AMERICAN NATIONAL STANDARD

Preferred Metric Limits and Fits

ANSI B4.2 - 1978

REAFFIRMED 1999

FOR CURRENT COMMITTEE PERSONNEL
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SECRETARIAT

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

PUBLISHED BY

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center 345 East 47th Street New York, N. Y. 10017

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FOREWORD

The American National Standards Committee B4 was organized in June 1920, and it developed the American Standard ASA B4a-1925, Tolerances, Allowances and Gages for Metal Fits.

As a result of committee work during World War II by ASA and ABC (American, British, Canadian), American Standard, Limits and Fits for Engineering and Manufacturing (Part I), ASA B4.1-1947, was produced. The preface to that document made significant reference to the contribution of the ABC meetings in developing agreement on five basic principles, four of which apply to the present standard. These related to the desirability of establishing common definitions, a table of preferred basic sizes, a system of preferred tolerances and allowances, and a uniform method of applying tolerances.

In 1973, the General Motors Corporation recognized a need for a metric standard similar to the ISO R286 and published an interim standard which was later adopted as an ANSI Special Metric Publication, SR 11.

The B4 Standards Committee was reorganized in November 1975, and renamed "Standardization of Allowances and Tolerances for Manufactured Parts". The first draft proposal of this standard was based on the principles noted above and utilized computer programs to implement the concept.

The preferred basic sizes have been selected from the American National Standard for Preferred Metric Sizes for Round, Square and Hexagonal Metal Products, B32.4-1974, and the first choice sizes are all consistently rounded off from the Renard 10 (R10) series of preferred numbers. A logical reduction or expansion of the first choice sizes can simply be achieved by utilizing the R5 or R20 series of preferred numbers as explained in this standard.

The selection of standard tolerance zones and preferred metric fits in this standard were based on international and national standards shown in the following list:

WORLD	ISO SYSTEM OF LIMITS AND FITS ISO/R286	PREFERRED TOLERANCE ZONES ISO 1829
USA	ANSI SR 11	ANSI B4.1 (INCH STD)
JAPAN	JIS B 0401	JIS B 0401
GERMANY	DIN 7160/61	DIN 7157/54/55
FRANCE	NF E 02-100-118	NF E 02-131-135
U.K.	BSI 4500	BSI 4500
ITALY	UNI 6388/89	UNI 7218
CANADA	NONE	CSA B97.3 (INCH STD)
AUSTRALIA	AS 1654	AS 1654

The above standards have affected the availability of material stock, tooling and gages to the preferred ISO tolerances throughout the world. Implementation of this standard by industry can greatly reduce cost in manufacturing.

A draft proposal was circulated for letter ballot of the B4 Committee on October 16, 1976. Comments received as a result of this ballot led to changes and subsequent approval of the text by the Committee. Final approval for this standard was granted by the American National Standards Institute (ANSI) on 8 March 1978.

ACKNOWLEDGMENT

Tables 2, 3, 4 and 5 of the text and Tables A1 through A24 of the Appendix were developed by Massey-Ferguson and full rights to usage have been conveyed to ASME.

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Standardization of Allowances and Tolerances for Manufactured Parts

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AMERICAN NATIONAL STANDARD

PREFERRED METRIC LIMITS AND FITS

1. SCOPE

This standard describes the ISO system of limits and fits for mating parts as it is approved for general engineering usage in the United States of America. It establishes: (1) the designation symbols used to define specific dimensional limits on drawings, material stock, related tools, gages, etc., (2) the preferred basic sizes (first and second choices), (3) the preferred tolerance zones (first, second and third choices), (4) the preferred limits and fits for sizes (first choice only) up to and including 500 millimeters, and (5) definitions of related terms. Tolerance zones for basic sizes in the range from 500 to 3150 mm are specified in Appendix B.

The general terms "hole" and "shaft" can also be taken as referring to the space containing or contained by two parallel faces of any part, such as the width of a slot, the thickness of a key, etc.

2. DEFINITIONS

The most important terms relating to limits and fits are as shown in Figure 1. The terms are defined in words below:

(1) *Basic Size.* The size to which limits or deviations are assigned. The basic sizes is the same for both members of a fit. It is designated by the number 40 in 40H7.

(2) *Deviation.* The algebraic difference between a size and the corresponding basic size.

(3) *Upper Deviation.* The algebraical difference between the maximum limit of size and the corresponding basic size.

(4) *Lower Deviation.* The algebraic difference between the minimum limit of size and the corresponding basic size.

(5) *Fundamental Deviation.* That one of the two deviations closest to the basic size. It is designated by the letter H in 40H7.

(6) *Tolerance.* The difference between the maximum and minimum size limits on a part.

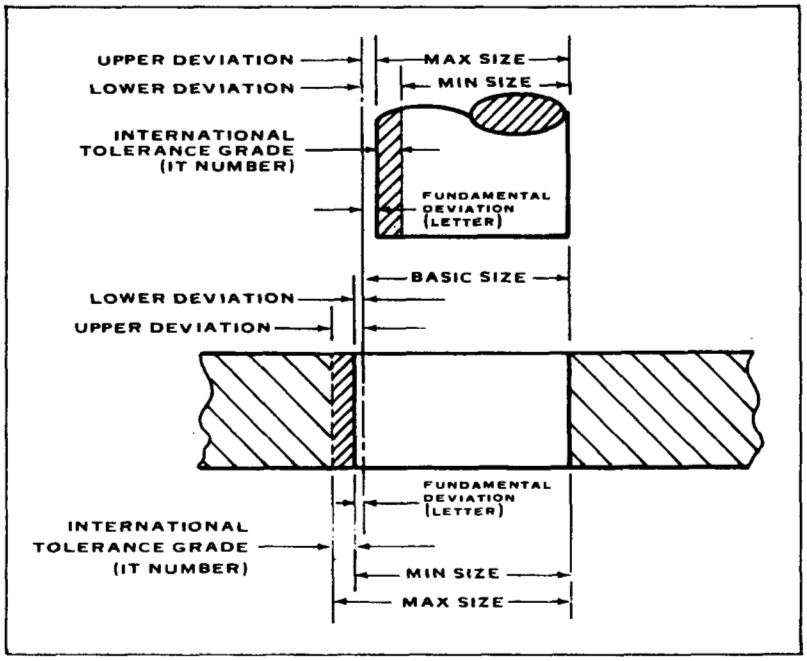


FIG. 1 ILLUSTRATION OF DEFINITIONS

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(7) *Tolerance Zone.* A zone representing the tolerance and its position in relation to the basic size.

(8) *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).

(9) *Hole Basis.* The system of fits where the minimum hole size is basic. The fundamental deviation for a hole basis system is "H".

(10) *Shaft Basis.* The system of fits where the maximum shaft size is basic. The fundamental deviation for a shaft basis system is "h".

(11) *Clearance Fit.* The relationship between assembled parts when clearance occurs under all tolerance conditions.

(12) *Interference Fit.* The relationship between assembled parts when interference occurs under all tolerance conditions.

(13) *Transition Fit.* The relationship between assembled parts when either a clearance or interference fit can result depending on the tolerance conditions of the mating parts.

3. DESCRIPTION OF TOLERANCE DESIGNATION

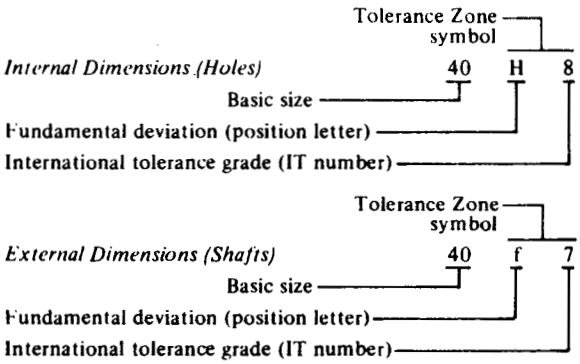
An "International Tolerance grade" establishes the magnitude of the tolerance zone or the amount of part size variation allowed for internal and external dimensions alike (see Figure 1). Tolerances are expressed in "grade numbers", which are consistant with International Tolerance grades identified by the prefix IT, i.e., "IT6", "IT11", etc. A smaller grade number provides a smaller tolerance zone (see Appendix B, Table B1).

A fundamental deviation establishes the position of the tolerance zone with respect to the basic size (see Figure 1). Fundamental deviations are expressed by "tolerance position letters". Capital letters are used for internal dimensions (see Appendix B, Table B2), and lower case or small letters are used for external dimensions (see Appendix B, Table B3).

4. SYMBOLS

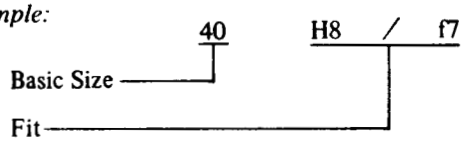
By combining the IT grade number and the tolerance position letter, the tolerance symbol is established which identifies the actual maximum and minimum limits of the part. The toleranced sizes is thus defined by the basic size of the part followed by a symbol composed of a letter and a number.

Examples:



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. $40H8\begin{pmatrix}40.039\\40.000\end{pmatrix}$ c. $\begin{matrix}40.039\\40.000\end{matrix}$ (40H8)

Note: Values in parentheses indicate reference only.

5. PREFERRED BASIC SIZES

The basic size of mating parts should, where possible, be chosen from the first choice sizes listed in Table 1, which were selected from the preferred diameters of round metal products in the American National Standard for Preferred Metric Sizes for Round, Square and Hexagonal Metal Products, B32.4-1974. The preference rating has been based on the RENARD'S series of preferred numbers (see American National Standards on Preferred Numbers, Z17.1-1973) and the first choice sizes shown in Table 1 follow approximately the preferred number series R10, where succeeding numbers in the series increase by 25%. The second choice series shown are rounded off from the R20 series of preferred numbers (12% increments).

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The first choice sizes can be rationalized by selecting every second number in the series such as 1, 1.6, 2.5, 4, 6, 10, 16, etc., and this number series is rounded off from the R5 series of preferred numbers (60% increments).

Preferred sizes outside the range of 1 through 1000 are found by multiplying or dividing the sizes shown in Table 1 by 1000 or multiples thereof.

Table 1 Preferred Sizes

Basic Size, mm		Basic Size, mm		Basic Size, mm	
First Choice	Second Choice	First Choice	Second Choice	First Choice	Second Choice
1		10		100	
	1.1		11		110
1.2		12		120	
	1.4		14		140
1.6		16		160	
	1.8		18		180
2		20		200	
	2.2		22		220
2.5		25		250	
	2.8		28		280
3		30		300	
	3.5		35		350
4		40		400	
	4.5		45		450
5		50		500	
	5.5		55		550
6		60		600	
	7		70		700
8		80		800	
	9		90		900
				1000	

6. PREFERRED TOLERANCE ZONES

The preferred tolerance zones are shown in Figure 2 for internal dimensions and in Figure 3 for external dimensions. The encircled tolerance zones (13 each) are first choice, the framed tolerance zones are second choice, and the open tolerance zones are third choice. The encircled tolerance zones are specified for all preferred fits in this standard.

Deviations from basic size for all tolerance zones in Figures 2 and 3 are tabulated in sizes over 0 to 500 mm in Appendix A.

Deviations from basic size for all tolerance zones not shown in Figure 2 and Figure 3 may be calculated from table values given in Appendix B for sizes up to 3150 mm.

7. PREFERRED FITS

First choice tolerance zones are used to establish preferred fits in this standard, as shown to relative scale in Figure 4 for hole basis and in Figure 5 for shaft basis fits. Hole basis fits have a fundamental deviation of "H" on the hole, and shaft basis fits have a fundamental deviation of "h" on the shaft. A description of both types of fits which have the same relative fit condition is given in Figure 6. Normally, the hole basis system is preferred, however, when a common shaft mates with several holes, the shaft basis system should be used. Thus, clearance fit H7/h6 is included in both hole basis and shaft basis fits.

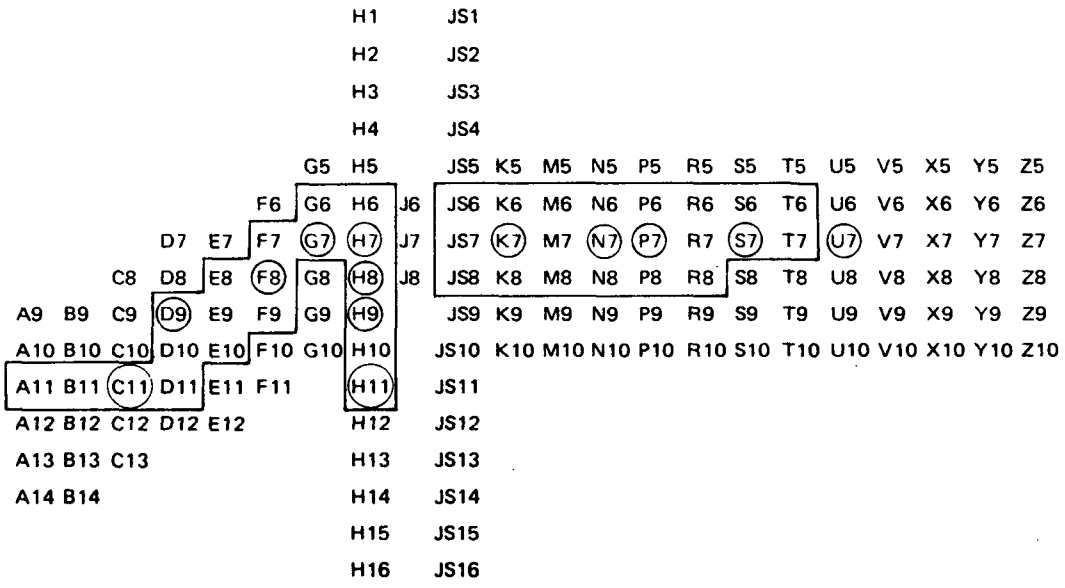
The hole basis and shaft basis fits of Figure 6 are combined with the first choice sizes of Table 1 to form Tables 2, 3, 4 and 5 where the specific limits as well as the resultant fits are tabulated.

If the required size is not tabulated in Tables 2, 3, 4 and 5, the preferred fit can be calculated from numerical values shown in Tables A1 through A24 in Appendix A.

It is anticipated that other fit conditions may be necessary to suit special requirements, and a preferred fit can be loosened or tightened simply by selecting a standard tolerance zone in Figure 2 or 3. Other fit conditions may be calculated from the numerical values for standard tolerance zones shown in Tables A1 through A24 in Appendix A.

Information on how to calculate the limit dimensions, clearances, and interferences, for non-preferred fits and sizes can be found in Appendix A and Appendix B.

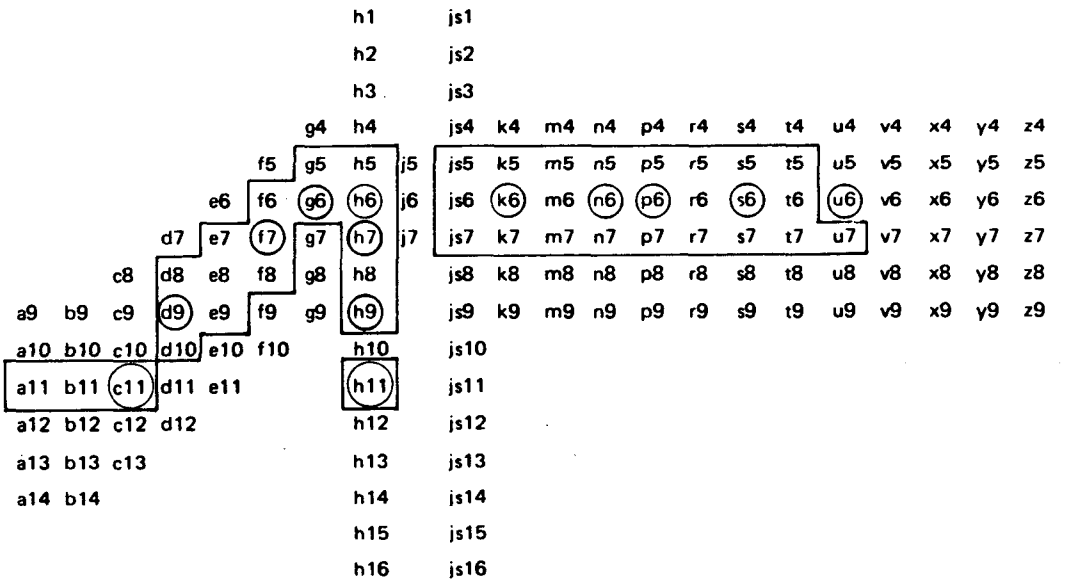
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For numeric values of tolerance zones shown see Appendix A.

FIG. 2 TOLERANCE ZONES FOR INTERNAL DIMENSIONS (HOLES)

Legend: First choice tolerance zones encircled (ANSI B4.2 preferred)
Second choice tolerance zones framed (ISO 1829 selected)
Third choice tolerance zones open



For numeric values of tolerance zones shown see Appendix A.

FIG. 3 TOLERANCE ZONES FOR EXTERNAL DIMENSIONS (SHAFTS)

Legend: First choice tolerance zones encircled (ANSI B4.2 preferred)
Second choice tolerance zones framed (ISO 1829 selected)
Third choice tolerance zones open

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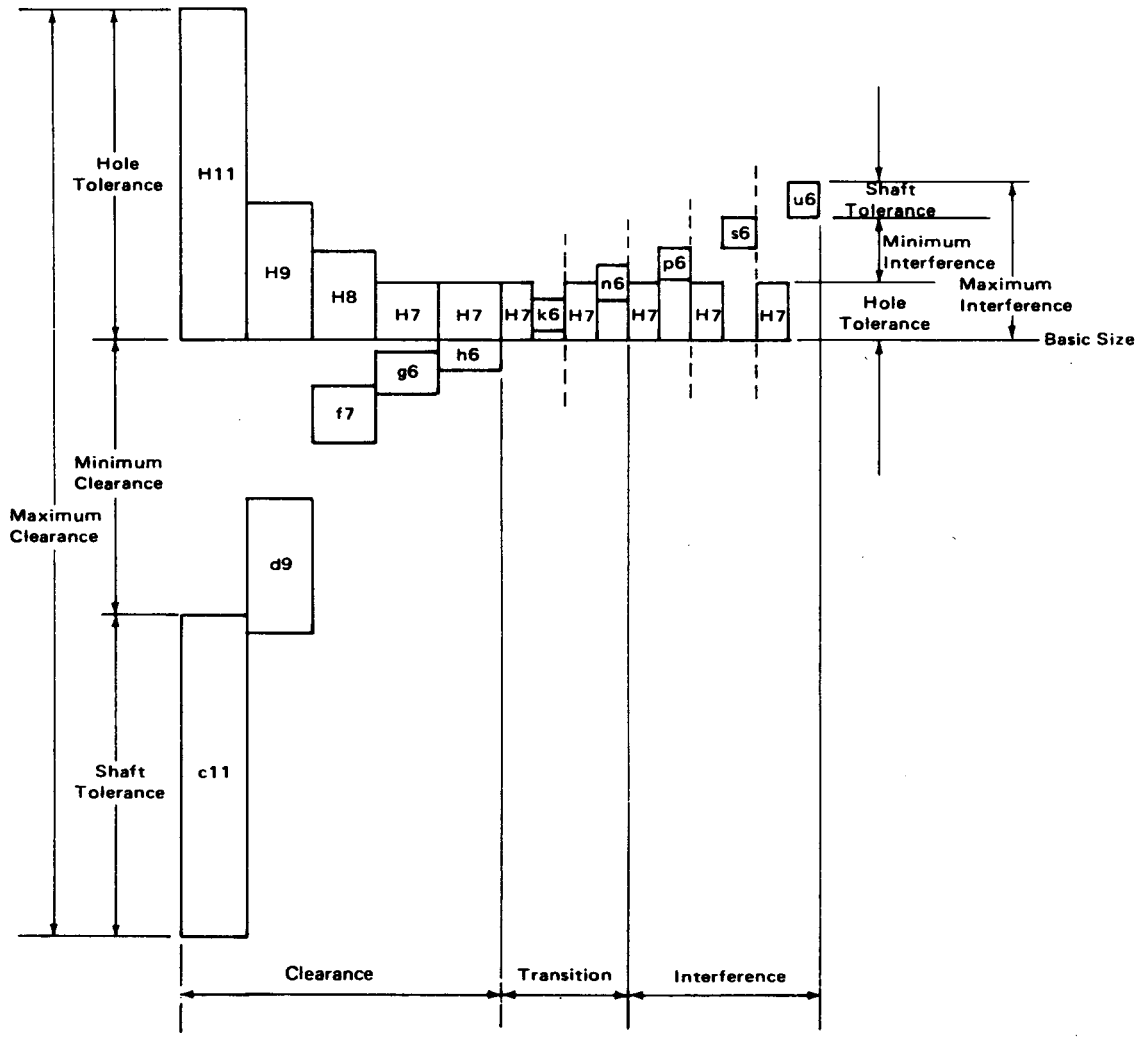


FIG. 4 PREFERRED HOLE BASIS FITS

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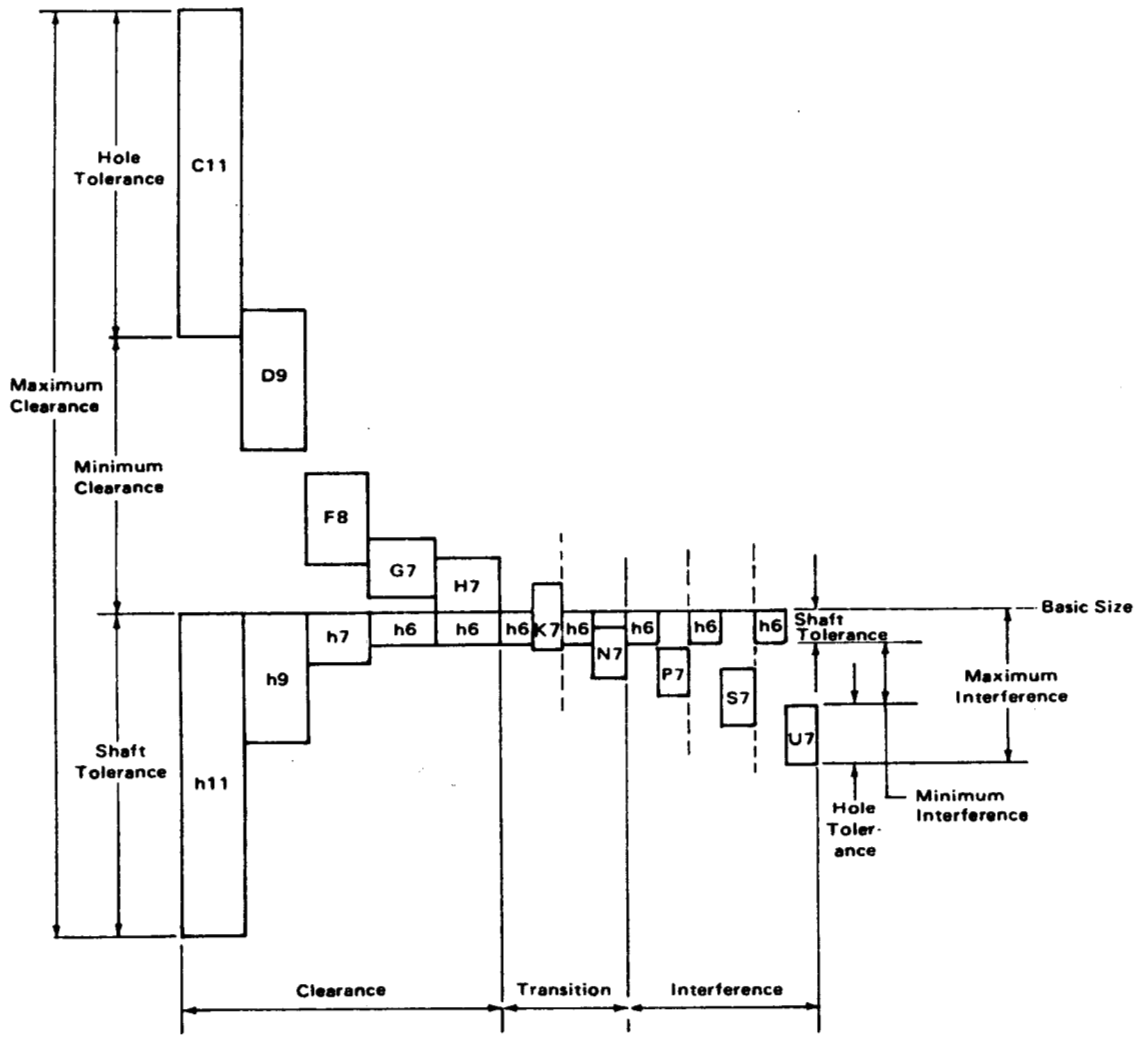


FIG. 5 PREFERRED SHAFT BASIS FITS

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

More Clearance — More Interference

[1] The transition and interference shaft basis fits shown do not convert to exactly the same hole basis fit conditions for basic sizes in range from 0 through 3 mm. Interference fit P7/h6 converts to a transition fit H7/p6 in the above size range.

FIG. 6 DESCRIPTION OF PREFERRED FITS

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TABLE 2 PREFERRED HOLE BASIS CLEARANCE FITS

Dimensions in mm.

BASIC SIZE		LOOSE RUNNING Hole H11	Shaft c11	Fit	FREE RUNNING Hole H9	Shaft d9	Fit	CLOSE RUNNING Hole H8	Shaft f7	Fit	SLIDING Hole H7	Shaft g6	Fit	LOCATIONAL CLEARANCE Hole H7	Shat h6	Fit
1	MAX	1.060	0.940	0.180	1.025	0.980	0.070	1.014	0.994	0.030	1.010	0.998	0.018	1.010	1.000	0.016
	MIN	1.000	0.880	0.060	1.000	0.955	0.020	1.000	0.984	0.006	1.000	0.992	0.002	1.000	0.994	0.000
1.2	MAX	1.260	1.140	0.180	1.225	1.180	0.070	1.214	1.194	0.030	1.210	1.198	0.018	1.210	1.200	0.016
	MIN	1.200	1.080	0.060	1.200	1.155	0.020	1.200	1.184	0.006	1.200	1.192	0.002	1.200	1.194	0.000
1.6	MAX	1.660	1.540	0.180	1.625	1.580	0.070	1.614	1.594	0.030	1.610	1.598	0.018	1.610	1.600	0.016
	MIN	1.600	1.480	0.060	1.600	1.555	0.020	1.600	1.584	0.006	1.600	1.592	0.002	1.600	1.594	0.000
2	MAX	2.060	1.940	0.180	2.025	1.980	0.070	2.014	1.994	0.030	2.010	1.998	0.018	2.010	2.000	0.016
	MIN	2.000	1.880	0.060	2.000	1.955	0.020	2.000	1.984	0.006	2.000	1.992	0.002	2.000	1.994	0.000
2.5	MAX	2.560	2.440	0.180	2.525	2.480	0.070	2.514	2.494	0.030	2.510	2.498	0.018	2.510	2.500	0.016
	MIN	2.500	2.380	0.060	2.500	2.455	0.020	2.500	2.484	0.006	2.500	2.492	0.002	2.500	2.494	0.000
3	MAX	3.060	2.940	0.180	3.025	2.980	0.070	3.014	2.994	0.030	3.010	2.998	0.018	3.010	3.000	0.016
	MIN	3.000	2.880	0.060	3.000	2.955	0.020	3.000	2.984	0.006	3.000	2.992	0.002	3.000	2.994	0.000
4	MAX	4.075	3.930	0.220	4.030	3.970	0.090	4.018	3.990	0.040	4.012	3.996	0.024	4.012	4.000	0.020
	MIN	4.000	3.855	0.070	4.000	3.940	0.030	4.000	3.978	0.010	4.000	3.988	0.004	4.000	3.992	0.000
5	MAX	5.075	4.930	0.220	5.030	4.970	0.090	5.018	4.990	0.040	5.012	4.996	0.024	5.012	5.000	0.020
	MIN	5.000	4.855	0.070	5.000	4.940	0.030	5.000	4.978	0.010	5.000	4.988	0.004	5.000	4.992	0.000
6	MAX	6.075	5.930	0.220	6.030	5.970	0.090	6.018	5.990	0.040	6.012	5.996	0.024	6.012	6.000	0.020
	MIN	6.000	5.855	0.070	6.000	5.940	0.030	6.000	5.978	0.010	6.000	5.988	0.004	6.000	5.992	0.000
8	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
10	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
12	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
16	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
20	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
25	MAX	25.130	24.890	0.370	25.052	24.935	0.169	25.033	24.980	0.074	25.021	24.993	0.041	25.021	25.000	0.034
	MIN	25.000	24.760	0.110	25.000	24.883	0.065	25.000	24.959	0.020	25.000	24.980	0.007	25.000	24.987	0.000
30	MAX	30.130	29.890	0.370	30.052	29.935	0.169	30.033	29.980	0.074	30.021	29.993	0.041	30.021	30.000	0.034
	MIN	30.000	29.760	0.110	30.000	29.883	0.065	30.000	29.959	0.020	30.000	29.980	0.007	30.000	29.987	0.000

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TABLE 2 PREFERRED HOLE BASIS CLEARANCE FITS (Continued)

Dimensions in mm.

BASIC SIZE		LOOSE RUNNING Hole H11	Shaft c11	Fit	FREE RUNNING Hole H9	Shaft d9	Fit	CLOSE RUNNING Hole H8	Shaft f7	Fit	SLIDING Hole H7	Shaft g6	Fit	LOCATIONAL CLEARANCE Hole H7	Shaft h6	Fit
40	MAX	40.160	39.880	0.440	40.062	39.920	0.204	40.039	39.975	0.089	40.025	39.991	0.050	40.025	40.000	0.041
	MIN	40.000	39.720	0.120	40.000	39.858	0.080	40.000	39.950	0.025	40.000	39.975	0.009	40.000	39.984	0.000
50	MAX	50.160	49.870	0.450	50.062	49.920	0.204	50.039	49.975	0.089	50.025	49.991	0.050	50.025	50.000	0.041
	MIN	50.000	49.710	0.130	50.000	49.858	0.080	50.000	49.950	0.025	50.000	49.975	0.009	50.000	49.984	0.000
60	MAX	60.190	59.860	0.520	60.074	59.900	0.248	60.046	59.970	0.106	60.030	59.990	0.059	60.030	60.000	0.049
	MIN	60.000	59.670	0.140	60.000	59.826	0.100	60.000	59.940	0.030	60.000	59.971	0.010	60.000	59.981	0.000
80	MAX	80.190	79.850	0.530	80.074	79.900	0.248	80.046	79.970	0.106	80.030	79.990	0.059	80.030	80.000	0.049
	MIN	80.000	79.660	0.150	80.000	79.826	0.100	80.000	79.940	0.030	80.000	79.971	0.010	80.000	79.981	0.000
100	MAX	100.220	99.830	0.610	100.087	99.880	0.294	100.054	99.964	0.125	100.035	99.988	0.069	100.035	100.000	0.057
	MIN	100.000	99.610	0.170	100.000	99.793	0.120	100.000	99.929	0.036	100.000	99.966	0.012	100.000	99.978	0.000
120	MAX	120.220	119.820	0.620	120.087	119.880	0.294	120.054	119.964	0.125	120.035	119.988	0.069	120.035	120.000	0.057
	MIN	120.000	119.600	0.180	120.000	119.793	0.120	120.000	119.929	0.036	120.000	119.966	0.012	120.000	119.978	0.000
160	MAX	160.250	159.790	0.710	160.100	159.855	0.345	160.063	159.957	0.146	160.040	159.986	0.079	160.040	160.000	0.065
	MIN	160.000	159.540	0.210	160.000	159.755	0.145	160.000	159.917	0.043	160.000	159.961	0.014	160.000	159.975	0.000
200	MAX	200.290	199.760	0.820	200.115	199.830	0.400	200.072	199.950	0.168	200.046	199.985	0.090	200.046	200.000	0.075
	MIN	200.000	199.470	0.240	200.000	199.715	0.170	200.000	199.904	0.050	200.000	199.956	0.015	200.000	199.971	0.000
250	MAX	250.290	249.720	0.860	250.115	249.830	0.400	250.072	249.950	0.168	250.046	249.985	0.090	250.046	250.000	0.075
	MIN	250.000	249.430	0.280	250.000	249.715	0.170	250.000	249.904	0.050	250.000	249.956	0.015	250.000	249.971	0.000
300	MAX	300.320	299.670	0.970	300.130	299.810	0.450	300.081	299.944	0.189	300.052	299.983	0.101	300.052	300.000	0.084
	MIN	300.000	299.350	0.330	300.000	299.680	0.190	300.000	299.892	0.056	300.000	299.951	0.017	300.000	299.968	0.000
400	MAX	400.360	399.600	1.120	400.140	399.790	0.490	400.089	399.938	0.208	400.057	399.982	0.111	400.057	400.000	0.093
	MIN	400.000	399.240	0.400	400.000	399.650	0.210	400.000	399.881	0.062	400.000	399.946	0.018	400.000	399.964	0.000
500	MAX	500.400	499.520	1.280	500.155	499.770	0.540	500.097	499.932	0.228	500.063	499.980	0.123	500.063	500.000	0.103
	MIN	500.000	499.120	0.480	500.000	499.615	0.230	500.000	499.869	0.068	500.000	499.940	0.020	500.000	499.960	0.000

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TABLE 3 PREFERRED HOLE BASIS TRANSITION AND INTERFERENCE FITS

Dimensions in mm.

BASIC SIZE		LOCATIONAL TRANSN. Hole H7	Shaft k6	Fit	LOCATIONAL TRANSN. Hole H7	Shaft n6	Fit	LOCATIONAL INTERF. Hole H7	Shaft p6	Fit	MEDIUM DRIVE Hole H7	Shaft s6	Fit	FORCE Hole H7	Shaft u6	Fit
1	MAX	1·010	1·006	0·010	1·010	1·010	0·006	1·010	1·012	0·004	1·010	1·020	−0·004	1·010	1·024	−0·008
	MIN	1·000	1·000	−0·006	1·000	1·004	−0·010	1·000	1·006	−0·012	1·000	1·014	−0·020	1·000	1·018	−0·024
1·2	MAX	1·210	1·206	0·010	1·210	1·210	0·006	1·210	1·212	0·004	1·210	1·220	−0·004	1·210	1·224	−0·008
	MIN	1·200	1·200	−0·006	1·200	1·204	−0·010	1·200	1·206	−0·012	1·200	1·214	−0·020	1·200	1·218	−0·024
1·6	MAX	1·610	1·606	0·010	1·610	1·610	0·006	1·610	1·612	0·004	1·610	1·620	−0·004	1·610	1·624	−0·008
	MIN	1·600	1·600	−0·006	1·600	1·604	−0·010	1·600	1·606	−0·012	1·600	1·614	−0·020	1·600	1·618	−0·024
2	MAX	2·010	2·006	0·010	2·010	2·010	0·006	2·010	2·012	0·004	2·010	2·020	−0·004	2·010	2·024	−0·008
	MIN	2·000	2·000	−0·006	2·000	2·004	−0·010	2·000	2·006	−0·012	2·000	2·014	−0·020	2·000	2·018	−0·024
2·5	MAX	2·510	2·506	0·010	2·510	2·510	0·006	2·510	2·512	0·004	2·510	2·520	−0·004	2·510	2·524	−0·008
	MIN	2·500	2·500	−0·006	2·500	2·504	−0·010	2·500	2·506	−0·012	2·500	2·514	−0·020	2·500	2·518	−0·024
3	MAX	3·010	3·006	0·010	3·010	3·010	0·006	3·010	3·012	0·004	3·010	3·020	−0·004	3·010	3·024	−0·008
	MIN	3·000	3·000	−0·006	3·000	3·004	−0·010	3·000	3·006	−0·012	3·000	3·014	−0·020	3·000	3·018	−0·024
4	MAX	4·012	4·009	0·011	4·012	4·016	0·004	4·012	4·020	0·000	4·012	4·027	−0·007	4·012	4·031	−0·011
	MIN	4·000	4·001	−0·009	4·000	4·008	−0·016	4·000	4·012	−0·020	4·000	4·019	−0·027	4·000	4·023	−0·031
5	MAX	5·012	5·009	0·011	5·012	5·016	0·004	5·012	5·020	0·000	5·012	5·027	−0·007	5·012	5·031	−0·011
	MIN	5·000	5·001	−0·009	5·000	5·008	−0·016	5·000	5·012	−0·020	5·000	5·019	−0·027	5·000	5·023	−0·031
6	MAX	6·012	6·009	0·011	6·012	6·016	0·004	6·012	6·020	0·000	6·012	6·027	−0·007	6·012	6·031	−0·011
	MIN	6·000	6·001	−0·009	6·000	6·008	−0·016	6·000	6·012	−0·020	6·000	6·019	−0·027	6·000	6·023	−0·031
8	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
10	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
12	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
16	MAX	16·018	16·012	0·017	16·018	16·023	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
20	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
25	MAX	25·021	25·015	0·019	25·021	25·028	0·006	25·021	25·035	−0·001	25·021	25·048	−0·014	25·021	25·061	−0·027
	MIN	25·000	25·002	−0·015	25·000	25·015	−0·028	25·000	25·022	−0·035	25·000	25·035	−0·048	25·000	25·048	−0·061
30	MAX	30·021	30·015	0·019	30·021	30·028	0·006	30·021	30·035	−0·001	30·021	30·048	−0·014	30·021	30·061	−0·027
	MIN	30·000	30·002	−0·015	30·000	30·015	−0·028	30·000	30·022	−0·035	30·000	30·035	−0·048	30·000	30·048	−0·061

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TABLE 3 PREFERRED HOLE BASIS TRANSITION AND INTERFERENCE FITS (Continued)

Dimensions in mm.

BASIC SIZE		LOCATIONAL TRANSN. Hole H7	Shaft k6	Fit	LOCATIONAL TRANSN. Hole H7	Shaft n6	Fit	LOCATIONAL INTERF. Hole H7	Shaft p6	Fit	MEDIUM DRIVE Hole H7	Shaft s6	Fit	FORCE Hole H7	Shaft u6	Fit
40	MAX	40.025	40.018	0.023	40.025	40.033	0.008	40.025	40.042	-0.001	40.025	40.059	-0.018	40.025	40.076	-0.035
	MIN	40.000	40.002	-0.018	40.000	40.017	-0.033	40.000	40.026	-0.042	40.000	40.043	-0.059	40.000	40.060	-0.076
50	MAX	50.025	50.018	0.023	50.025	50.033	0.008	50.025	50.042	-0.001	50.025	50.059	-0.018	50.025	50.086	-0.045
	MIN	50.000	50.002	-0.018	50.000	50.017	-0.033	50.000	50.026	-0.042	50.000	50.043	-0.059	50.000	50.070	-0.086
60	MAX	60.030	60.021	0.028	60.030	60.039	0.010	60.030	60.051	-0.002	60.030	60.072	-0.023	60.030	60.106	-0.057
	MIN	60.000	60.002	-0.021	60.000	60.020	-0.039	60.000	60.032	-0.051	60.000	60.053	-0.072	60.000	60.087	-0.106
80	MAX	80.030	80.021	0.028	80.030	80.039	0.010	80.030	80.051	-0.002	80.030	80.078	-0.029	80.030	80.121	-0.072
	MIN	80.000	80.002	-0.021	80.000	80.020	-0.039	80.000	80.032	-0.051	80.000	80.059	-0.078	80.000	80.102	-0.121
100	MAX	100.035	100.025	0.032	100.035	100.045	0.012	100.035	100.059	-0.002	100.035	100.093	-0.036	100.035	100.146	-0.089
	MIN	100.000	100.003	-0.025	100.000	100.023	-0.045	100.000	100.037	-0.059	100.000	100.071	-0.093	100.000	100.124	-0.146
120	MAX	120.035	120.025	0.032	120.035	120.045	0.012	120.035	120.059	-0.002	120.035	120.101	-0.044	120.035	120.166	-0.109
	MIN	120.000	120.003	-0.025	120.000	120.023	-0.045	120.000	120.037	-0.059	120.000	120.079	-0.101	120.000	120.144	-0.166
160	MAX	160.040	160.028	0.037	160.040	160.052	0.013	160.040	160.068	-0.003	160.040	160.125	-0.060	160.040	160.215	-0.150
	MIN	160.000	160.003	-0.028	160.000	160.027	-0.052	160.000	160.043	-0.068	160.000	160.100	-0.125	160.000	160.190	-0.215
200	MAX	200.046	200.033	0.042	200.046	200.060	0.015	200.046	200.079	-0.004	200.046	200.151	-0.076	200.046	200.265	-0.190
	MIN	200.000	200.004	-0.033	200.000	200.031	-0.060	200.000	200.050	-0.079	200.000	200.122	-0.151	200.000	200.236	-0.265
250	MAX	250.046	250.033	0.042	250.046	250.060	0.015	250.046	250.079	-0.004	250.046	250.169	-0.094	250.046	250.313	-0.238
	MIN	250.000	250.004	-0.033	250.000	250.031	-0.060	250.000	250.050	-0.079	250.000	250.140	-0.169	250.000	250.284	-0.313
300	MAX	300.052	300.036	0.048	300.052	300.066	0.018	300.052	300.088	-0.004	300.052	300.202	-0.118	300.052	300.382	-0.298
	MIN	300.000	300.004	-0.036	300.000	300.034	-0.066	300.000	300.056	-0.088	300.000	300.170	-0.202	300.000	300.350	-0.382
400	MAX	400.057	400.040	0.053	400.057	400.073	0.020	400.057	400.098	-0.005	400.057	400.244	-0.151	400.057	400.471	-0.378
	MIN	400.000	400.004	-0.040	400.000	400.037	-0.073	400.000	400.062	-0.098	400.000	400.208	-0.244	400.000	400.435	-0.471
500	MAX	500.063	500.045	0.058	500.063	500.080	0.023	500.063	500.108	-0.005	500.063	500.292	-0.189	500.063	500.580	-0.477
	MIN	500.000	500.005	-0.045	500.000	500.040	-0.080	500.000	500.068	-0.108	500.000	500.252	-0.292	500.000	500.540	-0.580

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TABLE 4 PREFERRED SHAFT BASIS CLEARANCE FITS

Dimensions in mm.

BASIC SIZE		LOOSE RUNNING Hole C11	Shaft h11	Fit	FREE RUNNING Hole D9	Shaft h9	Fit	CLOSE RUNNING Hole F8	Shaft h7	Fit	SLIDING Hole G7	Shaft h6	Fit	LOCATIONAL CLEARANCE Hole H7	Shaft h6	Fit
1	MAX	1.120	1.000	0.180	1.045	1.000	0.070	1.020	1.000	0.030	1.012	1.000	0.018	1.010	1.000	0.016
	MIN	1.060	0.940	0.060	1.020	0.975	0.020	1.006	0.990	0.006	1.002	0.994	0.002	1.000	0.994	0.000
1.2	MAX	1.320	1.200	0.180	1.245	1.200	0.070	1.220	1.200	0.030	1.212	1.200	0.018	1.210	1.200	0.016
	MIN	1.260	1.140	0.060	1.220	1.175	0.020	1.206	1.190	0.006	1.202	1.194	0.002	1.200	1.194	0.000
1.6	MAX	1.720	1.600	0.180	1.645	1.600	0.070	1.620	1.600	0.030	1.612	1.600	0.018	1.610	1.600	0.016
	MIN	1.660	1.540	0.060	1.620	1.575	0.020	1.606	1.590	0.006	1.602	1.594	0.002	1.600	1.594	0.000
2	MAX	2.120	2.000	0.180	2.045	2.000	0.070	2.020	2.000	0.030	2.012	2.000	0.018	2.010	2.000	0.016
	MIN	2.060	1.940	0.060	2.020	1.975	0.020	2.006	1.990	0.006	2.002	1.994	0.002	2.000	1.994	0.000
2.5	MAX	2.620	2.500	0.180	2.545	2.500	0.070	2.520	2.500	0.030	2.512	2.500	0.018	2.510	2.500	0.016
	MIN	2.560	2.440	0.060	2.520	2.475	0.020	2.506	2.490	0.006	2.502	2.494	0.002	2.500	2.494	0.000
3	MAX	3.120	3.000	0.180	3.045	3.000	0.070	3.020	3.000	0.030	3.012	3.000	0.018	3.010	3.000	0.016
	MIN	3.060	2.940	0.060	3.020	2.975	0.020	3.006	2.990	0.006	3.002	2.994	0.002	3.000	2.994	0.000
4	MAX	4.145	4.000	0.220	4.060	4.000	0.090	4.028	4.000	0.040	4.016	4.000	0.024	4.012	4.000	0.020
	MIN	4.070	3.925	0.070	4.030	3.970	0.030	4.010	3.988	0.010	4.004	3.992	0.004	4.000	3.992	0.000
5	MAX	5.145	5.000	0.220	5.060	5.000	0.090	5.028	5.000	0.040	5.016	5.000	0.024	5.012	5.000	0.020
	MIN	5.070	4.925	0.070	5.030	4.970	0.030	5.010	4.988	0.010	5.004	4.992	0.004	5.000	4.992	0.000
6	MAX	6.145	6.000	0.220	6.060	6.000	0.090	6.028	6.000	0.040	6.016	6.000	0.024	6.012	6.000	0.020
	MIN	6.070	5.925	0.070	6.030	5.970	0.030	6.010	5.988	0.010	6.004	5.992	0.004	6.000	5.992	0.000
8	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
10	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
12	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
16	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
20	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
25	MAX	25.240	25.000	0.370	25.117	25.000	0.169	25.053	25.000	0.074	25.028	25.000	0.041	25.021	25.000	0.034
	MIN	25.110	24.870	0.110	25.065	24.948	0.065	25.020	24.979	0.020	25.007	24.987	0.007	25.000	24.987	0.000
30	MAX	30.240	30.000	0.370	30.117	30.000	0.169	30.053	30.000	0.074	30.028	30.000	0.041	30.021	30.000	0.034
	MIN	30.110	29.870	0.110	30.065	29.948	0.065	30.020	29.979	0.020	30.007	29.987	0.007	30.000	29.987	0.000

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TABLE 4 PREFERRED SHAFT BASIS CLEARANCE FITS (Continued)

Dimensions in mm.

BASIC SIZE		LOOSE RUNNING Hole C11	Shaft h11	Fit	FREE RUNNING Hole D9	Shaft h9	Fit	CLOSE RUNNING Hole F8	Shaft h7	Fit	SLIDING Hole G7	Shaft h6	Fit	LOCATIONAL CLEARANCE Hole H7	Shaft h6	Fit
40	MAX	40.280	40.000	0.440	40.142	40.000	0.204	40.064	40.000	0.089	40.034	40.000	0.050	40.025	40.000	0.041
	MIN	40.120	39.840	0.120	40.080	39.938	0.080	40.025	39.975	0.025	40.009	39.984	0.009	40.000	39.984	0.000
50	MAX	50.290	50.000	0.450	50.142	50.000	0.204	50.064	50.000	0.089	50.034	50.000	0.050	50.025	50.000	0.041
	MIN	50.130	49.840	0.130	50.080	49.938	0.080	50.025	49.975	0.025	50.009	49.984	0.009	50.000	49.984	0.000
60	MAX	60.330	60.000	0.520	60.174	60.000	0.248	60.076	60.000	0.106	60.040	60.000	0.059	60.030	60.000	0.049
	MIN	60.140	59.810	0.140	60.100	59.926	0.100	60.030	59.970	0.030	60.010	59.981	0.010	60.000	59.981	0.000
80	MAX	80.340	80.000	0.530	80.174	80.000	0.248	80.076	80.000	0.106	80.040	80.000	0.059	80.030	80.000	0.049
	MIN	80.150	79.810	0.150	80.100	79.926	0.100	80.030	79.970	0.030	80.010	79.981	0.010	80.000	79.981	0.000
100	MAX	100.390	100.000	0.610	100.207	100.000	0.294	100.090	100.000	0.125	100.047	100.000	0.069	100.035	100.000	0.057
	MIN	100.170	99.780	0.170	100.120	99.913	0.120	100.036	99.965	0.036	100.012	99.978	0.012	100.000	99.978	0.000
120	MAX	120.400	120.000	0.620	120.207	120.000	0.294	120.090	120.000	0.125	120.047	120.000	0.069	120.035	120.000	0.057
	MIN	120.180	119.780	0.180	120.120	119.913	0.120	120.036	119.965	0.036	120.012	119.978	0.012	120.000	119.978	0.000
160	MAX	160.460	160.000	0.710	160.245	160.000	0.345	160.106	160.000	0.146	160.054	160.000	0.079	160.040	160.000	0.065
	MIN	160.210	159.750	0.210	160.145	159.900	0.145	160.043	159.960	0.043	160.014	159.975	0.014	160.000	159.975	0.000
200	MAX	200.530	200.000	0.820	200.285	200.000	0.400	200.122	200.000	0.168	200.061	200.000	0.090	200.046	200.000	0.075
	MIN	200.240	199.710	0.240	200.170	199.885	0.170	200.050	199.954	0.050	200.015	199.971	0.015	200.000	199.971	0.000
250	MAX	250.570	250.000	0.860	250.285	250.000	0.400	250.122	250.000	0.168	250.061	250.000	0.090	250.046	250.000	0.075
	MIN	250.280	249.710	0.280	250.170	249.885	0.170	250.050	249.954	0.050	250.015	249.971	0.015	250.000	249.971	0.000
300	MAX	300.650	300.000	0.970	300.320	300.000	0.450	300.137	300.000	0.189	300.069	300.000	0.101	300.052	300.000	0.084
	MIN	300.330	299.680	0.330	300.190	299.870	0.190	300.056	299.948	0.056	300.017	299.968	0.017	300.000	299.968	0.000
400	MAX	400.760	400.000	1.120	400.350	400.000	0.490	400.151	400.000	0.208	400.075	400.000	0.111	400.057	400.000	0.093
	MIN	400.400	399.640	0.400	400.210	399.860	0.210	400.062	399.943	0.062	400.018	399.964	0.018	400.000	399.964	0.000
500	MAX	500.880	500.000	1.280	500.385	500.000	0.540	500.165	500.000	0.228	500.083	500.000	0.123	500.063	500.000	0.103
	MIN	500.480	499.600	0.480	500.230	499.845	0.230	500.068	499.937	0.068	500.020	499.960	0.020	500.000	499.960	0.000

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TABLE 5 PREFERRED SHAFT BASIS TRANSITION AND INTERFERENCE FITS

Dimensions in mm.

BASIC SIZE		LOCATIONAL TRANSN. Hole K7	Shaft h6	Fit	LOCATIONAL TRANSN. Hole N7	Shaft h6	Fit	LOCATIONAL INTERF. Hole P7	Shaft h6	Fit	MEDIUM DRIVE Hole S7	Shaft h6	Fit	FORCE Hole U7	Shaft h6	Fit
1	MAX	1.000	1.000	0.006	0.996	1.000	0.002	0.994	1.000	0.000	0.986	1.000	-0.008	0.982	1.000	-0.012
	MIN	0.990	0.994	-0.010	0.986	0.994	-0.014	0.984	0.994	-0.016	0.976	0.994	-0.024	0.972	0.994	-0.028
1.2	MAX	1.200	1.200	0.006	1.196	1.200	0.002	1.194	1.200	0.000	1.186	1.200	-0.008	1.182	1.200	-0.012
	MIN	1.190	1.194	-0.010	1.186	1.194	-0.014	1.184	1.194	-0.016	1.176	1.194	-0.024	1.172	1.194	-0.028
1.6	MAX	1.600	1.600	0.006	1.596	1.600	0.002	1.594	1.600	0.000	1.586	1.600	-0.008	1.582	1.600	-0.012
	MIN	1.590	1.594	-0.010	1.586	1.594	-0.014	1.584	1.594	-0.016	1.576	1.594	-0.024	1.572	1.594	-0.028
2	MAX	2.000	2.000	0.006	1.996	2.000	0.002	1.994	2.000	0.000	1.986	2.000	-0.008	1.982	2.000	-0.012
	MIN	1.990	1.994	-0.010	1.986	1.994	-0.014	1.984	1.994	-0.016	1.976	1.994	-0.024	1.972	1.994	-0.028
2.5	MAX	2.500	2.500	0.006	2.496	2.500	0.002	2.494	2.500	0.000	2.486	2.500	-0.008	2.482	2.500	-0.012
	MIN	2.490	2.494	-0.010	2.486	2.494	-0.014	2.484	2.494	-0.016	2.476	2.494	-0.024	2.472	2.494	-0.028
3	MAX	3.000	3.000	0.006	2.996	3.000	0.002	2.994	3.000	0.000	2.986	3.000	-0.008	2.982	3.000	-0.012
	MIN	2.990	2.994	-0.010	2.986	2.994	-0.014	2.984	2.994	-0.016	2.976	2.994	-0.024	2.972	2.994	-0.028
4	MAX	4.003	4.000	0.011	3.996	4.000	0.004	3.992	4.000	0.000	3.985	4.000	-0.007	3.981	4.000	-0.011
	MIN	3.991	3.992	-0.009	3.984	3.992	-0.016	3.980	3.992	-0.020	3.973	3.992	-0.027	3.969	3.992	-0.031
5	MAX	5.003	5.000	0.011	4.996	5.000	0.004	4.992	5.000	0.000	4.985	5.000	-0.007	4.981	5.000	-0.011
	MIN	4.991	4.992	-0.009	4.984	4.992	-0.016	4.980	4.992	-0.020	4.973	4.992	-0.027	4.969	4.992	-0.031
6	MAX	6.003	6.000	0.011	5.996	6.000	0.004	5.992	6.000	0.000	5.985	6.000	-0.007	5.981	6.000	-0.011
	MIN	5.991	5.992	-0.009	5.984	5.992	-0.016	5.980	5.992	-0.020	5.973	5.992	-0.027	5.969	5.992	-0.031
8	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
10	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
12	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
16	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
20	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
25	MAX	25.006	25.000	0.019	24.993	25.000	0.006	24.986	25.000	-0.001	24.973	25.000	-0.014	24.960	25.000	-0.027
	MIN	24.985	24.987	-0.015	24.972	24.987	-0.028	24.965	24.987	-0.035	24.952	24.987	-0.048	24.939	24.987	-0.061
30	MAX	30.006	30.000	0.019	29.993	30.000	0.006	29.986	30.000	-0.001	29.973	30.000	-0.014	29.960	30.000	-0.027
	MIN	29.985	29.987	-0.015	29.972	29.987	-0.028	29.965	29.987	-0.035	29.952	29.987	-0.048	29.939	29.987	-0.061

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TABLE 5 PREFERRED SHAFT BASIS TRANSITION AND INTERFERENCE FITS (Continued)

Dimensions in mm.

BASIC SIZE		LOCATIONAL TRANSN. Hole K7	Shaft h6	Fit	LOCATIONAL TRANSN. Hole N7	Shaft h6	Fit	LOCATIONAL INTERF. Hole P7	Shaft h6	Fit	MEDIUM DRIVE Hole S7	Shaft h6	Fit	FORCE Hole U7	Shaft h6	Fit
40	MAX	40.007	40.000	0.023	39.992	40.000	0.008	39.983	40.000	-0.001	39.966	40.000	-0.018	39.949	40.000	-0.035
	MIN	39.982	39.984	-0.018	39.967	39.984	-0.033	39.958	39.984	-0.042	39.941	39.984	-0.059	39.924	39.984	-0.076
50	MAX	50.007	50.000	0.023	49.992	50.000	0.008	49.983	50.000	-0.001	49.966	50.000	-0.018	49.939	50.000	-0.045
	MIN	49.982	49.984	-0.018	49.967	49.984	-0.033	49.958	49.984	-0.042	49.941	49.984	-0.059	49.914	49.984	-0.086
60	MAX	60.009	60.000	0.028	59.991	60.000	0.010	59.979	60.000	-0.002	59.958	60.000	-0.023	59.924	60.000	-0.057
	MIN	59.979	59.981	-0.021	59.961	59.981	-0.039	59.949	59.981	-0.051	59.928	59.981	-0.072	59.894	59.981	-0.106
80	MAX	80.009	80.000	0.028	79.991	80.000	0.010	79.979	80.000	-0.002	79.952	80.000	-0.029	79.909	80.000	-0.072
	MIN	79.979	79.981	-0.021	79.961	79.981	-0.039	79.949	79.981	-0.051	79.922	79.981	-0.078	79.879	79.981	-0.121
100	MAX	100.010	100.000	0.032	99.990	100.000	0.012	99.976	100.000	-0.002	99.942	100.000	-0.036	99.889	100.000	-0.089
	MIN	99.975	99.978	-0.025	99.955	99.978	-0.045	99.941	99.978	-0.059	99.907	99.978	-0.093	99.854	99.978	-0.146
120	MAX	120.010	120.000	0.032	119.990	120.000	0.012	119.976	120.000	-0.002	119.934	120.000	-0.044	119.869	120.000	-0.109
	MIN	119.975	119.978	-0.025	119.955	119.978	-0.045	119.941	119.978	-0.059	119.899	119.978	-0.101	119.834	119.978	-0.166
160	MAX	160.012	160.000	0.037	159.988	160.000	0.013	159.972	160.000	-0.003	159.915	160.000	-0.060	159.825	160.000	-0.150
	MIN	159.972	159.975	-0.028	159.948	159.975	-0.052	159.932	159.975	-0.068	159.875	159.975	-0.125	159.785	159.975	-0.215
200	MAX	200.013	200.000	0.042	199.986	200.000	0.015	199.967	200.000	-0.004	199.895	200.000	-0.076	199.781	200.000	-0.190
	MIN	199.967	199.971	-0.033	199.940	199.971	-0.060	199.921	199.971	-0.079	199.849	199.971	-0.151	199.735	199.971	-0.265
250	MAX	250.013	250.000	0.042	249.986	250.000	0.015	249.967	250.000	-0.004	249.877	250.000	-0.094	249.733	250.000	-0.238
	MIN	249.967	249.971	-0.033	249.940	249.971	-0.060	249.921	249.971	-0.079	249.831	249.971	-0.169	249.687	249.971	-0.313
300	MAX	300.016	300.000	0.048	299.986	300.000	0.018	299.964	300.000	-0.004	299.850	300.000	-0.118	299.670	300.000	-0.298
	MIN	299.964	299.968	-0.036	299.934	299.968	-0.066	299.912	299.968	-0.088	299.798	299.968	-0.202	299.618	299.968	-0.382
400	MAX	400.017	400.000	0.053	399.984	400.000	0.020	399.959	400.000	-0.005	399.813	400.000	-0.151	399.586	400.000	-0.378
	MIN	399.960	399.964	-0.040	399.927	399.964	-0.073	399.902	399.964	-0.098	399.756	399.964	-0.244	399.529	399.964	-0.471
500	MAX	500.018	500.000	0.058	499.983	500.000	0.023	499.955	500.000	-0.005	499.771	500.000	-0.189	499.483	500.000	-0.477
	MIN	499.955	499.960	-0.045	499.920	499.960	-0.080	499.892	499.960	-0.108	499.708	499.960	-0.292	499.420	499.960	-0.580

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APPENDIX A

Tables of Deviation From Basic Sizes up to 500 mm of Preferred Tolerance Zones[2]

INDEX

Tolerance Zone Ranges — Holes	Table Number
A14 through A9 and B14 through B9	A1
C13 through C8 and D12 through D7	A2
E12 through E7 and F11 through F6	A3
G10 through G5 and J8 through J6	A4
H16 through H1	A5
JS16 through JS1	A6
K10 through K5 and M10 through M5	A7
N10 through N5 and P10 through P5	A8
R10 through R5 and S10 through S5	A9
T10 through T5 and U10 through U5	A10
V10 through V5 and X10 through X5	A11
Y10 through Y5 and Z10 through Z5	A12
Shafts	
a14 through a9 and b14 through b9	A13
c13 through c8 and d12 through d7	A14
e11 through e6 and f10 through f5	A15
g9 through g4 and j7 through j5	A16
h16 through h1	A17
js16 through js1	A18
k9 through k4 and m9 through m4	A19
n9 through n4 and p9 through p4	A20
r9 through r4 and s9 through s4	A21
t9 through t4 and u9 through u4	A22
v9 through v4 and x9 through x4	A23
y9 through y4 and z9 through z4	A24

[2] For first, second and third choice tolerance zones see Figure 2 and Figure 3.

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Table A1 Tolerance Zones for Internal (Hole) Dimensions (A14 through A9 and B14 through B9)

Dimensions in mm

BASIC SIZE	A14	A13	A12	A11	A10	A9	B14	B13	B12	B11	B10	B9
OVER 0	+0.520	+0.410	+0.370	+0.330	+0.310	+0.295	+0.390	+0.280	+0.240	+0.200	+0.180	+0.165
TO 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
OVER 3	+0.570	+0.450	+0.390	+0.345	+0.318	+0.300	+0.440	+0.320	+0.260	+0.215	+0.188	+0.170
TO 6	+0.270	+0.270	+0.270	+0.270	+0.270	+0.270	+0.140	+0.140	+0.140	+0.140	+0.140	+0.140
OVER 6	+0.640	+0.500	+0.430	+0.370	+0.338	+0.316	+0.510	+0.370	+0.300	+0.240	+0.208	+0.186
TO 10	+0.280	+0.280	+0.280	+0.280	+0.280	+0.280	+0.150	+0.150	+0.150	+0.150	+0.150	+0.150
OVER 10	+0.720	+0.560	+0.470	+0.400	+0.360	+0.338	+0.580	+0.420	+0.330	+0.260	+0.220	+0.193
TO 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
OVER 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
TO 18	+0.290	+0.290	+0.290	+0.290	+0.290	+0.290	+0.150	+0.150	+0.150	+0.150	+0.150	+0.150
OVER 18	+0.820	+0.630	+0.510	+0.430	+0.384	+0.352	+0.680	+0.490	+0.370	+0.290	+0.244	+0.212
TO 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
OVER 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
TO 30	+0.300	+0.300	+0.300	+0.300	+0.300	+0.300	+0.160	+0.160	+0.160	+0.160	+0.160	+0.160
OVER 30	+0.930	+0.700	+0.560	+0.470	+0.410	+0.372	+0.790	+0.560	+0.420	+0.330	+0.270	+0.232
TO 40	+0.310	+0.310	+0.310	+0.310	+0.310	+0.310	+0.170	+0.170	+0.170	+0.170	+0.170	+0.170
OVER 40	+0.940	+0.710	+0.570	+0.480	+0.420	+0.382	+0.800	+0.570	+0.430	+0.340	+0.280	+0.242
TO 50	+0.320	+0.320	+0.320	+0.320	+0.320	+0.320	+0.180	+0.180	+0.180	+0.180	+0.180	+0.180
OVER 50	+1.080	+0.800	+0.640	+0.530	+0.460	+0.414	+0.930	+0.650	+0.490	+0.380	+0.310	+0.264
TO 65	+0.340	+0.340	+0.340	+0.340	+0.340	+0.340	+0.190	+0.190	+0.190	+0.190	+0.190	+0.190
OVER 65	+1.100	+0.820	+0.660	+0.550	+0.480	+0.434	+0.940	+0.660	+0.500	+0.390	+0.320	+0.274
TO 80	+0.360	+0.360	+0.360	+0.360	+0.360	+0.360	+0.200	+0.200	+0.200	+0.200	+0.200	+0.200
OVER 80	+1.250	+0.920	+0.730	+0.600	+0.520	+0.467	+1.090	+0.760	+0.570	+0.440	+0.360	+0.307
TO 100	+0.380	+0.380	+0.380	+0.380	+0.380	+0.380	+0.220	+0.220	+0.220	+0.220	+0.220	+0.220
OVER 100	+1.280	+0.950	+0.760	+0.630	+0.550	+0.497	+1.110	+0.780	+0.590	+0.460	+0.380	+0.327
TO 120	+0.410	+0.410	+0.410	+0.410	+0.410	+0.410	+0.240	+0.240	+0.240	+0.240	+0.240	+0.240
OVER 120	+1.460	+1.090	+0.860	+0.710	+0.620	+0.560	+1.260	+0.890	+0.660	+0.510	+0.420	+0.360
TO 140	+0.460	+0.460	+0.460	+0.460	+0.460	+0.460	+0.260	+0.260	+0.260	+0.260	+0.260	+0.260
OVER 140	+1.520	+1.150	+0.920	+0.770	+0.680	+0.620	+1.280	+0.910	+0.680	+0.530	+0.440	+0.380
TO 160	+0.520	+0.520	+0.520	+0.520	+0.520	+0.520	+0.280	+0.280	+0.280	+0.280	+0.280	+0.280
OVER 160	+1.580	+1.210	+0.980	+0.830	+0.740	+0.680	+1.310	+0.940	+0.710	+0.560	+0.470	+0.410
TO 180	+0.580	+0.580	+0.580	+0.580	+0.580	+0.580	+0.310	+0.310	+0.310	+0.310	+0.310	+0.310
OVER 180	+1.810	+1.380	+1.120	+0.950	+0.845	+0.775	+1.490	+1.060	+0.800	+0.630	+0.525	+0.455
TO 200	+0.660	+0.660	+0.660	+0.660	+0.660	+0.660	+0.340	+0.340	+0.340	+0.340	+0.340	+0.340
OVER 200	+1.890	+1.460	+1.200	+1.030	+0.925	+0.855	+1.530	+1.100	+0.840	+0.670	+0.565	+0.495
TO 225	+0.740	+0.740	+0.740	+0.740	+0.740	+0.740	+0.380	+0.380	+0.380	+0.380	+0.380	+0.380
OVER 225	+1.970	+1.540	+1.280	+1.110	+1.005	+0.935	+1.570	+1.140	+0.880	+0.710	+0.605	+0.535
TO 250	+0.820	+0.820	+0.820	+0.820	+0.820	+0.820	+0.420	+0.420	+0.420	+0.420	+0.420	+0.420
OVER 250	+2.220	+1.730	+1.440	+1.240	+1.130	+1.050	+1.780	+1.290	+1.000	+0.800	+0.690	+0.610
TO 280	+0.920	+0.920	+0.920	+0.920	+0.920	+0.920	+0.480	+0.480	+0.480	+0.480	+0.480	+0.480
OVER 280	+2.350	+1.860	+1.570	+1.370	+1.260	+1.180	+1.840	+1.350	+1.060	+0.860	+0.750	+0.670
TO 315	+1.050	+1.050	+1.050	+1.050	+1.050	+1.050	+0.540	+0.540	+0.540	+0.540	+0.540	+0.540
OVER 315	+2.600	+2.090	+1.770	+1.560	+1.430	+1.340	+2.000	+1.490	+1.170	+0.960	+0.830	+0.740
TO 355	+1.200	+1.200	+1.200	+1.200	+1.200	+1.200	+0.600	+0.600	+0.600	+0.600	+0.600	+0.600
OVER 355	+2.750	+2.240	+1.920	+1.710	+1.580	+1.490	+2.080	+1.570	+1.250	+1.040	+0.910	+0.820
TO 400	+1.350	+1.350	+1.350	+1.350	+1.350	+1.350	+0.680	+0.680	+0.680	+0.680	+0.680	+0.680
OVER 400	+3.050	+2.470	+2.130	+1.900	+1.750	+1.655	+2.310	+1.730	+1.390	+1.160	+1.010	+0.915
TO 450	+1.500	+1.500	+1.500	+1.500	+1.500	+1.500	+0.760	+0.760	+0.760	+0.760	+0.760	+0.760
OVER 450	+3.200	+2.620	+2.280	+2.050	+1.900	+1.805	+2.390	+1.810	+1.470	+1.240	+1.090	+0.995
TO 500	+1.650	+1.650	+1.650	+1.650	+1.650	+1.650	+0.840	+0.840	+0.840	+0.840	+0.840	+0.840

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Table A2 Tolerance Zones for Internal (Hole) Dimensions (C13 through C8 and D12 through D7) Dimensions in mm

BASIC SIZE	C13	C12	C11	C10	C9	C8	D12	D11	D10	D9	D8	D7
OVER 0	+0.200	+0.160	+0.120	+0.100	+0.085	+0.074	+0.120	+0.080	+0.060	+0.045	+0.034	+0.030
TO 3	+0.060	+0.060	+0.060	+0.060	+0.060	+0.060	+0.020	+0.020	+0.020	+0.020	+0.020	+0.020
OVER 3	+0.250	+0.190	+0.145	+0.118	+0.100	+0.088	+0.150	+0.105	+0.078	+0.060	+0.048	+0.042
TO 6	+0.070	+0.070	+0.070	+0.070	+0.070	+0.070	+0.030	+0.030	+0.030	+0.030	+0.030	+0.030
OVER 6	+0.300	+0.230	+0.170	+0.138	+0.116	+0.102	+0.190	+0.130	+0.098	+0.076	+0.062	+0.055
TO 10	+0.080	+0.080	+0.080	+0.080	+0.080	+0.080	+0.040	+0.040	+0.040	+0.040	+0.040	+0.040
OVER 10	+0.365	+0.275	+0.205	+0.165	+0.138	+0.122	+0.230	+0.160	+0.120	+0.093	+0.077	+0.068
TO 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
OVER 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
TO 18	+0.095	+0.095	+0.095	+0.095	+0.095	+0.095	+0.050	+0.050	+0.050	+0.050	+0.050	+0.050
OVER 18	+0.440	+0.320	+0.240	+0.194	+0.162	+0.143	+0.275	+0.195	+0.149	+0.117	+0.098	+0.086
TO 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
OVER 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
TO 30	+0.110	+0.110	+0.110	+0.110	+0.110	+0.110	+0.065	+0.065	+0.065	+0.065	+0.065	+0.065
OVER 30	+0.510	+0.370	+0.280	+0.220	+0.182	+0.159	+0.330	+0.240	+0.180	+0.142	+0.119	+0.105
TO 40	+0.120	+0.120	+0.120	+0.120	+0.120	+0.120	+0.080	+0.080	+0.080	+0.080	+0.080	+0.080
OVER 40	+0.520	+0.380	+0.290	+0.230	+0.192	+0.169	+0.330	+0.240	+0.180	+0.142	+0.119	+0.105
TO 50	+0.130	+0.130	+0.130	+0.130	+0.130	+0.130	+0.080	+0.080	+0.080	+0.080	+0.080	+0.080
OVER 50	+0.600	+0.440	+0.330	+0.260	+0.214	+0.186	+0.400	+0.290	+0.220	+0.174	+0.146	+0.130
TO 65	+0.140	+0.140	+0.140	+0.140	+0.140	+0.140	+0.100	+0.100	+0.100	+0.100	+0.100	+0.100
OVER 65	+0.610	+0.450	+0.340	+0.270	+0.224	+0.196	+0.400	+0.290	+0.220	+0.174	+0.146	+0.130
TO 80	+0.150	+0.150	+0.150	+0.150	+0.150	+0.150	+0.100	+0.100	+0.100	+0.100	+0.100	+0.100
OVER 80	+0.710	+0.520	+0.390	+0.310	+0.257	+0.224	+0.470	+0.340	+0.260	+0.207	+0.174	+0.155
TO 100	+0.170	+0.170	+0.170	+0.170	+0.170	+0.170	+0.120	+0.120	+0.120	+0.120	+0.120	+0.120
OVER 100	+0.720	+0.530	+0.400	+0.320	+0.267	+0.234	+0.470	+0.340	+0.260	+0.207	+0.174	+0.155
TO 120	+0.180	+0.180	+0.180	+0.180	+0.180	+0.180	+0.120	+0.120	+0.120	+0.120	+0.120	+0.120
OVER 120	+0.830	+0.600	+0.450	+0.360	+0.300	+0.263	+0.545	+0.395	+0.305	+0.245	+0.208	+0.185
TO 140	+0.200	+0.200	+0.200	+0.200	+0.200	+0.200	+0.145	+0.145	+0.145	+0.145	+0.145	+0.145
OVER 140	+0.840	+0.610	+0.460	+0.370	+0.310	+0.273	+0.545	+0.395	+0.305	+0.245	+0.208	+0.185
TO 160	+0.210	+0.210	+0.210	+0.210	+0.210	+0.210	+0.145	+0.145	+0.145	+0.145	+0.145	+0.145
OVER 160	+0.860	+0.630	+0.480	+0.390	+0.330	+0.293	+0.545	+0.395	+0.305	+0.245	+0.208	+0.185
TO 180	+0.230	+0.230	+0.230	+0.230	+0.230	+0.230	+0.145	+0.145	+0.145	+0.145	+0.145	+0.145
OVER 180	+0.960	+0.700	+0.530	+0.425	+0.355	+0.312	+0.630	+0.460	+0.355	+0.285	+0.242	+0.216
TO 200	+0.240	+0.240	+0.240	+0.240	+0.240	+0.240	+0.170	+0.170	+0.170	+0.170	+0.170	+0.170
OVER 200	+0.980	+0.720	+0.550	+0.445	+0.375	+0.332	+0.630	+0.460	+0.355	+0.285	+0.242	+0.216
TO 225	+0.260	+0.260	+0.260	+0.260	+0.260	+0.260	+0.170	+0.170	+0.170	+0.170	+0.170	+0.170
OVER 225	+1.000	+0.740	+0.570	+0.465	+0.395	+0.352	+0.630	+0.460	+0.355	+0.285	+0.242	+0.216
TO 250	+0.280	+0.280	+0.280	+0.280	+0.280	+0.280	+0.170	+0.170	+0.170	+0.170	+0.170	+0.170
OVER 250	+1.110	+0.820	+0.620	+0.510	+0.430	+0.381	+0.710	+0.510	+0.400	+0.320	+0.271	+0.242
TO 280	+0.300	+0.300	+0.300	+0.300	+0.300	+0.300	+0.190	+0.190	+0.190	+0.190	+0.190	+0.190
OVER 280	+1.140	+0.850	+0.650	+0.540	+0.460	+0.411	+0.710	+0.510	+0.400	+0.320	+0.271	+0.242
TO 315	+0.330	+0.330	+0.330	+0.330	+0.330	+0.330	+0.190	+0.190	+0.190	+0.190	+0.190	+0.190
OVER 315	+1.250	+0.930	+0.720	+0.590	+0.500	+0.449	+0.780	+0.570	+0.440	+0.350	+0.299	+0.267
TO 355	+0.360	+0.360	+0.360	+0.360	+0.360	+0.360	+0.210	+0.210	+0.210	+0.210	+0.210	+0.210
OVER 355	+1.290	+0.970	+0.760	+0.630	+0.540	+0.489	+0.780	+0.570	+0.440	+0.350	+0.299	+0.267
TO 400	+0.400	+0.400	+0.400	+0.400	+0.400	+0.400	+0.210	+0.210	+0.210	+0.210	+0.210	+0.210
OVER 400	+1.410	+1.070	+0.840	+0.690	+0.595	+0.537	+0.860	+0.630	+0.480	+0.385	+0.327	+0.293
TO 450	+0.440	+0.440	+0.440	+0.440	+0.440	+0.440	+0.230	+0.230	+0.230	+0.230	+0.230	+0.230
OVER 450	+1.450	+1.110	+0.880	+0.730	+0.635	+0.577	+0.860	+0.630	+0.480	+0.385	+0.327	+0.293
TO 500	+0.480	+0.480	+0.480	+0.480	+0.480	+0.480	+0.230	+0.230	+0.230	+0.230	+0.230	+0.230

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Table A3 Tolerance Zones for Internal (Hole) Dimensions (E12 through E7 and F11 through F6)

Dimensions in mm

BASIC SIZE	E12	E11	E10	E9	E8	E7	F11	F10	F9	F8	F7	F6
OVER 0	+0.114	+0.074	+0.054	+0.039	+0.028	+0.024	+0.066	+0.046	+0.031	+0.020	+0.016	+0.012
TO 3	+0.014	+0.014	+0.014	+0.014	+0.014	+0.014	+0.006	+0.006	+0.006	+0.006	+0.006	+0.006
OVER 3	+0.140	+0.095	+0.068	+0.050	+0.038	+0.032	+0.085	+0.058	+0.040	+0.028	+0.022	+0.018
TO 6	+0.020	+0.020	+0.020	+0.020	+0.020	+0.020	+0.010	+0.010	+0.010	+0.010	+0.010	+0.010
OVER 6	+0.175	+0.115	+0.083	+0.061	+0.047	+0.040	+0.103	+0.071	+0.049	+0.035	+0.028	+0.022
TO 10	+0.025	+0.025	+0.025	+0.025	+0.025	+0.025	+0.013	+0.013	+0.013	+0.013	+0.013	+0.013
OVER 10	+0.212	+0.142	+0.102	+0.075	+0.059	+0.050	+0.126	+0.086	+0.059	+0.043	+0.034	+0.027
TO 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
OVER 14	+0.212	+0.142	+0.102	+0.075	+0.059	+0.050	+0.126	+0.086	+0.059	+0.043	+0.034	+0.027
TO 18	+0.032	+0.032	+0.032	+0.032	+0.032	+0.032	+0.016	+0.016	+0.016	+0.016	+0.016	+0.016
OVER 18	+0.250	+0.170	+0.124	+0.092	+0.073	+0.061	+0.150	+0.104	+0.072	+0.053	+0.041	+0.033
TO 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
OVER 24	+0.250	+0.170	+0.124	+0.092	+0.073	+0.061	+0.150	+0.104	+0.072	+0.053	+0.041	+0.033
TO 30	+0.040	+0.040	+0.040	+0.040	+0.040	+0.040	+0.020	+0.020	+0.020	+0.020	+0.020	+0.020
OVER 30	+0.300	+0.210	+0.150	+0.112	+0.089	+0.075	+0.185	+0.125	+0.087	+0.064	+0.050	+0.041
TO 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
OVER 40	+0.300	+0.210	+0.150	+0.112	+0.089	+0.075	+0.185	+0.125	+0.087	+0.064	+0.050	+0.041
TO 50	+0.050	+0.050	+0.050	+0.050	+0.050	+0.050	+0.025	+0.025	+0.025	+0.025	+0.025	+0.025
OVER 50	+0.360	+0.250	+0.180	+0.134	+0.106	+0.090	+0.220	+0.150	+0.104	+0.076	+0.060	+0.049
TO 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
OVER 65	+0.360	+0.250	+0.180	+0.134	+0.106	+0.090	+0.220	+0.150	+0.104	+0.076	+0.060	+0.049
TO 80	+0.060	+0.060	+0.060	+0.060	+0.060	+0.060	+0.030	+0.030	+0.030	+0.030	+0.030	+0.030
OVER 80	+0.422	+0.292	+0.212	+0.159	+0.126	+0.107	+0.256	+0.176	+0.123	+0.090	+0.071	+0.058
TO 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
OVER 100	+0.422	+0.292	+0.212	+0.159	+0.126	+0.107	+0.256	+0.176	+0.123	+0.090	+0.071	+0.058
TO 120	+0.072	+0.072	+0.072	+0.072	+0.072	+0.072	+0.036	+0.036	+0.036	+0.036	+0.036	+0.036
OVER 120	+0.485	+0.335	+0.245	+0.185	+0.148	+0.125	+0.293	+0.203	+0.143	+0.106	+0.083	+0.068
TO 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
OVER 140	+0.485	+0.335	+0.245	+0.185	+0.148	+0.125	+0.293	+0.203	+0.143	+0.106	+0.083	+0.068
TO 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
OVER 160	+0.485	+0.335	+0.245	+0.185	+0.148	+0.125	+0.293	+0.203	+0.143	+0.106	+0.083	+0.068
TO 180	+0.085	+0.085	+0.085	+0.085	+0.085	+0.085	+0.043	+0.043	+0.043	+0.043	+0.043	+0.043
OVER 180	+0.560	+0.390	+0.285	+0.215	+0.172	+0.146	+0.340	+0.235	+0.165	+0.122	+0.096	+0.079
TO 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
OVER 200	+0.560	+0.390	+0.285	+0.215	+0.172	+0.146	+0.340	+0.235	+0.165	+0.122	+0.096	+0.079
TO 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
OVER 225	+0.560	+0.390	+0.285	+0.215	+0.172	+0.146	+0.340	+0.235	+0.165	+0.122	+0.096	+0.079
TO 250	+0.100	+0.100	+0.100	+0.100	+0.100	+0.100	+0.050	+0.050	+0.050	+0.050	+0.050	+0.050
OVER 250	+0.630	+0.430	+0.320	+0.240	+0.191	+0.162	+0.376	+0.266	+0.186	+0.137	+0.108	+0.088
TO 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
OVER 280	+0.630	+0.430	+0.320	+0.240	+0.191	+0.162	+0.376	+0.266	+0.186	+0.137	+0.108	+0.088
TO 315	+0.110	+0.110	+0.110	+0.110	+0.110	+0.110	+0.056	+0.056	+0.056	+0.056	+0.056	+0.056
OVER 315	+0.695	+0.485	+0.355	+0.265	+0.214	+0.182	+0.422	+0.292	+0.202	+0.151	+0.119	+0.098
TO 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
OVER 355	+0.695	+0.485	+0.355	+0.265	+0.214	+0.182	+0.422	+0.292	+0.202	+0.151	+0.119	+0.098
TO 400	+0.125	+0.125	+0.125	+0.125	+0.125	+0.125	+0.062	+0.062	+0.062	+0.062	+0.062	+0.062
OVER 400	+0.765	+0.535	+0.385	+0.290	+0.232	+0.198	+0.468	+0.318	+0.223	+0.165	+0.131	+0.108
TO 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
OVER 450	+0.765	+0.535	+0.385	+0.290	+0.232	+0.198	+0.468	+0.318	+0.223	+0.165	+0.131	+0.108
TO 500	+0.135	+0.135	+0.135	+0.135	+0.135	+0.135	+0.068	+0.068	+0.068	+0.068	+0.068	+0.068

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Table A4 Tolerance Zones for Internal (Hole) Dimensions (G10 through G5 and J8 through J6)

Dimensions in mm

BASIC 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	+0.008	+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

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Table A5 Tolerance Zones for Internal (Hole) Dimensions (H16 through H1)

Dimensions in mm

BASIC SIZE	H16	H15	H14	H13	H12	H11	H10	H9	H8	H7	H6	H5	H4	H3	H2	H1
OVER 0	+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
TO 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
OVER 3	+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	+0.0025	+0.0015	+0.001
TO 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	0.0000	0.0000	0.000
OVER 6	+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	+0.0025	+0.0015	+0.001
TO 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	0.0000	0.0000	0.000
OVER 10	+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	+0.002	+0.0012
TO 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	0.000	0.0000
OVER 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	+0.002	+0.0012
TO 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	0.000	0.0000
OVER 18	+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
TO 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
OVER 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
TO 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
OVER 30	+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
TO 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
OVER 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
TO 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
OVER 50	+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	+0.003	+0.002
TO 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	0.000	0.000
OVER 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	+0.003	+0.002
TO 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	0.000	0.000
OVER 80	+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	+0.004	+0.0025
TO 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	0.000	0.0000
OVER 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	+0.004	+0.0025
TO 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	0.000	0.0000
OVER 120	+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	+0.005	+0.0035
TO 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	0.000	0.0000
OVER 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	+0.005	+0.0035
TO 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	0.000	0.0000
OVER 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	+0.005	+0.0035
TO 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	0.000	0.0000
OVER 180	+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	+0.007	+0.0045
TO 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	0.000	0.0000
OVER 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	+0.007	+0.0045
TO 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	0.000	0.0000
OVER 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	+0.007	+0.0045
TO 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	0.000	0.0000
OVER 250	+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	+0.008	+0.006
TO 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	0.000	0.000
OVER 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	+0.008	+0.006
TO 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	0.000	0.000
OVER 315	+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	+0.009	+0.007
TO 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	0.000	0.000
OVER 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	+0.009	+0.007
TO 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	0.000	0.000
OVER 400	+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	+0.010	+0.008
TO 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	0.000	0.000
OVER 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	+0.010	+0.008
TO 500	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	0.000	0.000

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Table A6 Tolerance Zones for Internal (Hole) Dimensions (JS16 through JS1)

Dimensions in mm

BASIC 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	+0.012	+0.007	+0.005	+0.003	+0.002	+0.0015	+0.001	+0.0006	+0.0004
TO 3	-0.300	-0.200	-0.125	-0.070	-0.050	-0.030	-0.020	-0.012	-0.007	-0.005	-0.003	-0.002	-0.0015	-0.001	-0.0006	-0.0004
OVER 3	+0.375	+0.240	+0.150	+0.090	+0.060	+0.037	+0.024	+0.015	+0.009	+0.006	+0.004	+0.0025	+0.002	+0.00125	+0.00075	+0.0005
TO 6	-0.375	-0.240	-0.150	-0.090	-0.060	-0.037	-0.024	-0.015	-0.009	-0.006	-0.004	-0.0025	-0.002	-0.00125	-0.00075	-0.0005
OVER 6	+0.450	+0.290	+0.180	+0.110	+0.075	+0.045	+0.029	+0.018	+0.011	+0.007	+0.0045	+0.003	+0.002	+0.00125	+0.00075	+0.0005
TO 10	-0.450	-0.290	-0.180	-0.110	-0.075	-0.045	-0.029	-0.018	-0.011	-0.007	-0.0045	-0.003	-0.002	-0.00125	-0.00075	-0.0005
OVER 10	+0.550	+0.350	+0.215	+0.135	+0.090	+0.055	+0.035	+0.021	+0.013	+0.009	+0.0055	+0.004	+0.0025	+0.0015	+0.001	+0.0006
TO 14	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.035	-0.021	-0.013	-0.009	-0.0055	-0.004	-0.0025	-0.0015	-0.001	-0.0006
OVER 14	+0.550	+0.350	+0.215	+0.135	+0.090	+0.055	+0.035	+0.021	+0.013	+0.009	+0.0055	+0.004	+0.0025	+0.0015	+0.001	+0.0006
TO 18	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.035	-0.021	-0.013	-0.009	-0.0055	-0.004	-0.0025	-0.0015	-0.001	-0.0006
OVER 18	+0.650	+0.420	+0.260	+0.165	+0.105	+0.065	+0.042	+0.026	+0.016	+0.010	+0.0065	+0.0045	+0.003	+0.002	+0.00125	+0.00075
TO 24	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.042	-0.026	-0.016	-0.010	-0.0065	-0.0045	-0.003	-0.002	-0.00125	-0.00075
OVER 24	+0.650	+0.420	+0.260	+0.165	+0.105	+0.065	+0.042	+0.026	+0.016	+0.010	+0.0065	+0.0045	+0.003	+0.002	+0.00125	+0.00075
TO 30	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.042	-0.026	-0.016	-0.010	-0.0065	-0.0045	-0.003	-0.002	-0.00125	-0.00075
OVER 30	+0.800	+0.500	+0.310	+0.195	+0.125	+0.080	+0.050	+0.031	+0.019	+0.012	+0.008	+0.0055	+0.0035	+0.002	+0.00125	+0.00075
TO 40	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.050	-0.031	-0.019	-0.012	-0.008	-0.0055	-0.0035	-0.002	-0.00125	-0.00075
OVER 40	+0.800	+0.500	+0.310	+0.195	+0.125	+0.080	+0.050	+0.031	+0.019	+0.012	+0.008	+0.0055	+0.0035	+0.002	+0.00125	+0.00075
TO 50	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.050	-0.031	-0.019	-0.012	-0.008	-0.0055	-0.0035	-0.002	-0.00125	-0.00075
OVER 50	+0.950	+0.600	+0.370	+0.230	+0.150	+0.095	+0.060	+0.037	+0.023	+0.015	+0.0095	+0.0065	+0.004	+0.0025	+0.0015	+0.001
TO 65	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.060	-0.037	-0.023	-0.015	-0.0095	-0.0065	-0.004	-0.0025	-0.0015	-0.001
OVER 65	+0.950	+0.600	+0.370	+0.230	+0.150	+0.095	+0.060	+0.037	+0.023	+0.015	+0.0095	+0.0065	+0.004	+0.0025	+0.0015	+0.001
TO 80	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.060	-0.037	-0.023	-0.015	-0.0095	-0.0065	-0.004	-0.0025	-0.0015	-0.001
OVER 80	+1.100	+0.700	+0.435	+0.270	+0.175	+0.110	+0.070	+0.043	+0.027	+0.017	+0.011	+0.0075	+0.005	+0.003	+0.002	+0.00125
TO 100	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.070	-0.043	-0.027	-0.017	-0.011	-0.0075	-0.005	-0.003	-0.002	-0.00125
OVER 100	+1.100	+0.700	+0.435	+0.270	+0.175	+0.110	+0.070	+0.043	+0.027	+0.017	+0.011	+0.0075	+0.005	+0.003	+0.002	+0.00125
TO 120	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.070	-0.043	-0.027	-0.017	-0.011	-0.0075	-0.005	-0.003	-0.002	-0.00125
OVER 120	+1.250	+0.800	+0.500	+0.315	+0.200	+0.125	+0.080	+0.050	+0.031	+0.020	+0.0125	+0.009	+0.006	+0.004	+0.0025	+0.00175
TO 140	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.009	-0.006	-0.004	-0.0025	-0.00175
OVER 140	+1.250	+0.800	+0.500	+0.315	+0.200	+0.125	+0.080	+0.050	+0.031	+0.020	+0.0125	+0.009	+0.006	+0.004	+0.0025	+0.00175
TO 160	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.009	-0.006	-0.004	-0.0025	-0.00175
OVER 160	+1.250	+0.800	+0.500	+0.315	+0.200	+0.125	+0.080	+0.050	+0.031	+0.020	+0.0125	+0.009	+0.006	+0.004	+0.0025	+0.00175
TO 180	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.009	-0.006	-0.004	-0.0025	-0.00175
OVER 180	+1.450	+0.925	+0.575	+0.360	+0.230	+0.145	+0.092	+0.057	+0.036	+0.023	+0.0145	+0.010	+0.007	+0.005	+0.0035	+0.00225
TO 200	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.092	-0.057	-0.036	-0.023	-0.0145	-0.010	-0.007	-0.005	-0.0035	-0.00225
OVER 200	+1.450	+0.925	+0.575	+0.360	+0.230	+0.145	+0.092	+0.057	+0.036	+0.023	+0.0145	+0.010	+0.007	+0.005	+0.0035	+0.00225
TO 225	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.092	-0.057	-0.036	-0.023	-0.0145	-0.010	-0.007	-0.005	-0.0035	-0.00225
OVER 225	+1.450	+0.925	+0.575	+0.360	+0.230	+0.145	+0.092	+0.057	+0.036	+0.023	+0.0145	+0.010	+0.007	+0.005	+0.0035	+0.00225
TO 250	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.092	-0.057	-0.036	-0.023	-0.0145	-0.010	-0.007	-0.005	-0.0035	-0.00225
OVER 250	+1.600	+1.050	+0.650	+0.405	+0.260	+0.160	+0.105	+0.065	+0.040	+0.026	+0.016	+0.0115	+0.008	+0.006	+0.004	+0.003
TO 280	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.105	-0.065	-0.040	-0.026	-0.016	-0.0115	-0.008	-0.006	-0.004	-0.003
OVER 280	+1.600	+1.050	+0.650	+0.405	+0.260	+0.160	+0.105	+0.065	+0.040	+0.026	+0.016	+0.0115	+0.008	+0.006	+0.004	+0.003
TO 315	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.105	-0.065	-0.040	-0.026	-0.016	-0.0115	-0.008	-0.006	-0.004	-0.003
OVER 315	+1.800	+1.150	+0.700	+0.445	+0.285	+0.180	+0.115	+0.070	+0.044	+0.028	+0.018	+0.0125	+0.009	+0.0065	+0.0045	+0.0035
TO 355	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.115	-0.070	-0.044	-0.028	-0.018	-0.0125	-0.009	-0.0065	-0.0045	-0.0035
OVER 355	+1.800	+1.150	+0.700	+0.445	+0.285	+0.180	+0.115	+0.070	+0.044	+0.028	+0.018	+0.0125	+0.009	+0.0065	+0.0045	+0.0035
TO 400	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.115	-0.070	-0.044	-0.028	-0.018	-0.0125	-0.009	-0.0065	-0.0045	-0.0035
OVER 400	+2.000	+1.250	+0.775	+0.485	+0.315	+0.200	+0.125	+0.077	+0.048	+0.031	+0.020	+0.0135	+0.010	+0.0075	+0.005	+0.004
TO 450	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.125	-0.077	-0.048	-0.031	-0.020	-0.0135	-0.010	-0.0075	-0.005	-0.004
OVER 450	+2.000	+1.250	+0.775	+0.485	+0.315	+0.200	+0.125	+0.077	+0.048	+0.031	+0.020	+0.0135	+0.010	+0.0075	+0.005	+0.004
TO 500	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.125	-0.077	-0.048	-0.031	-0.020	-0.0135	-0.010	-0.0075	-0.005	-0.004

Note: Some JS deviations in the grades 7 to 11 have been rounded off to ½ (IT - 0.001) when the IT value is odd.

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Table A7 Tolerance Zones for Internal (Hole) Dimensions (K10 through K5 and M10 through M5) Dimensions in mm

BASIC 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

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Table A8 Tolerance Zones for Internal (Hole) Dimensions (N10 through N5 and P10 through P5) Dimensions in mm

BASIC 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 40	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

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Table A9 Tolerance Zones for Internal (Hole) Dimensions (R10 through R5 and S10 through S5) Dimensions in mm

BASIC 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

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Table A10 Tolerance Zones for Internal (Hole) Dimensions (T10 through T5 and U10 through U5) Dimensions in mm

BASIC SIZE	T10	T9	T8	T7	T6	T5	U10	U9	U8	U7	U6	U5
OVER 0 TO 3	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED.						+0.018 −0.058	+0.018 −0.043	+0.018 −0.032	+0.018 −0.028	+0.018 −0.024	+0.018 −0.022
OVER 3 TO 6							+0.023 −0.071	+0.023 −0.053	+0.023 −0.041	+0.019 −0.031	+0.020 −0.028	+0.022 −0.027
OVER 6 TO 10							+0.028 −0.086	+0.028 −0.064	+0.028 −0.050	+0.022 −0.037	+0.025 −0.034	+0.026 −0.032
OVER 10 TO 14							+0.033 −0.103	+0.033 −0.076	+0.033 −0.060	+0.026 −0.044	+0.030 −0.041	+0.030 −0.038
OVER 14 TO 18							+0.033 −0.103	+0.033 −0.076	+0.033 −0.060	+0.026 −0.044	+0.030 −0.041	+0.030 −0.038
OVER 18 TO 24							+0.041 −0.125	+0.041 −0.093	+0.041 −0.074	+0.033 −0.054	+0.037 −0.050	+0.038 −0.047
OVER 24 TO 30	+0.041 −0.125	+0.041 −0.093	+0.041 −0.074	+0.033 −0.054	+0.037 −0.050	+0.038 −0.047	+0.048 −0.132	+0.048 −0.100	+0.048 −0.081	+0.040 −0.061	+0.044 −0.057	+0.045 −0.054
OVER 30 TO 40	+0.048 −0.148	+0.048 −0.110	+0.048 −0.087	+0.039 −0.064	+0.043 −0.059	+0.044 −0.055	+0.060 −0.160	+0.060 −0.122	+0.060 −0.099	+0.051 −0.076	+0.055 −0.071	+0.056 −0.067
OVER 40 TO 50	+0.054 −0.154	+0.054 −0.116	+0.054 −0.093	+0.045 −0.070	+0.049 −0.065	+0.050 −0.061	+0.070 −0.170	+0.070 −0.132	+0.070 −0.109	+0.061 −0.086	+0.065 −0.081	+0.066 −0.077
OVER 50 TO 65	+0.066 −0.186	+0.066 −0.140	+0.066 −0.112	+0.055 −0.085	+0.060 −0.079	+0.061 −0.074	+0.087 −0.207	+0.087 −0.161	+0.087 −0.133	+0.076 −0.106	+0.081 −0.100	+0.082 −0.095
OVER 65 TO 80	+0.075 −0.195	+0.075 −0.149	+0.075 −0.121	+0.064 −0.094	+0.069 −0.088	+0.070 −0.083	+0.102 −0.222	+0.102 −0.176	+0.102 −0.148	+0.091 −0.121	+0.096 −0.115	+0.097 −0.110
OVER 80 TO 100	+0.091 −0.231	+0.091 −0.178	+0.091 −0.145	+0.078 −0.113	+0.084 −0.106	+0.086 −0.101	+0.124 −0.264	+0.124 −0.211	+0.124 −0.178	+0.111 −0.146	+0.117 −0.139	+0.119 −0.134
OVER 100 TO 120	+0.104 −0.244	+0.104 −0.191	+0.104 −0.158	+0.091 −0.126	+0.097 −0.119	+0.098 −0.114	+0.144 −0.284	+0.144 −0.231	+0.144 −0.198	+0.131 −0.166	+0.137 −0.159	+0.139 −0.154
OVER 120 TO 140	+0.122 −0.282	+0.122 −0.222	+0.122 −0.185	+0.107 −0.147	+0.115 −0.140	+0.116 −0.134	+0.170 −0.330	+0.170 −0.270	+0.170 −0.233	+0.155 −0.195	+0.163 −0.188	+0.164 −0.182
OVER 140 TO 160	+0.134 −0.294	+0.134 −0.234	+0.134 −0.197	+0.119 −0.159	+0.127 −0.152	+0.128 −0.146	+0.190 −0.350	+0.190 −0.290	+0.190 −0.253	+0.175 −0.215	+0.183 −0.208	+0.184 −0.202
OVER 160 TO 180	+0.146 −0.306	+0.146 −0.246	+0.146 −0.209	+0.131 −0.171	+0.139 −0.164	+0.140 −0.158	+0.210 −0.370	+0.210 −0.310	+0.210 −0.273	+0.195 −0.235	+0.203 −0.228	+0.204 −0.222
OVER 180 TO 200	+0.166 −0.351	+0.166 −0.281	+0.166 −0.238	+0.149 −0.195	+0.157 −0.186	+0.160 −0.180	+0.236 −0.421	+0.236 −0.351	+0.236 −0.308	+0.219 −0.265	+0.227 −0.256	+0.230 −0.250
OVER 200 TO 225	+0.180 −0.365	+0.180 −0.295	+0.180 −0.252	+0.163 −0.209	+0.171 −0.200	+0.174 −0.194	+0.258 −0.443	+0.258 −0.373	+0.258 −0.330	+0.241 −0.287	+0.249 −0.278	+0.252 −0.272
OVER 225 TO 250	+0.196 −0.381	+0.196 −0.311	+0.196 −0.268	+0.179 −0.225	+0.187 −0.216	+0.190 −0.210	+0.284 −0.469	+0.284 −0.399	+0.284 −0.356	+0.267 −0.313	+0.275 −0.304	+0.278 −0.298
OVER 250 TO 280	+0.218 −0.428	+0.218 −0.348	+0.218 −0.299	+0.198 −0.250	+0.209 −0.241	+0.211 −0.234	+0.315 −0.525	+0.315 −0.445	+0.315 −0.396	+0.295 −0.347	+0.306 −0.338	+0.308 −0.331
OVER 280 TO 315	+0.240 −0.450	+0.240 −0.370	+0.240 −0.321	+0.220 −0.272	+0.231 −0.263	+0.233 −0.256	+0.350 −0.560	+0.350 −0.480	+0.350 −0.431	+0.330 −0.382	+0.341 −0.373	+0.343 −0.366
OVER 315 TO 355	+0.268 −0.498	+0.268 −0.408	+0.268 −0.357	+0.247 −0.304	+0.257 −0.293	+0.261 −0.286	+0.390 −0.620	+0.390 −0.530	+0.390 −0.479	+0.369 −0.426	+0.379 −0.415	+0.383 −0.408
OVER 355 TO 400	+0.294 −0.524	+0.294 −0.434	+0.294 −0.383	+0.273 −0.330	+0.283 −0.319	+0.287 −0.312	+0.435 −0.665	+0.435 −0.575	+0.435 −0.524	+0.414 −0.471	+0.424 −0.460	+0.428 −0.453
OVER 400 TO 450	+0.330 −0.580	+0.330 −0.485	+0.330 −0.427	+0.307 −0.370	+0.317 −0.357	+0.323 −0.350	+0.490 −0.740	+0.490 −0.645	+0.490 −0.587	+0.467 −0.530	+0.477 −0.517	+0.483 −0.510
OVER 450 TO 500	+0.360 −0.610	+0.360 −0.515	+0.360 −0.457	+0.337 −0.400	+0.347 −0.387	+0.353 −0.380	+0.540 −0.790	+0.540 −0.695	+0.540 −0.637	+0.517 −0.580	+0.527 −0.567	+0.533 −0.560

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Table A11 Tolerance Zones for Internal (Hole) Dimensions (V10 through V5 and X10 through X5) Dimensions in mm

BASIC SIZE	V10	V9	V8	V7	V6	V5	X10	X9	X8	X7	X6	X5
OVER 0 TO 3	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED.						+0.020 +0.060	+0.020 +0.045	+0.020 +0.034	+0.020 +0.030	+0.020 +0.026	+0.020 +0.024
OVER 3 TO 6							+0.028 +0.076	+0.028 +0.058	+0.028 +0.046	+0.024 +0.036	+0.025 +0.033	+0.027 +0.032
OVER 6 TO 10							+0.034 +0.092	+0.034 +0.070	+0.034 +0.056	+0.028 +0.043	+0.031 +0.040	+0.032 +0.038
OVER 10 TO 14							+0.040 +0.110	+0.040 +0.083	+0.040 +0.067	+0.033 +0.051	+0.037 +0.048	+0.037 +0.045
OVER 14 TO 18	+0.039 +0.109	+0.039 +0.082	+0.039 +0.066	+0.032 +0.050	+0.036 +0.047	+0.036 +0.044	+0.045 +0.115	+0.045 +0.088	+0.045 +0.072	+0.038 +0.056	+0.042 +0.053	+0.042 +0.050
OVER 18 TO 24	+0.047 +0.131	+0.047 +0.099	+0.047 +0.080	+0.039 +0.060	+0.043 +0.056	+0.044 +0.053	+0.054 +0.138	+0.054 +0.106	+0.054 +0.087	+0.046 +0.067	+0.050 +0.063	+0.051 +0.060
OVER 24 TO 30	+0.055 +0.139	+0.055 +0.107	+0.055 +0.088	+0.047 +0.068	+0.051 +0.064	+0.052 +0.061	+0.064 +0.148	+0.064 +0.116	+0.064 +0.097	+0.056 +0.077	+0.060 +0.073	+0.061 +0.070
OVER 30 TO 40	+0.068 +0.168	+0.068 +0.130	+0.068 +0.107	+0.059 +0.084	+0.063 +0.079	+0.064 +0.075	+0.080 +0.180	+0.080 +0.142	+0.080 +0.119	+0.071 +0.096	+0.075 +0.091	+0.076 +0.087
OVER 40 TO 50	+0.081 +0.181	+0.081 +0.143	+0.081 +0.120	+0.072 +0.097	+0.076 +0.092	+0.077 +0.088	+0.097 +0.197	+0.097 +0.159	+0.097 +0.136	+0.088 +0.113	+0.092 +0.108	+0.093 +0.104
OVER 50 TO 65	+0.102 +0.222	+0.102 +0.176	+0.102 +0.148	+0.091 +0.121	+0.096 +0.115	+0.097 +0.110	+0.122 +0.242	+0.122 +0.196	+0.122 +0.168	+0.111 +0.141	+0.116 +0.135	+0.117 +0.130
OVER 65 TO 80	+0.120 +0.240	+0.120 +0.194	+0.120 +0.166	+0.109 +0.139	+0.114 +0.133	+0.115 +0.128	+0.146 +0.266	+0.146 +0.220	+0.146 +0.192	+0.135 +0.165	+0.140 +0.159	+0.141 +0.154
OVER 80 TO 100	+0.146 +0.286	+0.146 +0.233	+0.146 +0.200	+0.133 +0.168	+0.139 +0.161	+0.141 +0.156	+0.178 +0.318	+0.178 +0.265	+0.178 +0.232	+0.165 +0.200	+0.171 +0.193	+0.173 +0.188
OVER 100 TO 120	+0.172 +0.312	+0.172 +0.259	+0.172 +0.226	+0.159 +0.194	+0.165 +0.187	+0.167 +0.182	+0.210 +0.350	+0.210 +0.297	+0.210 +0.264	+0.197 +0.232	+0.203 +0.225	+0.205 +0.220
OVER 120 TO 140	+0.202 +0.362	+0.202 +0.302	+0.202 +0.265	+0.187 +0.227	+0.195 +0.220	+0.196 +0.214	+0.248 +0.408	+0.248 +0.348	+0.248 +0.311	+0.233 +0.273	+0.241 +0.266	+0.242 +0.260
OVER 140 TO 160	+0.228 +0.388	+0.228 +0.328	+0.228 +0.291	+0.213 +0.253	+0.221 +0.246	+0.222 +0.240	+0.280 +0.440	+0.280 +0.380	+0.280 +0.343	+0.265 +0.305	+0.273 +0.298	+0.274 +0.292
OVER 160 TO 180	+0.252 +0.412	+0.252 +0.352	+0.252 +0.315	+0.237 +0.277	+0.245 +0.270	+0.246 +0.264	+0.310 +0.470	+0.310 +0.410	+0.310 +0.373	+0.295 +0.335	+0.303 +0.328	+0.304 +0.322
OVER 180 TO 200	+0.284 +0.469	+0.284 +0.399	+0.284 +0.356	+0.267 +0.313	+0.275 +0.304	+0.278 +0.298	+0.350 +0.535	+0.350 +0.465	+0.350 +0.422	+0.333 +0.379	+0.341 +0.370	+0.344 +0.364
OVER 200 TO 225	+0.310 +0.495	+0.310 +0.425	+0.310 +0.382	+0.293 +0.339	+0.301 +0.330	+0.304 +0.324	+0.385 +0.570	+0.385 +0.500	+0.385 +0.457	+0.368 +0.414	+0.376 +0.405	+0.379 +0.399
OVER 225 TO 250	+0.340 +0.525	+0.340 +0.455	+0.340 +0.412	+0.323 +0.369	+0.331 +0.360	+0.334 +0.354	+0.425 +0.610	+0.425 +0.540	+0.425 +0.497	+0.408 +0.454	+0.416 +0.445	+0.419 +0.439
OVER 250 TO 280	+0.385 +0.595	+0.385 +0.515	+0.385 +0.466	+0.365 +0.417	+0.376 +0.408	+0.378 +0.401	+0.475 +0.685	+0.475 +0.605	+0.475 +0.556	+0.455 +0.507	+0.466 +0.498	+0.468 +0.491
OVER 280 TO 315	+0.425 +0.635	+0.425 +0.555	+0.425 +0.506	+0.405 +0.457	+0.416 +0.448	+0.418 +0.441	+0.525 +0.735	+0.525 +0.655	+0.525 +0.606	+0.505 +0.557	+0.516 +0.548	+0.518 +0.541
OVER 315 TO 355	+0.475 +0.705	+0.475 +0.615	+0.475 +0.564	+0.454 +0.511	+0.464 +0.500	+0.468 +0.493	+0.590 +0.820	+0.590 +0.730	+0.590 +0.679	+0.569 +0.626	+0.579 +0.615	+0.583 +0.608
OVER 355 TO 400	+0.530 +0.760	+0.530 +0.670	+0.530 +0.619	+0.509 +0.566	+0.519 +0.555	+0.523 +0.548	+0.660 +0.890	+0.660 +0.800	+0.660 +0.749	+0.639 +0.696	+0.649 +0.685	+0.653 +0.678
OVER 400 TO 450	+0.595 +0.845	+0.595 +0.750	+0.595 +0.692	+0.572 +0.635	+0.582 +0.622	+0.588 +0.615	+0.740 +0.990	+0.740 +0.895	+0.740 +0.837	+0.717 +0.780	+0.727 +0.767	+0.733 +0.760
OVER 450 TO 500	+0.660 +0.910	+0.660 +0.815	+0.660 +0.757	+0.637 +0.700	+0.647 +0.687	+0.653 +0.680	+0.820 +1.070	+0.820 +0.975	+0.820 +0.917	+0.797 +0.860	+0.807 +0.847	+0.813 +0.840

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Table A12 Tolerance Zones for Internal (Hole) Dimensions (Y10 through Y5 and Z10 through Z5) Dimensions in mm

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

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Table A13 Tolerance Zones for External (Shaft) Dimensions (a14 through a9 and b14 through b9) Dimensions in mm

BASIC 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	-0.350	-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	-1.760	-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

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Table A14 Tolerance Zones for External (Shaft) Dimensions (c13 through c8 and d12 through d7) Dimensions in mm

BASIC 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

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Table A15 Tolerance Zones for External (Shaft) Dimensions (e11 through e6 and f10 through f5) Dimensions in mm

BASIC 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

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Table A16 Tolerance Zones for External (Shaft) Dimensions (g9 through g4 and j7 through j5)

Dimensions in mm

BASIC 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

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abl A17 Tolerance Zones for External (Shaft) Dimensions (h16 through h1)

Dimensions in mm

BASIC 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	0.0000	0.0000	0.000
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	-0.0025	-0.0015	-0.001
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	0.0000	0.0000	0.000
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	-0.0025	-0.0015	-0.001
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	0.000	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	-0.002	-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	0.000	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	-0.002	-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	0.000	0.000
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	-0.003	-0.002
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	0.000	0.000
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	-0.003	-0.002
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	0.000	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	-0.004	-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	0.000	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	-0.004	-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	0.000	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	-0.005	-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	0.000	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	-0.005	-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	0.000	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	-0.005	-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	0.000	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	-0.007	-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	0.000	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	-0.007	-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	0.000	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	-0.007	-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	0.000	0.000
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	-0.008	-0.006
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	0.000	0.000
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	-0.008	-0.006
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	0.000	0.000
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	-0.009	-0.007
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	0.000	0.000
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	-0.009	-0.007
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	0.000	0.000
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	-0.010	-0.008
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	0.000	0.000
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	-0.010	-0.008

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Table A18 Tolerance Zones for External (Shaft) Dimensions (js16 through js1)

Dimensions in mm

BASIC 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	+0.012	+0.007	+0.005	+0.003	+0.002	+0.0015	+0.001	+0.0006	+0.0004
TO 3	-0.300	-0.200	-0.125	-0.070	-0.050	-0.030	-0.020	-0.012	-0.007	-0.005	-0.003	-0.002	-0.0015	-0.001	-0.0006	-0.0004
OVER 3	+0.375	+0.240	+0.150	+0.090	+0.060	+0.037	+0.024	+0.015	+0.009	+0.006	+0.004	+0.0025	+0.002	+0.00125	+0.00075	+0.0005
TO 6	-0.375	-0.240	-0.150	-0.090	-0.060	-0.037	-0.024	-0.015	-0.009	-0.006	-0.004	-0.0025	-0.002	-0.00125	-0.00075	-0.0005
OVER 6	+0.450	+0.290	+0.180	+0.110	+0.075	+0.045	+0.029	+0.018	+0.011	+0.007	+0.0045	+0.003	+0.002	+0.00125	+0.00075	+0.0005
TO 10	-0.450	-0.290	-0.180	-0.110	-0.075	-0.045	-0.029	-0.018	-0.011	-0.007	-0.0045	-0.003	-0.002	-0.00125	-0.00075	-0.0005
OVER 10	+0.550	+0.350	+0.215	+0.135	+0.090	+0.055	+0.035	+0.021	+0.013	+0.009	+0.0055	+0.004	+0.0025	+0.0015	+0.001	+0.0006
TO 14	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.035	-0.021	-0.013	-0.009	-0.0055	-0.004	-0.0025	-0.0015	-0.001	-0.0006
OVER 14	+0.550	+0.350	+0.215	+0.135	+0.090	+0.055	+0.035	+0.021	+0.013	+0.009	+0.0055	+0.004	+0.0025	+0.0015	+0.001	+0.0006
TO 18	-0.550	-0.350	-0.215	-0.135	-0.090	-0.055	-0.035	-0.021	-0.013	-0.009	-0.0055	-0.004	-0.0025	-0.0015	-0.001	-0.0006
OVER 18	+0.650	+0.420	+0.260	+0.165	+0.105	+0.065	+0.042	+0.026	+0.016	+0.010	+0.0065	+0.0045	+0.003	+0.002	+0.00125	+0.00075
TO 24	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.042	-0.026	-0.016	-0.010	-0.0065	-0.0045	-0.003	-0.002	-0.00125	-0.00075
OVER 24	+0.650	+0.420	+0.260	+0.165	+0.105	+0.065	+0.042	+0.026	+0.016	+0.010	+0.0065	+0.0045	+0.003	+0.002	+0.00125	+0.00075
TO 30	-0.650	-0.420	-0.260	-0.165	-0.105	-0.065	-0.042	-0.026	-0.016	-0.010	-0.0065	-0.0045	-0.003	-0.002	-0.00125	-0.00075
OVER 30	+0.800	+0.500	+0.310	+0.195	+0.125	+0.080	+0.050	+0.031	+0.019	+0.012	+0.008	+0.0055	+0.0035	+0.002	+0.00125	+0.00075
TO 40	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.050	-0.031	-0.019	-0.012	-0.008	-0.0055	-0.0035	-0.002	-0.00125	-0.00075
OVER 40	+0.800	+0.500	+0.310	+0.195	+0.125	+0.080	+0.050	+0.031	+0.019	+0.012	+0.008	+0.0055	+0.0035	+0.002	+0.00125	+0.00075
TO 50	-0.800	-0.500	-0.310	-0.195	-0.125	-0.080	-0.050	-0.031	-0.019	-0.012	-0.008	-0.0055	-0.0035	-0.002	-0.00125	-0.00075
OVER 50	+0.950	+0.600	+0.370	+0.230	+0.150	+0.095	+0.060	+0.037	+0.023	+0.015	+0.0095	+0.0065	+0.004	+0.0025	+0.0015	+0.001
TO 65	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.060	-0.037	-0.023	-0.015	-0.0095	-0.0065	-0.004	-0.0025	-0.0015	-0.001
OVER 65	+0.950	+0.600	+0.370	+0.230	+0.150	+0.095	+0.060	+0.037	+0.023	+0.015	+0.0095	+0.0065	+0.004	+0.0025	+0.0015	+0.001
TO 80	-0.950	-0.600	-0.370	-0.230	-0.150	-0.095	-0.060	-0.037	-0.023	-0.015	-0.0095	-0.0065	-0.004	-0.0025	-0.0015	-0.001
OVER 80	+1.100	+0.700	+0.435	+0.270	+0.175	+0.110	+0.070	+0.043	+0.027	+0.017	+0.011	+0.0075	+0.005	+0.003	+0.002	+0.00125
TO 100	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.070	-0.043	-0.027	-0.017	-0.011	-0.0075	-0.005	-0.003	-0.002	-0.00125
OVER 100	+1.100	+0.700	+0.435	+0.270	+0.175	+0.110	+0.070	+0.043	+0.027	+0.017	+0.011	+0.0075	+0.005	+0.003	+0.002	+0.00125
TO 120	-1.100	-0.700	-0.435	-0.270	-0.175	-0.110	-0.070	-0.043	-0.027	-0.017	-0.011	-0.0075	-0.005	-0.003	-0.002	-0.00125
OVER 120	+1.250	+0.800	+0.500	+0.315	+0.200	+0.125	+0.080	+0.050	+0.031	+0.020	+0.0125	+0.009	+0.006	+0.004	+0.0025	+0.00175
TO 140	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.009	-0.006	-0.004	-0.0025	-0.00175
OVER 140	+1.250	+0.800	+0.500	+0.315	+0.200	+0.125	+0.080	+0.050	+0.031	+0.020	+0.0125	+0.009	+0.006	+0.004	+0.0025	+0.00175
TO 160	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.009	-0.006	-0.004	-0.0025	-0.00175
OVER 160	+1.250	+0.800	+0.500	+0.315	+0.200	+0.125	+0.080	+0.050	+0.031	+0.020	+0.0125	+0.009	+0.006	+0.004	+0.0025	+0.00175
TO 180	-1.250	-0.800	-0.500	-0.315	-0.200	-0.125	-0.080	-0.050	-0.031	-0.020	-0.0125	-0.009	-0.006	-0.004	-0.0025	-0.00175
OVER 180	+1.450	+0.925	+0.575	+0.360	+0.230	+0.145	+0.092	+0.057	+0.036	+0.023	+0.0145	+0.010	+0.007	+0.005	+0.0035	+0.00225
TO 200	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.092	-0.057	-0.036	-0.023	-0.0145	-0.010	-0.007	-0.005	-0.0035	-0.00225
OVER 200	+1.450	+0.925	+0.575	+0.360	+0.230	+0.145	+0.092	+0.057	+0.036	+0.023	+0.0145	+0.010	+0.007	+0.005	+0.0035	+0.00225
TO 225	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.092	-0.057	-0.036	-0.023	-0.0145	-0.010	-0.007	-0.005	-0.0035	-0.00225
OVER 225	+1.450	+0.925	+0.575	+0.360	+0.230	+0.145	+0.092	+0.057	+0.036	+0.023	+0.0145	+0.010	+0.007	+0.005	+0.0035	+0.00225
TO 250	-1.450	-0.925	-0.575	-0.360	-0.230	-0.145	-0.092	-0.057	-0.036	-0.023	-0.0145	-0.010	-0.007	-0.005	-0.0035	-0.00225
OVER 250	+1.600	+1.050	+0.650	+0.405	+0.260	+0.160	+0.105	+0.065	+0.040	+0.026	+0.016	+0.0115	+0.006	+0.006	+0.004	+0.003
TO 280	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.105	-0.065	-0.040	-0.026	-0.016	-0.0115	-0.006	-0.006	-0.004	-0.003
OVER 280	+1.600	+1.050	+0.650	+0.405	+0.260	+0.160	+0.105	+0.065	+0.040	+0.026	+0.016	+0.0115	+0.006	+0.006	+0.004	+0.003
TO 315	-1.600	-1.050	-0.650	-0.405	-0.260	-0.160	-0.105	-0.065	-0.040	-0.026	-0.016	-0.0115	-0.006	-0.006	-0.004	-0.003
OVER 315	+1.800	+1.150	+0.700	+0.445	+0.285	+0.180	+0.115	+0.070	+0.044	+0.028	+0.018	+0.0125	+0.009	+0.0065	+0.0045	+0.0035
TO 355	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.115	-0.070	-0.044	-0.028	-0.018	-0.0125	-0.009	-0.0065	-0.0045	-0.0035
OVER 355	+1.800	+1.150	+0.700	+0.445	+0.285	+0.180	+0.115	+0.070	+0.044	+0.028	+0.018	+0.0125	+0.009	+0.0065	+0.0045	+0.0035
TO 400	-1.800	-1.150	-0.700	-0.445	-0.285	-0.180	-0.115	-0.070	-0.044	-0.028	-0.018	-0.0125	-0.009	-0.0065	-0.0045	-0.0035
OVER 400	+2.000	+1.250	+0.775	+0.485	+0.315	+0.200	+0.125	+0.077	+0.048	+0.031	+0.020	+0.0135	+0.010	+0.0075	+0.005	+0.004
TO 450	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.125	-0.077	-0.048	-0.031	-0.020	-0.0135	-0.010	-0.0075	-0.005	-0.004
OVER 450	+2.000	+1.250	+0.775	+0.485	+0.315	+0.200	+0.125	+0.077	+0.048	+0.031	+0.020	+0.0135	+0.010	+0.0075	+0.005	+0.004
TO 500	-2.000	-1.250	-0.775	-0.485	-0.315	-0.200	-0.125	-0.077	-0.048	-0.031	-0.020	-0.0135	-0.010	-0.0075	-0.005	-0.004

Note: Some js deviations in the grades 7 to 11 have been rounded off to ½ (IT - 0.001) when the IT value is odd.

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Table A19 Tolerance Zones for External (Shaft) Dimensions (k9 through k4 and m9 through m4) Dimensions in mm

BASIC 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

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Table A20 Tolerance Zones for External (Shaft) Dimensions (n9 through n4 and p9 through p4) Dimensions in mm

BASIC 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

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Table A21 *Tolerance Zones for External (Shaft) Dimensions (r9 through r4 and s9 through s4)* Dimensions in mm

BASIC SIZE	r9	r8	r7	r6	r5	r4	s9	s8	s7	s6	s5	s4
OVER 0	+0.035	+0.024	+0.020	+0.016	+0.014	+0.013	+0.039	+0.028	+0.024	+0.020	+0.018	+0.017
TO 3	+0.010	+0.010	+0.010	+0.010	+0.010	+0.010	+0.014	+0.014	+0.014	+0.014	+0.014	+0.014
OVER 3	+0.045	+0.033	+0.027	+0.023	+0.020	+0.019	+0.049	+0.037	+0.031	+0.027	+0.024	+0.023
TO 6	+0.015	+0.015	+0.015	+0.015	+0.015	+0.015	+0.019	+0.019	+0.019	+0.019	+0.019	+0.019
OVER 6	+0.055	+0.041	+0.034	+0.028	+0.025	+0.023	+0.059	+0.045	+0.038	+0.032	+0.029	+0.027
TO 10	+0.019	+0.019	+0.019	+0.019	+0.019	+0.019	+0.023	+0.023	+0.023	+0.023	+0.023	+0.023
OVER 10	+0.066	+0.050	+0.041	+0.034	+0.031	+0.028	+0.071	+0.055	+0.046	+0.039	+0.036	+0.033
TO 14	+0.023	+0.023	+0.023	+0.023	+0.023	+0.023	+0.028	+0.028	+0.028	+0.028	+0.028	+0.028
OVER 14	+0.066	+0.050	+0.041	+0.034	+0.031	+0.028	+0.071	+0.055	+0.046	+0.039	+0.036	+0.033
TO 18	+0.023	+0.023	+0.023	+0.023	+0.023	+0.023	+0.028	+0.028	+0.028	+0.028	+0.028	+0.028
OVER 18	+0.080	+0.061	+0.049	+0.041	+0.037	+0.034	+0.087	+0.068	+0.056	+0.048	+0.044	+0.041
TO 24	+0.028	+0.028	+0.028	+0.028	+0.028	+0.028	+0.035	+0.035	+0.035	+0.035	+0.035	+0.035
OVER 24	+0.080	+0.061	+0.049	+0.041	+0.037	+0.034	+0.087	+0.068	+0.056	+0.048	+0.044	+0.041
TO 30	+0.028	+0.028	+0.028	+0.028	+0.028	+0.028	+0.035	+0.035	+0.035	+0.035	+0.035	+0.035
OVER 30	+0.096	+0.073	+0.059	+0.050	+0.045	+0.041	+0.105	+0.082	+0.068	+0.059	+0.054	+0.050
TO 40	+0.034	+0.034	+0.034	+0.034	+0.034	+0.034	+0.043	+0.043	+0.043	+0.043	+0.043	+0.043
OVER 40	+0.096	+0.073	+0.059	+0.050	+0.045	+0.041	+0.105	+0.082	+0.068	+0.059	+0.054	+0.050
TO 50	+0.034	+0.034	+0.034	+0.034	+0.034	+0.034	+0.043	+0.043	+0.043	+0.043	+0.043	+0.043
OVER 50	+0.115	+0.087	+0.071	+0.060	+0.054	+0.049	+0.127	+0.099	+0.083	+0.072	+0.066	+0.061
TO 65	+0.041	+0.041	+0.041	+0.041	+0.041	+0.041	+0.053	+0.053	+0.053	+0.053	+0.053	+0.053
OVER 65	+0.117	+0.089	+0.073	+0.062	+0.056	+0.051	+0.133	+0.105	+0.089	+0.078	+0.072	+0.067
TO 80	+0.043	+0.043	+0.043	+0.043	+0.043	+0.043	+0.059	+0.059	+0.059	+0.059	+0.059	+0.059
OVER 80	+0.138	+0.105	+0.086	+0.073	+0.066	+0.061	+0.158	+0.125	+0.106	+0.093	+0.086	+0.081
TO 100	+0.051	+0.051	+0.051	+0.051	+0.051	+0.051	+0.071	+0.071	+0.071	+0.071	+0.071	+0.071
OVER 100	+0.141	+0.108	+0.089	+0.076	+0.069	+0.064	+0.166	+0.133	+0.114	+0.101	+0.094	+0.089
TO 120	+0.054	+0.054	+0.054	+0.054	+0.054	+0.054	+0.079	+0.079	+0.079	+0.079	+0.079	+0.079
OVER 120	+0.163	+0.126	+0.103	+0.088	+0.081	+0.075	+0.192	+0.155	+0.132	+0.117	+0.110	+0.104
TO 140	+0.063	+0.063	+0.063	+0.063	+0.063	+0.063	+0.092	+0.092	+0.092	+0.092	+0.092	+0.092
OVER 140	+0.165	+0.128	+0.105	+0.090	+0.083	+0.077	+0.200	+0.163	+0.140	+0.125	+0.118	+0.112
TO 160	+0.065	+0.065	+0.065	+0.065	+0.065	+0.065	+0.100	+0.100	+0.100	+0.100	+0.100	+0.100
OVER 160	+0.168	+0.131	+0.108	+0.093	+0.086	+0.080	+0.208	+0.171	+0.148	+0.133	+0.126	+0.120
TO 180	+0.068	+0.068	+0.068	+0.068	+0.068	+0.068	+0.108	+0.108	+0.108	+0.108	+0.108	+0.108
OVER 180	+0.192	+0.149	+0.123	+0.106	+0.097	+0.091	+0.237	+0.194	+0.168	+0.151	+0.142	+0.136
TO 200	+0.077	+0.077	+0.077	+0.077	+0.077	+0.077	+0.122	+0.122	+0.122	+0.122	+0.122	+0.122
OVER 200	+0.195	+0.152	+0.126	+0.109	+0.100	+0.094	+0.245	+0.202	+0.176	+0.159	+0.150	+0.144
TO 225	+0.080	+0.080	+0.080	+0.080	+0.080	+0.080	+0.130	+0.130	+0.130	+0.130	+0.130	+0.130
OVER 225	+0.199	+0.156	+0.130	+0.113	+0.104	+0.098	+0.255	+0.212	+0.186	+0.169	+0.160	+0.154
TO 250	+0.084	+0.084	+0.084	+0.084	+0.084	+0.084	+0.140	+0.140	+0.140	+0.140	+0.140	+0.140
OVER 250	+0.224	+0.175	+0.146	+0.126	+0.117	+0.110	+0.288	+0.239	+0.210	+0.190	+0.181	+0.174
TO 280	+0.094	+0.094	+0.094	+0.094	+0.094	+0.094	+0.158	+0.158	+0.158	+0.158	+0.158	+0.158
OVER 280	+0.228	+0.179	+0.150	+0.130	+0.121	+0.114	+0.300	+0.251	+0.222	+0.202	+0.193	+0.186
TO 315	+0.098	+0.098	+0.098	+0.098	+0.098	+0.098	+0.170	+0.170	+0.170	+0.170	+0.170	+0.170
OVER 315	+0.248	+0.197	+0.165	+0.144	+0.133	+0.126	+0.330	+0.279	+0.247	+0.226	+0.215	+0.208
TO 355	+0.108	+0.108	+0.108	+0.108	+0.108	+0.108	+0.190	+0.190	+0.190	+0.190	+0.190	+0.190
OVER 355	+0.254	+0.203	+0.171	+0.150	+0.139	+0.132	+0.348	+0.297	+0.265	+0.244	+0.233	+0.226
TO 400	+0.114	+0.114	+0.114	+0.114	+0.114	+0.114	+0.208	+0.208	+0.208	+0.208	+0.208	+0.208
OVER 400	+0.281	+0.223	+0.189	+0.166	+0.153	+0.146	+0.387	+0.329	+0.295	+0.272	+0.259	+0.252
TO 450	+0.126	+0.126	+0.126	+0.126	+0.126	+0.126	+0.232	+0.232	+0.232	+0.232	+0.232	+0.232
OVER 450	+0.287	+0.229	+0.195	+0.172	+0.159	+0.152	+0.407	+0.349	+0.315	+0.292	+0.279	+0.272
TO 500	+0.132	+0.132	+0.132	+0.132	+0.132	+0.132	+0.252	+0.252	+0.252	+0.252	+0.252	+0.252

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Table A22 Tolerance Zones for External (Shaft) Dimensions (t9 through t4 and u9 through u4) Dimensions in mm

BASIC SIZE	t9	t8	t7	t6	t5	t4	u9	u8	u7	u6	u5	u4
OVER 0 TO 3	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED.						+0.043 +0.018	+0.032 +0.018	+0.028 +0.018	+0.024 +0.018	+0.022 +0.018	+0.021 +0.018
OVER 3 TO 6							+0.053 +0.023	+0.041 +0.023	+0.035 +0.023	+0.031 +0.023	+0.028 +0.023	+0.027 +0.023
OVER 6 TO 10							+0.064 +0.028	+0.050 +0.028	+0.043 +0.028	+0.037 +0.028	+0.034 +0.028	+0.032 +0.028
OVER 10 TO 14							+0.076 +0.033	+0.060 +0.033	+0.051 +0.033	+0.044 +0.033	+0.041 +0.033	+0.038 +0.033
OVER 14 TO 18							+0.076 +0.033	+0.060 +0.033	+0.051 +0.033	+0.044 +0.033	+0.041 +0.033	+0.038 +0.033
OVER 18 TO 24							+0.093 +0.041	+0.074 +0.041	+0.062 +0.041	+0.054 +0.041	+0.050 +0.041	+0.047 +0.041
OVER 24 TO 30	+0.093 +0.041	+0.074 +0.041	+0.062 +0.041	+0.054 +0.041	+0.050 +0.041	+0.047 +0.041	+0.100 +0.048	+0.081 +0.048	+0.069 +0.048	+0.061 +0.048	+0.057 +0.048	+0.054 +0.048
OVER 30 TO 40	+0.110 +0.048	+0.087 +0.048	+0.073 +0.048	+0.064 +0.048	+0.059 +0.048	+0.055 +0.048	+0.122 +0.060	+0.099 +0.060	+0.085 +0.060	+0.076 +0.060	+0.071 +0.060	+0.067 +0.060
OVER 40 TO 50	+0.116 +0.054	+0.093 +0.054	+0.079 +0.054	+0.070 +0.054	+0.065 +0.054	+0.061 +0.054	+0.132 +0.070	+0.109 +0.070	+0.095 +0.070	+0.086 +0.070	+0.081 +0.070	+0.077 +0.070
OVER 50 TO 65	+0.140 +0.066	+0.112 +0.066	+0.096 +0.066	+0.085 +0.066	+0.079 +0.066	+0.074 +0.066	+0.161 +0.087	+0.133 +0.087	+0.117 +0.087	+0.106 +0.087	+0.100 +0.087	+0.095 +0.087
OVER 65 TO 80	+0.149 +0.075	+0.121 +0.075	+0.105 +0.075	+0.094 +0.075	+0.088 +0.075	+0.083 +0.075	+0.176 +0.102	+0.148 +0.102	+0.132 +0.102	+0.121 +0.102	+0.115 +0.102	+0.110 +0.102
OVER 80 TO 100	+0.178 +0.091	+0.145 +0.091	+0.126 +0.091	+0.113 +0.091	+0.106 +0.091	+0.101 +0.091	+0.211 +0.124	+0.178 +0.124	+0.159 +0.124	+0.146 +0.124	+0.139 +0.124	+0.134 +0.124
OVER 100 TO 120	+0.191 +0.104	+0.158 +0.104	+0.139 +0.104	+0.126 +0.104	+0.119 +0.104	+0.114 +0.104	+0.231 +0.144	+0.198 +0.144	+0.179 +0.144	+0.166 +0.144	+0.159 +0.144	+0.154 +0.144
OVER 120 TO 140	+0.222 +0.122	+0.185 +0.122	+0.162 +0.122	+0.147 +0.122	+0.140 +0.122	+0.134 +0.122	+0.270 +0.170	+0.233 +0.170	+0.210 +0.170	+0.195 +0.170	+0.188 +0.170	+0.182 +0.170
OVER 140 TO 160	+0.234 +0.134	+0.197 +0.134	+0.174 +0.134	+0.159 +0.134	+0.152 +0.134	+0.146 +0.134	+0.290 +0.190	+0.253 +0.190	+0.230 +0.190	+0.215 +0.190	+0.208 +0.190	+0.202 +0.190
OVER 160 TO 180	+0.246 +0.146	+0.209 +0.146	+0.186 +0.146	+0.171 +0.146	+0.164 +0.146	+0.158 +0.146	+0.310 +0.210	+0.273 +0.210	+0.250 +0.210	+0.235 +0.210	+0.228 +0.210	+0.222 +0.210
OVER 180 TO 200	+0.281 +0.166	+0.238 +0.166	+0.212 +0.166	+0.195 +0.166	+0.186 +0.166	+0.180 +0.166	+0.351 +0.236	+0.308 +0.236	+0.282 +0.236	+0.265 +0.236	+0.256 +0.236	+0.250 +0.236
OVER 200 TO 225	+0.295 +0.180	+0.252 +0.180	+0.226 +0.180	+0.209 +0.180	+0.200 +0.180	+0.194 +0.180	+0.373 +0.258	+0.330 +0.258	+0.304 +0.258	+0.287 +0.258	+0.278 +0.258	+0.272 +0.258
OVER 225 TO 250	+0.311 +0.196	+0.268 +0.196	+0.242 +0.196	+0.225 +0.196	+0.216 +0.196	+0.210 +0.196	+0.399 +0.284	+0.356 +0.284	+0.330 +0.284	+0.313 +0.284	+0.304 +0.284	+0.298 +0.284
OVER 250 TO 280	+0.348 +0.218	+0.299 +0.218	+0.270 +0.218	+0.250 +0.218	+0.241 +0.218	+0.234 +0.218	+0.445 +0.315	+0.396 +0.315	+0.367 +0.315	+0.347 +0.315	+0.338 +0.315	+0.331 +0.315
OVER 280 TO 315	+0.370 +0.240	+0.321 +0.240	+0.292 +0.240	+0.272 +0.240	+0.263 +0.240	+0.256 +0.240	+0.480 +0.350	+0.431 +0.350	+0.402 +0.350	+0.382 +0.350	+0.373 +0.350	+0.366 +0.350
OVER 315 TO 355	+0.408 +0.268	+0.357 +0.268	+0.325 +0.268	+0.304 +0.268	+0.293 +0.268	+0.286 +0.268	+0.530 +0.390	+0.479 +0.390	+0.447 +0.390	+0.426 +0.390	+0.415 +0.390	+0.408 +0.390
OVER 355 TO 400	+0.434 +0.294	+0.383 +0.294	+0.351 +0.294	+0.330 +0.294	+0.319 +0.294	+0.312 +0.294	+0.575 +0.435	+0.524 +0.435	+0.492 +0.435	+0.471 +0.435	+0.460 +0.435	+0.453 +0.435
OVER 400 TO 450	+0.485 +0.330	+0.427 +0.330	+0.393 +0.330	+0.370 +0.330	+0.357 +0.330	+0.350 +0.330	+0.645 +0.490	+0.587 +0.490	+0.553 +0.490	+0.530 +0.490	+0.517 +0.490	+0.510 +0.490
OVER 450 TO 500	+0.515 +0.360	+0.457 +0.360	+0.423 +0.360	+0.400 +0.360	+0.387 +0.360	+0.380 +0.360	+0.695 +0.540	+0.637 +0.540	+0.603 +0.540	+0.580 +0.540	+0.567 +0.540	+0.560 +0.540

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Table A23 Tolerance Zones for External (Shaft) Dimensions (v9 through v4 and x9 through x4) Dimensions in mm

BASIC SIZE	v9	v8	v7	v6	v5	v4	x9	x8	x7	x6	x5	x4
OVER 0 TO 3	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED.						+0.045 +0.020	+0.034 +0.020	+0.030 +0.020	+0.026 +0.020	+0.024 +0.020	+0.023 +0.020
OVER 3 TO 6							+0.058 +0.028	+0.046 +0.028	+0.040 +0.028	+0.036 +0.028	+0.033 +0.028	+0.032 +0.028
OVER 6 TO 10							+0.070 +0.034	+0.056 +0.034	+0.049 +0.034	+0.043 +0.034	+0.040 +0.034	+0.038 +0.034
OVER 10 TO 14							+0.083 +0.040	+0.067 +0.040	+0.058 +0.040	+0.051 +0.040	+0.048 +0.040	+0.045 +0.040
OVER 14 TO 18	+0.082 +0.039	+0.066 +0.039	+0.057 +0.039	+0.050 +0.039	+0.047 +0.039	+0.044 +0.039	+0.085 +0.045	+0.072 +0.045	+0.063 +0.045	+0.056 +0.045	+0.053 +0.045	+0.050 +0.045
OVER 18 TO 24	+0.099 +0.047	+0.080 +0.047	+0.068 +0.047	+0.060 +0.047	+0.056 +0.047	+0.053 +0.047	+0.106 +0.054	+0.087 +0.054	+0.075 +0.054	+0.067 +0.054	+0.063 +0.054	+0.060 +0.054
OVER 24 TO 30	+0.107 +0.055	+0.088 +0.055	+0.076 +0.055	+0.068 +0.055	+0.064 +0.055	+0.061 +0.055	+0.116 +0.064	+0.097 +0.064	+0.085 +0.064	+0.077 +0.064	+0.073 +0.064	+0.070 +0.064
OVER 30 TO 40	+0.130 +0.068	+0.107 +0.068	+0.093 +0.068	+0.084 +0.068	+0.079 +0.068	+0.075 +0.068	+0.142 +0.080	+0.119 +0.080	+0.105 +0.080	+0.096 +0.080	+0.091 +0.080	+0.087 +0.080
OVER 40 TO 50	+0.143 +0.081	+0.120 +0.081	+0.106 +0.081	+0.097 +0.081	+0.092 +0.081	+0.088 +0.081	+0.159 +0.097	+0.136 +0.097	+0.122 +0.097	+0.113 +0.097	+0.108 +0.097	+0.104 +0.097
OVER 50 TO 65	+0.176 +0.102	+0.148 +0.102	+0.132 +0.102	+0.121 +0.102	+0.115 +0.102	+0.110 +0.102	+0.196 +0.122	+0.168 +0.122	+0.152 +0.122	+0.141 +0.122	+0.135 +0.122	+0.130 +0.122
OVER 65 TO 80	+0.194 +0.120	+0.166 +0.120	+0.150 +0.120	+0.139 +0.120	+0.133 +0.120	+0.128 +0.120	+0.220 +0.146	+0.192 +0.146	+0.176 +0.146	+0.165 +0.146	+0.159 +0.146	+0.154 +0.146
OVER 80 TO 100	+0.233 +0.146	+0.200 +0.146	+0.181 +0.146	+0.168 +0.146	+0.161 +0.146	+0.156 +0.146	+0.265 +0.178	+0.232 +0.178	+0.213 +0.178	+0.200 +0.178	+0.193 +0.178	+0.188 +0.178
OVER 100 TO 120	+0.259 +0.172	+0.226 +0.172	+0.207 +0.172	+0.194 +0.172	+0.187 +0.172	+0.182 +0.172	+0.297 +0.210	+0.264 +0.210	+0.245 +0.210	+0.232 +0.210	+0.225 +0.210	+0.220 +0.210
OVER 120 TO 140	+0.302 +0.202	+0.265 +0.202	+0.242 +0.202	+0.227 +0.202	+0.220 +0.202	+0.214 +0.202	+0.348 +0.248	+0.311 +0.248	+0.288 +0.248	+0.273 +0.248	+0.266 +0.248	+0.260 +0.248
OVER 140 TO 160	+0.328 +0.228	+0.291 +0.228	+0.268 +0.228	+0.253 +0.228	+0.246 +0.228	+0.240 +0.228	+0.380 +0.280	+0.343 +0.280	+0.320 +0.280	+0.305 +0.280	+0.298 +0.280	+0.292 +0.280
OVER 160 TO 180	+0.352 +0.252	+0.315 +0.252	+0.292 +0.252	+0.277 +0.252	+0.270 +0.252	+0.264 +0.252	+0.410 +0.310	+0.373 +0.310	+0.350 +0.310	+0.335 +0.310	+0.328 +0.310	+0.322 +0.310
OVER 180 TO 200	+0.399 +0.284	+0.356 +0.284	+0.330 +0.284	+0.313 +0.284	+0.304 +0.284	+0.298 +0.284	+0.465 +0.350	+0.422 +0.350	+0.396 +0.350	+0.379 +0.350	+0.370 +0.350	+0.364 +0.350
OVER 200 TO 225	+0.425 +0.310	+0.382 +0.310	+0.356 +0.310	+0.339 +0.310	+0.330 +0.310	+0.324 +0.310	+0.500 +0.385	+0.457 +0.385	+0.431 +0.385	+0.414 +0.385	+0.405 +0.385	+0.399 +0.385
OVER 225 TO 250	+0.455 +0.340	+0.412 +0.340	+0.386 +0.340	+0.369 +0.340	+0.360 +0.340	+0.354 +0.340	+0.540 +0.425	+0.497 +0.425	+0.471 +0.425	+0.454 +0.425	+0.445 +0.425	+0.439 +0.425
OVER 250 TO 280	+0.515 +0.385	+0.466 +0.385	+0.437 +0.385	+0.417 +0.385	+0.408 +0.385	+0.401 +0.385	+0.605 +0.475	+0.556 +0.475	+0.527 +0.475	+0.507 +0.475	+0.498 +0.475	+0.491 +0.475
OVER 280 TO 315	+0.555 +0.425	+0.506 +0.425	+0.477 +0.425	+0.457 +0.425	+0.448 +0.425	+0.441 +0.425	+0.655 +0.525	+0.606 +0.525	+0.577 +0.525	+0.557 +0.525	+0.548 +0.525	+0.541 +0.525
OVER 315 TO 355	+0.615 +0.475	+0.564 +0.475	+0.532 +0.475	+0.511 +0.475	+0.500 +0.475	+0.493 +0.475	+0.730 +0.590	+0.679 +0.590	+0.647 +0.590	+0.626 +0.590	+0.615 +0.590	+0.608 +0.590
OVER 355 TO 400	+0.670 +0.530	+0.619 +0.530	+0.587 +0.530	+0.566 +0.530	+0.555 +0.530	+0.548 +0.530	+0.800 +0.660	+0.749 +0.660	+0.717 +0.660	+0.696 +0.660	+0.685 +0.660	+0.678 +0.660
OVER 400 TO 450	+0.750 +0.595	+0.692 +0.595	+0.658 +0.595	+0.635 +0.595	+0.622 +0.595	+0.615 +0.595	+0.895 +0.740	+0.837 +0.740	+0.803 +0.740	+0.780 +0.740	+0.767 +0.740	+0.760 +0.740
OVER 450 TO 500	+0.815 +0.660	+0.757 +0.660	+0.723 +0.660	+0.700 +0.660	+0.687 +0.660	+0.680 +0.660	+0.975 +0.820	+0.917 +0.820	+0.883 +0.820	+0.860 +0.820	+0.847 +0.820	+0.840 +0.820

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Table A24 Tolerance Zones for External (Shaft) Dimensions (y9 through y4 and z9 through z4) Dimensions in mm

BASIC SIZE	y9	y8	y7	y6	y5	y4	z9	z8	z7	z6	z5	z4
OVER 0 TO 3	NUMERICAL VALUES FOR TOLERANCE ZONES IN THIS AREA NOT DEFINED.						+0.051 +0.026	+0.040 +0.026	+0.036 +0.026	+0.032 +0.026	+0.030 +0.026	+0.029 +0.026
OVER 3 TO 6							+0.065 +0.035	+0.053 +0.035	+0.047 +0.035	+0.043 +0.035	+0.040 +0.035	+0.039 +0.035
OVER 6 TO 10							+0.078 +0.042	+0.064 +0.042	+0.057 +0.042	+0.051 +0.042	+0.048 +0.042	+0.046 +0.042
OVER 10 TO 14							+0.093 +0.050	+0.077 +0.050	+0.068 +0.050	+0.061 +0.050	+0.058 +0.050	+0.055 +0.050
OVER 14 TO 18							+0.103 +0.060	+0.087 +0.060	+0.078 +0.060	+0.071 +0.060	+0.068 +0.060	+0.065 +0.060
OVER 18 TO 24	+0.115 +0.063	+0.096 +0.063	+0.084 +0.063	+0.076 +0.063	+0.072 +0.063	+0.069 +0.063	+0.125 +0.073	+0.106 +0.073	+0.094 +0.073	+0.086 +0.073	+0.082 +0.073	+0.079 +0.073
OVER 24 TO 30	+0.127 +0.075	+0.108 +0.075	+0.096 +0.075	+0.088 +0.075	+0.084 +0.075	+0.081 +0.075	+0.140 +0.088	+0.121 +0.088	+0.109 +0.088	+0.101 +0.088	+0.097 +0.088	+0.094 +0.088
OVER 30 TO 40	+0.156 +0.094	+0.133 +0.094	+0.119 +0.094	+0.110 +0.094	+0.105 +0.094	+0.101 +0.094	+0.174 +0.112	+0.151 +0.112	+0.137 +0.112	+0.128 +0.112	+0.123 +0.112	+0.119 +0.112
OVER 40 TO 50	+0.176 +0.114	+0.153 +0.114	+0.139 +0.114	+0.130 +0.114	+0.125 +0.114	+0.121 +0.114	+0.198 +0.136	+0.175 +0.136	+0.161 +0.136	+0.152 +0.136	+0.147 +0.136	+0.143 +0.136
OVER 50 TO 65	+0.218 +0.144	+0.190 +0.144	+0.174 +0.144	+0.163 +0.144	+0.157 +0.144	+0.152 +0.144	+0.246 +0.172	+0.218 +0.172	+0.202 +0.172	+0.191 +0.172	+0.185 +0.172	+0.180 +0.172
OVER 65 TO 80	+0.248 +0.174	+0.220 +0.174	+0.204 +0.174	+0.193 +0.174	+0.187 +0.174	+0.182 +0.174	+0.284 +0.210	+0.256 +0.210	+0.240 +0.210	+0.229 +0.210	+0.223 +0.210	+0.218 +0.210
OVER 80 TO 100	+0.301 +0.214	+0.268 +0.214	+0.249 +0.214	+0.236 +0.214	+0.229 +0.214	+0.224 +0.214	+0.345 +0.258	+0.312 +0.258	+0.293 +0.258	+0.280 +0.258	+0.273 +0.258	+0.268 +0.258
OVER 100 TO 120	+0.341 +0.254	+0.308 +0.254	+0.289 +0.254	+0.276 +0.254	+0.269 +0.254	+0.264 +0.254	+0.397 +0.310	+0.364 +0.310	+0.345 +0.310	+0.332 +0.310	+0.325 +0.310	+0.320 +0.310
OVER 120 TO 140	+0.400 +0.300	+0.363 +0.300	+0.340 +0.300	+0.325 +0.300	+0.318 +0.300	+0.312 +0.300	+0.465 +0.365	+0.428 +0.365	+0.405 +0.365	+0.390 +0.365	+0.383 +0.365	+0.377 +0.365
OVER 140 TO 160	+0.440 +0.340	+0.403 +0.340	+0.380 +0.340	+0.365 +0.340	+0.358 +0.340	+0.352 +0.340	+0.515 +0.415	+0.478 +0.415	+0.455 +0.415	+0.440 +0.415	+0.433 +0.415	+0.427 +0.415
OVER 160 TO 180	+0.480 +0.380	+0.443 +0.380	+0.420 +0.380	+0.405 +0.380	+0.398 +0.380	+0.392 +0.380	+0.565 +0.465	+0.528 +0.465	+0.505 +0.465	+0.490 +0.465	+0.483 +0.465	+0.477 +0.465
OVER 180 TO 200	+0.540 +0.425	+0.497 +0.425	+0.471 +0.425	+0.454 +0.425	+0.445 +0.425	+0.439 +0.425	+0.635 +0.520	+0.592 +0.520	+0.566 +0.520	+0.549 +0.520	+0.540 +0.520	+0.534 +0.520
OVER 200 TO 225	+0.585 +0.470	+0.542 +0.470	+0.516 +0.470	+0.499 +0.470	+0.490 +0.470	+0.484 +0.470	+0.690 +0.575	+0.647 +0.575	+0.621 +0.575	+0.604 +0.575	+0.595 +0.575	+0.589 +0.575
OVER 225 TO 250	+0.635 +0.520	+0.592 +0.520	+0.566 +0.520	+0.549 +0.520	+0.540 +0.520	+0.534 +0.520	+0.755 +0.640	+0.712 +0.640	+0.686 +0.640	+0.669 +0.640	+0.660 +0.640	+0.654 +0.640
OVER 250 TO 280	+0.710 +0.580	+0.661 +0.580	+0.632 +0.580	+0.612 +0.580	+0.603 +0.580	+0.596 +0.580	+0.840 +0.710	+0.791 +0.710	+0.762 +0.710	+0.742 +0.710	+0.733 +0.710	+0.726 +0.710
OVER 280 TO 315	+0.780 +0.650	+0.731 +0.650	+0.702 +0.650	+0.682 +0.650	+0.673 +0.650	+0.666 +0.650	+0.920 +0.790	+0.871 +0.790	+0.842 +0.790	+0.822 +0.790	+0.813 +0.790	+0.806 +0.790
OVER 315 TO 355	+0.870 +0.730	+0.819 +0.730	+0.787 +0.730	+0.766 +0.730	+0.755 +0.730	+0.748 +0.730	+1.040 +0.900	+0.989 +0.900	+0.957 +0.900	+0.936 +0.900	+0.925 +0.900	+0.918 +0.900
OVER 355 TO 400	+0.960 +0.820	+0.909 +0.820	+0.877 +0.820	+0.856 +0.820	+0.845 +0.820	+0.838 +0.820	+1.140 +1.000	+1.089 +1.000	+1.057 +1.000	+1.036 +1.000	+1.025 +1.000	+1.018 +1.000
OVER 400 TO 450	+1.075 +0.920	+1.017 +0.920	+0.983 +0.920	+0.960 +0.920	+0.947 +0.920	+0.940 +0.920	+1.255 +1.100	+1.197 +1.100	+1.163 +1.100	+1.140 +1.100	+1.127 +1.100	+1.120 +1.100
OVER 450 TO 500	+1.155 +1.000	+1.097 +1.000	+1.063 +1.000	+1.040 +1.000	+1.027 +1.000	+1.020 +1.000	+1.405 +1.250	+1.347 +1.250	+1.313 +1.250	+1.290 +1.250	+1.277 +1.250	+1.270 +1.250

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APPENDIX B

TABLE OF INTERNATIONAL TOLERANCE GRADES, FUNDAMENTAL DEVIATIONS AND THEIR DERIVATIONS

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APPENDIX B

B1. INTRODUCTION

This appendix provides the data needed to calculate limit dimensions for nonpreferred tolerance designations (that is those not shown in Figures 2 and 3 of this standard) and for basic sizes larger than 500 millimeters. This appendix contains:

a. *International tolerance grades from IT01 thru IT16* for basic sizes up to and including 3150 millimeters (Table B1). Tolerance zones with IT grades larger than IT16 are sometimes used. A footnote in Table B1 gives a simple formula for calculating IT17, IT18, etc.

b. *Fundamental deviations* for basic sizes up to 3150 millimeters:

Holes	Table B2
Shafts	Table B3

c. *Interpretation of ISO symbols* using the table values for basic sizes up to 3150 millimeters (paragraph B2).

d. *Formulas for the derivation of table values.* These formulas are for reference only. Rounding variations introduced in calculations may result in values which are inconsistent with the published national and international standards (paragraph B3).

e. *Guidelines for converting fits* (paragraph B4).

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TABLE B1 INTERNATIONAL TOLERANCE GRADES

Dimensions are in mm.

Basic sizes		Tolerance grades[3]																	
Over	Up to and including	IT01	IT0	IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16
0	3	0.0003	0.0005	0.0008	0.0012	0.002	0.003	0.004	0.006	0.010	0.014	0.025	0.040	0.060	0.100	0.140	0.250	0.400	0.600
3	6	0.0004	0.0006	0.001	0.0015	0.0025	0.004	0.005	0.008	0.012	0.018	0.030	0.048	0.075	0.120	0.180	0.300	0.480	0.750
6	10	0.0004	0.0006	0.001	0.0015	0.0025	0.004	0.006	0.009	0.015	0.022	0.036	0.058	0.090	0.150	0.220	0.360	0.580	0.900
10	18	0.0005	0.0008	0.0012	0.002	0.003	0.005	0.008	0.011	0.018	0.027	0.043	0.070	0.110	0.180	0.270	0.430	0.700	1.100
18	30	0.0006	0.001	0.0015	0.0025	0.004	0.006	0.009	0.013	0.021	0.033	0.052	0.084	0.130	0.210	0.330	0.520	0.840	1.300
30	50	0.0006	0.001	0.0015	0.0025	0.004	0.007	0.011	0.016	0.025	0.039	0.062	0.100	0.160	0.250	0.390	0.620	1.000	1.600
50	80	0.0008	0.0012	0.002	0.003	0.005	0.008	0.013	0.019	0.030	0.046	0.074	0.120	0.190	0.300	0.460	0.740	1.200	1.900
80	120	0.001	0.0015	0.0025	0.004	0.006	0.010	0.015	0.022	0.035	0.054	0.087	0.140	0.220	0.350	0.540	0.870	1.400	2.200
120	180	0.0012	0.002	0.0035	0.005	0.008	0.012	0.018	0.025	0.040	0.063	0.100	0.160	0.250	0.400	0.630	1.000	1.600	2.500
180	250	0.002	0.003	0.0045	0.007	0.010	0.014	0.020	0.029	0.046	0.072	0.115	0.185	0.290	0.460	0.720	1.150	1.850	2.900
250	315	0.0025	0.004	0.006	0.008	0.012	0.016	0.023	0.032	0.052	0.081	0.130	0.210	0.320	0.520	0.810	1.300	2.100	3.200
315	400	0.003	0.005	0.007	0.009	0.013	0.018	0.025	0.036	0.057	0.089	0.140	0.230	0.360	0.570	0.890	1.400	2.300	3.600
400	500	0.004	0.006	0.008	0.010	0.015	0.020	0.027	0.040	0.063	0.097	0.155	0.250	0.400	0.630	0.970	1.550	2.500	4.000
500	630	0.0045	0.006	0.009	0.011	0.016	0.022	0.030	0.044	0.070	0.110	0.175	0.280	0.440	0.700	1.100	1.750	2.800	4.400
630	800	0.005	0.007	0.010	0.013	0.018	0.025	0.035	0.050	0.080	0.125	0.200	0.320	0.500	0.800	1.250	2.000	3.200	5.000
800	1000	0.0055	0.008	0.011	0.015	0.021	0.029	0.040	0.056	0.090	0.140	0.230	0.360	0.560	0.900	1.400	2.300	3.600	5.600
1000	1250	0.0065	0.009	0.013	0.018	0.024	0.034	0.046	0.066	0.105	0.165	0.260	0.420	0.660	1.050	1.650	2.600	4.200	6.600
1250	1600	0.008	0.011	0.015	0.021	0.029	0.040	0.054	0.078	0.125	0.195	0.310	0.500	0.780	1.250	1.950	3.100	5.000	7.800
1600	2000	0.009	0.013	0.018	0.025	0.035	0.048	0.065	0.092	0.150	0.230	0.370	0.600	0.920	1.500	2.300	3.700	6.000	9.200
2000	2500	0.011	0.015	0.022	0.030	0.041	0.057	0.077	0.110	0.175	0.280	0.440	0.700	1.100	1.750	2.800	4.400	7.000	11.000
2500	3150	0.013	0.018	0.026	0.036	0.050	0.069	0.053	0.135	0.210	0.330	0.540	0.860	1.350	2.100	3.300	5.400	8.600	13.500

[3] IT Values for tolerance grades larger than IT16 can be calculated by using the following formulas:
IT 17 = IT12 x 10; IT18 = IT13 x 10; etc.

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TABLE B2 FUNDAMENTAL DEVIATIONS FOR HOLES

Dimensions are in mm.

Fundamental Deviation		Lower Deviation											
Letter		A	B	C	CD	D	E	EF	F	FG	G	H	JS[4]
IT Grade		01 to 16											
Basic Sizes													
Over	Up to and Including												
0	3	+ 0.270	+ 0.140	+ 0.060	+ 0.034	+ 0.020	+ 0.014	+ 0.010	+ 0.006	+ 0.004	+ 0.002	0	
3	6	+ 0.270	+ 0.140	+ 0.070	+ 0.046	+ 0.030	+ 0.020	+ 0.014	+ 0.010	+ 0.006	+ 0.004	0	
6	10	+ 0.280	+ 0.150	+ 0.080	+ 0.056	+ 0.040	+ 0.025	+ 0.018	+ 0.013	+ 0.008	+ 0.005	0	
10	14	+ 0.290	+ 0.150	+ 0.095	–	+ 0.050	+ 0.032	–	+ 0.016	–	+ 0.006	0	
14	18												
18	24	+ 0.300	+ 0.160	+ 0.110	–	+ 0.065	+ 0.040	–	+ 0.020	–	+ 0.007	0	- IT/2
24	30												
30	40	+ 0.310	+ 0.170	+ 0.120	–	+ 0.080	+ 0.050	–	+ 0.025	–	+ 0.009	0	
40	50	+ 0.320	+ 0.180	+ 0.130									
50	65	+ 0.340	+ 0.190	+ 0.140	–	+ 0.100	+ 0.060	–	+ 0.030	–	+ 0.010	0	
65	80	+ 0.360	+ 0.200	+ 0.150									
80	100	+ 0.380	+ 0.220	+ 0.170	–	+ 0.120	+ 0.072	–	+ 0.036	–	+ 0.012	0	
100	120	+ 0.410	+ 0.240	+ 0.180									
120	140	+ 0.460	+ 0.260	+ 0.200	–	+ 0.145	+ 0.085	–	+ 0.043	–	+ 0.014	0	
140	160	+ 0.520	+ 0.280	+ 0.210									
160	180	+ 0.580	+ 0.310	+ 0.230									
180	200	+ 0.660	+ 0.340	+ 0.240	–	+ 0.170	+ 0.100	–	+ 0.050	–	+ 0.015	0	
200	225	+ 0.740	+ 0.380	+ 0.260									
225	250	+ 0.820	+ 0.420	+ 0.280									
250	280	+ 0.920	+ 0.480	+ 0.300	–	+ 0.190	+ 0.110	–	+ 0.056	–	+ 0.017	0	
280	315	+ 1.050	+ 0.540	+ 0.330									
315	355	+ 1.200	+ 0.600	+ 0.360	–	+ 0.210	+ 0.125	-	+ 0.062	–	+ 0.018	0	
355	400	+ 1.350	+ 0.680	+ 0.400									
400	450	+ 1.500	+ 0.760	+ 0.440	–	+ 0.230	+ 0.135	–	+ 0.068	–	+ 0.020	0	
450	500	+ 1.650	+ 0.840	+ 0.480									
IT Grade		6 to 16											
500	630	–	–	–	–	+ 0.260	+ 0.145	–	+ 0.076	–	+ 0.022	0	
630	800	–	–	–	–	+ 0.290	+ 0.160	–	+ 0.080	–	+ 0.024	0	
800	1000	–	–	–	–	+ 0.320	+ 0.170	–	+ 0.086	–	+ 0.026	0	
1000	1250	–	–	–	–	+ 0.350	+ 0.195	–	+ 0.098	–	+ 0.028	0	- IT/2
1250	1600	–	–	–	–	+ 0.390	+ 0.220	–	+ 0.110	–	+ 0.030	0	
1600	2000	–	–	–	–	+ 0.430	+ 0.240	–	+ 0.120	–	+ 0.032	0	
2000	2500	–	–	–	–	+ 0.480	+ 0.260	–	+ 0.130	–	+ 0.034	0	
2500	3150	–	–	–	–	+ 0.520	+ 0.290	–	+ 0.145	–	+ 0.038	0	

[4] The JS deviations in the grades 7 to 11 should be rounded off to ½ (IT-0.001) when the IT value is odd.

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TABLE B2 FUNDAMENTAL DEVIATIONS FOR HOLES (Continued)

Dimensions are in mm.

Fundamental Deviation		Upper Deviation												
Letter		J			K		M		N		P to ZC	P	R	S	T
T Grade		6	7	8	≤ 8	> 8	≤ 8[1]	> 8	≤ 8	> 8	≤ 7	Above 7			
Basic Sizes															
Over	Up to and including														
0	3	+ 0.002	+ 0.004	+ 0.006	0	0	− 0.002	− 0.002	− 0.004	− 0.004		− 0.006	− 0.010	− 0.014	−
3	6	+ 0.005	+ 0.006	+ 0.010	− 0.001 + Δ	−	− 0.004 + Δ	− 0.004	− 0.008 + Δ	0		− 0.012	− 0.015	− 0.019	−
6	10	+ 0.005	+ 0.008	+ 0.012	− 0.001 + Δ	−	− 0.006 + Δ	− 0.006	− 0.010 + Δ	0		− 0.015	− 0.019	− 0.023	−
10	14	+ 0.006	+ 0.010	+ 0.015	− 0.001 + Δ	−	− 0.007 + Δ	− 0.007	− 0.012 + Δ	0		− 0.018	− 0.23	− 0.028	−
14	18														
18	24	+ 0.008	+ 0.012	+ 0.020	− 0.002 + Δ	−	− 0.008 + Δ	− 0.008	− 0.015 + Δ	0		− 0.022	− 0.028	− 0. 035	−
24	30														− 0.041
30	40	+ 0.010	+ 0.014	+ 0.024	− 0.002 + Δ	−	− 0.009 + Δ	− 0.009	− 0.017 + Δ	0		− 0.026	− 0.034	− 0.043	− 0.048
40	50														− 0.054
50	65	+ 0.013	+ 0.018	+ 0.028	+ 0.002 + Δ	−	− 0.011 + Δ	− 0.011	− 0.020 + Δ	0		− 0.032	− 0.041	− 0.053	− 0.066
65	80												− 0.043	− 0.059	− 0.075
80	100	+ 0.016	+ 0.022	+ 0.034	− 0.003 + Δ	−	− 0.013 + Δ	− 0.013	− 0.023 + Δ	0		− 0.037	− 0.051	− 0.071	− 0.091
100	120												− 0.054	− 0.079	− 0.104
120	140	+ 0.018	+ 0.026	+ 0.041	− 0.003 + Δ	−	− 0.015 + Δ	− 0.015	− 0.027 + Δ	0		− 0.043	− 0.063	− 0.092	− 0.122
140	160												− 0.065	− 0.100	− 0.134
160	180												− 0.068	− 0.108	− 0.146
180	200	+ 0.022	+ 0.030	+ 0.047	− 0.004 + Δ	−	− 0.017 + Δ	− 0.017	− 0.031 + Δ	0		− 0.050	− 0.077	− 0.122	− 0.166
200	225												− 0.080	− 0.130	− 0.180
225	250												− 0.084	− 0.140	− 0.196
250	280	+ 0.025	+ 0.036	+ 0.055	− 0.004 + Δ	−	− 0.020 + Δ	− 0.020	− 0.034 + Δ	0		− 0.056	− 0.094	− 0.158	− 0.218
280	315												− 0.098	− 0.170	− 0.240
315	355	+ 0.029	+ 0.039	+ 0.060	− 0.004 + Δ	−	− 0.021 + Δ	− 0.021	− 0.037 + Δ	0		− 0.062	− 0.108	− 0.190	− 0.268
355	400												− 0.114	− 0.208	− 0.294
400	450	+ 0.033	+ 0.043	+ 0.066	− 0.005 + Δ	−	− 0.023 + Δ	− 0.023	− 0.040 + Δ	0		− 0.068	− 0.126	− 0.232	− 0.330
450	500												− 0.132	− 0.252	− 0.360
T Grade		6 to 16													
500	560				0		− 0.026		− 0.044			− 0.078	− 0.150	− 0.280	− 0.400
560	630												− 0.155	− 0.310	− 0.450
630	710				0		− 0.030		− 0.050			− 0.088	− 0.175	− 0.340	− 0.500
710	800												− 0.185	− 0.380	− 0.560
800	900				0		− 0.034		− 0.056			− 0.100	− 0.210	− 0.430	− 0.620
900	1000												− 0.220	− 0.470	− 0.680
1000	1120				0		− 0.040		− 0.066			− 0.120	− 0.250	− 0.520	− 0.780
1120	1250												− 0.260	− 0.580	− 0.840
1250	1400				0		− 0.048		− 0.078			− 0.140	− 0.300	− 0.640	− 0.960
1400	1600												− 0.330	− 0.720	− 1.050
1600	1800				0		− 0.058		− 0.092			− 0.170	− 0.370	− 0.820	− 1.200
1800	2000												− 0.400	− 0.920	− 1.350
2000	2240				0		− 0.068		− 0.110			− 0.195	− 0.440	− 1.000	− 1.500
2240	2500												− 0.460	− 1.100	− 1.650
2500	2800				0		− 0.076		− 0.135			− 0.240	− 0.550	− 1.250	− 1.900
2800	3150												− 0.580	− 1.400	− 2.100

Same deviations as for grades above 7 increased by Δ

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TABLE B2 FUNDAMENTAL DEVIATIONS FOR HOLES (Continued)

Dimensions are in mm

Upper Deviation								Values for Δ[4]						Fundamental Deviation	
U	V	X	Y	Z	ZA	ZB	ZC							Letter	
Above 7														IT Grade	
								IT Grades:						Basic Size	
								3	4	5	6	7	8	Over	Up to and including
− 0.018	−	− 0.020	−	− 0.026	− 0.032	− 0.040	− 0.060	0	0	0	0	0	0	0	3
− 0.023	−	− 0.028	−	− 0.035	− 0.042	− 0.050	− 0.080	0.001	0.0015	0.001	0.003	0.004	0.006	3	6
− 0.028	−	− 0.034	−	− 0.042	− 0.052	− 0.067	− 0.097	0.001	0.0015	0.002	0.003	0.006	0.007	6	10
− 0.033	−	− 0.040	−	− 0.050	− 0.064	− 0.090	− 0.130	0.001	0.002	0.003	0.003	0.007	0.009	10	14
	− 0.039	− 0.045	−	− 0.060	− 0.077	− 0.108	− 0.150							14	18
− 0.041	− 0.047	− 0.054	− 0.063	− 0.073	− 0.098	− 0.136	− 0.188	0.0015	0.002	0.003	0.004	0.008	0.012	18	24
− 0.048	− 0.055	− 0.064	− 0.075	− 0.088	− 0.118	− 0.160	− 0.218							24	30
− 0.060	− 0.068	− 0.080	− 0.094	− 0.112	− 0.148	− 0.200	− 0.274	0.0015	0.003	0.004	0.005	0.009	0.014	30	40
− 0.070	− 0.081	− 0.097	− 0.114	− 0.136	− 0.180	− 0.242	− 0.325							40	50
− 0.087	− 0.102	− 0.122	− 0.144	− 0.172	− 0.226	− 0.300	− 0.405	0.002	0.003	0.005	0.006	0.011	0.016	50	65
− 0.102	− 0.120	− 0.146	− 0.174	− 0.210	− 0.274	− 0.360	− 0.480							65	80
− 0.124	− 0.146	− 0.178	− 0.214	− 0.258	− 0.335	− 0.445	− 0.585	0.002	0.004	0.005	0.007	0.013	0.019	80	100
− 0.144	− 0.172	− 0.210	− 0.254	− 0.310	− 0.400	− 0.525	− 0.690							100	120
− 0.170	− 0.202	− 0.248	− 0.300	− 0.365	− 0.470	− 0.620	− 0.800	0.003	0.004	0.006	0.007	0.015	0.023	120	140
− 0.190	− 0.228	− 0.280	− 0.340	− 0.415	− 0.535	− 0.700	− 0.900							140	160
− 0.210	− 0.252	− 0.310	− 0.380	− 0.465	− 0.600	− 0.780	− 1.000							160	180
− 0.236	− 0.284	− 0.350	− 0.425	− 0.520	− 0.670	− 0.880	− 1.150	0.003	0.004	0.006	0.009	0.017	0.026	180	200
− 0.258	− 0.310	− 0.385	− 0.470	− 0.575	− 0.740	− 0.960	− 1.250							200	225
− 0.284	− 0.340	− 0.425	− 0.520	− 0.640	− 0.820	− 1.050	− 1.350							225	250
− 0.315	− 0.385	− 0.475	− 0.580	− 0.710	− 0.920	− 1.200	− 1.550	0.004	0.004	0.007	0.009	0.020	0.029	250	280
− 0.350	− 0.425	− 0.525	− 0.650	− 0.790	− 1.000	− 1.300	− 1.700							280	315
− 0.390	− 0.475	− 0.590	− 0.730	− 0.900	− 1.150	− 1.500	− 1.900	0.004	0.005	0.007	0.011	0.021	0.032	315	355
− 0.435	− 0.530	− 0.660	− 0.820	− 1.000	− 1.300	− 1.650	− 2.100							355	400
− 0.490	− 0.595	− 0.740	− 0.920	− 1.100	− 1.450	− 1.850	− 2.400	0.005	0.005	0.007	0.013	0.023	0.034	400	450
−0.540	− 0.660	− 0.820	− 1.000	− 1.250	− 1.600	− 2.100	− 2.600							450	500
6 to 16														IT Grade	
− 0.600														500	560
− 0.660														560	630
− 0.740														630	710
− 0.840														710	800
− 0.940														800	900
− 1.050														900	1000
− 1.150														1000	1120
− 1.300														1120	1250
− 1.450														1250	1400
− 1.600														1400	1600
−1.850														1600	1800
− 2.000														1800	2000
− 2.300														2000	2240
− 2.500														2240	2500
−2.900														2500	2800
− 3.200														2800	3150

[5] Special case: for M6, upper deviation = − 0.009 from 250 to 315 (instead of − 0.011).

[4] In determining K, M, N up to IT grade 8 and P to ZC up to IT grade 7, add the Δ value appropriate to the IT grade as indicated, for example for P7 from 18 to 30, Δ = 0.008 ∴ upper deviation = −0.014.

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TABLE B3 FUNDAMENTAL DEVIATIONS FOR SHAFTS

Dimensions are in mm.

Fundamental Deviation		Upper Deviation											
Letter		a	b	c	cd	d	e	ef	f	fg	g	h	js
IT Grade		01 to 16											
Basic Sizes													
Over	Up to and including												
0	3	− 0.270	− 0.140	− 0.060	− 0.034	− 0.020	− 0.014	− 0.010	− 0.006	− 0.004	− 0.002	0	
3	6	− 0.270	− 0.140	− 0.070	− 0.046	− 0.030	− 0.020	− 0.014	− 0.010	− 0.006	− 0.004	0	
6	10	− 0.280	− 0.150	− 0.080	− 0.056	− 0.040	− 0.025	− 0.018	− 0.013	− 0.008	− 0.005	0	
10	14	− 0.290	− 0.150	− 0.095	−	− 0.050	− 0.032	−	− 0.016	−	− 0.006	0	
14	18												
18	24	− 0.300	− 0.160	− 0.110	−	− 0.065	− 0.040	−	− 0.020	−	− 0.007	0	± IT/2
24	30												
30	40	− 0.310	− 0.170	− 0.120	−	− 0.080	− 0.050	−	− 0.025	−	− 0.009	0	
40	50	− 0.320	− 0.180	− 0.130									
50	65	− 0.340	− 0.190	− 0.140	−	− 0.100	− 0.060	−	− 0.030	−	− 0.010	0	
65	80	− 0.360	− 0.200	− 0.150									
80	100	− 0.380	− 0.220	− 0.170	−	− 0.120	− 0.072	−	− 0.036	−	− 0.012	0	
100	120	0.410	− 0.240	− 0.180									
120	140	− 0.460	− 0.260	− 0.200	−	− 0.145	− 0.085	−	− 0.043	−	− 0.014	0	
140	160	0.520	− 0.280	− 0.210									
160	180	− 0.580	− 0.310	− 0.230									
180	200	− 0.660	− 0.340	− 0.240	−	− 0.170	− 0.100	−	− 0.050	−	− 0.015	0	
200	225	− 0.740	− 0.380	− 0.260									
225	250	− 0.820	− 0.420	− 0.280									
250	280	− 0.920	− 0.480	− 0.300	−	− 0.190	− 0.110	−	− 0.056	−	− 0.017	0	
280	315	− 1.050	− 0.540	− 0.330									
315	355	− 1.200	− 0.600	− 0.360	−	− 0.210	− 0.125	−	− 0.062	−	− 0.018	0	
355	400	− 1.350	− 0.680	− 0.400									
400	450	− 1.500	− 0.760	−0.440	−	− 0.230	− 0.135	−	− 0.068	−	− 0.020	0	
450	500	− 1.650	− 0.840	− 0.480									
IT Grade		6 to 16											
500	630	−	−	−	−	− 0.260	− 0.145	−	− 0.076	−	− 0.022	0	
630	800	−	−	−	−	− 0.290	− 0.160	−	− 0.080	−	− 0.024	0	
800	1000	−	−	−	−	− 0.320	− 0.170	−	− 0.086	−	− 0.026	0	
1000	1250	−	−	−	−	− 0.350	− 0.195	−	− 0.098	−	− 0.028	0	± IT/2
1250	1600	−	−	−	−	− 0.390	− 0.220	−	− 0.110	−	− 0.030	0	
1600	2000	−	−	−	−	− 0.430	− 0.240	−	− 0.120	−	− 0.032	0	
2000	2500	−	−	−	−	− 0.480	− 0.260	−	− 0.130	−	− 0.034	0	
2500	3150	−	−	−	−	− 0.520	− 0.290	−	− 0.145	−	− 0.038	0	

[7] The js deviations in the grades 7 to 11 should be rounded off to ½ (IT−0.001) when the IT value is odd.

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TABLE B3 FUNDAMENTAL DEVIATIONS FOR SHAFTS
(Continued)

Dimensions are in mm.

Fundamental Deviation		Lower Deviation									
Letter		j			k		m	n	p	r	s
IT Grade		5-6	7	8	4-7	≤ 3 > 7	01 to 16				
Basic Size											
Over	Up to and including										
0	3	− 0.002	− 0.004	− 0.006	0	0	+ 0.002	+ 0.004	+ 0.006	+ 0.010	+ 0.014
3	6	− 0.002	− 0.004	−	+ 0.001	0	+ 0.004	+ 0.008	+ 0.012	+ 0.015	+ 0.019
6	10	− 0.002	− 0.005	−	+ 0.001	0	+ 0.006	+ 0.010	+ 0.015	+ 0.019	+ 0.023
10	14	− 0.003	− 0.006	−	+ 0.001	0	+ 0.007	+ 0.012	+ 0.018	+ 0.023	+ 0.028
14	18										
18	24	− 0.004	− 0.008	−	+ 0.002	0	+ 0.008	+ 0.015	+ 0.022	+ 0.028	+ 0.035
24	30										
30	40	− 0.005	− 0.010	−	+ 0.002	0	+ 0.009	+ 0.017	+ 0.026	+ 0.034	+ 0.043
40	50										
50	65	− 0.007	− 0.012	−	+ 0.002	0	+ 0.011	+ 0.020	+ 0.032	+ 0.041	+ 0.053
65	80									+ 0.043	+ 0.059
80	100	− 0.009	− 0.015	−	+ 0.003	0	+ 0.013	+ 0.023	+ 0.037	+ 0.051	+ 0.071
100	120									+ 0.054	+ 0.079
120	140	− 0.011	− 0.018	−	+ 0.003	0	+ 0.015	+ 0.027	+ 0.043	+ 0.063	+ 0.092
140	160									+ 0.065	+ 0.100
160	180									+ 0.068	+ 0.108
180	200	− 0.013	− 0.021	−	+ 0.004	0	+ 0.017	+ 0.031	+ 0.050	+ 0.077	+ 0.122
200	225									+ 0.080	+ 0.130
225	250									+ 0.084	+ 0.140
250	280	− 0.016	− 0.026	−	+ 0.004	0	+ 0.020	+ 0.034	+ 0.056	+ 0.094	+ 0.158
280	315									+ 0.098	+ 0.170
315	355	− 0.018	− 0.028	−	+ 0.004	0	+ 0.021	+ 0.037	+ 0.062	+ 0.108	+ 0.190
355	400									+ 0.114	+ 0.208
400	450	− 0.020	− 0.032	−	+ 0.005	0	+ 0.023	+ 0.040	+ 0.068	+ 0.126	+ 0.232
450	500									+ 0.132	+ 0.252
IT Grade		6 to 16									
500	560				0		+ 0.026	+ 0.044	+ 0.078	+ 0.150	+ 0.280
560	630									+ 0.155	+ 0.310
630	710				0		+ 0.030	+ 0.050	+ 0.088	+ 0.175	+ 0.340
710	800									+ 0.185	+ 0.380
800	900				0		+ 0.034	+ 0.056	+ 0.100	+ 0.210	+ 0.430
900	1000									+ 0.220	+ 0.470
1000	1120				0		+ 0.040	+ 0.066	+ 0.120	+ 0.250	+ 0.520
1120	1250									+ 0.260	+ 0.580
1250	1400				0		+ 0.048	+ 0.078	+ 0.140	+ 0.300	+ 0.640
1400	1600									+ 0.330	+ 0.720
1600	1800				0		+ 0.058	+ 0.092	+ 0.170	+ 0.370	+ 0.820
1800	2000									+ 0.400	+ 0.920
2000	2240				0		+ 0.068	+ 0.110	+ 0.195	+ 0.440	+ 1.000
2240	2500									+ 0.460	+ 1.100
2500	2800				0		+ 0.076	+ 0.135	+ 0.240	+ 0.550	+ 1.250
2800	3150									+ 0.580	+ 1.400

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TABLE B3 FUNDAMENTAL DEVIATIONS FOR SHAFTS
(Continued)

Dimensions are in mm.

Lower Deviation									Fundamental Deviation	
t	u	v	x	y	z	za	zb	zc	Letter	
01 to 16									IT Grade	
									Basic Size	
									Over	Up to and including
–	+ 0.018	–	+ 0.020	–	+ 0.026	+ 0.032	+ 0.040	+ 0.060	0	3
–	+ 0.023	–	+ 0.028	–	+ 0.035	+ 0.042	+ 0.050	+ 0.080	3	6
–	+ 0.028	–	+ 0.034	–	+ 0.042	+ 0.052	+ 0.067	+ 0.097	6	10
–	+ 0.033	–	+ 0.040	–	+ 0.050	+ 0.064	+ 0.090	+ 0.130	10	14
		+ 0.039	+ 0.045	–	+ 0.060	+ 0.077	+ 0.108	+ 0.150	14	18
–	+ 0.041	+ 0.047	+ 0.054	+ 0.063	+ 0.073	+ 0.098	+ 0.136	+ 0.188	18	24
+ 0.041	+ 0.048	+ 0.055	+ 0.064	+ 0.075	+ 0.088	+ 0.118	+ 0.160	+ 0.218	24	30
+ 0.048	+ 0.060	+ 0.068	+ 0.080	+ 0.094	+ 0.112	+ 0.148	+ 0.200	+ 0.274	30	40
+ 0.054	+ 0.070	+ 0.081	+ 0.097	+ 0.114	+ 0.136	+ 0.180	+ 0.242	+ 0.325	40	50
+ 0.066	+ 0.087	+ 0.102	+ 0.122	+ 0.144	+ 0.172	+ 0.226	+ 0.300	+ 0.405	50	65
+ 0.075	+ 0.102	+ 0.120	+ 0.146	+ 0.174	+ 0.210	+ 0.274	+ 0.360	+ 0.480	65	80
+ 0.091	+ 0.124	+ 0.146	+ 0.178	+ 0.214	+ 0.258	+ 0.335	+ 0.445	+ 0.585	80	100
+ 0.104	+ 0.144	+ 0.172	+ 0.210	+ 0.254	+ 0.310	+ 0.400	+ 0.525	+ 0.690	100	120
+ 0.122	+ 0.170	+ 0.202	+ 0.248	+ 0.300	+ 0.365	+ 0.470	+ 0.620	+ 0.800	120	140
+ 0.134	+ 0.190	+ 0.228	+ 0.280	+ 0.340	+ 0.415	+ 0.535	+ 0.700	+ 0.900	140	160
+ 0.146	+ 0.210	+ 0.252	+ 0.310	+ 0.380	+ 0.465	+ 0.600	+ 0.780	+ 1.000	160	180
+ 0.166	+ 0.236	+ 0.284	+ 0.350	+ 0.425	+ 0.520	+ 0.670	+ 0.880	+ 1.150	180	200
+ 0.180	+ 0.258	+ 0.310	+ 0.385	+ 0.470	+ 0.575	+ 0.740	+ 0.960	+ 1.250	200	225
+ 0.196	+ 0.284	+ 0.340	+ 0.425	+ 0.520	+ 0.640	+ 0.820	+ 1.050	+ 1.350	225	250
+ 0.218	+ 0.315	+ 0.385	+ 0.475	+ 0.580	+ 0.710	+ 0.920	+ 1.200	+ 1.550	250	280
+ 0.240	+ 0.350	+ 0.425	+ 0.525	+ 0.650	+ 0.790	+ 1.000	+ 1.300	+ 1.700	280	315
+ 0.268	+ 0.390	+ 0.475	+ 0.590	+ 0.730	+ 0.900	+ 1.150	+ 1.500	+ 1.900	315	355
+ 0.294	+ 0.435	+ 0.530	+ 0.660	+ 0.820	+ 1.000	+ 1.300	+ 1.650	+ 2.100	355	400
+ 0.330	+ 0.490	+ 0.595	+ 0.740	+ 0.920	+ 1.100	+ 1.450	+ 1.850	+ 2.400	400	450
+ 0.360	+ 0.540	+ 0.660	+ 0.820	+ 1.000	+ 1.250	+ 1.600	+ 2.100	+ 2.600	450	500
6 to 16									IT Grade	
+ 0.400	+ 0.600								500	560
+ 0.450	+ 0.660								560	630
+ 0.500	+ 0.740								630	710
+ 0.560	+ 0.840								710	800
+ 0.620	+ 0.940								800	900
+ 0.680	+ 1.050								900	1000
+ 0.780	+ 1.150								1000	1120
+ 0.840	+ 1.300								1120	1250
+ 0.960	+ 1.450								1250	1400
+ 1.050	+ 1.600								1400	1600
+ 1.200	+ 1.850								1600	1800
+ 1.350	+ 2.000								1800	2000
+ 1.500	+ 2.300								2000	2240
+ 1.650	+ 2.500								2240	2500
+ 1.900	+ 2.900								2500	2800
+ 2.100	+ 3.200								2800	3150

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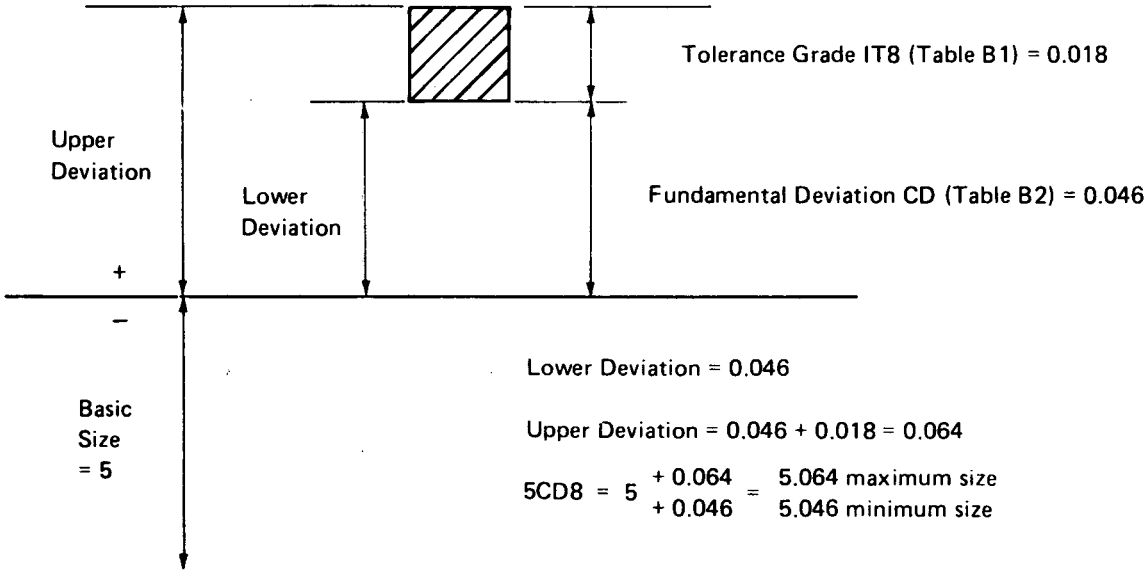
B2. INTERPRETATION OF ISO SYMBOLS USING TABLE VALUES

B2.1 HOLE LETTER CODES A THRU JS

The fundamental deviation equals the lower deviation, and the following equation is valid.

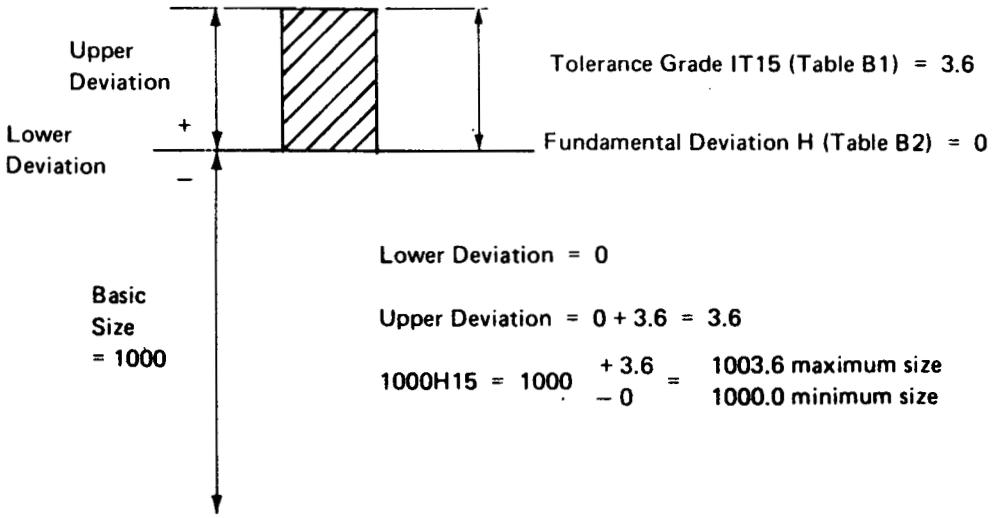
Upper Deviation = Lower Deviation + Tolerance Grade

EXAMPLE 1. INTERNAL (HOLE) DIMENSION 5CD8



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EXAMPLE 2. INTERNAL (HOLE) DIMENSION 1000H15

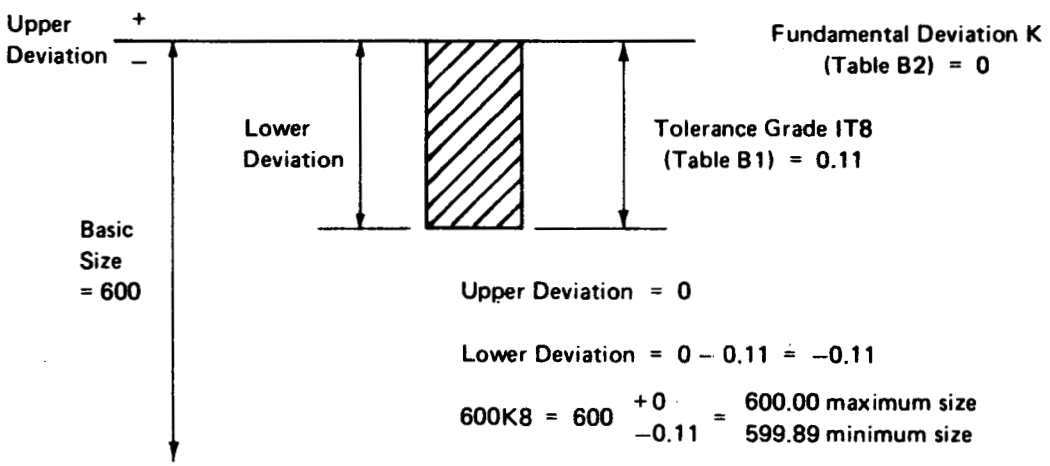


B2.2 HOLE LETTER CODES J THRU ZC

The fundamental deviation equals the upper deviation and the following equation is valid.

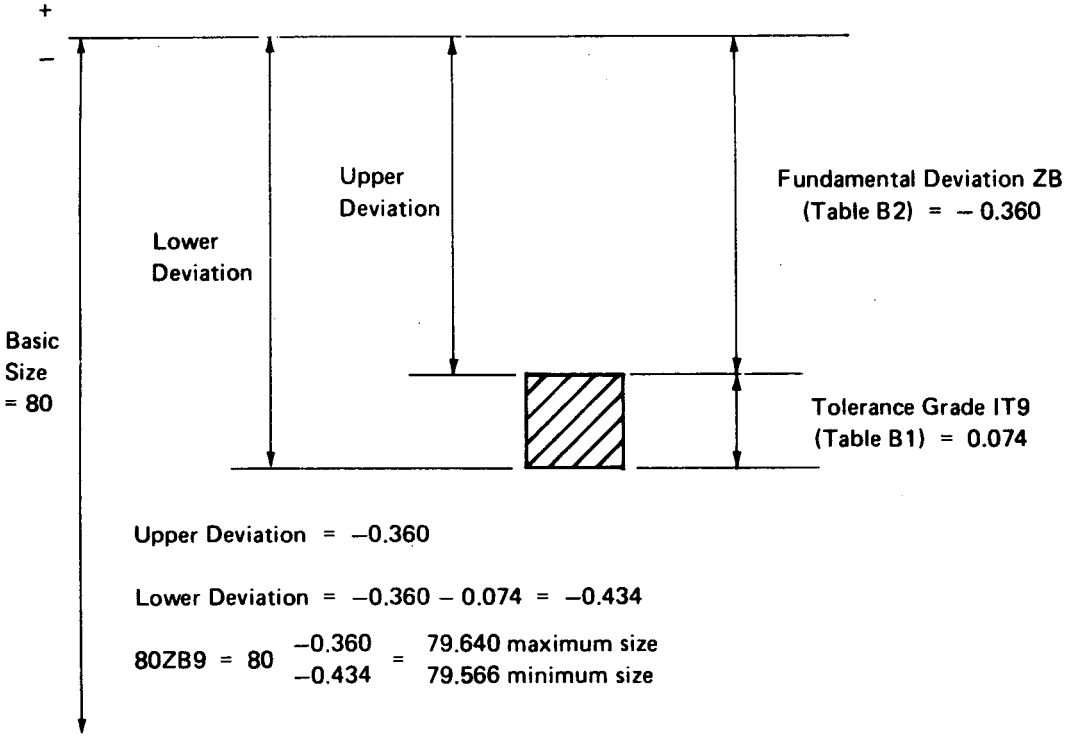
$$\text{Lower Deviation} = \text{Upper Deviation} - \text{Tolerance Grade}$$

EXAMPLE 3. INTERNAL (HOLE) DIMENSION 600K8



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EXAMPLE 4. INTERNAL (HOLE) DIMENSION 80ZB9



Upper Deviation = –0.360

Lower Deviation = –0.360 – 0.074 = –0.434

$$80ZB9 = 80\ ^{-0.360}_{-0.434} = \begin{matrix} 79.640 \text{ maximum size} \\ 79.566 \text{ minimum size} \end{matrix}$$

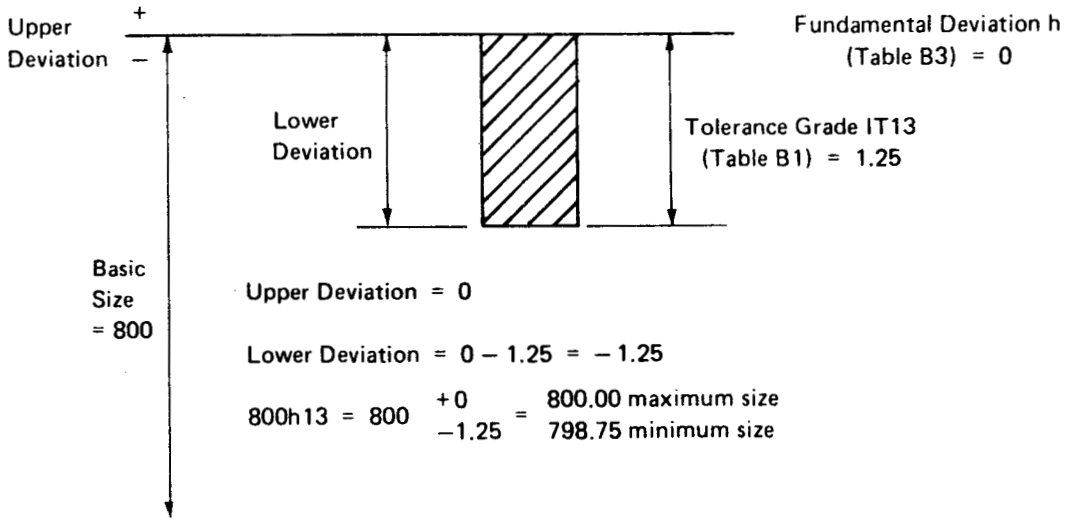
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B2.3 SHAFT LETTER CODES a THRU js

Fundamental deviation equals upper deviation and the following equation is valid.

Lower Deviation = Upper Deviation – Tolerance Grade

EXAMPLE 5. EXTERNAL (SHAFT) DIMENSION 800h13

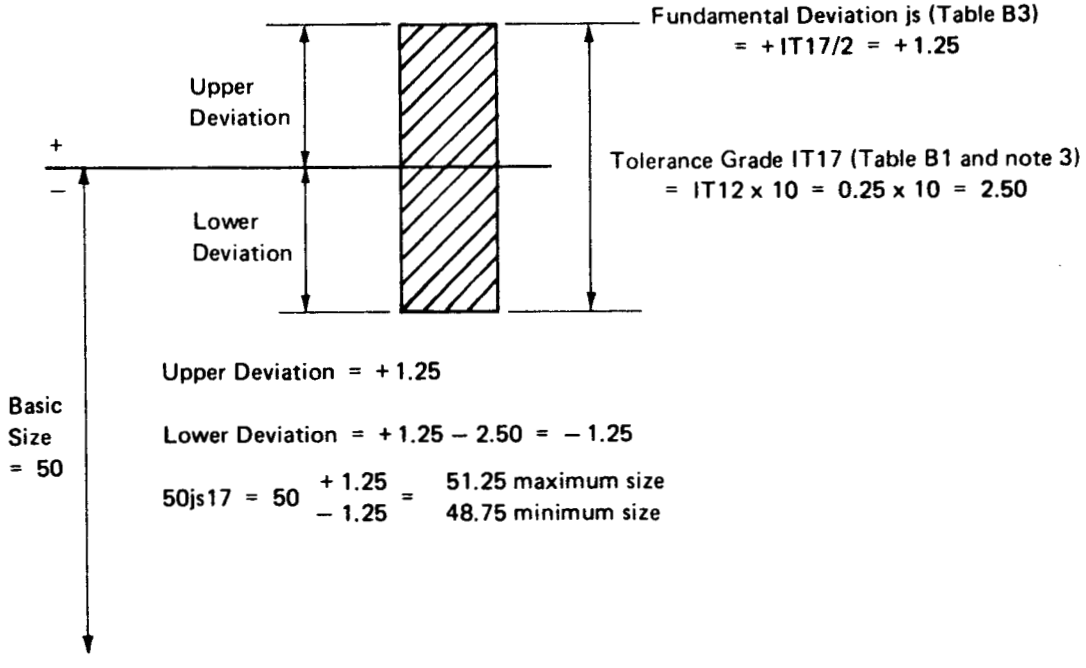


Upper Deviation = 0

Lower Deviation = 0 – 1.25 = – 1.25

$800h13 = 800\ ^{+0}_{-1.25} =$ 800.00 maximum size, 798.75 minimum size

EXAMPLE 6. EXTERNAL (SHAFT) DIMENSION 50js17[8]



Upper Deviation = +1.25

Lower Deviation = +1.25 – 2.50 = – 1.25

$50js17 = 50\ ^{+1.25}_{-1.25} =$ 51.25 maximum size, 48.75 minimum size

[8] IT grades larger than IT16 are sometimes used.

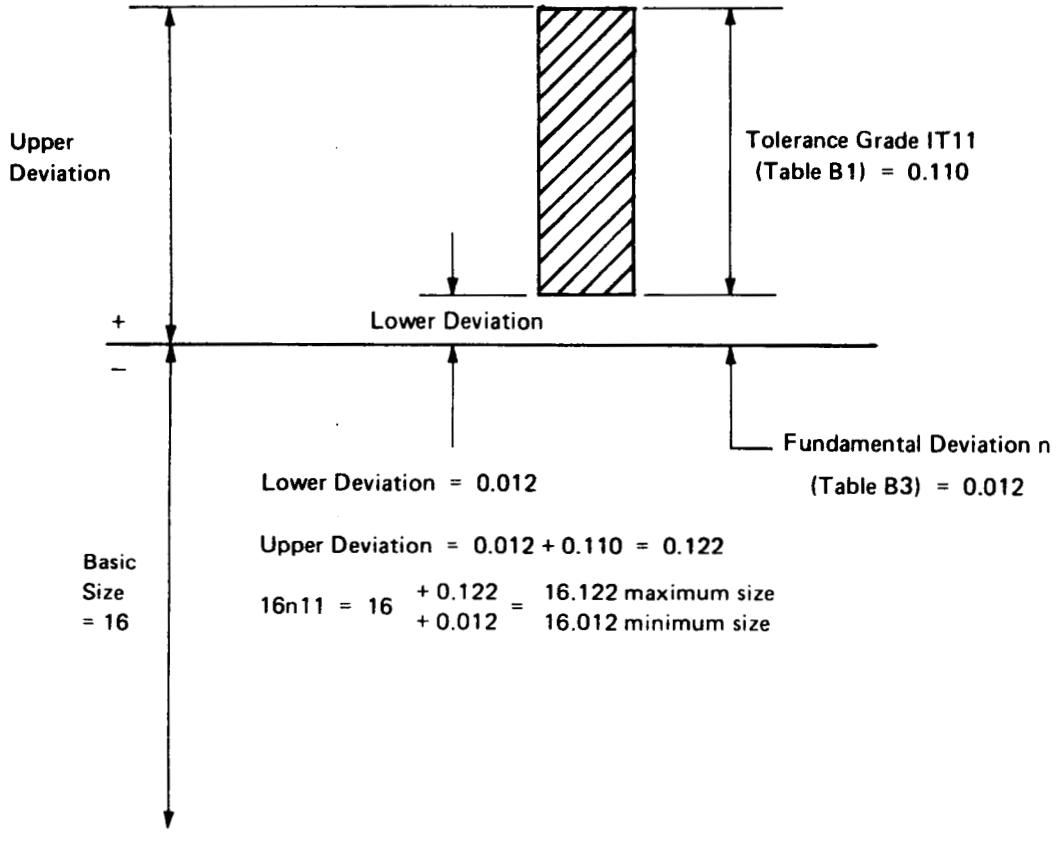
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B2.4 SHAFT LETTER CODES j THRU zc

The fundamental deviation equals the lower deviation and the following equation is valid.

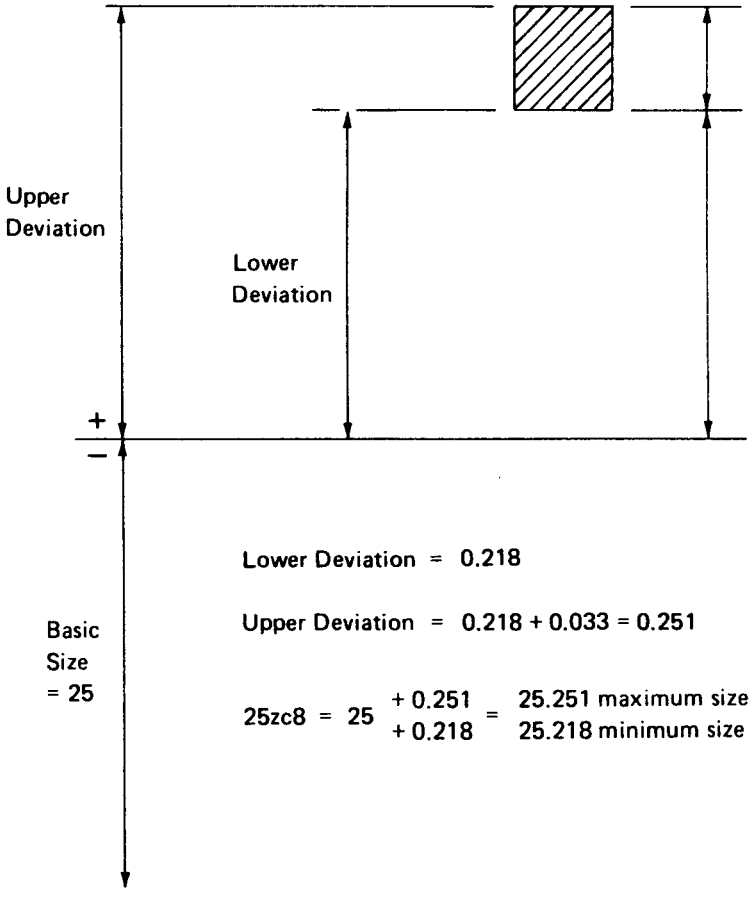
Upper Deviation = Lower Deviation + Tolerance Grade

EXAMPLE 7. EXTERNAL (SHAFT) DIMENSION 16n11



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EXAMPLE 8. EXTERNAL (SHAFT) DIMENSION 25zc8



Lower Deviation = 0.218

Upper Deviation = 0.218 + 0.033 = 0.251

$$25zc8 = 25\ ^{+0.251}_{+0.218} = \begin{matrix} 25.251 \text{ maximum size} \\ 25.218 \text{ minimum size} \end{matrix}$$

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B3 DERIVATION OF TABLE VALUES

This section explains how the numerical values shown in Tables B1, B2 and B3 were derived.

B3.1 INTERNATIONAL TOLERANCE GRADES (IT)

Table B1 of International Tolerance Grades lists values based on former national standards. Formulas have been empirically determined to meet these values. Eighteen International Tolerance Grades are provided in this standard, and are designated IT01, IT0 and IT1 through IT16. The lower numerical grade number, the more precision or closer tolerance of manufacture is required. The numerical values of these tolerance grades are given in Table B1.

Determination of the steps of the more commonly used grades of IT6 through IT16 is based on the Renard R5 geometric series as shown in Table B4.

TABLE B4 Formulas for IT Grades 6 Through 16[9]

IT6	10i*	IT11	100i	IT16	1000i
IT7	16i	IT12	160i		
IT8	25i	IT13	250i		
IT9	40i	IT14	400i		
IT10	64i	IT15	640i		

$$* i = \frac{0.45\sqrt[3]{D} + 0.001D}{1000}$$

where i and D are in millimeters. The diameter D is considered as the geometrical mean of the maximum and minimum diameters of each step $D = \sqrt{(\text{maximum diameter}) \times (\text{minimum diameter})}$. For the whole of the step up to 3 millimeters, the diameter is considered as the geometrical mean of 1 and 3 mm.

Grades IT01 through IT5 are used for high precision and are calculated by a different method as shown in Table B5.

TABLE B5 Formulas for IT Grades 01 Through 5[9]

IT01	$\frac{(0.3 + 0.008D)}{1000}$
IT0	$\frac{(0.5 + 0.012D)}{1000}$
IT1	$\frac{(0.8 + 0.02D)}{1000}$
IT2	$(IT1)\left(\frac{7i}{IT1}\right)^{1/4}$
IT3	$(IT1)\left(\frac{7i}{IT1}\right)^{1/2}$
IT4	$(IT1)\left(\frac{7i}{IT1}\right)^{3/4}$
IT5	$7i$

[9] Formulas for reference only. Table B1 values must be used to conform with accepted international tolerance grade values.

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B3.2 DERIVATION OF FUNDAMENTAL DEVIATIONS FOR SHAFTS

The fundamental deviation has been previously defined as that one of two deviations closest to the basic size. Table B3 lists these values for shafts. This table has been developed based on experimental data and cannot in every case be totally calculated. Formulas have been derived, however, from the table values to fit most cases. The general formula is as follows:

$$\text{Fundamental Deviation} = \alpha + \frac{\beta D^{\gamma}}{1000}$$

where α, β, and γ are determined from Table B6 and D represents the geometric mean diameter of the particular step in millimeters. As noted in the table there are several exceptions to the general formula.

The fundamental deviation for shafts designated "a" through "h" is the upper deviation. The lower deviation is found by subtracting the numerical value of the IT grade from the fundamental deviation. The fundamental deviation for shafts designated "j" through "zc" is the lower deviation. The upper deviation is found by adding the numerical value of the IT grade to the fundamental deviation.

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TABLE B6 COEFFICIENTS FOR THE CALCULATION OF FUNDAMENTAL DEVIATIONS FOR SHAFTS[10]

FUNDAMENTAL DEVIATION $= \alpha + \frac{\beta D^{\gamma}}{1000}$ Where D = Geometric Mean Diameter of Diameter Step

FUNDAMENTAL DEVIATION	α	β	γ	NOTES
a	−0.265 0	−1.3 −3.5	1 1	$D \leq 120$ $D > 120$
b	−0.140 0	−0.85 −1.8	1 1	$D \leq 160$ $D > 160$
c	0 −0.095	−5.2 −0.8	0.2 1	$D < 40$ $D > 40$
cd	–	–	–	
d	0	−16	0.44	$cd = \sqrt{c \cdot d}$
e	0	−11	0.41	
ef	–	–	–	$ef = \sqrt{e \cdot f}$
f	0	−5.5	0.41	
fg	–	–	–	$fg = \sqrt{f \cdot g}$
g	0	−2.5	0.34	
h	0	0	0	
j	–	–	–	No formula
js	–	–	–	$js = \frac{IT^{11}}{2}$
k	0 0	0.6 0	0.33 0	IT4–IT7* $D \leq 500$ IT8–IT16* $D > 500$
m	$\frac{IT7^{11}}{1000}$ 0.013	$-IT6^{11}$ 0.024	0 1	$D \leq 500$ $D > 500$
n	0 0.021	5 0.04	0.34 1	$D \leq 500$ $D > 500$
p	$IT7^{11}$ 0.038	2 0.072	0 D	$D \leq 500$ $D > 500$
r	–	–	–	$r = \sqrt{p \cdot s}$
s	$IT8^{11}$ $IT7^{11}$	2 0.4	0 1	$D \leq 50$ $D > 50$
t	$IT7^{11}$	0.63	1	
u	$IT7^{11}$	1	1	
v	$IT7^{11}$	1.25	1	
x	$IT7^{11}$	1.6	1	
y	$IT7^{11}$	2	1	
z	$IT7^{11}$	2.5	1	
za	$IT8^{11}$	3.15	1	
zb	$IT9^{11}$	4	1	
zc	$IT10^{11}$	5	1	

[10] Formulas for reference only. Table B3 values must be used to conform with accepted international fundamental deviation values.

[11] Use the Numerical Value for this Interntional Tolerance Grade.

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B3.3 DERIVATION OF FUNDAMENTAL DEVIATIONS FOR HOLES

The fundamental deviations for holes are based on the fundamental deviations for shafts. The relationship varies with both fundamental deviation letter and IT grade. The general rule for determining the fundamental deviation of a hole is as follows:

For fundamental deviations *A* through *H*, the lower deviation for holes equal minus the upper deviation for shafts and for fundamental deviations *J* through *ZC* the upper deviation for holes equals minus the lower deviation for shafts. This is shown pictorially in Figure B1.

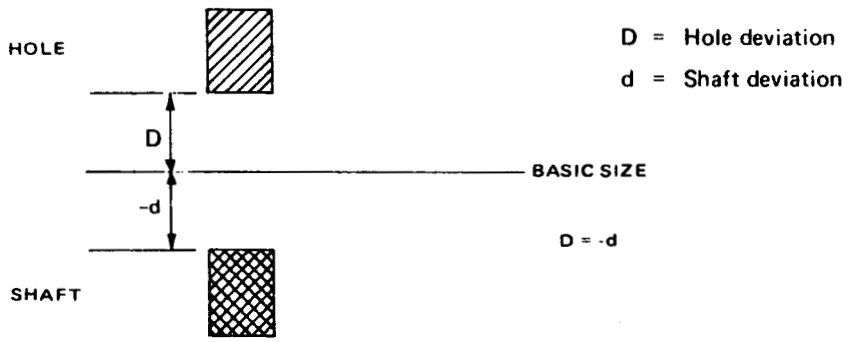


FIG. B1 GENERAL RULE

There are several exceptions to the general rule. The reasons for these exceptions must be maintained in order to keep the tables consistent with ISO standards. The exceptions to the general rule are as follows:

1. For holes *N* for IT grades 9 through 16 above 3 mm, the fundamental deviation = 0.000
2. For holes *J*, *K*, *M* and *N* up to IT grade 8 inclusive and *P* through *ZC* up to IT grade 7 inclusive above 3 mm, the fundamental deviation is calculated as follows: The upper deviation of the hole equals minus the lower deviation of the shaft plus the difference between the tolerance of the grade in question and that of the next finer grade.

$$\text{Upper Deviation (hole)} = -\text{lower deviation (shaft)} + \Delta$$

$$\text{Where } \Delta = IT_n - IT_{n-1}$$
$$= \text{IT (shaft)} - \text{IT (next finer shaft)}$$

Using a hole 60 P7 as an example, the calculation is as follows:

$-0.032 + (0.030 - 0.019) = -0.021$ or 59.979 (Max. hole size)
(Table B3) + (Table B1 grade 7 – grade 6) = (Table B2) (Table 5)

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B4. CONVERSION OF FITS

It may sometimes be necessary or desirable to modify the tolerance zone on one or both of two mating parts, yet still keep the *total* tolerance and fit condition the same. Examples of this appear in Figure 6 of ANSI B4.2 when converting from a hole basis fit to a shaft basis fit. The corresponding fits are identical yet the individual tolerance zones are different.

The rule for converting from one type of fit to another can be simply stated as, "Reverse the fundamental deviations between the shaft and hole keeping the IT grade the same on each individual part." Two examples of this are shown below. Each of the examples represent a preferred fit from Figure 6 of ANSI B4.2 and are for a 60 millimeter basic size.

EXAMPLE 9. FIT 60H11/c11 CONVERTED TO 60C11/h11

Initial hole basis *loose running* fit, designation 60H11/c11 (values shown from Table 2).

Hole 60H11 $\begin{pmatrix}60.190\\60.000\end{pmatrix}$; Shaft 60c11 $\begin{pmatrix}59.860\\59.670\end{pmatrix}$; Fit 60H11/c11 $\begin{pmatrix}0.520\\0.140\end{pmatrix}$

Desired shaft basis *loose running* fit, designation 60C11/h11 (values shown from Table 4).

Hole 60C11 $\begin{pmatrix}60.330\\60.140\end{pmatrix}$; Shaft 60h11 $\begin{pmatrix}60.000\\59.810\end{pmatrix}$; Fit 60C11/h11 $\begin{pmatrix}0.520\\0.140\end{pmatrix}$

The above two fits have the same maximum clearance (0.520) and the minimum clearance (0.140). Pictorially this is shown in Figure B2.

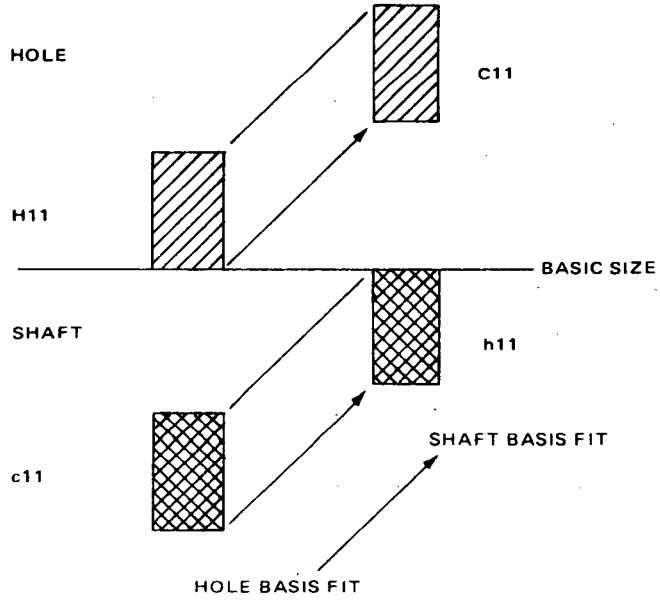


FIG. B2 CONVERSION FROM A HOLE BASIS CLEARANCE FIT TO A SHAFT BASIS CLEARANCE FIT

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EXAMPLE 10. FIT 60H7/p6 CONVERTED TO 60P7/h6

Initial hole basis *locational interference* fit, designation 60H7/p6 (values shown from Table 3).

$$\text{Hole 60H7} \begin{pmatrix} 60.030 \\ 60.000 \end{pmatrix}; \qquad \text{Shaft 60p6} \begin{pmatrix} 60.051 \\ 60.032 \end{pmatrix}; \qquad \text{Fit 60H7/p6} \begin{pmatrix} -0.002 \\ -0.051 \end{pmatrix}$$

Desired shaft basis *locational interference* fit, designation 60P7/h6 (values shown from Table 5).

$$\text{Hole 60P7} \begin{pmatrix} 59.979 \\ 59.949 \end{pmatrix}; \qquad \text{Shaft 60h6} \begin{pmatrix} 60.000 \\ 59.981 \end{pmatrix}; \qquad \text{Fit 60P7/h6} \begin{pmatrix} -0.002 \\ -0.051 \end{pmatrix}$$

The above two fits have the same minimum interference (–0.002) and the maximum interference (–0.051). Pictorially, this is shown in Figure B3.

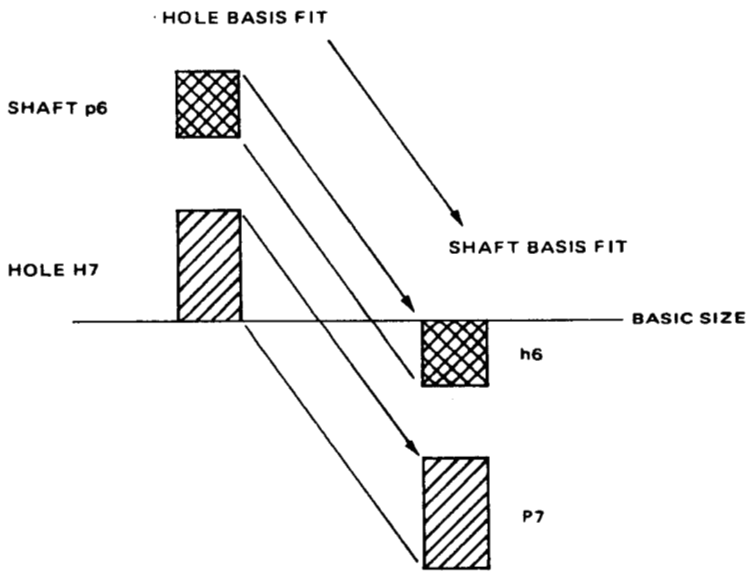


FIGURE B3 CONVERSION FROM A HOLE BASIS INTERFERENCE FIT TO A SHAFT BASIS INTERFERENCE FIT

Conversion of fits is not limited to shaft and hole basis fits as the following examples show:

clearance fit	C10/f10	=	F10/c10
interference fit	P9/t9	=	T9/p9
clearance fit	D7/f6	=	F7/d6
interference fit	S7/u6	=	U7/s6
transition fit	K8/n7	=	N8/k7

The above examples can be confirmed by calculations using Tables A1 through A24.

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APPENDIX C

APPLICATIONS

Many factors, such as length of engagement, bearing load, speed, lubrication, operating temperature, humidity, surface texture, and materials, must be taken into consideration in the selection of fits for a particular application. Choice of other than the preferred fits might be considered necessary to satisfy extreme conditions. Subsequent adjustments might also be desired as the result of experience in a particular application to suit critical functional requirements or to permit optimum manufacturing economy. Selection of departure from these recommendations will depend upon consideration of the engineering and economic factors that might be involved, however, the benefits derived from use of preferred fits should not be overlooked.

To indicate the machining processes which may normally be expected to produce work within the tolerances indicated by the IT tolerance grades given in this standard, Figure C1 has been provided. This information is intended merely as a guide in selecting suitable processes for a particular IT tolerance grade.

Practical usage of the various IT tolerance grades is shown in Figure C2.

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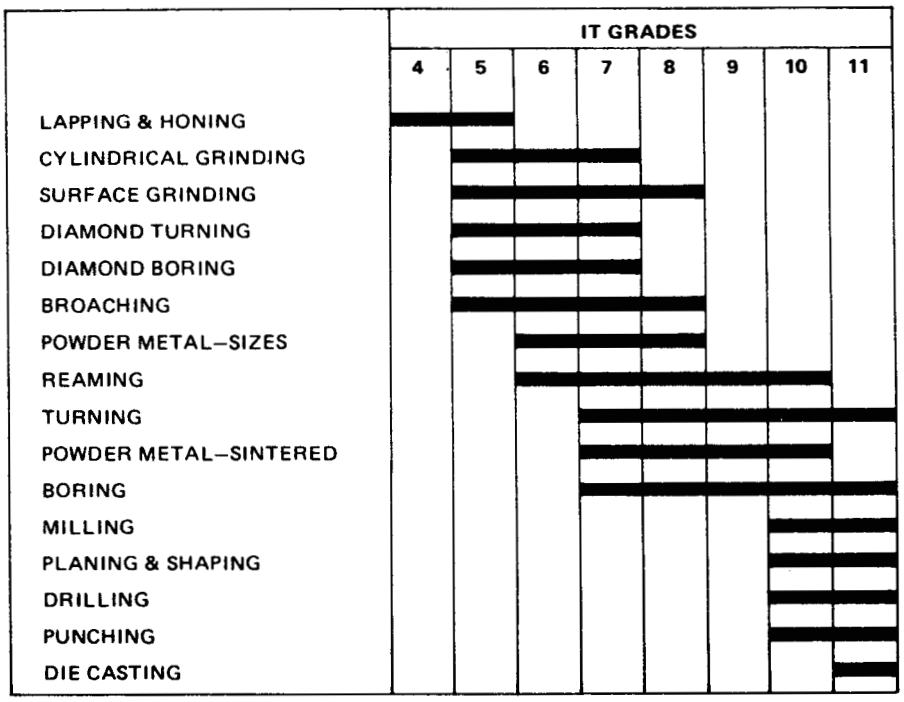


FIG. C1 MACHINING PROCESSES

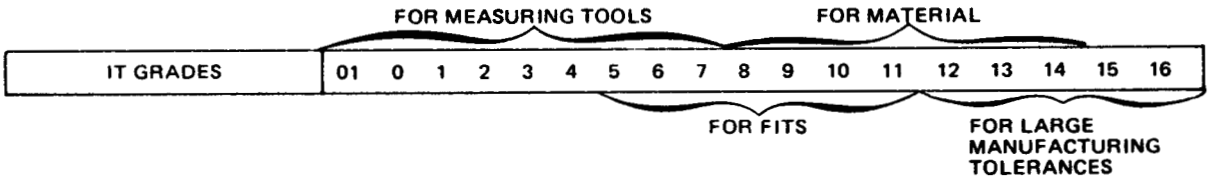


FIG. C2 PRACTICAL USE OF INTERNATIONAL TOLERANCE GRADES

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APPENDIX D

REFERENCE TEMPERATURE

The standard reference temperature for industrial length measurements is 20 degrees Celsius.

For other temperatures, particularly when the gage is made from another type of material than the part to be inspected corrections should be made in accordance with the difference in thermal expansion[12] for the two parts.

Example: Measure a hole in an aluminum die casting with a steel gage at the room temperature 30 °C.

Temperature correction	Δ
Length specified	$L = 20.021$ mm
Room temperature	$t = 30\ ^{\circ}C$
Reference temperature	$t_R = 20\ ^{\circ}C$

Linear thermal expansion coefficient for parts made from the material SAE 452 Grade 310

$$\alpha_{Part} = 24.7 \times 10^{-6}\ \text{mm/mm} \cdot {}^{\circ}C$$

Linear thermal expansion coefficient for gages made from 1.08% carbon steel

$$\alpha_{Gage} = 10.8 \times 10^{-6}\ \text{mm/mm} \cdot {}^{\circ}C$$

$$\Delta = L\,(t - t_R)\,(\alpha_{Part} - \alpha_{Gage})$$
$$= 20.021\,(30 - 20)\,(24.7 - 10.8)\,10^{-6}\ \text{mm}$$
$$= 2782.919\,10^{-6}\ \text{mm}$$
$$\approx 0.003\ \text{mm}$$

The dimension to read on the gage for hole measurement is temperature corrected to 20.024 mm.

[12] Linear thermal expansion coefficients for metals and alloys are shown in the "Materials Handbook" published by American Society for Metals, Metals Park, Ohio 44073.

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