

Catalog List & Appendix Table



CATALOG TITLES	CATALOG No.
● BALL AND ROLLER BEARINGS	
Ball and Roller Bearings	2202/C/E/I/P/S
Large Bearings	2250/E/P
Miniature and Extra Small Ball Bearings	3013/E
Miniature Molded Rubber Bearings	3014/E
Ball Bearings Shield and Seal Types	3015/E
Care and Maintenance of Bearings	3017/E/S/P
HL Bearings	3020/E
Bearings with Solid Grease	3022/E/S/P
Large Size, Long Operating Life Bearing-EA type	3024/E/P
Tapered Roller Bearings ECO-Top	3026/E/S/C
Self-Aligning Spherical Roller Bearings LH Series	3027/E/S/C
Bearings for Clean Environment	3028/E
Insulated Bearings-Resin Coated Type	3204/E
Type E Spherical Roller Bearings	3701/E
Sealed Self-Aligning Roller Bearings-WA Type	3702/E/S
Spherical Roller Bearings-UA Type	3710/E
HUB BEARINGS	4601/E
Aerospace Bearings	8102/E
Precision Rolling Bearings for Machine Tools	8401/E
Super High-speed Precision Bearings for Main Spindles of Machine Tools	8403/E
● NEEDLE ROLLER BEARINGS	
Needle Roller Bearings	2300/E/I/P/S
Miniature Cam Followers	3601/E
● CONSTANT VELOCITY JOINTS	
Constant Velocity Joints for Automobiles	5601/JE
TRI-Ball Joint / Constant Velocity Joints	5602/E
Constant Velocity Joints for Industrial Machines	5603/E
● BEARING UNITS	
Bearing Units	2400/E/I/S
Bearing Units with Ductile Cast Iron Housing	3901/E
Bearing Units Steel Series	3902/E
Bearing Units Stainless Series	3903/E
Bearing Units Plastic Housing Series	3904/E
Triple-Sealed Bearings for Bearing Units	3905/E

CATALOG TITLES	CATALOG No.
● PLUMMER BLOCKS	
Plummer Blocks	2500E/S
● PRECISION BALL SCREWS	
Precision Ball Screws	6000/E
Rolled Ball Screws	6206/E
● PARTS FEEDER	
Parts Feeder	7018/E
NTN Parts Feeder with Standard Attachments (for Bolts or Washer)	7016/E
● CLUTCHES	
One-way Clutches (Overrunning Clutches)	6402/E
● PLAIN BEARINGS	
"BEAREE" NTN Engineering Plastics	5100/E
Miniature Plastic Sliding Screws	5112/E
NTN "BEARPHITE" Oil Impregnated Sintered Bearings	5202/E
Spherical Plain Bearings	5301/E
● HANDBOOK	
Bearing Units Handbook	9011/E/S
Rolling Bearings Handbook	9012/E
Needle Roller Bearings Handbook	9013/E
● GUIDE BOOK	
Parts Feeder Guide Book	7019/E
Automotive Products Guide Book	8021/E/D/F/C
New Products Guide	9208/E/C
Food Machinery Component Guide	9209/E
Product Catalog for Paper Manufacturing Machinery	9210/E
Steel Manufacturing Machinery Product Guide Book	9211/E
● ELECTRONIC CATALOG	
NTN Electronic Catalog (CD-ROM for Windows)	7903/E
NTN Autoparts Catalog (CD-ROM for Windows)	7905/E
Reference Kit Program -Bearing Interchange- (CD-ROM for Windows)	7907/E
● OTHERS	
Bearing Handling	9103/E/P/S

C:Chinese E:English F:French D:Germany I:Italian
 K:Korean S:Spanish T:Thai TC: Taipei Chinese

Note : The above are basic numbers. Renewal of the suffix by a revision.

Appendix table 1: Boundary dimensions of radial bearings (Tapered roller bearings not included)-1

Single row radial ball bearings		67						68						69				160		60																
Double row radial ball bearings								78						79						70																
Cylindrical roller bearings								N28 N38 NN48						N19 N29 NN39 NN49						N10 N20 NN30 NN40																
Needle roller bearings								NA48						NA49 NA59 NA69																						
Spherical roller bearings														239 249								230 240														
Number	Dimension	Diameter series 7				Diameter series 8								Diameter series 9								Diameter series 0														
		Dimension series				Dimension series								Dimension series								Dimension series														
		17	27	37	17~37	08	18	28	38	48	58	68	08	18~68	09	19	29	39	49	59	69	09	19~39	49~69	00	10	20	30	40	50	60	00	10~60			
Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min	Nominal diameter of bearing D	Nominal width B	Chamfer dimension r s min				
1	0.6	2	0.8	—	—	0.05	2.5	—	1	—	1.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
1	1	2.5	1	—	0.05	3	—	1	—	1.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
2	1.5	3	1	—	0.05	4	—	1.2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
2	2	4	1.2	—	0.05	5	—	1.5	—	2.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
—	2.5	5	1.5	—	0.08	6	—	1.8	—	2.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
3	3	6	2	—	0.08	7	—	2	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
4	4	7	2	—	0.08	9	—	2.5	3.5	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
5	5	8	2	—	0.08	11	—	3	4	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
6	6	10	2.5	—	0.1	13	—	3.5	5	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
7	7	11	2.5	—	0.1	14	—	3.5	5	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
8	8	12	2.5	—	0.1	16	—	4	5	6	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
9	9	14	3	—	0.1	17	—	4	5	6	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
00	10	15	3	—	0.1	19	—	5	6	7	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
01	12	18	4	—	0.2	21	—	5	6	7	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
02	15	21	4	—	0.2	24	—	5	6	7	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
03	17	23	4	—	0.2	26	—	5	6	7	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
04	20	27	4	—	0.2	32	4	7	8	10	12	16	22	0.3	30	37	7	9	11	13	17	23	30	0.3	0.3	35	8	10	12	14	16	22	30	40	0.3	0.6
/22	22	—	—	—	—	34	4	7	8	10	12	16	22	0.3	32	39	7	9	11	13	17	23	30	0.3	0.3	35	8	10	12	14	16	22	30	40	0.3	0.6
05	25	32	4	—	0.2	37	4	7	8	10	12	16	22	0.3	39	47	7	9	11	13	17	23	30	0.3	0.3	37	8	10	12	14	16	22	30	40	0.3	0.6
/28	28	—	—	—	—	40	4	7	8	10	12	16	22	0.3	45	7	9	11	13	17	23	30	0.3	0.3	37	8	10	12	14	16	22	30	40	0.3	0.6	
06	30	37	4	—	0.2	42	4	7	8	10	12	16	22	0.3	47	7	9	11	13	17	23	30	0.3	0.3	37	8	10	12	14	16	22	30	40	0.3	0.6	
/32	32	—	—	—	—	44	4	7	8	10	12	16	22	0.3	52	7	10	13	15	20	27	36	0.3	0.6	0.6	58	9	13	16	19	25	34	45	0.3	1	
07	35	44	5	—	0.3	47	4	7	8	10	12	16	22	0.3	55	7	10	13	15	20	27	36	0.3	0.6	0.6	62	9	14	17	20	27	36	48	0.3	1	
08	40	—	—	—	—	52	4	7	8	10	12	16	22	0.3	62	8	12	14	16	22	30	40	0.3	0.6	0.6	68	9	15	18	21	28	38	50	0.3	1	
09	45	—	—	—	—	58	4	7	8	10	13	18	23	0.3	68	8	12	14	16	22	30	40	0.3	0.6	0.6	75	10	16	19	23	30	40	54	0.3	1	
10	50	—	—	—	—	65	5	7	10	12	15	20	27	0.3	72	8	12	14	16	22	30	40	0.3	0.6	0.6	80	10	16	19	23	30	40	54	0.6	1	
11	55	—	—	—	—	72	7	9	11	13	17	23	30	0.3	80	9	13	16	19	25	34	45	0.3	1	1	90	11	18	22	26	35	46	63	0.6	1.1	
12	60	—	—	—	—	78	7	10	12	14	18	24	32	0.3	85	9	13	16	19	25	34	45	0.3	1	1	95	11	18	22	26	35	46	63	0.6	1.1	
13	65	—	—	—	—	85	7	10	13	15	20	27	36	0.3	90	9	13	16	19	25	34	45	0.6	1	1	100	11	18	22	26	35	46	63	0.6	1.1	
14	70	—	—	—	—	90	8	10	13	15	20	27	36	0.3	100	10	13	16	19	23	30	40	0.6	1	1	110	13	20	24	30	40	54	71	0.6	1.1	
15	75	—	—	—	—	95	8	10	13	15	20	27	36	0.3	105	10	16	19	23	30	40	54	0.6	1	1	115	13	20	24	30	40	54	71	0.6	1.1	
16	80	—	—	—	—	100	8	10	13	15	20	27	36	0.3	110	10	16	19	23	30	40	54	0.6	1	1	125	14	22	27	34	45	60	80	0.6	1.1	
17	85	—	—	—	—	110	9	13	16	19	25	34	45	0.3	120	11	18	22	26	35	46	63	0.6	1.1	1.1	130	14	22	27	34	45	60	80	0.6	1.1	
18	90	—	—	—	—	115	9	13	16	19	25	34	45	0.3	125	11	18	22	26	35	46	63	0.6	1.1	1.1	140	16	24	30	37	50	67	90	1	1.5	
19	95	—	—	—	—	120	9	13	16	19	25	34	45	0.3	130	11	18	22	26	35	46	63	0.6	1.1	1.1	145	16	24	30	37	50	67	90	1	1.5	
20	100	—	—	—	—	125	9	13	16	19	25	34	45	0.3	140	13	20	24	30	40	54	0.6	1.1	1.1	150	16	24	30	37	50	67	100	1	1.5		
21	105	—	—	—	—	130	9	13	16	19	25	34	45	0.3	145	13	20	24	30	40	54	0.6	1.1	1.1	160	18	26	33	41	56	75	109	1	2		
22	110	—	—	—	—	140	10	16	19	23	30	40	54	0.6	150	13	20	24	30	40	54	0.6	1.1	1.1	170	19	28	36	45	60	80					

Appendix table 2: Comparison of SI, CGS and gravity units-1

Unit system	Quantity	Length <i>L</i>	Mass <i>M</i>	Time <i>T</i>	Acceleration	Force	Stress	Pressure	Energy
SI		m	kg	s	m/s ²	N	Pa	Pa	J
CGS system		cm	g	s	Gal	dyn	dyn/cm ²	dyn/cm ²	erg
Gravitation system		m	kgf · s ² /m	s	m/s ²	kgf	kgf/m ²	kgf/m ²	kgf · m

Appendix table 3: SI-customary unit conversion table-1

Quantity	Unit designation	Symbol	Conversion rate to SI	SI unit designation	Symbol
Angle	Degree	°	$\pi/180$	Radian	rad
	Minute	'	$\pi/10\ 800$		
	Second	" (sec)	$\pi/648\ 000$		
Length	Meter	m	1	Meter	m
	Micron	μ	10^{-6}		
	Angstrom	Å	10^{-10}		
Area	Square meter	m ²	1	Square meter	m ²
	Are	a	10^2		
	Hectare	ha	10^4		
Volume	Cubic meter	m ³	1	Cubic meter	m ³
	Liter	R.L	10^{-3}		
Mass	Kilogram	kg	1	Kilogram	kg
	Ton	t	10^3		
	Kilogram force / square second per meter	kgf · s ² /m	9.806 65		
Time	Second	s	1	Second	s
	Minute	min	60		
	Hour	h	3 600		
	Day	d	86 400		
Speed	Meters per second	m/s	1	Meters per second	m/s
	Knot	kn	1 852/3 600		
Frequency and vibration	Cycle	s ⁻¹ (pps)	1	Hertz	Hz
Revolutions (rotational speed)	Revolutions per minute (rpm)	rpm (r/min)	1/60	Per second	s ⁻¹
Angular speed	Radians per second	rad/s	1	Radians per second	rad/s
Acceleration	Meters per square second	m/s ²	1	Meters per second square	m/s ²
	G	G	9.806 65		
Force	Kilogram force	kgf	9.806 65	Newton	N
	Ton force	tf	9 806.65		
	Dyne	dyn	10^{-5}		
Force moment	Kilogram force / meter	kgf · m	9.806 65	Newton meter	N · m
Inertia moment	Kilogram force / meter / square second	kgf · m · s ²	9.806 65	Kilogram / square meter	kg · m ²
Stress	Kilogram force per square meter	kgf/m ²	9.806 65	Pascal or newton per square meter	Pa or N/m ²
Pressure	Kilogram force per square meter	kgf/m ²	9.806 65	Pascal	Pa
	Meter water column	mH ₂ O	9 806.65		
	Meter of mercury	mHg	101 325/0.76		
	Torr	Torr	101 325/760		
	Atmosphere	atm	101 325		
	Bar	bar	10^5		
Energy	Erg	erg	10^{-7}	Joule	J
	IT calorie	cal _{IT}	4.186 8		
	Kilogram force / meter	kgf · m	9.806 65		
	Kilowatt hour	kW · h	3.600×10^6		
	Metric horsepower per hour	PS · h	$2.647\ 79 \times 10^6$		
Power rate and power	Watt	W	1	Watt	W
	Metric horsepower	PS	735.5		
	Kilogram force / meter per second	kgf · m/s	9.806 65		

Appendix table 2: Comparison of SI, CGS and gravity units-2

Unit system \ Quantity	Power rate	Temperature	Viscosity	Dynamic viscosity	Magnetic flux	Flux density	Magnetic field strength
SI	W	K	Pa · s	m ² /s	Wb	T	A/m
CGS system	erg/s	°C	P	St	Mx	Gs	Oe
Gravitation system	kgf · m/s	°C	kgf · s/m ²	m ² /s	—	—	—

Appendix table 3: SI-customary unit conversion table-2

Quantity	Unit designation	Symbol	Conversion rate to SI	SI unit designation	Symbol
Viscosity	Poise	P	10 ⁻¹	Pascal second	Pa · s
	Centipoise	cP	10 ⁻³		
	Kilogram force / square second per meter	kgf · s/m ²	9.806 65		
Dynamic viscosity	Stoke	St	10 ⁻⁴	Square meter per second	m ² /s
	Centistoke	cSt	10 ⁻⁶		
Temperature	Degree	°C	+273.15	Kelvin	K
Radioactive Dosage	Curie	Ci	3.7 × 10 ¹⁰	Becquerel	Bq
	Roentgen	R	2.58 × 10 ⁻⁴	Coulombs per kilogram	C/kg
Absorption dosage	Rad	rad	10 ⁻²	Gray	Gy
Dosage equivalent	Rem	rem	10 ⁻²	Sievert	Sv
Magnetic flux	Maxwell	Mx	10 ⁻⁸	Weber	Wb
Flux density	Gamma	γ	10 ⁻⁹	Tesla	T
	Gauss	Gs	10 ⁻⁴		
Magnetic field strength	Oersted	Oe	10 ³ /4 π	Amperes per meter	A/m
Quantity of electricity	Coulomb	C	1	Coulomb	C
Potential difference	Volt	V	1	Volt	V
Electric resistance	Ohm	Ω	1	Ohm	Ω
Current	Ampere	A	1	Ampere	A

Appendix table 4: Tenth power multiples of SI unit

Multiples of unit	Prefix		Multiples of unit	Prefix	
	Name	Symbol		Name	Symbol
10 ¹⁸	Exa	E	10 ⁻¹	Deci	d
10 ¹⁵	Peta	P	10 ⁻²	Centi	c
10 ¹²	Tera	T	10 ⁻³	Mili	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

Appendix table 5: Dimensional tolerance for shafts

Diameter division mm		a13		c12		d6		e6		e13		f5		f6		g5		g6	
over	incl.	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low
3	6	-270	-450	-70	-190	-30	-38	-20	-28	-20	-200	-10	-15	-10	-18	-4	-9	-4	-12
6	10	-280	-500	-80	-230	-40	-49	-25	-34	-25	-245	-13	-19	-13	-22	-5	-11	-5	-14
10	18	-290	-560	-95	-275	-50	-61	-32	-43	-32	-302	-16	-24	-16	-27	-6	-14	-6	-17
18	30	-300	-630	-110	-320	-65	-78	-40	-53	-40	-370	-20	-29	-20	-33	-7	-16	-7	-20
30	40	-310	-700	-120	-370	-80	-96	-50	-66	-50	-440	-25	-36	-25	-41	-9	-20	-9	-25
40	50	-320	-710	-130	-380														
50	65	-340	-800	-140	-440	-100	-119	-60	-79	-60	-520	-30	-43	-30	-49	-10	-23	-10	-29
65	80	-360	-820	-150	-450														
80	100	-380	-920	-170	-520	-120	-142	-72	-94	-72	-612	-36	-51	-36	-58	-12	-27	-12	-34
100	120	-410	-950	-180	-530														
120	140	-460	-1 090	-200	-600	-145	-170	-85	-110	-85	-715	-43	-61	-43	-68	-14	-32	-14	-39
140	160	-520	-1 150	-210	-610														
160	180	-580	-1 210	-230	-630														
180	200	-660	-1 380	-240	-700														
200	225	-740	-1 460	-260	-720	-170	-199	-100	-129	-100	-820	-50	-70	-50	-79	-15	-35	-15	-44
225	250	-820	-1 540	-280	-740														
250	280	-920	-1 730	-300	-820	-190	-222	-110	-142	-110	-920	-56	-79	-56	-88	-17	-40	-17	-49
280	315	-1 050	-1 860	-330	-850														
315	355	-1 200	-2 090	-360	-930	-210	-246	-125	-161	-125	-1 015	-62	-87	-62	-98	-18	-43	-18	-54
355	400	-1 350	-2 240	-400	-970														
400	450	-1 500	-2 470	-440	-1 070	-230	-270	-135	-175	-135	-1 105	-68	-95	-68	-108	-20	-47	-20	-60
450	500	-1 650	-2 620	-480	-1 110														
500	560	-	-	-	-	-260	-304	-145	-189	-	-	-	-	-76	-120	-	-	-22	-66
560	630	-	-	-	-														
630	710	-	-	-	-	-290	-340	-160	-210	-	-	-	-	-80	-130	-	-	-24	-74
710	800	-	-	-	-														
800	900	-	-	-	-	-320	-376	-170	-226	-	-	-	-	-86	-142	-	-	-26	-82
900	1 000	-	-	-	-														
1 000	1 120	-	-	-	-	-350	-416	-195	-261	-	-	-	-	-98	-164	-	-	-28	-94
1 120	1 250	-	-	-	-														
1 250	1 400	-	-	-	-	-390	-468	-220	-298	-	-	-	-	-110	-188	-	-	-30	-108
1 400	1 600	-	-	-	-														

Diameter division mm		j5		js5		j6		js6		j7		k4		k5		k6		m5	
over	incl.	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low
3	6	+3	-2	+2.5	-2.5	+6	-2	+4	-4	+8	-4	+5	+1	+6	+1	+9	+1	+9	+4
6	10	+4	-2	+3	-3	+7	-2	+4.5	-4.5	+10	-5	+5	+1	+7	+1	+10	+1	+12	+6
10	18	+5	-3	+4	-4	+8	-3	+5.5	-5.5	+12	-6	+6	+1	+9	+1	+12	+1	+15	+7
18	30	+5	-4	+4.5	-4.5	+9	-4	+6.5	-6.5	+13	-8	+8	+2	+11	+2	+15	+2	+17	+8
30	40																		
40	50	+6	-5	+5.5	-5.5	+11	-5	+8	-8	+15	-10	+9	+2	+13	+2	+18	+2	+20	+9
50	65																		
65	80	+6	-7	+6.5	-6.5	+12	-7	+9.5	-9.5	+18	-12	+10	+2	+15	+2	+21	+2	+24	+11
80	100																		
100	120	+6	-9	+7.5	-7.5	+13	-9	+11	-11	+20	-15	+13	+3	+18	+3	+25	+3	+28	+13
120	140																		
140	160	+7	-11	+9	-9	+14	-11	+12.5	-12.5	+22	-18	+15	+3	+21	+3	+28	+3	+33	+15
160	180																		
180	200																		
200	225	+7	-13	+10	-10	+16	-13	+14.5	-14.5	+25	-21	+18	+4	+24	+4	+33	+4	+37	+17
225	250																		
250	280	+7	-16	+11.5	-11.5	+16	-16	+16	-16	+26	-26	+20	+4	+27	+4	+36	+4	+43	+20
280	315																		
315	355	+7	-18	+12.5	-12.5	+18	-18	+18	-18	+29	-28	+22	+4	+29	+4	+40	+4	+46	+21
355	400																		
400	450	+7	-20	+13.5	-13.5	+20	-20	+20	-20	+31	-32	+25	+5	+32	+5	+45	+5	+50	+23
450	500																		
500	560	-	-	-	-	-	-	+22	-22	-	-	-	-	-	-	+44	0	-	-
560	630	-	-	-	-	-	-												
630	710	-	-	-	-	-	-	+25	-25	-	-	-	-	-	-	+50	0	-	-
710	800	-	-	-	-	-	-												
800	900	-	-	-	-	-	-	+28	-28	-	-	-	-	-	-	+56	0	-	-
900	1 000	-	-	-	-	-	-												
1 000	1 120	-	-	-	-	-	-	+33	-33	-	-	-	-	-	-	+66	0	-	-
1 120	1 250	-	-	-	-	-	-												
1 250	1 400	-	-	-	-	-	-	+39	-39	-	-	-	-	-	-	+78	0	-	-
1 400	1 600	-	-	-	-	-	-												

Unit μm

h4		h5		h6		h7		h8		h9		h10		h11		h13		js4		Diameter division mm	
high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	over	incl.
0	-4	0	-5	0	-8	0	-12	0	-18	0	-30	0	-48	0	-75	0	-180	+2	-2	3	6
0	-4	0	-6	0	-9	0	-15	0	-22	0	-36	0	-58	0	-90	0	-220	+2	-2	6	10
0	-5	0	-8	0	-11	0	-18	0	-27	0	-43	0	-70	0	-110	0	-270	+2.5	-2.5	10	18
0	-6	0	-9	0	-13	0	-21	0	-33	0	-52	0	-84	0	-130	0	-330	+3	-3	18	30
0	-7	0	-11	0	-16	0	-25	0	-39	0	-62	0	-100	0	-160	0	-390	+3.5	-3.5	30	40
																				40	50
0	-8	0	-13	0	-19	0	-30	0	-46	0	-74	0	-120	0	-190	0	-460	+4	-4	50	65
																				65	80
0	-10	0	-15	0	-22	0	-35	0	-54	0	-87	0	-140	0	-220	0	-540	+5	-5	80	100
																				100	120
0	-12	0	-18	0	-25	0	-40	0	-63	0	-100	0	-160	0	-250	0	-630	+6	-6	120	140
																				140	160
																				160	180
0	-14	0	-20	0	-29	0	-46	0	-72	0	-115	0	-185	0	-290	0	-720	+7	-7	180	200
																				200	225
																				225	250
0	-16	0	-23	0	-32	0	-52	0	-81	0	-130	0	-210	0	-320	0	-810	+8	-8	250	280
																				280	315
0	-18	0	-25	0	-36	0	-57	0	-89	0	-140	0	-230	0	-360	0	-890	+9	-9	315	355
																				355	400
0	-20	0	-27	0	-40	0	-63	0	-97	0	-155	0	-250	0	-400	0	-970	+10	-10	400	450
																				450	500
-	-	-	-	0	-44	0	-70	0	-110	0	-175	0	-280	0	-440	0	-	-	-	500	560
																				560	630
-	-	-	-	0	-50	0	-80	0	-125	0	-200	0	-320	0	-500	0	-	-	-	630	710
																				710	800
-	-	-	-	0	-56	0	-90	0	-140	0	-230	0	-360	0	-560	0	-	-	-	800	900
																				900	1 000
-	-	-	-	0	-66	0	-105	0	-165	0	-260	0	-420	0	-660	0	-	-	-	1 000	1 120
																				1 120	1 250
-	-	-	-	0	-78	0	-125	0	-195	0	-310	0	-500	0	-780	0	-	-	-	1 250	1 400
																				1 400	1 600

Unit μm

m6		n5		n6		p5		p6		r6		r7		Basic tolerance				Diameter division mm	
high	low	high	low	high	low	high	low	high	low	high	low	high	low	IT2	IT3	IT5	IT7	over	incl.
+12	+4	+13	+8	+16	+8	+17	+12	+20	+12	+23	+15	+27	+15	1.5	2.5	5	12	3	6
+15	+6	+16	+10	+19	+10	+21	+15	+24	+15	+28	+19	+34	+19	1.5	2.5	6	15	6	10
+18	+7	+20	+12	+23	+12	+26	+18	+29	+18	+34	+23	+41	+23	2	3	8	18	10	18
+21	+8	+24	+15	+28	+15	+31	+22	+35	+22	+41	+28	+49	+28	2.5	4	9	21	18	30
+25	+9	+28	+17	+33	+17	+37	+26	+42	+26	+50	+34	+59	+34	2.5	4	11	25	30	40
																		40	50
+30	+11	+33	+20	+39	+20	+45	+32	+51	+32	+60	+41	+71	+41	3	5	13	30	50	65
																		65	80
+35	+13	+38	+23	+45	+23	+52	+37	+59	+37	+62	+43	+73	+43	4	6	15	35	80	100
																		100	120
+40	+15	+45	+27	+52	+27	+61	+43	+68	+43	+73	+51	+86	+51	5	8	18	40	120	140
																		140	160
																		160	180
+46	+17	+51	+31	+60	+31	+70	+50	+79	+50	+88	+63	+103	+63	7	10	20	46	180	200
																		200	225
																		225	250
+52	+20	+57	+34	+66	+34	+79	+56	+88	+56	+106	+77	+123	+77	8	12	23	52	250	280
																		280	315
+57	+21	+62	+37	+73	+37	+87	+62	+98	+62	+113	+84	+130	+84	9	13	25	57	315	355
																		355	400
+63	+23	+67	+40	+80	+40	+95	+68	+108	+68	+126	+94	+150	+94	10	15	27	63	400	450
																		450	500
+70	+26	-	-	+88	+44	-	-	+122	+78	+144	+108	+165	+108	-	-	-	70	500	560
																		560	630
+80	+30	-	-	+100	+50	-	-	+138	+88	+150	+114	+171	+114	-	-	-	80	630	710
																		710	800
+90	+34	-	-	+112	+56	-	-	+156	+100	+166	+126	+189	+126	-	-	-	90	800	900
																		900	1 000
+106	+40	-	-	+132	+66	-	-	+186	+120	+172	+132	+195	+132	-	-	-	105	1 000	1 120
																		1 120	1 250
+126	+48	-	-	+156	+78	-	-	+218	+140	+316	+250	+355	+250	-	-	-	125	1 250	1 400
																		1 400	1 600

Appendix table 6: Dimensional tolerance for housing bore

Diameter division mm	over	incl.	E7		E10		E11		E12		F6		F7		F8		G6		G7		H6	
			high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low
3	6		+32	+20	+68	+20	+95	+20	+140	+20	+18	+10	+22	+10	+28	+10	+12	+4	+16	+4	+8	0
6	10		+40	+25	+83	+25	+115	+25	+175	+25	+22	+13	+28	+13	+35	+13	+14	+5	+20	+5	+9	0
10	18		+50	+32	+102	+32	+142	+32	+212	+32	+27	+16	+34	+16	+43	+16	+17	+6	+24	+6	+11	0
18	30		+61	+40	+124	+40	+170	+40	+250	+40	+33	+20	+41	+20	+53	+20	+20	+7	+28	+7	+13	0
30	40	50	+75	+50	+150	+50	+210	+50	+300	+50	+41	+25	+50	+25	+64	+25	+25	+9	+34	+9	+16	0
50	65	80	+90	+60	+180	+60	+250	+60	+360	+60	+49	+30	+60	+30	+76	+30	+29	+10	+40	+10	+19	0
80	100	120	+107	+72	+212	+72	+292	+72	+422	+72	+58	+36	+71	+36	+90	+36	+34	+12	+47	+12	+22	0
120	140	160	+125	+85	+245	+85	+335	+85	+485	+85	+68	+43	+83	+43	+106	+43	+39	+14	+54	+14	+25	0
180	200	225	+146	+100	+285	+100	+390	+100	+560	+100	+79	+50	+96	+50	+122	+50	+44	+15	+61	+15	+29	0
250	280	315	+162	+110	+320	+110	+430	+110	+630	+110	+88	+56	+108	+56	+137	+56	+49	+17	+69	+17	+32	0
315	355	400	+182	+125	+355	+125	+485	+125	+695	+125	+98	+62	+119	+62	+151	+62	+54	+18	+75	+18	+36	0
400	450	500	+198	+135	+385	+135	+535	+135	+765	+135	+108	+68	+131	+68	+165	+68	+60	+20	+83	+20	+40	0
500	560	630	+215	+145	-	-	-	-	-	-	+120	+76	+146	+76	+186	+76	+66	+22	+92	+22	+44	0
630	710	800	+240	+160	-	-	-	-	-	-	+130	+80	+160	+80	+205	+80	+74	+24	+104	+24	+50	0
800	900	1000	+260	+170	-	-	-	-	-	-	+142	+86	+176	+86	+226	+86	+82	+26	+116	+26	+56	0
1 000	1 120	1 250	+300	+195	-	-	-	-	-	-	+164	+98	+203	+98	+263	+98	+94	+28	+133	+28	+66	0
1 250	1 400	1 600	+345	+220	-	-	-	-	-	-	+188	+110	+235	+110	+305	+110	+108	+30	+155	+30	+78	0
1 600	1 800	2 000	+390	+240	-	-	-	-	-	-	+212	+120	+270	+120	+350	+120	+124	+32	+182	+32	+92	0

Unit μm

Diameter division mm	over	incl.	K6		K7		M6		M7		N6		N7		P6		P7		R6		R7	
			high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low
3	6		+2	-6	+3	-9	-1	-9	0	-12	-5	-13	-4	-16	-9	-17	-8	-20	-12	-20	-11	-23
6	10		+2	-7	+5	-10	-3	-12	0	-15	-7	-16	-4	-19	-12	-21	-9	-24	-16	-25	-13	-28
10	18		+2	-9	+6	-12	-4	-15	0	-18	-9	-20	-5	-23	-15	-26	-11	-29	-20	-31	-16	-34
18	30		+2	-11	+6	-15	-4	-17	0	-21	-11	-24	-7	-28	-18	-31	-14	-35	-24	-37	-20	-41
30	40	50	+3	-13	+7	-18	-4	-20	0	-25	-12	-28	-8	-33	-21	-37	-17	-42	-29	-42	-25	-50
50	65	80	+4	-15	+9	-21	-5	-24	0	-30	-14	-33	-9	-39	-26	-45	-21	-51	-35	-54	-30	-60
80	100	120	+4	-18	+10	-25	-6	-28	0	-35	-16	-38	-10	-45	-30	-52	-24	-59	-44	-66	-38	-73
120	140	160	+4	-21	+12	-28	-8	-33	0	-40	-20	-45	-12	-52	-36	-61	-28	-68	-56	-81	-48	-88
180	200	225	+5	-24	+13	-33	-8	-37	0	-46	-22	-51	-14	-60	-41	-70	-33	-79	-71	-100	-63	-109
250	280	315	+5	-27	+16	-36	-9	-41	0	-52	-25	-57	-14	-66	-47	-79	-36	-88	-85	-117	-74	-126
315	355	400	+7	-29	+17	-40	-10	-46	0	-57	-26	-62	-16	-73	-51	-87	-41	-98	-97	-133	-87	-144
400	450	500	+8	-32	+18	-45	-10	-50	0	-63	-27	-67	-17	-80	-55	-95	-45	-108	-113	-153	-103	-166
500	560	630	0	-44	0	-70	-26	-70	-26	-96	-44	-88	-44	-114	-78	-122	-78	-148	-150	-194	-150	-220
630	710	800	0	-50	0	-80	-30	-80	-30	-100	-50	-100	-50	-130	-88	-138	-88	-168	-175	-225	-175	-225
800	900	1000	0	-56	0	-90	-34	-90	-34	-124	-56	-112	-56	-146	-100	-156	-100	-190	-210	-266	-210	-300
1 000	1 120	1 250	0	-66	0	-105	-40	-106	-40	-145	-66	-132	-66	-171	-120	-186	-120	-225	-250	-316	-250	-355
1 250	1 400	1 600	0	-78	0	-125	-48	-126	-48	-173	-78	-156	-78	-203	-140	-213	-140	-265	-300	-378	-300	-425
1 600	1 800	2 000	0	-92	0	-150	-58	-150	-58	-208	-92	-184	-92	-242	-170	-262	-170	-320	-370	-462	-370	-520
																			-400	-492	-400	-550

Unit μm

H7	H8	H9	H10	H11	H13	J6	Js6		J7	Js7		K5	Diameter division mm	
							high	low		high	low		over	incl.
+12 0	+18 0	+30 0	+48 0	+75 0	+180 0	+5 -3	+4 -4	+6 -6	+6 -6	+6 -6	0 -5	3 6	6 10	
+15 0	+22 0	+36 0	+58 0	+90 0	+220 0	+5 -4	+4.5 -4.5	+8 -7	+7.5 -7.5	+1 -5	+1 -5	6 10	10 18	
+18 0	+27 0	+43 0	+70 0	+110 0	+270 0	+6 -5	+5.5 -5.5	+10 -8	+9 -9	+2 -6	+2 -6	10 18	18 30	
+21 0	+33 0	+52 0	+84 0	+130 0	+330 0	+8 -5	+6.5 -6.5	+12 -9	+10.5 -10.5	+1 -8	+1 -8	18 30	30 40	
+25 0	+39 0	+62 0	+100 0	+160 0	+390 0	+10 -6	+8 -8	+14 -11	+12.5 -12.5	+2 -9	+2 -9	30 40	40 50	
+30 0	+46 0	+74 0	+120 0	+190 0	+460 0	+13 -6	+9.5 -9.5	+18 -12	+15 -15	+3 -10	+3 -10	50 65	65 80	
+35 0	+54 0	+87 0	+140 0	+220 0	+540 0	+16 -6	+11 -11	+22 -13	+17.5 -17.5	+2 -13	+2 -13	80 100	100 120	
+40 0	+63 0	+100 0	+160 0	+250 0	+630 0	+18 -7	+12.5 -12.5	+26 -14	+20 -20	+3 -15	+3 -15	120 140	140 160	
+46 0	+72 0	+115 0	+185 0	+290 0	+720 0	+22 -7	+14.5 -14.5	+30 -16	+23 -23	+2 -18	+2 -18	160 180	180 200	
+52 0	+81 0	+130 0	+210 0	+320 0	+810 0	+25 -7	+16 -16	+36 -16	+26 -26	+3 -20	+3 -20	200 225	225 250	
+57 0	+89 0	+140 0	+230 0	+360 0	+890 0	+29 -7	+18 -18	+39 -18	+28.5 -28.5	+3 -22	+3 -22	250 280	280 315	
+63 0	+97 0	+155 0	+250 0	+400 0	+970 0	+33 -7	+20 -20	+43 -20	+31.5 -31.5	+3 -22	+3 -22	315 355	355 400	
+63 0	+97 0	+155 0	+250 0	+400 0	+970 0	+33 -7	+20 -20	+43 -20	+31.5 -31.5	+2 -25	+2 -25	400 450	450 500	
+70 0	+110 0	+175 0	+280 0	+440 0	- 0	- -	+22 -22	- -	+35 -35	- -	- -	500 560	560 630	
+80 0	+125 0	+200 0	+320 0	+500 0	- 0	- -	+25 -25	- -	+40 -40	- -	- -	630 710	710 800	
+90 0	+140 0	+230 0	+360 0	+560 0	- 0	- -	+28 -28	- -	+45 -45	- -	- -	800 900	900 1 000	
+105 0	+165 0	+260 0	+420 0	+660 0	- 0	- -	+33 -33	- -	+52.5 -52.5	- -	- -	1 000 1 120	1 120 1 250	
+125 0	+195 0	+310 0	+500 0	+780 0	- 0	- -	+39 -39	- -	+62.5 -62.5	- -	- -	1 250 1 400	1 400 1 600	
+150 0	+230 0	+370 0	+600 0	+920 0	- 0	- -	+46 -46	- -	+75 -75	- -	- -	1 600 1 800	1 800 2 000	

Appendix table 7: Basic tolerance

Unit μm

Diameter division mm		IT basic tolerance class									
over	incl.	IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10
—	3	0.8	1.2	2	3	4	6	10	14	25	40
3	6	1	1.5	2.5	4	5	8	12	18	30	48
6	10	1	1.5	2.5	4	6	9	15	22	36	58
10	18	1.2	2	3	5	8	11	18	27	43	70
18	30	1.5	2.5	4	6	9	13	21	33	52	84
30	50	1.5	2.5	4	7	11	16	25	39	62	100
50	80	2	3	5	8	13	19	30	46	74	120
80	120	2.5	4	6	10	15	22	35	54	87	140
120	180	3.5	5	8	12	18	25	40	63	100	160
180	250	4.5	7	10	14	20	29	46	72	115	185
250	315	6	8	12	16	23	32	52	81	130	210
315	400	7	9	13	18	25	36	57	89	140	230
400	500	8	10	15	20	27	40	63	97	155	250
500	630	9	11	16	22	30	44	70	110	175	280
630	800	10	13	18	25	35	50	80	125	200	320
800	1 000	11	15	21	29	40	56	90	140	230	360
1 000	1 250	13	18	24	34	46	66	105	165	260	420
1 250	1 600	15	21	29	40	54	78	125	195	310	500
1 600	2 000	18	25	35	48	65	92	150	230	370	600
2 000	2 500	22	30	41	57	77	110	175	280	440	700
2 500	3 150	26	36	50	69	93	135	210	330	540	860

Appendix table 8: Viscosity conversion table

Kinematic viscosity mm ² /s	Saybolt SUS (second)	Redwood R ⁿ (second)	Engler E (degree)
2.7	35	32.2	1.18
4.3	40	36.2	1.32
5.9	45	40.6	1.46
7.4	50	44.9	1.60
8.9	55	49.1	1.75
10.4	60	53.5	1.88
11.8	65	57.9	2.02
13.1	70	62.3	2.15
14.5	75	67.6	2.31
15.8	80	71.0	2.42
17.0	85	75.1	2.55
18.2	90	79.6	2.68
19.4	95	84.2	2.81
20.6	100	88.4	2.95
23.0	110	97.1	3.21
25.0	120	105.9	3.49
27.5	130	114.8	3.77
29.8	140	123.6	4.04
32.1	150	132.4	4.32
34.3	160	141.1	4.59
36.5	170	150.0	4.88
38.8	180	158.8	5.15
41.0	190	167.5	5.44
43.2	200	176.4	5.72
47.5	220	194.0	6.28
51.9	240	212	6.85
56.5	260	229	7.38
60.5	280	247	7.95
64.9	300	265	8.51
70.3	325	287	9.24
75.8	350	309	9.95
81.2	375	331	10.7
86.8	400	353	11.4
92.0	425	375	12.1
97.4	450	397	12.8

Kinematic viscosity mm ² /s	Saybolt SUS (second)	Redwood R ⁿ (second)	Engler E (degree)
103	475	419	13.5
108	500	441	14.2
119	550	485	15.6
130	600	529	17.0
141	650	573	18.5
152	700	617	19.9
163	750	661	21.3
173	800	705	22.7
184	850	749	24.2
195	900	793	25.6
206	950	837	27.0
217	1 000	882	28.4
260	1 200	1 058	34.1
302	1 400	1 234	39.8
347	1 600	1 411	45.5
390	1 800	1 587	51
433	2 000	1 763	57
542	2 500	2 204	71
650	3 000	2 646	85
758	3 500	3 087	99
867	4 000	3 526	114
974	4 500	3 967	128
1 082	5 000	4 408	142
1 150	5 500	4 849	156
1 300	6 000	5 290	170
1 400	6 500	5 730	185
1 510	7 000	6 171	199
1 630	7 500	6 612	213
1 740	8 000	7 053	227
1 850	8 500	7 494	242
1 960	9 000	7 934	256
2 070	9 500	8 375	270
2 200	10 000	8 816	284

Appendix table 9: Kgf to N conversion table

kgf		N	kgf		N	kgf		N
0.1020	1	9.8066	3.4670	34	333.43	6.8321	67	657.04
0.2039	2	19.613	3.5690	35	343.23	6.9341	68	666.85
0.3059	3	29.420	3.6710	36	353.04	7.0361	69	676.66
0.4079	4	39.227	3.7730	37	362.85	7.1380	70	686.46
0.5099	5	49.033	3.8749	38	372.65	7.2400	71	696.27
0.6118	6	58.840	3.9769	39	382.46	7.3420	72	706.08
0.7138	7	68.646	4.0789	40	392.27	7.4440	73	715.88
0.8158	8	78.453	4.1808	41	402.07	7.5459	74	725.69
0.9177	9	88.260	4.2828	42	411.88	7.6479	75	735.50
1.0197	10	98.066	4.3848	43	421.68	7.7499	76	745.30
1.1217	11	107.87	4.4868	44	431.49	7.8518	77	755.11
1.2237	12	117.68	4.5887	45	441.30	7.9538	78	764.92
1.3256	13	127.49	4.6907	46	451.10	8.0558	79	774.72
1.4276	14	137.29	4.7927	47	460.91	8.1578	80	784.53
1.5296	15	147.10	4.8946	48	470.72	8.2597	81	794.34
1.6316	16	156.91	4.9966	49	480.52	8.3617	82	804.14
1.7335	17	166.71	5.0986	50	490.33	8.4637	83	813.95
1.8355	18	176.52	5.2006	51	500.14	8.5656	84	823.76
1.9375	19	186.33	5.3025	52	509.94	8.6676	85	833.56
2.0394	20	196.13	5.4045	53	519.75	8.7696	86	843.37
2.1414	21	205.94	5.5065	54	529.56	8.8716	87	853.18
2.2434	22	215.75	5.6085	55	539.36	8.9735	88	862.98
2.3454	23	225.55	5.7104	56	549.17	9.0755	89	872.79
2.4473	24	235.36	5.8124	57	558.98	9.1775	90	882.60
2.5493	25	245.17	5.9144	58	568.78	9.2794	91	892.40
2.6513	26	254.97	6.0163	59	578.59	9.3814	92	902.21
2.7532	27	264.78	6.1183	60	588.40	9.4834	93	912.02
2.8552	28	274.59	6.2203	61	598.20	9.5854	94	921.82
2.9572	29	284.39	6.3223	62	608.01	9.6873	95	931.63
3.0592	30	294.20	6.4242	63	617.82	9.7893	96	941.44
3.1611	31	304.01	6.5262	64	627.62	9.8913	97	951.24
3.2631	32	313.81	6.6282	65	637.43	9.9932	98	961.05
3.3651	33	323.62	6.7302	66	647.24	10.0952	99	970.86

(How to read the table) If for example you want to convert 10 kgf to N, find "10" in the middle column of the first set of columns on the right. Look in the N column directly to the right of "10," and you will see that 10 kgf equals 98.066 N. Oppositely, to convert 10 N to kgf, look in the kgf column to the right of "10" and you will see that 10 N equals 1.0197 kgf.

$$1\text{kgf}=9.80665\text{N}$$

$$1\text{N}=0.101972\text{kgf}$$

Appendix table 10: Inch-millimetre conversion table

inch		0"	1"	2"	3"	4"	5"	6"	7"	8"	9"
fraction	decimal										
1/64	0.015625	0.397	25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200	228.600
1/32	0.031250	0.794	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597	228.997
3/64	0.046875	1.191	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994	229.394
1/16	0.062500	1.588	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391	229.791
5/64	0.078125	1.984	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788	230.188
3/32	0.093750	2.381	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184	230.584
7/64	0.109375	2.778	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581	230.981
1/ 8	0.125000	3.175	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978	231.378
9/64	0.140625	3.572	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375	231.775
5/32	0.156250	3.969	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772	232.172
11/64	0.171875	4.366	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169	232.569
3/16	0.187500	4.762	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566	232.966
13/64	0.203125	5.159	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962	233.362
7/32	0.218750	5.556	30.559	55.959	81.359	106.759	132.159	157.559	182.959	208.359	233.759
15/64	0.234375	5.953	30.956	56.356	81.756	107.156	132.556	157.956	183.356	208.756	234.156
1/ 4	0.250000	6.350	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153	234.553
17/64	0.265625	6.747	31.750	57.150	82.550	107.950	133.350	158.750	184.150	209.550	234.950
9/32	0.281250	7.144	57.547	82.947	83.344	108.347	133.747	159.147	184.547	209.947	235.347
19/64	0.296875	7.541	57.944	83.344	83.741	108.744	134.144	159.544	184.944	210.344	235.744
5/16	0.312500	7.938	58.341	83.741	84.138	109.141	134.541	159.941	185.341	210.741	236.141
21/64	0.328125	8.334	58.738	84.138	84.534	109.538	134.938	160.338	185.738	211.138	236.538
11/32	0.343750	8.731	59.134	84.534	84.931	109.934	135.334	160.734	186.134	211.534	236.934
23/64	0.359375	9.128	59.531	84.931	85.328	110.331	135.731	161.131	186.531	211.931	237.331
3/ 8	0.375000	9.525	59.928	85.328	85.725	110.728	136.128	161.528	186.928	212.328	237.728
25/64	0.390625	9.922	60.325	85.725	86.122	111.125	136.525	161.925	187.325	212.725	238.125
13/32	0.406250	10.319	60.722	86.122	86.519	111.522	136.922	162.322	187.722	213.122	238.522
27/64	0.421875	10.716	61.119	86.519	86.916	111.919	137.319	162.719	188.119	213.519	238.919
7/16	0.437500	11.112	61.516	86.916	87.312	112.316	137.716	163.116	188.516	213.916	239.316
29/64	0.453125	11.509	61.912	87.312	87.709	112.712	138.112	163.512	188.912	214.312	239.712
15/32	0.468750	11.906	62.309	87.709	88.106	113.109	138.509	163.909	189.309	214.709	240.109
31/64	0.484375	12.303	62.706	88.106	88.503	113.506	138.906	164.306	189.706	215.106	240.506
1/ 2	0.500000	12.700	63.103	88.503	88.900	113.903	139.303	164.703	190.103	215.503	240.903
33/64	0.515625	13.097	63.500	88.900	89.297	114.300	139.700	165.100	190.500	215.900	241.300
17/32	0.531250	13.494	63.897	89.297	89.694	114.697	140.097	165.497	190.897	216.297	241.697
35/64	0.546875	13.891	64.294	89.694	90.091	115.094	140.494	165.894	191.294	216.694	242.094
9/16	0.562500	14.288	64.691	90.091	90.488	115.491	140.891	166.291	191.691	217.091	242.491
37/64	0.578125	14.684	90.488	90.884	90.884	115.888	141.283	166.688	192.088	217.488	242.888
19/32	0.593750	15.081	90.884	91.281	91.281	116.284	141.684	167.084	192.484	217.884	243.284
39/64	0.609375	15.478	91.678	91.678	91.678	116.681	142.081	167.481	192.881	218.281	243.681
5/ 8	0.625000	15.875	92.075	92.075	92.075	117.078	142.478	167.878	193.278	218.678	244.078
41/64	0.640625	16.272	92.472	92.472	92.472	117.475	142.875	168.275	193.675	219.075	244.475
21/32	0.656250	16.669	92.869	92.869	92.869	117.872	143.272	168.672	194.072	219.472	244.872
43/64	0.671875	17.066	93.266	93.266	93.266	118.269	143.669	169.069	194.469	219.869	245.269
11/16	0.687500	17.462	93.662	93.662	93.662	118.666	144.066	169.466	194.866	220.266	245.666
45/64	0.703125	17.859	94.059	94.059	94.059	119.062	144.462	169.862	195.262	220.662	246.062
23/32	0.718750	18.256	94.456	94.456	94.456	119.459	144.859	170.259	195.659	221.056	246.459
47/64	0.734375	18.653	94.853	94.853	94.853	119.856	145.256	170.656	196.056	221.456	246.856
3/ 4	0.750000	19.050	95.250	95.250	95.250	120.253	145.653	171.053	196.453	221.853	247.253
49/64	0.765625	19.447	95.647	95.647	95.647	120.650	146.050	171.450	196.850	222.250	247.650
25/32	0.781250	19.844	96.044	96.044	96.044	121.047	146.447	171.847	197.247	222.647	248.047
51/64	0.796875	20.241	96.441	96.441	96.441	121.444	146.844	172.244	197.644	223.044	248.444
13/16	0.812500	20.638	96.838	96.838	96.838	121.841	147.241	172.641	198.041	223.441	248.841
53/64	0.828125	21.034	97.234	97.234	97.234	122.238	147.638	173.038	198.438	223.838	249.238
27/32	0.843750	21.431	97.631	97.631	97.631	122.634	148.034	173.434	198.834	224.234	249.634
55/64	0.859375	21.828	98.028	98.028	98.028	123.031	148.431	173.831	199.231	224.631	250.031
7/ 8	0.875000	22.225	98.425	98.425	98.425	123.428	148.828	174.228	199.628	225.028	250.428
57/64	0.890625	22.622	98.822	98.822	98.822	123.825	149.225	174.625	200.025	225.425	250.825
39/32	0.906250	23.019	99.219	99.219	99.219	124.222	149.622	175.022	200.422	225.822	251.222
59/64	0.921875	23.416	99.616	99.616	99.616	124.619	150.019	175.419	200.819	226.219	251.619
15/16	0.937500	23.812	100.012	100.012	100.012	125.016	150.416	175.816	201.216	226.616	252.016
61/64	0.953125	24.209	100.409	100.409	100.409	125.412	150.812	176.212	201.612	227.012	252.412
31/32	0.968750	24.606	100.806	100.806	100.806	125.809	151.209	176.609	202.009	227.409	252.809
63/64	0.984375	25.003	101.203	101.203	101.203	126.206	151.606	177.006	202.406	227.806	253.206
						126.603	152.003	177.403	202.803	228.203	253.603