

ANSI Standard Fits.—Tables 3 through 9 inclusive show a series of standard types and classes of fits on a unilateral hole basis, such that the fit produced by mating parts in any one class will produce approximately similar performance throughout the range of sizes. These tables prescribe the fit for any given size, or type of fit; they also prescribe the standard limits for the mating parts that will produce the fit. The fits listed in these tables contain all those that appear in the approved American-British-Canadian proposal.

Selection of Fits: In selecting limits of size for any application, the type of fit is determined first, based on the use or service required from the equipment being designed; then the limits of size of the mating parts are established, to insure that the desired fit will be produced.

Theoretically, an infinite number of fits could be chosen, but the number of standard fits shown in the accompanying tables should cover most applications.

Designation of Standard Fits: Standard fits are designated by means of the following symbols which, facilitate reference to classes of fit for educational purposes. The symbols are not intended to be shown on manufacturing drawings; instead, sizes should be specified on drawings.

The letter symbols used are as follows:

RC = Running or Sliding Clearance Fit

LC = Locational Clearance Fit

LT = Transition Clearance or Interference Fit

LN = Locational Interference Fit

FN = Force or Shrink Fit

These letter symbols are used in conjunction with numbers representing the class of fit; thus FN 4 represents a Class 4, force fit.

Each of these symbols (two letters and a number) represents a complete fit for which the minimum and maximum clearance or interference and the limits of size for the mating parts are given directly in the tables.

Description of Fits.—The classes of fits are arranged in three general groups: running and sliding fits, locational fits, and force fits.

Running and Sliding Fits (RC): Running and sliding fits, for which limits of clearance are given in Table 2, are intended to provide a similar running performance, with suitable lubrication allowance, throughout the range of sizes. The clearances for the first two classes, used chiefly as slide fits, increase more slowly with the diameter than for the other classes, so that accurate location is maintained even at the expense of free relative motion.

These fits may be described as follows:

RC 1 *Close sliding fits* are intended for the accurate location of parts that must assemble without perceptible play.

RC 2 *Sliding fits* are intended for accurate location, but with greater maximum clearance than class RC 1. Parts made to this fit move and turn easily but are not intended to run freely, and in the larger sizes may seize with small temperature changes.

RC 3 *Precision running fits* are about the closest fits that can be expected to run freely, and are intended for precision work at slow speeds and light journal pressures, but are not suitable where appreciable temperature differences are likely to be encountered.

RC 4 *Close running fits* are intended chiefly for running fits on accurate machinery with moderate surface speeds and journal pressures, where accurate location and minimum play are desired.

RC 5 and RC 6 *Medium running fits* are intended for higher running speeds, or heavy journal pressures, or both.

RC 7 *Free running fits* are intended for use where accuracy is not essential, or where large temperature variations are likely to be encountered, or under both these conditions.

RC 8 and RC 9 *Loose running fits* are intended for use where wide commercial tolerances may be necessary, together with an allowance, on the external member.

Locational Fits (LC, LT, and LN): Locational fits are fits intended to determine only the location of the mating parts; they may provide rigid or accurate location, as with interference fits, or provide some freedom of location, as with clearance fits. Accordingly, they are divided into three groups: clearance fits (LC), transition fits (LT), and interference fits (LN).

These are described as follows:

LC *Locational clearance fits* are intended for parts which are normally stationary, but that can be freely assembled or disassembled. They range from snug fits for parts requiring accuracy of location, through the medium clearance fits for parts such as spigots, to the looser fastener fits where freedom of assembly is of prime importance.

LT *Locational transition fits* are a compromise between clearance and interference fits, for applications where accuracy of location is important, but either a small amount of clearance or interference is permissible.

LN *Locational interference fits* are used where accuracy of location is of prime importance, and for parts requiring rigidity and alignment with no special requirements for bore pressure. Such fits are not intended for parts designed to transmit frictional loads from one part to another by virtue of the tightness of fit. These conditions are covered by force fits.

Force Fits: (FN): Force or shrink fits constitute a special type of interference fit, normally characterized by maintenance of constant bore pressures throughout the range of sizes. The interference therefore varies almost directly with diameter, and the difference between its minimum and maximum value is small, to maintain the resulting pressures within reasonable limits.

These fits are described as follows:

FN 1 *Light drive fits* are those requiring light assembly pressures, and produce more or less permanent assemblies. They are suitable for thin sections or long fits, or in cast-iron external members.

FN 2 *Medium drive fits* are suitable for ordinary steel parts, or for shrink fits on light sections. They are about the tightest fits that can be used with high-grade cast-iron external members.

FN 3 *Heavy drive fits* are suitable for heavier steel parts or for shrink fits in medium sections.

FN 4 and FN 5 *Force fits* are suitable for parts that can be highly stressed, or for shrink fits where the heavy pressing forces required are impractical.

Graphical Representation of Limits and Fits.—A visual comparison of the hole and shaft tolerances and the clearances or interferences provided by the various types and classes of fits can be obtained from the diagrams on page 633. These diagrams have been drawn to scale for a nominal diameter of 1 inch.

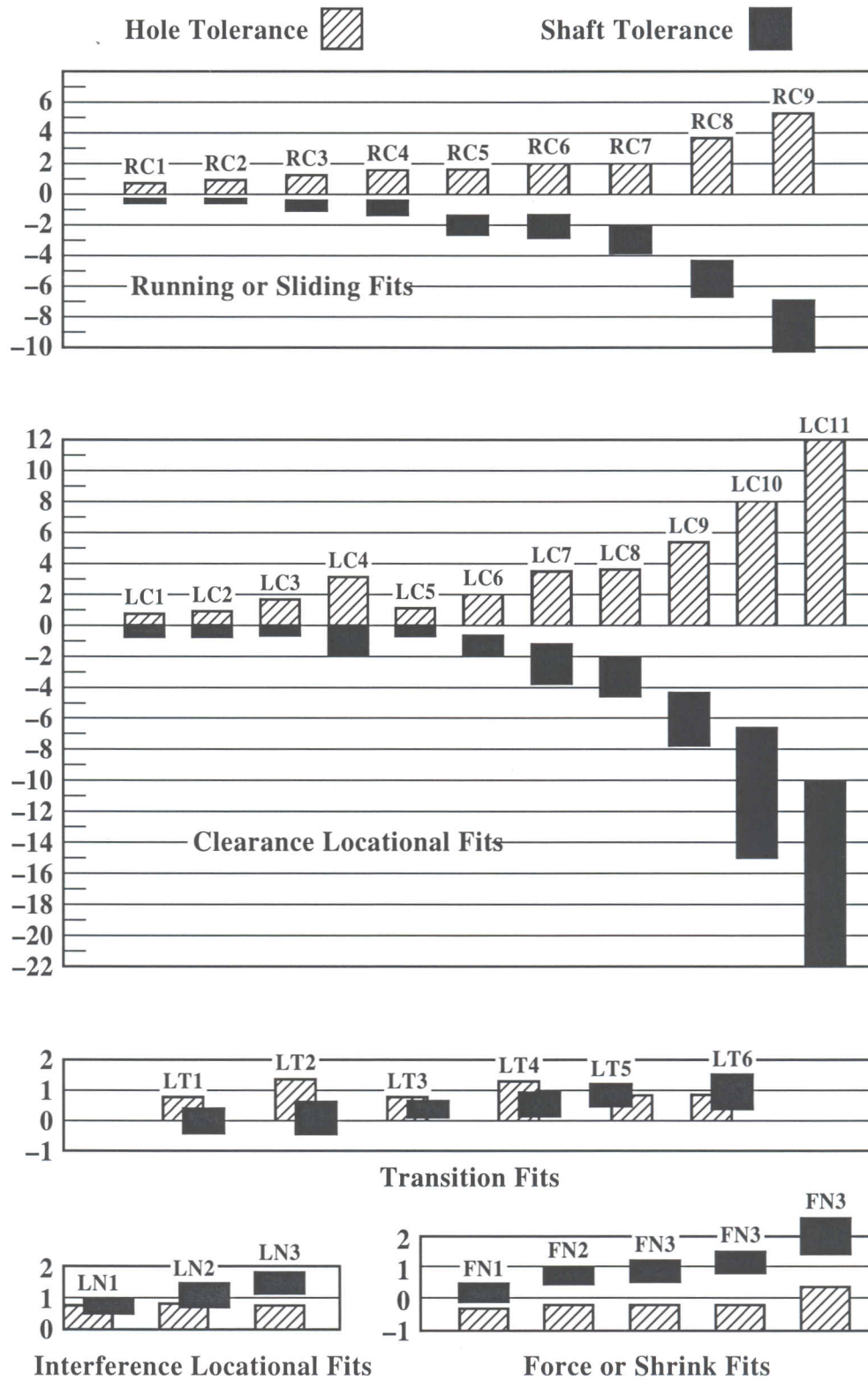
Use of Standard Fit Tables.—*Example 1:* A Class RC 1 fit is to be used in assembling a mating hole and shaft of 2-inch nominal diameter. This class of fit was selected because the application required accurate location of the parts with no perceptible play (see *Description of Fits*, RC 1 close sliding fits). From the data in Table 2, establish the limits of size and clearance of the hole and shaft.

Maximum hole = $2 + 0.005 = 2.00005$; minimum hole = 2 inches

Maximum shaft = $2 - 0.0004 = 1.9996$; minimum shaft = $2 - 0.0007 = 1.9993$ inches

Minimum clearance = 0.0004; maximum clearance = 0.0012 inch

Graphical Representation of ANSI Standard Limits and Fits



Diagrams show disposition of hole and shaft tolerances (in thousandths of an inch) with respect to basic size (0) for a diameter of 1 inch.

Table 3. American National Standard Running and Sliding Fits ANSI B4.1-1967 (R1987)

Nominal Size Range, Inches	Class RC 1			Class RC 2			Class RC 3			Class RC 4		
	Clear- ance ^a	Standard Tolerance Limits		Clearance ^a	Standard Tolerance Limits		Clearance ^a	Standard Tolerance Limits		Clearance ^a	Standard Tolerance Limits	
		Hole H5	Shaft g4		Hole H6	Shaft g5		Hole H7	Shaft f6		Hole H8	Shaft f7
Over To	Values shown below are in thousandths of an inch											
0 – 0.12	0.1	+0.2	−0.1	0.1	+0.25	−0.1	0.3	+0.4	−0.3	0.3	+0.6	−0.3
	0.45	0	−0.25	0.55	0	−0.3	0.95	0	−0.55	1.3	0	−0.7
0.12 – 0.24	0.15	+0.2	−0.15	0.15	+0.3	−0.15	0.4	+0.5	−0.4	0.4	+0.7	−0.4
	0.5	0	−0.3	0.65	0	−0.35	1.12	0	−0.7	1.6	0	−0.9
0.24 – 0.40	0.2	+0.25	−0.2	0.2	+0.4	−0.2	0.5	+0.6	−0.5	0.5	+0.9	−0.5
	0.6	0	−0.35	0.85	0	−0.45	1.5	0	−0.9	2.0	0	−1.1
0.40 – 0.71	0.25	+0.3	−0.25	0.25	+0.4	−0.25	0.6	+0.7	−0.6	0.6	+1.0	−0.6
	0.75	0	−0.45	0.95	0	−0.55	1.7	0	−1.0	2.3	0	−1.3
0.71 – 1.19	0.3	+0.4	−0.3	0.3	+0.5	−0.3	0.8	+0.8	−0.8	0.8	+1.2	−0.8
	0.95	0	−0.55	1.2	0	−0.7	2.1	0	−1.3	2.8	0	−1.6
1.19 – 1.97	0.4	+0.4	−0.4	0.4	+0.6	−0.4	1.0	+1.0	−1.0	1.0	+1.6	−1.0
	1.1	0	−0.7	1.4	0	−0.8	2.6	0	−1.6	3.6	0	−2.0
1.97 – 3.15	0.4	+0.5	−0.4	0.4	+0.7	−0.4	1.2	+1.2	−1.2	1.2	+1.8	−1.2
	1.2	0	−0.7	1.6	0	−0.9	3.1	0	−1.9	4.2	0	−2.4
3.15 – 4.73	0.5	+0.6	−0.5	0.5	+0.9	−0.5	1.4	+1.4	−1.4	1.4	+2.2	−1.4
	1.5	0	−0.9	2.0	0	−1.1	3.7	0	−2.3	5.0	0	−2.8
4.73 – 7.09	0.6	+0.7	−0.6	0.6	+1.0	−0.6	1.6	+1.6	−1.6	1.6	+2.5	−1.6
	1.8	0	−1.1	2.3	0	−1.3	4.2	0	−2.6	5.7	0	−3.2
7.09 – 9.85	0.6	+0.8	−0.6	0.6	+1.2	−0.6	2.0	+1.8	−2.0	2.0	+2.8	−2.0
	2.0	0	−1.2	2.6	0	−1.4	5.0	0	−3.2	6.6	0	−3.8
9.85 – 12.41	0.8	+0.9	−0.8	0.8	+1.2	−0.8	2.5	+2.0	−2.5	2.5	+3.0	−2.5
	2.3	0	−1.4	2.9	0	−1.7	5.7	0	−3.7	7.5	0	−4.5
12.41 – 15.75	1.0	+1.0	−1.0	1.0	+1.4	−1.0	3.0	+2.2	−3.0	3.0	+3.5	−3.0
	2.7	0	−1.7	3.4	0	−2.0	6.6	0	−4.4	8.7	0	−5.2
15.75 – 19.69	1.2	+1.0	−1.2	1.2	+1.6	−1.2	4.0	+2.5	−4.0	4.0	+4.0	−4.0
	3.0	0	−2.0	3.8	0	−2.2	8.1	0	−5.6	10.5	0	−6.5

^a Pairs of values shown represent minimum and maximum amounts of clearance resulting from application of standard tolerance limits.

Table 4. American National Standard Running and Sliding Fits ANSI B4.1-1967 (R1987)

Nominal Size Range, Inches Over To	Class RC 5			Class RC 6			Class RC 7			Class RC 8			Class RC 9		
	Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits	
		Hole H8	Shaft e7		Hole H9	Shaft e8		Hole H9	Shaft d8		Hole H10	Shaft c9		Hole H11	Shaft
Values shown below are in thousandths of an inch															
0 – 0.12	0.6	+0.6	– 0.6	0.6	+1.0	– 0.6	1.0	+1.0	– 1.0	2.5	+1.6	– 2.5	4.0	+2.5	– 4.0
	1.6	0	– 1.0	2.2	0	– 1.2	2.6	0	– 1.6	5.1	0	– 3.5	8.1	0	– 5.6
0.12 – 0.24	0.8	+0.7	– 0.8	0.8	+1.2	– 0.8	1.2	+1.2	– 1.2	2.8	+1.8	– 2.8	4.5	+3.0	– 4.5
	2.0	0	– 1.3	2.7	0	– 1.5	3.1	0	– 1.9	5.8	0	– 4.0	9.0	0	– 6.0
0.24 – 0.40	1.0	+0.9	– 1.0	1.0	+1.4	– 1.0	1.6	+1.4	– 1.6	3.0	+2.2	– 3.0	5.0	+3.5	– 5.0
	2.5	0	– 1.6	3.3	0	– 1.9	3.9	0	– 2.5	6.6	0	– 4.4	10.7	0	– 7.2
0.40 – 0.71	1.2	+1.0	– 1.2	1.2	+1.6	– 1.2	2.0	+1.6	– 2.0	3.5	+2.8	– 3.5	6.0	+4.0	– 6.0
	2.9	0	– 1.9	3.8	0	– 2.2	4.6	0	– 3.0	7.9	0	– 5.1	12.8	0	– 8.8
0.71 – 1.19	1.6	+1.2	– 1.6	1.6	+2.0	– 1.6	2.5	+2.0	– 2.5	4.5	+3.5	– 4.5	7.0	+5.0	– 7.0
	3.6	0	– 2.4	4.8	0	– 2.8	5.7	0	– 3.7	10.0	0	– 6.5	15.5	0	–10.5
1.19 – 1.97	2.0	+1.6	– 2.0	2.0	+2.5	– 2.0	3.0	+2.5	– 3.0	5.0	+4.0	– 5.0	8.0	+6.0	– 8.0
	4.6	0	– 3.0	6.1	0	– 3.6	7.1	0	– 4.6	11.5	0	– 7.5	18.0	0	–12.0
1.97 – 3.15	2.5	+1.8	– 2.5	2.5	+3.0	– 2.5	4.0	+3.0	– 4.0	6.0	+4.5	– 6.0	9.0	+7.0	– 9.0
	5.5	0	– 3.7	7.3	0	– 4.3	8.8	0	– 5.8	13.5	0	– 9.0	20.5	0	–13.5
3.15 – 4.73	3.0	+2.2	– 3.0	3.0	+3.5	– 3.0	5.0	+3.5	– 5.0	7.0	+5.0	– 7.0	10.0	+9.0	–10.0
	6.6	0	– 4.4	8.7	0	– 5.2	10.7	0	– 7.2	15.5	0	–10.5	24.0	0	–15.0
4.73 – 7.09	3.5	+2.5	– 3.5	3.5	+4.0	– 3.5	6.0	+4.0	– 6.0	8.0	+6.0	– 8.0	12.0	+10.0	–12.0
	7.6	0	– 5.1	10.0	0	– 6.0	12.5	0	– 8.5	18.0	0	–12.0	28.0	0	–18.0
7.09 – 9.85	4.0	+2.8	– 4.0	4.0	+4.5	– 4.0	7.0	+4.5	– 7.0	10.0	+7.0	–10.0	15.0	+12.0	–15.0
	8.6	0	– 5.8	11.3	0	– 6.8	14.3	0	– 9.8	21.5	0	–14.5	34.0	0	–22.0
9.85 – 12.41	5.0	+3.0	– 5.0	5.0	+5.0	– 5.0	8.0	+5.0	– 8.0	12.0	+8.0	–12.0	18.0	+12.0	–18.0
	10.0	0	– 7.0	13.0	0	– 8.0	16.0	0	–11.0	25.0	0	–17.0	38.0	0	–26.0
12.41 – 15.75	6.0	+3.5	– 6.0	6.0	+6.0	– 6.0	10.0	+6.0	–10.0	14.0	+9.0	–14.0	22.0	+14.0	–22.0
	11.7	0	– 8.2	15.5	0	– 9.5	19.5	0	–13.5	29.0	0	–20.0	45.0	0	–31.0
15.75 – 19.69	8.0	+4.0	– 8.0	8.0	+6.0	– 8.0	12.0	+6.0	–12.0	16.0	+10.0	–16.0	25.0	+16.0	–25.0
	14.5	0	–10.5	18.0	0	–12.0	22.0	0	–16.0	32.0	0	–22.0	51.0	0	–35.0

Tolerance limits given in body of table are added to or subtracted from basic size (as indicated by + or – sign) to obtain maximum and minimum sizes of mating parts.

All data above heavy lines are in accord with ABC agreements. Symbols H5, g4, etc. are hole and shaft designations in ABC system. Limits for sizes above 19.69 inches are also given in the ANSI Standard.

Table 5. American National Standard Clearance Locational Fits ANSI B4.1-1967 (R1987)

Nominal Size Range, Inches	Class LC 1			Class LC 2			Class LC 3			Class LC 4			Class LC 5		
	Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits		Clear- ance ^a	Standard Tolerance Limits	
		Hole H6	Shaft h5		Hole H7	Shaft h6		Hole H8	Shaft h7		Hole H10	Shaft h9		Hole H7	Shaft g6
Over	To														
	Values shown below are in thousandths of an inch														
0– 0.12	0 0.45	+0.25 0	0 –0.2	0 0.65	+0.4 0	0 –0.25	0 1	+0.6 0	0 –0.4	0 2.6	+1.6 0	0 –1.0	0.1 0.75	+0.4 0	–0.1 –0.35
0.12– 0.24	0 0.5	+0.3 0	0 –0.2	0 0.8	+0.5 0	0 –0.3	0 1.2	+0.7 0	0 –0.5	0 3.0	+1.8 0	0 –1.2	0.15 0.95	+0.5 0	–0.15 –0.45
0.24– 0.40	0 0.65	+0.4 0	0 –0.25	0 1.0	+0.6 0	0 –0.4	0 1.5	+0.9 0	0 –0.6	0 3.6	+2.2 0	0 –1.4	0.2 1.2	+0.6 0	–0.2 –0.6
0.40– 0.71	0 0.7	+0.4 0	0 –0.3	0 1.1	+0.7 0	0 –0.4	0 1.7	+1.0 0	0 –0.7	0 4.4	+2.8 0	0 –1.6	0.25 1.35	+0.7 0	–0.25 –0.65
0.71– 1.19	0 0.9	+0.5 0	0 –0.4	0 1.3	+0.8 0	0 –0.5	0 2	+1.2 0	0 –0.8	0 5.5	+3.5 0	0 –2.0	0.3 1.6	+0.8 0	–0.3 –0.8
1.19– 1.97	0 1.0	+0.6 0	0 –0.4	0 1.6	+1.0 0	0 –0.6	0 2.6	+1.6 0	0 –1	0 6.5	+4.0 0	0 –2.5	0.4 2.0	+1.0 0	–0.4 –1.0
1.97– 3.15	0 1.2	+0.7 0	0 –0.5	0 1.9	+1.2 0	0 –0.7	0 3	+1.8 0	0 –1.2	0 7.5	+4.5 0	0 –3	0.4 2.3	+1.2 0	–0.4 –1.1
3.15– 4.73	0 1.5	+0.9 0	0 –0.6	0 2.3	+1.4 0	0 –0.9	0 3.6	+2.2 0	0 –1.4	0 8.5	+5.0 0	0 –3.5	0.5 2.8	+1.4 0	–0.5 –1.4
4.73– 7.09	0 1.7	+1.0 0	0 –0.7	0 2.6	+1.6 0	0 –1.0	0 4.1	+2.5 0	0 –1.6	0 10.0	+6.0 0	0 –4	0.6 3.2	+1.6 0	–0.6 –1.6
7.09– 9.85	0 2.0	+1.2 0	0 –0.8	0 3.0	+1.8 0	0 –1.2	0 4.6	+2.8 0	0 –1.8	0 11.5	+7.0 0	0 –4.5	0.6 3.6	+1.8 0	–0.6 –1.8
9.85– 12.41	0 2.1	+1.2 0	0 –0.9	0 3.2	+2.0 0	0 –1.2	0 5	+3.0 0	0 –2.0	0 13.0	+8.0 0	0 –5	0.7 3.9	+2.0 0	–0.7 –1.9
12.41– 15.75	0 2.4	+1.4 0	0 –1.0	0 3.6	+2.2 0	0 –1.4	0 5.7	+3.5 0	0 –2.2	0 15.0	+9.0 0	0 –6	0.7 4.3	+2.2 0	–0.7 –2.1
15.75– 19.69	0 2.6	+1.6 0	0 –1.0	0 4.1	+2.5 0	0 –1.6	0 6.5	+4 0	0 –2.5	0 16.0	+10.0 0	0 –6	0.8 4.9	+2.5 0	–0.8 –2.4

^aPairs of values shown represent minimum and maximum amounts of interference resulting from application of standard tolerance limits.

Table 6. American National Standard Clearance Locational Fits *ANSI B4.1-1967 (R1987)*

Nominal Size Range, Inches	Class LC 6			Class LC 7			Class LC 8			Class LC 9			Class LC 10			Class LC 11			
	Clear- ance ^a	Std. Tolerance Limits		Clear- ance ^a	Std. Tolerance Limits		Clear- ance ^a	Std. Tolerance Limits		Clear- ance ^a	Std. Tolerance Limits		Clear- ance ^a	Std. Tolerance Limits		Clear- ance ^a	Std. Tolerance Limits		
		Hole H9	Shaft f8		Hole H10	Shaft e9		Hole H10	Shaft d9		Hole H11	Shaft c10		Hole H12	Shaft		Hole H13	Shaft	
Over	To	Values shown below are in thousandths of an inch																	
0 – 0.12	0.3	+1.0	−0.3	0.6	+1.6	− 0.6	1.0	+1.6	− 1.0	2.5	+2.5	− 2.5	4	+4	− 4	5	+6	− 5	
	1.9	0	−0.9	3.2	0	− 1.6	2.0	0	− 2.0	6.6	0	− 4.1	12	0	− 8	17	0	− 11	
0.12 – 0.24	0.4	+1.2	−0.4	0.8	+1.8	− 0.8	1.2	+1.8	− 1.2	2.8	+3.0	− 2.8	4.5	+5	− 4.5	6	+7	− 6	
	2.3	0	−1.1	3.8	0	− 2.0	4.2	0	− 2.4	7.6	0	− 4.6	14.5	0	− 9.5	20	0	− 13	
0.24 – 0.40	0.5	+1.4	−0.5	1.0	+2.2	− 1.0	1.6	+2.2	− 1.6	3.0	+3.5	− 3.0	5	+6	− 5	7	+9	− 7	
	2.8	0	−1.4	4.6	0	− 2.4	5.2	0	− 3.0	8.7	0	− 5.2	17	0	− 11	25	0	− 16	
0.40 – 0.71	0.6	+1.6	−0.6	1.2	+2.8	− 1.2	2.0	+2.8	− 2.0	3.5	+4.0	− 3.5	6	+7	− 6	8	+10	− 8	
	3.2	0	−1.6	5.6	0	− 2.8	6.4	0	− 3.6	10.3	0	− 6.3	20	0	− 13	28	0	− 18	
0.71 – 1.19	0.8	+2.0	−0.8	1.6	+3.5	− 1.6	2.5	+3.5	− 2.5	4.5	+5.0	− 4.5	7	+8	− 7	10	+12	− 10	
	4.0	0	−2.0	7.1	0	− 3.6	8.0	0	− 4.5	13.0	0	− 8.0	23	0	− 15	34	0	− 22	
1.19 – 1.97	1.0	+2.5	−1.0	2.0	+4.0	− 2.0	3.6	+4.0	− 3.0	5.0	+6	− 5.0	8	+10	− 8	12	+16	− 12	
	5.1	0	−2.6	8.5	0	− 4.5	9.5	0	− 5.5	15.0	0	− 9.0	28	0	− 18	44	0	− 28	
1.97 – 3.15	1.2	+3.0	−1.0	2.5	+4.5	− 2.5	4.0	+4.5	− 4.0	6.0	+7	− 6.0	10	+12	− 10	14	+18	− 14	
	6.0	0	−3.0	10.0	0	− 5.5	11.5	0	− 7.0	17.5	0	− 10.5	34	0	− 22	50	0	− 32	
3.15 – 4.73	1.4	+3.5	−1.4	3.0	+5.0	− 3.0	5.0	+5.0	− 5.0	7	+9	− 7	11	+14	− 11	16	+22	− 16	
	7.1	0	−3.6	11.5	0	− 6.5	13.5	0	− 8.5	21	0	− 12	39	0	− 25	60	0	− 38	
4.73 – 7.09	1.6	+4.0	−1.6	3.5	+6.0	− 3.5	6	+6	− 6	8	+10	− 8	12	+16	− 12	18	+25	− 18	
	8.1	0	−4.1	13.5	0	− 7.5	16	0	− 10	24	0	− 14	44	0	− 28	68	0	− 43	
7.09 – 9.85	2.0	+4.5	−2.0	4.0	+7.0	− 4.0	7	+7	− 7	10	+12	− 10	16	+18	− 16	22	+28	− 22	
	9.3	0	−4.8	15.5	0	− 8.5	18.5	0	− 11.5	29	0	− 17	52	0	− 34	78	0	− 50	
9.85 – 12.41	2.2	+5.0	−2.2	4.5	+8.0	− 4.5	7	+8	− 7	12	+12	− 12	20	+20	− 20	28	+30	− 28	
	10.2	0	−5.2	17.5	0	− 9.5	20	0	− 12	32	0	− 20	60	0	− 40	88	0	− 58	
12.41 – 15.75	2.5	+6.0	−2.5	5.0	+9.0	− 5	8	+9	− 8	14	+14	− 14	22	+22	− 22	30	+35	− 30	
	12.0	0	−6.0	20.0	0	− 11	23	0	− 14	37	0	− 23	66	0	− 44	100	0	− 65	
15.75 – 19.69	2.8	+6.0	−2.8	5.0	+10.0	− 5	9	+10	− 9	16	+16	− 16	25	+25	− 25	35	+40	− 35	
	12.8	0	−6.8	21.0	0	− 11	25	0	− 15	42	0	− 26	75	0	− 50	115	0	− 75	

Tolerance limits given in body of table are added or subtracted to basic size (as indicated by + or – sign) to obtain maximum and minimum sizes of mating parts.

All data above heavy lines are in accordance with American-British-Canadian (ABC) agreements. Symbols H6, H7, s6, etc. are hole and shaft designations in ABC system. Limits for sizes above 19.69 inches are not covered by ABC agreements but are given in the ANSI Standard.

Table 7. ANSI Standard Transition Locational Fits ANSI B4.1-1967 (R1987)

Nominal Size Range, Inches	Class LT 1			Class LT 2			Class LT 3			Class LT 4			Class LT 5			Class LT 6		
	Fit ^a	Std. Tolerance Limits		Fit ^a	Std. Tolerance Limits		Fit ^a	Std. Tolerance Limits		Fit ^a	Std. Tolerance Limits		Fit ^a	Std. Tolerance Limits		Fit ^a	Std. Tolerance Limits	
		Hole H7	Shaft js6		Hole H8	Shaft js7		Hole H7	Shaft k6		Hole H8	Shaft k7		Hole H7	Shaft n6		Hole H7	Shaft n7
Over To	Values shown below are in thousandths of an inch																	
0 – 0.12	-0.12 +0.52	+0.4 0	+0.12 -0.12	-0.2 +0.8	+0.6 0	+0.2 -0.2							-0.5 +0.15	+0.4 0	+0.5 +0.25	-0.65 +0.15	+0.4 0	+0.65 +0.25
0.12 – 0.24	-0.15 +0.65	+0.5 0	+0.15 -0.15	-0.25 +0.95	+0.7 0	+0.25 -0.25							-0.6 +0.2	+0.5 0	+0.6 +0.3	-0.8 +0.2	+0.5 0	+0.8 +0.3
0.24 – 0.40	-0.2 +0.8	+0.6 0	+0.2 -0.2	-0.3 +1.2	+0.9 0	+0.3 -0.3	-0.5 +0.5	+0.6 0	+0.5 +0.1	-0.7 +0.8	+0.9 0	+0.7 +0.1	-0.8 +0.2	+0.6 0	+0.8 +0.4	-1.0 +0.2	+0.6 0	+1.0 +0.4
0.40 – 0.71	-0.2 +0.9	+0.7 0	+0.2 -0.2	-0.35 +1.35	+1.0 0	+0.35 -0.35	-0.5 +0.6	+0.7 0	+0.5 +0.1	-0.8 +0.9	+1.0 0	+0.8 +0.1	-0.9 +0.2	+0.7 0	+0.9 +0.5	-1.2 +0.2	+0.7 0	+1.2 +0.5
0.71 – 1.19	-0.25 +1.05	+0.8 0	+0.25 -0.25	-0.4 +1.6	+1.2 0	+0.4 -0.4	-0.6 +0.7	+0.8 0	+0.6 +0.1	-0.9 +1.1	+1.2 0	+0.9 +0.1	-1.1 +0.2	+0.8 0	+1.1 +0.6	-1.4 +0.2	+0.8 0	+1.4 +0.6
1.19 – 1.97	-0.3 +1.3	+1.0 0	+0.3 -0.3	-0.5 +2.1	+1.6 0	+0.5 -0.5	-0.7 +0.9	+1.0 0	+0.7 +0.1	-1.1 +1.5	+1.6 0	+1.1 +0.1	-1.3 +0.3	+1.0 0	+1.3 +0.7	-1.7 +0.3	+1.0 0	+1.7 +0.7
1.97 – 3.15	-0.3 +1.5	+1.2 0	+0.3 -0.3	-0.6 +2.4	+1.8 0	+0.6 -0.6	-0.8 +1.1	+1.2 0	+0.8 +0.1	-1.3 +1.7	+1.8 0	+1.3 +0.1	-1.5 +0.4	+1.2 0	+1.5 +0.8	-2.0 +0.4	+1.2 0	+2.0 +0.8
3.15 – 4.73	-0.4 +1.8	+1.4 0	+0.4 -0.4	-0.7 +2.9	+2.2 0	+0.7 -0.7	-1.0 +1.3	+1.4 0	+1.0 +0.1	-1.5 +2.1	+2.2 0	+1.5 +0.1	-1.9 +0.4	+1.4 0	+1.9 +1.0	-2.4 +0.4	+1.4 0	+2.4 +1.0
4.73 – 7.09	-0.5 +2.1	+1.6 0	+0.5 -0.5	-0.8 +3.3	+2.5 0	+0.8 -0.8	-1.1 +1.5	+1.6 0	+1.1 +0.1	-1.7 +2.4	+2.5 0	+1.7 +0.1	-2.2 +0.4	+1.6 0	+2.2 +1.2	-2.8 +0.4	+1.6 0	+2.8 +1.2
7.09 – 9.85	-0.6 +2.4	+1.8 0	+0.6 -0.6	-0.9 +3.7	+2.8 0	+0.9 -0.9	-1.4 +1.6	+1.8 0	+1.4 +0.2	-2.0 +2.6	+2.8 0	+2.0 +0.2	-2.6 +0.4	+1.8 0	+2.6 +1.4	-3.2 +0.4	+1.8 0	+3.2 +1.4
9.85 – 12.41	-0.6 +2.6	+2.0 0	+0.6 -0.6	-1.0 +4.0	+3.0 0	+1.0 -1.0	-1.4 +1.8	+2.0 0	+1.4 +0.2	-2.2 +2.8	+3.0 0	+2.2 +0.2	-2.6 +0.6	+2.0 0	+2.6 +1.4	-3.4 +0.6	+2.0 0	+3.4 +1.4
12.41 – 15.75	-0.7 +2.9	+2.2 0	+0.7 -0.7	-1.0 +4.5	+3.5 0	+1.0 -1.0	-1.6 +2.0	+2.2 0	+1.6 +0.2	-2.4 +3.3	+3.5 0	+2.4 +0.2	-3.0 +0.6	+2.2 0	+3.0 +1.6	-3.8 +0.6	+2.2 0	+3.8 +1.6
15.75 – 19.69	-0.8 +3.3	+2.5 0	+0.8 -0.8	-1.2 +5.2	+4.0 0	+1.2 -1.2	-1.8 +2.3	+2.5 0	+1.8 +0.2	-2.7 +3.8	+4.0 0	+2.7 +0.2	-3.4 +0.7	+2.5 0	+3.4 +1.8	-4.3 +0.7	+2.5 0	+4.3 +1.8

^a Pairs of values shown represent maximum amount of interference (–) and maximum amount of clearance (+) resulting from application of standard tolerance limits. All data above heavy lines are in accord with ABC agreements. Symbols H7, js6, etc., are hole and shaft designations in the ABC system.

Table 8. ANSI Standard Interference Location Fits ANSI B4.1-1967 (R1987)

Nominal Size Range, Inches Over To		Class LN 1			Class LN 2			Class LN 3		
		Limits of Inter- ference	Standard Limits		Lim- its of Inter- ference	Standard Limits		Limits of Inter- ference	Standard Limits	
			Hole H6	Shaft n5		Hole H7	Shaft p6		Hole H7	Shaft r6
Values shown below are given in thousandths of an inch										
0– 0.12		0	+0.25	+0.45	0	+0.4	+0.65	0.1	+0.4	+0.75
		0.45	0	+0.25	0.65	0	+0.4	0.75	0	+0.5
0.12– 0.24		0	+0.3	+0.5	0	+0.5	+0.8	0.1	+0.5	+0.9
		0.5	0	+0.3	0.8	0	+0.5	0.9	0	+0.6
0.24– 0.40		0	+0.4	+0.65	0	+0.6	+1.0	0.2	+0.6	+1.2
		0.65	0	+0.4	1.0	0	+0.6	1.2	0	+0.8
0.40– 0.71		0	+0.4	+0.8	0	+0.7	+1.1	0.3	+0.7	+1.4
		0.8	0	+0.4	1.1	0	+0.7	1.4	0	+1.0
0.71– 1.19		0	+0.5	+1.0	0	+0.8	+1.3	0.4	+0.8	+1.7
		1.0	0	+0.5	1.3	0	+0.8	1.7	0	+1.2
1.19– 1.97		0	+0.6	+1.1	0	+1.0	+1.6	0.4	+1.0	+2.0
		1.1	0	+0.6	1.6	0	+1.0	2.0	0	+1.4
1.97– 3.15		0.1	+0.7	+1.3	0.2	+1.2	+2.1	0.4	+1.2	+2.3
		1.3	0	+0.8	2.1	0	+1.4	2.3	0	+1.6
3.15– 4.73		0.1	+0.9	+1.6	0.2	+1.4	+2.5	0.6	+1.4	+2.9
		1.6	0	+1.0	2.5	0	+1.6	2.9	0	+2.0
4.73– 7.09		0.2	+1.0	+1.9	0.2	+1.6	+2.8	0.9	+1.6	+3.5
		1.9	0	+1.2	2.8	0	+1.8	3.5	0	+2.5
7.09– 9.85		0.2	+1.2	+2.2	0.2	+1.8	+3.2	1.2	+1.8	+4.2
		2.2	0	+1.4	3.2	0	+2.0	4.2	0	+3.0
9.85– 12.41		0.2	+1.2	+2.3	0.2	+2.0	+3.4	1.5	+2.0	+4.7
		2.3	0	+1.4	3.4	0	+2.2	4.7	0	+3.5
12.41– 15.75		0.2	+1.4	+2.6	0.3	+2.2	+3.9	2.3	+2.2	+5.9
		2.6	0	+1.6	3.9	0	+2.5	5.9	0	+4.5
15.75– 19.69		0.2	+1.6	+2.8	0.3	+2.5	+4.4	2.5	+2.5	+6.6
		2.8	0	+1.8	4.4	0	+2.8	6.6	0	+5.0

All data in this table are in accordance with American-British-Canadian (ABC) agreements.

Limits for sizes above 19.69 inches are not covered by ABC agreements but are given in the ANSI Standard.

Symbols H7, p6, etc., are hole and shaft designations in the ABC system.

Tolerance limits given in body of table are added or subtracted to basic size (as indicated by + or – sign) to obtain maximum and minimum sizes of mating parts.

Table 9. ANSI Standard Force and Shrink Fits ANSI B4.1-1967 (R1987)

Nominal Size Range, Inches	Class FN 1			Class FN 2			Class FN 3			Class FN 4			Class FN 5			
	Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits		
		Hole H6	Shaft		Hole H7	Shaft s6		Hole H7	Shaft t6		Hole H7	Shaft u6		Hole H8	Shaft x7	
Over	To	Values shown below are in thousandths of an inch														
0– 0.12	0.05 0.5	+0.25 0	+0.5 +0.3	0.2 0.85	+0.4 0	+0.85 +0.6				0.3 0.95	+0.4 0	+0.95 +0.7	0.3 1.3	+0.6 0	+1.3 +0.9	
0.12– 0.24	0.1 0.6	+0.3 0	+0.6 +0.4	0.2 1.0	+0.5 0	+1.0 +0.7				0.4 1.2	+0.5 0	+1.2 +0.9	0.5 1.7	+0.7 0	+1.7 +1.2	
0.24– 0.40	0.1 0.75	+0.4 0	+0.75 +0.5	0.4 1.4	+0.6 0	+1.4 +1.0				0.6 1.6	+0.6 0	+1.6 +1.2	0.5 2.0	+0.9 0	+2.0 +1.4	
0.40– 0.56	0.1 0.8	+0.4 0	+0.8 +0.5	0.5 1.6	+0.7 0	+1.6 +1.2				0.7 1.8	+0.7 0	+1.8 +1.4	0.6 2.3	+1.0 0	+2.3 +1.6	
0.56– 0.71	0.2 0.9	+0.4 0	+0.9 +0.6	0.5 1.6	+0.7 0	+1.6 +1.2				0.7 1.8	+0.7 0	+1.8 +1.4	0.8 2.5	+1.0 0	+2.5 +1.8	
0.71– 0.95	0.2 1.1	+0.5 0	+1.1 +0.7	0.6 1.9	+0.8 0	+1.9 +1.4				0.8 2.1	+0.8 0	+2.1 +1.6	1.0 3.0	+1.2 0	+3.0 +2.2	
0.95– 1.19	0.3 1.2	+0.5 0	+1.2 +0.8	0.6 1.9	+0.8 0	+1.9 +1.4	0.8 2.1	+0.8 0	+2.1 +1.6	+1.0 2.3	+0.8 0	+2.3 +1.8	1.3 3.3	+1.2 0	+3.3 +2.5	
1.19– 1.58	0.3 1.3	+0.6 0	+1.3 +0.9	0.8 2.4	+1.0 0	+2.4 +1.8	1.0 2.6	+1.0 0	+2.6 +2.0	1.5 3.1	+1.0 0	+3.1 +2.5	1.4 4.0	+1.6 0	+4.0 +3.0	
1.58– 1.97	0.4 1.4	+0.6 0	+1.4 +1.0	0.8 2.4	+1.0 0	+2.4 +1.8	1.2 2.8	+1.0 0	+2.8 +2.2	1.8 3.4	+1.0 0	+3.4 +2.8	2.4 5.0	+1.6 0	+5.0 +4.0	
1.97– 2.56	0.6 1.8	+0.7 0	+1.8 +1.3	0.8 2.7	+1.2 0	+2.7 +2.0	1.3 3.2	+1.2 0	+3.2 +2.5	2.3 4.2	+1.2 0	+4.2 +3.5	3.2 6.2	+1.8 0	+6.2 +5.0	
2.56– 3.15	0.7 1.9	+0.7 0	+1.9 +1.4	1.0 2.9	+1.2 0	+2.9 +2.2	1.8 3.7	+1.2 0	+3.7 +3.0	2.8 4.7	+1.2 0	+4.7 +4.0	4.2 7.2	+1.8 0	+7.2 +6.0	
3.15– 3.94	0.9 2.4	+0.9 0	+2.4 +1.8	1.4 3.7	+1.4 0	+3.7 +2.8	2.1 4.4	+1.4 0	+4.4 +3.5	3.6 5.9	+1.4 0	+5.9 +5.0	4.8 8.4	+2.2 0	+8.4 +7.0	
3.94– 4.73	1.1 2.6	+0.9 0	+2.6 +2.0	1.6 3.9	+1.4 0	+3.9 +3.0	2.6 4.9	+1.4 0	+4.9 +4.0	4.6 6.9	+1.4 0	+6.9 +6.0	5.8 9.4	+2.2 0	+9.4 +8.0	

Table 9. (Continued) ANSI Standard Force and Shrink Fits ANSI B4.1-1967 (R1987)

Nominal Size Range, Inches		Class FN 1			Class FN 2			Class FN 3			Class FN 4			Class FN 5		
		Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits		Inter- ference ^a	Standard Tolerance Limits	
			Hole H6	Shaft		Hole H7	Shaft s6		Hole H7	Shaft t6		Hole H7	Shaft u6		Hole H8	Shaft x7
Over	To	Values shown below are in thousandths of an inch														
4.73–	5.52	1.2	+1.0	+2.9	1.9	+1.6	+4.5	3.4	+1.6	+6.0	5.4	+1.6	+8.0	7.5	+2.5	+11.6
		2.9	0	+2.2	4.5	0	+3.5	6.0	0	+5.0	8.0	0	+7.0	11.6	0	+10.0
5.52–	6.30	1.5	+1.0	+3.2	2.4	+1.6	+5.0	3.4	+1.6	+6.0	5.4	+1.6	+8.0	9.5	+2.5	+13.6
		3.2	0	+2.5	5.0	0	+4.0	6.0	0	+5.0	8.0	0	+7.0	13.6	0	+12.0
6.30–	7.09	1.8	+1.0	+3.5	2.9	+1.6	+5.5	4.4	+1.6	+7.0	6.4	+1.6	+9.0	9.5	+2.5	+13.6
		3.5	0	+2.8	5.5	0	+4.5	7.0	0	+6.0	9.0	0	+8.0	13.6	0	+12.0
7.09–	7.88	1.8	+1.2	+3.8	3.2	+1.8	+6.2	5.2	+1.8	+8.2	7.2	+1.8	+10.2	11.2	+2.8	+15.8
		3.8	0	+3.0	6.2	0	+5.0	8.2	0	+7.0	10.2	0	+9.0	15.8	0	+14.0
7.88–	8.86	2.3	+1.2	+4.3	3.2	+1.8	+6.2	5.2	+1.8	+8.2	8.2	+1.8	+11.2	13.2	+2.8	+17.8
		4.3	0	+3.5	6.2	0	+5.0	8.2	0	+7.0	11.2	0	+10.0	17.8	0	+16.0
8.86–	9.85	2.3	+1.2	+4.3	4.2	+1.8	+7.2	6.2	+1.8	+9.2	10.2	+1.8	+13.2	13.2	+2.8	+17.8
		4.3	0	+3.5	7.2	0	+6.0	9.2	0	+8.0	13.2	0	+12.0	17.8	0	+16.0
9.85–	11.03	2.8	+1.2	+4.9	4.0	+2.0	+7.2	7.0	+2.0	+10.2	10.0	+2.0	+13.2	15.0	+3.0	+20.0
		4.9	0	+4.0	7.2	0	+6.0	10.2	0	+9.0	13.2	0	+12.0	20.0	0	+18.0
11.03–	12.41	2.8	+1.2	+4.9	5.0	+2.0	+8.2	7.0	+2.0	+10.2	12.0	+2.0	+15.2	17.0	+3.0	+22.0
		4.9	0	+4.0	8.2	0	+7.0	10.2	0	+9.0	15.2	0	+14.0	22.0	0	+20.0
12.41–	13.98	3.1	+1.4	+5.5	5.8	+2.2	+9.4	7.8	+2.2	+11.4	13.8	+2.2	+17.4	18.5	+3.5	+24.2
		5.5	0	+4.5	9.4	0	+8.0	11.4	0	+10.0	17.4	0	+16.0	24.2	0	+22.0
13.98–	15.75	3.6	+1.4	+6.1	5.8	+2.2	+9.4	9.8	+2.2	+13.4	15.8	+2.2	+19.4	21.5	+3.5	+27.2
		6.1	0	+5.0	9.4	0	+8.0	13.4	0	+12.0	19.4	0	+18.0	27.2	0	+25.0
15.75–	17.72	4.4	+1.6	+7.0	6.5	+2.5	+10.6	+9.5	+2.5	+13.6	17.5	+2.5	+21.6	24.0	+4.0	+30.5
		7.0	0	+6.0	10.6	0	+9.0	13.6	0	+12.0	21.6	0	+20.0	30.5	0	+28.0
17.72–	19.69	4.4	+1.6	+7.0	7.5	+2.5	+11.6	11.5	+2.5	+15.6	19.5	+2.5	+23.6	26.0	+4.0	+32.5
		7.0	0	+6.0	11.6	0	+10.0	15.6	0	+14.0	23.6	0	+22.0	32.5	0	+30.0

^aPairs of values shown represent minimum and maximum amounts of interference resulting from application of standard tolerance limits.

All data above heavy lines are in accordance with American-British-Canadian (ABC) agreements. Symbols H6, H7, s6, etc., are hole and shaft designations in the ABC system. Limits for sizes above 19.69 inches are not covered by ABC agreements but are given in the ANSI standard.