

Veerelaagrite mõõtmete täpsusklassid

Veerelaagrite mõõtmete täpsusklassid on määratud standarditega, nt. ISO 492:2002

Veerelaagrite tolerantsiklassid erinevate standardite järgi

Standard	Applicable standard	Tolerance Class						Bearing Types
Japanese industrial standard (JIS)	JIS B 1514	Class 0,6X	Class 6	Class 5	Class 4	Class 2		All type
International Organization for Standardization (ISO)	ISO 492	Normal class Class 6X	Class 6	Class 5	Class 4	Class 2		Radial bearings
	ISO 199	Normal Class	Class 6	Class 5	Class 4	—		Thrust ball bearings
	ISO 578	Class 4	—	Class 3	Class 0	Class 00		Tapered roller bearings (Inch series)
	ISO 1224	—	—	Class 5A	Class 4A	—		Precision instrument bearings
Deutsches Institut für Normung (DIN)	DIN 620	P0	P6	P5	P4	P2		All type
American National Standards Institute (ANSI) American Bearing Manufacturer's Association (ABMA)	ANSI/ABMA Std.20	ABEC-1 RBEC-1	ABEC-3 RBEC-3	ABEC-5 RBEC-5	ABEC-7	ABEC-9		Radial bearings (Except tapered roller bearings)
	ANSI/ABMA Std.19.1	Class K	Class N	Class C	Class B	Class A		Tapered roller bearings (Metric series)
	ANSI/ABMA Std.19	Class 4	Class 2	Class 3	Class 0	Class 00		Tapered roller bearings (Inch series)

Kõige ebatäpsem

Kõige täpsem

Allikas: www.ntn-europe.com

Veerelaagrite mõõtmete täpsus (1)

SKF normaalklassi (ehk 6X ehk P0) radiaal-kuullaagrite sisevõru piirmõõtmised

Inner ring		$\Delta_{dmp}^{2)}$		V_{dp}			V_{dmp}		Δ_{Bs}		Δ_{B1s}		V_{Bs}		K_{is}	
d ¹⁾				Diameter Series												
over	incl.	high	low	7,8,9	0,1	2,3,4	max	high	low	high	low	max	max	max	max	max
mm		μm		μm	μm	μm	μm	μm	μm	μm	μm	μm	μm	μm	μm	μm
-	2,5	0	-8	10	8	6	6	0	-40	-	-	12	10			
2,5	10	0	-8	10	8	6	6	0	-120	0	-250	15	10			
10	18	0	-8	10	8	6	6	0	-120	0	-250	20	10			
18	30	0	-10	13	10	8	8	0	-120	0	-250	20	13			
30	50	0	-12	15	12	9	9	0	-120	0	-250	20	15			
50	80	0	-15	19	19	11	11	0	-150	0	-380	25	20			
80	120	0	-20	25	25	15	15	0	-200	0	-380	25	25			
120	180	0	-25	31	31	19	19	0	-250	0	-500	30	30			
180	250	0	-30	38	38	23	23	0	-300	0	-500	30	40			

Veerelaagrite mõõtmete piirhälbed annab valmistaja

Allikas: www.skf.com

Veerelaagrite mõõtmete täpsus (2)

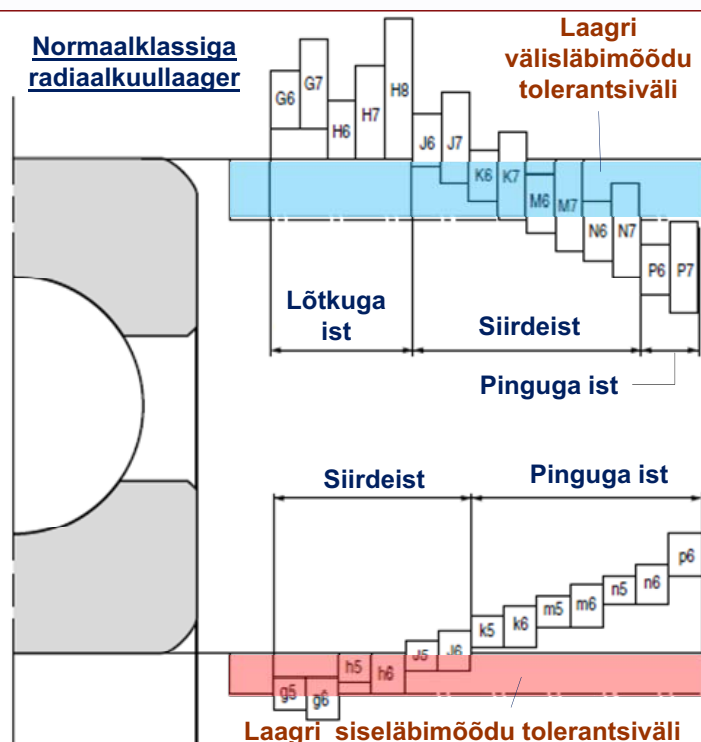
Allikas: www.skf.com

SKF normaalklassi (ehk 6X ehk P0) radiaalkuullaagrite sisevõru tolerantside tähistused

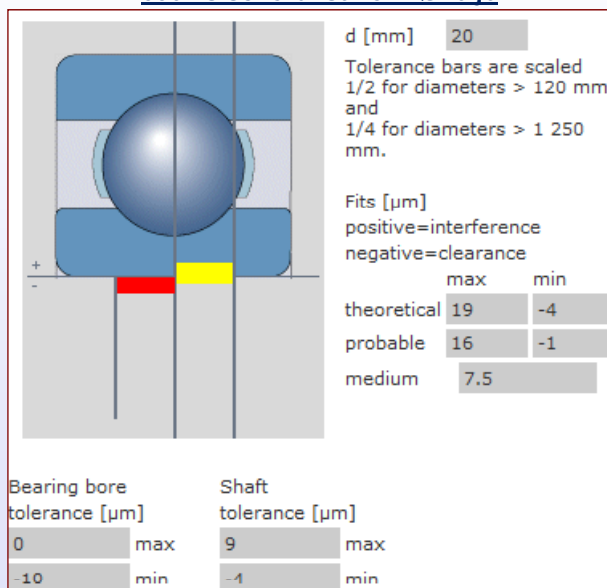
d	Nominal bore diameter
d_{mp}	1. Mean bore diameter, arithmetical mean of the largest and smallest single bore diameters in one plane 2. Mean diameter of the small end of a tapered bore, arithmetical
Δd_{mp}	Deviation of the mean bore diameter from the nominal $\Delta d_{mp} = d_{mp} - d$
V_{dp}	Bore diameter variation; difference between the largest and smallest single bore diameters in one plane
V_{dmp}	Mean bore diameter variation; difference between the largest and smallest mean bore diameter
B, C	Nominal width of inner ring and outer ring, respectively
B_s, C_s	Single width of inner ring and outer ring, respectively
B_{1s}, C_{1s}	Single width of inner ring and outer ring, respectively, of a bearing specially manufactured for paired mounting
$\Delta B_s, \Delta C_s$ etc.	Deviation of single inner ring width or single outer ring width from the nominal $\Delta B_s = B_s - B, \Delta C_s = C_s - C$ $\Delta B_{1s} = B_{1s} - B_1, \Delta C_{1s} = C_{1s} - C_1$
V_{Bs}, V_{Cs}	Ring width variation; difference between the largest and smallest single widths of inner ring and of outer ring, respectively
K_{is}, K_{os}	Radial runout of inner ring and outer ring, respectively, of assembled bearing

Veerelaagrite istud

Normaalklassiga radiaalkuullaager



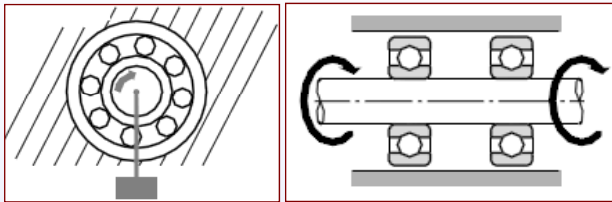
Üherealise normaalklassiga radiaalkuullaagri 6304 sisevõru ist völliil Ø20 j6



Allikas: www.skf.com – on-line arvutusvahend

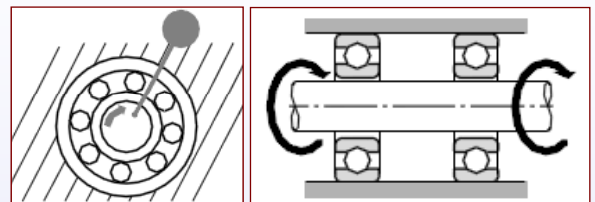
Radiaal-veerelaagrite istude valik (1)

Koormuse suund on püsiv
Sisevõru pöörleb, välisvõru seisab



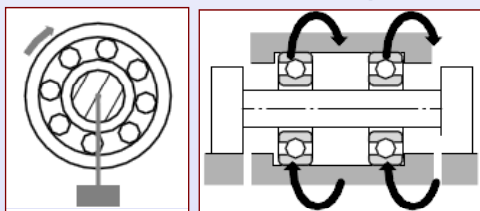
Sisevõru völli: pinguga ist;
Välisvõru kesse: lõtkuga ist

Koormuse suund on muutuv
Sisevõru pöörleb, välisvõru seisab



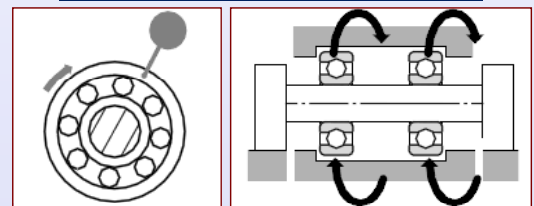
Sisevõru völli: siirdeist;
Välisvõru kesse: pinguga ist

Koormuse suund on püsiv
Sisevõru seisab, välisvõru pöörleb



Sisevõru völli: siirde- või lõtkuga ist;
Välisvõru kesse: pinguga ist

Koormuse suund on muutuv
Sisevõru seisab, välisvõru pöörleb



Sisevõru völli: siirde- või pinguga ist;
Välisvõru kesse: lõtkuga ist

Radiaal-veerelaagrite istude valik (2)

Conditions		Ball bearings		Cylindrical roller bearings Tapered roller bearings		Self-aligning roller bearings		Shaft tolerance class	Remarks	
		Shaft diameter (mm)								
		Over	Up to	Over	Up to	Over	Up to			
Cylindrical bore bearing (Class 0, 6X, 6)										
Inner ring rotating load or indeterminate direction load	Light or fluctuating load ^①	—	18	—	—	—	—	h5	js5, k5 and m5 may be used in place of js6, k6 and m6 if more precision is required.	
		18	100	—	40	—	—	js6		
		100	200	40	140	—	—	k6		
	Normal load ^①	—	18	—	—	—	—	—	h6	Internal clearance variation according to fit doesn't have to be considered for single row angular contact ball bearings and tapered roller bearings. You may therefore use k6 and m6 in place of k5 and m5.
		18	100	—	40	—	40	js5		
		100	140	40	100	40	65	k5		
		140	200	100	140	65	100	m5		
		200	280	140	200	100	140	m6		
		—	—	200	400	140	280	n6		
	Heavy or shock load ^①	—	—	50	140	50	100	n6	Use bearing with internal clearance larger than CN clearance bearing.	
—		—	140	200	100	140	p6			
—		—	200	—	140	200	r6			
Inner ring static load	Inner ring must be able to move easily on shaft.	All shaft diameters						g6	Use g5 if more precision is required. F6 is also OK to facilitate movement in the case of large bearings.	
	Inner ring does not have to be able to move easily on shaft.	All shaft diameters						h6	Use h5 if more precision is required.	
Centric axial load		All shaft diameters						js6	Shaft and bearing are not generally fixed by fit.	

Radiaal-veerelaagrite istude valik (3)

Conditions		Transfer in axial direction of outer ring	Tolerance class of housing bore	Remarks
Housing	Load type, etc.			
Integral or two-piece housing	All load types	Able to transfer.	H7	G7 may be used for large bearings or when there is a large temperature difference between outer ring and housing.
	Light or normal loads	Able to transfer.	H8	—
	Temperature of shaft and inner ring become high.	Easily able to transfer.	G7	F7 may be used for large bearings or when there is a large temperature difference between outer ring and housing.
Integral housing	Requires precision rotation with light or normal loads.	As a rule, not able to transfer.	K6	Primarily applies to roller bearings.
		Able to transfer.	JS6	Primarily applies to ball bearings.
		Requires silent running.	H6	—
	Indeterminate direction load	Light or normal loads	JS7	JS6 and K6 may be used in place of JS7 and K7 if more precision is required.
		Normal or heavy loads	K7	
		Large shock loads	M7	
	Outer ring rotating load	Light or fluctuating loads	M7	—
		Normal or heavy loads	N7	Primarily applies to ball bearings.
		Heavy or large shock loads with thin wall housing	P7	Primarily applies to roller bearings.

Priit Põd

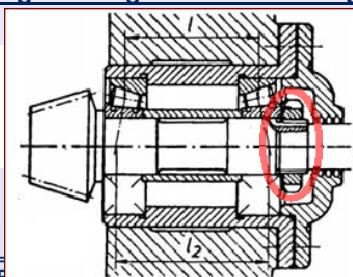
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Veerelaagerduse üldised nõuded (1)

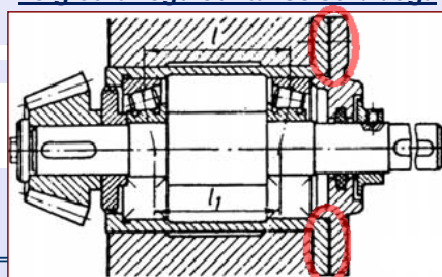
Veerelaagerduse kujundamisel tuleb välistada laagritele lisakoormuste teke:

1. Lisa-telgkoormuse vältimiseks fikseeritakse kere ja võlli suhtes vaid üks laager ja teine jäetakse teljesihiliselt (võllil või keres) fikseerimata – sellisel juhul on välditud näiteks:
 - komponentide soojuspaisumise mõju;
 - laagerduse komponentide valmistamise ebatäpsuste mõju;
2. Laagrite lisa-külgkoormuse vältimiseks tuleb tagada laagrite piisav samatelgsus:
 - laagrikerede avad tuleks töödelda ühe läbimiga;
 - muudel juhtudel tuleks kasutada seaduvaid laagerid;
3. Lisa-telgkoormuse vältimiseks tuleb radiaal-tugilaagerid kasutada nii, et laagerduse komponentide soojuspaisumisega kaasneb laagrite lõtku suurenemine;
4. Laagri istude valikul võllile ja keresse tuleb arvestada koormuse iseloomu.

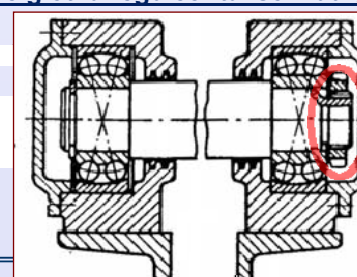
Telglõtku reguleeritakse mutriga



Telglõtku reguleeritakse seibidega



Telglõtku reguleeritakse mutriga



Priit Põd

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