ACE Hardware Zimbabwe

Reaming, Fits & Tolerances Chart

ISO 286 tolerance grades, hole and shaft limits, how to choose a fit, and reaming allowances.

Workshop Reference Charts
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Tolerance grades

ISO 286 tolerance grades - width of tolerance band in µm (0.001 mm)

Size mm	IT5	IT6	IT7	IT8	IT9	IT10	IT11
≤ 3	4	6	10	14	25	40	60
3 - 6	5	8	12	18	30	48	75
6 - 10	6	9	15	22	36	58	90
10 - 18	8	11	18	27	43	70	110
18 - 30	9	13	21	33	52	84	130
30 - 50	11	16	25	39	62	100	160
50 - 80	13	19	30	46	74	120	190
80 - 120	15	22	35	54	87	140	220
120 - 180	18	25	40	63	100	160	250
180 - 250	20	29	46	72	115	185	290
250 - 315	23	32	52	81	130	210	320
315 - 400	25	36	57	89	140	230	360
400 - 500	27	40	63	97	155	250	400

Hole and shaft limits

Hole limits (µm) - upper / lower

Size mm	H7	H8	H9	H11
≤ 3	+10 / 0	+14 / 0	+25 / 0	+60 / 0
3 - 6	+12 / 0	+18 / 0	+30 / 0	+75 / 0
6 - 10	+15 / 0	+22 / 0	+36 / 0	+90 / 0
10 - 18	+18 / 0	+27 / 0	+43 / 0	+110 / 0
18 - 30	+21 / 0	+33 / 0	+52 / 0	+130 / 0
30 - 50	+25 / 0	+39 / 0	+62 / 0	+160 / 0
50 - 80	+30 / 0	+46 / 0	+74 / 0	+190 / 0
80 - 120	+35 / 0	+54 / 0	+87 / 0	+220 / 0
120 - 180	+40 / 0	+63 / 0	+100 / 0	+250 / 0
180 - 250	+46 / 0	+72 / 0	+115 / 0	+290 / 0
250 - 315	+52 / 0	+81 / 0	+130 / 0	+320 / 0
315 - 400	+57 / 0	+89 / 0	+140 / 0	+360 / 0
400 - 500	+63 / 0	+97 / 0	+155 / 0	+400 / 0

Shaft limits (µm) - upper / lower

Size mm	d9	f7	g6	h6	k6	n6	p6
≤ 3	-20 / -45	-6 / -16	-2 / -8	0 / -6	+6 / 0	+10 / +4	+12 / +6
3 - 6	-30 / -60	-10 / -22	-4 / -12	0 / -8	+9 / +1	+16 / +8	+20 / +12
6 - 10	-40 / -76	-13 / -28	-5 / -14	0 / -9	+10 / +1	+19 / +10	+24 / +15
10 - 18	-50 / -93	-16 / -34	-6 / -17	0 / -11	+12 / +1	+23 / +12	+29 / +18
18 - 30	-65 / -117	-20 / -41	-7 / -20	0 / -13	+15 / +2	+28 / +15	+35 / +22
30 - 50	-80 / -142	-25 / -50	-9 / -25	0 / -16	+18 / +2	+33 / +17	+42 / +26
50 - 80	-100 / -174	-30 / -60	-10 / -29	0 / -19	+21 / +2	+39 / +20	+51 / +32
80 - 120	-120 / -207	-36 / -71	-12 / -34	0 / -22	+25 / +3	+45 / +23	+59 / +37
120 - 180	-145 / -245	-43 / -83	-14 / -39	0 / -25	+28 / +3	+52 / +27	+68 / +43
180 - 250	-170 / -285	-50 / -96	-15 / -44	0 / -29	+33 / +4	+60 / +31	+79 / +50
250 - 315	-190 / -320	-56 / -108	-17 / -49	0 / -32	+36 / +4	+66 / +34	+88 / +56
315 - 400	-210 / -350	-62 / -119	-18 / -54	0 / -36	+40 / +4	+73 / +37	+98 / +62
400 - 500	-230 / -385	-68 / -131	-20 / -60	0 / -40	+45 / +5	+80 / +40	+108 / +68

Worked example - 25 H7/g6: hole H7 for 18 – 30 mm = +21 / 0 µm → 25.000 – 25.021 mm. Shaft g6 = −7 / −20 µm → 24.980 – 24.993 mm. Clearance is 0.007 to 0.041 mm.

Fits and reaming

Choosing a fit (hole-basis)

Fit	Type	Assembly	Typical use
H11/c11, H9/d9	Loose clearance	Free by hand, large gap	Loose pins, agricultural and rough machinery
H8/f7	Running clearance	Turns freely, oil film	Plain bearings, shafts in bushes, pump shafts
H7/g6	Sliding clearance	Slides and turns with little play	Spigots, sliding gears, guided pins, piston-type fits
H7/h6	Locational clearance	Slides on by hand when oiled	Locating fits, gears and pulleys held by keys
H7/k6	Transition	Light mallet tap	Gears, pulleys, couplings; bearing seats with steady load
H7/n6	Transition (tight)	Press or heavy tap	Locating pins, bushes, motor shafts in rotors
H7/p6	Interference	Press or shrink fit	Bushes and sleeves that must not move; transmit torque without a key

Reaming allowance (machine reaming)

Reamer Ø mm	Stock to leave on diameter	Example: drill before reaming
up to 5	0.1 - 0.2 mm	4 mm reamer → 3.8 mm drill
5 - 10	0.2 mm	8 mm reamer → 7.8 mm drill
10 - 20	0.2 - 0.3 mm	12 mm → 11.8; 16 mm → 15.7 mm drill
20 - 30	0.3 - 0.4 mm	25 mm reamer → 24.6 mm drill
30 - 50	0.4 - 0.5 mm	40 mm reamer → 39.5 mm drill

Reaming tips

- Run the reamer at about **half to two-thirds** of the drilling speed for the same size, and feed at **2 – 3 times** the drilling feed. Too slow a feed rubs, glazes the hole and wears the reamer.
- Too little stock also rubs. Too much overloads the reamer and gives an oversize, rough hole.
- For an accurate position, spot and drill, then bore or use a slightly undersize drill so the reamer follows a straight hole.
- Use cutting oil on steel. Ream cast iron and brass dry or with air.
- Never turn a reamer backwards, even when withdrawing it: it chips the edges.
- Hand reamers need 0.05 – 0.1 mm stock only. Use a tap wrench, keep the reamer square and turn steadily.
- Standard machine reamers produce H7 holes in good conditions. Check the first hole with a plug gauge.

Guide values for general workshop use. Always follow the equipment or fastener maker's figure where one is given, and check critical work against the relevant standard.

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