

Technical specification of slewing bearing

Calculation for type selection of slewing bearing

1 Static type selection

Refer to the calculation of load F_{a1} and M_1 .

(1) Single row four-point contact ball type

The type selection calculation of the single row four-point ball type slewing bearing is done according to the bearing angle 45° and 60° respectively.

$$1. a = 45^\circ$$

$$2. a = 60^\circ$$

$$F_{a1} = (1.225 * Fa + 2.676 * Fr) * fs$$

$$F_{a1} = (Fa + 5.046 * Fr) * fs$$

$$M_1 = 1.225 * M * fs$$

$$M_1 = M * fs$$

Find the foresaid two points on the curve chart and one point is below the curve.

(2) Single -row crossed roller type

$$F_{a1} = (Fa + 2.05 * Fr) * fs$$

$$M_1 = M * fs$$

(3) Double-row different diameter ball type

With regard to the type selection calculation of the double-row ball type slewing bearing, Fr may be omitted if the $Fr \leq 10\% Fa$. If the $Fr > 10\% Fa$, the change of pressure angle in the race must be considered; in this case, please contact us for the calculation.

$$F_{a1} = Fa * fs$$

$$M_1 = M * fs$$

(4) Three-row roller type

For the type selection calculation of the three-row roller type slewing rings, only calculate the axial race load and capsizing moment.

$$F_{a1} = Fa * fs$$

$$M_1 = M * fs$$

2 Dynamic type selections:

For the application with continuous operation, high speed slewing and other specific requirement for the service life of slewing ring, please contact our Technical Department.

3 Checking calculation of bolt bearing capacity:

1) Regard the max. Bearing load (not multiplied with the static safety factor fs) of the slewing bearing as the load for the bolt selection;

2) Check whether the load falls below the curve of bolt limit load in the required class;

3) If the bolt bearing capacity is not enough, you may change the slewing bearing or contact with our Technical Department.

Table 1

Applications	fs	fL	In principle, it is necessary to support the role of the maximum load value as a
Floating crane (Cargo Load)			
Truck Crane (Cargo Load)	1.10	1.0	

Marine deck crane (Grab) Welding equipment Table (continuous operation)					static calculations, the additional load must include loading and test load. Was not included in the table of occasions, can refer to the table with the similar working conditions and application, select static safety factor f_L . *) Rotary tower crane M = empty overturning the reverse torque M = maximum rate of the overturning moment **) The static safety factor of 1.45 f_s admission applications, and due to higher average load heavy workload occasions, priority should be given choice of multi-Roller-slewing bearings.
Tower Crane	Slewing*	$Mf \leq 0.5M$	1.25	1.0	
		$0.5M \leq Mf < 0.8M$		1.15	
		$Mf \geq 0.8M$		1.25	
Under Rotary	1.0				
Rotary Crane (Cargo Load) Shipyards Crane Loading/unloader				1.15	
Metallurgical Crane			1.45**	1.5	
Truck Crane (Grab-or handling heavy workload) Rotary Crane (grab or sucker) Bridge Crane (grab or sucker) Floating crane (grab or sucker)				1.7	
Bucket wheel excavators Stacker reclaimer Cantilever conveyor				2.15	
Offshore Crane			According to special standards		
Railway Crane Deck crane (Cargo Load)			1.00		
Reactor Feeder Carriers			1.10		
Rope excavator/Cable fight			1.25		
Less than or equal to 1.5 m ³ hydraulic excavators			1.45		
More than 1.5 m ³ hydraulic excavators			According to special standards		
Ladle turret			1.75		

Note: f_l is the dynamic safety factor. It must be used under the combination with the dynamic bearing curve (It is not included in the sample). It originates from the experience and experiment, as a reference value based upon the max. working load. If the slewing ring has to be chosen according to the service life, please contact with our Technical Department.

Installation bolt pair

1. The bolt dimension of the slewing bearing should conform to GB/T5782-2000 and GB/T5783-2000. The strength grade should be no lower than 8.8 in GB/T3098.1-2000, chosen according to the force the bearing bears.

2. The nut dimension should conform to GB/T6170-2000 and GB/T6175-2000 and its mechanical performance should conform to GB3098.2-2000.

3. The washer dimension should conform to GB/T97.1-1985 and GB/T97.2-1985 and it needs the quenching and tempering treatment. The spring washer should not be used.

4. The bolt tightening way should follow the design of the principle machine. Certain pre-tightening force should be ensured. Unless otherwise specified, the pre-tightening force usually should be 0.7 times as much as the bolt yield limit. During the tighteing , little oil may be spread at the thread . For the pre-tightening torque or pre-tightening force, see Table 4.

5. The bolt clamping length $LK > 5d$ (d-bolt diameter).

TABLE 2 Pre-tightening Torque or Pre-tightening Moment:

Bolt Specification (GB/T5782-2000 GB/T5783-2000)	The size of mounting hole (mm)	The bolt strength and grade(GB/T3098.1-2000)	
		8.8	10.9
		Limit of yielding σ min (N / mm ²)	
		640	900
		Pre-tightening torque Ma (Nm)	
M10	11	44	62
M12	13.5	77.5	110
M14	15.5	120	170
M16	18	190	265
M18	20	260	365
M20	22	370	520
M22	24	500	700
M24	26	640	900
M27	30	950	1350
M30	33	1300	1800
		Pre-tightening force Fa (1000N)	
M33	36	293	412
M36	39	344	484
M39	42	414	581
M42	45	473	665
M45	48	553	777
M48	52	623	876
M52	56	749	1054
M56	62	863	1214
M60	66	1008	1418

Note: (1) when the bolt dimension does not conform to GB/T5782-2000 or GB/T5783-2000, the values in the table needs the re-calculation.

(2)The total frictional coefficient between the bolt head and the clamped surface, $\mu=0.14$. Spread little oil on the thread.

Clearance of turntable bearing

The bearing clearance of slewing bearing is mainly used to compensate the parts of slewing bearing and the disassembly position of the principle machine against the manufacture error and installation error, so as to ensure the normal use of bearing .The clearance values or interferences are listed from Table 3 to Table 6 according to the slewing bearing structure type, tolerance grade and the pitch diameter of rolling element group.

Table 3 Axial Clearance of Four-point Contact Ball Slewing Ring Bearing μm

Dpw mm		Tolerance grade					
		G		E		D	
		Axial clearance					
over	upto	Min	Max	Min	Max	Min	Max
280	450	70	170	50	130	30	90
450	710	100	220	70	170	40	120
710	1120	120	280	100	220	50	150
1120	1800	150	350	100	260	60	180
1800	2800	200	440	150	350	80	240
3800	4500	260	540	200	440	100	300

Table4 Axial Clearance of Double-row Angular Contact Thrust Ball Slewing Bearing μm

Dpw mm		Tolerance grade					
		G		E		D	
		Axial clearance					
over	upto	Min	Max	Min	Max	Min	Max
280	450	50	130	30	90	25	70
450	710	70	170	40	120	30	90
710	1120	100	220	50	150	40	120
1120	1800	100	260	60	180	40	140
1800	2800	150	350	80	240	60	180
3800	4500	200	440	100	300	80	240

Table 5 Axial Clearance of Cylindrical Roller Slewing Bearing μm

Dpw mm		Tolerance grade					
		G		E		D	
		Axial clearance					
over	upto	Min	Max	Min	Max	Min	Max
280	450	50	130	30	90	25	70
450	710	70	170	40	120	30	90
710	1120	100	220	50	150	40	120
1120	1800	100	260	60	180	40	140
1800	2800	150	350	80	240	60	180
3800	4500	200	440	100	300	80	240

Table 6 Clearance of Three-row Cylindrical Roller Combined Slewing Bearing μm

Dpw mm		Tolerance grade											
		G				E				D			
		Axial		Radial		Axial		Radial		Axial		Radial	
over	upto	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
280	450	30	90	50	130	25	70	30	90	10	50	25	70
450	710	40	120	70	170	30	90	40	120	15	65	30	90
710	1120	50	150	100	220	40	120	50	150	20	80	40	120
1120	1800	60	180	100	260	40	140	60	180	20	100	40	140
1800	2800	80	240	150	350	60	180	80	240	30	130	60	180
3800	4500	100	300	200	440	80	240	100	300	40	160	80	240

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