

APPENDICES

Appendix Table 1	SI (International Units) System Conversion Table	E 002
Appendix Table 2	N–kgf Force Conversion Table	E 004
Appendix Table 3	kg–lb Mass Conversion Table	E 005
Appendix Table 4	°C–°F Temperature Conversion Table	E 006
Appendix Table 5	Viscosity Conversion Table	E 007
Appendix Table 6	inch–mm Conversion Table	E 008
Appendix Table 7	Hardness Conversion Table	E 010
Appendix Table 8	Physical and Mechanical Properties of Materials	E 011
Appendix Table 9	Tolerances for Shaft Diameters	E 012
Appendix Table 10	Tolerances for Housing Bore Diameters	E 014
Appendix Table 11	Values of IT Standard Tolerance Grades	E 016
Appendix Table 12	Speed Factor f_n	E 018
Appendix Table 13	Fatigue Life Factor f_h and Fatigue Life $L-L_h$	E 019
Appendix Table 14	Index of Inch Series Tapered Roller Bearings	E 020

Appendix Table 1 SI (International Units) System Conversion Table

Comparison of SI, CGS, and Engineering Units

Unit System	Units				Units					
	Length	Mass	Time	Temp.	Acceleration	Force	Stress	Pressure	Energy	Power
SI	m	kg	s	K, °C	m/s ²	N	Pa	Pa	J	W
CGS System	cm	g	s	°C	Gal	dyn	dyn/cm ²	dyn/cm ²	erg	erg/s
Engineering Unit System	m	kgf · s ² /m	s	°C	m/s ²	kgf	kgf/m ²	kgf/m ²	kgf · m	kgf · m/s

Prefixes Used in SI

Multiples	Prefix	Symbols	Multiples	Prefix	Symbols
10 ¹⁸	Exa	E	10 ⁻¹	Deci	d
10 ¹⁵	Peta	P	10 ⁻²	Centi	c
10 ¹²	Tera	T	10 ⁻³	Milli	m
10 ⁹	Giga	G	10 ⁻⁶	Micro	μ
10 ⁶	Mega	M	10 ⁻⁹	Nano	n
10 ³	Kilo	k	10 ⁻¹²	Pico	p
10 ²	Hecto	h	10 ⁻¹⁵	Femto	f
10	Deca	da	10 ⁻¹⁸	Ato	a

Conversion Factors From SI Units

Parameter	SI Units		Units Other Than SI		Conversion Factors From SI Units
	Names of Units	Symbols	Name of Units	Symbols	
Angle	Radian	rad	Degree	°	180/π
			Minute	'	10 800/π
			Second	"	648 000/π
Length	Meter	m	Micron	μ	10 ⁶
			Angstrom	Å	10 ¹⁰
Area	Square meter	m ²	Are	a	10 ⁻²
			Hectare	ha	10 ⁻⁴
Volume	Cubic meter	m ³	Liter	l, L	10 ³
			Deciliter	dl, dL	10 ⁴
Time	Second	s	Minute	min	1/60
			Hour	h	1/3 600
			Day	d	1/86 400
Frequency	Hertz	Hz	Cycle	s ⁻¹	1
Speed of Rotation	Revolution per second	s ⁻¹	Revolution per minute	rpm	60
Speed	Meter per second	m/s	Kilometer per hour	km/h	3 600/1 000
			Knot	kn	3 600/1 852
Acceleration	Meter per second per second	m/s ²	Gal	Gal	10 ²
			g	G	1/9.806 65
Mass	Kilogram	kg	Ton	t	10 ⁻³
Force	Newton	N	Kilogram-force	kgf	1/9.806 65
			Ton-force	tf	1/ (9.806 65×10 ³)
			Dyne	dyn	10 ⁵
Torque or Moment	Newton · meter	N · m	Kilogram-force meter	kgf · m	1/9.806 65
Stress	Pascal	Pa (N/m ²)	Kilogram-force per square centimeter	kgf/cm ²	1/ (9.806 65×10 ⁴)
			Kilogram-force per square millimeter	kgf/mm ²	1/ (9.806 65×10 ⁶)

Conversion Factors From SI Units (Continued)

Parameter	SI Units		Units Other Than SI		Conversion Factors From SI Units
	Names of Units	Symbols	Names of Units	Units	
Pressure	Pascal (Newton per square meter)	Pa (N/m ²)	Kilogram-force per square meter	kgf/m ²	1/9.806 65
			Water Column	mH ₂ O	1/ (9.806 65×10 ³)
			Mercury Column	mmHg	760/ (1.013 25×10 ⁵)
			Torr	Torr	760/ (1.013 25×10 ⁵)
			Bar	bar	10 ⁻⁵
			Atmosphere	atm	1/ (1.013 25×10 ⁵)
Energy	Joule (Newton · meter)	J (N · m)	Erg	erg	10 ⁷
			Calorie (International)	cal _{IT}	1/4.186 8
			Kilogram-force meter	kgf · m	1/9.806 65
			Kilowatt hour	kW · h	1/ (3.6×10 ⁶)
			French horsepower hour	PS · h	≈ 3.776 72×10 ⁻⁷
Work	Watt (Joule per second)	W (J/s)	Kilogram-force meter per second	kgf · m/s	1/9.806 65
			Kilocalorie per hour	kcal/h	1/1.163
			French horsepower	PS	≈ 1/735.498 8
Viscosity, Viscosity Index	Pascal second	Pa · s	Poise	P	10
Kinematic Viscosity, Kinematic Viscosity Index	Square meter per second	m ² /s	Stokes	St	10 ⁴
			Centistokes	cSt	10 ⁶
Temperature	Kelvin, Degree celsius	K, °C	Degree	°C	(See note ⁽¹⁾)
Electric Current, Magnetomotive Force	Ampere	A	Ampere	A	1
			Voltage, Electromotive Force	Volt	V
Magnetic Field Strength	Ampere per meter	A/m	Oersted	Oe	4π/10 ³
Magnetic Flux Density	Tesla	T	Gauss	Gs	10 ⁴
			Gamma	γ	10 ⁹
Electrical Resistance	Ohm	Ω	(Volts per ampere)	(V/A)	1

Note ⁽¹⁾ The conversion from TK into θ °C is θ = T - 273.15 but ΔT = Δθ for temperature differences. Note that, ΔT and Δθ represent temperature differences measured using the Kelvin and Celsius scales respectively.

Remarks Names or symbols in parentheses () are equivalent to those directly above them or on their left. Example conversion 1 N = 1 / 9.806 65 kgf

Appendix Table 2 N-kgf Force Conversion Table

[Using this table] To convert between units, find the figure in the shaded column that corresponds to the number in the unit you wish to convert. Then, look to the appropriate column on the right or left in the same row for the converted value. For example, from this table 10 N = 1.0197 kgf, while 10 kgf = 98.066 N.

1 N=0.1019716 kgf
1 kgf=9.80665 N

N		kgf	N		kgf	N		kgf
9.8066	1	0.1020	333.43	34	3.4670	657.05	67	6.8321
19.613	2	0.2039	343.23	35	3.5690	666.85	68	6.9341
29.420	3	0.3059	353.04	36	3.6710	676.66	69	7.0360
39.227	4	0.4079	362.85	37	3.7729	686.47	70	7.1380
49.033	5	0.5099	372.65	38	3.8749	696.27	71	7.2400
58.840	6	0.6118	382.46	39	3.9769	706.08	72	7.3420
68.647	7	0.7138	392.27	40	4.0789	715.89	73	7.4439
78.453	8	0.8158	402.07	41	4.1808	725.69	74	7.5459
88.260	9	0.9177	411.88	42	4.2828	735.50	75	7.6479
98.066	10	1.0197	421.69	43	4.3848	745.31	76	7.7498
107.87	11	1.1217	431.49	44	4.4868	755.11	77	7.8518
117.68	12	1.2237	441.30	45	4.5887	764.92	78	7.9538
127.49	13	1.3256	451.11	46	4.6907	774.73	79	8.0558
137.29	14	1.4276	460.91	47	4.7927	784.53	80	8.1577
147.10	15	1.5296	470.72	48	4.8946	794.34	81	8.2597
156.91	16	1.6315	480.53	49	4.9966	804.15	82	8.3617
166.71	17	1.7335	490.33	50	5.0986	813.95	83	8.4636
176.52	18	1.8355	500.14	51	5.2006	823.76	84	8.5656
186.33	19	1.9375	509.95	52	5.3025	833.57	85	8.6676
196.13	20	2.0394	519.75	53	5.4045	843.37	86	8.7696
205.94	21	2.1414	529.56	54	5.5065	853.18	87	8.8715
215.75	22	2.2434	539.37	55	5.6084	862.99	88	8.9735
225.55	23	2.3453	549.17	56	5.7104	872.79	89	9.0755
235.36	24	2.4473	558.98	57	5.8124	882.60	90	9.1774
245.17	25	2.5493	568.79	58	5.9144	892.41	91	9.2794
254.97	26	2.6513	578.59	59	6.0163	902.21	92	9.3814
264.78	27	2.7532	588.40	60	6.1183	912.02	93	9.4834
274.59	28	2.8552	598.21	61	6.2203	921.83	94	9.5853
284.39	29	2.9572	608.01	62	6.3222	931.63	95	9.6873
294.20	30	3.0591	617.82	63	6.4242	941.44	96	9.7893
304.01	31	3.1611	627.63	64	6.5262	951.25	97	9.8912
313.81	32	3.2631	637.43	65	6.6282	961.05	98	9.9932
323.62	33	3.3651	647.24	66	6.7301	970.86	99	10.095

Appendix Table 3 kg-lb Mass Conversion Table

[Using this table] To convert between units, find the figure in the shaded column that corresponds to the number in the unit you wish to convert. Then, look to the appropriate column on the right or left in the same row for the converted value. For example, from this table 10 kg = 22.046 lb, while 10 lb = 4.536 kg.

1 kg=2.2046226 lb
1 lb=0.45359237 kg

kg		lb	kg		lb	kg		lb
0.454	1	2.205	15.422	34	74.957	30.391	67	147.71
0.907	2	4.409	15.876	35	77.162	30.844	68	149.91
1.361	3	6.614	16.329	36	79.366	31.298	69	152.12
1.814	4	8.818	16.783	37	81.571	31.751	70	154.32
2.268	5	11.023	17.237	38	83.776	32.205	71	156.53
2.722	6	13.228	17.690	39	85.980	32.659	72	158.73
3.175	7	15.432	18.144	40	88.185	33.112	73	160.94
3.629	8	17.637	18.597	41	90.390	33.566	74	163.14
4.082	9	19.842	19.051	42	92.594	34.019	75	165.35
4.536	10	22.046	19.504	43	94.799	34.473	76	167.55
4.990	11	24.251	19.958	44	97.003	34.927	77	169.76
5.443	12	26.455	20.412	45	99.208	35.380	78	171.96
5.897	13	28.660	20.865	46	101.41	35.834	79	174.17
6.350	14	30.865	21.319	47	103.62	36.287	80	176.37
6.804	15	33.069	21.772	48	105.82	36.741	81	178.57
7.257	16	35.274	22.226	49	108.03	37.195	82	180.78
7.711	17	37.479	22.680	50	110.23	37.648	83	182.98
8.165	18	39.683	23.133	51	112.44	38.102	84	185.19
8.618	19	41.888	23.587	52	114.64	38.555	85	187.39
9.072	20	44.092	24.040	53	116.84	39.009	86	189.60
9.525	21	46.297	24.494	54	119.05	39.463	87	191.80
9.979	22	48.502	24.948	55	121.25	39.916	88	194.01
10.433	23	50.706	25.401	56	123.46	40.370	89	196.21
10.886	24	52.911	25.855	57	125.66	40.823	90	198.42
11.340	25	55.116	26.308	58	127.87	41.277	91	200.62
11.793	26	57.320	26.762	59	130.07	41.730	92	202.83
12.247	27	59.525	27.216	60	132.28	42.184	93	205.03
12.701	28	61.729	27.669	61	134.48	42.638	94	207.23
13.154	29	63.934	28.123	62	136.69	43.091	95	209.44
13.608	30	66.139	28.576	63	138.89	43.545	96	211.64
14.061	31	68.343	29.030	64	141.10	43.998	97	213.85
14.515	32	70.548	29.484	65	143.30	44.452	98	216.05
14.969	33	72.753	29.937	66	145.51	44.906	99	218.26

Appendix Table 7 Hardness Conversion Table (Reference)

Rockwell C Scale Hardness (1 471N) (150kgf)	Vickers Hardness	Brinell Hardness		Rockwell Hardness		Shore Hardness
		Standard Ball	Tungsten Carbide Ball	A Scale Load ^{588.4N} (60kgf) Brale Indenter	B Scale Load ^{980.7N} (100kgf) 1.588 mm Ball (1/16in)	
68	940	—	—	85.6	—	97
67	900	—	—	85.0	—	95
66	865	—	—	84.5	—	92
65	832	—	739	83.9	—	91
64	800	—	722	83.4	—	88
63	772	—	705	82.8	—	87
62	746	—	688	82.3	—	85
61	720	—	670	81.8	—	83
60	697	—	654	81.2	—	81
59	674	—	634	80.7	—	80
58	653	—	615	80.1	—	78
57	633	—	595	79.6	—	76
56	613	—	577	79.0	—	75
55	595	—	560	78.5	—	74
54	577	—	543	78.0	—	72
53	560	—	525	77.4	—	71
52	544	500	512	76.8	—	69
51	528	487	496	76.3	—	68
50	513	475	481	75.9	—	67
49	498	464	469	75.2	—	66
48	484	451	455	74.7	—	64
47	471	442	443	74.1	—	63
46	458	432	432	73.6	—	62
45	446	421	421	73.1	—	60
44	434	409	409	72.5	—	58
43	423	400	400	72.0	—	57
42	412	390	390	71.5	—	56
41	402	381	381	70.9	—	55
40	392	371	371	70.4	—	54
39	382	362	362	69.9	—	52
38	372	353	353	69.4	—	51
37	363	344	344	68.9	—	50
36	354	336	336	68.4	(109.0)	49
35	345	327	327	67.9	(108.5)	48
34	336	319	319	67.4	(108.0)	47
33	327	311	311	66.8	(107.5)	46
32	318	301	301	66.3	(107.0)	44
31	310	294	294	65.8	(106.0)	43
30	302	286	286	65.3	(105.5)	42
29	294	279	279	64.7	(104.5)	41
28	286	271	271	64.3	(104.0)	41
27	279	264	264	63.8	(103.0)	40
26	272	258	258	63.3	(102.5)	38
25	266	253	253	62.8	(101.5)	38
24	260	247	247	62.4	(101.0)	37
23	254	243	243	62.0	100.0	36
22	248	237	237	61.5	99.0	35
21	243	231	231	61.0	98.5	35
20	238	226	226	60.5	97.8	34
(18)	230	219	219	—	96.7	33
(16)	222	212	212	—	95.5	32
(14)	213	203	203	—	93.9	31
(12)	204	194	194	—	92.3	29
(10)	196	187	187	—	90.7	28
(8)	188	179	179	—	89.5	27
(6)	180	171	171	—	87.1	26
(4)	173	165	165	—	85.5	25
(2)	166	158	158	—	83.5	24
(0)	160	152	152	—	81.7	24

Appendix Table 8 Physical and Mechanical Properties of Materials

Materials	Specific Gravity	Coefficient of Linear Expansion (0° to 100°C) (K ⁻¹)	Hardness (Brinell)	Young's modulus (MPa) (kgf/mm ²)	Tensile Strength (MPa) (kgf/mm ²)	Yield Point (MPa) (kgf/mm ²)	Elongation (%)
Bearing Steel (hardened)	7.83	12.5×10 ⁻⁶	650 to 740	208 000 (21 200)	1 570 to 1 960 (160 to 200)	—	—
Martensitic Stainless Steel SUS 440C	7.68	10.1×10 ⁻⁶	580	200 000 (20 400)	1 960 (200)	1 860 (190)	—
Mild Steel (C=0.12 to 0.20%)	7.86	11.6×10 ⁻⁶	100 to 130	206 000 (21 000)	373 to 471 (38 to 48)	216 to 294 (22 to 30)	24 to 36
Hard Steel (C=0.3 to 0.5%)	7.84	11.3×10 ⁻⁶	160 to 200	206 000 (21 000)	539 to 686 (55 to 70)	333 to 451 (34 to 46)	14 to 26
Austenitic Stainless Steel SUS 304	8.03	16.3×10 ⁻⁶	150	193 000 (19 700)	588 (60)	245 (25)	60
Cast Iron Gray Iron FC200	7.3	10.4×10 ⁻⁶	223	98 100 (10 000)	More than 200 (20)	—	—
Cast Iron Spheroidal graphite Iron FCD400	7.0	11.7×10 ⁻⁶	Less than 201	169 000 (17 200)	More than 400 (41)	—	More than 12
Aluminum	2.69	23.7×10 ⁻⁶	15 to 26	70 600 (7 200)	78 (8)	34 (3.5)	35
Zinc	7.14	31×10 ⁻⁶	30 to 60	92 200 (9 400)	147 (15)	—	30 to 40
Copper	8.93	16.2×10 ⁻⁶	50	123 000 (12 500)	196 (20)	69 (7)	15 to 20
Brass (Annealed)	8.5	19.1×10 ⁻⁶	45	103 000 (10 500)	294 to 343 (30 to 35)	—	65 to 75
Brass (Machined)			85 to 130		363 to 539 (37 to 55)		15 to 50

Remark The hardness of hardened bearing steel and martensitic stainless steel is usually expressed using the Rockwell C Scale, but for comparison, here it is converted into Brinell hardness.

Appendix Table 9 Tolerances

Diameter Classification (mm)		Single Plane Mean B.D. Deviation (Normal) Δd_{mp}	d6	e6	f6	g5	g6	h5	h6	h7	h8	h9	h10	js5	js6
over	incl.														
3	6	0 -8	-30 -38	-20 -28	-10 -18	-4 -4 -9 -12	-4 -4 -9 -12	0 0 -5 -8	0 0 -12 -18	0 0 -18 -30	0 0 -30 -48	± 2.5	± 4		
6	10	0 -8	-40 -49	-25 -34	-13 -22	-5 -5 -11 -14	-5 -5 -11 -14	0 0 -6 -9	0 0 -15 -22	0 0 -22 -36	0 0 -36 -58	± 3	± 4.5		
10	18	0 -8	-50 -61	-32 -43	-16 -27	-6 -6 -14 -17	-6 -6 -14 -17	0 0 -8 -11	0 0 -18 -27	0 0 -27 -43	0 0 -43 -70	± 4	± 5.5		
18	30	0 -10	-65 -78	-40 -53	-20 -33	-7 -7 -16 -20	-7 -7 -16 -20	0 0 -9 -13	0 0 -21 -33	0 0 -33 -52	0 0 -52 -84	± 4.5	± 6.5		
30	50	0 -12	-80 -96	-50 -66	-25 -41	-9 -9 -20 -25	-9 -9 -20 -25	0 0 -11 -16	0 0 -25 -39	0 0 -39 -62	0 0 -62 -100	± 5.5	± 8		
50	80	0 -15	-100 -119	-60 -79	-30 -49	-10 -10 -23 -29	-10 -10 -23 -29	0 0 -13 -19	0 0 -30 -46	0 0 -46 -74	0 0 -74 -120	± 6.5	± 9.5		
80	120	0 -20	-120 -142	-72 -94	-36 -58	-12 -12 -27 -34	-12 -12 -27 -34	0 0 -15 -22	0 0 -35 -54	0 0 -54 -87	0 0 -87 -140	± 7.5	± 11		
120	180	0 -25	-145 -170	-85 -110	-43 -68	-14 -14 -32 -39	-14 -14 -32 -39	0 0 -18 -25	0 0 -40 -63	0 0 -63 -100	0 0 -100 -160	± 9	± 12.5		
180	250	0 -30	-170 -199	-100 -129	-50 -79	-15 -15 -35 -44	-15 -15 -35 -44	0 0 -20 -29	0 0 -46 -72	0 0 -72 -115	0 0 -115 -185	± 10	± 14.5		
250	315	0 -35	-190 -222	-110 -142	-56 -88	-17 -17 -40 -49	-17 -17 -40 -49	0 0 -23 -32	0 0 -52 -81	0 0 -81 -130	0 0 -130 -210	± 11.5	± 16		
315	400	0 -40	-210 -246	-125 -161	-62 -98	-18 -18 -43 -54	-18 -18 -43 -54	0 0 -25 -36	0 0 -57 -89	0 0 -89 -140	0 0 -140 -230	± 12.5	± 18		
400	500	0 -45	-230 -270	-135 -175	-68 -108	-20 -20 -47 -60	-20 -20 -47 -60	0 0 -27 -40	0 0 -63 -97	0 0 -97 -155	0 0 -155 -250	± 13.5	± 20		
500	630	0 -50	-260 -304	-145 -189	-76 -120	- - 22 - - 66	- - 22 - - 66	- - 44 - - 70	0 0 -110 -175	0 0 -175 -280	0 0 -280 -	-	± 22		
630	800	0 -75	-290 -340	-160 -210	-80 -130	- - 24 - - 74	- - 24 - - 74	- - 50 - - 80	0 0 -125 -200	0 0 -200 -320	0 0 -320 -	-	± 25		
800	1 000	0 -100	-320 -376	-170 -226	-86 -142	- - 26 - - 82	- - 26 - - 82	- - 56 - - 90	0 0 -140 -230	0 0 -230 -360	0 0 -360 -	-	± 28		
1 000	1 250	0 -125	-350 -416	-195 -261	-98 -164	- - 28 - - 94	- - 28 - - 94	- - 66 - - 105	0 0 -165 -260	0 0 -260 -420	0 0 -420 -	-	± 33		
1 250	1 600	0 -160	-390 -468	-220 -298	-110 -188	- - 30 - - 108	- - 30 - - 108	- - 78 - - 125	0 0 -195 -310	0 0 -310 -500	0 0 -500 -	-	± 39		
1 600	2 000	0 -200	-430 -522	-240 -332	-120 -212	- - 32 - - 124	- - 32 - - 124	- - 92 - - 150	0 0 -230 -370	0 0 -370 -600	0 0 -600 -	-	± 46		

for Shaft Diameters

														Units : μm	
Diameter Classification (mm)		j5	j6	j7	k5	k6	k7	m5	m6	n6	p6	r6	r7	over	incl.
over	incl.														
3	6	+3 -2	+6 -2	+8 -4	+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +8	+20 +12	+23 +15	+27 +15	3	6
6	10	+4 -2	+7 -2	+10 -5	+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+19 +10	+24 +15	+28 +19	+34 +19	6	10
10	18	+5 -3	+8 -3	+12 -6	+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+23 +12	+29 +18	+34 +23	+41 +23	10	18
18	30	+5 -4	+9 -4	+13 -8	+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+28 +15	+35 +28	+41 +28	+49 +28	18	30
30	50	+6 -5	+11 -5	+15 -10	+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+33 +17	+42 +26	+50 +34	+59 +34	30	50
50	80	+6 -7	+12 -7	+18 -12	+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+39 +20	+51 +32	+60 +41	+71 +41	50	80
80	120	+6 -9	+13 -9	+20 -15	+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+45 +23	+59 +37	+73 +51	+86 +51	80	120
120	180	+7 -11	+14 -11	+22 -18	+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+52 +27	+68 +43	+88 +63	+103 +63	120	180
180	250	+7 -13	+16 -13	+25 -21	+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+60 +31	+79 +50	+106 +77	+123 +77	180	250
250	315	+7 -16	+16 -16	+25 ±26	+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+66 +34	+88 +56	+106 +94	+123 +94	250	315
315	400	+7 -18	+18 ±18	+29 -28	+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+73 +37	+98 +62	+144 +108	+165 +108	315	400
400	500	+7 -20	+20 ±20	+31 -32	+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+80 +40	+108 +68	+166 +126	+189 +126	400	500
500	630	-	-	-	-	+44 0	+70 0	-	+70 +26	+88 +44	+122 +78	+194 +150	+220 +150	500	630
630	800	-	-	-	-	+50 0	+80 0	-	+80 +30	+100 +50	+138 +88	+225 +175	+255 +175	630	800
800	1 000	-	-	-	-	+56 0	+90 0	-	+90 +34	+112 +56	+156 +100	+266 +210	+300 +210	800	1 000
1 000	1 250	-	-	-	-	+66 0	+105 0	-	+106 +40	+132 +66	+186 +120	+316 +250	+355 +250	1 000	1 250
1 250	1 600	-	-	-	-	+78 0	+125 0	-	+126 +48	+156 +78	+218 +140	+326 +408	+365 +455	1 250	1 600
1 600	2 000	-	-	-	-	+92 0	+150 0	-	+150 +58	+184 +92	+262 +170	+462 +370	+520 +370	1 600	2 000

Appendix Table 10

Diameter Classification (mm)		Single Plane Mean O.D. Deviation (Normal) ΔD_{mp}	E6	F6	F7	G6	G7	H6	H7	H8	J6	J7	JS6	JS7
over	incl.													
10	18	0 - 8	+ 43 + 32	+ 27 + 16	+ 34 + 16	+ 17 + 6	+ 24 + 6	+ 11 0	+ 18 0	+ 27 0	+ 6 - 5	+ 10 - 8	± 5.5	± 9
18	30	0 - 9	+ 53 + 40	+ 33 + 20	+ 41 + 20	+ 20 + 7	+ 28 + 7	+ 13 0	+ 21 0	+ 33 0	+ 8 - 5	+ 12 - 9	± 6.5	± 10.5
30	50	0 - 11	+ 66 + 50	+ 41 + 25	+ 50 + 25	+ 25 + 9	+ 34 + 9	+ 16 0	+ 25 0	+ 39 0	+ 10 - 6	+ 14 - 11	± 8	± 12.5
50	80	0 - 13	+ 79 + 60	+ 49 + 30	+ 60 + 30	+ 29 + 10	+ 40 + 10	+ 19 0	+ 30 0	+ 46 0	+ 13 - 6	+ 18 - 12	± 9.5	± 15
80	120	0 - 15	+ 94 + 72	+ 58 + 36	+ 71 + 36	+ 34 + 12	+ 47 + 12	+ 22 0	+ 35 0	+ 54 0	+ 16 - 6	+ 22 - 13	± 11	± 17.5
120	150	0 - 18	+ 110 + 85	+ 68 + 43	+ 83 + 43	+ 39 + 14	+ 54 + 14	+ 25 0	+ 40 0	+ 63 0	+ 18 - 7	+ 26 - 14	± 12.5	± 20
150	180	0 - 25	+ 129 + 100	+ 79 + 50	+ 96 + 50	+ 44 + 15	+ 61 + 15	+ 29 0	+ 46 0	+ 72 0	+ 22 - 7	+ 30 - 16	± 14.5	± 23
180	250	0 - 30	+ 142 + 110	+ 88 + 56	+ 108 + 56	+ 49 + 17	+ 69 + 17	+ 32 0	+ 52 0	+ 81 0	+ 25 - 7	+ 36 - 16	± 16	± 26
250	315	0 - 35	+ 161 + 125	+ 98 + 62	+ 119 + 62	+ 54 + 18	+ 75 + 18	+ 36 0	+ 57 0	+ 89 0	+ 29 - 7	+ 39 - 18	± 18	± 28.5
315	400	0 - 40	+ 175 + 135	+ 108 + 68	+ 131 + 68	+ 60 + 20	+ 83 + 20	+ 40 0	+ 63 0	+ 97 0	+ 33 - 7	+ 43 - 20	± 20	± 31.5
400	500	0 - 45	+ 189 + 145	+ 120 + 76	+ 146 + 76	+ 66 + 22	+ 92 + 22	+ 44 0	+ 70 0	+ 110 0	—	—	± 22	± 35
500	630	0 - 50	+ 210 + 160	+ 130 + 80	+ 160 + 80	+ 74 + 24	+ 104 + 24	+ 50 0	+ 80 0	+ 125 0	—	—	± 25	± 40
630	800	0 - 75	+ 226 + 170	+ 142 + 86	+ 176 + 86	+ 82 + 26	+ 116 + 26	+ 56 0	+ 90 0	+ 140 0	—	—	± 28	± 45
800	1 000	0 - 100	+ 261 + 195	+ 164 + 98	+ 203 + 98	+ 94 + 28	+ 133 + 28	+ 66 0	+ 105 0	+ 165 0	—	—	± 33	± 52.5
1 000	1 250	0 - 125	+ 298 + 220	+ 188 + 110	+ 235 + 110	+ 108 + 30	+ 155 + 30	+ 78 0	+ 125 0	+ 195 0	—	—	± 39	± 62.5
1 250	1 600	0 - 160	+ 332 + 240	+ 212 + 120	+ 270 + 120	+ 124 + 32	+ 182 + 32	+ 92 0	+ 150 0	+ 230 0	—	—	± 46	± 75
1 600	2 000	0 - 200	+ 370 + 260	+ 240 + 130	+ 305 + 130	+ 144 + 34	+ 209 + 34	+ 110 0	+ 175 0	+ 280 0	—	—	± 55	± 87.5
2 000	2 500	0 - 250												

Tolerances for Housing Bore Diameters

Units : μm

K5	K6	K7	M5	M6	M7	N5	N6	N7	P6	P7	Diameter Classification (mm)	
											over	incl.
+ 2 - 6	+ 2 - 9	+ 6 - 12	- 4 - 12	- 4 - 15	0 - 18	- 9 - 17	- 9 - 20	- 5 - 23	- 15 - 26	- 11 - 29	10	18
+ 1 - 8	+ 2 - 11	+ 6 - 15	- 5 - 14	- 4 - 17	0 - 21	- 12 - 21	- 11 - 24	- 7 - 28	- 18 - 31	- 14 - 35	18	30
+ 2 - 9	+ 3 - 13	+ 7 - 18	- 5 - 16	- 4 - 20	0 - 25	- 13 - 24	- 12 - 28	- 8 - 33	- 21 - 37	- 17 - 42	30	50
+ 3 - 10	+ 4 - 15	+ 9 - 21	- 6 - 19	- 5 - 24	0 - 30	- 15 - 28	- 14 - 33	- 9 - 39	- 26 - 45	- 21 - 51	50	80
+ 2 - 13	+ 4 - 18	+ 10 - 25	- 8 - 23	- 6 - 28	0 - 35	- 18 - 33	- 16 - 38	- 10 - 45	- 30 - 52	- 24 - 59	80	120
+ 3 - 15	+ 4 - 21	+ 12 - 28	- 9 - 27	- 8 - 33	0 - 40	- 21 - 39	- 20 - 45	- 12 - 52	- 36 - 61	- 28 - 68	120	180
+ 2 - 18	+ 5 - 24	+ 13 - 33	- 11 - 31	- 8 - 37	0 - 46	- 25 - 45	- 22 - 51	- 14 - 60	- 41 - 70	- 33 - 79	180	250
+ 3 - 20	+ 5 - 27	+ 16 - 36	- 13 - 36	- 9 - 41	0 - 52	- 27 - 50	- 25 - 57	- 14 - 66	- 47 - 79	- 36 - 88	250	315
+ 3 - 22	+ 7 - 29	+ 17 - 40	- 14 - 39	- 10 - 46	0 - 57	- 30 - 55	- 26 - 62	- 16 - 73	- 51 - 87	- 41 - 98	315	400
+ 2 - 25	+ 8 - 32	+ 18 - 45	- 16 - 43	- 10 - 50	0 - 63	- 33 - 60	- 27 - 67	- 17 - 80	- 55 - 95	- 45 - 108	400	500
—	0 - 44	0 - 70	—	- 26 - 70	- 26 - 96	—	- 44 - 88	- 44 - 114	- 78 - 122	- 78 - 148	500	630
—	0 - 50	0 - 80	—	- 30 - 80	- 30 - 110	—	- 50 - 100	- 50 - 130	- 88 - 138	- 88 - 168	630	800
—	0 - 56	0 - 90	—	- 34 - 90	- 34 - 124	—	- 56 - 112	- 56 - 146	- 100 - 156	- 100 - 190	800	1 000
—	0 - 66	0 - 105	—	- 40 - 106	- 40 - 145	—	- 66 - 132	- 66 - 171	- 120 - 186	- 120 - 225	1 000	1 250
—	0 - 78	0 - 125	—	- 48 - 126	- 48 - 173	—	- 78 - 156	- 78 - 203	- 140 - 218	- 140 - 265	1 250	1 600
—	0 - 92	0 - 150	—	- 58 - 150	- 58 - 208	—	- 92 - 184	- 92 - 242	- 170 - 262	- 170 - 320	1 600	2 000
—	0 - 110	0 - 175	—	- 68 - 178	- 68 - 243	—	- 110 - 220	- 110 - 285	- 195 - 305	- 195 - 370	2 000	2 500

Appendix Table 11 Values of

Basic Size (mm)		Standard										
		IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10	IT11
over	incl.	Tolerances (μm)										
—	3	0.8	1.2	2	3	4	6	10	14	25	40	60
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90
10	18	1.2	2	3	5	8	11	18	27	43	70	110
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160
50	80	2	3	5	8	13	19	30	46	74	120	190
80	120	2.5	4	6	10	15	22	35	54	87	140	220
120	180	3.5	5	8	12	18	25	40	63	100	160	250
180	250	4.5	7	10	14	20	29	46	72	115	185	290
250	315	6	8	12	16	23	32	52	81	130	210	320
315	400	7	9	13	18	25	36	57	89	140	230	360
400	500	8	10	15	20	27	40	63	97	155	250	400
500	630	9	11	16	22	32	44	70	110	175	280	440
630	800	10	13	18	25	36	50	80	125	200	320	500
800	1 000	11	15	21	28	40	56	90	140	230	360	560
1 000	1 250	13	18	24	33	47	66	105	165	260	420	660
1 250	1 600	15	21	29	39	55	78	125	195	310	500	780
1 600	2 000	18	25	35	46	65	92	150	230	370	600	920
2 000	2 500	22	30	41	55	78	110	175	280	440	700	1 100
2 500	3 150	26	36	50	68	96	135	210	330	540	860	1 350

- Remarks**
- Standard tolerance grades IT14 to IT18 must not be used for basic sizes less than or equal to 1 mm.
 - Values for standard tolerance grades IT1 to IT5 for basic sizes over 500 mm are included for experimental use.

IT Standard Tolerance Grades

Grades							Basic Size (mm)	
IT12	IT13	IT14	IT15	IT16	IT17	IT18		
Tolerances (mm)							over	incl.
0.10	0.14	0.25	0.40	0.60	1.00	1.40	—	3
0.12	0.18	0.30	0.48	0.75	1.20	1.80	3	6
0.15	0.22	0.36	0.58	0.90	1.50	2.20	6	10
0.18	0.27	0.43	0.70	1.10	1.80	2.70	10	18
0.21	0.33	0.52	0.84	1.30	2.10	3.30	18	30
0.25	0.39	0.62	1.00	1.60	2.50	3.90	30	50
0.30	0.46	0.74	1.20	1.90	3.00	4.60	50	80
0.35	0.54	0.87	1.40	2.20	3.50	5.40	80	120
0.40	0.63	1.00	1.60	2.50	4.00	6.30	120	180
0.46	0.72	1.15	1.85	2.90	4.60	7.20	180	250
0.52	0.81	1.30	2.10	3.20	5.20	8.10	250	315
0.57	0.89	1.40	2.30	3.60	5.70	8.90	315	400
0.63	0.97	1.55	2.50	4.00	6.30	9.70	400	500
0.70	1.10	1.75	2.80	4.40	7.00	11.00	500	630
0.80	1.25	2.00	3.20	5.00	8.00	12.50	630	800
0.90	1.40	2.30	3.60	5.60	9.00	14.00	800	1 000
1.05	1.65	2.60	4.20	6.60	10.50	16.50	1 000	1 250
1.25	1.95	3.10	5.00	7.80	12.50	19.50	1 250	1 600
1.50	2.30	3.70	6.00	9.20	15.00	23.00	1 600	2 000
1.75	2.80	4.40	7.00	11.00	17.50	28.00	2 000	2 500
2.10	3.30	5.40	8.60	13.50	21.00	33.00	2 500	3 150

