004	+0	-0.12	+0	-0.005
30	50	1.1811	1.9685	+0	-0.012	+0	-0.0005	+0	-0.12	+0	-0.005
50	80	1.9685	3.1496	+0	-0.015	+0	-0.0006	+0	-0.15	+0	-0.006
80	120	3.1496	4.7244	+0	-0.020	+0	-0.0008	+0	-0.20	+0	-0.008
120	180	4.7244	7.0866	+0	-0.025	+0	-0.0010	+0	-0.25	+0	-0.010
180	250	7.0866	9.8425	+0	-0.030	+0	-0.0012	+0	-0.30	+0	-0.012
250	315	9.8425	12.4015	+0	-0.035	+0	-0.0014	+0	-0.35	+0	-0.014

<sup>(1)</sup> "Single Mean Diameter" is defined as the mean diameter in a single radial plane.

**TABLE 2 OUTER RING (FS, FSH) BEARINGS, METRIC SERIES**

Outside Diameter, D				Single Mean Outside Diameter, $D_{mp}^{(2)}$				Width, B			
mm		inch		mm		inch		mm		in.	
over	incl.	over	incl.	high	low	high	low	high	low	high	low
18	30	0.7087	1.1811	+0	-0.009	+0	-0.0004	+0	-0.24	+0	-0.009
30	50	1.1811	1.9685	+0	-0.011	+0	-0.0004	+0	-0.24	+0	-0.009
50	80	1.9685	3.1496	+0	-0.013	+0	-0.0005	+0	-0.30	+0	-0.012
80	120	3.1496	4.7244	+0	-0.015	+0	-0.0006	+0	-0.40	+0	-0.016
120	150	4.7244	5.9055	+0	-0.018	+0	-0.0007	+0	-0.50	+0	-0.020
150	180	5.9055	7.0866	+0	-0.025	+0	-0.0010	+0	-0.50	+0	-0.020
180	250	7.0866	9.8425	+0	-0.030	+0	-0.0012	+0	-0.60	+0	-0.024
250	315	9.8425	12.4015	+0	-0.035	+0	-0.0014	+0	-0.70	+0	-0.028
315	400	12.4015	15.7480	+0	-0.040	+0	-0.0016	+0	-0.80	+0	-0.031
400	500	15.7480	19.6850	+0	-0.045	+0	-0.0018	+0	-0.90	+0	-0.035

<sup>(2)</sup> Tolerances apply before coating with MoS<sub>2</sub> and fracturing outer ring.

"Single Mean Diameter" is defined as the mean diameter in a single radial plane.

**TABLE 3 INNER RING (SF, SFH, SBT, SBDT) BEARINGS, INCH SERIES**

Bore Diameter, d				Single Mean Bore Diameter, $d_{mp}^{(1)}$				Width, B1			
mm		inch		mm		inch		mm		in.	
over	incl.	over	incl.	high	low	high	low	high	low	high	low
11.112	50.800	0.4375	2.0000	+0	-0.013	+0	-0.0005	+0	-0.13	+0	-0.005
50.800	76.200	2.0000	3.0000	+0	-0.015	+0	-0.0006	+0	-0.13	+0	-0.005
76.200	120.650	3.0000	4.7500	+0	-0.020	+0	-0.0008	+0	-0.13	+0	-0.005
120.6500	152.400	4.7500	6.0000	+0	-0.025	+0	-0.0010	+0	-0.13	+0	-0.005

<sup>(1)</sup> "Single Mean Diameter" is defined as the mean diameter in a single radial plane.

**TABLE 4 OUTER RING (SF, SFH, SBT, SBDT) BEARINGS, INCH SERIES**

Outside Diameter, D				Single Mean Outside Diameter, $D_{mp}^{(2)}$				Width, B			
mm		inch		mm		inch		mm		in.	
over	incl.	over	incl.	high	low	high	low	high	low	high	low
20.638	50.800	0.8125	2.0000	+0	-0.013	+0	-0.0005	+0	-0.13	0	-0.005
50.800	80.962	2.0000	3.1875	+0	-0.015	+0	-0.0006	+0	-0.13	0	-0.005
80.962	120.650	3.1875	4.7500	+0	-0.020	+0	-0.0008	+0	-0.13	0	-0.005
120.650	177.800	4.7500	7.0000	+0	-0.025	+0	-0.0010	+0	-0.13	0	-0.005
177.800	222.250	7.0000	8.7500	+0	-0.030	+0	-0.0012	+0	-0.13	0	-0.005

<sup>(2)</sup> Tolerances apply before coating with MoS<sub>2</sub> and fracturing outer ring.

"Single Mean Diameter" is defined as the mean diameter in a single radial plane.



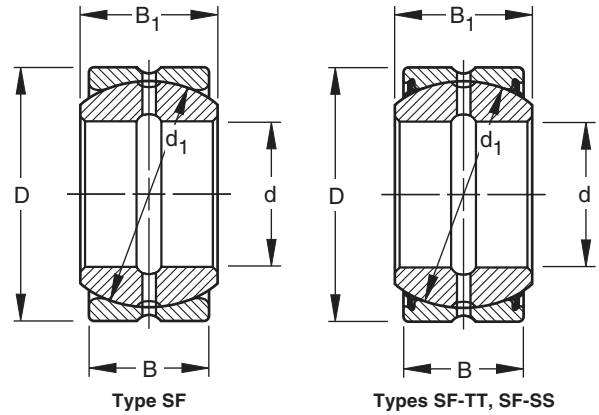
# SPHERICAL PLAIN BEARINGS

## RADIAL BEARINGS TYPE SF

B

- Unit assembly consisting of a solid, spherical O.D. inner ring and a spherical I.D. outer ring.
- Outer ring has a single fracture to permit assembly.
- Both inner and outer rings are phosphate treated and then coated with molybdenum disulphide ( $\text{MoS}_2$ ).
- Bearings 7SF12 through 50SBB80 are available with reinforced rubber seals. To order, add suffix "-TT" to bearing designation – Example: 25SF40-TT.
- Bearings 27SF44 through 608BB96 are available with synthetic resin seals. To order, add suffix "-SS" to bearing designation – Example: 27SF44-SS.
- Before ordering any bearing, check for availability.
- Metric-inch conversions have been included. The controlling dimensions are in inches.
- For tolerances, see Tables 3 and 4. Dimensions listed are after the bearing has been coated with molybdenum disulphide.

- The axial internal clearance is approximately three times the radial internal clearance.
- $\alpha$  is the maximum tilting angle for sealed radial bearings. To utilize the maximum tilting angle  $\alpha$  for unsealed radial bearings, the suggested shaft shoulder diameter,  $d_a$ , shown in the drawing on the facing page, must not be exceeded.
- Dimensions and locations of lubrication holes and grooves may be obtained from your Timken representative.



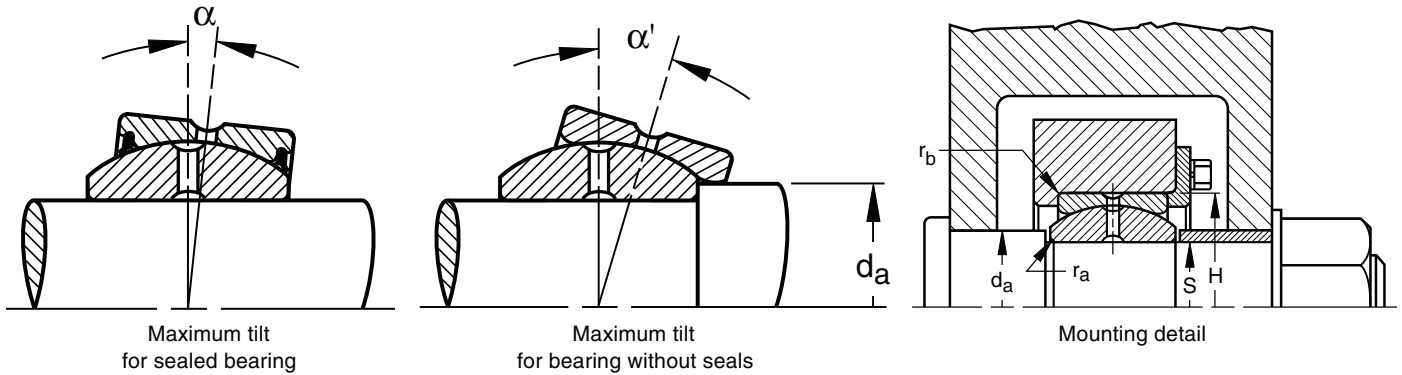
## DIMENSIONS - LOAD RATINGS

Bearing Number	Bore d		Outside Diameter D		Inner Ring Width B <sub>1</sub>		Outer ring Width B		Spherical Diameter d <sub>1</sub>		Radial Clearance* (unmounted)				Load Ratings	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	(mm)		(in.)		Radial Limit Load Rating	Dynamic Radial Load Rating
											min.	max.	min.	max.	lbf.	lbf.
5SF8	12.700	0.5000	22.225	0.8750	11.10	0.437	9.52	0.375	18.26	0.719	0.10	0.20	0.004	0.008	8330	2690
6SF10	15.875	0.6250	26.988	1.0625	13.89	0.547	11.91	0.469	22.83	0.899	0.10	0.20	0.004	0.008	13000	4200
7SF12	19.050	0.7500	31.750	1.2500	16.66	0.656	14.27	0.562	27.43	1.080	0.13	0.23	0.005	0.009	18700	6070
8SF14	22.225	0.8750	36.512	1.4375	19.43	0.765	16.66	0.656	31.95	1.258	0.13	0.23	0.005	0.009	25500	8250
10SF16	25.400	1.0000	41.275	1.6250	22.22	0.875	19.05	0.750	36.50	1.437	0.13	0.23	0.005	0.009	33300	10800
12SF20	31.750	1.2500	50.800	2.0000	27.76	1.093	23.80	0.937	45.59	1.795	0.13	0.23	0.005	0.009	52000	16800
13SF22	34.925	1.3750	55.562	2.1875	30.15	1.187	26.19	1.031	49.20	1.937	0.13	0.13	0.005	0.009	61300	20100
15SF24	38.100	1.5000	61.912	2.4375	33.32	1.312	28.58	1.125	54.74	2.155	0.13	0.13	0.005	0.009	75000	24300
17SF28	44.450	1.7500	71.438	2.8125	38.89	1.531	33.32	1.312	63.88	2.515	0.13	0.23	0.005	0.009	102000	33000
20SF32	50.800	2.0000	80.962	3.1875	44.45	1.750	38.10	1.500	73.02	2.875	0.13	0.23	0.005	0.009	133000	43200
22SF36	57.150	2.2500	90.488	3.5625	50.01	1.969	42.85	1.687	82.17	3.235	0.15	0.25	0.006	0.010	169000	54600
25SF40	63.500	2.5000	100.012	3.9375	55.55	2.187	47.62	1.875	91.19	3.590	0.15	0.25	0.006	0.010	208000	67400
27SF44	69.850	2.7500	111.125	4.3750	61.11	2.406	52.37	2.062	100.33	3.950	0.15	0.25	0.006	0.010	252000	81600
30SF48	76.200	3.0000	120.650	4.7500	66.68	2.625	57.15	2.250	109.52	4.312	0.15	0.25	0.006	0.010	300000	97100
32SF52	82.550	3.2500	130.175	5.1250	72.24	2.844	61.90	2.437	118.74	4.675	0.18	0.28	0.007	0.011	353000	114000
35SF56	88.900	3.5000	139.700	5.5000	77.77	3.062	66.68	2.625	128.02	5.040	0.18	0.28	0.007	0.011	410000	132000
37SF60	95.250	3.7500	149.225	5.8750	83.34	3.281	71.42	2.812	136.91	5.390	0.18	0.28	0.007	0.011	467000	152000
40SF64	101.600	4.0000	158.750	6.2500	88.90	3.500	76.20	3.000	146.05	5.750	0.18	0.28	0.007	0.011	533000	173000
45SBB72	114.300	4.5000	177.800	7.0000	100.00	3.937	85.72	3.375	164.46	6.475	0.18	0.28	0.007	0.011	673000	218000
50SBB80	127.000	5.0000	196.850	7.7500	111.13	4.375	95.25	3.750	182.63	7.190	0.18	0.28	0.007	0.011	833000	270000
60SBB96	152.400	6.0000	222.250	8.7500	120.65	4.750	104.78	4.125	207.16	8.156	0.18	0.28	0.007	0.011	1050000	351000

\* Prior to coating with  $\text{MoS}_2$  and fracturing outer ring.

**MOUNTING**

- Housing bore dimensions listed below are applicable to bearings mounted in steel.
- Because of fracturing, the outer ring may be slightly out-of-round.
- Roundness will be restored when the bearing is mounted in a housing of sufficient cross section.
- Preferred shaft and housing bore dimensions are listed below.
- Refer to the m6 tolerance limits per ANSI B4.1 in the Shaft Diameter Tolerance table on page B422 for a shaft interference fit.



Maximum tilt for sealed bearing

Maximum tilt for bearing without seals

Mounting detail

**MOUNTING DIMENSIONS**

Weight (Approx.)		Tilting Angle		Shaft Shoulder Diameter $d_a$		Shaft Fillet Radius* $r_a^\dagger$ (Max.)		Housing Fillet Radius $r_b^\ddagger$ (Max.)		Shaft Diameter S				Housing Bore H			
		$\alpha$	$\alpha'$							mm		in.		mm		in.	
kg	lbs.	deg.	deg.	mm	in.	mm	in.	mm	in.	max.	min.	max.	min.	max.	min.		
0.020	0.044	5.5	14	14.3	0.56	*	*	0.6	0.022	12.695	12.685	0.4998	0.4994	22.197	22.217	0.8739	0.8747
0.036	0.079	6	14	17.8	0.70	*	*	0.8	0.032	15.870	15.860	0.6248	0.6244	26.960	26.980	1.0614	1.0622
0.057	0.126	6	14.5	21.4	0.84	*	*	0.8	0.032	19.042	19.029	0.7497	0.7492	31.717	31.742	1.2487	1.2497
0.087	0.193	6	14.5	25.0	0.98	*	*	0.8	0.032	22.217	22.204	0.8747	0.8742	36.479	36.504	1.4362	1.4372
0.125	0.276	6	14.5	28.6	1.12	*	*	0.8	0.032	25.392	25.379	0.9997	0.9992	41.242	41.267	1.6237	1.6247
0.234	0.516	6	14.5	35.7	1.41	*	*	0.8	0.032	31.740	31.725	1.2496	1.2490	50.762	50.792	1.9985	1.9997
0.349	0.770	5.5	14	38.9	1.53	*	*	0.8	0.032	34.915	34.900	1.3746	1.3740	55.524	55.554	2.1860	2.1872
0.424	0.934	6	14.5	43.3	1.70	*	*	0.8	0.032	38.090	38.075	1.4996	1.4990	61.874	61.904	2.4360	2.4372
0.649	1.430	6	15.5	50.0	1.97	*	*	0.8	0.032	44.440	44.425	1.7496	1.7490	71.399	71.429	2.8110	2.8122
0.939	2.070	6	15.5	57.2	2.25	*	*	0.8	0.032	50.790	50.772	1.9996	1.9989	80.914	80.950	3.1856	3.1870
1.324	2.920	6	14	65.1	2.56	*	*	0.8	0.032	57.140	57.122	2.2496	2.2489	90.439	90.475	3.5606	3.5620
1.855	4.090	6	14	72.2	2.84	*	*	0.8	0.032	63.490	63.472	2.4996	2.4989	99.964	100.000	3.9356	3.9370
2.440	5.380	6	12	79.4	3.12	0.6	0.022	0.8	0.032	69.840	69.822	2.7496	2.7489	111.077	111.113	4.3731	4.3745
3.116	6.870	6	12	86.5	3.41	0.6	0.022	0.8	0.032	76.190	76.172	2.9996	2.9989	120.594	120.635	4.7478	4.7494
3.914	8.630	6	12	94.1	3.70	0.6	0.022	0.8	0.032	82.537	82.514	3.2495	3.2486	130.119	130.160	5.1228	5.1244
4.853	10.700	6	12	101.0	3.97	0.6	0.022	0.8	0.032	88.887	88.864	3.4995	3.4986	139.644	139.685	5.4978	5.4994
5.897	13.000	6	12	108.0	4.25	0.6	0.022	0.8	0.032	95.237	95.214	3.7495	3.7486	149.169	149.210	5.8728	5.8744
7.076	15.600	6	11.5	116.0	4.56	0.6	0.022	0.8	0.032	101.587	101.564	3.9995	3.9986	158.694	158.735	6.2478	6.2494
9.934	21.900	6	12	130.0	5.12	0.8	0.032	1.1	0.044	114.287	114.264	4.4995	4.4986	177.744	177.785	6.9978	6.9994
13.472	29.700	6	12	144.0	5.69	0.8	0.032	1.1	0.044	126.985	126.960	4.9994	4.9984	196.784	196.830	7.7474	7.7492
17.600	38.800	5	10.5	168.0	6.59	0.8	0.032	1.1	0.044	152.385	152.360	5.9994	5.9984	222.184	222.230	8.7474	8.7492

\* For bearing sizes 5SF8 through 25SF40, shaft and shoulder should be undercut to eliminate fillet.

† Equal to minimum inner ring bore chamfer.

‡ Equal to minimum outer ring O.D. chamfer.



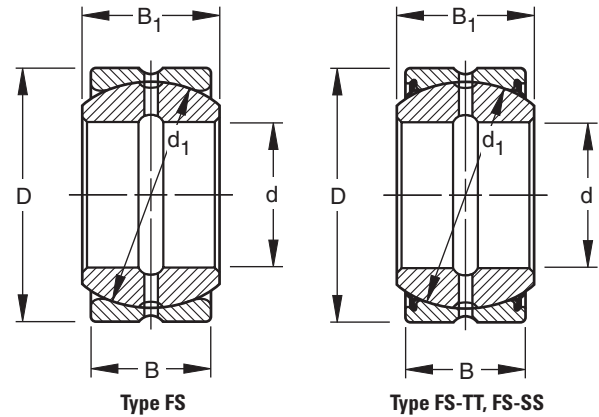
# SPHERICAL PLAIN BEARINGS

## RADIAL BEARINGS TYPE FS

B

- Type FS spherical plain radial bearing is a unit assembly consisting of a solid, spherical O.D. inner ring and a spherical I.D. outer ring.
- The outer ring has a single fracture to permit assembly. Both inner and outer rings are phosphate treated and then coated with molybdenum disulphide (MoS<sub>2</sub>).
- Bearings 16FS30 through 60FS90 are available with reinforced rubber seals. To order, add suffix "TT" to bearing designation - Example: 16FS30-TT.
- Bearings 70FS105 through 300FS430 are available with synthetic resin seals. To order, add suffix "SS" to bearing designation - Example: 70FS105-SS.
- Before ordering any bearing, check for availability.
- Type FS bearings are a metric series which follows proposed International Standards Organization (ISO) standards. Metric-Inch conversions given are for the convenience of the user. The controlling dimensions are in millimeters.

- For tolerances of nominal dimensions see the tables 1 and 2 on page B423. Dimensions listed are before coating with molybdenum disulphide. The axial internal clearance is approximately three times the radial internal clearance.
- $\alpha$  is the maximum tilting angle for sealed radial bearings. To utilize the maximum tilting angle for unsealed radial bearings the suggested shaft shoulder diameter  $d_{a1}$  shown in the drawing on facing page must not be exceeded.
- Dimensions and locations of lubrication holes and grooves may be obtained from your Timken representative.



### DIMENSIONS - LOAD RATINGS

Bearing Number	Bore d		Outside Diameter D		Inner Ring Width B <sub>1</sub>		Outer ring Width B		Spherical Diameter d <sub>1</sub>		Radial Clearance* (unmounted)				Load Ratings	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		in.		Radial Limit Load Rating	Dynamic Radial Load Rating
											min.	max.	min.	max.	lbf.	lbf.
12FS22	12	.4724	22	0.8661	10	.394	7	.276	19	.748	0.10	0.22	.004	.009	8630	2290
14FS26	14	.5512	26	1.0236	12	.472	9	.354	22	.866	0.10	0.22	.004	.009	11600	3210
16FS30	16	.6300	30	1.1811	14	.551	10	.394	25	.984	0.10	0.22	.004	.009	14400	4280
20FS35	20	.7874	35	1.3780	16	.630	12	.472	30	1.181	0.12	0.24	.005	.010	21500	6110
24FS42	24	.9449	42	1.6142	20	.787	16	.630	36	1.417	0.12	0.24	.005	.010	31000	9170
30FS47	30	1.1811	47	1.8504	22	.866	18	.709	41	1.614	0.12	0.24	.005	.010	40200	12600
35FS55	35	1.3780	55	2.1654	25	.984	20	.787	48	1.890	0.12	0.24	.005	.010	55100	16700
40FS62	40	1.5748	62	2.4409	28	1.102	22	.866	55	2.165	0.12	0.24	.005	.010	72300	21400
45FS68	45	1.7717	68	2.6772	32	1.260	25	.984	60	2.362	0.12	0.24	.005	.010	86100	27500
50FS75	50	1.9685	79	2.9528	35	1.378	28	1.102	67	2.638	0.12	0.24	.005	.010	107000	33400
60FS90	60	2.3622	90	3.5433	44	1.732	36	1.417	81	3.150	0.14	0.26	.006	.011	157000	50400
70FS105	70	2.7559	105	4.1339	49	1.929	40	1.575	94	3.701	0.14	0.26	.006	.011	211000	65500
80FS120	80	3.1496	120	4.7244	55	2.165	45	1.772	107	4.213	0.14	0.26	.006	.011	274000	84100
90FS130	90	3.5433	130	5.1181	60	2.362	50	1.968	117	4.606	0.14	0.26	.006	.011	327000	103000
100FS150	100	3.9370	150	5.9055	70	2.756	55	2.165	134	5.276	0.14	0.26	.006	.011	429000	134000
110FS160	110	4.3307	160	6.2992	70	2.756	55	2.165	143	5.630	0.14	0.26	.006	.011	489000	147000
120FS180	120	4.7244	180	7.0866	85	3.346	70	2.756	160	6.299	0.14	0.26	.006	.011	612000	195000
140FS210	140	5.5118	210	8.2677	90	3.543	70	2.756	187	7.362	0.16	0.28	.006	.011	836000	241000
160FS230	160	6.2992	230	9.0551	105	4.134	80	3.150	206	8.110	0.16	0.28	.006	.011	1020000	321000
180FS260	180	7.0866	260	10.2362	105	4.134	80	3.150	234	9.213	0.16	0.28	.006	.011	1300000	361000
200FS290	200	7.8740	290	11.4173	130	5.118	100	3.937	265	10.433	0.18	0.30	.007	.012	1680000	497000
220FS320	220	8.6614	320	12.5984	135	5.315	100	3.937	286	11.260	0.18	0.30	.007	.012	1960000	568000
240FS340	240	9.4488	340	13.3858	140	5.512	100	3.937	306	12.047	0.18	0.30	.007	.012	2240000	642000
260FS370	260	10.2362	370	14.5669	150	5.906	110	4.331	333	13.110	0.20	0.32	.008	.013	2650000	745000
280FS400	280	11.0236	400	15.7480	155	6.102	120	4.724	360	14.173	0.20	0.32	.008	.013	3100000	829000
300FS430	300	11.8110	430	16.9291	165	6.496	120	4.724	386	15.197	0.20	0.32	.008	.013	3560000	946000

\* Prior to fracturing outer ring.

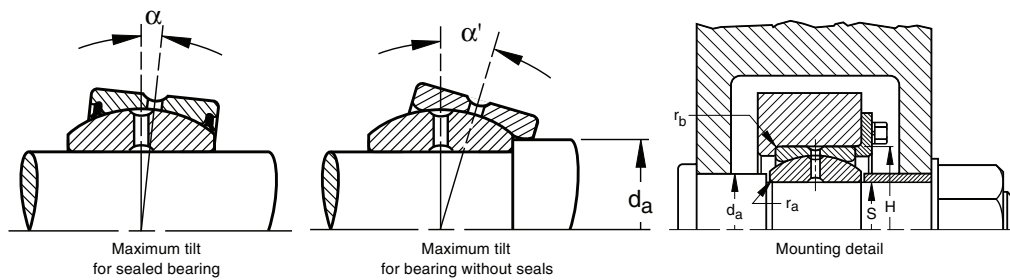
**MOUNTING**

- Due to fracturing, the outer ring may be slightly out-of-round. Roundness will be restored, however, when the bearing is mounted in a housing of sufficient cross section.
- The preferred shaft tolerance is f6 as listed below per ANSI B4.2. To obtain a shaft interference fit, refer to the m6 tolerance limits listed in the Shaft Diameter Tolerance table on page B422.

**LOAD RATING**

- The “dynamic load rating” is the maximum load suggested for extended life with periodic lubrication. It is based upon the radially projected area of the inner ring bore and an allowable stress level of 85 megapascals (approximately 12,300 psi).

- For intermittent loading and intermittent operation, the applied radial load should not exceed the dynamic load rating. For constant loading and continuous operation, the applied radial load should not exceed 75 percent of the dynamic load rating. For dynamic or static thrust loading, use 25 percent of respective radial load values. For combined radial and thrust loading, consult your Timken representative.
- The “limit load rating” is the maximum static load that can be applied to a Timken spherical plain bearing. Shaft and housing stresses should be checked when the load approaches the limit load rating since the shaft or housing may then become the critical member. The ultimate, or static fracture, rating of the bearing is at least 1.5 times the limit load rating.
- Load ratings are given in pounds-force:  
1 lbf = 0.454kgf = 4.448 N.



**MOUNTING DIMENSIONS**

Weight (Approx.)		Tilting Angle		Shaft Shoulder Diameter d <sub>a</sub>		Shaft Fillet Radius* r <sub>a</sub> <sup>†</sup> (Max.)		Housing Fillet Radius r <sub>b</sub> <sup>‡</sup> (Max.)		Shaft Diameter S				Housing Bore H			
kg	lbs.	α deg.	α' deg.	mm	in.	mm	in.	mm	in.	max.	min.	max.	min.	max.	min.	min.	max.
.038		10.0	11.5	16	.63	0.5	.02	0.5	.02	11.984	11.973	.4718	.4714	21.977	21.995	.8650	.8658
.065		8.5	14.5	18	.71	0.5	.02	0.5	.02	13.984	13.973	.5506	.5502	25.972	25.993	1.0225	1.0233
.115		10.0	16.0	20	.79	0.5	.02	0.5	.02	15.984	15.973	.6293	.6289	29.972	29.993	1.1800	1.1808
.149		8.5	14.0	25	.98	0.5	.02	0.6	.02	19.980	19.967	.7866	.7861	34.967	34.992	1.3767	1.3777
.257		7.0	12.5	29	1.14	0.5	.02	0.6	.02	23.980	23.967	.9441	.9436	41.967	41.992	1.6522	1.6532
.337		6.0	10.5	34	1.38	0.5	.02	0.6	.02	29.980	29.967	1.1803	1.1798	46.967	46.992	1.8491	1.8501
.523		6.5	10.5	40	1.61	0.6	.02	0.8	.03	34.975	34.959	1.3770	1.3764	54.961	54.991	2.1638	2.1650
.729		7.0	10.5	47	1.85	0.6	.02	0.8	.03	39.975	39.959	1.5738	1.5732	61.961	61.991	2.4394	2.4406
.948		7.5	10.5	50	2.01	0.6	.02	0.8	.03	44.975	44.959	1.7707	1.7701	67.961	67.991	2.6756	2.6768
1.27		6.5	10.0	56	2.24	0.6	.02	0.8	.03	49.975	49.959	1.9675	1.9669	74.961	74.991	2.9512	2.9524
2.32		6.5	11.0	66	2.64	0.8	.03	1.0	.04	59.970	59.951	2.3610	2.3603	89.955	89.990	3.5415	3.5429
3.53		6.0	9.5	80	3.15	0.8	.03	1.0	.04	69.970	69.951	2.7547	2.7540	104.955	104.990	4.1321	4.1335
5.20		6.0	7.5	92	3.62	0.8	.03	1.0	.04	79.970	79.951	3.1484	3.1477	119.955	119.990	4.7226	4.7240
6.28		5.5	7.5	100	3.94	1.0	.04	1.0	.04	89.964	89.942	3.5419	3.5410	129.948	129.988	5.1161	5.1177
10.1		7.0	8.5	114	4.49	1.0	.04	1.0	.04	99.964	99.942	3.9356	3.9347	149.948	149.988	5.9035	5.9051
10.9		6.0	7.5	125	4.92	1.0	.04	1.0	.04	109.964	109.942	4.3293	4.3284	159.948	159.988	6.2972	6.2988
18.1		6.0	7.5	136	5.35	1.0	.04	1.0	.04	119.964	119.942	4.7230	4.7221	179.948	179.988	7.0846	7.0862
25.6		6.5	7.0	164	6.46	1.0	.04	1.0	.04	139.957	139.932	5.5101	5.5091	209.940	209.986	8.2654	8.2674
32.3		7.5	9.0	177	6.97	1.0	.04	1.0	.04	159.957	159.932	6.2975	6.2965	229.940	229.986	9.0528	9.0548
42.8		6.5	7.0	209	8.23	1.0	.04	1.0	.04	179.957	179.932	7.0849	7.0839	259.934	259.986	10.2336	10.2356
66.5		7.0	7.5	231	9.09	1.0	.04	1.0	.04	199.950	199.921	7.8720	7.8709	289.934	289.986	11.4147	11.4167
82.3		7.5	8.0	252	9.92	1.0	.04	1.0	.04	219.950	219.921	8.6594	8.6583	319.927	319.984	12.5956	12.5978
90.1		8.0	9.0	272	10.70	1.0	.04	1.0	.04	239.950	239.921	9.4468	9.4457	339.927	339.984	13.3830	13.3852
117		7.0	8.5	297	11.69	1.0	.04	1.0	.04	259.944	259.912	10.2340	10.2327	369.927	369.984	14.5641	14.5663
147		6.0	7.0	325	12.80	1.0	.04	1.0	.04	279.944	279.912	11.0214	11.0201	399.927	399.984	15.7452	15.7474
177		7.0	9.0	349	13.74	1.0	.04	1.0	.04	299.944	299.912	11.8088	11.8075	429.920	429.983	16.9260	16.9285

\* For bearing sizes 5SF8 through 25SF40, shaft and shoulder should be undercut to eliminate fillet.

† Equal to minimum inner ring bore chamfer.

‡ Equal to minimum outer ring O.D. chamfer.



# SPHERICAL PLAIN BEARINGS

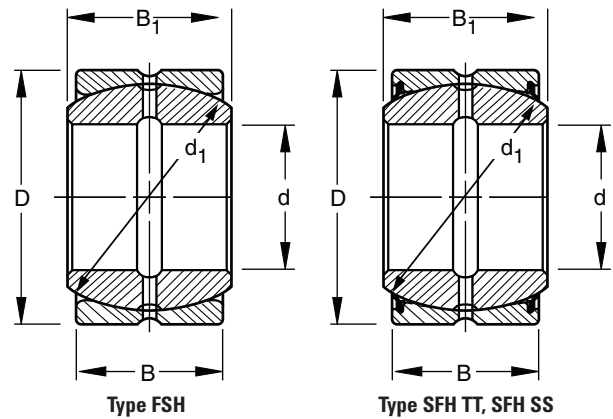
## RADIAL BEARINGS TYPE FSH

- The FSH spherical plain radial bearing is a unit assembly consisting of a solid spherical O.D. inner ring and a spherical I.D. outer ring.
- The outer ring has a single fracture to permit assembly. Both inner and outer rings are phosphate treated and then coated with molybdenum disulphide (MoS<sub>2</sub>). The type FSH bearing is similar to type FS, but the inner ring bore diameter has been reduced and the width made greater to increase the spherical surface. This permits greater misalignment while maintaining full bearing contact.
- Bearings 14FSH30 through 50FSH90 are available with reinforced rubber seals. To order, add suffix "TT" to bearing designation - Example: 14FSH30-TT.
- Bearings 60FSH105 through 280FSH430 are available with synthetic resin seals. To order, add suffix "SS" to bearing designation - Example: 60FSH105-SS.
- Before ordering any bearing, check for availability.

### DIMENSIONS

- Type FSH bearings are a metric series which follows proposed International Standards Organization (ISO) standards. Metric Inch conversions given are for the convenience of the user. The controlling dimensions are in millimeters.

- For tolerances of nominal dimensions, see Tables 1 and 2 on page B411. Dimensions listed are before coating with molybdenum disulphide. The axial internal clearance is approximately three times the radial internal clearance.
- $\alpha$  is the maximum tilting angle for sealed radial bearings. To utilize the maximum tilting angle for unsealed radial bearings, the suggested shaft shoulder diameter  $d_1$  shown in the drawing on facing page must not be exceeded.
- Dimensions and locations of lubrication holes and grooves may be obtained from your Timken representative.



### DIMENSIONS - LOAD RATINGS

Bearing Number	Bore d		Outside Diameter D		Inner Ring Width B <sub>1</sub>		Outer ring Width B		Spherical Diameter d <sub>1</sub>		Radial Clearance* (unmounted)				Load Ratings		
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	min.	max.	min.	max.	Radial Limit Load Rating
12FSH26	12	.4724	26	1.0236	15	.591	9	.354	22	.866	0.10	0.22	.004	.009	11600	3440	
14FSH30	14	.5512	30	1.1811	16	.630	10	.394	25	.984	0.10	0.22	.004	.009	14400	4280	
16FSH35	16	.6300	35	1.3780	20	.787	12	.472	30	1.181	0.12	0.24	.005	.010	21500	6110	
20FSH42	20	.7874	42	1.6142	25	.984	16	.630	36	1.417	0.12	0.24	.005	.010	31000	9550	
24FSH47	24	.9449	47	1.8504	28	1.102	18	.709	41	1.614	0.12	0.24	.005	.010	40200	12800	
30FSH55	30	1.1811	55	2.1654	32	1.260	20	.787	48	1.890	0.12	0.24	.005	.010	55100	18300	
35FSH62	35	1.3780	62	2.4409	35	1.378	22	.866	55	2.165	0.12	0.24	.005	.010	72300	23400	
40FSH68	40	1.5748	68	2.6772	40	1.575	25	.984	60	2.362	0.12	0.24	.005	.010	86100	30600	
45FSH75	45	1.7717	75	2.9528	43	1.693	28	1.102	67	2.638	0.12	0.24	.005	.010	107000	37000	
50FSH90	50	1.9685	90	3.5433	56	2.205	36	1.417	81	3.150	0.14	0.26	.006	.011	157000	53500	
60FSH105	60	2.3622	105	4.1339	63	2.480	40	1.575	94	3.701	0.14	0.26	.006	.011	211000	72200	
70FSH120	70	2.7559	120	4.7244	70	2.756	45	1.772	107	4.213	0.14	0.26	.006	.011	274000	93600	
80FSH130	80	3.1496	130	5.1181	75	2.953	50	1.968	117	4.606	0.14	0.26	.006	.011	327000	115000	
90FSH150	90	3.5433	150	5.9055	85	3.346	55	2.165	134	5.276	0.14	0.26	.006	.011	429000	146000	
100FSH160	100	3.9370	160	6.2992	85	3.346	55	2.165	143	5.630	0.14	0.26	.006	.011	489000	162000	
110FSH180	110	4.3307	180	7.0866	100	3.937	70	2.756	160	6.299	0.14	0.26	.006	.011	612000	210000	
120FSH210	120	4.7244	210	8.2677	115	4.528	70	2.756	187	7.362	0.16	0.28	.006	.011	836000	264000	
140FSH230	140	5.5118	230	9.0551	130	5.118	80	3.150	206	8.110	0.16	0.28	.006	.011	1020000	348000	
160FSH260	160	6.2992	260	10.2362	135	5.315	80	3.150	234	9.213	0.16	0.28	.006	.011	1300000	413000	
180FSH290	180	7.0866	290	11.4173	155	6.102	100	3.937	265	10.433	0.18	0.30	.007	.012	1680000	533000	
200FSH320	200	7.8740	320	12.5984	165	6.496	100	3.937	286	11.260	0.18	0.30	.007	.012	1960000	631000	
220FSH340	220	8.6614	340	13.3858	175	6.890	100	3.937	306	12.047	0.18	0.30	.007	.012	2240000	736000	
240FSH370	240	9.4488	370	14.5669	190	7.480	110	4.331	333	13.110	0.20	0.32	.008	.013	2650000	871000	
260FSH400	260	10.2362	400	15.7480	205	8.071	120	4.724	360	14.173	0.20	0.32	.008	.013	3100000	1020000	
280FSH430	280	11.0236	430	16.9291	210	8.268	120	4.724	386	15.197	0.20	0.32	.008	.013	3560000	1120000	

\* Prior to fracturing outer ring.

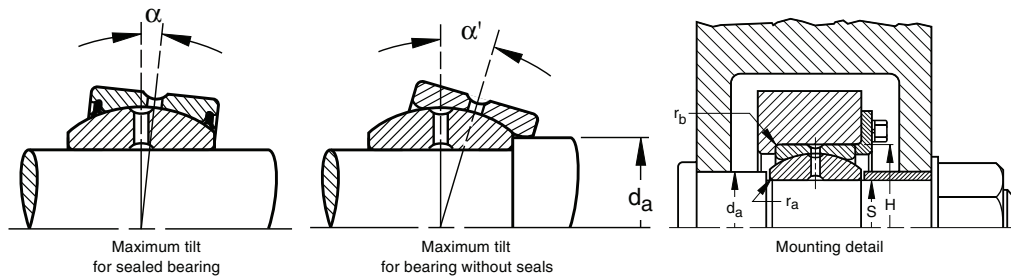
**MOUNTING**

- The housing bore dimensions given below are applicable to bearings mounted in steel.
- Due to fracturing, the outer ring may be slightly out-of-round. Roundness will be restored, however, when the bearing is mounted in a housing of sufficient cross section.
- The preferred shaft tolerance is f6 as listed below per ANSI B4.2. To obtain a shaft interference fit, refer to the m6 tolerance limits listed in the Shaft Diameter Tolerance table on page B422.

- For intermittent loading and intermittent operation, the applied radial load should not exceed the dynamic load rating for constant loading and continuous operation, the applied radial load should not exceed 75 percent of the dynamic load rating. For dynamic or static thrust loading, use 25 percent of respective radial load rating values. For combined radial and thrust loading, consult your Timken representative.
- The “limit load rating” is the maximum static load that can be applied to a Timken spherical plain bearing. Shaft and housing stresses should be checked when the load approaches the limit load rating since the shaft or housing may then become the critical member. The ultimate or static fracture rating of the bearing is at least 1.5 times the limit load rating.
- Load ratings are given in pounds force:  
1 lbf = 0.454 kgf = 4.448N.

**LOAD RATING**

- The “dynamic load rating” is the maximum load suggested for extended life with periodic lubrication. It is based upon the radially projected area of the inner ring bore and allowable stress level of 85 megapascals (approximately 12,300 psi).



**MOUNTING DIMENSIONS**

Weight (Approx.) lbs.	Tilting Angle		Shaft Shoulder Diameter $d_a$		Shaft Fillet Radius* $r_a^\dagger$ (Max.)		Housing Fillet Radius $r_b^\ddagger$ (Max.)		Shaft Diameter S				Housing Bore H			
	$\alpha$	$\alpha'$							mm		in.		mm		in.	
	deg.	deg.	mm	in.	mm	in.	mm	in.	max.	min.	max.	min.	max.	min.	min.	max.
.069	18.5	25.0	16	.63	0.5	.02	0.5	.02	11.984	11.973	.4718	.4714	25.972	25.993	1.0225	1.0233
.130	16.0	22.0	19	.75	0.5	.02	0.5	.02	13.984	13.973	.5506	.5502	29.972	29.993	1.1800	1.1808
.171	18.0	27.0	21	.83	0.5	.02	0.6	.02	15.984	15.973	.6293	.6289	34.967	34.992	1.3767	1.3777
.298	17.5	26.5	24	.94	0.5	.02	0.6	.02	19.980	19.967	.7866	.7861	41.967	41.992	1.6522	1.6532
.397	17.0	23.0	29	1.14	0.5	.02	0.6	.02	23.980	23.963	.9441	.9436	46.967	46.992	1.8491	1.8501
.574	17.0	24.0	34	1.34	0.5	.02	0.8	.03	29.980	29.967	1.1803	1.1798	54.961	54.991	2.1638	2.1650
.794	15.5	24.5	39	1.54	0.6	.02	0.8	.03	34.975	34.959	1.3770	1.3764	61.961	61.991	2.4394	2.4406
.982	17.0	21.0	44	1.73	0.6	.02	0.8	.03	39.975	39.959	1.5738	1.5732	67.961	67.991	2.6756	2.6768
1.31	15.0	20.0	50	1.97	0.6	.02	0.8	.03	44.975	44.959	1.7707	1.7701	74.961	74.991	2.9512	2.9524
2.63	17.0	23.5	57	2.24	0.6	.02	1.0	.04	49.975	49.959	1.9675	1.9669	89.955	89.990	3.5415	3.5429
3.91	16.5	22.5	67	2.64	0.8	.03	1.0	.04	59.970	59.951	2.3610	2.3603	104.955	104.990	4.1321	4.1335
5.62	15.5	20.5	77	3.03	0.8	.03	1.0	.04	69.970	69.951	2.7547	2.7540	119.955	119.990	4.7226	4.7240
6.66	14.5	18.5	87	3.43	0.8	.03	1.0	.04	79.970	79.951	3.1484	3.1477	129.948	129.988	5.1161	5.1177
10.4	15.0	19.5	98	3.86	1.0	.04	1.0	.04	89.964	89.942	3.5419	3.5410	149.948	149.988	5.9035	5.9051
11.5	13.5	18.0	110	4.33	1.0	.04	1.0	.04	99.964	99.942	3.9356	3.9347	159.948	159.988	6.2972	6.2988
17.9	12.5	15.5	122	4.80	1.0	.04	1.0	.04	109.964	109.942	4.3293	4.3284	179.948	179.988	7.0846	7.0862
29.7	15.5	23.5	132	5.20	1.0	.04	1.0	.04	119.964	119.942	4.7230	4.7221	209.940	209.986	8.2654	8.2674
35.8	16.0	20.5	152	5.98	1.0	.04	1.0	.04	139.957	139.932	5.5101	5.5091	229.940	229.986	9.0528	9.0548
48.9	15.0	21.0	176	6.93	1.0	.04	1.0	.04	159.957	159.932	6.2975	6.2965	259.934	259.986	10.2336	10.2356
71.5	13.0	20.5	196	7.72	1.0	.04	1.0	.04	179.957	179.932	7.0849	7.0839	289.934	289.986	11.4147	11.4167
88.2	14.5	19.5	220	8.66	1.0	.04	1.0	.04	199.950	199.921	7.8720	7.8709	319.927	319.984	12.5956	12.5978
96.4	15.5	19.0	243	9.57	1.0	.04	1.0	.04	219.950	219.921	8.6594	8.6583	339.927	339.984	13.3830	13.3852
124	15.5	19.5	263	10.35	1.0	.04	1.0	.04	239.950	239.921	9.4468	9.4457	369.927	369.984	14.5641	14.5663
157	15.0	19.5	283	11.14	1.0	.04	1.0	.04	259.944	259.912	10.2340	10.2327	399.927	399.984	15.7452	15.7474
188	14.5	20.0	310	12.20	1.0	.04	1.0	.04	279.944	279.912	11.0214	11.0201	429.920	429.983	16.9260	16.9285

\* For bearing sizes 5SF8 through 25SF40, shaft and shoulder should be undercut to eliminate fillet.

† Equal to minimum inner ring bore chamfer.

‡ Equal to minimum outer ring O.D. chamfer.





# SPHERICAL PLAIN BEARINGS

## RADIAL BEARINGS TYPE SFH

B

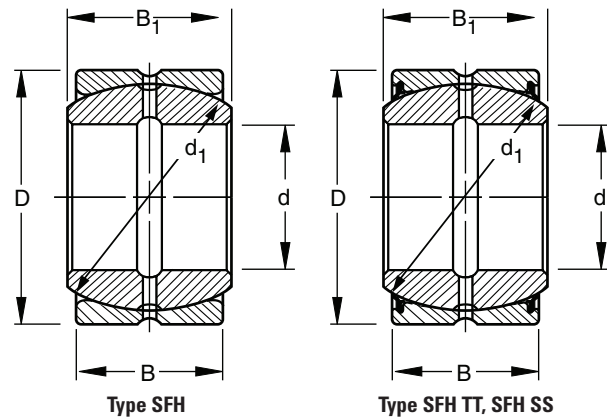
- The SFH spherical plain radial bearing is a unit assembly consisting of a solid spherical O.D. inner ring and a spherical I.D. outer ring. The outer ring has a single fracture to permit assembly. Both inner and outer rings are phosphate treated and then coated with molybdenum disulphide (MoS<sub>2</sub>).
- The type SFH bearing is similar to type SF, but the inner ring bore diameter has been reduced and the width made greater to increase the spherical surface. This permits greater misalignment yet maintains full bearing contact.
- Bearings 12SFH24 through 22SFH40 are available with reinforced rubber seals. To order, add suffix "TT" to bearing designation - Example: 22SFH40-TT.
- Bearings 25SFH44 through 55SFH96 are available with synthetic resin seals. To order, add suffix "SS" to bearing designation - Example: 25SFH44-SS.
- Before ordering any bearing, check for availability.

### DIMENSIONS

- Inch-metric conversions given are for the convenience of the user. The controlling dimensions are in inches.
- For tolerances of nominal dimensions, see Tables 2 and 2A on page B411. Dimensions listed are after coating with

MoS<sub>2</sub> except outer ring O.D. and internal clearance are before coating and fracturing. The axial internal clearance is approximately three times the radial internal clearance.

- $\alpha$  is the maximum tilting angle for sealed radial bearings. To utilize the maximum tilting angle for unsealed radial bearings, the suggested shaft shoulder diameter  $d_a$ , shown in the drawing on facing page must not be exceeded.
- Dimensions and locations of lubrication holes and grooves may be obtained from your Timken representative.



### DIMENSIONS - LOAD RATINGS

Bearing Number	Bore d		Outside Diameter D		Inner Ring Width B <sub>1</sub>		Outer ring Width B		Spherical Diameter d <sub>1</sub> (Ref.)	Radial Clearance* (unmounted)				Load Ratings		
	mm	in.	mm	in.	mm	in.	mm	in.		mm		in.		Radial Load Rating	Dynamic Radial Load Rating	
										min.	max.	min.	max.	lbf.	lbf.	
12SFH24	31.750	1.2500	61.912	2.4375	35.31	1.390	28.58	1.125	54.74	2.155	0.13	0.23	.005	.009	75000	21400
15SFH28	38.100	1.5000	71.438	2.8125	40.13	1.580	33.32	1.312	63.88	2.515	0.13	0.23	.005	.009	102000	29200
17SFH32	44.450	1.7500	80.962	3.1875	46.23	1.820	38.10	1.500	73.02	2.875	0.13	0.23	.005	.009	133000	39300
20SFH36	50.800	2.0000	90.488	3.5625	52.58	2.070	42.85	1.687	82.17	3.235	0.15	0.25	.006	.010	169000	51000
22SFH40	57.150	2.2500	100.012	3.9375	58.88	2.318	47.62	1.875	91.19	3.590	0.15	0.25	.006	.010	208000	64000
25SFH44	63.500	2.5000	111.125	4.3750	64.64	2.545	52.37	2.062	100.33	3.950	0.15	0.25	.006	.010	252000	78400
27SFH48	69.850	2.7500	120.650	4.7500	70.87	2.790	57.15	2.250	109.52	4.312	0.15	0.25	.006	.010	300000	94600
30SFH52	76.200	3.0000	130.175	5.1250	76.76	3.022	61.90	2.437	118.74	4.675	0.18	0.28	.007	.011	353000	112000
32SFH56	82.550	3.2500	139.700	5.5000	82.93	3.265	66.68	2.625	128.02	5.040	0.18	0.28	.007	.011	410000	131000
35SFH60	88.900	3.5000	149.225	5.8750	90.42	3.560	71.42	2.812	136.91	5.390	0.18	0.28	.007	.011	467000	154000
37SFH64	95.250	3.7500	158.750	6.2500	94.95	3.738	76.20	3.000	146.05	5.750	0.18	0.28	.007	.011	533000	173000
40SFH72	101.600	4.0000	177.800	7.0000	107.32	4.225	85.72	3.375	164.46	6.475	0.18	0.28	.007	.011	673000	208000
45SFH80	114.300	4.5000	196.850	7.7500	119.13	4.690	95.25	3.750	182.63	7.190	0.18	0.28	.007	.011	833000	260000
55SFH96	139.700	5.5000	222.250	8.7500	125.73	4.950	104.78	4.125	207.16	8.156	0.18	0.28	.007	.011	1050000	336000

\* Prior to fracturing outer ring.

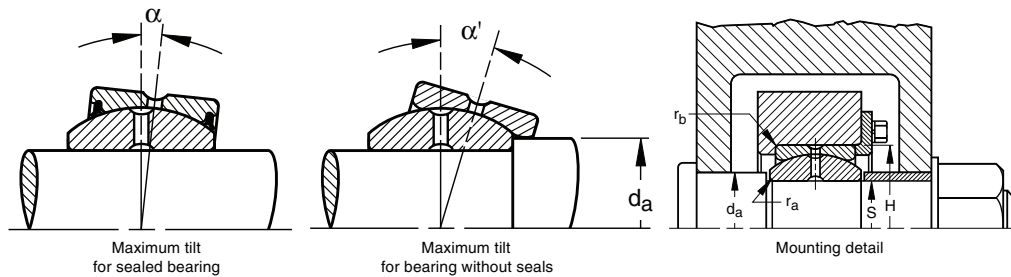
**MOUNTING**

- The housing bore dimensions given below are applicable to bearings mounted in steel.
- Due to fracturing, the outer ring may be slightly out-of-round. Roundness will be restored, however, when the bearing is mounted in a housing of sufficient cross section.
- The preferred shaft tolerance is g6 as listed below per ANSI B4.1. To obtain a shaft interference fit, refer to the m6 tolerance limits listed in the Shaft Diameter Tolerance table on page B422.

**LOAD RATING**

- The “dynamic load rating” is the maximum load suggested for extended life with periodic lubrication. It is based upon the radially projected area of the inner ring bore and an allowable stress level of 85 megapascals (approximately 12,300 psi).

- For intermittent loading and intermittent operation, the applied radial load should not exceed the dynamic load rating. For constant loading and continuous operation, the applied radial load should not exceed 75 percent of the dynamic load rating. For dynamic or static thrust loading, use 25 percent of respective radial load rating values. For combined radial and thrust loading, consult your Timken representative.
- The “limit load rating” is the maximum static load that can be applied to a Timken spherical plain bearing. Shaft and housing stresses should be checked when the load approaches the limit load rating since the shaft or housing may then become the critical member. The ultimate, or static fracture, rating of the bearing is at least 1.5 times the limit load rating.
- Load ratings are given in pounds force:  
1lbf = 0.454 kgf = 4.448N.



**MOUNTING DIMENSIONS**

Weight (Approx.) lbs.	Tilting Angle		Shaft Shoulder Diameter da		Shaft Fillet Radius* ra† (Max.)		Housing Fillet Radius rb‡ (Max.)		Shaft Diameter S				Housing Bore H			
	α	α'	mm	in.	mm	in.	mm	in.	mm		in.		mm		in.	
	deg.	deg.							max.	min.	max.	min.	max.	min.	max.	min.
1.00	8.5	16.5	41.9	1.64	1.0	.040	0.8	.032	31.740	31.725	1.2496	1.2490	61.874	61.904	2.4360	2.4372
1.60	7.0	15.5	49.8	1.95	1.0	.040	0.8	.032	38.090	38.075	1.4996	1.4990	71.399	71.429	2.8110	2.8122
2.50	7.5	16.0	56.6	2.22	1.5	.060	0.8	.032	44.440	44.425	1.7496	1.7490	80.914	80.950	3.1856	3.1870
3.70	8.0	16.0	63.2	2.48	1.5	.060	0.8	.032	50.790	50.772	1.9996	1.9989	90.439	90.475	3.5606	3.5620
4.40	8.5	16.5	69.6	2.74	1.5	.060	0.8	.032	57.140	57.122	2.2496	2.2489	99.964	100.000	3.9356	3.9370
6.50	8.5	14.0	76.7	3.02	2.0	.080	0.8	.032	63.490	63.472	2.4996	2.4989	111.077	111.113	4.3731	4.3745
8.00	8.5	14.0	83.6	3.28	2.0	.080	0.8	.032	69.840	69.822	2.7496	2.7489	120.594	120.635	4.7478	4.7494
9.60	8.5	14.0	90.7	3.56	2.0	.080	0.8	.032	76.190	76.172	2.9996	2.9989	130.119	130.160	5.1228	5.1244
11.7	8.5	14.0	97.5	3.83	2.0	.080	0.8	.032	82.537	82.514	3.2495	3.2486	139.544	139.685	5.4978	5.4994
15.0	9.5	15.0	103	4.04	2.0	.080	0.8	.032	88.887	88.864	3.4995	3.4986	149.169	149.210	5.8728	5.8744
19.5	9.0	14.5	111	4.36	2.0	.080	0.8	.032	95.237	95.214	3.7495	3.7486	158.694	158.735	6.2478	6.2494
22.5	9.0	14.5	125	4.90	2.0	.080	1.1	.044	101.587	101.564	3.9995	3.9986	177.744	177.785	6.9978	6.9994
30.0	9.0	14.5	138	5.44	2.0	.080	1.1	.044	114.287	114.264	4.4995	4.4986	196.784	196.830	7.7474	7.7492
45.0	6.5	12.0	165	6.48	2.0	.080	1.1	.044	139.685	139.660	5.4994	5.4984	222.184	222.230	8.7474	8.7492

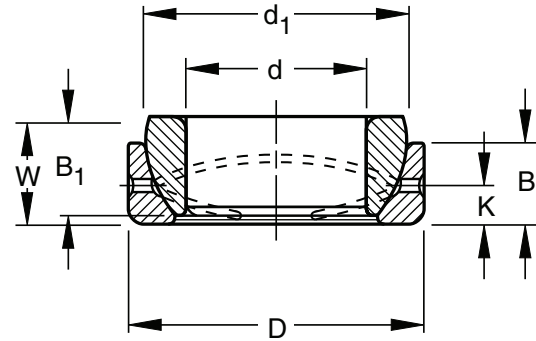
\* For bearing sizes 5SF8 through 25SF40, shaft and shoulder should be undercut to eliminate fillet.  
 † Equal to minimum inner ring bore chamfer.  
 ‡ Equal to minimum outer ring O.D. chamfer.



# SPHERICAL PLAIN BEARINGS

## ANGULAR CONTACT BEARINGS TYPE SBT

- Separable assembly consisting of an inner and outer ring with hemispherically shaped surfaces that mate with each other.
- Both inner and outer rings are phosphate-treated and coated with molybdenum disulphide (MoS<sub>2</sub>).
- If a Timken ring is assembled with a ring of another make, consult your Timken representative.
- To order inner and outer rings separately, specify by adding suffix “-OR” for outer ring or “-IR” for inner ring.
- Metric-inch conversions are provided for the convenience of the user. The controlling dimensions are in inches.
- See Table 2 and 3 for tolerances. Dimensions listed are after the bearing has been coated with molybdenum disulphide.
- $\alpha$  is the maximum tilting angle through the shaft. A stub shaft can be used to obtain a larger angle.
- Dimensions and locations of lubrication holes and grooves may be obtained from your Timken representative.

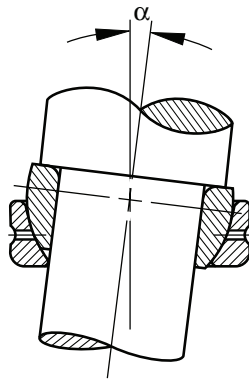


### DIMENSIONS - LOAD RATINGS

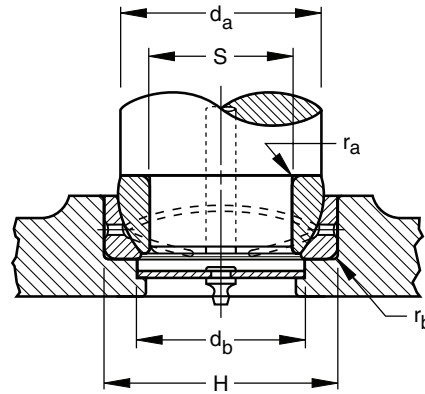
Bearing Number	Bore d		Outside Diameter D		Inner Ring Width B <sub>1</sub>		Outer ring Width B		Overall Width W		Lube Hole Location K		Spherical Diameter d <sub>1</sub>		Load Ratings	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	max.	min.	max.	Radial Limit Load Rating	
5SBT80	12.700	0.5000	22.225	0.8750	6.86	0.270	4.83	0.190	7.62	0.300	0.094	2.39	0.719	18.26	4600	1860
6SBT10	15.875	0.6250	26.988	1.0625	8.64	0.340	6.35	0.250	9.40	0.370	0.109	2.77	0.899	22.83	7600	3080
7SBT12	19.050	0.7500	31.750	1.2500	10.41	0.410	7.87	0.310	11.18	0.440	0.125	3.18	1.080	27.43	11100	4500
8SBT14	22.225	0.8750	36.512	1.4375	12.19	0.480	9.65	0.380	13.21	0.520	0.172	4.37	1.258	31.95	15400	6210
10SBT16	25.400	1.0000	41.275	1.6250	13.97	0.550	11.18	0.440	15.24	0.600	0.203	5.16	1.437	36.50	19400	7860
12SBT20	31.750	1.2500	50.800	2.0000	17.78	0.700	13.97	0.550	18.80	0.740	0.234	5.94	1.795	45.59	31000	12500
13SBT22	34.925	1.3750	55.562	2.1875	19.56	0.770	15.24	0.600	21.34	0.840	0.281	7.14	1.937	49.20	37000	15100
15SBT24	38.100	1.5000	61.912	2.4375	21.34	0.840	16.76	0.660	23.11	0.910	0.312	7.92	2.155	54.74	44500	18300
17SBT28	44.450	1.7500	71.438	2.8125	24.89	0.980	20.07	0.790	27.18	1.070	0.328	8.33	2.515	63.88	60000	24400
20SBT32	50.800	2.0000	80.962	3.1875	28.70	1.130	23.37	0.920	31.24	1.230	0.375	9.52	2.875	73.02	79000	32300
22SBT36	57.150	2.2500	90.488	3.5625	32.26	1.270	26.67	1.050	35.31	1.390	0.453	11.51	3.235	82.17	100000	40800
25SBT40	63.500	2.5000	100.012	3.9375	36.07	1.420	29.97	1.180	39.12	1.540	0.500	12.70	3.590	91.19	126000	51500
27SBT44	69.850	2.7500	111.125	4.3750	39.62	1.560	32.38	1.275	43.18	1.700	0.515	13.08	3.950	100.33	154000	62150
30SBT48	76.200	3.0000	120.650	4.7500	43.43	1.710	35.69	1.405	47.24	1.860	0.578	14.68	4.312	109.52	186000	75000
32SBT52	82.550	3.2500	130.175	5.1250	47.24	1.860	39.24	1.545	51.56	2.030	0.656	16.66	4.675	118.74	218000	87500
35SBT56	88.900	3.5000	139.700	5.5000	50.80	2.000	42.54	1.675	55.37	2.180	0.703	17.86	5.040	128.02	257000	102400
37SBT60	95.250	3.7500	149.225	5.8750	54.61	2.150	45.85	1.805	59.44	2.340	0.765	19.43	5.390	136.91	295000	118500
40SBT64	101.600	4.0000	158.750	6.2500	58.42	2.300	49.15	1.935	63.50	2.500	0.781	19.84	5.750	146.05	336000	135000
45SBT72	114.300	4.5000	177.800	7.0000	65.79	2.590	55.75	2.195	71.12	2.800	0.875	22.22	6.475	164.46	432000	173500
50SBT80	127.000	5.0000	196.850	7.7500	73.15	2.880	62.36	2.455	79.50	3.130	1.000	25.40	7.190	182.63	524000	211000
60SBT96	152.400	6.0000	222.250	8.7500	78.74	3.100	66.42	2.615	85.72	3.375	1.370	34.80	8.156	207.16	585000	235000

**MOUNTING**

- Housing bore dimensions listed are appropriate for bearings mounted in steel.
- Suggested diameters of shoulder supports should be used to assure proper function of the bearing.
- Preferred shaft and housing bore dimensions are listed below per ANSI B4.1.
- Refer to the m6 tolerance limits listed in the Shaft Diameter Tolerance table on page B422 for shaft interference fit.
- Bearings are to be mounted with sufficient axial preload to ensure contact of the spherical surfaces under all load conditions.



Maximum tilt for bearing



Mounting detail

**MOUNTING DIMENSIONS**

Weight (Approx.)		Tilting Angle (Max.)	Shaft Shoulder Diameter $d_a$		Shaft Fillet Radius $r_a^\dagger$ (Max.)		Housing Shoulder Diameter $d_b$		Housing Fillet Radius $r_b^\ddagger$ (Max.)		Shaft Diameter S				Housing Bore H			
			kg	lbs.	deg.	mm	in.	mm	in.	mm	in.	mm	in.	min.	max.	min.	max.	min.
0.013	0.029	7	17.0	0.67	0.5	0.020	14.5	0.57	0.5	0.020	12.685	12.695	0.4994	0.4998	22.197	22.217	0.8739	0.8747
0.025	0.056	6	21.3	0.84	0.8	0.030	17.8	0.70	0.5	0.030	15.860	15.870	0.6244	0.6248	26.960	26.980	1.0614	1.0622
0.038	0.083	6	25.9	1.02	1.0	0.040	21.3	0.84	1.0	0.040	19.029	19.042	0.7492	0.7497	31.717	31.742	1.2487	1.2497
0.050	0.110	5.5	31.2	1.23	2.0	0.080	24.6	0.97	2.0	0.080	22.204	22.217	0.8742	0.8747	36.479	36.504	1.4362	1.4372
0.085	0.188	6	35.6	1.40	2.0	0.080	28.4	1.12	2.0	0.080	25.379	25.392	0.9992	0.9997	41.242	41.267	1.6237	1.6247
0.159	0.351	6	43.4	1.71	2.0	0.080	35.3	1.39	2.0	0.080	31.725	31.740	1.2490	1.2496	50.762	50.792	1.9985	1.9997
0.213	0.470	4	48.0	1.89	2.5	0.100	37.6	1.48	2.5	0.100	34.900	34.915	1.3740	1.3746	55.524	55.554	2.1860	2.1872
0.300	0.662	5.5	52.1	2.05	2.5	0.100	42.2	1.66	2.5	0.100	38.075	38.090	1.4990	1.4996	61.874	61.904	2.4360	2.4372
0.458	1.010	6	59.9	2.36	2.5	0.100	49.5	1.95	2.5	0.100	44.425	44.440	1.7490	1.7496	71.399	71.429	2.8110	2.8122
0.671	1.480	5.5	69.8	2.75	3.6	0.140	56.4	2.22	3.6	0.140	50.772	50.790	1.9989	1.9996	80.914	80.950	3.1856	3.1870
0.948	2.090	5.5	77.7	3.06	3.6	0.140	63.5	2.50	3.6	0.140	57.122	57.140	2.2489	2.2496	90.439	90.475	3.5606	3.5620
1.129	2.490	5	85.6	3.37	3.6	0.140	69.9	2.75	3.6	0.140	63.472	63.490	2.4989	2.4996	99.964	100.000	3.9356	3.9370
1.751	3.860	5	94.2	3.71	4.6	0.180	77.0	3.03	4.6	0.180	69.822	69.840	2.7489	2.7496	111.077	111.113	4.3731	4.3745
2.277	5.020	5	103.0	4.07	4.6	0.180	83.8	3.30	4.6	0.180	76.172	76.190	2.9989	2.9996	120.594	120.635	4.7478	4.7494
2.885	6.360	5	112.0	4.42	4.6	0.180	90.9	3.58	4.6	0.180	82.514	82.537	3.2486	3.2495	130.119	130.160	5.1228	5.1244
3.570	7.870	5	121.0	4.77	4.6	0.180	97.8	3.85	4.6	0.180	88.864	88.887	3.4986	3.4995	139.644	139.685	5.4978	5.4994
4.350	9.590	4.5	130.0	5.11	4.6	0.180	104.0	4.10	4.6	0.180	95.214	95.237	3.7486	3.7495	149.169	149.210	5.8728	5.8744
5.262	11.600	4.5	138.0	5.43	4.6	0.180	111.0	4.37	4.6	0.180	101.564	101.587	3.9986	3.9995	158.694	158.735	6.2478	6.2494
7.756	17.100	4.5	156.0	6.14	4.6	0.180	125.0	4.90	4.6	0.180	114.264	114.287	4.4986	4.4995	177.744	177.785	6.9978	6.9994
11.068	24.400	4.5	174.0	6.83	4.6	0.180	139.0	5.47	4.6	0.180	126.959	126.984	4.9984	4.9994	196.784	196.830	7.7474	7.7492
17.373	38.300	4.5	197.0	7.75	4.6	0.180	165.0	6.50	4.6	0.180	152.360	152.385	5.9984	5.9994	222.184	222.230	8.7474	8.7492

† Equal to minimum inner ring bore chamfer.

‡ Equal to minimum outer ring O.D. chamfer.



# SPHERICAL PLAIN BEARINGS

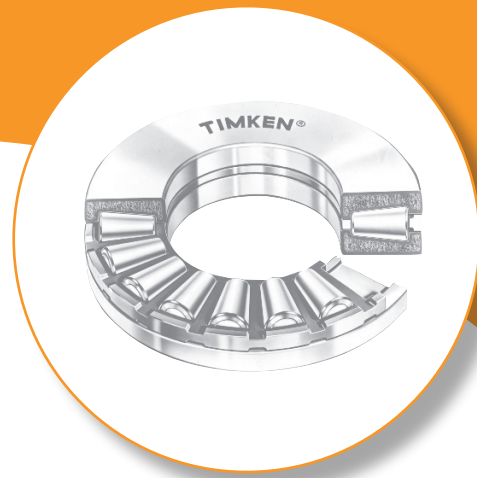


## THRUST BEARINGS

**Overview:** Timken thrust bearings are designed specifically to manage thrust loads and provide high-shock-load resistance in industrial and automotive applications. We manufacture seven basic designs of thrust bearings that include ball, crossed roller, cylindrical, machined tapered (TTHD, V-Flat, screwdown), stamped tapered and spherical.

- **Sizes:** 35 mm - 2940 mm (1375 in. - 115.75 in.).
- **Markets:** Aggregate, Machine Tool, Metals, Oil, Power Generation.
- **Applications:** Cone crushers, crane hooks, oil well swivels, extruders, pulverizer drives, rolling mills, machine tool spindles & tables, drilling rig hydraulic heads, gear boxes, pre-heater fans.
- **Benefits:** High performance and application flexibility. Large range of product offering.





### Ball and Roller Thrust Bearings

From the three-digit "Series" number, it is known this is an inch size bearing. "50" is read as "5.0" and represents approximate or actual bore.

The series number (always three numerals) represents a specific size cage assembly.



- TVB** thrust ball bearings
- TVL** angular contact thrust ball bearings
- DTVL** angular contact thrust ball bearings – upper and lower complement of balls
- TSR** thrust spherical roller bearings
- TTVF** thrust tapered roller bearings
- TTVS** thrust tapered roller bearings – with aligning washer
- TTSV, TTSX** thrust tapered roller bearings – full complement
- TP** thrust cylindrical roller bearings
- TPS** thrust cylindrical roller bearings – with aligning washer
- TTHD** thrust tapered roller bearings

modification to inner ring

modification to outer ring

descriptive of modification code

# ***Ball and Roller Thrust Bearings***

	<i>Page</i>
Introduction . . . . .	B438
Ball and Roller Thrust Bearing Types . . . . .	B438

## ***DIMENSIONS – LOAD RATINGS***

Ball Thrust Bearing Type TVB . . . . .	B442
Angular Contact Ball Thrust Bearing Type TVL . . . . .	B443
Angular Contact Ball Thrust Bearing Type DTVL . . . . .	B444
Spherical Roller Thrust Bearing Type TSR . . . . .	B445
Cylindrical Roller Thrust Bearing Type TP . . . . .	B447
Cylindrical Roller Thrust Bearing Type TPS . . . . .	B449
Crossed Roller Thrust Bearing Type XR and JXR . . . . .	B451







## INTRODUCTION

Six basic designs of ball and roller thrust bearings are available: ball, cross roller, cylindrical, machine tapered (TTHD, V-Flat, Screwdown), stamped tapered and spherical tapered roller. Dimensional data for all styles are presented in order by bore size.

Engineering data such as tolerances, shaft and housing fits, and life and load rating calculations are found in the engineering section of this catalog.

B

## BEARING TYPES

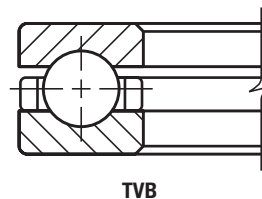
### BALL THRUST BEARINGS

Ball thrust bearings provide optimum performance in high-speed installations, particularly where loads are generally lighter. Two types including axial (TVB), and angular contact (TVL) are available. The DTVL Type is offered with both an upper and lower complement of angular contact balls and three race elements. The standard tolerances for ball thrust bearings (both types) are equivalent to ABEC 1 where applicable. Higher precision tolerances are available. Consult your Timken representative for information on such installations.

#### TVB

TVB Types are separable, consisting of two hardened and ground steel washers. Precision ground and lapped balls run in a grooved raceway separated by a bronze cage. Other materials may be specified for the cage, depending on the application.

Most TVB bearings include washers of the same bore and outside diameter. Housings should be designed to clear the O.D. of rotating races, with shafts stepped to clear the bore of stationary washers. Provides axial rigidity, but are not suggested if radial load is expected. The TVB is exceptionally easy to mount with the rotating washer usually shaft mounted. The stationary washer should be housed with an outside diameter clearance that allows the bearing to assume a normal operating position.



TVB

#### TVL

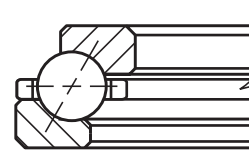
TVL Types provide exceptionally low friction, are cool running and have quiet operation when operated at high speeds. They are also less sensitive to misalignment. Consult your Timken representative for assistance in determining limits of such loading for specific applications.

Although ball thrust bearings have been designed exclusively for thrust loads, the TVL bearing will accommodate some radial loading. Consult your Timken representative for assistance in determining the limits of such loading for specific applications.

Hardened and ground steel races of TVL bearings enclose a complement of precision ground and lapped steel balls, separated by a bronze cage. Other material may be specified as required.

Not strictly an annular ball bearing, the larger ring is identified as the outer ring; the smaller as the inner. Inner ring is usually the rotating element and is shaft mounted. Outer ring is normally stationary and should be mounted with an outside diameter clearance that allows the bearing to assume a normal operating position. If combined loads are expected, the outer ring must be radially located in the housing.

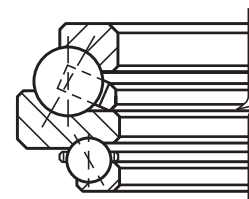
TVL bearings should always be operated under thrust loading. If a constant thrust load is not normally present, it should be imposed by springs or other devices.



TVL

#### DTVL

The DTVL has an upper and lower complement of angular contact balls and three race elements. It is capable of carrying thrust in one direction, comparable to the TVL Series and lighter thrust in the opposite direction.



DTVL

## SPHERICAL ROLLER THRUST BEARINGS

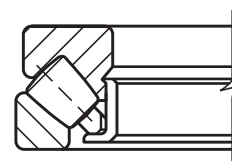
### TSR

A combination radial and thrust bearing designed to operate even if shaft and housing are, or become, misaligned under load. A favored bearing when conditions include heavy loads, difficulties in establishing or maintaining housing alignment or when shaft deflection can be expected.

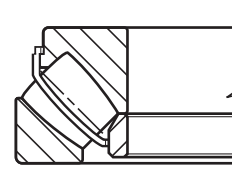
Shaft deflections and housing distortions caused by shock or heavy loads (which lead to misalignment) are compensated for by the internal self-alignment of the bearing elements during operation. Corner loading of rollers, a condition that limits service life on other types of bearings, cannot develop in spherical roller thrust bearings.

The TSR achieves high thrust capacity and allows axial misalignment between the inner ring and the outer ring of up to  $\pm 2.5^\circ$ . Spherically contoured rollers, arranged in a steep angular position, not only accept high axial loads, but also moderate radial loads. "E" styles, (EM-machined bronze cage, EJ- stamped steel cage) have increased capacity. Should extreme conditions of loading and/or speed under misalignment be anticipated, contact your Timken representative before ordering.

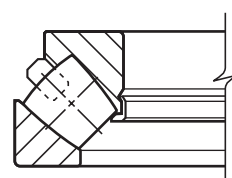
The inherent compensation for misalignment, provided by the spherical roller bearings, offers the designer the opportunity to use weldments for housing frames instead of complex castings. This eliminates high-cost machining operations. When castings are preferred, bore alignment is less critical if spherical roller bearings are specified.



TSR



TSR-EJ



TSR-EM

## CYLINDRICAL ROLLER THRUST BEARINGS

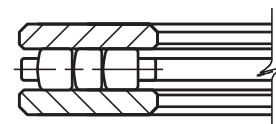
Timken's cylindrical roller thrust bearings are designed to operate under heavy loads at moderate speeds. Standard versions can be operated at peripheral speeds (bearing O.D.) of up to 3000 feet per minute. Special design features are available for both the bearing and mounting permitting even higher rotational speeds for this type of bearing. Two types of cylindrical roller thrust bearings, TP and TPS, are available.

### TP

Type TP bearings include two flat hardened and ground steel washers with a cage retainer holding one or more controlled contour rollers in each pocket. If specifications call for two or more rollers per pocket, they are manufactured to different lengths. The longer rollers are placed in alternate positions in adjacent pockets. Overlapping roller paths prevent "grooving" of the races and prolong bearing life. Due to the simplicity of design, standard TP thrust bearings are among the most economical to buy and install.

Minor radial displacement of the races does not affect the operation of the TP bearing, resulting in manufacturing economies and simplified installation.

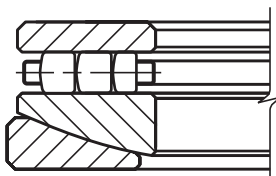
Shaft and housing seats must be square to the axis of rotation to prevent initial misalignment problems.



TP

### TPS

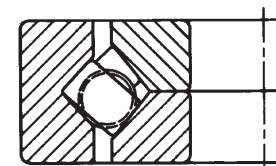
The TPS design is similar to the TP style, except the bottom washer assembly is comprised of two races, with the contacting faces spherically ground. The TPS bearing is self-adjusting to initial misalignment. It is not suggested for installations where alignment may be continuously changing (dynamic misalignment).



TPS

### TXR

The crossed roller bearing is ideal for machine tool applications such as vertical boring mills, vertical grinding machines and other similar applications. A crossed roller bearing is comprised of two sets of bearing races and rollers brought together at right angles to each other – with alternate rollers facing in opposite directions – and within a section height not much greater than that of a single bearing housing.



TXR





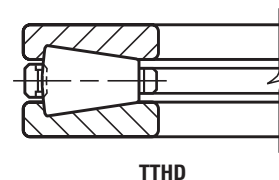
## TAPERED ROLLER THRUST BEARINGS

Timken true rolling tapered roller thrust bearings include rollers that have conical sections. These bearings have been engineered so that the rollers and raceways form a cone in which the vertex is on the center line of the bearing. This bearing geometry assures a true rolling motion. In addition, the large end of each tapered roller is spherically ground so that its curvature conforms with the concave face of the washer rib. Pressure between the rib and roller, under load, guides the rollers accurately. Timken manufactures five types of tapered roller thrust bearings: standard (TTHD), V-Flat (TTVF) self-aligning V-Flat (TTVS), concave washer (TTSV), and convex washer (TTSX).

B

### TTHD

The TTHD design has an identical pair of hardened and ground steel washers with tapered raceways. Both washers have the same bore and O.D., therefore housings should be designed to clear the O.D. of rotating washers and shafts stepped to clear the bore of stationary washers. Controlled contour tapered rollers are equally spaced by a cage. The TTHD bearing is well-suited for applications where extremely high thrust loads and heavy shock may be encountered as in crane hooks. For very low speed applications with unusually high loading, TTHD bearings can be supplied with a full complement of rollers. These bearings are identified in the tables by suffix 00278 following the bearing number. Applications for full-complement bearings should be reviewed by your Timken representative to ensure selection of the proper bearing.



### TTVF, TTVS, TTSV, TTSX

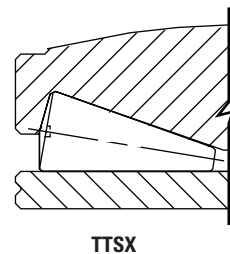
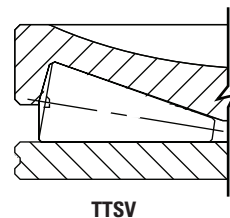
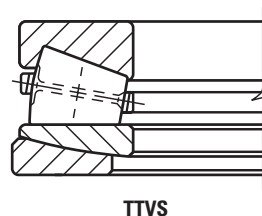
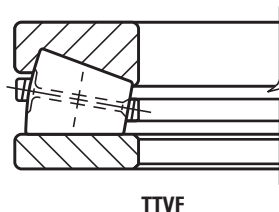
V-Flat Tapered Roller thrust bearings (TTVF and TTVS) combine the outstanding features of tapered thrust and cylindrical roller bearings, offering the highest possible capacity of any thrust bearing of its size. The V-Flat design includes one flat washer and one with a tapered raceway matching the rollers. The design was originally developed for screwdown applications in metal rolling mills where thrust loads exceeding one million pounds are common. The V-Flat bearings have exceptional dynamic capacity within a given envelope and provides static capacity. They have been highly successful in heavily loaded extruders, in cone crushers and other applications where a wide range of operating conditions are found. Most sizes utilize cages with hardened pins through the center of the rollers, allowing closer spacing of the rollers to maximize capacity.

Smaller sizes have brass cages, designed for unidirectional retention of rollers.

Both the pin type and brass cage are designed to permit a full flow of lubricant to all critical surfaces, providing cooler operation.

Self-aligning V-Flat bearings (TTVS) employ the same basic roller and raceway design, except the lower washer is in two pieces, with the contacting faces spherically ground permitting self-alignment under conditions of initial misalignment. TTVS bearings should not be used if dynamic misalignment (changing under load) is expected.

- The contact surface of each roller of the V-Flat bearings has a controlled contour wherein the ends are slightly relieved. This optimizes stress distribution by avoiding concentration of stress in the raceways at the ends of the rollers.
- Conformity between roller end and the rib is controlled to enhance the flow of lubricant between these surfaces, allowing the development of a hydrodynamic oil film between the end of the roller and the guiding surface of the rib.
- Full roller complement designs (TTSV and TTSX) do not have conventional bores, but are provided with center inserts for attachment purposes as well as for lifting.
- The TTSV and TTSX designs offer the highest capacity but at a somewhat reduced speed capability as compared with other V-Flat types.
- The TTSV and TTSX bearings encompass tapered rollers between two raceways. One raceway is flat and the other raceway forms the surface of a cone. The conical raceway has a washer with a rib to resist the radial component of the thrust force caused by the inclined plane and to guide the rollers.



- Lines extended from the TTSV and TTSX roller-to-raceway contact surfaces converge to form a cone. The vertex of this cone is common with the centerline of the bearing and the plane of the raceway surface of the flat washer.
- The TTSV and TTSX design achieves true rolling motion between the tapered rollers and both raceways with no sliding or skidding at any point on the rolling surfaces. The flat raceway permits radial displacement without affecting the operation of the bearing.

**TTSP**

The types TTSP and TTSPS (not shown) thrust bearings are made up of two tapered thrust races, rollers, cage and outside retainer which holds the components together during shipping and installation. The types TTSP and TTSPS thrust bearings are employed extensively in the steering pivot positions of automotive and industrial applications.

**TTC, TTCS**

The types TTC, TTCS and TTCL (not shown) thrust bearings consist of two tapered thrust races, rollers and an outside retainer and are cageless. The outside retainer holds the assembly together for shipping and installation. Types TTC, TTCS and TTCL bearings are thrust bearings specifically designed for oscillating applications. These types are identical with the exception of the retainer construction.

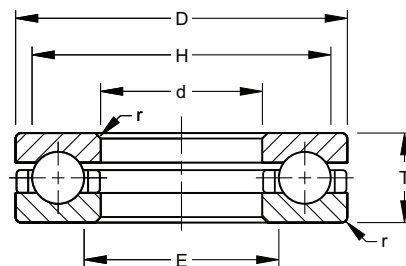




## BALL THRUST BEARINGS

### TYPE TVB

- Designed for optimum performance in high speed installations.
- Provide axial rigidity, but are not suggested if radial loading is expected.
- Exceptionally easy to mount, with the rotating washer usually shaft-mounted.



### DIMENSIONS – LOAD RATINGS

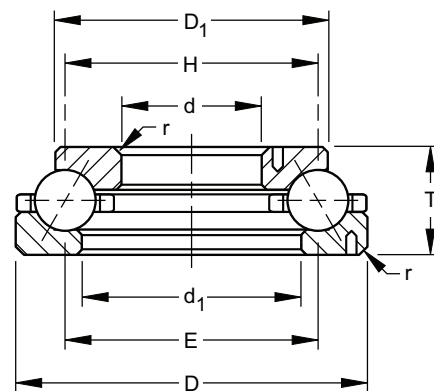
Bearing Number	Bore d	O.D. D	Height T (min.)	Shoulder Diameter		Fillet Radius <sup>(1)</sup> r (max.)	Wt.	Load Rating	
				Shaft H (min.)	Housing E (max.)			Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>t</sub>
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg lbs.	kN lbs.	kN lbs.
50TVB190	127.000 5.0000	184.150 7.2500	41.275 1.6250	170.7 6.72	140.5 5.53	2.4 0.09	3.4 7.2	583.0 131000	169.0 38000
52TVB253	133.350 5.2500	203.200 8.0000	50.800 2.0000	185.7 7.31	150.8 5.94	2.4 0.09	5.5 12.2	756.0 170000	223.0 50200
55TVB245	139.700 5.5000	209.550 8.2500	47.625 1.8750	192.1 7.56	157.2 6.19	2.4 0.09	5.1 11.3	770.0 173000	231.0 52000
57TVB248	146.050 5.7500	215.900 8.5000	47.625 1.8750	198.4 7.81	163.5 6.44	2.4 0.09	5.3 11.7	810.0 182000	239.0 53800
60TVB252	152.400 6.0000	222.250 8.7500	47.625 1.8750	204.8 8.06	169.9 6.69	2.4 0.09	5.6 12.4	832.0 187000	238.0 53500
62TVB291	158.750 6.2500	228.600 9.0000	47.625 1.8750	215.1 8.47	172.2 6.78	2.4 0.09	5.8 12.8	867.0 195000	245.0 55100
65TVB293	165.100 6.5000	241.300 9.5000	57.150 2.2500	224.6 8.84	181.8 7.16	3.2 0.12	7.7 17.0	1060.0 238000	317.0 71300
67TVB296	171.450 6.7500	247.650 9.7500	57.150 2.2500	229.4 9.03	189.7 7.47	3.2 0.12	7.9 17.5	1110.0 251000	328.0 73800
70TVB298	177.800 7.0000	254.000 10.0000	57.150 2.2500	235.7 9.28	196.1 7.72	3.2 0.12	8.2 18.1	1170.0 263000	339.0 76300
75TVB343	190.500 7.5000	266.700 10.5000	57.150 2.2500	250 9.84	207.2 8.16	3.2 0.12	9.1 20.0	1140.0 255000	321.0 72300
75TVB344	190.500 7.5000	276.225 10.8750	69.850 2.7500	258.8 10.19	208 8.19	3.2 0.12	12.7 27.9	1390.0 313000	407.0 91400
80TVB346	203.200 8.0000	279.400 11.0000	57.150 2.2500	262.7 10.34	219.9 8.66	3.2 0.12	8.8 19.3	1370.0 309000	395.0 88900
80TVB347	203.200 8.0000	295.275 11.6250	76.200 3.0000	273.1 10.75	222.2 8.75	6.4 0.25	15.6 34.5	1700.0 382000	504.0 113000
85TVB391	215.900 8.5000	292.100 11.5000	57.150 2.2500	275.4 10.84	232.6 9.16	3.2 0.12	10.1 22.2	1280.0 289000	349.0 78400
90TVB393	228.600 9.0000	304.800 12.0000	57.150 2.2500	288.1 11.34	245.3 9.66	3.2 0.12	9.7 21.3	1620.0 365000	442.0 99400
95TVB431	241.300 9.5000	317.500 12.5000	57.150 2.2500	300.8 11.84	258 10.16	3.2 0.12	11.1 24.4	1380.0 311000	366.0 82400
100TVB433	254.000 10.0000	342.900 13.5000	57.150 2.2500	324.6 12.78	272.3 10.72	6.4 0.25	13.4 29.5	1560.0 351000	431.0 96800
105TVB471	266.700 10.5000	355.600 14.0000	57.150 2.2500	337.3 13.28	285.0 11.22	6.4 0.25	13.9 30.7	1810.0 407000	476.0 107000
110TVB472	279.400 11.0000	368.300 14.5000	57.150 2.2500	350 13.78	297.7 11.72	6.4 0.25	14.5 31.9	1870.0 421000	486.0 109000
120TVB511	304.800 12.0000	393.700 15.5000	57.150 2.2500	375.4 14.78	323.1 12.72	6.4 0.25	15.6 34.5	2000.0 450000	507.0 114000
130TVB551	330.200 13.0000	419.100 16.5000	63.500 2.5000	400.8 15.78	348.5 13.72	6.4 0.25	18 39.6	2470.0 555000	627.0 141000
140TVB581	355.600 14.0000	444.500 17.5000	63.500 2.5000	426.2 16.78	373.9 14.72	6.4 0.25	19.2 42.3	2620.0 590000	649.0 146000
150TVB610	381.000 15.0000	482.600 19.0000	63.500 2.5000	460.4 18.12	403.6 15.89	6.4 0.25	24.8 54.7	2620.0 590000	649.0 146000
160TVB640	406.400 16.0000	508.000 20.0000	63.500 2.5000	482.6 19.00	431.8 17.00	6.4 0.25	26.3 57.9	2780.0 624000	677.0 152000

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.

## ANGULAR CONTACT BALL THRUST BEARINGS

### TYPE TVL

- Provides exceptionally low friction, cool running and quiet operation when run at high speeds.
- Although designed exclusively for thrust loads, will accommodate some radial loading.



### DIMENSIONS – LOAD RATINGS<sup>(2)</sup>

Bearing Number	Bore d	O.D. D	Height T	Washers		Shoulder Diam.		Dowel Pin (one per Washer)			Fillet <sup>(1)</sup> Radius r	Weight	Load Rating		
				Small Diameter O.D. D <sub>1</sub>	Large Bore I.D. d <sub>1</sub>	Shaft H (Min.)	Housing E (Max.)	Pin Diameter	Hole Location from Centerline				kg. lbs.	Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>1</sub>
									Small Bore Washer	Large Bore Washer					
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg. lbs.	kN lbs.	kN lbs.	
90TVL710	228.600 9.0000	295.275 11.6250	38.100 1.5000	277.81 10.938	246.06 9.688	261.9 10.31	261.9 10.31	—	—	—	3.2 0.12	6.2 13.6	636.0 143000	164.0 36900	
120TVL700	304.800 12.0000	406.400 16.0000	57.150 2.2500	368.30 14.500	342.90 13.500	355.6 14.00	355.6 14.00	9.52 0.375	165.1 6.50	190.5 7.50	3.2 0.12	18.5 40.8	1600.0 359000	429.0 96400	
150TVL701	381.000 15.0000	520.700 20.5000	84.125 3.3120	482.60 19.000	419.10 16.500	450.8 17.75	450.8 17.75	12.70 0.500	206.4 8.12	244.5 9.62	4.8 0.19	50.2 110.7	2700.0 606000	721.0 162000	
170TVL500	431.800 17.0000	635.000 25.0000	88.900 3.5000	565.15 22.250	488.95 19.250	533.4 21.00	533.4 21.00	12.70 0.500	235 9.25	298.4 11.75	7.9 0.31	89.6 197.5	4390.0 986000	1130.0 254000	
180TVL605	457.200 18.0000	625.475 24.6250	92.075 3.6250	549.28 21.625	508 20.000	541.3 21.31	541.3 21.31	15.88 0.625	247.6 9.75	285.8 11.25	3.2 0.12	78.4 172.9	4790.0 1076000	1280.0 288000	
195TVL470	495.300 19.5000	584.200 23.0000	57.150 2.2500	571.50 22.500	508 20.000	539.8 21.25	539.8 21.25	9.52 0.375	258.8 10.19	281 11.06	3.2 0.12	28.4 62.7	2600.0 585000	596.0 134000	
200TVL850	508.000 20.0000	704.850 27.7500	117.475 4.6250	628.68 24.750	565.15 22.250	606.4 23.88	606.4 23.88	15.88 0.625	276.2 10.88	330.2 13.00	6.4 0.25	127.3 280.7	5160.0 1160000	1350.0 303000	
201TVL615	511.175 20.1250	628.650 24.7500	66.675 2.6250	590.55 23.250	549.28 21.625	569.9 22.44	569.9 22.44	12.70 0.500	268.3 10.56	300 11.81	3.2 0.12	41.9 92.3	3320.0 746000	787.0 177000	
202TVL620	514.350 20.5000	704.850 27.7500	114.300 4.5000	622.30 24.500	571.50 22.500	609.6 24.00	609.6 24.00	20.64 0.812	279.4 11.00	327 12.88	6.4 0.25	122.3 269.7	5910.0 1330000	1560.0 351000	
227TVL302	577.850 22.7500	774.700 30.5000	117.475 4.6250	704.85 27.750	622.30 24.500	676.3 26.62	676.3 26.62	20.64 0.812	311.2 12.25	365.1 14.38	6.4 0.25	149.8 330.2	6620.0 1490000	1690.0 379000	
233TVL303	593.725 23.3750	790.575 31.1250	117.475 4.6250	720.72 28.375	650.88 25.625	692.2 27.25	692.2 27.25	22.22 0.875	320.7 12.62	369.9 14.56	6.4 0.25	150.7 332.2	6850.0 1540000	1730.0 388000	
238TVL304	606.425 23.8750	847.725 35.3950	133.350 5.2500	739.78 29.125	688.98 27.125	727.1 28.62	727.1 28.62	22.22 0.875	327 12.88	396.9 15.62	6.4 0.25	212.6 468.7	8510.0 1910000	2200.0 494000	
245TVL716	622.300 24.5000	768.350 30.2500	82.550 3.2500	733.42 28.875	680.47 26.790	695.3 27.38	695.3 27.38	12.70 0.500	323.8 12.75	371.5 14.62	3.2 0.12	76.2 168.0	3830.0 861000	863.0 194000	
245TVL612	622.300 24.5000	831.850 32.7500	117.475 4.6250	742.95 29.250	679.45 26.750	727.1 28.62	727.1 28.62	15.88 0.625	330.2 13.00	396.9 15.62	6.4 0.25	164.5 362.7	7070.0 1590000	1770.0 397000	
252TVL505	341.350 25.2500	793.750 31.2500	88.900 3.5000	746.12 29.375	708.02 27.875	717.6 28.25	717.6 28.25	12.70 0.500	342.9 13.50	376.2 14.81	6.4 0.25	89.3 197.0	5430.0 1220000	1300.0 293000	
260TVL635	660.400 26.0000	893.350 35.2500	133.350 5.2500	790.58 31.125	727.08 28.625	777.9 30.62	777.9 30.62	20.64 0.812	355.6 14.00	422.3 16.62	6.4 0.25	226.9 500.4	9520.0 2140000	2370.0 533000	
302TVL510	768.350 30.2500	920.750 36.2500	88.900 3.5000	873.12 34.375	835.02 32.875	844.6 33.25	844.6 33.25	12.70 0.500	408 16.06	439.7 17.31	6.4 0.25	105.2 231.9	6360.0 1430000	1450.0 325000	
302TVL624	768.350 30.2500	1006.475 39.6250	139.700 5.5000	901.7 35.500	838.2 33.000	887.4 34.94	887.4 34.94	22.22 0.875	409.6 16.12	476.2 18.75	6.4 0.25	271.1 597.8	10600.0 2370000	2540.0 570000	
303TVL706	771.525 30.3750	898.525 35.3750	63.500 2.5000	860.42 33.875	809.62 31.875	835 32.88	835 32.88	12.70 0.500	403.2 15.88	431.8 17.00	6.4 0.25	58 128.0	3900.0 877000	778.0 175000	
309TVL707	785.812 30.9375	952.500 37.5000	95.250 3.7500	882.65 34.750	857.25 33.750	870 34.25	870 34.25	15.88 0.625	415.9 16.38	454 17.88	6.4 0.25	117.9 260.0	4230.0 952000	1100.0 248000	
310TVL625	787.400 31.0000	1025.525 40.3750	139.700 5.5000	917.58 36.125	893.76 35.188	906.5 35.69	906.5 35.69	22.22 0.875	422.3 16.62	485.8 19.12	6.4 0.25	263.5 581.0	10900.0 2450000	2590.0 582000	
317TVL307	806.450 31.7500	1025.525 40.3750	127.000 5.0000	933.45 36.750	873.12 34.375	914.4 36.00	914.4 36.00	22.22 0.875	427 16.81	476.2 18.75	6.4 0.25	240.6 530.6	10900.0 2450000	2590.0 582000	
402TVL717	1022.350 40.2500	1181.100 46.5000	88.900 3.5000	1133.48 44.625	1069.98 42.125	1101.7 43.38	1101.7 43.38	19.05 0.750	530.2 20.88	571.5 22.50	6.4 0.25	147.8 326.0	8180.0 1840000	1710.0 384000	
410TVL718	1041.400 41.0000	1260.475 49.6250	127.000 5.0000	1189.04 46.812	1112.84 43.812	1150.9 45.31	1150.9 45.31	19.05 0.750	544.5 21.44	606.4 23.88	6.4 0.25	308.8 681.0	14000.0 3140000	3060.0 687000	
420TVL721	1066.800 42.0000	1285.875 50.6250	127.000 5.0000	1214.44 47.812	1138.24 44.812	1176.3 46.31	1176.3 46.31	22.22 0.875	560.4 22.06	616 24.25	6.4 0.25	315.2 695.0	14000.0 3140000	3060.0 687000	
530TVL719	1346.200 53.0000	1517.650 59.7500	104.775 4.1250	1457.32 57.375	1406.52 55.375	1431.9 56.38	1431.9 56.38	22.22 0.875	695.3 27.38	733.4 28.88	6.4 0.25	229.99 507.0	9080.0 2040000	1830.0 412000	
540TVL720	1371.600 54.0000	1619.250 63.7500	139.700 5.5000	1533.52 60.375	1457.32 57.375	1495.4 58.88	1495.4 58.88	22.22 0.875	714.4 28.12	781 30.75	6.4 0.25	480.3 1059.0	18000.0 4060000	3630.0 815000	

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.

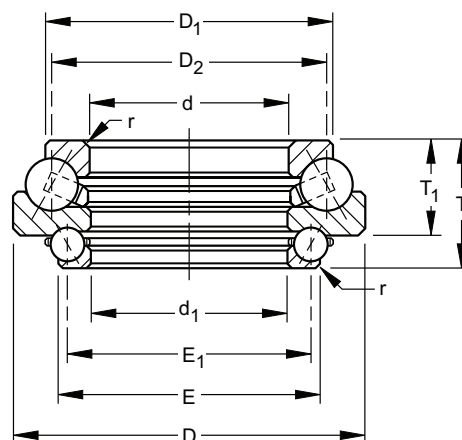
<sup>(2)</sup> See engineering section for application of Equivalent Thrust Load Factors:  $X = 0.76, Y = 1.00, \frac{T}{R} (\text{min}) = 1.56$ .  $\left[ \frac{T}{R} \right]$  is Thrust Load ÷ Radial Load



## ANGULAR CONTACT BALL THRUST BEARINGS

### TYPE DTVL

- Capable of carrying thrust in one direction, plus a lighter thrust in the opposite direction.
- Designed with an upper and lower complement of angular contact balls and three race elements.



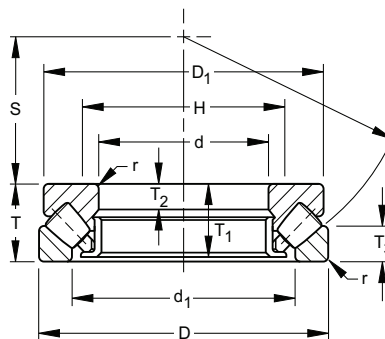
### DIMENSIONS – LOAD RATINGS<sup>(2)</sup>

Bearing Number	Bore		O.D. D	Height T	Upper Race		Lower Race		T <sub>1</sub>	Fillet <sup>(1)</sup> Radius r (Max.)	Weight	Load Rating		
	Upper d	Lower d <sub>1</sub>			O.D. D <sub>1</sub>	Shoulder D <sub>2</sub>	O.D. E	Shoulder E <sub>1</sub>				Upper		Lower
	mm in.	mm in.										Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>1</sub>	
<b>200DTV1722</b>	<b>508.000</b> 20.0000	<b>508.000</b> 20.0000	<b>742.95</b> 29.2500	<b>171.45</b> 6.7500	<b>679.45</b> 26.750	<b>616</b> 24.250	<b>587.38</b> 23.125	<b>558.8</b> 22.00	<b>127.000</b> 5.000	<b>6.4</b> 0.25	<b>177.3</b> 391.0	<b>5340</b> 1200000	<b>1560</b> 351000	<b>2310</b> 519000
<b>202DTV1723</b>	<b>514.350</b> 20.2500	<b>511.175</b> 20.1250	<b>704.85</b> 27.7500	<b>158.75</b> 6.2500	<b>622.30</b> 24.500	<b>609.60</b> 24.000	<b>590.55</b> 23.250	<b>569.9</b> 22.44	<b>114.3</b> 4.50	<b>6.4</b> 0.25	<b>133.3</b> 294.0	<b>5430</b> 1220000	<b>1480</b> 332000	<b>3750</b> 844000
<b>235DTV1724</b>	<b>596.900</b> 23.5000	<b>590.550</b> 23.2500	<b>838.2</b> 33.0000	<b>184.15</b> 7.2500	<b>774.70</b> 30.500	<b>711.20</b> 28.000	<b>676.28</b> 26.625	<b>647.7</b> 25.50	<b>139.7</b> 5.50	<b>6.4</b> 0.25	<b>246.2</b> 543.0	<b>7560</b> 1700000	<b>1970</b> 443000	<b>3660</b> 822000
<b>245DTV1725</b>	<b>622.300</b> 24.5000	<b>619.125</b> 24.3750	<b>815.975</b> 32.1250	<b>158.75</b> 6.2500	<b>730.25</b> 28.750	<b>717.60</b> 28.250	<b>698.50</b> 27.500	<b>677.9</b> 26.68	<b>114.3</b> 4.50	<b>6.4</b> 0.25	<b>157.4</b> 347.0	<b>6410</b> 1440000	<b>1640</b> 369000	<b>4430</b> 995000
<b>266DTV1726</b>	<b>676.275</b> 26.6250	<b>673.100</b> 26.5000	<b>914.4</b> 36.0000	<b>193.675</b> 7.6250	<b>876.30</b> 34.500	<b>787.40</b> 31.000	<b>787.4</b> 31.00	<b>743</b> 29.25	<b>142.88</b> 5.625	<b>6.4</b> 0.25	<b>296.6</b> 654.0	<b>8510</b> 1910000	<b>2480</b> 558000	<b>6320</b> 1420000
<b>305DTV1727</b>	<b>774.700</b> 30.5000	<b>768.35</b> 30.2500	<b>971.55</b> 38.2500	<b>158.75</b> 6.2500	<b>885.82</b> 34.875	<b>873.10</b> 34.380	<b>847.72</b> 33.38	<b>827.1</b> 32.56	<b>114.3</b> 4.50	<b>6.4</b> 0.25	<b>194.6</b> 429.0	<b>7780</b> 1750000	<b>1880</b> 423000	<b>5390</b> 1210000
<b>312DTV1728</b>	<b>793.750</b> 31.2500	<b>787.400</b> 31.0000	<b>1006.475</b> 39.6250	<b>200.025</b> 7.8750	<b>1000.12</b> 39.375	<b>895.40</b> 35.250	<b>901.7</b> 35.50	<b>863.6</b> 34.00	<b>139.7</b> 5.50	<b>6.4</b> 0.25	<b>325.2</b> 717.0	<b>10200</b> 2300000	<b>2480</b> 557000	<b>7200</b> 1620000
<b>405DTV1729</b>	<b>1028.700</b> 40.5000	<b>1025.525</b> 40.3750	<b>1231.9</b> 48.5000	<b>158.75</b> 6.2500	<b>1143</b> 45.000	<b>1130.30</b> 44.500	<b>1104.9</b> 43.50	<b>1084.3</b> 42.69	<b>114.3</b> 4.50	<b>6.4</b> 0.25	<b>254.4</b> 561.0	<b>10200</b> 2280000	<b>2240</b> 504000	<b>6540</b> 1470000
<b>412DTV1730</b>	<b>1047.750</b> 41.2500	<b>1041.400</b> 41.0000	<b>1260.475</b> 49.6250	<b>200.025</b> 7.8750	<b>1254.12</b> 49.375	<b>1149.40</b> 45.250	<b>1155.7</b> 45.50	<b>1117.6</b> 44.00	<b>139.7</b> 5.50	<b>6.4</b> 0.25	<b>417.2</b> 920.0	<b>12300</b> 2760000	<b>2780</b> 625000	<b>8230</b> 1850000
<b>541DTV1731</b>	<b>1374.775</b> 54.1250	<b>1371.600</b> 54.0000	<b>1597.025</b> 62.8750	<b>247.65</b> 9.7500	<b>1536.70</b> 60.500	<b>1481.10</b> 58.310	<b>1489.08</b> 58.625	<b>1447.8</b> 57.00	<b>168.28</b> 6.625	<b>6.4</b> 0.25	<b>654.4</b> 1443.0	<b>17700</b> 3980000	<b>3580</b> 804000	<b>11100</b> 2500000

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.

<sup>(2)</sup> See engineering section for application of Equivalent Thrust Load Factors: X = 0.76, Y = 1.00,  $\frac{T}{R}$  (min) = 1.56.  $\left[\frac{T}{R}\right]$  is Thrust Load ÷ Radial Load

## SPHERICAL ROLLER THRUST BEARINGS



### TYPE TSR

- Design achieves a high thrust capacity with low friction and continuous roller alignment.
- Spherically contoured rollers, arranged in steep angular position, not only accommodates high thrust loads, but supports moderate radial loads as well.
- Low friction of the bearing results from a combination of bearing geometry and manufacturing technology.

### TYPE TSR-EM

- Utilize bronze retainers and enhanced internal geometry allowing for higher dynamic load ratings and improved lubrication characteristics.
- Utilizes spherically contoured rollers arranged in a steep angular configuration to accommodate high thrust load alone or in combination with moderate radial loads.
- Possesses inherent dynamic misalignment capabilities.

### DIMENSIONS – LOAD RATINGS

Bearing Number	Bore d	O.D. D	Height T	Shoulder Diameter		Inner Ring			Outer Ring Height T <sub>3</sub>	S	Fillet Radius r (Max.)	Wt.	Load Rating		Approx. Limiting Speed (for Oil Bath Only)	k <sup>(2)</sup>
				d <sub>1</sub> Housing (Min.)	H Shaft (Max.)	O.D. D <sub>1</sub>	Assembly Height T <sub>1</sub>	Pilot Height T <sub>2</sub>					Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>1</sub>		
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg lbs.	kN lbs.	kN lbs.	RPM	
29422	110 4.3307	230 9.0551	73 2.8740	162 6.378	165 6.496	220 8.661	69 2.717	26 1.024	35 1.378	69 2.717	2.5 0.10	33.4 33.4	1150 260000	800 176000	1500	30
29424	120 4.7244	250 9.8425	78 3.0709	174 6.850	180 7.087	236 9.291	74 2.913	29 1.142	37 1.476	74 2.933	3.0 0.12	18.5 40.7	1180 256000	965 216000	1350	40
29326	130 5.1181	225 8.8583	58 2.2835	171 6.744	177 6.963	215 8.465	55 2.165	19 0.748	29 1.130	75 2.972	2.0 0.08	9.8 21.6	880 197000	600 132000	1700	22
29426	130 5.1181	270 10.6299	85 3.3464	187 7.375	195 7.677	255 10.039	81 3.189	31 1.22	42 1.669	81 3.189	3.0 0.12	23.9 52.6	1730 388000	1120 253000	1250	60
29330	150 5.9055	250 9.8425	60 2.3622	194 7.638	195 7.677	240 9.449	57 2.244	20 0.787	29 1.142	87 3.425	2.0 0.08	12.5 27.5	1140 255000	670 150000	1550	30
29430	150 5.9055	300 11.8110	90 3.5433	213 8.405	220 8.661	285 11.220	86 3.386	32 1.260	44 1.732	92 3.622	3.0 0.12	29.3 64.5	1930 440000	1220 275000	1100	80
29334	170 6.6929	280 11.0236	67 2.6378	216 8.504	220 8.661	270 10.630	64 2.520	23 0.906	32 1.280	96 3.780	2.5 0.10	16.5 36.3	1500 340000	880 196000	1350	50
29434	170 6.6929	340 13.3858	103 4.0551	243 9.567	245 9.646	324 12.756	99 3.898	37 1.457	50 1.968	104 4.094	4.0 0.16	42.4 93.5	2650 600000	1630 365000	950	140
29338EJ	190 7.4803	320 12.5984	78 3.0709	246 9.685	250 9.843	308 12.126	74 2.913	27 1.063	38 1.496	110 4.331	3.0 0.12	25.6 56.5	2442 549000	1481 333000	1150	80
29438EJ	190 7.4803	380 14.9606	115 4.5276	271 10.669	275 10.827	360 14.173	111 4.370	41 1.614	55 2.185	117 4.606	4.0 0.16	60.3 133.0	4168 937000	2482 558000	850	210
29340	200 7.8740	340 13.3858	85 3.3465	264 10.3937	265 10.4331	325 12.7953	81 3.2452	29 1.1417	40 1.5748	114 4.4882	3.0 0.12	29 63	2157 485000	1236 278000	950	100
29440	200 7.8740	400 15.7480	122 4.8031	286 11.254	290 11.417	380 14.961	117 4.606	43 1.693	59 2.323	122 4.803	4.0 0.16	69.8 154.0	3625 815000	2135 480000	800	260
29344	220 8.6614	360 14.1732	85 3.3464	280 11.024	285 11.220	345 13.583	81 3.189	29 1.142	41 1.614	125 4.921	3.0 0.12	33.9 74.8	2500 550000	1340 300000	1000	120
29444	220 8.6614	420 16.5354	122 4.8031	307 12.106	310 12.205	400 15.748	117 4.606	43 1.693	59 2.323	133 5.236	5.1 0.20	73.9 163.0	3800 865000	2200 500000	750	300
29348	240 9.4488	380 14.9606	85 3.3464	300 11.811	300 11.811	365 14.370	81 3.189	29 1.142	41 1.614	135 5.315	3.0 0.12	41.9 92.4	2650 600000	1400 315000	950	140
29448EM	240 9.4488	440 17.3228	122 4.8031	315 12.4016	322 12.6772	385 15.1575	87 3.4252	46 1.8110	61 2.4016	142 5.5906	6.1 0.24	78 171	4884 1098000	2736 615000	750	350

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.

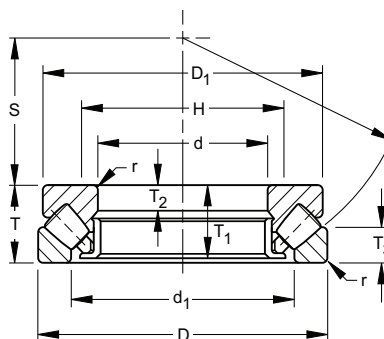
<sup>(2)</sup> Centrifugal force constant. See engineering section for calculations using this factor.





**SPHERICAL ROLLER THRUST BEARINGS**

TYPE TSR, TSR-EM – *continued*



**DIMENSIONS – LOAD RATINGS - *continued***

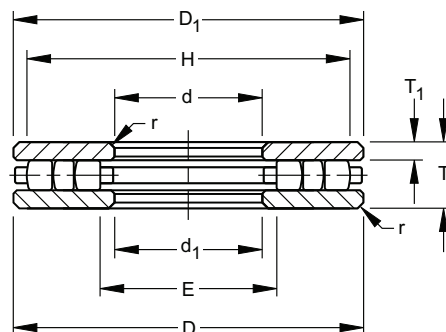
Bearing Number	Bore d	O.D. D	Height T	Shoulder Diameter		Inner Ring			Outer Ring Height T <sub>3</sub>	S	Fillet <sup>(1)</sup> r (Max.)	Wt.	Load Rating		Approx. Limiting Speed (for Oil Bath Only)	k <sup>(2)</sup>
				d <sub>1</sub> Housing (Min.)	H Shaft (Max.)	O.D. D <sub>1</sub>	Assembly Height T <sub>1</sub>	Pilot Height T <sub>2</sub>					Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>i</sub>		
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg lbs.	kN lbs.	kN lbs.	RPM	
29352	260 10.2362	420 16.5354	95 3.7402	329 12.953	330 12.992	405 15.945	91 3.583	32 1.260	45 1.791	148 5.827	4.0 0.16	51.2 113.0	3350 750000	1800 400000	850	230
29452	260 10.2362	480 18.8976	132 5.1968	357 14.055	360 14.173	460 18.110	127 5.000	48 1.890	64 2.520	154 6.063	5.1 0.20	103 227.0	4900 1120000	1800 620000	650	500
29360	300 11.8110	480 18.8976	109 4.2913	379 14.921	380 14.961	460 18.110	105 4.134	37 1.457	50 1.988	168 6.614	4.0 0.16	76.6 169.0	4150 930000	2160 490000	700	350
29460	300 11.8110	540 21.2598	145 5.7086	402 15.827	410 16.142	515 20.276	140 5.512	52 2.047	70 2.776	175 6.890	5.1 0.20	136 301.0	6400 1430000	3450 770000	550	780
29364	320 12.5984	500 19.6850	109 4.2913	399 15.709	400 15.748	482 18.976	105 4.134	37 1.457	53 2.087	180 7.087	4.0 0.16	79.8 176.0	4300 980000	2240 500000	650	380
29468	340 13.3858	620 24.4094	170 6.6929	462 18.189	465 18.307	590 23.228	164 6.457	61 2.402	82 3.248	201 7.913	6.1 0.24	220 486.0	8500 1900000	4500 1020000	450	1350
29372	360 14.1732	560 22.0472	122 4.8031	448 17.638	450 17.717	540 21.260	117 4.606	41 1.614	59 2.343	202 7.953	4.0 0.16	113 249.0	5600 1250000	2800 620000	550	640
29476	380 14.9606	670 26.3780	175 6.8898	504 19.842	510 20.079	640 25.197	168 6.614	63 2.480	85 3.331	220 8.740	6.1 0.24	261 575.0	9000 2040000	4750 1060000	410	1700
29576	380 14.9606	820 32.2835	265 10.4330	570 22.441	578 22.756	780 30.709	226 10.078	100 3.927	128 5.062	241 9.488	9.1 0.36	824 1816.0	17300 3900000	9500 2120000	280	5550
29380	400 15.748	620 24.4094	132 5.1968	494 19.449	500 19.685	596 23.465	127 5.000	44 1.732	64 2.520	225 8.858	5.1 0.20	165 363.0	7100 1600000	3450 780000	500	970
29284EM	420 16.5354	580 22.8346	95 3.7402	479 18.8583	500 19.685	542 21.339	70 2.7559	41 1.6142	50 1.9685	228 8.9764	5.1 0.20	70 154.0	5329 1198000	2624 590000	630	300
29388	440 17.3228	680 26.7717	145 5.7089	548 21.5748	563 22.1654	657 25.866	140 5.5118	49 1.9291	69 2.7165	246 9.6850	5.1 0.20	180 397.0	7588 1706000	3647 820000	480	1400
29488	440 17.3228	780 30.7087	206 8.1102	588 23.150	595 23.425	745 29.331	199 7.835	74 2.913	99 3.917	257 10.118	7.1 0.28	411 906.0	13200 2900000	6700 1500000	320	3400
29392	460 18.1102	710 27.9528	150 5.9055	566 22.293	575 22.638	685 26.969	144 5.669	51 2.008	72 2.857	257 10.118	5.1 0.20	220 486.0	9300 2100000	4400 1000000	400	1700
29496EM	480 18.8976	850 33.4646	224 8.8189	626 24.6457	658 25.9055	770 30.315	159 6.2598	93 3.6614	110 4.3307	279 10.9843	9.7 0.38	550 1212.0	22458 5049000	11342 2550000	290	4700
294/500	500 19.6850	870 34.2520	224 8.8189	661 26.024	670 26.378	830 32.677	216 8.504	81 3.189	107 4.213	290 11.417	7.1 0.28	560 1235.0	16000 3600000	8000 1800000	270	4800
293/530	530 20.8661	800 31.4961	160 6.2992	648 25.512	650 25.591	772 30.394	154 6.063	54 2.126	76 2.992	295 11.614	6.1 0.24	288 634.0	11000 2450000	5100 1140000	350	2500
293/600	600 23.6220	900 35.4331	180 7.0866	727 28.6220	730 28.7402	868 34.173	173 6.8110	61 2.4016	87 3.4252	333 13.1102	5.1 0.20	635 1400.0	16770 3770000	7619 1713000	320	4200
294/630	630 24.8031	1090 42.9134	280 11.0236	831 32.707	850 33.465	1044 41.102	271 10.669	101 3.976	133 5.236	365 14.393	9.1 0.36	1170 2580.0	23000 5200000	11400 2550000	250	12200

(1) Maximum shaft or housing fillet radius that bearing corners will clear.  
 (2) Centrifugal force constant. See engineering section for calculations using this factor.

## CYLINDRICAL ROLLER THRUST BEARINGS

### TYPE TP

- Most economical to buy and install because of design simplicity.
- Minor radial displacement of the races does not affect its operation, resulting in manufacturing economies and simplified installation.



### DIMENSIONS – LOAD RATINGS

Bearing Number	Bore d	O.D. D	Height T	Washers			Shoulder Diameter		Fillet <sup>(1)</sup> Radius r (Max.)	Wt.	Load Rating	
				Thickness T <sub>1</sub>	Small Diameter O.D. D <sub>1</sub>	Large Bore I.D. d <sub>1</sub>	Shaft H (Min.)	Housing E (Max.)			Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>t</sub>
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg lbs.	kN lbs.	kN lbs.	
20TP103	50.800 2.0000	152.400 6.0000	34.925 1.3750	9.52 0.375	150.81 5.938	52.39 2.062	141.3 5.56	61.9 2.44	1.6 0.06	3.7 8.1	814 183000	331 74500
20TP104	50.800 2.0000	177.800 7.0000	34.925 1.3750	9.52 0.375	176.21 6.938	52.39 2.062	163.5 6.44	65.1 2.56	1.6 0.06	5.1 11.3	1010 227000	398 89500
30TP106	76.200 3.0000	152.400 6.0000	34.925 1.3750	9.52 0.375	150.81 5.938	77.79 3.062	142.9 5.62	85.7 3.38	1.6 0.06	3.2 7.0	747 168000	340 76500
30TP107	76.200 3.0000	177.800 7.0000	34.925 1.3750	9.52 0.375	176.21 6.938	77.79 3.062	166.7 6.56	87.3 3.44	1.6 0.06	4.6 10.2	1040 234000	414 93200
30TP108	76.200 3.0000	203.200 8.0000	34.925 1.3750	9.52 0.375	201.61 7.938	77.79 3.062	188.9 7.44	90.5 3.56	1.6 0.06	6.3 13.9	1380 311000	520 117000
30TP109	76.200 3.0000	228.600 9.0000	34.925 1.3750	9.52 0.375	227.01 8.938	77.79 3.062	212.7 8.38	92.1 3.62	1.6 0.06	8.2 18.1	1800 405000	636 143000
35TP113	88.900 3.5000	132.558 5.2188	25.400 1.0000	7.14 0.281	130.97 5.156	90.49 3.562	123.8 4.88	97.6 3.84	1.6 0.06	1.4 3.0	381 85600	180 40400
40TP114	101.600 4.0000	177.800 7.0000	44.450 1.7500	12.7 0.500	176.21 6.938	103.19 4.062	168.3 6.62	111.1 4.38	1.6 0.06	5 11.0	1030 231000	503 113000
40TP115	101.600 4.0000	203.200 8.0000	44.450 1.7500	12.7 0.500	201.61 7.938	103.19 4.062	190.5 7.50	114.3 4.50	1.6 0.06	7.1 15.6	1370 308000	589 132000
40TP116	101.600 4.0000	228.600 9.0000	44.450 1.7500	12.7 0.500	227.01 8.938	103.19 4.062	214.3 8.44	115.9 4.56	1.6 0.06	9.5 21.0	1770 397000	676 152000
40TP117	101.600 4.0000	254 10.0000	44.450 1.7500	12.7 0.500	252.41 9.938	103.19 4.062	238.1 9.38	117.5 4.62	1.6 0.06	11.6 25.6	2220 498000	896 202000
50TP119	127 5.0000	203.200 8.0000	44.450 1.7500	12.7 0.500	201.61 7.938	128.59 5.062	190.5 7.50	139.7 5.50	1.6 0.06	5.9 13.1	1280 288000	593 133000
50TP120	127 5.0000	228.600 9.0000	44.450 1.7500	12.7 0.500	227.01 8.938	128.59 5.062	215.9 8.50	139.7 5.50	1.6 0.06	8.3 18.4	1710 385000	716 161000
50TP121	127 5.0000	254 10.0000	50.800 2.0000	14.29 0.562	252.41 9.938	128.59 5.062	239.7 9.44	141.3 5.56	3.2 0.12	12.4 27.4	2180 491000	841 189000
50TP122	127 5.0000	279.400 11.0000	50.800 2.0000	14.29 0.562	277.81 10.938	128.59 5.062	261.9 10.31	144.5 5.69	3.2 0.12	15.8 34.8	2760 620000	996 224000
50TP123	127 5.0000	304.800 12.0000	50.800 2.0000	14.29 0.562	303.21 11.938	128.59 5.062	288.9 11.38	146 5.75	3.2 0.12	19.4 42.8	3290 789000	1170 262000
60TP124	152.400 6.0000	228.600 9.0000	50.800 2.0000	14.29 0.562	227.01 8.938	153.99 6.062	217.5 8.56	163.5 6.44	3.2 0.12	7.6 16.8	1410 317000	600 135000
60TP125	152.400 6.0000	254 10.0000	50.800 2.0000	14.29 0.562	252.41 9.938	153.99 6.062	241.3 9.50	165.1 6.50	3.2 0.12	10.7 23.7	2000 449000	845 190000
60TP126	152.400 6.0000	279.400 11.0000	50.800 2.0000	14.29 0.562	277.81 10.938	153.99 6.062	265.1 10.44	166.7 6.56	3.2 0.12	14.2 31.4	2700 608000	1000 226000
60TP127	152.400 6.0000	304.800 12.0000	50.800 2.0000	14.29 0.562	303.31 11.938	153.99 6.062	287.3 11.31	169.9 6.69	3.2 0.12	17.7 39.4	3220 725000	1110 250000
70TP129	177.800 7.0000	254 10.0000	50.800 2.0000	14.29 0.562	251.62 9.906	180.18 7.094	242.9 9.56	188.9 7.44	3.2 0.12	9.2 20.2	1620 365000	663 149000
70TP130	177.800 7.0000	279.400 11.0000	50.800 2.0000	14.29 0.562	277.02 10.906	180.18 7.094	266.7 10.50	190.5 7.50	3.2 0.12	12.8 28.3	2400 540000	930 209000
70TP131	177.800 7.0000	304.800 12.0000	50.800 2.0000	14.29 0.562	302.42 11.906	180.18 7.094	288.9 11.38	193.7 7.62	3.2 0.12	16.8 37.0	3090 695000	1080 242000
70TP132	177.800 7.0000	355.600 14.0000	76.200 3.0000	20.64 0.812	353.22 13.906	180.18 7.094	335 13.19	198.4 7.81	6.4 0.25	36.3 80.1	4490 1010000	1750 394000

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.



## CYLINDRICAL ROLLER THRUST BEARINGS

### TYPE TP – continued

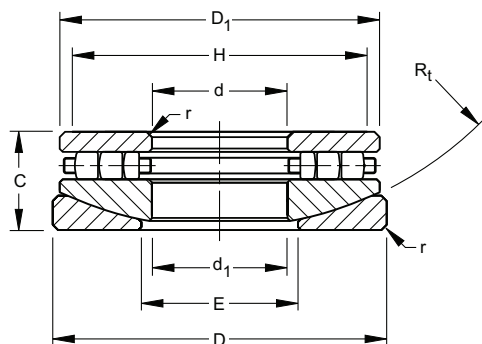
Bearing Number	Bore d	O.D. D	Height T	Washers			Shoulder Diameter		Filler <sup>(1)</sup> Radius r (Max.)	Wt.	Load Rating	
				Thickness T <sub>1</sub>	Small Diameter O.D. D <sub>1</sub>	Large Bore I.D. d <sub>1</sub>	Shaft H (Min.)	Housing E (Max.)			Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>t</sub>
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg lbs.	kN lbs.	kN lbs.	
80TP134	203.2 8.0000	304.8 12.0000	76.2 3.0000	20.64 0.812	302.42 11.906	205.58 8.094	292.1 11.50	215.9 8.50	6.4 0.25	20.5 45.1	2660 599000	1150 258000
80TP135	203.2 8.0000	355.6 14.0000	76.2 3.0000	20.64 0.812	353.22 13.906	205.58 8.094	336.6 13.25	222.2 8.75	6.4 0.25	33 72.8	4230 950000	1730 389000
80TP136	203.2 8.0000	406.4 16.0000	76.2 3.0000	20.64 0.812	404.02 15.906	205.58 8.094	382.6 15.06	227.0 8.94	6.4 0.25	44.5 98.1	5740 1290000	2310 520000
90TP139	228.6 9.0000	355.6 14.0000	76.2 3.0000	20.64 0.812	353.22 13.906	230.98 9.094	339.7 13.38	244.5 9.62	6.4 0.25	29.3 64.5	3910 879000	1460 328000
90TP140	228.6 9.0000	406.4 16.0000	76.2 3.0000	20.64 0.812	404.02 15.906	230.98 9.094	385.8 15.19	249.2 9.81	6.4 0.25	43.6 96.2	5560 1250000	2140 482000
100TP143	254 10.0000	406.4 16.0000	76.2 3.0000	20.64 0.812	404.02 15.906	256.38 10.094	387.4 15.25	273.0 10.75	6.4 0.25	39.5 86.6	5160 1160000	1750 394000
100TP144	254 10.0000	457.2 18.0000	95.25 3.7500	26.19 1.031	454.82 17.906	256.38 10.094	435.0 17.12	276.2 10.88	6.4 0.25	68.8 151.8	7210 1620000	2690 604000
100TP145	254 10.0000	508 20.0000	95.25 3.7500	26.19 1.031	505.62 19.906	256.38 10.094	481.0 18.94	281.0 11.06	6.4 0.25	91.7 202.2	9560 2150000	3670 825000
120TP151	304.8 12.0000	457.2 18.0000	95.25 3.7500	26.19 1.031	454.82 17.906	307.18 12.094	438.2 17.25	323.8 12.75	6.4 0.25	56.7 125.1	6340 1420000	2300 518000
120TP152	304.8 12.0000	508 20.0000	114.3 4.5000	31.75 1.250	505.62 19.906	307.18 12.094	484.2 19.06	328.6 12.94	6.4 0.25	104.5 230.5	7900 1780000	3300 743000
120TP153	304.8 12.0000	609.6 24.0000	114.3 4.5000	31.75 1.250	607.22 23.906	307.18 12.094	584.2 23.00	330.2 13.00	6.4 0.25	168.5 371.5	12900 2900000	4680 1050000
140TP158	355.6 14.0000	508 20.0000	95.25 3.7500	26.19 1.031	504.82 19.875	358.78 14.125	489.0 19.25	374.6 14.75	6.4 0.25	62.6 138.1	7200 1620000	2610 588000
140TP159	355.6 14.0000	558.8 22.0000	95.25 3.7500	26.19 1.031	555.62 21.875	358.78 14.125	535.0 21.06	379.4 14.94	6.4 0.25	89.6 197.5	10000 2250000	3750 802000
140TP160	355.6 14.0000	609.6 24.0000	95.25 3.7500	26.19 1.031	606.4 23.875	358.78 14.125	581.0 22.88	384.2 15.12	6.4 0.25	125.3 276.2	12600 2840000	4040 908000
160TP164	406.4 16.0000	558.8 22.0000	114.3 4.5000	31.75 1.250	555.62 21.875	409.6 16.125	539.8 21.25	425.4 16.75	6.4 0.25	85.9 189.4	7860 1770000	3090 695000
160TP165	406.4 16.0000	609.6 24.0000	114.3 4.5000	31.75 1.250	606.4 23.875	409.6 16.125	585.8 23.06	430.2 16.94	6.4 0.25	121.4 267.7	11200 2510000	4170 937000
160TP166	406.4 16.0000	660.4 26.0000	114.3 4.5000	31.75 1.250	657.2 25.875	409.6 16.125	633.4 24.94	433.4 17.06	6.4 0.25	168.8 372.1	13800 3090000	4710 1060000
180TP168	457.2 18.0000	660.4 26.0000	127 5.0000	34.92 1.375	657.2 25.875	460.4 18.125	635 25.00	482.6 19.00	6.4 0.25	148.8 328.1	11800 2650000	4090 919000
180TP169	457.2 18.0000	711.2 28.0000	127 5.0000	34.92 1.375	708.0 27.875	460.4 18.125	684.2 26.94	484.2 19.06	6.4 0.25	195.3 430.7	15500 3480000	5480 1230000
180TP170	457.2 18.0000	762 30.0000	139.7 5.5000	38.10 1.500	758.8 29.875	460.4 18.125	735.0 28.94	484.2 19.06	6.4 0.25	280.7 618.9	19700 4430000	6840 1540000
200TP171	508 20.0000	711.2 28.0000	139.7 5.5000	38.10 1.500	708.0 27.875	511.2 20.125	685.8 27.00	533.4 21.00	6.4 0.25	178 392.5	13100 2940000	4710 1060000
200TP172	508 20.0000	762 30.0000	139.7 5.5000	38.10 1.500	758.8 29.875	511.2 20.125	736.6 29.00	533.4 21.00	6.4 0.25	232.2 512.0	17500 3930000	6370 1430000
200TP173	508 20.0000	812.8 32.0000	152.4 6.0000	42.07 1.656	809.6 31.875	511.2 20.125	787.4 31.00	533.4 21.00	6.4 0.25	317 698.9	22400 5050000	7610 1700000
220TP174	558.8 22.0000	762 30.0000	139.7 5.5000	38.10 1.500	758.8 29.875	562 22.125	736.6 29.00	584.2 23.00	6.4 0.25	192.7 425.0	14200 3200000	5070 1140000
220TP175	558.8 22.0000	812.8 32.0000	139.7 5.5000	38.10 1.500	809.6 31.875	562.0 22.125	782.6 30.81	589.0 23.19	6.4 0.25	250.6 552.6	19000 4270000	6570 1480000
220TP176	558.8 22.0000	863.6 34.0000	152.4 6.0000	42.07 1.656	860.4 33.875	562.0 22.125	838.2 33.00	584.2 23.00	6.4 0.25	340.9 751.6	24500 5500000	8200 1840000
240TP177	609.6 24.0000	812.8 32.0000	139.7 5.5000	38.10 1.500	809.6 31.875	612.8 24.125	790.6 31.12	631.8 24.88	9.5 0.38	206.5 455.4	16000 3600000	5650 1270000
240TP178	609.6 24.0000	863.6 34.0000	139.7 5.5000	38.10 1.500	860.4 33.875	612.8 24.125	838.2 33.00	635.0 25.00	9.5 0.38	269 593.2	20500 4610000	6880 1550000
240TP179	609.6 24.0000	914.4 36.0000	152.4 6.0000	42.07 1.656	911.2 35.875	612.8 24.125	889.0 35.00	635.0 25.00	9.5 0.38	364.7 804.2	25200 5670000	8450 1900000

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.

## CYLINDRICAL ROLLER THRUST BEARINGS

### TYPE TPS

- Similar to Type TP except one washer is spherically ground to seat against an aligning washer. This makes it adaptable to initial misalignment.
- Not suggested for operating conditions where alignment is constantly changing.



### DIMENSIONS – LOAD RATINGS

Bearing Number	Bore d	O.D. D	Height C	Aligning Washer radius Rt	Washers		Shoulder Diameter		Fillet <sup>(1)</sup> Radius r (Max.)	Wt.	Load Rating	
					Small Diameter O.D. D1	Large Bore I.D. d1	Shaft H (Min.)	Housing E (Max.)			Static Load Rating Coa	Dynamic Load Rating Ct
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg lbs.	kN lbs.	kN lbs.
20TPS103	50.800 2.0000	160.325 6.3120	46.038 1.8125	190.50 7.500	150.81 5.938	52.39 2.062	141.3 5.56	85.7 3.38	1.6 0.06	5.2 11.4	814 183000	331 74500
20TPS104	50.800 2.0000	185.725 7.3120	46.038 1.8125	241.30 9.500	176.21 6.938	52.39 2.062	163.5 6.44	108.0 4.25	1.6 0.06	7.12 15.7	1010 227000	398 89500
30TPS106	76.200 3.0000	160.325 6.3120	46.038 1.8125	152.40 6.000	150.81 5.938	77.79 3.062	142.9 5.62	101.6 4.00	1.6 0.06	4.5 9.9	747 168000	340 76500
30TPS107	76.200 3.0000	185.725 7.3120	46.038 1.8125	241.30 9.500	176.21 6.938	77.79 3.062	166.7 6.56	111.1 4.38	1.6 0.06	6.4 14.2	1040 234000	414 93200
30TPS108	76.200 3.0000	211.125 8.3120	46.038 1.8125	304.80 12.000	201.61 7.938	77.79 3.062	188.9 7.44	133.4 5.25	1.6 0.06	8.7 19.2	1380 311000	520 117000
35TPS113	88.900 3.5000	138.908 5.4688	33.338 1.3125	127.00 5.000	130.97 5.156	91.28 3.594	123.8 4.88	103.2 4.06	1.6 0.06	1.9 4.1	381 85600	180 40400
40TPS114	101.600 4.0000	187.327 7.3750	58.738 2.3125	161.93 6.375	176.21 6.938	103.98 4.094	168.3 6.62	127 5.00	1.6 0.06	7.0 15.4	1030 231000	503 113000
40TPS115	101.600 4.0000	212.725 8.3750	58.738 2.3125	215.90 8.500	201.61 7.938	103.98 4.094	190.5 7.50	133.4 5.25	1.6 0.06	10.0 22.1	1370 308000	589 132000
40TPS116	101.600 4.0000	238.125 9.3750	58.738 2.3125	254.00 10.000	227.01 8.938	103.98 4.094	214.3 8.44	149.2 5.88	1.6 0.06	13.4 29.5	1770 397000	676 152000
40TPS117	101.600 4.0000	266.7 10.5000	58.738 2.3125	355.60 14.000	252.41 9.938	103.98 4.094	238.1 9.38	165.1 6.50	1.6 0.06	17.1 37.7	2220 498000	896 202000
50TPS119	127 5.0000	215.9 8.5000	58.738 2.3125	187.33 7.375	201.61 7.938	130.18 5.125	190.5 7.50	152.4 6.00	1.6 0.06	8.4 18.5	1280 288000	592 133000
50TPS120	127 5.0000	241.3 9.5000	58.738 2.3125	266.70 10.500	227.01 8.938	130.18 5.125	215.9 8.50	155.6 6.12	1.6 0.06	11.8 26.1	1710 385000	716 161000
50TPS121	127 5.0000	266.7 10.5000	66.675 2.6250	323.85 12.750	252.41 9.938	130.18 5.125	239.7 9.44	158.8 6.25	3.2 0.12	17.6 38.7	2180 491000	841 189000
50TPS122	127 5.0000	292.1 11.5000	66.675 2.6250	406.40 16.000	277.81 10.938	130.18 5.125	261.9 10.31	177.8 7.00	3.2 0.12	22.1 48.8	2760 620000	996 224000
50TPS123	127.000 5.0000	317.5 12.5000	66.675 2.6250	501.65 19.750	303.21 11.938	130.18 5.125	288.9 11.38	184.1 7.25	3.2 0.12	27.2 60.0	3290 739000	1170 262000
60TPS124	152.400 6.0000	241.3 9.5000	66.675 2.6250	171.45 6.750	227.01 8.938	155.58 6.125	217.5 8.56	184.1 7.25	3.2 0.12	10.8 23.8	1410 317000	600 135000
60TPS125	152.400 6.0000	266.7 10.5000	66.675 2.6250	241.30 9.500	252.46 9.938	155.58 6.125	241.3 9.50	187.3 7.38	3.2 0.12	15.2 33.5	2000 449000	845 190000
60TPS126	152.400 6.0000	292.1 11.5000	66.675 2.6250	342.90 13.500	277.81 10.938	155.58 6.125	265.1 10.44	187.3 7.38	3.2 0.12	20.1 44.3	2700 607000	1000 225000
60TPS127	152.400 6.0000	317.5 12.5000	66.675 2.6250	431.80 17.000	303.21 11.938	155.58 6.125	287.3 11.31	190.5 7.50	3.2 0.12	25.2 55.6	3220 725000	1110 250000
70TPS129	177.800 7.0000	266.7 10.5000	66.675 2.6250	206.38 8.125	251.62 9.906	180.8 7.125	242.9 9.56	206.4 8.12	3.2 0.12	12.7 27.9	1620 365000	663 149000
70TPS130	177.800 7.0000	292.100 11.5000	66.675 2.6250	292.10 11.500	277.02 10.906	180.98 7.125	266.7 10.50	209.6 8.25	3.2 0.12	17.7 39.1	2400 540000	930 209000
70TPS131	177.800 7.0000	317.500 12.5000	66.675 2.6250	390.53 15.375	302.42 11.906	180.98 7.125	288.9 11.38	209.6 8.25	3.2 0.12	23.3 51.3	3090 695000	1080 242000

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.



**CYLINDRICAL ROLLER THRUST BEARINGS**

TYPE TPS – *continued*

B

**DIMENSIONS – LOAD RATINGS - *continued***

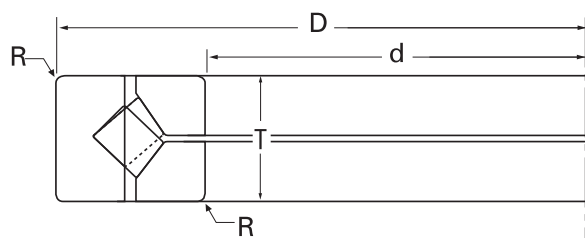
Bearing Number	Bore d	O.D. D	Height C	Aligning Washer radius R <sub>t</sub>	Washers		Shoulder Diameter		Fillet <sup>(1)</sup> Radius r (Max.)	Wt.	Load Rating	
					Small Diameter O.D. D <sub>1</sub>	Large Bore I.D. d <sub>1</sub>	Shaft H (Min.)	Housing E (Max.)			Static Load Rating C <sub>0a</sub>	Dynamic Load Rating C <sub>t</sub>
	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	mm in.	kg lbs.	kN lbs.	kN lbs.
70TPS132	177.800 7.0000	374.650 14.7500	101.600 4.0000	390.53 15.375	353.22 13.906	180.98 7.125	335.0 13.19	228.6 9.00	6.4 0.25	52.6 115.9	4490 1010000	1750 394000
80TPS134	203.200 8.0000	323.850 12.7500	101.600 4.0000	215.90 8.500	302.42 11.906	207.96 8.188	292.1 11.50	238.1 9.38	6.4 0.25	29.8 65.8	2660 599000	1150 258000
80TPS135	203.200 8.0000	374.650 14.7500	101.600 4.0000	304.80 12.000	353.22 13.906	207.96 8.188	336.6 13.25	263.5 10.38	6.4 0.25	47.7 105.2	4230 950000	1730 389000
80TPS136	203.200 8.0000	428.625 16.8750	101.600 4.0000	495.30 19.500	404.02 15.906	209.55 8.250	382.6 15.06	266.7 10.50	6.4 0.25	68.2 150.4	5740 1290000	2310 520000
90TPS139	228.600 9.0000	374.650 14.7500	101.600 4.0000	304.80 12.000	353.22 13.906	234.95 9.250	339.7 13.38	263.5 10.38	6.4 0.25	42.2 93.1	3910 879000	1460 328000
90TPS140	228.600 9.0000	428.625 16.8750	101.600 4.0000	495.30 19.500	404.02 15.906	234.95 9.250	385.8 15.19	266.7 10.50	6.4 0.25	63.3 139.5	5560 1250000	2140 482000
100TPS143	254.000 10.0000	428.625 16.8750	101.600 4.0000	425.45 16.750	404.02 15.906	260.36 10.250	387.4 15.25	292.1 11.50	6.4 0.25	56.2 124.0	5160 1160000	1750 394000
100TPS144	254.000 10.0000	479.425 18.8750	127.000 5.0000	508.00 20.000	454.82 17.906	260.36 10.250	435.0 17.12	304.8 12.00	6.4 0.25	99.5 219.5	7210 1620000	2690 604000
100TPS145	254.000 10.0000	530.225 20.8750	127.000 5.0000	609.6 24.000	505.62 19.906	260.36 10.250	481.0 18.94	336.6 13.25	6.4 0.25	131.8 290.6	9560 2150000	3670 825000
120TPS151	304.800 12.0000	479.425 18.8750	127.000 5.0000	390.53 15.375	454.82 17.906	311.15 12.250	438.2 17.25	346.1 13.62	6.4 0.25	82.1 181.0	6340 1420000	2300 518000
120TPS152	304.800 12.0000	530.225 20.8750	152.400 6.0000	619.13 24.375	505.62 19.906	311.15 12.250	484.2 19.06	352.4 13.88	6.4 0.25	139.4 307.4	7900 1780000	3300 743000
120TPS153	304.800 12.0000	631.825 24.8750	152.400 6.0000	723.90 28.500	607.22 23.906	311.15 12.250	584.2 23.00	406.4 16.00	6.4 0.25	236.9 522.4	12900 2900000	4680 1050000
140TPS158	355.600 14.0000	530.225 20.8750	123.825 4.8750	495.30 19.500	504.82 19.875	361.95 14.250	489.0 19.25	393.7 15.50	6.4 0.25	89.2 196.6	7200 1620000	2610 588000
140TPS159	355.600 14.0000	581.025 22.8750	123.825 4.8750	723.90 28.500	555.62 21.875	361.95 14.250	535.0 21.06	393.7 15.50	6.4 0.25	125.0 275.6	10000 2250000	3570 802000
140TPS160	355.600 14.0000	631.825 24.8750	123.825 4.8750	917.58 36.125	606.62 23.875	361.95 14.250	581.0 22.88	415.9 16.38	6.4 0.25	170.9 376.9	12600 2840000	4040 908000
160TPS164	406.400 16.0000	581.025 22.8750	152.400 6.0000	444.50 17.500	555.62 21.875	412.75 16.250	539.8 21.25	444.5 17.50	6.4 0.25	123.9 273.2	7860 1770000	3090 695000
160TPS165	406.400 16.0000	635.000 25.0000	152.400 6.0000	596.90 23.500	606.42 23.875	412.75 16.250	585.8 23.06	457.2 18.00	6.4 0.25	174.4 384.6	11200 2510000	4170 937000
160TPS166	406.400 16.0000	685.800 27.0000	152.400 6.0000	752.48 29.625	657.22 25.875	412.75 16.250	633.4 24.94	469.9 18.50	6.4 0.25	229.8 506.7	13800 3090000	4710 1060000

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.

## CROSSED ROLLER THRUST BEARINGS

### TYPE XR AND JXR

- Withstands high overturning moments.
- Applications include machine tool table bearing for vertical boring and grinding machines. Other applications include various pivot and pedestal applications.
- Dimensions given in the following table relate to bearing type TXRDO, which is the most common form of crossed roller bearing.
- TXRDO bearing has a double outer race and two inner races with rollers spaced by separators.
- Other mounting configurations and sizes of crossed roller bearing can be supplied to meet particular assembly or setting requirements.
- Contact your Timken representative for more information.



### DIMENSIONS – LOAD RATINGS

Bearing Number	Dimensions				Load Ratings		Factor $k^{(2)}$
	Bore d	O.D. D	Height T	Radius <sup>(1)</sup> R	Two-Row radial	Thrust	
	mm in.	mm in.	mm in.	mm in.	kN lbs.	kN lbs.	
XR496051	203.200 8.0000	279.400 11.0000	31.750 1.2500	1.5 0.06	51.300 11500	61.600 13800	0.48
JXR637050	300.000 11.8110	400.000 15.7480	37.000 1.4567	1.5 0.06	63.000 14200	80.100 18000	0.45
JXR652050	310.000 12.2047	425.000 16.7323	45.000 1.7717	2.5 0.10	82.200 18500	102.000 23000	0.46
XR678052	330.200 13.0000	457.200 18.0000	63.500 2.50000	3.3 0.13	100.000 22500	123.000 27600	0.47
JXR699050	370.000 14.5669	495.000 19.4882	50.000 1.9685	3.0 0.12	93.600 21000	119.000 26700	0.45
XR766051	457.200 18.0000	609.600 24.0000	63.500 2.5000	3.3 0.13	141.000 31600	178.000 40100	0.45
XR820060	580.000 22.8346	760.000 29.9213	80.000 3.1496	6.4 0.25	240.000 53900	299.000 67200	0.46
XR855053	685.800 27.0000	914.400 36.0000	79.375 3.1250	3.3 0.13	270.000 60700	344.000 77200	0.45
XR882055	901.700 35.50000	1117.600 44.0000	82.550 3.2500	3.3 0.13	300.000 67400	396.000 88900	0.44
XR889058	1028.700 40.5000	1327.150 52.2500	114.300 4.5000	3.3 0.13	405.000 91000	534.000 120000	0.44
XR897051	1549.400 61.0000	1828.800 72.0000	101.600 4.0000	3.3 0.13	518.000 116000	699.000 157000	0.43

<sup>(1)</sup> Maximum shaft or housing fillet radius that bearing corners will clear.

<sup>(2)</sup> Centrifugal force constant. See engineering section for calculations using this factor.





**NOTES**

**B**



# TIMKEN

Where You Turn

Bearings • Steel •  
Power Transmission Systems •  
Precision Components •  
Gears • Seals • Lubrication •  
Industrial Services •  
Remanufacture and Repair

[www.timken.com](http://www.timken.com)



Price: USD \$75