8. Fits

8-1 Importance of Correct Fits

For bearings to serve their function well, both shaft fit of inner ring and housing fit of outer ring have to be appropriate for their specific use.

Therefore, fitting is as important as selecting an appropriate bearing, and improper fitting will shorten the bearing life.

Common symptoms caused by improper fitting are creeping, rupture of rings, and indentation on raceway at ball pitch intervals by rolling element, etc.

Creeping usually happens when bearing is mounted on the shaft with almost no interference, causing the inner/outer rings to move relatively in circumferential direction against the shaft or housing, which generates excessive heat or wornout, and leaves scratches on fitted surface.

If this happens, the peeled-off metal particles may enter the inside of the bearing. This may shorten the bearing life.

When interference is excessively large, rings could even crack in circumferential direction due to large hoop stress, and narrowing of bearing clearance generates excessive stress between rolling element and ring, which, in return, may leave the indentation marks on the rings at ball pitch intervals.

The following aspects should be taken into account when selecting the fit.

- The bearing rings should be well supported on their circumference, so that the load carrying capacity of the bearing is fully utilized.
- The inner/outer rings should not move on their mating parts, otherwise seats will be damaged.
- One of the floating bearing rings must be able to accomodate length variations of shaft and housing, which means it is axially adjustable. (Except the bearings of split type, of which inner/outer rings are freely, axially displaceable.)
- High loads, especially shock loads, require a larger interference and tighter tolerances.
- The radial clearance changes with tight fits and temperature gradient between inner and outer rings. Therefore, this should be taken into consideration when selecting the radial clearance group.
- Mounting and dismounting of bearings should be easy and convenient.

8-2 Selection of Fits

The basic factor in fit selection for bearings is whether the direction of applied load is rotating or stationary in relation to the bearing ring.

If an applied load is rotating in relation to its ring, then it is called a circumferential load, and if it is constantly directed at the same point, a point load.

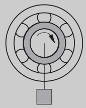
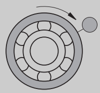
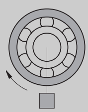
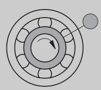
For some machines with not so simple operating conditions, it will be difficult to determine whether it is a circumferential or point load.

For example, for a machine with fast rotating element, a certain load is applied to the rolling element by its weight load. This, in return, causes generation of the rotating load, because its rolling element is dynamically unbalanced.

When an operating load of a machine is applied to this combined load, its directions vary even more widely, which is why the fits have to be carefully selected.

Fitting conditions for each kind of applied loads are shown in Table 8-1.

Table 8-1 Proper Fits for Various Loads

Bearing Motions	Examples	Illustration	Loading Conditions	Fits
Rotating inner Ring Stationary Outer Ring Constant Direction	Weight suspended by the shaft Driving wheel of automotive vehicles	 Weight	Circumferential load on inner ring	Inner ring:Tight fit mandatory
Fixed Inner Ring Rotating Outer Ring Directions of Load Rotating with Outer Ring	imbalance load applied to outer ring	 Imbalance load	Point load on outer ring	outer ring:Slide fit permissible
Bearing Motions	**Examples**	**Illustration**	**Loading a Conditions**	**Fits**
Stationary Inner Ring Rotating Outer Ring Constant Direction Load	Non-driven wheel of automotive vehicles Conveyor idler	 Weight	Point load on Inner Ring	Inner ring:slide fit Permissble
Rotating Inner Ring Stationary Outer Ring Direction of Load Rotating with Outer Ring	Centrifuge Vibrating screen	 Imbalance Load	Circumferential Load on outer ring	Outer ring: Tight fit mandatory

8-3 Calculation of Fitting Tolerances

When selecting the fitting tolerances, the minimum interference has to be determined first, considering varying fits depending on the kinds of applied loads to bearing and the temperature gradient of mounted parts, the interference variations caused by surface roughness when fitting, and the effect of centrifugal force generated by fast rotation, etc.

Furthermore, the hoop stress applied to the inner/outer rings of bearing has to be considered to prevent the bearing from being damaged.

8-3-1 Minimum Required Interference

(1) Influences by Load

When radial load is applied to bearing, clearance can be created in some parts of the unloaded zone because of the reduced interference.

The minimum amount of interference, which will be used for prevention of clearance generated by the loads, can be obtained by using the following Equations.

- In case of $F_r \leqq 0.2C_{0r}$

$$\Delta_{dF} = 0.08\sqrt{\frac{d \cdot F_r}{B}} \quad \text{(Equation 8-1)}$$

- In case of $F_r > 0.2C_{0r}$

$$\Delta_{dF} = 0.02\frac{F_r}{B} \quad \text{(Equation 8-2)}$$

Where,

Δ_{dF} : Reduction in inner ring interference by the load [μm]
d : Bearing bore diameter [mm]
B : Width of bearing inner ring [mm]
F_r : Radial load applied to bearing [N]
C_{0r} : Bearing's static load rating [N]

(2) Influences by Temperature

When bearing becomes hotter during operation, the amount of interference of fitting surface of bearing rings can be either increased or decreased. The variations of interference caused by temperature rises of fitting surface, bearing, or surrounding parts can be calculated by using the Equations below.

$$\Delta_{dT} = (\alpha_{Bi} - \alpha_S)\Delta_{TS} \cdot d \quad \text{(Equation 8-3)}$$

$$\Delta_{DT} = (\alpha_H - \alpha_{Bo})\Delta_{TH} \cdot D \quad \text{(Equation 8-4)}$$

Where,

Δ_{dT} : Interference variation by temperature difference between bearing's inner ring and shaft [μm]
Δ_{DT} : Interference variation by temperature difference between bearing's outer ring and housing. [μm]
Δ_{TS} : Temperature difference between seated surface area of inner ring and shaft, and the surrounding area of housing. [°C]
Δ_{TH} : Temperature difference between seated surface area of outer ring and housing, and the surrounding area of housing. [°C]
α_{Bi} : Linear expansion coefficient of inner ring material. [1/°C]
α_S : Linear expansion coefficient of shaft material [1/°C]
α_H : Linear expansion coefficient of housing material [1/°C]
α_{Bo} : Linear expansion coefficient of outer ring material [1/°C]
d : Bearing bore diameter [mm]
D : Bearing outer diameter [mm]

For practical use, when bearing becomes hotter due to its rotation, the minimum interference required for proper fits of inner ring and shaft can be obtained, by using the Equation below.

$$\Delta_{dT} = 0.0015 \cdot d \cdot \Delta_T \quad \text{(Equation 8-5)}$$

Where,

Δ_{dT} : Reduction in interference by temperature difference [μm]

Δ_T : Temperature difference between bearing inside and the surrounding housing [°C]

(3) Influences by Surface Roughness and Plastic Deformation

Plastic deformation occurs in the fitted area because of the mounting force and interference, and this is why the amount of residual interference measured after fitting is smaller than the theoretical value calculated by presuming various fitting conditions. And the magnitude of variation depends on the degree of roughness of both fitted surfaces. The reductions in interference in relation to surface roughness are shown in Table 8-2.

Table 8-2 Interference Reduction by Fabrication Precision

Fabrication Precision	Surface Roughness R_a [μm]	Reduction of interference [μm]
Super Precision Grinding	0.8	≈1.0
Precision Grinding	2.0	≈2.5
Super Precision Lathe-Turning	4.0	≈5.0
Precision Lathe-Turning	6.0	≈7.0

(4) Influences by Centrifugal Force

When bearing is rotating at a high speed, the interference of inner ring and shaft can vary due to the radial expansion of inner ring. However, it is recommended and practical to take the centrifugal force restrictively into consideration only when the bearing is operated above its permissible speed

8-3-2 Maximum Interference

The fitting interference causes the mounting seats of surrounding structures, such as bearing, its shaft, and housing, not only to expand or contract, but also to generate the surface stress.The surface stress and the max circumferential stress generated in the mounting seats by fitting interference can be calculated by using the Equations below, and for the heat-treated bearing steel, the material tensile strength generally lies in the range of 1570 ~1960MPa, so it is safe to set up the fitting conditions, so that the max. circumferential stress generated by fitting interference does not exceed 130MPa.

$$P_{mi} = \frac{\Delta d_{eff}/d}{\frac{1}{E_{Bi}}\left[\frac{k^2+1}{k^2-1}+m_{Bi}\right]+\frac{1}{E_S}\left[\frac{k_o^2+1}{k_o^2-1}-m_S\right]} \quad \text{(Equation 8-6)}$$

$$P_{mo} = \frac{\Delta D_{eff}/D}{\frac{1}{E_{Bo}}\left[\frac{h^2+1}{h^2-1}-m_{Bo}\right]+\frac{1}{E_H}\left[\frac{h_o^2+1}{h_o^2-1}+m_H\right]} \quad \text{(Equation 8-7)}$$

$$\sigma_{ti\,max} = P_{mi} \cdot \frac{k^2+1}{k^2-1} \quad \text{(Equation 8-8)}$$

$$\sigma_{to\,max} = P_{mo} \cdot \frac{2h^2}{h^2-1} \quad \text{(Equation 8-9)}$$

Where,

$\Delta d_{eff}, \Delta D_{eff}$: Effective interference of fitting surface of inner/outer ring. [mm]

d : Shaft diameter or bearing bore diameter [mm]

d_{Bi} : Mean outer diameter of bearing inner ring [mm]

D_S : Outer diameter of hollow shaft [mm]

D : Inner diameter of housing or bearing outer diameter [mm]

d_H : Outer diameter of housing [mm]

D_{Bo} : Mean inner diameter of bearing outer ring [mm]

E_{Bi}, E_{Bo} : Elastic modulus of bearing inner/outer rings [N/mm^2]

E_S, E_H : Elastic modulus of materials of shaft and housing [N/mm^2]

m_{Bi}, m_{Bo} : Poisson' s ratio of Bearing inner/outer rings

m_S, m_H : Poisson' s ratio of shaft and housing

k : $= d_{Bi} / d$

k_o : $= d / D_S$

h : $= D / D_{Bo}$

h_o : $= d_H / D$

P_{mi} : Surface stress of mounted seat generated by fitting interference between bearing inner ring and shaft. [N/mm^2]

P_{mo} : Surface stress of mounted seat generated by fitting interference between bearing outer ring and housing. [N/mm^2]

$\sigma_{ti\,max}$: Max. circumferential stress of the mounted seats generated by fitting interference between bearing inner ring and shaft. [N/mm^2]

$\sigma_{to\,max}$: Max. circumferential stress of the mounted seats generated by fitting interference between bearing outer ring and housing. [N/mm^2]

Table 8-3 Recommended Shaft Tolerances for Radial Bearings(Cylindrical Bore Diameter)

Type of Load	Bearing Type	Shaft Diameter	Axial Displacement Ability and Load Magnitude	Tolerances
Point Load on Inner Ring	Ball, Roller, and Needle Roller Bearings	All sizes	Floating bearings with sliding inner ring	g6 (g5)
			Angular contact ball bearings and tapered roller bearings with adjustable preload of inner ring	h6 (j6)
Circumferential Load on Inner Ring or Indeterminate Load	Ball Bearings	Up to 40mm	Normal load	j6 (j5)
		Up to 100mm	Low load	j6 (j5)
			Normal and high load	k6 (k5)
		Up to 200mm	Low load	k6 (k5)
			Normal and high load	m6 (m5)
		Over 200mm	Normal load	m6 (m5)
			High load Shocks	n6 (n5)
	Roller and Needle Roller Bearings	Up to 60mm	Low load	j6 (j5)
			Normal and high load	k6 (k5)
		Up to 200mm	Low load	k6 (k5)
			Normal load	m6 (m5)
			High load	n6 (n5)
		Up to 500mm	Normal load	m6 (n6)
			High load Shocks	p6
		Over 500mm	Normal load	n6 (p6)
			High load	p6

8-4 Recommended Fits

The most generally recommended fitting tolerances of radial bearings are shown in Table 8-3 and 8-4, and in Table 8-5 for deep groove ball bearing with CM clearance, and in Table 8-6 and 8-7 for inch series tapered roller bearings.

Also, in Table 8-8 and 8-9, the interferences for each tolerance class of "KS Class 0" radial bearings and their shaft and housing are shown.

Table 8-4 Recommended Housing Tolerances for Radial Bearings

Type of Load	Axial Displacement Ability and Load Magnitude	Operating Conditions	Tolerances
Point Load on Outer Ring	Floating Side Bearing Easily Adjustable Outer Ring	Closeness of tolerances based on required running accuracy.	H7(H6)
	Outer ring generally displaceable, angular contact ball bearings and tapered roller bearings with adjustment via outer ring.	Requires high running accuracy	H6(J6)
		Requires normal running accuracy	H7(J7)
		Heat dissipation through shaft	G7
Circumferential Load on Outer Ring or Indeterminate Load	Low load	K6, M6, N6, and P6, when high running accuracy is required.	K7(K6)
	Normal load shocks		M6(M6)
	high load shocks		N7(N6)
	High load, severe impact, thin housing		N7(P6)

Table 8-5 Recommended Fitting Tolerances for Deep Groove Ball Bearings of Clearance Class CM

Bearing Bore Diameter Over	Up to	Shaft Tolerances	Housing Tolerances
10[1])	**18**	js5(j5)	H6…H7 or Js6…Js7 (J6…J7)
18	**30**	k5	
30	**50**		
50	**80**		
80	**100**		
100	**120**	m5	

[1]) Including 10mm

Table 8-6 Recommended Shaft Tolerances of Inch Series Tapered Roller Bearings

AFBMA CLASS 4 AND CLASS 2

Operating Conditions		Bearing Bore Diameter d mm Over	Up to	Shaft Tolerances µm min	max	Remarks
Circumferential Load on Inner Ring	Load without Impact	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	+38 +64 +127 +190	+25 +38 +76 +114	For bearings with d≤152.4, the bearings with larger clearance than normal are generally used.
	High Load, Impact Load, High Speed Rotation	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	+64 A A +381	+38 +305	The average interference of "A" should be approximately 0.0005d.
Circumferential Load on Outer Ring	High Load, Impact Load, High Speed Rotation	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	+64 A A +381	+38 +305	The average interference of "A" should be approximately 0.0005d.
	Normal Load without Impact(When placed apart from ground surface)	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	+13 +25 +51 +76	0 0 0 0	
	Normal Load without Impact(When it touches the ground surface)	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	0 0 0 0	–13 –25 –51 –76	Axially displaceable inner ring

AFBMA CLASS 3 AND CLASS 0 1)

Operating Conditions		Bearing Bore Diameter d mm Over	Up to	Shaft Tolerances µm min	max	Remarks
Circumferential Load on Inner Ring	Main Shaft of Precision Tools	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	+13 +13 +25 +38	0 0 0 0	
	High Load, Impact Load, High Speed Rotation	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	B B B B		The minimum interference of "B" should be approximately 0.00025d.
Circumferential Load on Outer Ring	Main Shaft of Precision Tools	- 76.2 304.8 609.6	76.2 304.8 609.6 914.4	+13 +13 +25 +38	0 0 0 0	

1) There are no Class 0 bearings for the ones with bore diameter(d) larger than 304.8mm.

Table 8-7 Recommended Housing Tolerances of Inch Series Tapered Roller Bearings

AFBMA CLASS 4 AND CLASS 2

Operating Conditions		Bearing Bore Diameter D mm Over	Up to	Housing Tolerances µm min	max	Remarks
Circumferential Load on Inner Ring	When used in Floating or Locating Sides	-	76.2	+76	+51	Axially displaceable outer ring
		76.2	127	+76	+51	
		127	304.8	+76	+51	
		304.8	609.6	+152	+102	
		609.6	914.4	+229	+152	
	Outer ring can be displaced axially.	-	76.2	+25	0	Axially displaceable outer ring
		76.2	127	+25	0	
		127	304.8	+51	0	
		304.8	609.6	+76	+25	
		609.6	914.4	+127	+51	
	Outer ring can not be displaced axially.	-	76.2	−13	−38	Axially non-displaceable outer ring
		76.2	127	−25	−51	
		127	304.8	−25	−51	
		304.8	609.6	−25	−76	
		609.6	914.4	−25	−102	
Circumferential Load on Outer Ring	Outer ring can not be displaced axially.	-	76.2	−13	−38	Axially non-displaceable outer ring
		76.2	127	−25	−51	
		127	304.8	−25	−51	
		304.8	609.6	−25	−76	
		609.6	914.4	−25	−102	

AFBMA CLASS 3 AND CLASS 0 [1)]

Operating Conditions		Bearing Bore Diameter D mm Over	Up to	Housing Tolerances µm min	max	Remarks
Circumferential Load on Inner Ring	Used in Floating Side	-	152.4	+38	+25	Axially displaceable outer ring
		152.4	304.8	+38	+25	
		304.8	609.6	+64	+38	
		609.6	914.4	+89	+51	
	Used in Locating Side	-	152.4	+25	+13	Axially displaceable outer ring
		152.4	304.8	+25	+13	
		304.8	609.6	+51	+25	
		609.6	914.4	+76	+38	
	Outer ring can be displaced axially.	-	152.4	+13	0	Axially displaceable outer ring
		152.4	304.8	+25	0	
		304.8	609.6	+25	0	
		609.6	914.4	+38	0	
	Outer ring can not be displaced axially.	-	152.4	0	−13	Axially non-displaceable outer ring
		152.4	304.8	0	−25	
		304.8	609.6	0	−25	
		609.6	914.4	0	−38	
Circumferential Load on Outer Ring	Outer ring can not be displaced axially.	-	76.2	−13	−25	Axially non-displaceable outer ring
		76.2	152.4	−13	−25	
		152.4	304.8	−13	−38	
		304.8	609.6	−13	−38	
		609.6	914.4	−13	−51	

[1)] There are no Class 0 bearings for the ones with outer diameter(D) larger than 304.8mm.

Table 8-8 Comparisons of Fitting Interferences of "KS Class 0" Radial Bearings and Shafts

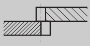
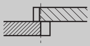
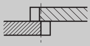
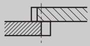
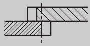
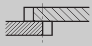
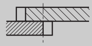
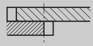
Bearing Bore Diameter d mm Over	Up to	Mean Bore Diameter Deviation Δ_{dmp} 1) mm Upper	Lower	g5 Bearing Shaft	g6 Bearing Shaft	h5 Bearing Shaft	h6 Bearing Shaft	j5 Bearing Shaft	js5 Bearing Shaft	j6 Bearing Shaft
3	**6**	0	−8	4T…9L	4T…12L	8T…5L	8T…8L	11T…2L	10.5T…2.5L	14T…2L
6	**10**	0	−8	3T…11L	3T…14L	8T…6L	8T…9L	12T…2L	11T…3L	15T…2L
10	**18**	0	−8	2T…14L	2T…17L	8T…8L	8T…11L	13T…3L	12T…4L	16T…3L
18	**30**	0	−10	3T…16L	3T…20L	10T…9L	10T…13L	15T…4L	14.5T…4.5L	19T…4L
30	**50**	0	−12	3T…20L	3T…25L	12T…11L	12T…16L	18T…5L	17.5T…5.5L	23T…5L
50	**80**	0	−15	5T…23L	5T…29L	15T…13L	15T…19L	21T…7L	21.5T…6.5L	27T…7L
80	**120**	0	−20	8T…27L	8T…34L	20T…15L	20T…22L	26T…9L	27.5T…7.5L	33T…9L
120 **140** **160**	**140** **160** **180**	0	−25	11T..32L	11T…39L	25T…18L	25T…25L	32T…11L	34T…9L	39T…11L
180 **200** **225**	**200** **225** **250**	0	−30	15T…35L	15T…44L	30T…20L	30T…29L	37T…13L	40T…10L	46T…13L
250 **280**	**280** **315**	0	−35	18T…40L	18T…49L	35T…23L	35T…32L	42T…16L	46.5T…11.5L	51T…16L
315 **355**	**355** **400**	0	−40	22T…43L	22T…54L	40T…25L	40T…36L	47T…18L	52.5T…12.5L	58T…18L
400 **450**	**450** **500**	0	−45	25T…47L	25T…60L	45T…27L	45T…40L	52T…20L	58.5T…13.5L	65T…20L

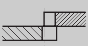
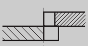
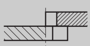
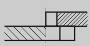
1) The tolerances, for the tapered roller bearings with 30mm of bearing bore diameter(d) or lower, are different from the values shown in this Table.

Table 8-9 Comparisons of Fitting Interferences of "KS Class O" Radial Bearings and Housings

Bearing Outer Diameter D mm Over	Up to	Mean outer Diameter Deviation Δ_{Dmp} 1) mm Upper	Lower	G7 Housing Bearing	H6 Housing Bearing	H7 Housing Bearing	J6 Housing Bearing	J7 Housing Bearing	Js7 Housing Bearing	K6 Housing Bearing
6	**10**	0	−8	5L…28L	0…17L	0…23L	4T…13L	7T…16L	7.5T…15.5L	7T…10L
10	**18**	0	−8	6L…32L	0…19L	0…26L	5T…14L	8T…18L	9T…17L	9T…10L
18	**30**	0	−9	7L…37L	0…22L	0…30L	5T…17L	9T…21L	10.5T…19.5L	11T…11L
30	**50**	0	−11	9L…45L	0…27L	0…36L	6T…21L	11T…25L	12.5T…23.5L	13T…14L
50	**80**	0	−13	10L…53L	0…32L	0…43L	6T…26L	12T…31L	15T…28L	15T…17L
80	**120**	0	−15	12L…62L	0…37L	0…50L	6T…31L	13T…37L	17.5T…32.5L	18T…19L
120	**150**	0	−18	14L…72L	0…43L	0…58L	7T…36L	14T…44L	20T…38L	21T…22L
150	**180**	0	−25	14L…79L	0…50L	0…65L	7T…43L	14T…51L	20T…45L	21T…29L
180	**250**	0	−30	15L…91L	0…59L	0…76L	7T…52L	16T…60L	23T…53L	24T…35L
250	**315**	0	−35	17L…104L	0…67L	0…87L	7T…60L	16T…71L	26T…61L	27T…40L
315	**400**	0	−40	18L…115L	0…76L	0…97L	7T…69L	18T…79L	28.5T…68.5L	29T…47L
400	**500**	0	−45	20L…128L	0…85L	0…108L	7T…78L	20T…88L	31.5T…76.5L	32T…53L

1) The tolerances, for the tapered roller bearings with 150mm of bearing outer diameter(D) or lower, are different from the values shown in this Table.

js6 Bearing Shaft 	k5 Bearing Shaft 	k6 Bearing Shaft 	m5 Bearing Shaft 	m6 Bearing Shaft 	n6 Bearing Shaft 	p6 Bearing Shaft 	r6 Bearing Shaft 
12T…4L	14T…1T	17T…1T	17T…4T	20T…4T	24T…8T	28T…12T	– –
12.5T…4.5L	15T…1T	18T…1T	20T…6T	23T…6T	27T…10T	32T…15T	– –
13.5T…5.5L	17T…1T	20T…1T	23T…7T	26T…7T	31T…12T	37T…18T	– –
16.5T…6.5L	21T…2T	25T…2T	27T…8T	31T…8T	38T…15T	45T…22T	– –
20T…8L	25T…2T	30T…2T	32T…9T	37T…9T	45T…17T	54T…26T	– –
24.5T…9.5L	30T…2T	36T…2T	39T…11T	45T…11T	54T…20T	66T…32T	– –
31T…11L	38T…3T	45T…3T	48T…13T	55T…13T	65T…23T	79T…37T	– –
37.5T…12.5L	46T…3T	53T…3T	58T…15T	65T…15T	77T…27T	93T…43T	113T…63T 115T…65T 118T…68T
44.5T…14.5L	54T…4T	63T…4T	67T…17T	76T…17T	90T…31T	109T…50T	136T…77T 139T…80T 143T…84T
51T…16L	62T…4T	71T…4T	78T…20T	87T…20T	101T…34T	123T…56T	161T…94T 165T…98T
58T…18L	69T…4T	80T…4T	86T…21T	97T…21T	113T…37T	138T…62T	184T…108T 190T…114T
65T…20L	77T…5T	90T…4T	95T…23T	108T…23T	125T…40T	153T…68T	211T…126T 217T…132T

K7 Housing Bearing 	M7 Housing Bearing 	N7 Housing Bearing 	P7 Housing Bearing 
10T…13L	15T…8L	19T…4L	24T…1T
12T…14L	18T…8L	23T…3L	29T…3T
15T…15L	21T…9L	28T…2L	35T…5T
18T…18L	25T…11L	33T…3L	42T…6T
21T…22L	30T…13L	39T…4L	51T..8T
25T…25L	35T…15L	45T…5L	59T…9T
28T…30L	40T…18L	52T…6L	68T…10T
28T…37L	40T…25L	52T…13L	68T…3T
33T…43L	46T…30L	60T…16L	79T…3T
36T…51L	52T…35L	66T…21L	88T…1T
40T…57L	57T…40L	73T…24L	98T…1T
45T…63L	63T…45L	80T…28L	108T…0

Note: Fitting code “L” means the clearance and “t” means the interference.