

Chapter 6

The ISO System of Limits and Fits - Tolerances and Deviations

SUMMARY*

The ISO System of Limits and Fits is a coordinated system of hole and shaft tolerances for engineering and manufacturing used for cutting tools, material stock, gages, etc. If held to these tolerances, cutting tools, material stock, and gages are generally available throughout the world.

The hole basis fits have four preferred hole tolerances (H11, H9, H8, and H7); the shaft basis fits have four preferred shaft tolerances (h11, h9, h7, and h6) as shown in Table 6-1. The above shaft tolerances are now covered in the new ANSI B32.100-2005 standard.

Select the basic size from Table 4-1 and one of the ten fits from Table 6-1 and read or cut and paste limit dimensions and clearances (interferences) from Tables 6-2 through 6-6 or CD. Now also available on-line at the site shown below.

Tolerance Zones for holes are shown in Fig. 6-1 and for shafts in Fig. 6-2.

NOTE *Complete ISO System of Limits and Fits is now stored a CD [KOK ISOTOL™](http://www.kokisotol.com) Computer Tolerancing Software. The CD is now available from ANSI, [GO metric USA™.org, Inc.](http://www.GOmetricUSA.org) or on the sites: www.GOmetricUSA.org or www.kok.com/order.htm.

TABLE 6-1 DESCRIPTION OF PREFERRED FITS (ANSI B4.2)

	ISO SYMBOL		DESCRIPTION	
	Hole Basis	Shaft Basis		
Clearance Fits	H11/c11	C11/h11	<u>Loose running fit</u> for wide commercial tolerances or allowances on external members.	More Clearance
	H9/d9	D9/h9	<u>Free running fit</u> not for use where accuracy is essential, but good for large temperature variations, high running speeds, or heavy journal pressures.	
	H8/f7	F8/h7	<u>Close running fit</u> for running on accurate machines and for accurate location at moderate speeds and journal pressures.	
	H7/g6	G7/h6	<u>Sliding fit</u> not intended to run freely, but to move and turn freely and locate accurately.	
Transition Fits	H7/h6	H7/h6	<u>Locational clearance fit</u> provides snug fit for locating stationary parts; but can be freely assembled and disassembled.	More Interference
	H7/k6	K7/h6	<u>Locational transition fit</u> for accurate location, a compromise between clearance and interference.	
Interference Fits	H7/n6	N7/h6	<u>Locational transition fit</u> for more accurate location where greater interference is permissible.	
	H7/p6 ¹	P7/h6	<u>Locational interference fit</u> for parts requiring rigidity and alignment with prime accuracy of location but without special bore pressure requirements.	
	H7/s6	S7/h6	<u>Medium drive fit</u> for ordinary steel parts or shrink fits on light sections, the tightest fit usable with cast iron.	
	H7/u6	U7/h6	<u>Force fit</u> suitable for parts which can be highly stressed or for shrink fits where the heavy pressing forces required are impractical.	

¹Transition fit for basic sizes in range from 0 through 3 mm.

TABLE 6-2 PREFERRED HOLE BASIS CLEARANCE FITS (ANSI B4.2)

mm

BASIC SIZE	LOOSE RUNNING			FREE RUNNING			CLOSE RUNNING			SLIDING			LOCATIONAL CLEARANCE			
	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	
	H11	c11		H9	d9		H8	f7		H7	g6		H7	h6		
S7	MAX	7.090	6.920	0.260	7.036	6.960	0.112	7.022	6.987	0.050	7.015	6.995	0.029	7.015	7.000	0.024
	MIN	7.000	6.830	0.080	7.000	6.924	0.040	7.000	6.972	0.013	7.000	6.986	0.005	7.000	6.991	0.000
F8	MAX	8.090	7.920	0.260	8.036	7.960	0.112	8.022	7.987	0.050	8.015	7.995	0.029	8.015	8.000	0.024
	MIN	8.000	7.830	0.080	8.000	7.924	0.040	8.000	7.972	0.013	8.000	7.986	0.005	8.000	7.991	0.000
S9	MAX	9.090	8.920	0.260	9.036	8.960	0.112	9.022	8.987	0.050	9.015	8.995	0.029	9.015	9.000	0.024
	MIN	9.000	8.830	0.080	9.000	8.924	0.040	9.000	8.972	0.013	9.000	8.986	0.005	9.000	8.991	0.000
F10	MAX	10.090	9.920	0.260	10.036	9.960	0.112	10.022	9.987	0.050	10.015	9.995	0.029	10.015	10.000	0.024
	MIN	10.000	9.830	0.080	10.000	9.924	0.040	10.000	9.972	0.013	10.000	9.986	0.005	10.000	9.991	0.000
S11	MAX	11.110	10.905	0.315	11.043	10.950	0.136	11.027	10.984	0.061	11.018	10.994	0.035	11.018	11.000	0.029
	MIN	11.000	10.795	0.095	11.000	10.907	0.050	11.000	10.966	0.016	11.000	10.983	0.006	11.000	10.989	0.000
F12	MAX	12.110	11.905	0.315	12.043	11.950	0.136	12.027	11.984	0.061	12.018	11.994	0.035	12.018	12.000	0.029
	MIN	12.000	11.795	0.095	12.000	11.907	0.050	12.000	11.966	0.016	12.000	11.983	0.006	12.000	11.989	0.000
T13	MAX	13.110	12.905	0.315	13.043	12.950	0.136	13.027	12.984	0.061	13.018	12.994	0.035	13.018	13.000	0.029
	MIN	13.000	12.795	0.095	13.000	12.907	0.050	13.000	12.966	0.016	13.000	12.983	0.006	13.000	12.989	0.000
S14	MAX	14.110	13.905	0.315	14.043	13.950	0.136	14.027	13.984	0.061	14.018	13.994	0.035	14.018	14.000	0.029
	MIN	14.000	13.795	0.095	14.000	13.907	0.050	14.000	13.966	0.016	14.000	13.983	0.006	14.000	13.989	0.000
T15	MAX	15.110	14.905	0.315	15.043	14.950	0.136	15.027	14.984	0.061	15.018	14.994	0.035	15.018	15.000	0.029
	MIN	15.000	14.795	0.095	15.000	14.907	0.050	15.000	14.966	0.016	15.000	14.983	0.006	15.000	14.989	0.000
F16	MAX	16.110	15.905	0.315	16.043	15.950	0.136	16.027	15.984	0.061	16.018	15.994	0.035	16.018	16.000	0.029
	MIN	16.000	15.795	0.095	16.000	15.907	0.050	16.000	15.966	0.016	16.000	15.983	0.006	16.000	15.989	0.000
T17	MAX	17.110	16.905	0.315	17.043	16.950	0.136	17.027	16.984	0.061	17.018	16.994	0.035	17.018	17.000	0.029
	MIN	17.000	16.795	0.095	17.000	16.907	0.050	17.000	16.966	0.016	17.000	16.983	0.006	17.000	16.989	0.000
S18	MAX	18.110	17.905	0.315	18.043	17.950	0.136	18.027	17.984	0.061	18.018	17.994	0.035	18.018	18.000	0.029
	MIN	18.000	17.795	0.095	18.000	17.907	0.050	18.000	17.966	0.016	18.000	17.983	0.006	18.000	17.989	0.000
T19	MAX	19.130	18.890	0.370	19.052	18.935	0.169	19.033	18.980	0.074	19.021	18.993	0.041	19.021	19.000	0.034
	MIN	19.000	18.760	0.110	19.000	18.883	0.065	19.000	18.959	0.020	19.000	18.980	0.007	19.000	18.987	0.000
F20	MAX	20.130	19.890	0.370	20.052	19.935	0.169	20.033	19.980	0.074	20.021	19.993	0.041	20.021	20.000	0.034
	MIN	20.000	19.760	0.110	20.000	19.883	0.065	20.000	19.959	0.020	20.000	19.980	0.007	20.000	19.987	0.000
T21	MAX	21.130	20.890	0.370	21.052	20.935	0.169	21.033	20.980	0.074	21.021	20.993	0.041	21.021	21.000	0.034
	MIN	21.000	20.760	0.110	21.000	20.883	0.065	21.000	20.959	0.020	21.000	20.980	0.007	21.000	20.987	0.000
S22	MAX	22.130	21.890	0.370	22.052	21.935	0.169	22.033	21.980	0.074	22.021	21.993	0.041	22.021	22.000	0.034
	MIN	22.000	21.760	0.110	22.000	21.883	0.065	22.000	21.959	0.020	22.000	21.980	0.007	22.000	21.987	0.000
T23	MAX	23.130	22.890	0.370	23.052	22.935	0.169	23.033	22.980	0.074	23.021	22.993	0.041	23.021	23.000	0.034
	MIN	23.000	22.760	0.110	23.000	22.883	0.065	23.000	22.959	0.020	23.000	22.980	0.007	23.000	22.987	0.000
T24	MAX	24.130	23.890	0.370	24.052	23.935	0.169	24.033	23.980	0.074	24.021	23.993	0.041	24.021	24.000	0.034
	MIN	24.000	23.760	0.110	24.000	23.883	0.065	24.000	23.959	0.020	24.000	23.980	0.007	24.000	23.987	0.000

NOTES: 1. Select nominal sizes to preference rating as follows: F = First Choice, S = Second Choice, T = Third Choice.
 2. ANSI B4.2 lists limit dimensions for nominal sizes marked "F" (First Choice) only. A cost penalty for material stock, tooling and gages is anticipated for sizes marked with "S" (Second Choice) and "T" (Third Choice).

TABLE 6-3 PREFERRED HOLE BASIS TRANSITION AND INTERFERENCE FITS (ANSI B4.2)

mm

BASIC SIZE	LOCATIONAL TRANSN			LOCATIONAL TRANSN			LOCATIONAL INTERF			MEDIUM DRIVE			FORCE			
	HOLE H7	SHAFT k6	DIFF	HOLE H7	SHAFT n6	DIFF	HOLE H7	SHAFT p6	DIFF	HOLE H7	SHAFT s6	DIFF	HOLE H7	SHAFT u6	DIFF	
S7	MAX	7.015	7.010	0.014	7.015	7.019	0.005	7.015	7.024	0.000	7.015	7.032	-0.008	7.015	7.037	-0.013
	MIN	7.000	7.001	-0.010	7.000	7.010	-0.019	7.000	7.015	-0.024	7.000	7.023	-0.032	7.000	7.028	-0.037
F8	MAX	8.015	8.010	0.014	8.015	8.019	0.005	8.015	8.024	0.000	8.015	8.032	-0.008	8.015	8.037	-0.013
	MIN	8.000	8.001	-0.010	8.000	8.010	-0.019	8.000	8.015	-0.024	8.000	8.023	-0.032	8.000	8.028	-0.037
S9	MAX	9.015	9.010	0.014	9.015	9.019	0.005	9.015	9.024	0.000	9.015	9.032	-0.008	9.015	9.037	-0.013
	MIN	9.000	9.001	-0.010	9.000	9.010	-0.019	9.000	9.015	-0.024	9.000	9.023	-0.032	9.000	9.028	-0.037
F10	MAX	10.015	10.010	0.014	10.015	10.019	0.005	10.015	10.024	0.000	10.015	10.032	-0.008	10.015	10.037	-0.013
	MIN	10.000	10.001	-0.010	10.000	10.010	-0.019	10.000	10.015	-0.024	10.000	10.023	-0.032	10.000	10.028	-0.037
S11	MAX	11.018	11.012	0.017	11.018	11.023	0.006	11.018	11.029	0.000	11.018	11.039	-0.010	11.018	11.044	-0.015
	MIN	11.000	11.001	-0.012	11.000	11.012	-0.023	11.000	11.018	-0.029	11.000	11.028	-0.039	11.000	11.033	-0.044
F12	MAX	12.018	12.012	0.017	12.018	12.023	0.006	12.018	12.029	0.000	12.018	12.039	-0.010	12.018	12.044	-0.015
	MIN	12.000	12.001	-0.012	12.000	12.012	-0.023	12.000	12.018	-0.029	12.000	12.028	-0.039	12.000	12.033	-0.044
T13	MAX	13.018	13.012	0.017	13.018	13.023	0.006	13.018	13.029	0.000	13.018	13.039	-0.010	13.018	13.044	-0.015
	MIN	13.000	13.001	-0.012	13.000	13.012	-0.023	13.000	13.018	-0.029	13.000	13.028	-0.039	13.000	13.033	-0.044
S14	MAX	14.018	14.012	0.017	14.018	14.023	0.006	14.018	14.029	0.000	14.018	14.039	-0.010	14.018	14.044	-0.015
	MIN	14.000	14.001	-0.012	14.000	14.012	-0.023	14.000	14.018	-0.029	14.000	14.028	-0.039	14.000	14.033	-0.044
T15	MAX	15.018	15.012	0.017	15.018	15.023	0.006	15.018	15.029	0.000	15.018	15.039	-0.010	15.018	15.044	-0.015
	MIN	15.000	15.001	-0.012	15.000	15.012	-0.023	15.000	15.018	-0.029	15.000	15.028	-0.039	15.000	15.033	-0.044
F16	MAX	16.018	16.012	0.017	16.018	16.029	0.006	16.018	16.029	0.000	16.018	16.039	-0.010	16.018	16.044	-0.015
	MIN	16.000	16.001	-0.012	16.000	16.012	-0.023	16.000	16.018	-0.029	16.000	16.028	-0.039	16.000	16.033	-0.044
T17	MAX	17.018	17.012	0.017	17.018	17.023	0.006	17.018	17.029	0.000	17.018	17.039	-0.010	17.018	17.044	-0.015
	MIN	17.000	17.001	-0.012	17.000	17.012	-0.023	17.000	17.018	-0.029	17.000	17.028	-0.039	17.000	17.033	-0.044
S18	MAX	18.018	18.012	0.017	18.018	18.023	0.006	18.018	18.029	0.000	18.018	18.039	-0.010	18.018	18.044	-0.015
	MIN	18.000	18.001	-0.012	18.000	18.012	-0.023	18.000	18.018	-0.029	18.000	18.028	-0.039	18.000	18.033	-0.044
T19	MAX	19.021	19.015	0.019	19.021	19.028	0.006	19.021	19.035	-0.001	19.021	19.048	0.014	19.021	19.054	-0.020
	MIN	19.000	19.002	-0.015	19.000	19.015	-0.028	19.000	19.022	-0.035	19.000	19.035	-0.048	19.000	19.041	-0.054
F20	MAX	20.021	20.015	0.019	20.021	20.028	0.006	20.021	20.035	-0.001	20.021	20.048	0.014	20.021	20.054	-0.020
	MIN	20.000	20.002	-0.015	20.000	20.015	-0.028	20.000	20.022	-0.035	20.000	20.035	-0.048	20.000	20.041	-0.054
T21	MAX	21.021	21.015	0.019	21.021	21.028	0.006	21.021	21.035	-0.001	21.021	21.048	0.014	21.021	21.054	-0.020
	MIN	21.000	21.002	-0.015	21.000	21.015	-0.028	21.000	21.022	-0.035	21.000	21.035	-0.048	21.000	21.041	-0.054
S22	MAX	22.021	22.015	0.019	22.021	22.028	0.006	22.021	22.035	-0.001	22.021	22.048	0.014	22.021	22.054	-0.020
	MIN	22.000	22.002	-0.015	22.000	22.015	-0.028	22.000	22.022	-0.035	22.000	22.035	-0.048	22.000	22.041	-0.054
T23	MAX	23.021	23.015	0.019	23.021	23.028	0.006	23.021	23.035	-0.001	23.021	23.048	0.014	23.021	23.054	-0.020
	MIN	23.000	23.002	-0.015	23.000	23.015	-0.028	23.000	23.022	-0.035	23.000	23.035	-0.048	23.000	23.041	-0.054
T24	MAX	24.021	24.015	0.019	24.021	24.028	0.006	24.021	24.035	-0.001	24.021	24.048	0.014	24.021	24.054	-0.020
	MIN	24.000	24.002	-0.015	24.000	24.015	-0.028	24.000	24.022	-0.035	24.000	24.035	-0.048	24.000	24.041	-0.054

NOTES: 1. Select nominal sizes to preference rating as follows: F = First Choice, S = Second Choice, T = Third Choice.

2. ANSI B4.2 lists limit dimensions for nominal sizes marked "F" (First Choice) only. A cost penalty for material stock, tooling and gages is anticipated for sizes marked with "S" (Second Choice) and "T" (Third Choice).

TABLE 6-4 PREFERRED SHAFT BASIS CLEARANCE FITS (ANSI B4.2)

mm

BASIC SIZE	LOOSE RUNNING			FREE RUNNING			CLOSE RUNNING			SLIDING			LOC CLEARANCE			
	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	HOLE	SHAFT	DIFF	
	C11	h11		D9	h9		F8	h7		G7	h6		H7	h6		
S7	MAX	7.170	7.000	0.260	7.076	7.000	0.112	7.035	7.000	0.050	7.020	7.000	0.029	7.015	7.000	0.024
	MIN	7.080	6.910	0.080	7.040	6.964	0.040	7.013	6.985	0.013	7.005	6.991	0.005	7.000	6.991	0.000
F8	MAX	8.170	8.000	0.260	8.076	8.000	0.112	8.035	8.000	0.050	8.020	8.000	0.029	8.015	8.000	0.024
	MIN	8.080	7.910	0.080	8.040	7.964	0.040	8.013	7.985	0.013	8.005	7.991	0.005	8.000	7.991	0.000
S9	MAX	9.170	9.000	0.260	9.076	9.000	0.112	9.035	9.000	0.050	9.020	9.000	0.029	9.015	9.000	0.024
	MIN	9.080	8.910	0.080	9.040	8.964	0.040	9.013	8.985	0.013	9.005	8.991	0.005	9.000	8.991	0.000
F10	MAX	10.170	10.000	0.260	10.076	10.000	0.112	10.035	10.000	0.050	10.020	10.000	0.029	10.015	10.000	0.024
	MIN	10.080	9.910	0.080	10.040	9.964	0.040	10.013	9.985	0.013	10.005	9.991	0.005	10.000	9.991	0.000
S11	MAX	11.205	11.000	0.315	11.093	11.000	0.136	11.043	11.000	0.061	11.024	11.000	0.035	11.018	11.000	0.029
	MIN	11.095	10.890	0.095	11.050	10.957	0.050	11.016	10.982	0.016	11.006	10.989	0.006	11.000	10.989	0.000
F12	MAX	12.205	12.000	0.315	12.093	12.000	0.136	12.043	12.000	0.061	12.024	12.000	0.035	12.018	12.000	0.029
	MIN	12.095	11.890	0.095	12.050	11.957	0.050	12.016	11.982	0.016	12.006	11.989	0.006	12.000	11.989	0.000
T13	MAX	13.205	13.000	0.315	13.093	13.000	0.136	13.043	13.000	0.061	13.024	13.000	0.035	13.018	13.000	0.029
	MIN	13.095	12.890	0.095	13.050	12.957	0.050	13.016	12.982	0.016	13.006	12.989	0.006	13.000	12.989	0.000
S14	MAX	14.205	14.000	0.315	14.093	14.000	0.136	14.043	14.000	0.061	14.024	14.000	0.035	14.018	14.000	0.029
	MIN	14.095	13.890	0.095	14.050	13.957	0.050	14.016	13.982	0.016	14.006	13.989	0.006	14.000	13.989	0.000
T15	MAX	15.205	15.000	0.315	15.093	15.000	0.136	15.043	15.000	0.061	15.024	15.000	0.035	15.018	15.000	0.029
	MIN	15.095	14.890	0.095	15.050	14.957	0.050	15.016	14.982	0.016	15.006	14.989	0.006	15.000	14.989	0.000
F16	MAX	16.205	16.000	0.315	16.093	16.000	0.136	16.043	16.000	0.061	16.024	16.000	0.035	16.018	16.000	0.029
	MIN	16.095	15.890	0.095	16.050	15.957	0.050	16.016	15.982	0.016	16.006	15.989	0.006	16.000	15.989	0.000
T17	MAX	17.205	17.000	0.315	17.093	17.000	0.136	17.043	17.000	0.061	17.024	17.000	0.035	17.018	17.000	0.029
	MIN	17.095	16.890	0.095	17.050	16.957	0.050	17.016	16.982	0.016	17.006	16.989	0.006	17.000	16.989	0.000
S18	MAX	18.205	18.000	0.315	18.093	18.000	0.136	18.043	18.000	0.061	18.024	18.000	0.035	18.018	18.000	0.029
	MIN	18.095	17.890	0.095	18.050	17.957	0.050	18.016	17.982	0.016	18.006	17.989	0.006	18.000	17.989	0.000
T19	MAX	19.240	19.000	0.370	19.117	19.000	0.169	19.053	19.000	0.074	19.028	19.000	0.041	19.021	19.000	0.034
	MIN	19.110	18.870	0.110	19.065	18.948	0.065	19.020	18.979	0.020	19.007	18.987	0.007	19.000	18.987	0.000
F20	MAX	20.240	20.000	0.370	20.117	20.000	0.169	20.053	20.000	0.074	20.028	20.000	0.041	20.021	20.000	0.034
	MIN	20.110	19.870	0.110	20.065	19.948	0.065	20.020	19.979	0.020	20.007	19.987	0.007	20.000	19.987	0.000
T21	MAX	21.240	21.000	0.370	21.117	21.000	0.169	21.053	21.000	0.074	21.028	21.000	0.041	21.021	21.000	0.034
	MIN	21.110	20.870	0.110	21.065	20.948	0.065	21.020	20.979	0.020	21.007	20.987	0.007	21.000	20.987	0.000
S22	MAX	22.240	22.000	0.370	22.117	22.000	0.169	22.053	22.000	0.074	22.028	22.000	0.041	22.021	22.000	0.034
	MIN	22.110	21.870	0.110	22.065	21.948	0.065	22.020	21.979	0.020	22.007	21.987	0.007	22.000	21.987	0.000
T23	MAX	23.240	23.000	0.370	23.117	23.000	0.169	23.053	23.000	0.074	23.028	23.000	0.041	23.021	23.000	0.034
	MIN	23.110	22.870	0.110	23.065	22.948	0.065	23.020	22.979	0.020	23.007	22.987	0.007	23.000	22.987	0.000
T24	MAX	24.240	24.000	0.370	24.117	24.000	0.169	24.053	24.000	0.074	24.028	24.000	0.041	24.021	24.000	0.034
	MIN	24.110	23.870	0.110	24.065	23.948	0.065	24.020	23.979	0.020	24.007	23.987	0.007	24.000	23.987	0.000

NOTES: 1. Select nominal sizes to preference rating as follows: F = First Choice, S = Second Choice, T = Third Choice.
 2. ANSI B4.2 lists limit dimensions for nominal sizes marked "F" (First Choice) only. A cost penalty for material stock, tooling and gages is anticipated for sizes marked with "S" (Second Choice) and "T" (Third Choice).

TABLE 6-5 PREFERRED SHAFT BASIS TRANSITION AND INTERFERENCE FITS (ANSI B4.2)

mm

BASIC SIZE	LOCATIONAL TRANSN			LOCATIONAL TRANSN			LOCATIONAL INTERF			MEDIUM DRIVE			FORCE			
	HOLE K7	SHAFT h6	DIFF	HOLE N7	SHAFT h6	DIFF	HOLE P7	SHAFT h6	DIFF	HOLE S7	SHAFT h6	DIFF	HOLE U7	SHAFT h6	DIFF	
S7	MAX	7.005	7.000	0.014	6.996	7.000	0.005	6.991	7.000	0.000	6.983	7.000	-0.008	6.978	7.000	-0.013
	MIN	6.990	6.991	-0.010	6.981	6.991	-0.019	6.976	6.991	-0.024	6.968	6.991	-0.032	6.963	6.991	-0.037
F8	MAX	8.005	8.000	0.014	7.996	8.000	0.005	7.991	8.000	0.000	7.983	8.000	-0.008	7.978	8.000	-0.013
	MIN	7.990	7.991	-0.010	7.981	7.991	-0.019	7.976	7.991	-0.024	7.968	7.991	-0.032	7.963	7.991	-0.037
S9	MAX	9.005	9.000	0.014	8.996	9.000	0.005	8.991	9.000	0.000	8.983	9.000	-0.008	8.978	9.000	-0.013
	MIN	8.990	8.991	-0.010	8.981	8.991	-0.019	8.976	8.991	-0.024	8.968	8.991	-0.032	8.963	8.991	-0.037
F10	MAX	10.005	10.000	0.014	9.996	10.000	0.005	9.991	10.000	0.000	9.983	10.000	-0.008	9.978	10.000	-0.013
	MIN	9.990	9.991	-0.010	9.981	9.991	-0.019	9.976	9.991	-0.024	9.968	9.991	-0.032	9.963	9.991	-0.037
S11	MAX	11.006	11.000	0.017	10.995	11.000	0.006	10.989	11.000	0.000	10.979	11.000	-0.010	10.974	11.000	-0.015
	MIN	10.988	10.989	-0.012	10.977	10.989	-0.023	10.971	10.989	-0.029	10.961	10.989	-0.039	10.956	10.989	-0.044
F12	MAX	12.006	12.000	0.017	11.995	12.000	0.006	11.989	12.000	0.000	11.979	12.000	-0.010	11.974	12.000	-0.015
	MIN	11.988	11.989	-0.012	11.977	11.989	-0.023	11.971	11.989	-0.029	11.961	11.989	-0.039	11.956	11.989	-0.044
T13	MAX	13.006	13.000	0.017	12.995	13.000	0.006	12.989	13.000	0.000	12.979	13.000	-0.010	12.974	13.000	-0.015
	MIN	12.988	12.989	-0.012	12.977	12.989	-0.023	12.971	12.989	-0.029	12.961	12.989	-0.039	12.956	12.989	-0.044
S14	MAX	14.006	14.000	0.017	13.995	14.000	0.006	13.989	14.000	0.000	13.979	14.000	-0.010	13.974	14.000	0.015
	MIN	13.988	13.989	-0.012	13.977	13.989	-0.023	13.971	13.989	-0.029	13.961	13.989	-0.039	13.956	13.989	-0.044
T15	MAX	15.006	15.000	0.017	14.995	15.000	0.006	14.989	15.000	0.000	14.979	15.000	-0.010	14.974	15.000	-0.015
	MIN	14.988	14.989	-0.012	14.977	14.989	-0.023	14.971	14.989	-0.029	14.961	14.989	-0.039	14.956	14.989	-0.044
F16	MAX	16.006	16.000	0.017	15.995	16.000	0.006	15.989	16.000	0.000	15.979	16.000	-0.010	15.974	16.000	-0.015
	MIN	15.988	15.989	-0.012	15.977	15.989	-0.023	15.971	15.989	-0.029	15.961	15.989	-0.039	15.956	15.989	-0.044
T17	MAX	17.006	17.000	0.017	16.995	17.000	0.006	16.989	17.000	0.000	16.979	17.000	-0.010	16.974	17.000	-0.015
	MIN	16.988	16.989	-0.012	16.977	16.989	-0.023	16.971	16.989	-0.029	16.961	16.989	-0.039	16.956	16.989	-0.044
S18	MAX	18.006	18.000	0.017	17.995	18.000	0.006	17.989	18.000	0.000	17.979	18.000	-0.010	17.974	18.000	-0.015
	MIN	17.988	17.989	-0.012	17.977	17.989	-0.023	17.971	17.989	-0.029	17.961	17.989	-0.039	17.956	17.989	-0.044
T19	MAX	19.006	19.000	0.019	18.993	19.000	0.006	18.986	19.000	-0.001	18.973	19.000	-0.014	18.967	19.000	-0.020
	MIN	18.985	18.987	-0.015	18.972	18.987	-0.028	18.965	18.987	-0.035	18.952	18.987	-0.048	18.946	18.987	-0.054
F20	MAX	20.006	20.000	0.019	19.993	20.000	0.006	19.986	20.000	-0.001	19.973	20.000	-0.014	19.967	20.000	-0.020
	MIN	19.985	19.987	-0.015	19.972	19.987	-0.028	19.965	19.987	-0.035	19.952	19.987	-0.048	19.946	19.987	-0.054
T21	MAX	21.006	21.000	0.019	20.993	21.000	0.006	20.986	21.000	-0.001	20.973	21.000	-0.014	20.967	21.000	-0.020
	MIN	20.985	20.987	-0.015	20.972	20.987	-0.028	20.965	20.987	-0.035	20.952	20.987	-0.048	20.946	20.987	-0.054
S22	MAX	22.006	22.000	0.019	21.993	22.000	0.006	21.986	22.000	-0.001	21.973	22.000	-0.014	21.967	22.000	-0.020
	MIN	21.985	21.987	-0.015	21.972	21.987	-0.028	21.965	21.987	-0.035	21.952	21.987	-0.048	21.946	21.987	-0.054
T23	MAX	23.006	23.000	0.019	22.993	23.000	0.006	22.986	23.000	-0.001	22.973	23.000	-0.014	22.967	23.000	-0.020
	MIN	22.985	22.987	-0.015	22.972	22.987	-0.028	22.965	22.987	-0.035	22.952	22.987	-0.048	22.946	22.987	-0.054
T24	MAX	24.006	24.000	0.019	23.993	24.000	0.006	23.986	24.000	-0.001	23.973	24.000	-0.014	23.967	24.000	-0.020
	MIN	23.985	23.987	-0.015	23.972	23.987	-0.028	23.965	23.987	-0.035	23.952	23.987	-0.048	23.946	23.987	-0.054

NOTES: 1. Select nominal sizes to preference rating as follows: F = First Choice, S = Second Choice, T = Third Choice.

2. ANSI B4.2 lists limit dimensions for nominal sizes marked "F" (First Choice) only. A cost penalty for material stock, tooling and gages is anticipated for sizes marked with "S" (Second Choice) and "T" (Third Choice).

TABLE 6-9 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (G10 ... G5, J8 ... J6) (ANSI B4.2)

mm

SIZE	G10	G9	G8	G7	G6	G5	J8	J7	J6
OVER 0	0.042	0.027	+0.016	+0.012	+0.008	+0.006	+0.006	+0.004	+0.002
TO 3	+0.002	+0.002	+0.002	+0.002	+0.002	+0.002	-0.008	-0.006	-0.004
OVER 3	+0.052	+0.034	+0.022	+0.016	+0.012	+0.009	0.010	+0.006	+0.005
TO 6	+0.004	+0.004	+0.004	+0.004	+0.004	+0.004	-0.008	-0.006	-0.003
OVER 6	+0.063	+0.041	+0.027	+0.020	+0.014	+0.011	+0.012	+0.008	+0.005
TO 10	+0.005	+0.005	+0.005	+0.005	+0.005	+0.005	-0.010	-0.007	-0.004
OVER 10	+0.076	+0.049	+0.033	+0.024	0.017	+0.014	0.015	0.010	+0.006
TO 14	+0.006	+0.006	+0.006	+0.006	+0.006	+0.006	-0.012	-0.008	-0.005
OVER 14	+0.076	+0.049	+0.033	+0.024	0.017	+0.014	0.015	0.010	+0.006
TO 18	+0.006	+0.006	+0.006	+0.006	+0.006	+0.006	-0.012	-0.008	-0.005
OVER 18	+0.091	+0.059	+0.040	+0.028	+0.020	+0.016	+0.020	+0.012	+0.008
TO 24	+0.007	+0.007	+0.007	+0.007	+0.007	+0.007	-0.013	-0.009	-0.005
OVER 24	+0.091	+0.059	+0.040	+0.028	+0.020	+0.016	+0.020	+0.012	+0.008
TO 30	+0.007	+0.007	+0.007	+0.007	+0.007	+0.007	-0.013	-0.009	-0.005
OVER 30	+0.109	+0.071	+0.048	+0.034	+0.025	+0.020	0.024	0.014	0.010
TO 40	+0.009	+0.009	+0.009	+0.009	+0.009	+0.009	-0.015	-0.011	-0.006
OVER 40	+0.109	+0.071	+0.048	+0.034	+0.025	+0.020	0.024	0.014	0.010
TO 50	+0.009	+0.009	+0.009	+0.009	+0.009	+0.009	-0.015	-0.011	-0.006
OVER 50	+0.130	+0.084	+0.056	+0.040	0.029	+0.023	+0.028	0.018	0.013
TO 65	+0.010	+0.010	+0.010	+0.010	+0.010	+0.010	-0.018	-0.012	-0.006
OVER 65	+0.130	+0.084	+0.056	+0.040	+0.029	+0.023	+0.028	0.018	0.013
TO 80	+0.010	+0.010	+0.010	+0.010	+0.010	+0.010	-0.018	-0.012	-0.006
OVER 80	+0.152	+0.099	+0.066	+0.047	+0.034	+0.027	0.034	0.022	0.016
TO 100	+0.012	+0.012	+0.012	+0.012	+0.012	+0.012	-0.020	-0.013	-0.006
OVER 100	+0.152	+0.099	+0.066	+0.047	+0.034	+0.027	0.034	0.022	0.016
TO 120	+0.012	+0.012	+0.012	+0.012	+0.012	+0.012	-0.020	-0.013	-0.006
OVER 120	+0.174	+0.114	+0.077	+0.054	+0.039	+0.032	0.041	0.026	+0.018
TO 140	+0.014	+0.014	+0.014	+0.014	+0.014	+0.014	-0.022	-0.014	-0.007
OVER 140	+0.174	+0.114	+0.077	+0.054	+0.039	+0.032	0.041	0.026	+0.018
TO 160	+0.014	+0.014	+0.014	+0.014	+0.014	+0.014	-0.022	-0.014	-0.007
OVER 160	+0.174	+0.114	+0.077	+0.054	+0.039	+0.032	0.041	0.026	+0.018
TO 180	+0.014	+0.014	+0.014	+0.014	+0.014	+0.014	-0.022	-0.014	-0.007
OVER 180	+0.200	+0.130	+0.087	+0.061	+0.044	+0.035	0.047	0.030	+0.022
TO 200	+0.015	+0.015	+0.015	+0.015	+0.015	+0.015	-0.025	-0.016	-0.007
OVER 200	+0.200	+0.130	+0.087	+0.061	+0.044	+0.035	0.047	0.030	+0.022
TO 225	+0.015	+0.015	+0.015	+0.015	+0.015	+0.015	-0.025	-0.016	-0.007
OVER 225	+0.200	+0.130	+0.087	+0.061	+0.044	+0.035	0.047	0.030	+0.022
TO 250	+0.015	+0.015	+0.015	+0.015	+0.015	+0.015	-0.025	-0.016	-0.007
OVER 250	+0.227	+0.147	+0.098	+0.069	+0.049	+0.040	0.055	+0.036	0.025
TO 280	+0.017	+0.017	+0.017	+0.017	+0.017	+0.017	-0.026	-0.016	-0.007
OVER 280	+0.227	+0.147	+0.098	+0.069	+0.049	+0.040	0.055	+0.036	0.025
TO 315	+0.017	+0.017	+0.017	+0.017	+0.017	+0.017	-0.026	-0.016	-0.007
OVER 315	+0.248	+0.158	+0.107	+0.075	+0.054	+0.043	0.060	0.039	0.029
TO 355	+0.018	+0.018	+0.018	+0.018	+0.018	+0.018	-0.029	-0.018	-0.007
OVER 355	+0.248	+0.158	+0.107	+0.075	+0.054	+0.043	0.060	0.039	0.029
TO 400	+0.018	+0.018	+0.018	+0.018	+0.018	+0.018	-0.029	-0.018	-0.007
OVER 400	+0.270	+0.175	+0.117	+0.083	+0.060	+0.047	0.066	+0.043	+0.033
TO 450	+0.020	+0.020	+0.020	+0.020	+0.020	+0.020	-0.031	-0.020	-0.007
OVER 450	+0.270	+0.175	+0.117	+0.083	+0.060	+0.047	0.066	+0.043	+0.033
TO 500	+0.020	+0.020	+0.020	+0.020	+0.020	+0.020	-0.031	-0.020	-0.007

TABLE 6-11 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (JS16...JS1) (ANSI B4.2)

mm

SIZE	JS16	JS15	JS14	JS13	JS12	JS11	JS10	JS9	JS8	JS7	JS6	JS5	JS4	JS3	JS2	JS1
OVER 0	0.300	0.200	0.125	0.070	0.050	0.030	0.020	0.013	0.007	0.0050	0.0030	0.0020	0.0015	0.0010	0.00060	0.00040
TO 3	-0.300	-0.200	-0.125	-0.070	-0.050	-0.030	-0.020	-0.013	-0.007	-0.0050	-0.0030	-0.0020	-0.0015	-0.0010	-0.00060	-0.00040
OVER 3	0.375	0.240	0.150	0.090	0.060	0.038	0.024	0.015	0.009	0.0060	0.0040	0.0025	0.0020	0.0013	0.00075	0.00050
TO 6	-0.375	-0.240	-0.150	-0.090	-0.060	-0.038	-0.024	-0.015	-0.009	-0.0060	-0.0040	-0.0025	-0.0020	-0.0013	-0.00075	-0.00050
OVER 6	0.450	0.290	0.180	0.110	0.075	0.045	0.029	0.018	0.011	0.0075	0.0045	0.0030	0.0020	0.0013	0.00075	0.00050
TO 10	-0.450	-0.290	-0.180	-0.110	-0.075	-0.045	-0.029	-0.018	-0.011	-0.0075	-0.0045	-0.0030	-0.0020	-0.0013	-0.00075	-0.00050
OVER 10	0.550	0.350	0.215	0.135	0.090	0.055	0.035	0.022	0.014	0.0090	0.0055	0.0040	0.0025	0.0015	0.00100	0.00060
TO 14	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.035	-0.022	-0.014	-0.0090	-0.0055	-0.0040	-0.0025	-0.0015	-0.00100	-0.00060
OVER 14	0.550	0.350	0.215	0.135	0.090	0.055	0.035	0.022	0.014	0.0090	0.0055	0.0040	0.0025	0.0015	0.00100	0.00060
TO 18	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.035	-0.022	-0.014	-0.0090	-0.0055	-0.0040	-0.0025	-0.0015	-0.00100	-0.00060
OVER 18	0.650	0.420	0.260	0.165	0.105	0.065	0.042	0.026	0.017	0.0105	0.0065	0.0045	0.0030	0.0020	0.00125	0.00075
TO 24	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.042	-0.026	-0.017	-0.0105	-0.0065	-0.0045	-0.0030	-0.0020	-0.00125	-0.00075
OVER 24	0.650	0.420	0.260	0.165	0.105	0.065	0.042	0.026	0.017	0.0105	0.0065	0.0045	0.0030	0.0020	0.00125	0.00075
TO 30	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.042	-0.026	-0.017	-0.0105	-0.0065	-0.0045	-0.0030	-0.0020	-0.00125	-0.00075
OVER 30	0.800	0.500	0.310	0.195	0.125	0.080	0.050	0.031	0.020	0.0125	0.0080	0.0055	0.0035	0.0020	0.00125	0.00075
TO 40	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.0080	-0.0055	-0.0035	-0.0020	-0.00125	-0.00075
OVER 40	0.800	0.500	0.310	0.195	0.125	0.080	0.050	0.031	0.020	0.0125	0.0080	0.0055	0.0035	0.0020	0.00125	0.00075
TO 50	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.0080	-0.0055	-0.0035	-0.0020	-0.00125	-0.00075
OVER 50	0.950	0.600	0.370	0.230	0.150	0.095	0.060	0.037	0.023	0.0150	0.0095	0.0065	0.0040	0.0025	0.00150	0.00100
TO 65	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.060	-0.037	-0.023	-0.0150	-0.0095	-0.0065	-0.0040	-0.0025	-0.00150	-0.00100
OVER 65	0.950	0.600	0.370	0.230	0.150	0.095	0.060	0.037	0.023	0.0150	0.0095	0.0065	0.0040	0.0025	0.00150	0.00100
TO 80	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.060	-0.037	-0.023	-0.0150	-0.0095	-0.0065	-0.0040	-0.0025	-0.00150	-0.00100
OVER 80	1.100	0.700	0.435	0.270	0.175	0.110	0.070	0.044	0.027	0.0175	0.0110	0.0075	0.0050	0.0030	0.00200	0.00125
TO 100	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.070	-0.044	-0.027	-0.0175	-0.0110	-0.0075	-0.0050	-0.0030	-0.00200	-0.00125
OVER 100	1.100	0.700	0.435	0.270	0.175	0.110	0.070	0.044	0.027	0.0175	0.0110	0.0075	0.0050	0.0030	0.00200	0.00125
TO 120	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.070	-0.044	-0.027	-0.0175	-0.0110	-0.0075	-0.0050	-0.0030	-0.00200	-0.00125
OVER 120	1.250	0.800	0.500	0.315	0.200	0.125	0.080	0.050	0.032	0.0200	0.0125	0.0090	0.0060	0.0040	0.00250	0.00175
TO 140	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.032	-0.0200	-0.0125	-0.0090	-0.0060	-0.0040	-0.00250	-0.00175
OVER 140	1.250	0.800	0.500	0.315	0.200	0.125	0.080	0.050	0.032	0.0200	0.0125	0.0090	0.0060	0.0040	0.00250	0.00175
TO 160	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.032	-0.0200	-0.0125	-0.0090	-0.0060	-0.0040	-0.00250	-0.00175
OVER 160	1.250	0.800	0.500	0.315	0.200	0.125	0.080	0.050	0.032	0.0200	0.0125	0.0090	0.0060	0.0040	0.00250	0.00175
TO 180	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.032	-0.0200	-0.0125	-0.0090	-0.0060	-0.0040	-0.00250	-0.00175
OVER 180	1.450	0.925	0.575	0.360	0.230	0.145	0.093	0.058	0.036	0.0230	0.0145	0.0100	0.0070	0.0050	0.00350	0.00225
TO 200	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.093	-0.058	-0.036	-0.0230	-0.0145	-0.0100	-0.0070	-0.0050	-0.00350	-0.00225
OVER 200	1.450	0.925	0.575	0.360	0.230	0.145	0.093	0.058	0.036	0.0230	0.0145	0.0100	0.0070	0.0050	0.00350	0.00225
TO 225	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.093	-0.058	-0.036	-0.0230	-0.0145	-0.0100	-0.0070	-0.0050	-0.00350	-0.00225
OVER 225	1.450	0.925	0.575	0.360	0.230	0.145	0.093	0.058	0.036	0.0230	0.0145	0.0100	0.0070	0.0050	0.00350	0.00225
TO 250	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.093	-0.058	-0.036	-0.0230	-0.0145	-0.0100	-0.0070	-0.0050	-0.00350	-0.00225
OVER 250	1.600	1.050	0.650	0.405	0.260	0.160	0.105	0.065	0.041	0.0260	0.0160	0.0115	0.0080	0.0060	0.0040	0.0030
TO 280	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.105	-0.065	-0.041	-0.0260	-0.0160	-0.0115	-0.0080	-0.0060	-0.0040	-0.0030
OVER 280	1.600	1.050	0.650	0.405	0.260	0.160	0.105	0.065	0.041	0.0260	0.0160	0.0115	0.0080	0.0060	0.0040	0.0030
TO 315	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.105	-0.065	-0.041	-0.0260	-0.0160	-0.0115	-0.0080	-0.0060	-0.0040	-0.0030
OVER 315	1.800	1.150	0.700	0.445	0.285	0.180	0.115	0.070	0.045	0.0285	0.0180	0.0125	0.0090	0.0065	0.0045	0.0035
TO 355	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.115	-0.070	-0.045	-0.0285	-0.0180	-0.0125	-0.0090	-0.0065	-0.0045	-0.0035
OVER 355	1.800	1.150	0.700	0.445	0.285	0.180	0.115	0.070	0.045	0.0285	0.0180	0.0125	0.0090	0.0065	0.0045	0.0035
TO 400	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.115	-0.070	-0.045	-0.0285	-0.0180	-0.0125	-0.0090	-0.0065	-0.0045	-0.0035
OVER 400	2.000	1.250	0.775	0.485	0.315	0.200	0.125	0.078	0.049	0.0315	0.0200	0.0135	0.0100	0.0075	0.0050	0.0040
TO 450	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.125	-0.078	-0.049	-0.0315	-0.0200	-0.0135	-0.0100	-0.0075	-0.0050	-0.0040
OVER 450	2.000	1.250	0.775	0.485	0.315	0.200	0.125	0.078	0.049	0.0315	0.0200	0.0135	0.0100	0.0075	0.0050	0.0040
TO 500	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.125	-0.078	-0.049	-0.0315	-0.0200	-0.0135	-0.0100	-0.0075	-0.0050	-0.0040

NOTE: Some js deviations in the grades 7 to 11 have been rounded off to 1/2(IT - 0.001) when IT values is odd.

TABLE 6-12 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (K10 ... K5, M10 ... M5) (ANSI B4.2)

mm

SIZE		K10	K9	K8	K7	K6	K5	M10	M9	M8	M7	M6	M5
OVER	0	0.000	0.000	0.000	0.000	0.000	0.000	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
TO	3	-0.040	-0.025	-0.014	-0.010	-0.006	-0.004	-0.042	-0.027	-0.016	-0.012	-0.008	-0.006
OVER	3	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED		+0.005	+0.003	+0.002	0.000	-0.004	-0.004	+0.002	0.000	-0.001	-0.003
TO	6			-0.013	-0.009	-0.006	-0.005	-0.052	-0.034	-0.016	-0.012	-0.009	-0.008
OVER	6			+0.006	+0.005	+0.002	+0.001	-0.006	-0.006	+0.001	0.000	-0.003	-0.004
TO	10			-0.016	-0.010	-0.007	-0.005	-0.064	-0.042	-0.021	-0.015	-0.012	-0.010
OVER	10			+0.008	+0.006	+0.002	+0.002	-0.007	-0.007	+0.002	0.000	-0.004	-0.004
TO	14			-0.019	-0.012	-0.009	-0.006	-0.077	-0.050	-0.025	-0.018	-0.015	-0.012
OVER	14			+0.008	+0.006	+0.002	+0.002	-0.007	-0.007	+0.002	0.000	-0.004	-0.004
TO	18			-0.019	-0.012	-0.009	-0.006	-0.077	-0.050	-0.025	-0.018	-0.015	-0.012
OVER	18			+0.010	+0.006	+0.002	+0.001	-0.008	-0.008	+0.004	0.000	-0.004	-0.005
TO	24			-0.023	-0.015	-0.011	-0.008	-0.092	-0.060	-0.029	-0.021	-0.017	-0.014
OVER	24			+0.010	+0.006	+0.002	+0.001	-0.008	-0.008	+0.004	0.000	-0.004	-0.005
TO	30			-0.023	-0.015	-0.011	-0.008	-0.092	-0.060	-0.029	-0.021	-0.017	-0.014
OVER	30			+0.012	+0.007	+0.003	+0.002	-0.009	-0.009	+0.005	0.000	-0.004	-0.005
TO	40			-0.027	-0.018	-0.013	-0.009	-0.109	-0.071	-0.034	-0.025	-0.020	-0.016
OVER	40			+0.012	+0.007	+0.003	+0.002	-0.009	-0.009	+0.005	0.000	-0.004	-0.005
TO	50			-0.027	-0.018	-0.013	-0.009	-0.109	-0.071	-0.034	-0.025	-0.020	-0.016
OVER	50		+0.014	+0.009	+0.004	+0.003	-0.011	-0.011	+0.005	0.000	-0.005	-0.006	
TO	65		-0.032	-0.021	-0.015	-0.010	-0.131	-0.085	-0.041	-0.030	-0.024	-0.019	
OVER	65		+0.014	+0.009	+0.004	+0.003	-0.011	-0.011	+0.005	0.000	-0.005	-0.006	
TO	80		-0.032	-0.021	-0.015	-0.010	-0.131	-0.085	-0.041	-0.030	-0.024	-0.019	
OVER	80		+0.016	+0.010	+0.004	+0.002	-0.013	-0.013	+0.006	0.000	-0.006	-0.008	
TO	100		-0.038	-0.025	-0.018	-0.013	-0.153	-0.100	-0.048	-0.035	-0.028	-0.023	
OVER	100		+0.016	+0.010	+0.004	+0.002	-0.013	-0.013	+0.006	0.000	-0.006	-0.008	
TO	120		-0.038	-0.025	-0.018	-0.013	-0.153	-0.100	-0.048	-0.035	-0.028	-0.023	
OVER	120		+0.020	+0.012	+0.004	+0.003	-0.015	-0.015	+0.008	0.000	-0.008	-0.009	
TO	140		-0.043	-0.028	-0.021	-0.015	-0.175	-0.115	-0.055	-0.040	-0.033	-0.027	
OVER	140		+0.020	+0.012	+0.004	+0.003	-0.015	-0.015	+0.008	0.000	-0.008	-0.009	
TO	160		-0.043	-0.028	-0.021	-0.015	-0.175	-0.115	-0.055	-0.040	-0.033	-0.027	
OVER	160		+0.020	+0.012	+0.004	+0.003	-0.015	-0.015	+0.008	0.000	-0.008	-0.009	
TO	180		-0.043	-0.028	-0.021	-0.015	-0.175	-0.115	-0.055	-0.040	-0.033	-0.027	
OVER	180		+0.022	+0.013	+0.005	+0.002	-0.017	-0.017	+0.009	0.000	-0.008	-0.011	
TO	200		-0.050	-0.033	-0.024	-0.018	-0.202	-0.132	-0.063	-0.046	-0.037	-0.031	
OVER	200		+0.022	+0.013	+0.005	+0.002	-0.017	-0.017	+0.009	0.000	-0.008	-0.011	
TO	225		-0.050	-0.033	-0.024	-0.018	-0.202	-0.132	-0.063	-0.046	-0.037	-0.031	
OVER	225		+0.022	+0.013	+0.005	+0.002	-0.017	-0.017	+0.009	0.000	-0.008	-0.011	
TO	250		-0.050	-0.033	-0.024	-0.018	-0.202	-0.132	-0.063	-0.046	-0.037	-0.031	
OVER	250		+0.025	+0.016	+0.005	+0.003	-0.020	-0.020	+0.009	0.000	-0.009	-0.013	
TO	280		-0.056	-0.036	-0.027	-0.020	-0.230	-0.150	-0.072	-0.052	-0.041	-0.036	
OVER	280		+0.025	+0.016	+0.005	+0.003	-0.020	-0.020	+0.009	0.000	-0.009	-0.013	
TO	315		-0.056	-0.036	-0.027	-0.020	-0.230	-0.150	-0.072	-0.052	-0.041	-0.036	
OVER	315		+0.028	+0.017	+0.007	+0.003	-0.021	-0.021	+0.011	0.000	-0.010	-0.014	
TO	355		-0.061	-0.040	-0.029	-0.022	-0.251	-0.161	-0.078	-0.057	-0.046	-0.039	
OVER	355		+0.028	+0.017	+0.007	+0.003	-0.021	-0.021	+0.011	0.000	-0.010	-0.014	
TO	400		-0.061	-0.040	-0.029	-0.022	-0.251	-0.161	-0.078	-0.057	-0.046	-0.039	
OVER	400		+0.029	+0.018	+0.008	+0.002	-0.023	-0.023	+0.011	0.000	-0.010	-0.016	
TO	450		-0.068	-0.045	-0.032	-0.025	-0.273	-0.178	-0.086	-0.063	-0.050	-0.043	
OVER	450		+0.029	+0.018	+0.008	+0.002	-0.023	-0.023	+0.011	0.000	-0.010	-0.016	
TO	500		-0.068	-0.045	-0.032	-0.025	-0.273	-0.178	-0.086	-0.063	-0.050	-0.043	

TABLE 6-13 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (N10 ... N5, P10 ... P5) (ANSI B4.2)

mm

SIZE	N10	N9	N8	N7	N6	N5	P10	P9	P8	P7	P6	P5
OVER 0	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
TO 3	-0.044	-0.029	-0.018	-0.014	-0.010	-0.008	-0.046	-0.031	-0.020	-0.016	-0.012	-0.010
OVER 3	0.000	0.000	-0.002	-0.004	-0.005	-0.007	-0.012	-0.012	-0.012	-0.008	-0.009	-0.011
TO 6	-0.048	-0.030	-0.020	-0.016	-0.013	-0.012	-0.060	-0.042	-0.030	-0.020	-0.017	-0.016
OVER 6	0.000	0.000	-0.003	-0.004	-0.007	-0.008	-0.015	-0.015	-0.015	-0.009	-0.012	-0.013
TO 10	-0.058	-0.036	-0.025	-0.019	-0.016	-0.014	-0.073	-0.051	-0.037	-0.024	-0.021	-0.019
OVER 10	0.000	0.000	-0.003	-0.005	-0.009	-0.009	-0.018	-0.018	-0.018	-0.011	-0.015	-0.015
TO 14	-0.070	-0.043	-0.030	-0.023	-0.020	-0.017	-0.088	-0.061	-0.045	-0.029	-0.026	-0.023
OVER 14	0.000	0.000	-0.003	-0.005	-0.009	-0.009	-0.018	-0.018	-0.018	-0.011	-0.015	-0.015
TO 18	-0.070	-0.043	-0.030	-0.023	-0.020	-0.017	-0.088	-0.061	-0.045	-0.029	-0.026	-0.023
OVER 18	0.000	0.000	-0.003	-0.007	-0.011	-0.012	-0.022	-0.022	-0.022	-0.014	-0.018	-0.019
TO 24	-0.084	-0.052	-0.036	-0.028	-0.024	-0.021	-0.106	-0.074	-0.055	-0.035	-0.031	-0.028
OVER 24	0.000	0.000	-0.003	-0.007	-0.011	-0.012	-0.022	-0.022	-0.022	-0.014	-0.018	-0.019
TO 30	-0.084	-0.052	-0.036	-0.028	-0.024	-0.021	-0.106	-0.074	-0.055	-0.035	-0.031	-0.028
OVER 30	0.000	0.000	-0.003	-0.008	-0.012	-0.013	-0.026	-0.026	-0.026	-0.017	-0.021	-0.022
TO 40	-0.100	-0.062	-0.042	-0.033	-0.028	-0.024	-0.126	-0.088	-0.065	-0.042	-0.037	-0.033
OVER 10	0.000	0.000	-0.003	-0.008	-0.012	-0.013	-0.026	-0.026	-0.026	-0.017	-0.021	-0.022
TO 50	-0.100	-0.062	-0.042	-0.033	-0.028	-0.024	-0.126	-0.088	-0.065	-0.042	-0.037	-0.033
OVER 50	0.000	0.000	-0.004	-0.009	-0.014	-0.015	-0.032	-0.032	-0.032	-0.021	-0.026	-0.027
TO 65	-0.120	-0.074	-0.050	-0.039	-0.033	-0.028	-0.152	-0.106	-0.078	-0.051	-0.045	-0.040
OVER 65	0.000	0.000	-0.004	-0.009	-0.014	-0.015	-0.032	-0.032	-0.032	-0.021	-0.026	-0.027
TO 80	-0.120	-0.074	-0.050	-0.039	-0.033	-0.028	-0.152	-0.106	-0.078	-0.051	-0.045	-0.040
OVER 80	0.000	0.000	-0.004	-0.010	-0.016	-0.018	-0.037	-0.037	-0.037	-0.024	-0.030	-0.032
TO 100	-0.140	-0.087	-0.058	-0.045	-0.038	-0.033	-0.177	-0.124	-0.091	-0.059	-0.052	-0.047
OVER 100	0.000	0.000	-0.004	-0.010	-0.016	-0.018	-0.037	-0.037	-0.037	-0.024	-0.030	-0.032
TO 120	-0.140	-0.087	-0.058	-0.045	-0.038	-0.033	-0.177	-0.124	-0.091	-0.059	-0.052	-0.047
OVER 120	0.000	0.000	-0.004	-0.012	-0.020	-0.021	-0.043	-0.043	-0.043	-0.028	-0.036	-0.037
TO 140	-0.160	-0.100	-0.067	-0.052	-0.045	-0.039	-0.203	-0.143	-0.106	-0.068	-0.061	-0.055
OVER 140	0.000	0.000	-0.004	-0.012	-0.020	-0.021	-0.043	-0.043	-0.043	-0.028	-0.036	-0.037
TO 160	-0.160	-0.100	-0.067	-0.052	-0.045	-0.039	-0.203	-0.143	-0.106	-0.068	-0.061	-0.055
OVER 160	0.000	0.000	-0.004	-0.012	-0.020	-0.021	-0.043	-0.043	-0.043	-0.028	-0.036	-0.037
TO 180	-0.160	-0.100	-0.067	-0.052	-0.045	-0.039	-0.203	-0.143	-0.106	-0.068	-0.061	-0.055
OVER 180	0.000	0.000	-0.005	-0.014	-0.022	-0.025	-0.050	-0.050	-0.050	-0.033	-0.041	-0.044
TO 200	-0.185	-0.115	-0.077	-0.060	-0.051	-0.045	-0.235	-0.165	-0.122	-0.079	-0.070	-0.064
OVER 200	0.000	0.000	-0.005	-0.014	-0.022	-0.025	-0.050	-0.050	-0.050	-0.033	-0.041	-0.044
TO 225	-0.185	-0.115	-0.077	-0.060	-0.051	-0.045	-0.235	-0.165	-0.122	-0.079	-0.070	-0.064
OVER 225	0.000	0.000	-0.005	-0.014	-0.022	-0.025	-0.050	-0.050	-0.050	-0.033	-0.041	-0.044
TO 250	-0.185	-0.115	-0.077	-0.060	-0.051	-0.045	-0.235	-0.165	-0.122	-0.079	-0.070	-0.064
OVER 250	0.000	0.000	-0.005	-0.014	-0.025	-0.027	-0.056	-0.056	-0.056	-0.036	-0.047	-0.049
TO 280	-0.210	-0.130	-0.086	-0.066	-0.057	-0.050	-0.266	-0.186	-0.137	-0.088	-0.079	-0.072
OVER 280	0.000	0.000	-0.005	-0.014	-0.025	-0.027	-0.056	-0.056	-0.056	-0.036	-0.047	-0.049
TO 315	-0.210	-0.130	-0.086	-0.066	-0.057	-0.050	-0.266	-0.186	-0.137	-0.088	-0.079	-0.072
OVER 315	0.000	0.000	-0.005	-0.016	-0.026	-0.030	-0.062	-0.062	-0.062	-0.041	-0.051	-0.055
TO 355	-0.230	-0.140	-0.094	-0.073	-0.062	-0.055	-0.292	-0.202	-0.151	-0.098	-0.087	-0.080
OVER 355	0.000	0.000	-0.005	-0.016	-0.026	-0.030	-0.062	-0.062	-0.062	-0.041	-0.051	-0.055
TO 400	-0.230	-0.140	-0.094	-0.073	-0.062	-0.055	-0.292	-0.202	-0.151	-0.098	-0.087	-0.080
OVER 400	0.000	0.000	-0.006	-0.017	-0.027	-0.033	-0.068	-0.068	-0.068	-0.045	-0.055	-0.061
TO 450	-0.250	-0.155	-0.103	-0.080	-0.067	-0.060	-0.318	-0.223	-0.165	-0.108	-0.095	-0.088
OVER 450	0.000	0.000	-0.006	-0.017	-0.027	-0.033	-0.068	-0.068	-0.068	-0.045	-0.055	-0.061
TO 500	-0.250	-0.155	-0.103	-0.080	-0.067	-0.060	-0.318	-0.223	-0.165	-0.108	-0.095	-0.088

TABLE 6-14 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (R10 ... R5, S10 ... S5) (ANSI B4.2)

mm

SIZE	R10	R9	R8	R7	R6	R5	S10	S9	S8	S7	S6	S5
OVER 0	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014
TO 3	-0.050	-0.035	-0.024	-0.020	-0.016	-0.014	-0.054	-0.039	-0.028	-0.024	-0.020	-0.018
OVER 3	-0.015	-0.015	-0.015	-0.011	-0.012	-0.014	-0.019	-0.019	-0.019	-0.015	-0.016	-0.018
TO 6	-0.063	-0.045	-0.033	-0.023	-0.020	-0.019	-0.067	-0.049	-0.037	-0.027	-0.024	-0.023
OVER 6	-0.019	-0.019	-0.019	-0.013	-0.016	-0.017	-0.023	-0.023	-0.023	-0.017	-0.020	-0.021
TO 10	-0.077	-0.055	-0.041	-0.028	-0.025	-0.023	-0.081	-0.059	-0.045	-0.032	-0.029	-0.027
OVER 10	-0.023	-0.023	-0.023	-0.016	-0.020	-0.020	-0.028	-0.028	-0.028	-0.021	-0.025	-0.025
TO 14	-0.093	-0.066	-0.050	-0.034	-0.031	-0.028	-0.098	-0.071	-0.055	-0.039	-0.036	-0.033
OVER 14	-0.023	-0.023	-0.023	-0.016	-0.020	-0.020	-0.028	-0.028	-0.028	-0.021	-0.025	-0.025
TO 18	-0.093	-0.066	-0.050	-0.034	-0.031	-0.028	-0.098	-0.071	-0.055	-0.039	-0.036	-0.033
OVER 18	-0.028	-0.028	-0.028	-0.020	-0.024	-0.025	-0.035	-0.035	-0.035	-0.027	-0.031	-0.032
TO 24	-0.112	-0.080	-0.061	-0.041	-0.037	-0.034	-0.119	-0.087	-0.068	-0.048	-0.044	-0.041
OVER 24	-0.028	-0.028	-0.028	-0.020	-0.024	-0.025	-0.035	-0.035	-0.035	-0.027	-0.031	-0.032
TO 30	-0.112	-0.080	-0.061	-0.041	-0.037	-0.034	-0.119	-0.087	-0.068	-0.048	-0.044	-0.041
OVER 30	-0.034	-0.034	-0.034	-0.025	-0.029	-0.030	-0.043	-0.043	-0.043	-0.034	-0.038	-0.039
TO 40	-0.134	-0.096	-0.073	-0.050	-0.045	-0.041	-0.143	-0.105	-0.082	-0.059	-0.054	-0.050
OVER 40	-0.034	-0.034	-0.034	-0.025	-0.029	-0.030	-0.043	-0.043	-0.043	-0.034	-0.038	-0.039
TO 50	-0.134	-0.096	-0.073	-0.050	-0.045	-0.041	-0.143	-0.105	-0.082	-0.059	-0.054	-0.050
OVER 50	-0.041	-0.041	-0.041	-0.030	-0.035	-0.036	-0.053	-0.053	-0.053	-0.042	-0.047	-0.048
TO 65	-0.161	-0.115	-0.087	-0.060	-0.054	-0.049	-0.173	-0.127	-0.099	-0.072	-0.066	-0.061
OVER 65	-0.043	-0.043	-0.043	-0.032	-0.037	-0.038	-0.059	-0.059	-0.059	-0.048	-0.053	-0.054
TO 80	-0.163	-0.117	-0.089	-0.062	-0.056	-0.051	-0.179	-0.133	-0.105	-0.078	-0.072	-0.067
OVER 80	-0.051	-0.051	-0.051	-0.038	-0.044	-0.046	-0.071	-0.071	-0.071	-0.058	-0.064	-0.066
TO 100	-0.191	-0.138	-0.105	-0.073	-0.066	-0.061	-0.211	-0.158	-0.125	-0.093	-0.086	-0.081
OVER 100	-0.054	-0.054	-0.054	-0.041	-0.047	-0.049	-0.079	-0.079	-0.079	-0.066	-0.072	-0.074
TO 120	-0.194	-0.141	-0.108	-0.076	-0.069	-0.064	-0.219	-0.166	-0.133	-0.101	-0.094	-0.089
OVER 120	-0.063	-0.063	-0.063	-0.048	-0.056	-0.057	-0.092	-0.092	-0.092	-0.077	-0.085	-0.086
TO 140	-0.223	-0.163	-0.126	-0.088	-0.081	-0.075	-0.252	-0.192	-0.155	-0.117	-0.110	-0.104
OVER 140	-0.065	-0.065	-0.065	-0.050	-0.058	-0.059	-0.100	-0.100	-0.100	-0.085	-0.093	-0.094
TO 160	-0.225	-0.165	-0.128	-0.090	-0.083	-0.077	-0.260	-0.200	-0.163	-0.125	-0.118	-0.112
OVER 160	-0.068	-0.068	-0.068	-0.053	-0.061	-0.062	-0.108	-0.108	-0.108	-0.093	-0.101	-0.102
TO 180	-0.228	-0.168	-0.131	-0.093	-0.086	-0.080	-0.268	-0.208	-0.171	-0.133	-0.126	-0.120
OVER 180	-0.077	-0.077	-0.077	-0.060	-0.068	-0.071	-0.122	-0.122	-0.122	-0.105	-0.113	-0.116
TO 200	-0.262	-0.192	-0.149	-0.106	-0.097	-0.091	-0.307	-0.237	-0.194	-0.151	-0.142	-0.136
OVER 200	-0.080	-0.080	-0.080	-0.063	-0.071	-0.074	-0.130	-0.130	-0.130	-0.113	-0.121	-0.124
TO 225	-0.265	-0.195	-0.152	-0.109	-0.100	-0.094	-0.315	-0.245	-0.202	-0.159	-0.150	-0.144
OVER 225	-0.084	-0.084	-0.084	-0.067	-0.075	-0.078	-0.140	-0.140	-0.140	-0.123	-0.131	-0.134
TO 250	-0.269	-0.199	-0.156	-0.113	-0.104	-0.098	-0.325	-0.255	-0.212	-0.169	-0.160	-0.154
OVER 250	-0.094	-0.094	-0.094	-0.074	-0.085	-0.087	-0.158	-0.158	-0.158	-0.138	-0.149	-0.151
TO 280	-0.304	-0.224	-0.175	-0.126	-0.117	-0.110	-0.368	-0.288	-0.239	-0.190	-0.181	-0.174
OVER 280	-0.098	-0.098	-0.098	-0.078	-0.089	-0.091	-0.170	-0.170	-0.170	-0.150	-0.161	-0.163
TO 315	-0.308	-0.228	-0.179	-0.130	-0.121	-0.114	-0.380	-0.300	-0.251	-0.202	-0.193	-0.186
OVER 315	-0.108	-0.108	-0.108	-0.087	-0.097	-0.101	-0.190	-0.190	-0.190	-0.169	-0.179	-0.183
TO 355	-0.338	-0.248	-0.197	-0.144	-0.133	-0.126	-0.420	-0.330	-0.279	-0.226	-0.215	-0.208
OVER 355	-0.114	-0.114	-0.114	-0.093	-0.103	-0.107	-0.208	-0.208	-0.208	-0.187	-0.197	-0.201
TO 400	-0.344	-0.254	-0.203	-0.150	-0.139	-0.132	-0.438	-0.348	-0.297	-0.244	-0.233	-0.226
OVER 400	-0.126	-0.126	-0.126	-0.103	-0.113	-0.119	-0.232	-0.232	-0.232	-0.209	-0.219	-0.225
TO 450	-0.376	-0.281	-0.223	-0.166	-0.153	-0.146	-0.482	-0.387	-0.329	-0.272	-0.259	-0.252
OVER 450	-0.132	-0.132	-0.132	-0.109	-0.119	-0.125	-0.252	-0.252	-0.252	-0.229	-0.239	-0.245
TO 500	-0.382	-0.287	-0.229	-0.172	-0.159	-0.152	-0.502	-0.407	-0.349	-0.292	-0.279	-0.272

TABLE 6-15 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (T10 ... T5, U10... U5) (ANSI B4.2)

mm

SIZE	T10	T9	T8	T7	T6	T5	U10	U9	U8	U7	U6	U5	
OVER 0	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED							-0.018	-0.018	-0.018	-0.018	-0.018	-0.018
TO 3								-0.058	-0.043	-0.032	-0.028	-0.024	-0.022
OVER 3								-0.023	-0.023	-0.023	-0.019	-0.020	-0.022
TO 6								-0.071	-0.053	-0.041	-0.031	-0.028	-0.027
OVER 6								-0.028	-0.028	-0.028	-0.022	-0.025	-0.026
TO 10								-0.086	-0.064	-0.050	-0.037	-0.034	-0.032
OVER 10								-0.033	-0.033	-0.033	-0.026	-0.030	-0.030
TO 14								-0.103	-0.076	-0.060	-0.044	-0.041	-0.038
OVER 14								-0.033	-0.033	-0.033	-0.026	-0.030	-0.030
TO 18								-0.103	-0.076	-0.060	-0.044	-0.041	-0.038
OVER 18	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED							-0.041	-0.041	-0.041	-0.033	-0.037	-0.038
TO 24								-0.125	-0.093	-0.074	-0.054	-0.050	-0.047
OVER 24							-0.041	-0.041	-0.041	-0.033	-0.037	-0.038	-0.048
TO 30							-0.125	-0.093	-0.074	-0.054	-0.050	-0.047	-0.132
OVER 30							-0.048	-0.048	-0.048	-0.039	-0.043	-0.044	-0.060
TO 40							-0.148	-0.110	-0.087	-0.064	-0.059	-0.055	-0.160
OVER 40							-0.054	-0.054	-0.054	-0.045	-0.049	-0.050	-0.070
TO 50							-0.154	-0.116	-0.093	-0.070	-0.065	-0.061	-0.170
OVER 50							-0.066	-0.066	-0.066	-0.055	-0.060	-0.061	-0.087
TO 65							-0.186	-0.140	-0.112	-0.085	-0.079	-0.074	-0.207
OVER 65	-0.075	-0.075	-0.075	-0.064	-0.069	-0.070	-0.102						
TO 80	-0.195	-0.149	-0.121	-0.094	-0.088	-0.088	-0.222						
OVER 80	-0.091	-0.091	-0.091	-0.078	-0.084	-0.086	-0.124						
TO 100	-0.231	-0.178	-0.145	-0.113	-0.106	-0.101	-0.264						
OVER 100	-0.104	-0.104	-0.104	-0.091	-0.097	-0.099	-0.144						
TO 120	-0.244	-0.191	-0.158	-0.126	-0.119	-0.114	-0.284						
OVER 120	-0.122	-0.122	-0.122	-0.107	-0.115	-0.116	-0.170						
TO 140	-0.282	-0.222	-0.185	-0.147	-0.140	-0.134	-0.330						
OVER 140	-0.134	-0.134	-0.134	-0.119	-0.127	-0.128	-0.190						
TO 160	-0.294	-0.234	-0.197	-0.159	-0.152	-0.146	-0.350						
OVER 160	-0.146	-0.146	-0.146	-0.131	-0.139	-0.140	-0.210						
TO 180	-0.306	-0.246	-0.209	-0.171	-0.164	-0.158	-0.370						
OVER 180	-0.166	-0.166	-0.166	-0.149	-0.157	-0.160	-0.236						
TO 200	-0.351	-0.281	-0.238	-0.195	-0.186	-0.180	-0.421						
OVER 200	-0.180	-0.180	-0.180	-0.163	-0.171	-0.174	-0.258						
TO 225	-0.365	-0.295	-0.252	-0.209	-0.200	-0.194	-0.443						
OVER 225	-0.196	-0.196	-0.196	-0.179	-0.187	-0.190	-0.284						
TO 250	-0.381	-0.311	-0.268	-0.225	-0.216	-0.210	-0.469						
OVER 250	-0.218	-0.218	-0.218	-0.198	-0.209	-0.211	-0.315						
TO 280	-0.428	-0.348	-0.299	-0.250	-0.241	-0.234	-0.525						
OVER 280	-0.240	-0.240	-0.240	-0.220	-0.231	-0.233	-0.350						
TO 315	-0.450	-0.370	-0.321	-0.272	-0.263	-0.256	-0.560						
OVER 315	-0.268	-0.268	-0.268	-0.247	-0.257	-0.261	-0.390						
TO 355	-0.498	-0.408	-0.357	-0.304	-0.293	-0.286	-0.620						
OVER 355	-0.294	-0.294	-0.294	-0.273	-0.283	-0.287	-0.435						
TO 400	-0.524	-0.434	-0.383	-0.330	-0.319	-0.312	-0.665						
OVER 400	-0.330	-0.330	-0.330	-0.307	-0.317	-0.323	-0.490						
TO 450	-0.580	-0.485	-0.427	-0.370	-0.357	-0.350	-0.740						
OVER 450	-0.360	-0.360	-0.360	-0.337	-0.347	-0.353	-0.540						
TO 500	-0.610	-0.515	-0.457	-0.400	-0.387	-0.380	-0.790						

TABLE 6-16 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (V10 ... V5, X10 ... X5) (ANSI B4.2)

mm

SIZE	V10	V9	V8	V7	V6	V5	X10	X9	X8	X7	X6	X5	
OVER 0	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED.						-0.020	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020
TO 3							-0.060	-0.045	-0.034	-0.030	-0.026	-0.024	
OVER 3							-0.028	-0.028	-0.028	-0.024	-0.025	-0.027	
TO 6							-0.076	-0.058	-0.046	-0.036	-0.033	-0.032	
OVER 6							-0.034	-0.034	-0.034	-0.028	-0.031	-0.032	
TO 10							-0.092	-0.070	-0.056	-0.043	-0.040	-0.038	
OVER 10							-0.040	-0.040	-0.040	-0.033	-0.037	-0.037	
TO 14							-0.110	-0.083	-0.067	-0.051	-0.048	-0.045	
OVER 14							-0.039	-0.039	-0.039	-0.032	-0.036	-0.036	
TO 18							-0.109	-0.082	-0.066	-0.050	-0.047	-0.044	
OVER 18	-0.047	-0.047	-0.047	-0.039	-0.043	-0.044	-0.054	-0.054	-0.054	-0.046	-0.050	-0.051	
TO 24	-0.131	-0.099	-0.080	-0.060	-0.056	-0.053	-0.138	-0.106	-0.087	-0.067	-0.063	-0.060	
OVER 24	-0.055	-0.055	-0.055	-0.047	-0.051	-0.052	-0.064	-0.064	-0.064	-0.056	-0.060	-0.061	
TO 30	-0.139	-0.107	-0.088	-0.068	-0.064	-0.061	-0.148	-0.116	-0.097	-0.077	-0.073	-0.070	
OVER 30	-0.068	-0.068	-0.068	-0.059	-0.063	-0.064	-0.080	-0.080	-0.080	-0.071	-0.075	-0.076	
TO 40	-0.168	-0.130	-0.107	-0.084	-0.079	-0.075	-0.180	-0.142	-0.119	-0.096	-0.091	-0.087	
OVER 40	-0.081	-0.081	-0.081	-0.072	-0.076	-0.077	-0.097	-0.097	-0.097	-0.088	-0.092	-0.093	
TO 50	-0.181	-0.143	-0.120	-0.097	-0.092	-0.088	-0.197	-0.159	-0.136	-0.113	-0.108	-0.104	
OVER 50	-0.102	-0.102	-0.102	-0.091	-0.096	-0.097	-0.122	-0.122	-0.122	-0.111	-0.116	-0.117	
TO 65	-0.222	-0.176	-0.148	-0.121	-0.115	-0.110	-0.242	-0.196	-0.168	-0.141	-0.135	-0.130	
OVER 65	-0.120	-0.120	-0.120	-0.109	-0.114	-0.115	-0.146	-0.146	-0.146	-0.135	-0.140	-0.141	
TO 80	-0.240	-0.194	-0.166	-0.139	-0.133	-0.128	-0.266	-0.220	-0.192	-0.165	-0.159	-0.154	
OVER 80	-0.146	-0.146	-0.146	-0.133	-0.139	-0.141	-0.178	-0.178	-0.178	-0.165	-0.171	-0.173	
TO 100	-0.286	-0.233	-0.200	-0.168	-0.161	-0.156	-0.318	-0.265	-0.232	-0.200	-0.193	-0.188	
OVER 100	-0.172	-0.172	-0.172	-0.159	-0.165	-0.167	-0.210	-0.210	-0.210	-0.197	-0.203	-0.205	
TO 120	-0.312	-0.259	-0.226	-0.194	-0.187	-0.182	-0.350	-0.297	-0.264	-0.232	-0.225	-0.220	
OVER 120	-0.202	-0.202	-0.202	-0.187	-0.195	-0.196	-0.248	-0.248	-0.248	-0.233	-0.241	-0.242	
TO 140	-0.362	-0.302	-0.265	-0.227	-0.220	-0.214	-0.408	-0.348	-0.311	-0.273	-0.266	-0.260	
OVER 140	-0.228	-0.228	-0.228	-0.213	-0.221	-0.222	-0.280	-0.280	-0.280	-0.265	-0.273	-0.274	
TO 160	-0.388	-0.328	-0.291	-0.253	-0.246	-0.240	-0.440	-0.380	-0.343	-0.305	-0.298	-0.292	
OVER 160	-0.252	-0.252	-0.252	-0.237	-0.245	-0.246	-0.310	-0.310	-0.310	-0.295	-0.303	-0.304	
TO 180	-0.412	-0.352	-0.315	-0.277	-0.270	-0.264	-0.470	-0.410	-0.373	-0.335	-0.328	-0.322	
OVER 180	-0.284	-0.284	-0.284	-0.267	-0.275	-0.278	-0.350	-0.350	-0.350	-0.333	-0.341	-0.344	
TO 200	-0.469	-0.399	-0.356	-0.313	-0.304	-0.298	-0.535	-0.465	-0.422	-0.379	-0.370	-0.364	
OVER 200	-0.310	-0.310	-0.310	-0.293	-0.301	-0.304	-0.385	-0.385	-0.385	-0.368	-0.376	-0.379	
TO 225	-0.495	-0.425	-0.382	-0.339	-0.330	-0.324	-0.570	-0.500	-0.457	-0.414	-0.405	-0.399	
OVER 225	-0.340	-0.340	-0.340	-0.323	-0.331	-0.334	-0.425	-0.425	-0.425	-0.408	-0.416	-0.419	
TO 250	-0.525	-0.455	-0.412	-0.369	-0.360	-0.354	-0.610	-0.540	-0.497	-0.454	-0.445	-0.439	
OVER 250	-0.385	-0.385	-0.385	-0.365	-0.376	-0.378	-0.475	-0.475	-0.475	-0.455	-0.466	-0.468	
TO 280	-0.595	-0.515	-0.466	-0.417	-0.408	-0.401	-0.685	-0.605	-0.556	-0.507	-0.498	-0.491	
OVER 280	-0.425	-0.425	-0.425	-0.405	-0.416	-0.418	-0.525	-0.525	-0.525	-0.505	-0.516	-0.518	
TO 315	-0.635	-0.555	-0.506	-0.457	-0.448	-0.441	-0.735	-0.655	-0.606	-0.557	-0.548	-0.541	
OVER 315	-0.475	-0.475	-0.475	-0.454	-0.464	-0.468	-0.590	-0.590	-0.590	-0.569	-0.579	-0.583	
TO 355	-0.705	-0.615	-0.564	-0.511	-0.500	-0.493	-0.820	-0.730	-0.679	-0.626	-0.615	-0.608	
OVER 355	-0.530	-0.530	-0.530	-0.509	-0.519	-0.523	-0.660	-0.660	-0.660	-0.639	-0.649	-0.653	
TO 400	-0.760	-0.670	-0.619	-0.566	-0.555	-0.548	-0.890	-0.800	-0.749	-0.696	-0.685	-0.678	
OVER 400	-0.595	-0.595	-0.595	-0.572	-0.582	-0.588	-0.740	-0.740	-0.740	-0.717	-0.727	-0.733	
TO 450	-0.845	-0.750	-0.692	-0.635	-0.622	-0.615	-0.990	-0.895	-0.837	-0.780	-0.767	-0.760	
OVER 450	-0.660	-0.660	-0.660	-0.637	-0.647	-0.653	-0.820	-0.820	-0.820	-0.797	-0.807	-0.813	
TO 500	-0.910	-0.815	-0.757	-0.700	-0.687	-0.680	-1.070	-0.975	-0.917	-0.860	-0.847	-0.840	

TABLE 6-17 TOLERANCE ZONES - INTERNAL DIMENSIONS (HOLES) (Y10 ... Y5, Z10 ... Z5) (ANSI B4.2)

mm

SIZE	Y10	Y9	Y8	Y7	Y6	Y5	Z10	Z9	Z8	Z7	Z6	Z5	
OVER 0	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED.						-0.026	-0.026	-0.026	-0.026	-0.026	-0.026	-0.026
TO 3							-0.066	-0.051	-0.040	-0.036	-0.032	-0.030	
OVER 3							-0.035	-0.035	-0.035	-0.031	-0.032	-0.034	
TO 6							-0.083	-0.065	-0.053	-0.043	-0.040	-0.039	
OVER 6							-0.042	-0.042	-0.042	-0.036	-0.039	-0.040	
TO 10							-0.100	-0.078	-0.064	-0.051	-0.048	-0.046	
OVER 10							-0.050	-0.050	-0.050	-0.043	-0.047	-0.047	
TO 14							-0.120	-0.093	-0.077	-0.061	-0.058	-0.055	
OVER 14							-0.060	-0.060	-0.060	-0.053	-0.057	-0.057	
TO 18							-0.130	-0.103	-0.087	-0.071	-0.068	-0.065	
OVER 18	-0.063	-0.063	-0.063	-0.055	-0.059	-0.060	-0.073	-0.073	-0.073	-0.065	-0.069	-0.070	
TO 24	-0.147	-0.115	-0.096	-0.076	-0.072	-0.069	-0.157	-0.125	-0.106	-0.086	-0.082	-0.079	
OVER 24	-0.075	-0.075	-0.075	-0.067	-0.071	-0.072	-0.088	-0.088	-0.088	-0.080	-0.084	-0.085	
TO 30	-0.159	-0.127	-0.108	-0.088	-0.084	-0.081	-0.172	-0.140	-0.121	-0.101	-0.097	-0.094	
OVER 30	-0.094	-0.094	-0.094	-0.085	-0.089	-0.090	-0.112	-0.112	-0.112	-0.103	-0.107	-0.108	
TO 40	-0.194	-0.156	-0.133	-0.110	-0.105	-0.101	-0.212	-0.174	-0.151	-0.128	-0.123	-0.119	
OVER 40	-0.114	-0.114	-0.114	-0.105	-0.109	-0.110	-0.136	-0.136	-0.136	-0.127	-0.131	-0.132	
TO 50	-0.214	-0.176	-0.153	-0.130	-0.125	-0.121	-0.236	-0.198	-0.175	-0.152	-0.147	-0.143	
OVER 50	-0.144	-0.144	-0.144	-0.133	-0.138	-0.139	-0.172	-0.172	-0.172	-0.161	-0.166	-0.167	
TO 65	-0.264	-0.218	-0.190	-0.163	-0.157	-0.152	-0.292	-0.246	-0.218	-0.191	-0.185	-0.180	
OVER 65	-0.174	-0.174	-0.174	-0.163	-0.168	-0.169	-0.210	-0.210	-0.210	-0.199	-0.204	-0.205	
TO 80	-0.294	-0.248	-0.220	-0.193	-0.187	-0.182	-0.330	-0.284	-0.256	-0.229	-0.223	-0.218	
OVER 80	-0.214	-0.214	-0.214	-0.201	-0.207	-0.209	-0.258	-0.258	-0.258	-0.245	-0.251	-0.253	
TO 100	-0.354	-0.301	-0.268	-0.236	-0.229	-0.224	-0.398	-0.345	-0.312	-0.280	-0.273	-0.268	
OVER 100	-0.254	-0.254	-0.254	-0.241	-0.247	-0.249	-0.310	-0.310	-0.310	-0.297	-0.303	-0.305	
TO 120	-0.394	-0.341	-0.308	-0.276	-0.269	-0.264	-0.450	-0.397	-0.364	-0.332	-0.325	-0.320	
OVER 120	-0.300	-0.300	-0.300	-0.285	-0.293	-0.294	-0.365	-0.365	-0.365	-0.350	-0.358	-0.359	
TO 140	-0.460	-0.400	-0.363	-0.325	-0.318	-0.312	-0.525	-0.465	-0.428	-0.390	-0.383	-0.377	
OVER 140	-0.340	-0.340	-0.340	-0.325	-0.333	-0.334	-0.415	-0.415	-0.415	-0.400	-0.408	-0.409	
TO 160	-0.500	-0.440	-0.403	-0.365	-0.358	-0.352	-0.575	-0.515	-0.478	-0.440	-0.433	-0.427	
OVER 160	-0.380	-0.380	-0.380	-0.365	-0.373	-0.374	-0.465	-0.465	-0.465	-0.450	-0.458	-0.459	
TO 180	-0.540	-0.480	-0.443	-0.405	-0.398	-0.392	-0.625	-0.565	-0.528	-0.490	-0.483	-0.477	
OVER 180	-0.425	-0.425	-0.425	-0.408	-0.416	-0.419	-0.520	-0.520	-0.520	-0.503	-0.511	-0.514	
TO 200	-0.610	-0.540	-0.497	-0.454	-0.445	-0.439	-0.705	-0.635	-0.592	-0.549	-0.540	-0.534	
OVER 200	-0.470	-0.470	-0.470	-0.453	-0.461	-0.464	-0.575	-0.575	-0.575	-0.558	-0.566	-0.569	
TO 225	-0.655	-0.585	-0.542	-0.499	-0.490	-0.484	-0.760	-0.690	-0.647	-0.604	-0.595	-0.589	
OVER 225	-0.520	-0.520	-0.520	-0.503	-0.511	-0.514	-0.640	-0.640	-0.640	-0.623	-0.631	-0.634	
TO 250	-0.705	-0.635	-0.592	-0.549	-0.540	-0.534	-0.825	-0.755	-0.712	-0.669	-0.660	-0.654	
OVER 250	-0.580	-0.580	-0.580	-0.560	-0.571	-0.573	-0.710	-0.710	-0.710	-0.690	-0.701	-0.703	
TO 280	-0.790	-0.710	-0.661	-0.612	-0.603	-0.596	-0.920	-0.840	-0.791	-0.742	-0.733	-0.726	
OVER 280	-0.650	-0.650	-0.650	-0.630	-0.641	-0.643	-0.790	-0.790	-0.790	-0.770	-0.781	-0.783	
TO 315	-0.860	-0.780	-0.731	-0.682	-0.673	-0.666	-1.000	-0.920	-0.871	-0.822	-0.813	-0.806	
OVER 315	-0.730	-0.730	-0.730	-0.709	-0.719	-0.723	-0.900	-0.900	-0.900	-0.879	-0.889	-0.893	
TO 355	-0.960	-0.870	-0.819	-0.766	-0.755	-0.748	-1.130	-1.040	-0.989	-0.936	-0.925	-0.918	
OVER 355	-0.820	-0.820	-0.820	-0.799	-0.809	-0.813	-1.000	-1.000	-1.000	-0.979	-0.989	-0.993	
TO 400	-1.050	-0.960	-0.909	-0.856	-0.845	-0.838	-1.230	-1.140	-1.089	-1.036	-1.025	-1.018	
OVER 400	-0.920	-0.920	-0.920	-0.897	-0.907	-0.913	-1.100	-1.100	-1.100	-1.077	-1.087	-1.093	
TO 450	-1.170	-1.075	-1.017	-0.960	-0.947	-0.940	-1.350	-1.255	-1.197	-1.140	-1.127	-1.120	
OVER 450	-1.000	-1.000	-1.000	-0.977	-0.987	-0.993	-1.250	-1.250	-1.250	-1.227	-1.237	-1.243	
TO 500	-1.250	-1.155	-1.097	-1.040	-1.027	-1.020	-1.500	-1.405	-1.347	-1.290	-1.277	-1.270	

TABLE 6-18 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (a14 ... a9, b14 ... b9) (ANSI B4.2)

mm

SIZE	a14	a13	a12	a11	a10	a9	b14	b13	b12	b11	b10	b9
OVER 0	-0.270	-0.270	-0.270	-0.270	-0.270	-0.270	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140
TO 3	-0.520	-0.410	-0.370	-0.330	-0.310	-0.295	-0.390	-0.280	-0.240	-0.200	-0.180	-0.165
OVER 3	-0.270	-0.270	-0.270	-0.270	-0.270	-0.270	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140
TO 6	-0.570	-0.450	-0.390	-0.345	-0.318	-0.300	-0.440	-0.320	-0.260	-0.215	-0.188	-0.170
OVER 6	-0.280	-0.280	-0.280	-0.280	-0.280	-0.280	-0.150	-0.150	-0.150	-0.150	-0.150	-0.150
TO 10	-0.640	-0.500	-0.430	-0.370	-0.338	-0.316	-0.510	-0.370	-0.300	-0.240	-0.208	-0.186
OVER 10	-0.290	-0.290	-0.290	-0.290	-0.290	-0.290	-0.150	-0.150	-0.150	-0.150	-0.150	-0.150
TO 14	-0.720	-0.560	-0.470	-0.400	-0.360	-0.333	-0.580	-0.420	-0.330	-0.260	-0.220	-0.193
OVER 14	-0.290	-0.290	-0.290	-0.290	-0.290	-0.290	-0.150	-0.150	-0.150	-0.150	-0.150	-0.150
TO 18	-0.720	-0.560	-0.470	-0.400	-0.360	-0.333	-0.580	-0.420	-0.330	-0.260	-0.220	-0.193
OVER 18	-0.300	-0.300	-0.300	-0.300	-0.300	-0.300	-0.160	-0.160	-0.160	-0.160	-0.160	-0.160
TO 24	-0.820	-0.630	-0.510	-0.430	-0.384	-0.352	-0.680	-0.490	-0.370	-0.290	-0.244	-0.212
OVER 24	-0.300	-0.300	-0.300	-0.300	-0.300	-0.300	-0.160	-0.160	-0.160	-0.160	-0.160	-0.160
TO 30	-0.820	-0.630	-0.510	-0.430	-0.384	-0.352	-0.680	-0.490	-0.370	-0.290	-0.244	-0.212
OVER 30	-0.310	-0.310	-0.310	-0.310	-0.310	-0.310	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170
TO 40	-0.930	-0.700	-0.560	-0.470	-0.410	-0.372	-0.790	-0.560	-0.420	-0.330	-0.270	-0.232
OVER 40	-0.320	-0.320	-0.320	-0.320	-0.320	-0.320	-0.180	-0.180	-0.180	-0.180	-0.180	-0.180
TO 50	-0.940	-0.710	-0.570	-0.480	-0.420	-0.382	-0.800	-0.570	-0.430	-0.340	-0.280	-0.242
OVER 50	-0.340	-0.340	-0.340	-0.340	-0.340	-0.340	-0.190	-0.190	-0.190	-0.190	-0.190	-0.190
TO 65	-1.080	-0.800	-0.640	-0.530	-0.460	-0.414	-0.930	-0.650	-0.490	-0.380	-0.310	-0.264
OVER 65	-0.360	-0.360	-0.360	-0.360	-0.360	-0.360	-0.200	-0.200	-0.200	-0.200	-0.200	-0.200
TO 80	-1.100	-0.820	-0.660	-0.550	-0.480	-0.434	-0.940	-0.660	-0.500	-0.390	-0.320	-0.274
OVER 80	-0.380	-0.380	-0.380	-0.380	-0.380	-0.380	-0.220	-0.220	-0.220	-0.220	-0.220	-0.220
TO 100	-1.250	-0.920	-0.730	-0.600	-0.520	-0.467	-1.090	-0.760	-0.570	-0.440	-0.360	-0.307
OVER 100	-0.410	-0.410	-0.410	-0.410	-0.410	-0.410	-0.240	-0.240	-0.240	-0.240	-0.240	-0.240
TO 120	-1.280	-0.950	-0.760	-0.630	-0.550	-0.497	-1.110	-0.780	-0.590	-0.460	-0.380	-0.327
OVER 120	-0.460	-0.460	-0.460	-0.460	-0.460	-0.460	-0.260	-0.260	-0.260	-0.260	-0.260	-0.260
TO 140	-1.460	-1.090	-0.860	-0.710	-0.620	-0.560	-1.260	-0.890	-0.660	-0.510	-0.420	-0.360
OVER 140	-0.520	-0.520	-0.520	-0.520	-0.520	-0.520	-0.280	-0.280	-0.280	-0.280	-0.280	-0.280
TO 160	-1.520	-1.150	-0.920	-0.770	-0.680	-0.620	-1.280	-0.910	-0.680	-0.530	-0.440	-0.380
OVER 160	-0.580	-0.580	-0.580	-0.580	-0.580	-0.580	-0.310	-0.310	-0.310	-0.310	-0.310	-0.310
TO 180	-1.580	-1.210	-0.980	-0.830	-0.740	-0.680	-1.310	-0.940	-0.710	-0.560	-0.470	-0.410
OVER 180	-0.660	-0.660	-0.660	-0.660	-0.660	-0.660	-0.340	-0.340	-0.340	-0.340	-0.340	-0.340
TO 200	-1.810	-1.380	-1.120	-0.950	-0.845	-0.775	-1.490	-1.060	-0.800	-0.630	-0.525	-0.455
OVER 200	-0.740	-0.740	-0.740	-0.740	-0.740	-0.740	-0.380	-0.380	-0.380	-0.380	-0.380	-0.380
TO 225	-1.890	-1.460	-1.200	-1.030	-0.925	-0.855	-1.530	-1.100	-0.840	-0.670	-0.565	-0.495
OVER 225	-0.820	-0.820	-0.820	-0.820	-0.820	-0.820	-0.420	-0.420	-0.420	-0.420	-0.420	-0.420
TO 250	-1.970	-1.540	-1.280	-1.110	-1.005	-0.935	-1.570	-1.140	-0.880	-0.710	-0.605	-0.535
OVER 250	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.480	-0.480	-0.480	-0.480	-0.480	-0.480
TO 280	-2.220	-1.730	-1.440	-1.240	-1.130	-1.050	-1.780	-1.290	-1.000	-0.800	-0.690	-0.610
OVER 280	-1.050	-1.050	-1.050	-1.050	-1.050	-1.050	-0.540	-0.540	-0.540	-0.540	-0.540	-0.540
TO 315	-2.350	-1.860	-1.570	-1.370	-1.260	-1.180	-1.840	-1.350	-1.060	-0.860	-0.750	-0.670
OVER 315	-1.200	-1.200	-1.200	-1.200	-1.200	-1.200	-0.600	-0.600	-0.600	-0.600	-0.600	-0.600
TO 355	-2.600	-2.090	-1.770	-1.560	-1.430	-1.340	-2.000	-1.490	-1.170	-0.960	-0.830	-0.740
OVER 355	-1.350	-1.350	-1.350	-1.350	-1.350	-1.350	-0.680	-0.680	-0.680	-0.680	-0.680	-0.680
TO 400	-2.750	-2.240	-1.920	-1.710	-1.580	-1.490	-2.080	-1.570	-1.250	-1.040	-0.910	-0.820
OVER 400	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500	-0.760	-0.760	-0.760	-0.760	-0.760	-0.760
TO 450	-3.050	-2.470	-2.130	-1.900	-1.750	-1.655	-2.310	-1.730	-1.390	-1.160	-1.010	-0.915
OVER 450	-1.650	-1.650	-1.650	-1.650	-1.650	-1.650	-0.840	-0.840	-0.840	-0.840	-0.840	-0.840
TO 500	-3.200	-2.620	-2.280	-2.050	-1.900	-1.805	-2.390	-1.810	-1.470	-1.240	-1.090	-0.995

TABLE 6-19 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (c13 ... c8, d12 ... d7) (ANSI B4.2)

mm

SIZE		c13	c12	c11	c10	c9	c8	d12	d11	d10	d9	d8	d7
OVER	0	-0.060	-0.060	-0.060	-0.060	-0.060	-0.060	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020
TO	3	-0.200	-0.160	-0.120	-0.100	-0.085	-0.074	-0.120	-0.080	-0.060	-0.045	-0.034	-0.030
OVER	3	-0.070	-0.070	-0.070	-0.070	-0.070	-0.070	-0.030	-0.030	-0.030	-0.030	-0.030	-0.030
TO	6	-0.250	-0.190	-0.145	-0.118	-0.100	-0.088	-0.150	-0.105	-0.078	-0.060	-0.048	-0.042
OVER	6	-0.080	-0.080	-0.080	-0.080	-0.080	-0.080	-0.040	-0.040	-0.040	-0.040	-0.040	-0.040
TO	10	-0.300	-0.230	-0.170	-0.138	-0.116	-0.102	-0.190	-0.130	-0.098	-0.076	-0.062	-0.055
OVER	10	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
TO	14	-0.365	-0.275	-0.205	-0.165	-0.138	-0.122	-0.230	-0.160	-0.120	-0.093	-0.077	-0.068
OVER	14	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
TO	18	-0.365	-0.275	-0.205	-0.165	-0.138	-0.122	-0.230	-0.160	-0.120	-0.093	-0.077	-0.068
OVER	18	-0.110	-0.110	-0.110	-0.110	-0.110	-0.110	-0.065	-0.065	-0.065	-0.065	-0.065	-0.065
TO	24	-0.440	-0.320	-0.240	-0.194	-0.162	-0.143	-0.275	-0.195	-0.149	-0.117	-0.098	-0.086
OVER	24	-0.110	-0.110	-0.110	-0.110	-0.110	-0.110	-0.065	-0.065	-0.065	-0.065	-0.065	-0.065
TO	30	-0.440	-0.320	-0.240	-0.194	-0.162	-0.143	-0.275	-0.195	-0.149	-0.117	-0.098	-0.086
OVER	30	-0.120	-0.120	-0.120	-0.120	-0.120	-0.120	-0.080	-0.080	-0.080	-0.080	-0.080	-0.080
TO	40	-0.510	-0.370	-0.280	-0.220	-0.182	-0.159	-0.330	-0.240	-0.180	-0.142	-0.119	-0.105
OVER	40	-0.130	-0.130	-0.130	-0.130	-0.130	-0.130	-0.080	-0.080	-0.080	-0.080	-0.080	-0.080
TO	50	-0.520	-0.380	-0.290	-0.230	-0.192	-0.169	-0.330	-0.240	-0.180	-0.142	-0.119	-0.105
OVER	50	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100
TO	65	-0.600	-0.440	-0.330	-0.260	-0.214	-0.186	-0.400	-0.290	-0.220	-0.174	-0.146	-0.130
OVER	65	-0.150	-0.150	-0.150	-0.150	-0.150	-0.150	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100
TO	80	-0.610	-0.450	-0.340	-0.270	-0.224	-0.196	-0.400	-0.290	-0.220	-0.174	-0.146	-0.130
OVER	80	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170	-0.120	-0.120	-0.120	-0.120	-0.120	-0.120
TO	100	-0.710	-0.520	-0.390	-0.310	-0.257	-0.224	-0.470	-0.340	-0.260	-0.207	-0.174	-0.155
OVER	100	-0.180	-0.180	-0.180	-0.180	-0.180	-0.180	-0.120	-0.120	-0.120	-0.120	-0.120	-0.120
TO	120	-0.720	-0.530	-0.400	-0.320	-0.267	-0.234	-0.470	-0.340	-0.260	-0.207	-0.174	-0.155
OVER	120	-0.200	-0.200	-0.200	-0.200	-0.200	-0.200	-0.145	-0.145	-0.145	-0.145	-0.145	-0.145
TO	140	-0.830	-0.600	-0.450	-0.360	-0.300	-0.263	-0.545	-0.395	-0.305	-0.245	-0.208	-0.185
OVER	140	-0.210	-0.210	-0.210	-0.210	-0.210	-0.210	-0.145	-0.145	-0.145	-0.145	-0.145	-0.145
TO	160	-0.840	-0.610	-0.460	-0.370	-0.310	-0.273	-0.545	-0.395	-0.305	-0.245	-0.208	-0.185
OVER	160	-0.230	-0.230	-0.230	-0.230	-0.230	-0.230	-0.145	-0.145	-0.145	-0.145	-0.145	-0.145
TO	180	-0.860	-0.630	-0.480	-0.390	-0.330	-0.293	-0.545	-0.395	-0.305	-0.245	-0.208	-0.185
OVER	180	-0.240	-0.240	-0.240	-0.240	-0.240	-0.240	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170
TO	200	-0.960	-0.700	-0.530	-0.425	-0.355	-0.312	-0.630	-0.460	-0.355	-0.285	-0.242	-0.216
OVER	200	-0.260	-0.260	-0.260	-0.260	-0.260	-0.260	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170
TO	225	-0.980	-0.720	-0.550	-0.445	-0.375	-0.332	-0.630	-0.460	-0.355	-0.285	-0.242	-0.216
OVER	225	-0.280	-0.280	-0.280	-0.280	-0.280	-0.280	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170
TO	250	-1.000	-0.740	-0.570	-0.465	-0.395	-0.352	-0.630	-0.460	-0.355	-0.285	-0.242	-0.216
OVER	250	-0.300	-0.300	-0.300	-0.300	-0.300	-0.300	-0.190	-0.190	-0.190	-0.190	-0.190	-0.190
TO	280	-1.110	-0.820	-0.620	-0.510	-0.430	-0.381	-0.710	-0.510	-0.400	-0.320	-0.271	-0.242
OVER	280	-0.330	-0.330	-0.330	-0.330	-0.330	-0.330	-0.190	-0.190	-0.190	-0.190	-0.190	-0.190
TO	315	-1.140	-0.850	-0.650	-0.540	-0.460	-0.411	-0.710	-0.510	-0.400	-0.320	-0.271	-0.242
OVER	315	-0.360	-0.360	-0.360	-0.360	-0.360	-0.360	-0.210	-0.210	-0.210	-0.210	-0.210	-0.210
TO	355	-1.250	-0.930	-0.720	-0.590	-0.500	-0.449	-0.780	-0.570	-0.440	-0.350	-0.299	-0.267
OVER	355	-0.400	-0.400	-0.400	-0.400	-0.400	-0.400	-0.210	-0.210	-0.210	-0.210	-0.210	-0.210
TO	400	-1.290	-0.970	-0.760	-0.630	-0.540	-0.489	-0.780	-0.570	-0.440	-0.350	-0.299	-0.267
OVER	400	-0.440	-0.440	-0.440	-0.440	-0.440	-0.440	-0.230	-0.230	-0.230	-0.230	-0.230	-0.230
TO	450	-1.410	-1.070	-0.840	-0.690	-0.595	-0.537	-0.860	-0.630	-0.480	-0.385	-0.327	-0.293
OVER	450	-0.480	-0.480	-0.480	-0.480	-0.480	-0.480	-0.230	-0.230	-0.230	-0.230	-0.230	-0.230
TO	500	-1.450	-1.110	-0.880	-0.730	-0.635	-0.577	-0.860	-0.630	-0.480	-0.385	-0.327	-0.293

TABLE 6-20 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (e11 ... e6, f10 ... f5) (ANSI B4.2)

mm

SIZE	e11	e10	e9	e8	e7	e6	f10	f9	f8	f7	f6	f5
OVER 0	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
TO 3	-0.074	-0.054	-0.039	-0.028	-0.024	-0.020	-0.046	-0.031	-0.020	-0.016	-0.012	-0.010
OVER 3	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
TO 6	-0.095	-0.068	-0.050	-0.038	-0.032	-0.028	-0.058	-0.040	-0.028	-0.022	-0.018	-0.015
OVER 6	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.013	-0.013	-0.013	-0.013	-0.013	-0.013
TO 10	-0.115	-0.083	-0.061	-0.047	-0.040	-0.034	-0.071	-0.049	-0.035	-0.028	-0.022	-0.019
OVER 10	-0.032	-0.032	-0.032	-0.032	-0.032	-0.032	-0.016	-0.016	-0.016	-0.016	-0.016	-0.016
TO 14	-0.142	-0.102	-0.075	-0.059	-0.050	-0.043	-0.086	-0.059	-0.043	-0.034	-0.027	-0.024
OVER 14	-0.032	-0.032	-0.032	-0.032	-0.032	-0.032	-0.016	-0.016	-0.016	-0.016	-0.016	-0.016
TO 18	-0.142	-0.102	-0.075	-0.059	-0.050	-0.043	-0.086	-0.059	-0.043	-0.034	-0.027	-0.024
OVER 18	-0.040	-0.040	-0.040	-0.040	-0.040	-0.040	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020
TO 24	-0.170	-0.124	-0.092	-0.073	-0.061	-0.053	-0.104	-0.072	-0.053	-0.041	-0.033	-0.029
OVER 24	-0.040	-0.040	-0.040	-0.040	-0.040	-0.040	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020
TO 30	-0.170	-0.124	-0.092	-0.073	-0.061	-0.053	-0.104	-0.072	-0.053	-0.041	-0.033	-0.029
OVER 30	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025
TO 40	-0.210	-0.150	-0.112	-0.089	-0.075	-0.066	-0.125	-0.087	-0.064	-0.050	-0.041	-0.036
OVER 40	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025
TO 50	-0.210	-0.150	-0.112	-0.089	-0.075	-0.066	-0.125	-0.087	-0.064	-0.050	-0.041	-0.036
OVER 50	-0.060	-0.060	-0.060	-0.060	-0.060	-0.060	-0.030	-0.030	-0.030	-0.030	-0.030	-0.030
TO 65	-0.250	-0.180	-0.134	-0.106	-0.090	-0.079	-0.150	-0.104	-0.076	-0.060	-0.049	-0.043
OVER 65	-0.060	-0.060	-0.060	-0.060	-0.060	-0.060	-0.030	-0.030	-0.030	-0.030	-0.030	-0.030
TO 80	-0.250	-0.180	-0.134	-0.106	-0.090	-0.079	-0.150	-0.104	-0.076	-0.060	-0.049	-0.043
OVER 80	-0.072	-0.072	-0.072	-0.072	-0.072	-0.072	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036
TO 100	-0.292	-0.212	-0.159	-0.126	-0.107	-0.094	-0.176	-0.123	-0.090	-0.071	-0.058	-0.051
OVER 100	-0.072	-0.072	-0.072	-0.072	-0.072	-0.072	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036
TO 120	-0.292	-0.212	-0.159	-0.126	-0.107	-0.094	-0.176	-0.123	-0.090	-0.071	-0.058	-0.051
OVER 120	-0.085	-0.085	-0.085	-0.085	-0.085	-0.085	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043
TO 140	-0.335	-0.245	-0.185	-0.148	-0.125	-0.110	-0.203	-0.143	-0.106	-0.083	-0.068	-0.061
OVER 140	-0.085	-0.085	-0.085	-0.085	-0.085	-0.085	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043
TO 160	-0.335	-0.245	-0.185	-0.148	-0.125	-0.110	-0.203	-0.143	-0.106	-0.083	-0.068	-0.061
OVER 160	-0.085	-0.085	-0.085	-0.085	-0.085	-0.085	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043
TO 180	-0.335	-0.245	-0.185	-0.148	-0.125	-0.110	-0.203	-0.143	-0.106	-0.083	-0.068	-0.061
OVER 180	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
TO 200	-0.390	-0.285	-0.215	-0.172	-0.146	-0.129	-0.235	-0.165	-0.122	-0.096	-0.079	-0.070
OVER 200	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
TO 225	-0.390	-0.285	-0.215	-0.172	-0.146	-0.129	-0.235	-0.165	-0.122	-0.096	-0.079	-0.070
OVER 225	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
TO 250	-0.390	-0.285	-0.215	-0.172	-0.146	-0.129	-0.235	-0.165	-0.122	-0.096	-0.079	-0.070
OVER 250	-0.110	-0.110	-0.110	-0.110	-0.110	-0.110	-0.056	-0.056	-0.056	-0.056	-0.056	-0.056
TO 280	-0.430	-0.320	-0.240	-0.191	-0.162	-0.142	-0.266	-0.186	-0.137	-0.108	-0.088	-0.079
OVER 280	-0.110	-0.110	-0.110	-0.110	-0.110	-0.110	-0.056	-0.056	-0.056	-0.056	-0.056	-0.056
TO 315	-0.430	-0.320	-0.240	-0.191	-0.162	-0.142	-0.266	-0.186	-0.137	-0.108	-0.088	-0.079
OVER 315	-0.125	-0.125	-0.125	-0.125	-0.125	-0.125	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
TO 355	-0.485	-0.355	-0.265	-0.214	-0.182	-0.161	-0.292	-0.202	-0.151	-0.119	-0.098	-0.087
OVER 355	-0.125	-0.125	-0.125	-0.125	-0.125	-0.125	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
TO 400	-0.485	-0.355	-0.265	-0.214	-0.182	-0.161	-0.292	-0.202	-0.151	-0.119	-0.098	-0.087
OVER 400	-0.135	-0.135	-0.135	-0.135	-0.135	-0.135	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068
TO 450	-0.535	-0.385	-0.290	-0.232	-0.198	-0.175	-0.318	-0.223	-0.165	-0.131	-0.108	-0.095
OVER 450	-0.135	-0.135	-0.135	-0.135	-0.135	-0.135	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068
TO 500	-0.535	-0.385	-0.290	-0.232	-0.198	-0.175	-0.318	-0.223	-0.165	-0.131	-0.108	-0.095

TABLE 6-21 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (g9 ... g4, j7 ... j5) (ANSI B4.2)

mm

SIZE		g9	g8	g7	g6	g5	g4	j7	j6	j5
OVER	0	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	0.006	0.004	0.002
TO	3	-0.027	-0.016	-0.012	-0.008	-0.006	-0.005	-0.004	-0.002	-0.002
OVER	3	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	0.008	0.006	0.003
TO	6	-0.034	-0.022	-0.016	-0.012	-0.009	-0.008	-0.004	-0.002	-0.002
OVER	6	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	0.010	0.007	0.004
TO	10	-0.041	-0.027	-0.020	-0.014	-0.011	-0.009	-0.005	-0.002	-0.002
OVER	10	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006	0.012	0.008	0.005
TO	14	-0.049	-0.033	-0.024	-0.017	-0.014	-0.011	-0.006	-0.003	-0.003
OVER	14	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006	0.012	0.008	0.005
TO	18	-0.049	-0.033	-0.024	-0.017	-0.014	-0.011	-0.006	-0.003	-0.003
OVER	18	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007	0.013	0.009	0.005
TO	24	-0.059	-0.040	-0.028	-0.020	-0.016	-0.013	-0.008	-0.004	-0.004
OVER	24	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007	0.013	0.009	0.005
TO	30	-0.059	-0.040	-0.028	-0.020	-0.016	-0.013	-0.008	-0.004	-0.004
OVER	30	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	0.015	0.011	0.006
TO	40	-0.071	-0.048	-0.034	-0.025	-0.020	-0.016	-0.010	-0.005	-0.005
OVER	40	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	0.015	0.011	0.006
TO	50	-0.071	-0.048	-0.034	-0.025	-0.020	-0.016	-0.010	-0.005	-0.005
OVER	50	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	0.018	0.012	0.006
TO	65	-0.084	-0.056	-0.040	-0.029	-0.023	-0.018	-0.012	-0.007	-0.007
OVER	65	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	0.018	0.012	0.006
TO	80	-0.084	-0.056	-0.040	-0.029	-0.023	-0.018	-0.012	-0.007	-0.007
OVER	80	-0.012	-0.012	-0.012	-0.012	-0.012	-0.012	0.020	0.013	0.006
TO	100	-0.099	-0.066	-0.047	-0.034	-0.027	-0.022	-0.015	-0.009	-0.009
OVER	100	-0.012	-0.012	-0.012	-0.012	-0.012	-0.012	0.020	0.013	0.006
TO	120	-0.099	-0.066	-0.047	-0.034	-0.027	-0.022	-0.015	-0.009	-0.009
OVER	120	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014	0.022	0.014	0.007
TO	140	-0.114	-0.077	-0.054	-0.039	-0.032	-0.026	-0.018	-0.011	-0.011
OVER	140	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014	0.022	0.014	0.007
TO	160	-0.114	-0.077	-0.054	-0.039	-0.032	-0.026	-0.018	-0.011	-0.011
OVER	160	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014	0.022	0.014	0.007
TO	180	-0.114	-0.077	-0.054	-0.039	-0.032	-0.026	-0.018	-0.011	-0.011
OVER	180	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	0.025	0.016	0.007
TO	200	-0.130	-0.087	-0.061	-0.044	-0.035	-0.029	-0.021	-0.013	-0.013
OVER	200	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	0.025	0.016	0.007
TO	225	-0.130	-0.087	-0.061	-0.044	-0.035	-0.029	-0.021	-0.013	-0.013
OVER	225	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	0.025	0.016	0.007
TO	250	-0.130	-0.087	-0.061	-0.044	-0.035	-0.029	-0.021	-0.013	-0.013
OVER	250	-0.017	-0.017	-0.017	-0.017	-0.017	-0.017	0.026	0.016	0.007
TO	280	-0.147	-0.098	-0.069	-0.049	-0.040	-0.033	-0.026	-0.016	-0.016
OVER	280	-0.017	-0.017	-0.017	-0.017	-0.017	-0.017	0.026	0.016	0.007
TO	315	-0.147	-0.098	-0.069	-0.049	-0.040	-0.033	-0.026	-0.016	-0.016
OVER	315	-0.018	-0.018	-0.018	-0.018	-0.018	-0.018	0.029	0.018	0.007
TO	355	-0.158	-0.107	-0.075	-0.054	-0.043	-0.036	-0.028	-0.018	-0.018
OVER	355	-0.018	-0.018	-0.018	-0.018	-0.018	-0.018	0.029	0.018	0.007
TO	400	-0.158	-0.107	-0.075	-0.054	-0.043	-0.036	-0.028	-0.018	-0.018
OVER	400	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020	0.031	0.020	0.007
TO	450	-0.175	-0.117	-0.083	-0.060	-0.047	-0.040	-0.032	-0.020	-0.020
OVER	450	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020	0.031	0.020	0.007
TO	500	-0.175	-0.117	-0.083	-0.060	-0.047	-0.040	-0.032	-0.020	-0.020

TABLE 6-22 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (h16 ... h1) (ANSI B4.2)

mm

SIZE	h16	h15	h14	h13	h12	h11	h10	h9	h8	h7	h6	h5	h4	h3	h2	h1
OVER 0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 3	-0.600	-0.400	-0.250	-0.140	-0.100	-0.060	-0.040	-0.025	-0.014	-0.010	-0.006	-0.004	-0.003	-0.002	-0.0012	-0.0008
OVER 3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 6	-0.750	-0.480	-0.300	-0.180	-0.120	-0.075	-0.048	-0.030	-0.018	-0.012	-0.008	-0.005	-0.004	-0.003	-0.0015	-0.0010
OVER 6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 10	-0.900	-0.580	-0.360	-0.220	-0.150	-0.090	-0.058	-0.036	-0.022	-0.015	-0.009	-0.006	-0.004	-0.003	-0.0015	-0.0010
OVER 10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 14	-1.100	-0.700	-0.430	-0.270	-0.180	-0.110	-0.070	-0.043	-0.027	-0.018	-0.011	-0.008	-0.005	-0.003	-0.0020	-0.0012
OVER 14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 18	-1.100	-0.700	-0.430	-0.270	-0.180	-0.110	-0.070	-0.043	-0.027	-0.018	-0.011	-0.008	-0.005	-0.003	-0.0020	-0.0012
OVER 18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 24	-1.300	-0.840	-0.520	-0.330	-0.210	-0.130	-0.084	-0.052	-0.033	-0.021	-0.013	-0.009	-0.006	-0.004	-0.0025	-0.0015
OVER 24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 30	-1.300	-0.840	-0.520	-0.330	-0.210	-0.130	-0.084	-0.052	-0.033	-0.021	-0.013	-0.009	-0.006	-0.004	-0.0025	-0.0015
OVER 30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 40	-1.600	-1.000	-0.620	-0.390	-0.250	-0.160	-0.100	-0.062	-0.039	-0.025	-0.016	-0.011	-0.007	-0.004	-0.0025	-0.0015
OVER 40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 50	-1.600	-1.000	-0.620	-0.390	-0.250	-0.160	-0.100	-0.062	-0.039	-0.025	-0.016	-0.011	-0.007	-0.004	-0.0025	-0.0015
OVER 50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 65	-1.900	-1.200	-0.740	-0.460	-0.300	-0.190	-0.120	-0.074	-0.046	-0.030	-0.019	-0.013	-0.008	-0.005	-0.0030	-0.0020
OVER 65	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 80	-1.900	-1.200	-0.740	-0.460	-0.300	-0.190	-0.120	-0.074	-0.046	-0.030	-0.019	-0.013	-0.008	-0.005	-0.0030	-0.0020
OVER 80	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 100	-2.200	-1.400	-0.870	-0.540	-0.350	-0.220	-0.140	-0.087	-0.054	-0.035	-0.022	-0.015	-0.010	-0.006	-0.0040	-0.0025
OVER 100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 120	-2.200	-1.400	-0.870	-0.540	-0.350	-0.220	-0.140	-0.087	-0.054	-0.035	-0.022	-0.015	-0.010	-0.006	-0.0040	-0.0025
OVER 120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 140	-2.500	-1.600	-1.000	-0.630	-0.400	-0.250	-0.160	-0.100	-0.063	-0.040	-0.025	-0.018	-0.012	-0.008	-0.0050	-0.0035
OVER 140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 160	-2.500	-1.600	-1.000	-0.630	-0.400	-0.250	-0.160	-0.100	-0.063	-0.040	-0.025	-0.018	-0.012	-0.008	-0.0050	-0.0035
OVER 160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 180	-2.500	-1.600	-1.000	-0.630	-0.400	-0.250	-0.160	-0.100	-0.063	-0.040	-0.025	-0.018	-0.012	-0.008	-0.0050	-0.0035
OVER 180	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 200	-2.900	-1.850	-1.150	-0.720	-0.460	-0.290	-0.185	-0.115	-0.072	-0.046	-0.029	-0.020	-0.014	-0.010	-0.0070	-0.0045
OVER 200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 225	-2.900	-1.850	-1.150	-0.720	-0.460	-0.290	-0.185	-0.115	-0.072	-0.046	-0.029	-0.020	-0.014	-0.010	-0.0070	-0.0045
OVER 225	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 250	-2.900	-1.850	-1.150	-0.720	-0.460	-0.290	-0.185	-0.115	-0.072	-0.046	-0.029	-0.020	-0.014	-0.010	-0.0070	-0.0045
OVER 250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 280	-3.200	-2.100	-1.300	-0.810	-0.520	-0.320	-0.210	-0.130	-0.081	-0.052	-0.032	-0.023	-0.016	-0.012	-0.0080	-0.0060
OVER 280	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 315	-3.200	-2.100	-1.300	-0.810	-0.520	-0.320	-0.210	-0.130	-0.081	-0.052	-0.032	-0.023	-0.016	-0.012	-0.0080	-0.0060
OVER 315	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 355	-3.600	-2.300	-1.400	-0.890	-0.570	-0.360	-0.230	-0.140	-0.089	-0.057	-0.036	-0.025	-0.018	-0.013	-0.0090	-0.0070
OVER 355	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 400	-3.600	-2.300	-1.400	-0.890	-0.570	-0.360	-0.230	-0.140	-0.089	-0.057	-0.036	-0.025	-0.018	-0.013	-0.0090	-0.0070
OVER 400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 450	-4.000	-2.500	-1.550	-0.970	-0.630	-0.400	-0.250	-0.155	-0.097	-0.063	-0.040	-0.027	-0.020	-0.015	-0.0100	-0.0080
OVER 450	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000
TO 500	-4.000	-2.500	-1.550	-0.970	-0.630	-0.400	-0.250	-0.155	-0.097	-0.063	-0.040	-0.027	-0.020	-0.015	-0.0100	-0.0080

TABLE 6-23 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (js16 ... js1) (ANSI B4.2)

mm

SIZE	js16	js15	js14	js13	js12	js11	js10	js9	js8	js7	js6	js5	js4	js3	js2	js1
OVER 0	0.300	0.200	0.125	0.070	0.050	0.030	0.0200	0.0125	0.0070	0.0050	0.0030	0.0020	0.0015	0.00100	0.00060	0.00040
TO 3	-0.300	-0.200	-0.125	-0.070	-0.050	-0.030	-0.0200	-0.0125	-0.0070	-0.0050	-0.0030	-0.0020	-0.0015	-0.00100	-0.00060	-0.00040
OVER 3	0.375	0.240	0.150	0.090	0.060	0.0375	0.0240	0.0150	0.0090	0.0060	0.0040	0.0025	0.0020	0.00125	0.00075	0.00050
TO 6	-0.375	-0.240	-0.150	-0.090	-0.060	-0.0375	-0.0240	-0.0150	-0.0090	-0.0060	-0.0040	-0.0025	-0.0020	-0.00125	-0.00075	-0.00050
OVER 6	0.450	0.290	0.180	0.110	0.075	0.045	0.0290	0.0180	0.0110	0.0075	0.0045	0.0030	0.0020	0.00125	0.00075	0.00050
TO 10	-0.450	-0.290	-0.180	-0.110	-0.075	-0.045	-0.0290	-0.0180	-0.0110	-0.0075	-0.0045	-0.0030	-0.0020	-0.00125	-0.00075	-0.00050
OVER 10	0.550	0.350	0.215	0.135	0.090	0.055	0.0350	0.0215	0.0135	0.0090	0.0055	0.0040	0.0025	0.00150	0.00100	0.00060
TO 14	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.0350	-0.0215	-0.0135	-0.0090	-0.0055	-0.0040	-0.0025	-0.00150	-0.00100	-0.00060
OVER 14	0.550	0.350	0.215	0.135	0.090	0.055	0.0350	0.0215	0.0135	0.0090	0.0055	0.0040	0.0025	0.00150	0.00100	0.00060
TO 18	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.0350	-0.0215	-0.0135	-0.0090	-0.0055	-0.0040	-0.0025	-0.00150	-0.00100	-0.00060
OVER 18	0.650	0.420	0.260	0.165	0.105	0.065	0.0420	0.0260	0.0165	0.0105	0.0065	0.0045	0.0030	0.00200	0.00125	0.00075
TO 24	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.0420	-0.0260	-0.0165	-0.0105	-0.0065	-0.0045	-0.0030	-0.00200	-0.00125	-0.00075
OVER 24	0.650	0.420	0.260	0.165	0.105	0.065	0.0420	0.0260	0.0165	0.0105	0.0065	0.0045	0.0030	0.00200	0.00125	0.00075
TO 30	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.0420	-0.0260	-0.0165	-0.0105	-0.0065	-0.0045	-0.0030	-0.00200	-0.00125	-0.00075
OVER 30	0.800	0.500	0.310	0.195	0.125	0.080	0.0500	0.0310	0.0195	0.0125	0.0080	0.0055	0.0035	0.00200	0.00125	0.00075
TO 40	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.0500	-0.0310	-0.0195	-0.0125	-0.0080	-0.0055	-0.0035	-0.00200	-0.00125	-0.00075
OVER 40	0.800	0.500	0.310	0.195	0.125	0.080	0.0500	0.0310	0.0195	0.0125	0.0080	0.0055	0.0035	0.00200	0.00125	0.00075
TO 50	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.0500	-0.0310	-0.0195	-0.0125	-0.0080	-0.0055	-0.0035	-0.00200	-0.00125	-0.00075
OVER 50	0.950	0.600	0.370	0.230	0.150	0.095	0.0600	0.0370	0.0230	0.0150	0.0095	0.0065	0.0040	0.00250	0.00150	0.00100
TO 65	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.0600	-0.0370	-0.0230	-0.0150	-0.0095	-0.0065	-0.0040	-0.00250	-0.00150	-0.00100
OVER 65	0.950	0.600	0.370	0.230	0.150	0.095	0.0600	0.0370	0.0230	0.0150	0.0095	0.0065	0.0040	0.00250	0.00150	0.00100
TO 80	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.0600	-0.0370	-0.0230	-0.0150	-0.0095	-0.0065	-0.0040	-0.00250	-0.00150	-0.00100
OVER 80	1.100	0.700	0.435	0.270	0.175	0.110	0.0700	0.0435	0.0270	0.0175	0.0110	0.0075	0.0050	0.00300	0.00200	0.00125
TO 100	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.0700	-0.0435	-0.0270	-0.0175	-0.0110	-0.0075	-0.0050	-0.00300	-0.00200	-0.00125
OVER 100	1.100	0.700	0.435	0.270	0.175	0.110	0.0700	0.0435	0.0270	0.0175	0.0110	0.0075	0.0050	0.00300	0.00200	0.00125
TO 120	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.0700	-0.0435	-0.0270	-0.0175	-0.0110	-0.0075	-0.0050	-0.00300	-0.00200	-0.00125
OVER 120	1.250	0.800	0.500	0.315	0.200	0.125	0.0800	0.0500	0.0315	0.0200	0.0125	0.0090	0.0060	0.00400	0.00250	0.00175
TO 140	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.0800	-0.0500	-0.0315	-0.0200	-0.0125	-0.0090	-0.0060	-0.00400	-0.00250	-0.00175
OVER 140	1.250	0.800	0.500	0.315	0.200	0.125	0.0800	0.0500	0.0315	0.0200	0.0125	0.0090	0.0060	0.00400	0.00250	0.00175
TO 160	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.0800	-0.0500	-0.0315	-0.0200	-0.0125	-0.0090	-0.0060	-0.00400	-0.00250	-0.00175
OVER 160	1.250	0.800	0.500	0.315	0.200	0.125	0.0800	0.0500	0.0315	0.0200	0.0125	0.0090	0.0060	0.00400	0.00250	0.00175
TO 180	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.0800	-0.0500	-0.0315	-0.0200	-0.0125	-0.0090	-0.0060	-0.00400	-0.00250	-0.00175
OVER 180	1.450	0.925	0.575	0.360	0.230	0.145	0.0925	0.0575	0.0360	0.0230	0.0145	0.0100	0.0070	0.00500	0.00350	0.00225
TO 200	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.0925	-0.0575	-0.0360	-0.0230	-0.0145	-0.0100	-0.0070	-0.00500	-0.00350	-0.00225
OVER 200	1.450	0.925	0.575	0.360	0.230	0.145	0.0925	0.0575	0.0360	0.0230	0.0145	0.0100	0.0070	0.00500	0.00350	0.00225
TO 225	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.0925	-0.0575	-0.0360	-0.0230	-0.0145	-0.0100	-0.0070	-0.00500	-0.00350	-0.00225
OVER 225	1.450	0.925	0.575	0.360	0.230	0.145	0.0925	0.0575	0.0360	0.0230	0.0145	0.0100	0.0070	0.00500	0.00350	0.00225
TO 250	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.0925	-0.0575	-0.0360	-0.0230	-0.0145	-0.0100	-0.0070	-0.00500	-0.00350	-0.00225
OVER 250	1.600	1.050	0.650	0.405	0.260	0.160	0.1050	0.0650	0.0405	0.0260	0.0160	0.0115	0.0080	0.00600	0.00400	0.00300
TO 280	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.1050	-0.0650	-0.0405	-0.0260	-0.0160	-0.0115	-0.0080	-0.00600	-0.00400	-0.00300
OVER 280	1.600	1.050	0.650	0.405	0.260	0.160	0.1050	0.0650	0.0405	0.0260	0.0160	0.0115	0.0080	0.00600	0.00400	0.00300
TO 315	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.1050	-0.0650	-0.0405	-0.0260	-0.0160	-0.0115	-0.0080	-0.00600	-0.00400	-0.00300
OVER 315	1.800	1.150	0.700	0.445	0.285	0.180	0.1150	0.0700	0.0445	0.0285	0.0180	0.0125	0.0090	0.00650	0.00450	0.00350
TO 355	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.1150	-0.0700	-0.0445	-0.0285	-0.0180	-0.0125	-0.0090	-0.00650	-0.00450	-0.00350
OVER 355	1.800	1.150	0.700	0.445	0.285	0.180	0.1150	0.0700	0.0445	0.0285	0.0180	0.0125	0.0090	0.00650	0.00450	0.00350
TO 400	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.1150	-0.0700	-0.0445	-0.0285	-0.0180	-0.0125	-0.0090	-0.00650	-0.00450	-0.00350
OVER 400	2.000	1.250	0.775	0.485	0.315	0.200	0.1250	0.0775	0.0485	0.0315	0.0200	0.0135	0.0100	0.00750	0.00500	0.00400
TO 450	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.1250	-0.0775	-0.0485	-0.0315	-0.0200	-0.0135	-0.0100	-0.00750	-0.00500	-0.00400
OVER 450	2.000	1.250	0.775	0.485	0.315	0.200	0.1250	0.0775	0.0485	0.0315	0.0200	0.0135	0.0100	0.00750	0.00500	0.00400
TO 500	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.1250	-0.0775	-0.0485	-0.0315	-0.0200	-0.0135	-0.0100	-0.00750	-0.00500	-0.00400

NOTE: Some js deviations in the grades 7 to 11 have been rounded off to 1/2(IT - 0.001) when IT values is odd.

TABLE 6-24 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (k9 ... k4, m9 ... m4) (ANSI B4.2)

mm

SIZE	k9	k8	k7	k6	k5	k4	m9	m8	m7	m6	m5	m4
OVER 0	0.025	0.014	0.010	0.006	0.004	0.003	0.027	0.016	0.012	0.008	0.006	0.005
TO 3	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.002	0.002	0.002	0.002
OVER 3	0.030	0.018	0.013	0.009	0.006	0.005	0.034	0.022	0.016	0.012	0.009	0.008
TO 6	0.000	0.000	0.001	0.001	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004
OVER 6	0.036	0.022	0.016	0.010	0.007	0.005	0.042	0.028	0.021	0.015	0.012	0.010
TO 10	0.000	0.000	0.001	0.001	0.001	0.001	0.006	0.006	0.006	0.006	0.006	0.006
OVER 10	0.043	0.027	0.019	0.012	0.009	0.006	0.050	0.034	0.025	0.018	0.015	0.012
TO 14	0.000	0.000	0.001	0.001	0.001	0.001	0.007	0.007	0.007	0.007	0.007	0.007
OVER 14	0.043	0.027	0.019	0.012	0.009	0.006	0.050	0.034	0.025	0.018	0.015	0.012
TO 18	0.000	0.000	0.001	0.001	0.001	0.001	0.007	0.007	0.007	0.007	0.007	0.007
OVER 18	0.052	0.033	0.023	0.015	0.011	0.008	0.060	0.041	0.029	0.021	0.017	0.014
TO 24	0.000	0.000	0.002	0.002	0.002	0.002	0.008	0.008	0.008	0.008	0.008	0.008
OVER 24	0.052	0.033	0.023	0.015	0.011	0.008	0.060	0.041	0.029	0.021	0.017	0.014
TO 30	0.000	0.000	0.002	0.002	0.002	0.002	0.008	0.008	0.008	0.008	0.008	0.008
OVER 30	0.062	0.039	0.027	0.018	0.013	0.009	0.071	0.048	0.034	0.025	0.020	0.016
TO 40	0.000	0.000	0.002	0.002	0.002	0.002	0.009	0.009	0.009	0.009	0.009	0.009
OVER 40	0.062	0.039	0.027	0.018	0.013	0.009	0.071	0.048	0.034	0.025	0.020	0.016
TO 50	0.000	0.000	0.002	0.002	0.002	0.002	0.009	0.009	0.009	0.009	0.009	0.009
OVER 50	0.074	0.046	0.032	0.021	0.015	0.010	0.085	0.057	0.041	0.030	0.024	0.019
TO 65	0.000	0.000	0.002	0.002	0.002	0.002	0.011	0.011	0.011	0.011	0.011	0.011
OVER 65	0.074	0.046	0.032	0.021	0.015	0.010	0.085	0.057	0.041	0.030	0.024	0.019
TO 80	0.000	0.000	0.002	0.002	0.002	0.002	0.011	0.011	0.011	0.011	0.011	0.011
OVER 80	0.087	0.054	0.038	0.025	0.018	0.013	0.100	0.067	0.048	0.035	0.028	0.023
TO 100	0.000	0.000	0.003	0.003	0.003	0.003	0.013	0.013	0.013	0.013	0.013	0.013
OVER 100	0.087	0.054	0.038	0.025	0.018	0.013	0.100	0.067	0.048	0.035	0.028	0.023
TO 120	0.000	0.000	0.003	0.003	0.003	0.003	0.013	0.013	0.013	0.013	0.013	0.013
OVER 120	0.100	0.063	0.043	0.028	0.021	0.015	0.115	0.078	0.055	0.040	0.033	0.027
TO 140	0.000	0.000	0.003	0.003	0.003	0.003	0.015	0.015	0.015	0.015	0.015	0.015
OVER 140	0.100	0.063	0.043	0.028	0.021	0.015	0.115	0.078	0.055	0.040	0.033	0.027
TO 160	0.000	0.000	0.003	0.003	0.003	0.003	0.015	0.015	0.015	0.015	0.015	0.015
OVER 160	0.100	0.063	0.043	0.028	0.021	0.015	0.115	0.078	0.055	0.040	0.033	0.027
TO 180	0.000	0.000	0.003	0.003	0.003	0.003	0.015	0.015	0.015	0.015	0.015	0.015
OVER 180	0.115	0.072	0.050	0.033	0.024	0.018	0.132	0.089	0.063	0.046	0.037	0.031
TO 200	0.000	0.000	0.004	0.004	0.004	0.004	0.017	0.017	0.017	0.017	0.017	0.017
OVER 200	0.115	0.072	0.050	0.033	0.024	0.018	0.132	0.089	0.063	0.046	0.037	0.031
TO 225	0.000	0.000	0.004	0.004	0.004	0.004	0.017	0.017	0.017	0.017	0.017	0.017
OVER 225	0.115	0.072	0.050	0.033	0.024	0.018	0.132	0.089	0.063	0.046	0.037	0.031
TO 250	0.000	0.000	0.004	0.004	0.004	0.004	0.017	0.017	0.017	0.017	0.017	0.017
OVER 250	0.130	0.081	0.056	0.036	0.027	0.020	0.150	0.101	0.072	0.052	0.043	0.036
TO 280	0.000	0.000	0.004	0.004	0.004	0.004	0.020	0.020	0.020	0.020	0.020	0.020
OVER 280	0.130	0.081	0.056	0.036	0.027	0.020	0.150	0.101	0.072	0.052	0.043	0.036
TO 315	0.000	0.000	0.004	0.004	0.004	0.004	0.020	0.020	0.020	0.020	0.020	0.020
OVER 315	0.140	0.089	0.061	0.040	0.029	0.022	0.161	0.110	0.078	0.057	0.046	0.039
TO 355	0.000	0.000	0.004	0.004	0.004	0.004	0.021	0.021	0.021	0.021	0.021	0.021
OVER 355	0.140	0.089	0.061	0.040	0.029	0.022	0.161	0.110	0.078	0.057	0.046	0.039
TO 400	0.000	0.000	0.004	0.004	0.004	0.004	0.021	0.021	0.021	0.021	0.021	0.021
OVER 400	0.155	0.097	0.068	0.045	0.032	0.025	0.178	0.120	0.086	0.063	0.050	0.043
TO 450	0.000	0.000	0.005	0.005	0.005	0.005	0.023	0.023	0.023	0.023	0.023	0.023
OVER 450	0.155	0.097	0.068	0.045	0.032	0.025	0.178	0.120	0.086	0.063	0.050	0.043
TO 500	0.000	0.000	0.005	0.005	0.005	0.005	0.023	0.023	0.023	0.023	0.023	0.023

TABLE 6-25 TOLERANCE ZONES - EXTERNAL DIMENSIONS (SHAFTS) (n9 ... n4, p9 ... p4) (ANSI B4.2)

mm

SIZE	n9	n8	n7	n6	n5	n4	p9	p8	p7	p6	p5	p4
OVER 0	0.029	0.018	0.014	0.010	0.008	0.007	0.031	0.020	0.016	0.012	0.010	0.009
TO 3	0.004	0.004	0.004	0.004	0.004	0.004	0.006	0.006	0.006	0.006	0.006	0.006
OVER 3	0.038	0.026	0.020	0.016	0.013	0.012	0.042	0.030	0.024	0.020	0.017	0.016
TO 6	0.008	0.008	0.008	0.008	0.008	0.008	0.012	0.012	0.012	0.012	0.012	0.012
OVER 6	0.046	0.032	0.025	0.019	0.016	0.014	0.051	0.037	0.030	0.024	0.021	0.019
TO 10	0.010	0.010	0.010	0.010	0.010	0.010	0.015	0.015	0.015	0.015	0.015	0.015
OVER 10	0.055	0.039	0.030	0.023	0.020	0.017	0.061	0.045	0.036	0.029	0.026	0.023
TO 14	0.012	0.012	0.012	0.012	0.012	0.012	0.018	0.018	0.018	0.018	0.018	0.018
OVER 14	0.055	0.039	0.030	0.023	0.020	0.017	0.061	0.045	0.036	0.029	0.026	0.023
TO 18	0.012	0.012	0.012	0.012	0.012	0.012	0.018	0.018	0.018	0.018	0.018	0.018
OVER 18	0.067	0.048	0.036	0.028	0.024	0.021	0.074	0.055	0.043	0.035	0.031	0.028
TO 24	0.015	0.015	0.015	0.015	0.015	0.015	0.022	0.022	0.022	0.022	0.022	0.022
OVER 24	0.067	0.048	0.036	0.028	0.024	0.021	0.074	0.055	0.043	0.035	0.031	0.028
TO 30	0.015	0.015	0.015	0.015	0.015	0.015	0.022	0.022	0.022	0.022	0.022	0.022
OVER 30	0.079	0.056	0.042	0.033	0.028	0.024	0.088	0.065	0.051	0.042	0.037	0.033
TO 40	0.017	0.017	0.017	0.017	0.017	0.017	0.026	0.026	0.026	0.026	0.026	0.026
OVER 40	0.079	0.056	0.042	0.033	0.028	0.024	0.088	0.065	0.051	0.042	0.037	0.033
TO 50	0.017	0.017	0.017	0.017	0.017	0.017	0.026	0.026	0.026	0.026	0.026	0.026
OVER 50	0.094	0.066	0.050	0.039	0.033	0.028	0.106	0.078	0.062	0.051	0.045	0.040
TO 65	0.020	0.020	0.020	0.020	0.020	0.020	0.032	0.032	0.032	0.032	0.032	0.032
OVER 65	0.094	0.066	0.050	0.039	0.033	0.028	0.106	0.078	0.062	0.051	0.045	0.040
TO 80	0.020	0.020	0.020	0.020	0.020	0.020	0.032	0.032	0.032	0.032	0.032	0.032
OVER 80	0.110	0.077	0.058	0.045	0.038	0.033	0.124	0.091	0.072	0.059	0.052	0.047
TO 100	0.023	0.023	0.023	0.023	0.023	0.023	0.037	0.037	0.037	0.037	0.037	0.037
OVER 100	0.110	0.077	0.058	0.045	0.038	0.033	0.124	0.091	0.072	0.059	0.052	0.047
TO 120	0.023	0.023	0.023	0.023	0.023	0.023	0.037	0.037	0.037	0.037	0.037	0.037
OVER 120	0.127	0.090	0.067	0.052	0.045	0.039	0.143	0.106	0.083	0.068	0.061	0.055
TO 140	0.027	0.027	0.027	0.027	0.027	0.027	0.043	0.043	0.043	0.043	0.043	0.043
OVER 140	0.127	0.090	0.067	0.052	0.045	0.039	0.143	0.106	0.083	0.068	0.061	0.055
TO 160	0.027	0.027	0.027	0.027	0.027	0.027	0.043	0.043	0.043	0.043	0.043	0.043
OVER 160	0.127	0.090	0.067	0.052	0.045	0.039	0.143	0.106	0.083	0.068	0.061	0.055
TO 180	0.027	0.027	0.027	0.027	0.027	0.027	0.043	0.043	0.043	0.043	0.043	0.043
OVER 180	0.146	0.103	0.077	0.060	0.051	0.045	0.165	0.122	0.096	0.079	0.070	0.064
TO 200	0.031	0.031	0.031	0.031	0.031	0.031	0.050	0.050	0.050	0.050	0.050	0.050
OVER 200	0.146	0.103	0.077	0.060	0.051	0.045	0.165	0.122	0.096	0.079	0.070	0.064
TO 225	0.031	0.031	0.031	0.031	0.031	0.031	0.050	0.050	0.050	0.050	0.050	0.050
OVER 225	0.146	0.103	0.077	0.060	0.051	0.045	0.165	0.122	0.096	0.079	0.070	0.064
TO 250	0.031	0.031	0.031	0.031	0.031	0.031	0.050	0.050	0.050	0.050	0.050	0.050
OVER 250	0.164	0.115	0.086	0.066	0.057	0.050	0.186	0.137	0.108	0.088	0.079	0.072
TO 280	0.034	0.034	0.034	0.034	0.034	0.034	0.056	0.056	0.056	0.056	0.056	0.056
OVER 280	0.164	0.115	0.086	0.066	0.057	0.050	0.186	0.137	0.108	0.088	0.079	0.072
TO 315	0.034	0.034	0.034	0.034	0.034	0.034	0.056	0.056	0.056	0.056	0.056	0.056
OVER 315	0.177	0.126	0.094	0.073	0.062	0.055	0.202	0.151	0.119	0.098	0.087	0.080
TO 355	0.037	0.037	0.037	0.037	0.037	0.037	0.062	0.062	0.062	0.062	0.062	0.062
OVER 355	0.177	0.126	0.094	0.073	0.062	0.055	0.202	0.151	0.119	0.098	0.087	0.080
TO 400	0.037	0.037	0.037	0.037	0.037	0.037	0.062	0.062	0.062	0.062	0.062	0.062
OVER 400	0.195	0.137	0.103	0.080	0.067	0.060	0.223	0.165	0.131	0.108	0.095	0.088
TO 450	0.040	0.040	0.040	0.040	0.040	0.040	0.068	0.068	0.068	0.068	0.068	0.068
OVER 450	0.195	0.137	0.103	0.080	0.067	0.060	0.223	0.165	0.131	0.108	0.095	0.088
TO 500	0.040	0.040	0.040	0.040	0.040	0.040	0.068	0.068	0.068	0.068	0.068	0.068

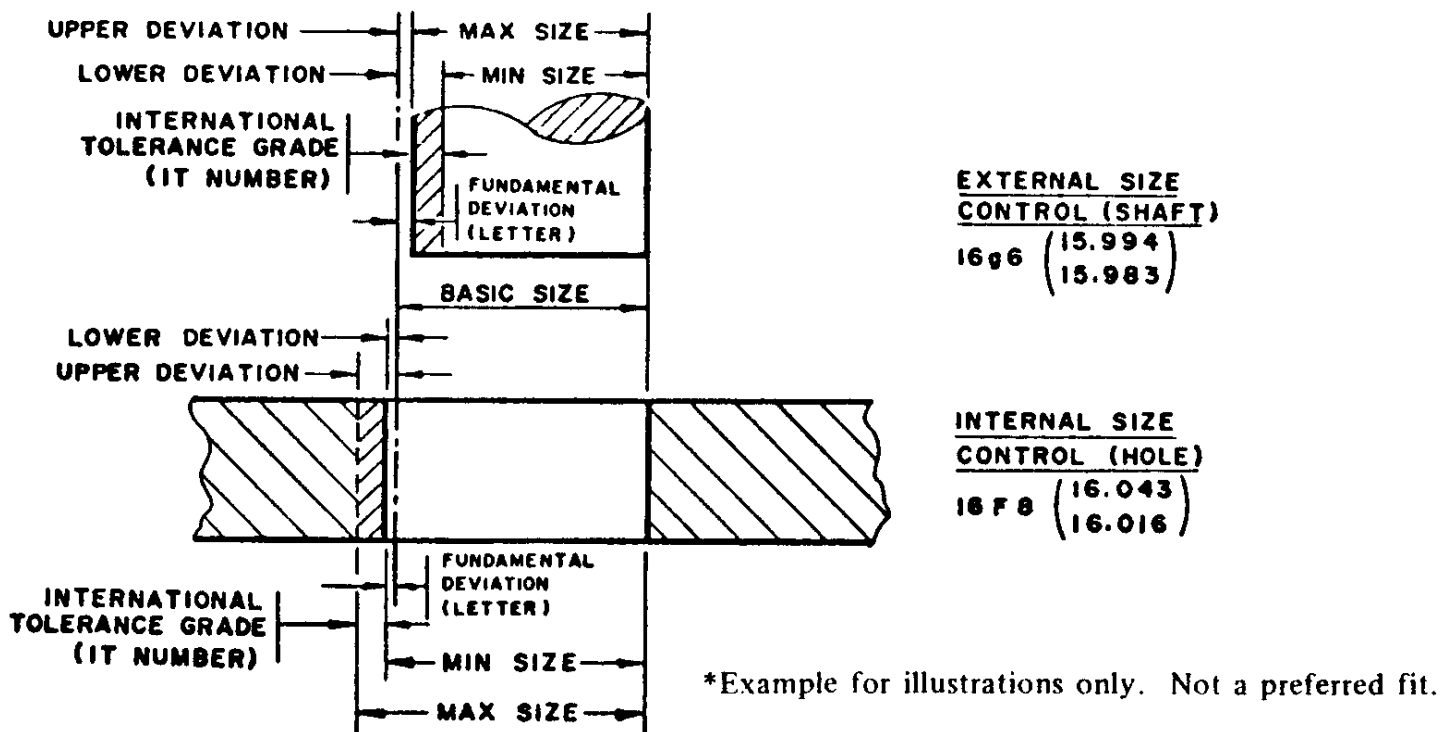


FIG. 6-3 ILLUSTRATIONS OF DEFINITIONS

INTRODUCTION

The ISO System of Limits and Fits (referred to as the ISO system) is covered in national standards throughout the world, as shown by the following list:

Global	ISO 286
USA	ANSI B4.2
Japan	JIS B0401
Germany	DIN 7160//61
France	NF E 02-100-122
UK	BSI 4500
Italy	UNI 6388
Australia	AS 1654

HISTORY OF THE ISO SYSTEM

The present ISO system is based on the ISA System of Limits and Fits published in ISA Bulletin 25 (1940), and on comments included in the Draft Final Report of ISA Committee 3, December 1935. The unification of the various national systems of limits and fits was one of the essential tasks discussed at the initial conference of the ISA in New York, in April, 1926. The same year the Secretariat of ISA Committee 3, Limits and Fits, was entrusted to the Germany Standardizing Association, and needless to say, the system was all metric from the start.

USAGE

The ISO System of Limits and Fits is now in extensive use in Europe.

An increasing number of drawings issued throughout the world specify the tolerances with the ISO symbols only. The ISO system for tolerances and gages is fully covered in ANSI B4.2 and B4.4M.

Cutting tools, material stock, and gages held to ISO tolerances are available in many major industrial countries. It is recommended that a similar specification in USA standards be provided if the worldwide manufacture of products is a defined goal.

BASES

Temperature. The standard reference temperature for industrial length measurement is 20°C (68°F).

DEFINITIONS

The most important terms relating to limits and fits are as shown in Fig. 6-3. The terms are defined below.

basic size — the size to which limits or deviations are assigned. The basic size is the same for both members of a fit. It is designated by the number 40 in 40H7.

deviation — the algebraic difference between a size and the corresponding basic size

upper deviation — the algebraical difference between the maximum limit of size and the corresponding basic size

lower deviation — the algebraic difference between the minimum limit of size and the corresponding basic size

fundamental deviation — the one of the two deviations closest to the basic size. It is designated by the letter H in 40H7

tolerance — the difference between the maximum and minimum size limits on a part

tolerance zone — a zone representing the tolerance and its position in relation to the basic size

international tolerance grade (IT) — a group of tolerances which vary depending on the basic size, but which provide the same relative level of accuracy within a given grade. It is designated by the number 7 in 40H7 (IT7).

hole basis — the system of fits where the minimum hole size is basic. The fundamental deviation for a hole basis system is “H”.

shaft basis — the system of fits where the maximum shaft size is basic. The fundamental deviation for a shaft basis system is “h”.

clearance fit — the relationship between assembled parts when clearance occurs under all tolerance conditions

interference fit — the relationship between assembled parts when interference occurs under all tolerance conditions

transition — the relationship between assembled parts when either a clearance or interference fit can result depending on the tolerance conditions of the mating parts

DESCRIPTION OF TOLERANCE DESIGNATION

An “International Tolerance grade” establishes the magnitude of the tolerance zone or the amount of part size variation allowed for internal and external dimensions alike (see Fig. 6-3). Tolerances are expressed in “grade number,” which are consistent with International Tolerance grades identified by the prefix IT, i.e., “IT6,” “IT11,” etc. A smaller grade number provides a smaller tolerance zone.

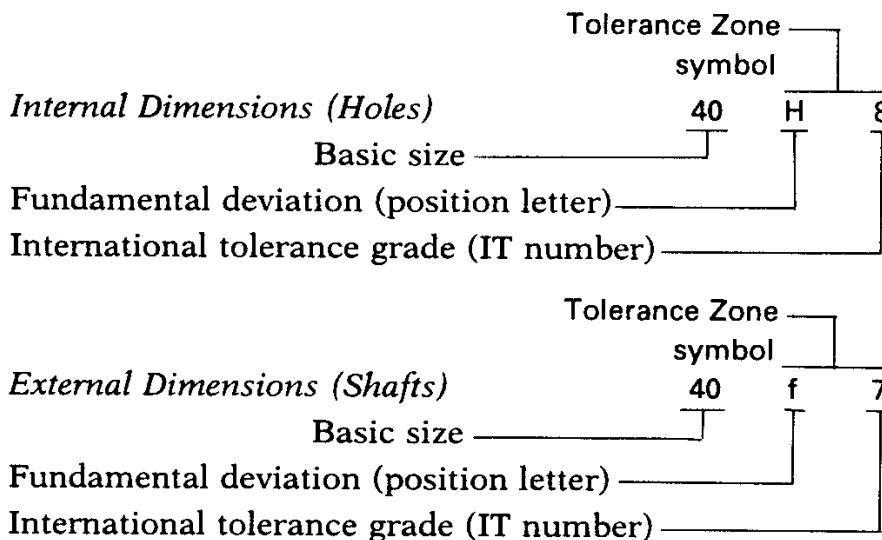
A fundamental deviation establishes the position of the tolerance zone with respect to the basic size (see Fig. 6-3).

Fundamental deviations are expressed by “tolerance position letters.” Capital letters are used for internal dimensions, and lower case or small letters are used for external dimensions.

Symbols

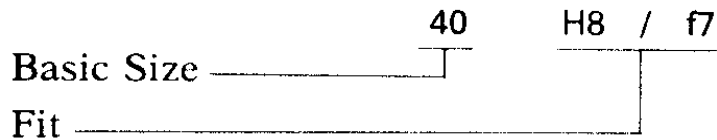
By combining the IT grade number and the tolerance position letter, the tolerance symbol is established which identifies the actual maximum and minimum limits of the part. The tolerated sizes are thus defined by the basic size of the part followed by a symbol composed of a letter and a number.

Example:



A fit is indicated by the basic size common to both components, followed by a symbol corresponding to each component, the internal part symbol preceding the external part symbol.

Example:



Some methods of designating tolerances on drawings gages, etc. are shown in the following three examples.

(a) 40H8 (b) 40H8(40.039/40.000) (c) 40.039/40.000(40H8)

NOTE: Values in parentheses indicate reference only.

BILATERAL TOLERANCE SYSTEM

The ISO system of limits and fits has a full range of bilateral (two-sided) tolerances designated js and JS. The two symmetrical deviations are $\pm IT/2$ (one half of the International Tolerances grade).

UNILATERAL TOLERANCE SYSTEM

The ISO system of limits and fits, with all its possible combinations, includes two unilateral (one-sided) tolerancing methods that are in common use. One tolerancing practice is based on a nominal hole (H, hole basis), the other on a nominal shaft (h, shaft basis). The ISO system has been in use in Germany for over 60 years, and standards for selected fits have influenced the European market for metric standard material sizes, measuring tools, couplings, collars, bearings, etc.

HOLE-BASIS OR SHAFT-BASIS FITS

The nominal H, hole-basis fit and h, shaft-basis fit tolerancing systems are both used, depending on each specific application. The hole-basis system is used with stepped shaft designs. Standard gages for checking the hole-basis fits cost less than those required for checking shaft-basis fits. In designs where a uniform-diameter shaft is used it is advantageous to employ the shaft-basis system. For example, in the case of driving shafts, a single shaft may have to accommodate a variety of accessories — such as couplings, bearings, collars, etc. Steel products toleranced to the shaft-basis system are supplied in a number of steel grades and finishes throughout Europe. Both types of fits might be used on the same design.

PREFERRED FITS

ANSI B4.2 specifies the ten hole and shaft basis fits as shown in Table 6-1 and as illustrated in Fig. 6-4. Each of the ten hole basis fits corresponds to a shaft basis fit with equal clearances for the same nominal size.

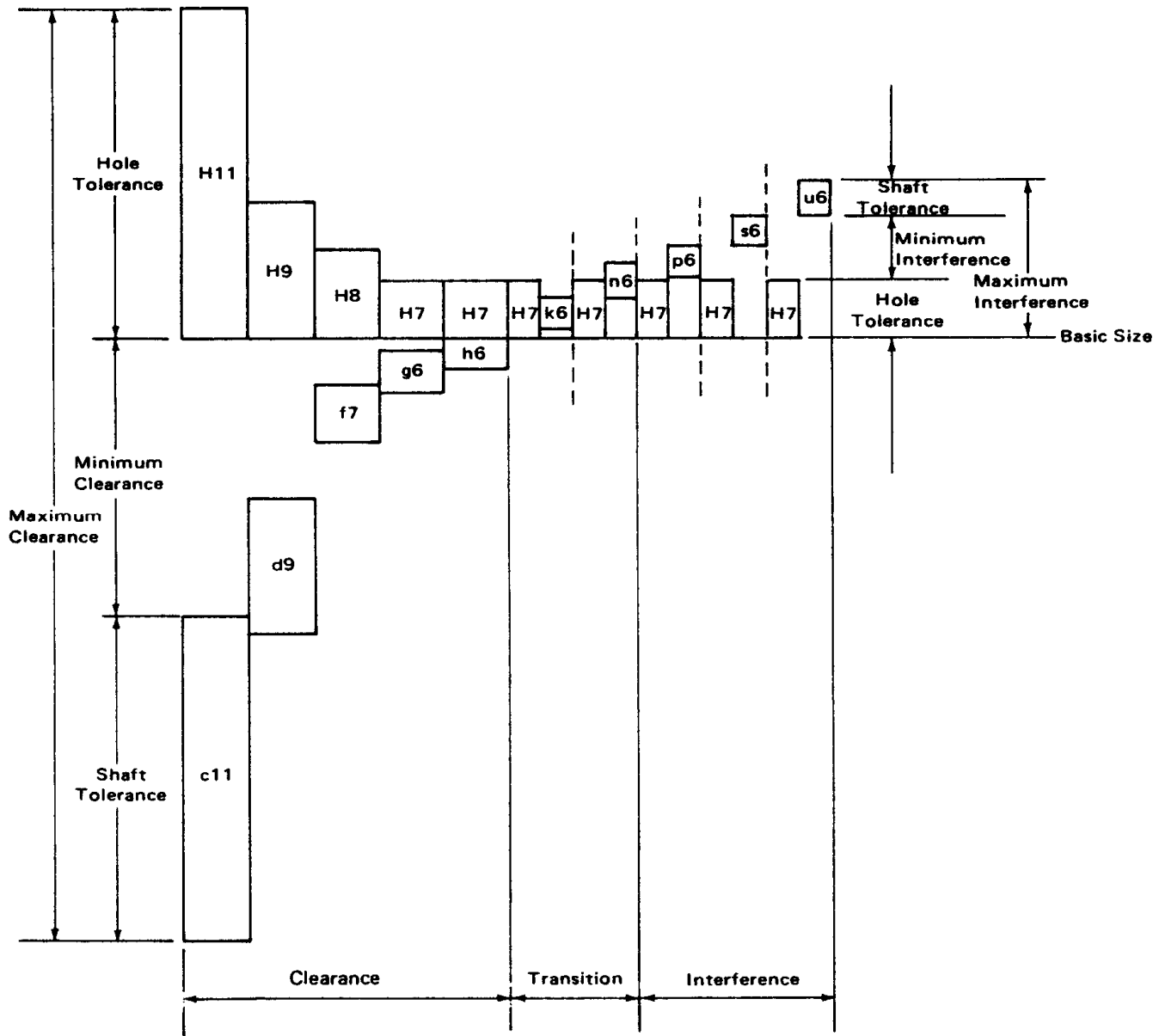


FIG. 6-4 PREFERRED HOLE BASIS FITS (ANSI B4.2)

The ten hole-basis preferred fits use the following tolerances:

Hole: H7, H8, H9, H11
 Shaft: c11, d9, f7, g6, h6, k6, n6, p6, s6, u6

It might be desirable for a user to standardize on three, or even two, of the above hole tolerances. The shaft tolerances might also be reduced to fit the requirements of certain types of products.

The ten shaft-basis preferred fits use the following tolerances:

Hole: C11, D9, F8, G7, H7, K7, N7, P7, S7, U7
 Shaft: h6, h7, h9, h11

Note that many steel products shown in Chapter 10 are produced worldwide to the shaft tolerances shown above. The new ANSI B32.100 standard specifies the above four shaft tolerances. An illustration of the ten shaft fits is shown in Fig. 6-5.

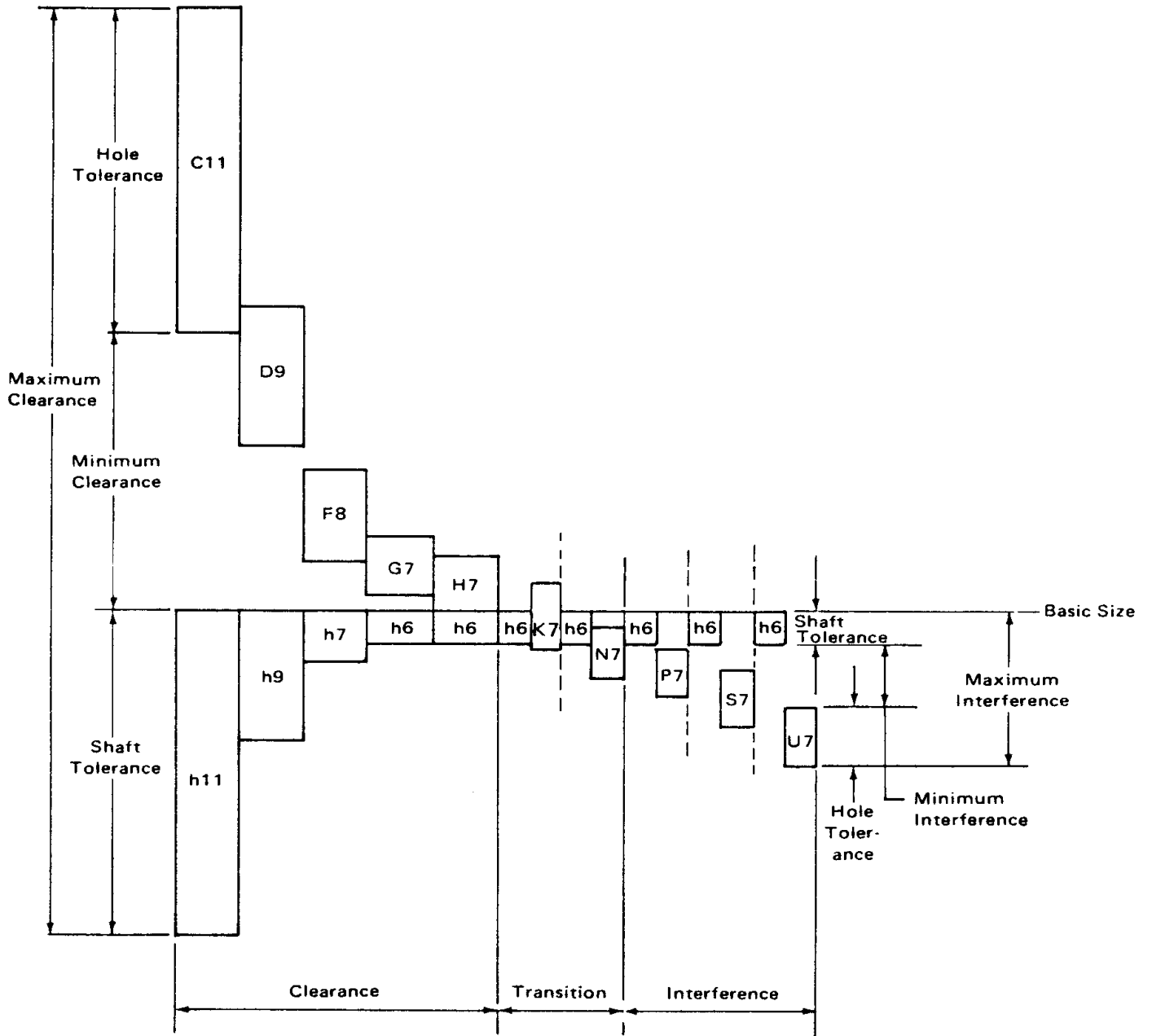


FIG. 6-5 PREFERRED SHAFT BASIS FITS (ANSI B4.2)

PRACTICAL USE OF IT GRADES

The machining process shown in Fig. 6-6 can, under normal conditions, produce the IT grades indicated. Practical usage of the various IT tolerance grades is shown in Fig. 6-7. Numerical values for IT grades from IT1 through IT18 for basic series up to 3150 mm are shown in Table 6-30.

	IT GRADES							
	4	5	6	7	8	9	10	11
LAPPING & HONING	█							
CYLINDRICAL GRINDING		█						
SURFACE GRINDING		█						
DIAMOND TURNING		█						
DIAMOND BORING		█						
BROACHING		█						
POWDER METAL—SIZES		█						
REAMING		█		█				
TURNING		█		█			█	
POWDER METAL—SINTERED		█		█			█	
BORING		█		█			█	
MILLING		█		█			█	
PLANING & SHAPING		█		█			█	
DRILLING		█		█			█	
PUNCHING		█		█			█	
DIE CASTING		█		█			█	

FIG. 6-6 MACHINING PROCESSES (ANSI B4.2)

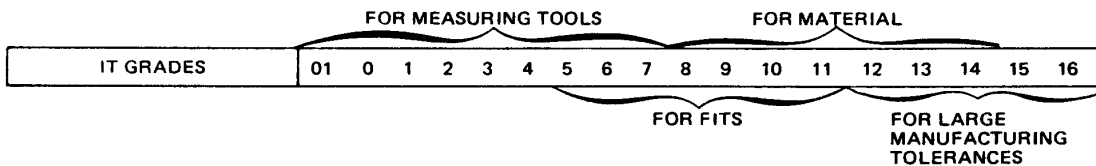


FIG. 6-7 PRACTICAL USE OF INTERNATIONAL TOLERANCE GRADES (ANSI B4.2)

NON-TOLERANCED DIMENSIONS

The ISO system of limits and fits can be used on a great number of applications from the finest tolerances to the coarsest. The tolerances are increasing with the nominal size in the ISO system. It is common practice in those countries that have used the ISO system to apply a somewhat related system to the non-toleranced dimensions on a drawing. It is now part of ISO 2768-1. The tolerances are dependent on the nominal sizes and are shown in the following table.

TABLE 6-30 INTERNATIONAL TOLERANCE GRADES FOR BASIS SIZES UP TO 3150 mm AND IT GRADES FROM IT1 THROUGH IT18 (ISO 286)

Basic size mm		International tolerance (IT) grades																	
		IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16	IT17	IT18
Above	Up to and including	Tolerances																	
		micrometers												millimeters					
-	3	0.8	1.2	2	3	4	6	10	14	25	40	60	0.1	0.14	0.25	0.4	0.6	1	1.4
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75	0.12	0.18	0.3	0.48	0.75	1.2	1.8
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90	0.15	0.22	0.36	0.58	0.9	1.5	2.2
10	18	1.2	2	3	5	8	11	18	27	43	70	110	0.18	0.27	0.43	0.7	1.1	1.8	2.7
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130	0.21	0.33	0.52	0.84	1.3	2.1	3.3
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160	0.25	0.39	0.62	1	1.6	2.5	3.9
50	80	2	3	5	8	13	19	30	46	74	120	190	0.3	0.46	0.74	1.2	1.9	3	4.6
80	120	2.5	4	6	10	15	22	35	54	87	140	220	0.35	0.54	0.87	1.4	2.2	3.5	5.4
120	180	3.5	5	8	12	18	25	40	63	100	160	250	0.4	0.63	1	1.6	2.5	4	6.3
180	250	4.5	7	10	14	20	29	46	72	115	185	290	0.46	0.72	1.15	1.85	2.9	4.6	7.2
250	315	6	8	12	16	23	32	52	81	130	210	320	0.52	0.81	1.3	2.1	3.2	5.2	8.1
315	400	7	9	13	18	25	36	57	89	140	230	360	0.57	0.89	1.4	2.3	3.6	5.7	8.9
400	500	8	10	15	20	27	40	63	97	155	250	400	0.63	0.97	1.55	2.5	4	6.3	9.7
500	630	9	11	16	22	32	44	70	110	175	280	440	0.7	1.1	1.75	2.8	4.4	7	11
630	800	10	13	18	25	36	50	80	125	200	320	500	0.8	1.25	2	3.2	5	8	12.5
B00	1000	11	15	21	28	40	56	90	140	230	360	560	0.9	1.4	2.3	3.6	5.6	9	14
1000	1250	13	18	24	33	47	66	105	165	260	420	660	1.05	1.65	2.6	4.2	6.6	10.5	16.5
1250	1600	15	21	29	39	55	78	125	195	310	500	780	1.25	1.95	3.1	5	7.8	12.5	19.5
1600	2000	18	25	35	46	65	92	150	230	370	600	920	1.5	2.3	3.7	6	9.2	15	23
2000	2500	22	30	41	55	78	110	175	280	440	700	1100	1.75	2.8	4.4	7	11	17.5	28
2500	3150	26	36	50	68	96	135	210	330	540	860	1350	2.1	3.3	5.4	8.6	13.5	21	33

- NOTES:
1. Values for international tolerance grades IT01 and IT0 for basic sizes less than or equal to 500 mm are given in ISO 286-1, annex A, table 5.
 2. Values for international tolerance grades IT1 to IT5 (incl) for basic sizes over 500 mm are included for experimental use.
 3. International tolerance grades IT14 to IT18 (incl) shall not be used for basic sizes less than or equal to 1 mm.

TABLE 6-31 GENERAL TOLERANCE - LINEAR DIMENSIONS (ISO 2768-1)

Tolerance class		Permissible deviations for basic size range							
Designation	Description	0.5 ¹	over	over	over	over	over	over	over
		up to 3	3 up to 6	6 up to 30	30 up to 120	120 up to 400	400 up to 1000	1000 up to 2000	2000 up to 4000
f	fine	± 0.05	± 0.05	± 0.1	± 0.15	± 0.2	± 0.3	± 0.5	-
m	medium	± 0.1	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2
c	coarse	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3	± 4
v	very coarse	-	± 0.5	± 1	± 1.5	± 2.5	± 4	± 6	± 8

1. For nominal sizes below 0,5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s).

TOLERANCES ON ANGLES

The nominal size for an angle is the length (in mm) of the short leg.

Tolerances shown in Table 6-31 apply to the fine, medium, and coarse, and very coarse series specified in ISO 2768-1. Radii and chamfer tolerances are shown in Table 6-32 and angular tolerances are given in Table 6-33.

TABLE 6-32 GENERAL TOLERANCE - RADII AND CHAMFERS (ISO 2768-1)

mm

Tolerance class		Permissible deviations for basic size range		
Description	Designation	0.5 ¹ up to 3	over 3 up to 6	over 6
f	fine	± 0.2	± 0.5	± 1
m	medium			
c	coarse	± 0.4	± 1	± 2
v	very coarse			

NOTE: 1. For nominal sizes below 0.5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s).

TABLE 6-33 GENERAL TOLERANCE - ANGLES (ISO 2768-1)

Tolerance class		Permissible deviations for ranges of lengths, in millimeters, of the shorter side of the angle concerned				
Description	Designation	up to 10	over 10 up to 50	over 50 up to 120	over 120 up to 400	over 400
f	fine	± 1°	± 0°30'	± 0°20'	± 0°10'	± 0°5'
m	medium					
c	coarse	± 1°30'	± 1°	± 0°30'	± 0°15'	± 0°10'
v	very coarse	± 3°	± 2°	± 1°	± 0°30'	± 0°20'

RELATED ISO STANDARDS

17.040.10 Limits and fits

ISO 286-1: 2010 Geometrical product specifications (GPS) -- ISO code system for tolerances on linear sizes -- Part 1: Basis of tolerances, deviations and fits
ISO 286-2: 2010 Geometrical product specifications (GPS) -- ISO code system for tolerances on linear sizes -- Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts
ISO 1101:2004 Geometrical Product Specifications (GPS) -- Geometrical tolerancing -- Tolerances of form, orientation, location and run-out
ISO 1101 (Draft) Geometrical product specifications (GPS) -- Geometrical tolerancing -- Tolerances of form, orientation, location and run-out
ISO 1938-1: 2012 Geometrical product specifications (GPS) - Dimensional measuring equipment -- Part 1: Plain limit gauges of linear size
ISO 2768-1:1989 General tolerances -- Part 1: Tolerances for linear and angular dimensions without individual tolerance indications
ISO 2768-2:1989 General tolerances -- Part 2: Geometrical tolerances for features without individual tolerance indications
ISO 5458:1998 Geometrical Product Specifications (GPS) -- Geometrical tolerancing -- Positional tolerancing
ISO 5459: 2011 Geometrical product specifications (GPS) -- Geometrical tolerancing -- Datums and datum systems
ISO 8062:1994 Castings -- System of dimensional tolerances and machining allowances
ISO 8062-1:2007 Geometrical product specifications (GPS) -- Dimensional and geometrical tolerances for moulded parts -- Part 1: Vocabulary
ISO/PRF TS 8062-2 Geometrical product specifications (GPS) -- Dimensional and geometrical tolerances for moulded parts -- Part 2: Rules
ISO 8062-3:2007 Geometrical product specifications (GPS) -- Dimensional and geometrical tolerances for moulded parts -- Part 3: General dimensional and geometrical tolerances and machining allowances for castings. ISO 8062-3:2007/Cor 1:2009
ISO 13920:1996 Welding -- General tolerances for welded constructions -- Dimensions for lengths and angles -- Shape and position
ISO 14405-1:2010 Geometrical product specifications (GPS) -- Dimensional tolerancing -- Part 1: Linear sizes
ISO 14405-2:2011 Geometrical product specifications (GPS) -- Dimensional tolerancing -- Part 2: Dimensions other than linear sizes

ISO HANDBOOKS

ISO Standards Handbook - Limits, fits and surface properties



This handbook contains a comprehensive collection of ISO standards for: general limits and fits; limits and fits for screw threads; limits and fits for gears and involute splines; properties of surfaces. Standards on relevant terminology complete the collection. Year of publication: 1999 2nd Edition. ISBN 92-67-10293-1. This book is also shown after Chapter 5.