SI Unit Conversion Table

■ SI Basic Unit

● Quantity as a Reference of SI Unit

Quantity	Name	Symbol
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Current	Ampere	A
Temperature	Kelvin	K
Quantity of Substance	Mol	mol
Luminous Intensity	Candela	cd

● Basic Unit Provided with Unique Name and Symbol (Extracted)

Quantity	Name	Symbol
Frequency	Hertz	Hz
Force	Newton	N
Pressure and Stress	Pascal	Pa
Energy, Work, and Calorie	Joule	J
Power and Efficiency	Watt	W
Voltage	Volt	V
Resistance	Ohm	Ω

■ SI Prefix

● Prefix Showing Integral Power of 10 Combined with SI Unit

Coefficient	Name	Symbol	Coefficient	Name	Symbol	Coefficient	Name	Symbol
10^{24}	Yota	Y	10^{3}	Kilo	k	10^{-9}	Nano	n
10^{21}	Zeta	Z	10^{2}	Hecto	h	10^{-12}	Pico	p
10^{18}	Exa	E	10^{1}	Deca	da	10^{-15}	Femto	f
10^{15}	Peta	P	10^{-1}	Deci	d	10^{-18}	Atto	a
10^{12}	Tera	T	10^{-2}	Centi	c	10^{-21}	Zepto	z
10^{9}	Giga	G	10^{-3}	Milli	m	10^{-24}	Yocto	y
10^{6}	Mega	M	10^{-6}	Micro	μ			

■ Principal SI Unit Conversion List (□ colored portions are SI units)

● Force

N	kgf
1	1.01972×10^{-1}
9.80665	1

● Stress

Pa (N/m^2)	MPa (N/mm^2)	kgf/mm^2	kgf/cm^2	kgf/m^2
1	1×10^{-6}	1.01972×10^{-7}	1.01972×10^{-5}	1.01972×10^{-1}
1×10^{6}	1	1.01972×10^{-1}	1.01972×10	1.01972×10^{5}
9.80665×10^{6}	9.80665	1	1×10^{2}	1×10^{6}
9.80665×10^{4}	9.80665×10^{-2}	1×10^{-2}	1	1×10^{4}
9.80665	9.80665×10^{-6}	1×10^{-6}	1×10^{-4}	1

$1Pa = 1N/m^2$, $1MPa = 1N/mm^2$

● Pressure

Pa (N/m^2)	kPa	MPa	GPa	bar	kgf/cm^2	mmHg or Torr
1	1×10^{-3}	1×10^{-6}	1×10^{-9}	1×10^{-5}	1.01972×10^{-5}	7.50062×10^{-3}
1×10^{3}	1	1×10^{-3}	1×10^{-6}	1×10^{-2}	1.01972×10^{-2}	7.50062
1×10^{6}	1×10^{3}	1	1×10^{-3}	1×10	1.01972×10	7.50062×10^{3}
1×10^{9}	1×10^{6}	1×10^{3}	1	1×10^{4}	1.01972×10^{4}	7.50062×10^{6}
1×10^{5}	1×10^{2}	1×10^{-1}	1×10^{-4}	1	1.01972	7.50062×10^{2}
9.80665×10^{4}	9.80665×10	9.80665×10^{-2}	9.80665×10^{-5}	9.80665×10^{-1}	1	7.35559×10^{2}
1.33322×10^{2}	1.33322×10^{-1}	1.33322×10^{-4}	1.33322×10^{-7}	1.33322×10^{-3}	1.35951×10^{-3}	1

$1Pa = 1N/m^2$

● Work / Energy / Calorie

J	kW · h	kgf · m	kcal
1	2.77778×10^{-7}	1.01972×10^{-1}	2.38889×10^{-4}
3.60000×10^{6}	1	3.67098×10^{5}	8.60000×10^{2}
9.80665	2.72407×10^{-6}	1	2.34270×10^{-3}
4.18605×10^{3}	1.16279×10^{-3}	4.26858×10^{2}	1

$1J = 1W \cdot s, 1J = 1N \cdot m$

● Power (Efficiency and Motive Energy) / Thermal Flow

W	kgf · m/s	PS	kcal/h
1	1.01972×10^{-1}	1.35962×10^{-3}	8.60000×10^{-1}
1×10^{3}	1.01972×10^{2}	1.35962	8.60000×10^{2}
9.80665	1	1.33333×10^{-2}	8.43371
7.355×10^{2}	7.5×10	1	6.32529×10^{2}
1.16279	1.18572×10^{-1}	1.58095×10^{-3}	1

1W = 1J/s, PS : Horsepower

● Specific Heat

J/(kg · K)	1kcal (kg · °C)cal/(g · °C)
1	2.38889×10^{-4}
4.18605×10^{3}	1

● Thermal Conductivity

W/(m · K)	kcal/(h · m · °C)
1	8.60000×10^{-1}
1.16279	1

● Rotating Speed

min^{-1}	rpm
1	1

$1min^{-1} = 1rpm$

References

■ Steel and Non-Ferrous Metal Symbols Chart

● Carbon Steels

JIS	AISI	DIN
S10C	1010	C10
S15C	1015	C15
S20C	1020	C22
S25C	1025	C25
S30C	1030	C30
S35C	1035	C35
S40C	1040	C40
S45C	1045	C45
S50C	1049	C50
S55C	1055	C55

● Ni-Cr-Mo Steels

SNCM220	8620	21NiCrMo2
SNCM240	8640	—
SNCM415	—	—
SNCM420	4320	—
SNCM439	4340	—
SNCM447	—	—

● Cr Steels

SCr415	—	—
SCr420	5120	—
SCr430	5130	34Cr4
SCr435	5132	37Cr4
SCr440	5140	41Cr4
SCr445	5147	—

● Cr-Mo Steels

SCM415	—	—
SCM420	—	—
SCM430	4131	—
SCM435	4137	34CrMo4
SCM440	4140	42CrMo4
SCM445	4145	—

● Mn Steels and Mn-Cr Steels for Structurer Use

SMn420	1522	—
SMn433	1534	—
SMn438	1541	—
SMn443	1541	—
SMnC420	—	—
SMnC443	—	—

● Carbon Tool Steels

SK1	—	—
SK2	W1-11 $^1/_2$	—
SK3	W1-10	C105W1
SK4	W1-9	—
SK5	W1-8	C80W1
SK6	—	C80W1
SK7	—	C70W2

● High Seed Steels

JIS	AISI	DIN
SKH2	T1	—
SKH3	T4	S18-1-2-5
SKH10	T15	S12-1-4-5
SKH51	M2	S6-5-2
SKH52	M3–1	—
SKH53	M3–2	S6-5-3
SKH54	M4	—
SKH56	M36	—

● Alloy Tool Steels

SKS11	F2	—
SKS51	L6	—
SKS43	W2-9 $^1/_2$	—
SKS44	W2-8	—
SKD1	D3	X210Cr12
SKD11	D2	—

● Grey Cast Iron

FC100	No 20B	GG-10
FC150	No 25B	GG-15
FC200	No 30B	GG-20
FC250	No 35B	GG-25
FC300	No 45B	GG-30
FC350	No 50B	GG-35

● Nodular Cast Iron

FCD400	60-40-18	GGG-40
FCD450	—	GGG-40.3
FCD500	80-55-06	GGG-50
FCD600	—	GGG-60
FCD700	100-70-03	GGG-70

● Ferritic Stainless Steels

SUS405	405	X10CrAl13
SUS429	429	—
SUS430	430	X6Cr17
SUS430F	430F	X7CrMo18
SUS434	434	X6CrMo17 1

● Martensitic Stainless Steels

SUS403	403	—
SUS410	410	X10Cr13
SUS416	416	—
SUS420JI	420	X20Cr13
SUS420F	420F	—
SUS431	431	X20CrNi17 2
SUS440A	440A	—
SUS440B	440B	—
SUS440C	440C	—

● Austenitic Stainless Steels

JIS	AISI	DIN
SUS201	201	—
SUS202	202	—
SUS301	301	X12CrNi17 7
SUS302	302	—
SUS302B	302B	—
SUS303	303	X10CrNiS18 9
SUS303Se	303Se	—
SUS304	304	X5CrNiS18 10
SUS304L	304L	X2CrNi19 11
SUS304NI	304N	—
SUS305	305	X5CrNi18 12
SUS308	308	—
SUS309S	309S	—
SUS310S	310S	—
SUS316	316	X5CrMo17 12 2
SUS316L	316L	X2CrNiMo17 13 2
SUS316N	316N	—
SUS317	317	—
SUS317L	317L	X2CrNiMo18 16 4
SUS321	321	X6CrNiTi18 10
SUS347	347	X6CrNiNb18 10
SUS384	384	—

● Heat Resisting Steels

SUH31	—	—
SUH35	—	—
SUH36	—	X53CrMnNi21 9
SUH37	—	—
SUH38	—	—
SUH309	309	—
SUH310	310	CrNi2520
SUH330	N08330	—

● Ferritic Heat Resisting Steels

SUH21	—	CrAl1205
SUH409	409	X6CrTi12
SUH446	446	—

● Martensitic Heat Resisting Steels

SUH1	—	X45CrSi9 3
SUH3	—	—
SUH4	—	—
SUH11	—	—
SUH600	—	—

■ Steel and Non-Ferrous Metal Symbols Chart

● Classifications and Symbols of Steels

Class	Material	Symbol	Code Description
Structural Steels	Rolled Steels for welded structures	SM	"M" for "Marine"-Usually used in welded marine structures
	Re-rolled Steels	SRB	"R" for "Re-rolled" and "B" for "Bar"
	Rolled Steels for general structures	SS	S for "Steel" and for "Structure"
	Light gauge sections for general structures	SSC	C for "Cold"
Steel Sheets	Hot rolled mild steel sheets / plates in coil form	SPH	P for "Plate" and "H" for "Hot"
Steel Tubes	Carbon steel tubes for piping	SGP	"GP" for "Gas Pipe"
	Carbon steel tubes for boiler and heat exchangers	STB	"T" for "Tube" and "B" for "Boiler"
	Seamless steel tubes for high pressure gas cylinders	STH	"H" for "High Pressure"
	Carbon steel tubes for general structures	STK	"K" for "Kozo"-Japanese word meaning "structure"
	Carbon steel tubes for machine structural uses	STKM	"M" for "Machine"
	Alloy steel tubes for structures	STKS	"S" for "Special"
	Alloy steel tubes for piping	STPA	"P" for "Piping" and "A" for "Alloy"
	Carbon steel tubes for pressure piping	STPG	"G" for "General"
	Carbon steel tubes for high temperature piping	STPT	"T" for "Temperatures"
	Carbon steel tubes for high pressure piping	STS	"S" after "SP" is abbreviation for "Special"
	Stainless steel tubes for piping	SUS-TP	"T" for "Tube" and "P" for "Piping"
Steel for Machine Structures	Carbon steels for machine structural uses	SxxC	"C" for "Carbon"
	Aluminium Chromium Molybdenum steels	SACM	"A" for "Al", "C" for "Cr" and "M" for "Mo"
	Chromium Molybdenum steels	SCM	"C" for "Cr" and "M" for "Mo"
	Chromium steels	SCr	"Cr" for "Chromium"
	Nickel Chromium steels	SNC	"N" for "Nickel" and "C"for "Chromium"
	Nickel Chromium Molybdenum steels	SNCM	"M" for "Molybdenum"
	Manganese steels for structural use Manganese Chromium steels	SMn SMnC	"Mn" for "Manganese" "C" for "Chromium"
Special Steels – Tool Steels	Carbon tool steels	SK	"K" for "Kogu"-Japanese word meaning "tool"
	Hollow drill steels	SKC	"C" for "Chisel"
	Alloy tool steel	SKS SKD SKT	S for "Special" D for "Die" T for "Tanzo"-Japanese word for "forging"
	High speed tool steels	SKH	"H" for "High speed"
Special Steels – Stainless Steels	Free cutting sulphuric steels	SUM	"M" for "Machinability"
	High Carbon Chromium bearing steels	SUJ	"J" for "Jikuuke"-Japanese word meaning "bearing"
	Spring steels	SUP	"P" for "Spring"
	Stainless Steels	SUS	"S" after "SU" is abbreviation for "Stainless"
Special Steels – Heat-resistant Steels	Heat-resistant steels	SUH	"U" for "Special Usage" and "H" for "Heat"
	Heat-resistant steel bars	SUH-B	"B" for "Bar"
	Heat-resistant steels sheets	SUHP	"P" for "Plate"
Forged Steels	Carbon steel forgings for general use	SF	"F" for "Forging"
	Carbon steel booms and billets for forgings	SFB	"B" for "Billet"
	Chromium Molybdenum steel forgings	SFCM	"C" for "Chromium" and "M" for "Molybdenum"
	Nickel Chromium Molybdenum steel forgings	SFNCM	"N" for "Nickel"
Cast Irons	Grey cast irons	FC	"F" for "Ferrous" and "C" for "Casting"
	Spherical graphite / Ductile cast irons	FCD	"D" for "Ductile"
	Blackheart malleable cast irons	FCMB	"M" for "Malleable" and "B" for "Black"
	Whiteheart malleable cast irons	FCMW	"W" for "White"
	Pearlite malleable cast irons	FCMP	"P" for "Pearlite"
Cast Steels	Carbon cast steels	SC	"C" for "Casting"
	Stainless cast steels	SCS	"S" for "Stainless"
	Heat-resistant cast steels	SCH	"H" for "Heat"
	High Manganese cast steels	SCMnH	"Mn" for "Manganese" and "H" for "High"

● Non-Ferrous Metals

Class	Material	Symbol
Copper and Copper Alloys	Copper and Copper alloys - Sheets, plates and strips	CxxxxP
		CxxxxPP
		CxxxxR
	Copper and Copper alloys - Welded pipes and tubes	CxxxxBD
		CxxxxBDS
		CxxxxBE
		CxxxxBF
Aluminium and Aluminium Alloys	Aluminium and Al alloys - Sheets, plates and strips	AxxxxP
		AxxxxPC
	Aluminium and Al alloys -Rods, bars, and wires	AxxxxBE
		AxxxxBD
		AxxxxW
	Aluminium and Al alloys-Extruded shapes	AxxxxS
	Aluminium and Al alloys forgings	AxxxxFD
		AxxxxFH
Magnesium Alloys	Magnesium alloy sheets and plates	MP
Nickel Alloys	Nickel-copper alloy sheets and plates	NCuP
	Nickel-copper alloy rods and bars	NCuB
Wrought Titanium	Titanium rods and bars	TB
Castings	Brass castings	YBsCx
	High strength Brass castings	HBsCx
	Bronze castings	BCx
	Phosphorus Bronze castings	PBCx
	Aluminium Bronze castings	AlBCx
	Aluminium alloy castings	AC
	Magnesium alloy castings	MC
	Zinc alloy die castings	ZDCx
	Aluminium alloy die castings	ADC
	Magnesium alloy die castings	MDC
	White metals	WJ
	Aluminium alloy castings for bearings	AJ
	Copper-Lead alloy castings for bearings	KJ

References

■ Hardness Scale Comparison Chart

● Approximate Corresponding Values for Steel Hardness on the Brinell Scale

Brinell Hardness 3,000kgf HB	Rockwell Hardness A Scale 60kgf brale HRA	Rockwell Hardness B Scale 100kgf 1/10in Ball HRB	Rockwell Hardness C Scale 150kgf brale HRC	Rockwell Hardness D Scale 100kgf brale HRD	Vickers Hardness 50kgf HV	Shore Hardness HS	Traverse Rupture Strength (GPa)
—	85.6	—	68.0	76.9	940	97	—
—	85.3	—	67.5	76.5	920	96	—
—	85.0	—	67.0	76.1	900	95	—
767	84.7	—	66.4	75.7	880	93	—
757	84.4	—	65.9	75.3	860	92	—
745	84.1	—	65.3	74.8	840	91	—
733	83.8	—	64.7	74.3	820	90	—
722	83.4	—	64.0	73.8	800	88	—
712	—	—	—	—	—	—	—
710	83.0	—	63.3	73.3	780	87	—
698	82.6	—	62.5	72.6	760	86	—
684	82.2	—	61.8	72.1	740	—	—
682	82.2	—	61.7	72.0	737	84	—
670	81.8	—	61.0	71.5	720	83	—
656	81.3	—	60.1	70.8	700	—	—
653	81.2	—	60.0	70.7	697	81	—
647	81.1	—	59.7	70.5	690	—	—
638	80.8	—	59.2	70.1	680	80	—
630	80.6	—	58.8	69.8	670	—	—
627	80.5	—	58.7	69.7	667	79	—
601	79.8	—	57.3	68.7	640	77	—
578	79.1	—	56.0	67.7	615	75	—
555	78.4	—	54.7	66.7	591	73	2.06
534	77.8	—	53.5	65.8	569	71	1.98
514	76.9	—	52.1	64.7	547	70	1.89
495	76.3	—	51.0	63.8	528	68	1.82
477	75.6	—	49.6	62.7	508	66	1.73
461	74.9	—	48.5	61.7	491	65	1.67
444	74.2	—	47.1	60.8	472	63	1.59
429	73.4	—	45.7	59.7	455	61	1.51
415	72.8	—	44.5	58.8	440	59	1.46
401	72.0	—	43.1	57.8	425	58	1.39
388	71.4	—	41.8	56.8	410	56	1.33
375	70.6	—	40.4	55.7	396	54	1.26
363	70.0	—	39.1	54.6	383	52	1.22
352	69.3	(110.0)	37.9	53.8	372	51	1.18
341	68.7	(109.0)	36.6	52.8	360	50	1.13
331	68.1	(108.5)	35.5	51.9	350	48	1.10
321	67.5	(108.0)	34.3	50.1	339	47	1.06
311	66.9	(107.5)	33.1	50.0	328	46	1.03
302	66.3	(107.0)	32.1	49.3	319	45	1.01
293	65.7	(106.0)	30.9	48.3	309	43	0.97
285	65.3	(105.5)	29.9	47.6	301	—	0.95
277	64.6	(104.5)	28.8	46.7	292	41	0.92
269	64.1	(104.0)	27.6	45.9	284	40	0.89
262	63.6	(103.0)	26.6	45.0	276	39	0.87
255	63.0	(102.0)	25.4	44.2	269	38	0.84
248	62.5	(101.0)	24.2	43.2	261	37	0.82
241	61.8	100.0	22.8	42.0	253	36	0.80
235	61.4	99.0	21.7	41.4	247	35	0.78
229	60.8	98.2	20.5	40.5	241	34	0.76
223	—	97.3	(18.8)	—	234	—	—
217	—	96.4	(17.5)	—	228	33	0.73
212	—	95.5	(16.0)	—	222	—	0.71
207	—	94.6	(15.2)	—	218	32	0.69
201	—	93.8	(13.8)	—	212	31	0.68
197	—	92.8	(12.7)	—	207	30	0.66
192	—	91.9	(11.5)	—	202	29	0.64
187	—	90.7	(10.0)	—	196	—	0.62
183	—	90.0	(9.0)	—	192	28	0.62
179	—	89.0	(8.0)	—	188	27	0.60
174	—	87.8	(6.4)	—	182	—	0.59
170	—	86.8	(5.4)	—	178	26	0.57
167	—	86.0	(4.4)	—	175	—	0.56
163	—	85.0	(3.3)	—	171	25	0.55
156	—	82.9	(0.9)	—	163	—	0.52
149	—	80.8	—	—	156	23	0.50
143	—	78.7	—	—	150	22	0.49
137	—	76.4	—	—	143	21	0.46
131	—	74.0	—	—	137	—	0.45
126	—	72.0	—	—	132	20	0.43
121	—	69.8	—	—	127	19	0.41
116	—	67.6	—	—	122	18	0.40
111	—	65.7	—	—	117	15	0.38

1) Figures within the ( ) are not commonly used
2) Rockwell A, C and D scales utilise a diamond brale
3) This chart was taken from the JIS Iron and Steel Handbook (1980)

■ Standard of Tapers

● Morse Taper

Fig. 1 With Tang Type

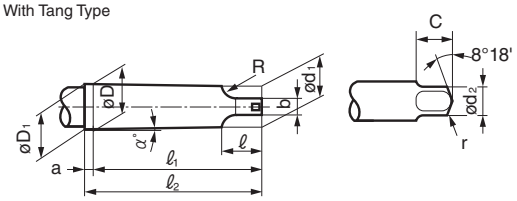
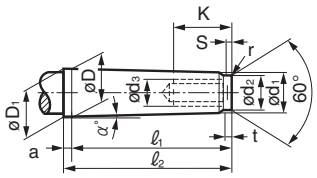


Fig. 2 Drawing Thread Type



(Units: mm)

Morse Taper Number	Taper(1)		Taper Angle (α)	Taper						Tang						Fig
				D	a	D₁(2) (Estimated)	d₁(2) (Estimated)	ℓ₁ (Max)	ℓ₂ (Max)	d₂ (Max)	b	C (Max)	e (Max)	R	r	
0	1/19.212	0.05205	1°29'27"	9.045	3	9.2	6.1	56.5	59.5	6.0	3.9	6.5	10.5	4	1	1
1	1/20.047	0.04988	1°25'43"	12.065	3.5	12.2	9.0	62.0	65.5	8.7	5.2	8.5	13.5	5	1.2	
2	1/20.020	0.04995	1°25'50"	17.780	5	18.0	14.0	75.0	80.0	13.5	6.3	10	16	6	1.6	
3	1/19.922	0.05020	1°26'16"	23.825	5	24.1	19.1	94.0	99.0	18.5	7.9	13	20	7	2	
4	1/19.245	0.05194	1°29'15"	31.267	6.5	31.6	25.2	117.5	124.0	24.5	11.9	16	24	8	2.5	
5	1/19.002	0.05263	1°30'26"	44.399	6.5	44.7	36.5	149.5	156.0	35.7	15.9	19	29	10	3	
6	1/19.180	0.05214	1°29'36"	63.348	8	63.8	52.4	210.0	218.0	51.0	19.0	27	40	13	4	
7	1/19.231	0.05200	1°29'22"	83.058	10	83.6	68.2	286.0	296.0	66.8	28.6	35	54	19	5	

Morse Taper Number	Taper(1)		Taper Angle (α)	Taper						Tang					Fig
				D	a	D₁(2) (Estimated)	d₁(2) (Estimated)	ℓ₁ (Max)	ℓ₂ (Max)	d₂ (Max)	d₃	K (Min)	t (Max)	r	
0	1/19.212	0.05205	1°29'27"	9.045	3	9.2	6.4	50	53	6	—	—	4	0.2	2
1	1/20.047	0.04988	1°25'43"	12.065	3.5	12.2	9.4	53.5	57	9	M 6	16	5	0.2	
2	1/20.020	0.04995	1°25'50"	17.780	5	18.0	14.6	64	69	14	M10	24	5	0.2	
3	1/19.922	0.05020	1°26'16"	23.825	5	24.1	19.8	81	86	19	M12	28	7	0.6	
4	1/19.254	0.05194	1°29'15"	31.267	6.5	31.6	25.9	102.5	109	25	M16	32	9	1	
5	1/19.002	0.05263	1°30'26"	44.399	6.5	44.7	37.6	129.5	136	35.7	M20	40	9	2.5	
6	1/19.180	0.05214	1°29'36"	63.348	8	63.8	53.9	182	190	51	M24	50	12	4	
7	1/19.231	0.05200	1°29'22"	83.058	10	83.6	70.0	250	260	65	M33	80	18.5	5	

(1) The fractional values are the taper standards.

(2) Diameters (D1) and (d1) are calculated from the values of (D) and other values of the taper. (values are rounded up to one decimal place).

Remarks 1. Tapers are measured using JIS B 3301 ring gauges. At least 75% must be correct.

2. Screws must have metric coarse screw thread as per JIS B 0205, and 3rd grade precision as per JIS B 0209.

● Bottle Grip Taper

● American Standard Taper (National Taper)

Fig 3

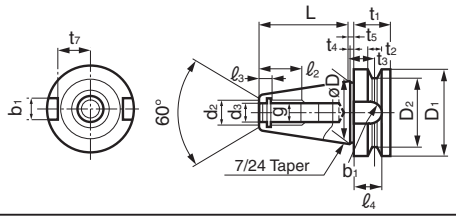
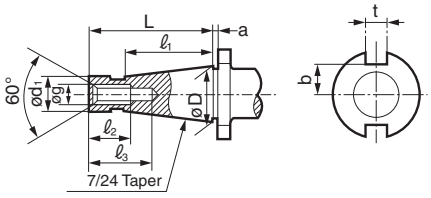


Fig 4



● Bottle Grip Taper

(Units: mm)

Taper No.	D (Standard)	D₁	D₂	t₁	t₂	t₃	t₄	t₅	d₂	d₃	L	ℓ₂	ℓ₃	ℓ₄	g	b₁	t₇	Fig
BT30	31.75	46	38	20	8	13.6	2	2	14	12.5	48.4	24	7	17	M12	16.1	16.3	3
BT35	38.10	53	43	22	10	14.6	2	2	14	12.5	56.4	24	7	20	M12	16.1	19.6	
BT40	44.45	63	53	25	10	16.6	2	2	19	17	65.4	30	8	21	M16	16.1	22.6	
BT45	57.15	85	73	30	12	21.2	3	3	23	21	82.8	36	9	26	M20	19.3	29.1	
BT50	69.85	100	85	35	15	23.2	3	3	27	25	101.8	45	11	31	M24	25.7	35.4	
BT60	107.95	155	135	45	20	28.2	3	3	33	31	161.8	56	12	34	M30	25.7	60.1	

● American Standard Taper (National Taper)

(Units: mm)

Taper No.	Nominal Diameter	D	d₁		L	ℓ₁(Min)	ℓ₂(Min)	ℓ₃(Min)	g	a	t	b	Fig
30	1 1/4"	31.750	17.4	−0.29 −0.36	68.4	48.4	24	34	1/2"	1.6	15.9	16	4
40	1 3/4"	44.450	25.3	−0.30 −0.384	93.4	65.4	32	43	5/8"	1.6	15.9	22.5	
50	2 3/4"	69.850	39.6	−0.31 −0.41	126.8	101.8	47	62	1"	3.2	25.4	35	
60	4 1/4"	107.950	60.2	−0.34 −0.46	206.8	161.8	59	76	1 1/4"	3.2	25.4	60	

■ Dimensional Tolerances for Regularly Used Fits [Taken from JIS B 0401 (1999)]

● Dimensional Tolerances for Regularly Used Shaft Fits

Units μm

Base Dimension (mm)		Tolerance Zone Class of Shaft																											
More than	Max.	b9	c9	d8	d9	e7	e8	e9	f6	f7	f8	g5	g6	h5	h6	h7	h8	h9	js5	js6	js7	k5	k6	m5	m6	n6	p6	r6	s6	t6	u6	x6
—	3	-140 -165	-60 -85	-20 -34	-20 -45	-14 -24	-14 -28	-14 -39	-6 -12	-6 -16	-8 -20	-2 -6	-2 -8	0 -4	0 -6	0 -10	0 -14	0 -25	±2	±3	±5	+4 0	+6 0	+6 +2	+8 +2	+10 +4	+12 +6	+16 +10	+20 +14	—	+24 +18	+26 +20
3	6	-140 -170	-70 -100	-30 -48	-30 -60	-20 -32	-20 -38	-20 -50	-10 -18	-10 -22	-10 -28	-4 -9	-4 -12	0 -5	0 -8	0 -12	0 -18	0 -30	±2.5	±4	±6	+6 +1	+9 +1	+9 +4	+12 +4	+16 +8	+20 +12	+23 +15	+27 +19	—	+31 +23	+36 +28
6	10	-150 -186	-80 -116	-40 -62	-40 -76	-25 -40	-25 -47	-25 -61	-13 -22	-13 -28	-13 -35	-5 -11	-5 -14	0 -6	0 -9	0 -15	0 -22	0 -36	±3	±4.5	±7.5	+7 +1	+10 +1	+12 +6	+15 +6	+19 +10	+24 +15	+28 +19	+32 +23	—	+37 +28	+43 +34
10	14	-150 -193	-95 -138	-50 -77	-50 -93	-32 -50	-32 -59	-32 -75	-16 -27	-16 -34	-16 -43	-6 -14	-6 -17	0 -8	0 -11	0 -18	0 -27	0 -43	±4	±5.5	±9	+9 +1	+12 +1	+15 +7	+18 +7	+23 +12	+29 +18	+34 +23	+39 +28	—	+44 +33	+51 +40
14	18																															+56 +45
18	24	-160 -212	-110 -162	-65 -98	-65 -117	-40 -61	-40 -73	-40 -92	-20 -33	-20 -41	-20 -53	-7 -16	-7 -20	0 -9	0 -13	0 -21	0 -33	0 -52	±4.5	±6.5	±10.5	+11 +2	+15 +2	+17 +8	+21 +8	+28 +15	+35 +22	+41 +28	+48 +35	—	+54 +41	+67 +54
24	30																													+54 +41	+61 +48	+77 +64
30	40	-170 -232	-120 -182	-80 -119	-80 -142	-50 -75	-50 -89	-50 -112	-25 -41	-25 -50	-25 -64	-9 -20	-9 -25	0 -11	0 -16	0 -25	0 -39	0 -62	±5.5	±8	±12.5	+13 +2	+18 +2	+20 +9	+25 +9	+33 +17	+42 +26	+50 +34	+59 +43	+64 +48	+76 +60	—
40	50	-180 -242	-130 -192																											+70 +54	+86 +70	
50	65	-190 -264	-140 -214	-100 -146	-100 -174	-60 -90	-60 -106	-60 -134	-30 -49	-30 -60	-30 -76	-10 -23	-10 -29	0 -13	0 -19	0 -30	0 -46	0 -74	±6.5	±9.5	±15	+15 +2	+21 +2	+24 +11	+30 +11	+39 +20	+51 +32	+60 +41	+72 +53	+85 +66	+106 +87	—
65	80	-200 -274	-150 -224																									+62 +43	+78 +59	+94 +75	+121 +102	
80	100	-220 -307	-170 -257	-120 -174	-120 -207	-72 -107	-72 -126	-72 -159	-36 -58	-36 -71	-36 -90	-12 -27	-12 -34	0 -15	0 -22	0 -35	0 -54	0 -87	±7.5	±11	±17.5	+18 +3	+25 +3	+28 +13	+35 +13	+45 +23	+59 +37	+73 +51	+93 +71	+113 +91	+146 +124	—
100	120	-240 -327	-180 -267																									+76 +54	+101 +79	+126 +104	+166 +144	
120	140	-260 -360	-200 -300	-145 -208	-145 -245	-85 -125	-85 -148	-85 -185	-43 -68	-43 -83	-43 -106	-14 -32	-14 -39	0 -18	0 -25	0 -40	0 -63	0 -100	±9	±12.5	±20	+21 +3	+28 +3	+33 +15	+40 +15	+52 +27	+68 +43	+88 +63	+117 +92	+147 +122	—	—
140	160	-280 -380	-210 -310																									+90 +65	+125 +100	+159 +134		
160	180	-310 -410	-230 -330																									+93 +68	+133 +108	+171 +146		
180	200	-340 -455	-240 -355	-170 -242	-170 -285	-100 -146	-100 -172	-100 -215	-50 -79	-50 -96	-50 -122	-15 -35	-15 -44	0 -20	0 -29	0 -46	0 -72	0 -115	±10	±14.5	±23	+24 +4	+33 +4	+37 +17	+46 +17	+60 +31	+79 +50	+106 +77	+151 +122	—	—	—
200	225	-380 -495	-260 -375																									+109 +80	+159 +130			
225	250	-420 -535	-280 -395																									+113 +84	+169 +140			
250	280	-480 -610	-300 -430	-190 -271	-190 -320	-110 -162	-110 -191	-110 -240	-56 -88	-56 -108	-56 -137	-17 -40	-17 -49	0 -23	0 -32	0 -52	0 -81	0 -130	±11.5	±16	±26	+27 +4	+36 +4	+43 +20	+52 +20	+66 +34	+88 +56	+126 +94	—	—	—	—
280	315	-540 -670	-330 -460																									+130 +98				
315	355	-600 -740	-360 -500	-210 -299	-210 -350	-125 -182	-125 -214	-125 -265	-62 -98	-62 -119	-62 -151	-18 -43	-18 -54	0 -25	0 -36	0 -57	0 -89	0 -140	±12.5	±18	±28.5	+29 +4	+40 +4	+46 +21	+57 +21	+73 +37	+98 +62	+144 +108	—	—	—	—
355	400	-680 -820	-400 -540																									+150 +114				
400	450	-760 -915	-440 -595	-230 -327	-230 -385	-135 -198	-135 -232	-135 -290	-68 -108	-68 -131	-68 -165	-20 -47	-20 -60	0 -27	0 -40	0 -63	0 -97	0 -155	±13.5	±20	±31.5	+32 +5	+45 +5	+50 +23	+63 +23	+80 +40	+108 +68	+166 +126	—	—	—	—
450	500	-840 -995	-480 -635																									+172 +132				

■ Dimensional Tolerances for Regularly Used Fits [Taken from JIS B 0401 (1999)]

● Dimensional Tolerances for Regularly Used Fits

Units μm

Base Dimension (mm)		Tolerance Zone Class of Hole																														
More than	Max.	B10	C9	C10	D8	D9	D10	E7	E8	E9	F6	F7	F8	G6	G7	H6	H7	H8	H9	H10	JS6	JS7	K6	K7	M6	M7	N6	N7	P6	P7	R7	S7	T7	U7	X7
—	3	+180 +140	+85 +60	+100 +60	+34 +20	+45 +20	+60 +20	+24 +14	+28 +14	+39 +14	+12 +6	+16 +6	+20 +6	+8 +2	+12 +2	+6 0	+10 0	+14 0	+25 0	+40 0	±3	±5	0 -6	0 -10	-2 -8	-2 -12	-4 -10	-4 -14	-6 -12	-6 -16	-10 -20	-14 -24	—	-18 -28	-20 -30
3	6	+188 +140	+100 +70	+118 +70	+48 +30	+60 +30	+78 +30	+32 +20	+38 +20	+50 +20	+18 +10	+22 +10	+28 +10	+12 +4	+16 +4	+8 0	+12 0	+18 0	+30 0	+48 0	±4	±6	+2 -6	+3 -9	-1 -9	0 -12	-5 -13	-4 -16	-9 -17	-8 -20	-11 -23	-15 -27	—	-19 -31	-24 -36
6	10	+208 +150	+116 +80	+138 +80	+62 +40	+76 +40	+98 +40	+40 +25	+47 +25	+61 +25	+22 +13	+28 +13	+35 +13	+14 +5	+20 +5	+9 0	+15 0	+22 0	+36 0	+58 0	±4.5	±7.5	+2 -7	+5 -10	-3 -12	0 -15	-7 -16	-4 -19	-12 -21	-9 -24	-13 -28	-17 -32	—	-22 -37	-28 -43
10	14	+220 +150	+138 +95	+165 +95	+77 +50	+93 +50	+120 +50	+50 +32	+59 +32	+75 +32	+27 +16	+34 +16	+43 +16	+17 +6	+24 +6	+11 0	+18 0	+27 0	+43 0	+70 0	±5.5	±9	+2 -9	+6 -12	-4 -15	0 -18	-9 -20	-5 -23	-15 -26	-11 -29	-16 -34	-21 -39	—	-26 -44	-33 -51
14	18																																		-38 -56
18	24	+244 +160	+162 +110	+194 +110	+98 +65	+117 +65	+149 +65	+61 +40	+73 +40	+92 +40	+33 +20	+41 +20	+53 +20	+20 +7	+28 +7	+13 0	+21 0	+33 0	+52 0	+84 0	±6.5	±10.5	+2 -11	+6 -15	-4 -17	0 -21	-11 -24	-7 -28	-18 -31	-14 -35	-20 -41	-27 -48	—	-33 -54	-46 -67
24	30																															-33 -54	-40 -61	-56 -77
30	40	+270 +170	+182 +120	+220 +120	+119 +80	+142 +80	+180 +80	+75 +50	+89 +50	+112 +50	+41 +25	+50 +25	+64 +25	+25 +9	+34 +9	+16 0	+25 0	+39 0	+62 0	+100 0	±8	±12.5	+3 -13	+7 -18	-4 -20	0 -25	-12 -28	-8 -33	-21 -37	-17 -42	-25 -50	-34 -59	-39 -64	-51 -76	—
40	50	+280 +180	+192 +130	+230 +130																												-45 -70	-61 -86	
50	65	+310 +190	+214 +140	+260 +140	+146 +100	+174 +100	+220 +100	+90 +60	+106 +60	+134 +60	+49 +30	+60 +30	+76 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	+74 0	+120 0	±9.5	±15	+4 -15	+9 -21	-5 -24	0 -30	-14 -33	-9 -39	-26 -45	-21 -51	-30 -60	-42 -72	-55 -85	-76 -106	—
65	80	+320 +200	+224 +150	+270 +150																											-32 -62	-48 -78	-64 -94	-91 -121	
80	100	+360 +220	+257 +170	+310 +170	+174 +120	+207 +120	+260 +120	+107 +72	+126 +72	+159 +72	+58 +36	+71 +36	+90 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	+87 0	+140 0	±11	±17.5	+4 -18	+10 -25	-6 -28	0 -35	-16 -38	-10 -45	-30 -52	-24 -59	-38 -73	-58 -93	-78 -113	-111 -146	—
100	120	+380 +240	+267 +180	+320 +180																											-41 -76	-66 -101	-91 -126	-131 -166	
120	140	+420 +260	+300 +200	+360 +200	+208 +145	+245 +145	+305 +145	+125 +85	+148 +85	+185 +85	+68 +43	+83 +43	+106 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	±12.5	±20	+4 -21	+12 -28	-8 -33	0 -40	-20 -45	-12 -52	-36 -61	-28 -68	-48 -88	-77 -117	-107 -147	—	—
140	160	+440 +280	+310 +210	+370 +210																											-50 -90	-85 -125	-119 -159		
160	180	+470 +310	+330 +230	+390 +230																											-53 -93	-93 -133	-131 -171		
180	200	+525 +340	+355 +240	+425 +240	+242 +170	+285 +170	+355 +170	+146 +100	+172 +100	+215 +100	+79 +50	+96 +50	+122 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	±14.5	±23	+5 -24	+13 -33	-8 -37	0 -46	-22 -51	-14 -60	-41 -70	-33 -79	-60 -106	-105 -151	—	—	—
200	225	+565 +380	+375 +260	+445 +260																											-63 -109	-113 -159			
225	250	+605 +420	+395 +280	+465 +280																											-67 -113	-123 -169			
250	280	+690 +480	+430 +300	+510 +300	+271 +190	+320 +190	+400 +190	+162 +110	+191 +110	+240 +110	+88 +56	+108 +56	+137 +56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+130 0	+210 0	±16	±26	+5 -27	+16 -36	-9 -41	0 -52	-25 -57	-14 -66	-47 -79	-36 -88	-74 -126		—	—	—	—
280	315	+750 +540	+460 +330	+540 +330																											-78 -130				
315	355	+830 +600	+500 +360	+590 +360	+299 +210	+350 +210	+440 +210	+182 +125	+214 +125	+265 +125	+98 +62	+119 +62	+151 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+140 0	+230 0	±18	±28.5	+7 -29	+17 -40	-10 -46	0 -57	-26 -62	-16 -73	-51 -87	-41 -98	-87 -144		—	—	—	—
355	400	+910 +680	+540 +400	+630 +400																											-93 -150				
400	450	+1010 +760	+595 +440	+690 +440	+327 +230	+385 +230	+480 +230	+198 +135	+232 +135	+290 +135	+108 +68	+131 +68	+165 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+155 0	+250 0	±20	±31.5	+8 -32	+18 -45	-10 -50	0 -63	-27 -67	-17 -80	-55 -95	-45 -108	-103 -166		—	—	—	—
450	500	+1090 +840	+635 +480	+730 +480																											-109 -172				

References

■ Dimensional Tolerances and Fits [Taken from JIS B 0401 (1999)]

● Standard Hole Fit for Regular Use

Standard Hole	Tolerance Zone Class of Shaft																
	Clearance Fit							Transition Fit			Interference Fit						
H6						g5	h5	js5	k5	m5							
					f6	g6	h6	js6	k6	m6	n6*	p6*					
H7					f6	g6	h6	js6	k6	m6	n6	p6*	r6*	s6	t6	u6	x6
				e7	f7		h7	js7									
H8					f7		h7										
				e8	f8		h8										
			d9	e9													
H9			d8	e8			h8										
		c9	d9	e9			h9										
H10	b9	c9	d9														

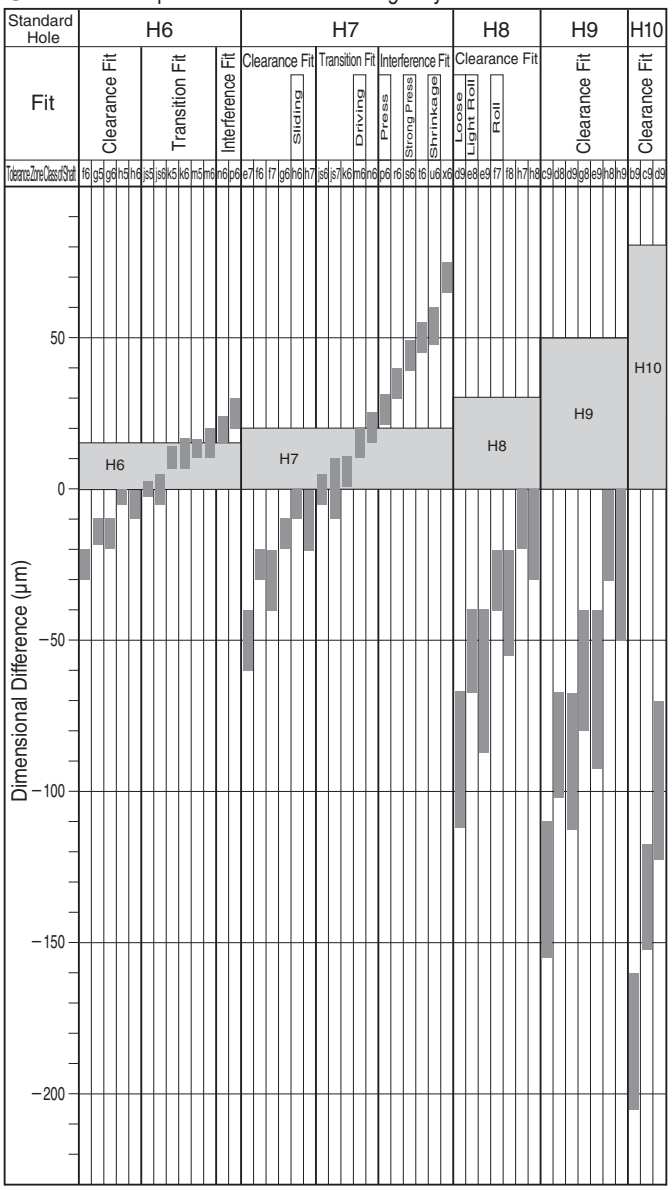
Note: These fittings produce exceptions depending on dimension category.

● Standard Shaft Fit for Regular Use

Standard Shaft	Tolerance Zone Class of Hole																
	Clearance Fit							Transition Fit			Interference Fit						
h5							H6	JS6	K6	M6	N6*	P6					
h6					F6	G6	H6	JS6	K6	M6	N6	P6*					
					F7	G7	H7	JS7	K7	M7	N7	P7*	R7	S7	T7	U7	X7
h7				E7	F7		H7										
					F8		H8										
h8			D8	E8	F8		H8										
			D9	E9			H9										
h9			D8	E8			H8										
		C9	D9	E9			H9										
	B10	C10	D10														

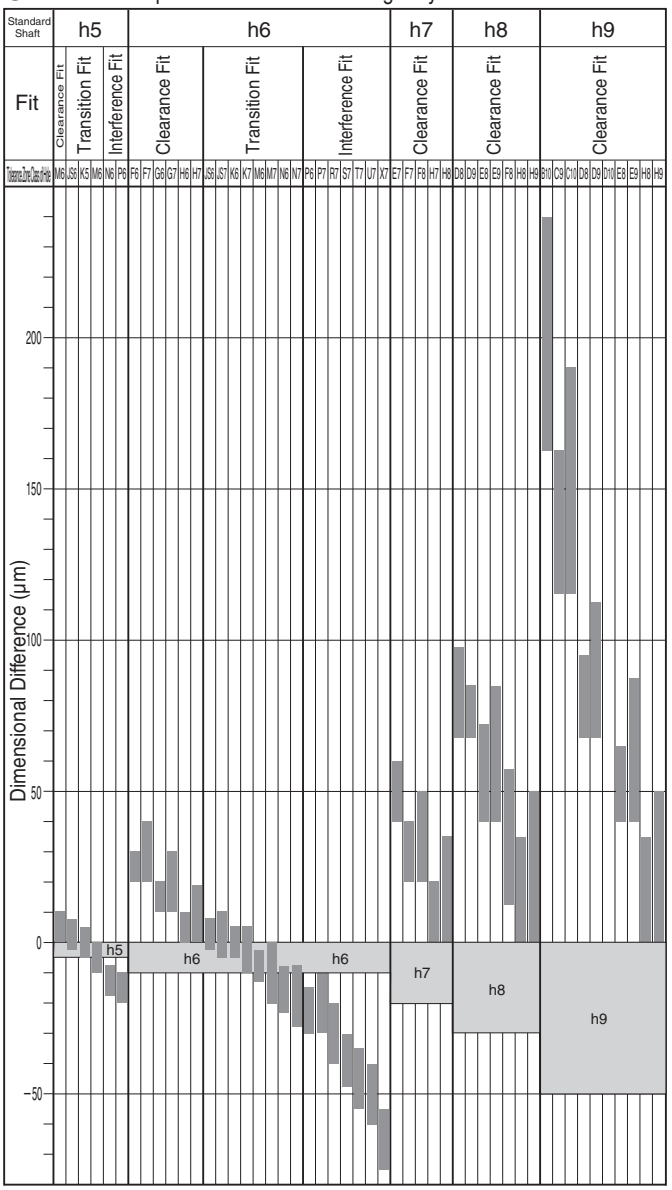
Note: These fittings produce exceptions depending on dimension category.

● Interrelationship of Tolerance Zones for Regularly Used Standard Hole Fits



Note: The above table is for standard dimensions of more than 18 mm and less than or equal to 30 mm.

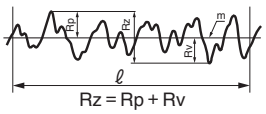
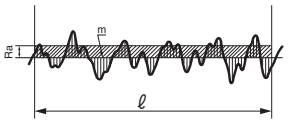
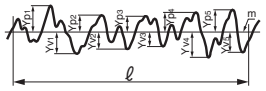
● Interrelationship of Tolerance Zones for Regularly Used Standard Shaft Fits



Note: The above table is for standard dimensions of more than 18 mm and less than or equal to 30 mm.

■ Finished Surface Roughness

● Types and Definitions of Typical Surface Roughness

Types	Symbol	Method of Determination	Descriptive Figure
Maximum Height	*1) Rz	This is the value expressed in micrometers (μm), obtained by extracting from the roughness curve a segment of the reference length in the direction of the mean line and measuring the distance from the d eepest valley to the highest peak of the extracted segment in the direction of the longitudinal magnification of that roughness curve. Remarks: When obtaining Rz, care must be taken to extract a segment of the reference length from a portion having no unusually high peaks and deep valleys as they are considered as flaws.	 Rz = Rp + Rv
Calculated Roughness	Ra	This is the value expressed in micrometers (μm), obtained by extracting from the roughness curve a segment of the reference length in the direction of the mean line, plotting a roughness curve of y = f(x) with the X-axis set in the direction and the Y-axis set in the direction of the extracted segment, and using the following formula.	 $Ra=\frac{1}{\ell}\int_0^{\ell}\{f(x)\}dx$
Ten-point Mean Roughness	*2) RzJIS	This is the value expressed in micrometers (μm), obtained by extracting from the roughness curve a segment of the reference length in the direction of the mean line, measuring the heights of the highest to 5th highest peaks (Yp) as well as the heights of the deepest to 5th deepest valleys (Yv) in the direction of the longitudinal magnification of that mean line of the that roughness curve, and calculating the sum of the mean of the absolute values of Yp and that of Yv.	 $RzJIS=\frac{(Yp1+Yp2+Yp3+Yp4+Yp5)+(Yv1+Yv2+Yv3+Yv4+Yv5)}{5}$

Designated values of the above types of surface roughness, standard reference length values and the triangular symbol classifications are shown on the table on the right.

● Relationship with Triangular Symbols

Designated Values for *1) Rz	Designated Values for Ra	Designated Values for *2) RzJIS	Standard Reference Length Values, (mm)	Triangular* Symbols
(0.05) 0.1 0.2 0.4	(0.012) 0.025 0.05 0.10	(0.05) 0.1 0.2 0.4	0.25	▽▽▽▽
0.8	0.20	0.8		
1.6 3.2 6.3	0.40 0.80 1.6	1.6 3.2 6.3	0.8	▽▽▽
12.5 (18) 25	3.2 6.3	12.5 (18) 25	2.5	▽▽
(35) 50 (70) 100	12.5 25	(35) 50 (70) 100	8	▽
(140) 200 (280) 400 (560)	(50) (100)	(140) 200 (280) 400 (560)	—	—

Remarks: The designated values in the brackets do not apply unless otherwise stated.

* Due to the revision of JIS in 1994, the finishing symbols, triangular (▽) and wavy (~) symbols, were abolished.