WORKSHOP REFERENCE · 07

ISO Fits & Tolerances

Limit deviations for the most used hole and shaft tolerances, standard IT grades, and how to choose a fit.

Hole tolerances

upper / lower deviation in µm · ISO 286-2

Size mm over – incl.	H6	H7	H8	H9	H11	F7	G7	K7	M7	N7	P7
– 3	+6 0	+10 0	+14 0	+25 0	+60 0	+16 +6	+12 +2	0 −10	−2 −12	−4 −14	−6 −16
3 – 6	+8 0	+12 0	+18 0	+30 0	+75 0	+22 +10	+16 +4	+3 −9	0 −12	−4 −16	−8 −20
6 – 10	+9 0	+15 0	+22 0	+36 0	+90 0	+28 +13	+20 +5	+5 −10	0 −15	−4 −19	−9 −24
10 – 18	+11 0	+18 0	+27 0	+43 0	+110 0	+34 +16	+24 +6	+6 −12	0 −18	−5 −23	−11 −29
18 – 30	+13 0	+21 0	+33 0	+52 0	+130 0	+41 +20	+28 +7	+6 −15	0 −21	−7 −28	−14 −35
30 – 50	+16 0	+25 0	+39 0	+62 0	+160 0	+50 +25	+34 +9	+7 −18	0 −25	−8 −33	−17 −42
50 – 80	+19 0	+30 0	+46 0	+74 0	+190 0	+60 +30	+40 +10	+9 −21	0 −30	−9 −39	−21 −51
80 – 120	+22 0	+35 0	+54 0	+87 0	+220 0	+71 +36	+47 +12	+10 −25	0 −35	−10 −45	−24 −59
120 – 180	+25 0	+40 0	+63 0	+100 0	+250 0	+83 +43	+54 +14	+12 −28	0 −40	−12 −52	−28 −68
180 – 250	+29 0	+46 0	+72 0	+115 0	+290 0	+96 +50	+61 +15	+13 −33	0 −46	−14 −60	−33 −79
250 – 315	+32 0	+52 0	+81 0	+130 0	+320 0	+108 +56	+69 +17	+16 −36	0 −52	−14 −66	−36 −88
315 – 400	+36 0	+57 0	+89 0	+140 0	+360 0	+119 +62	+75 +18	+17 −40	0 −57	−16 −73	−41 −98
400 – 500	+40 0	+63 0	+97 0	+155 0	+400 0	+131 +68	+83 +20	+18 −45	0 −63	−17 −80	−45 −108

Shaft tolerances

upper / lower deviation in µm · ISO 286-2

Size mm over – incl.	d9	e8	f7	g6	h6	h7	h9	h11	js6	k6	m6	n6	p6
– 3	−20 −45	−14 −28	−6 −16	−2 −8	0 −6	0 −10	0 −25	0 −60	+3 −3	+6 0	+8 +2	+10 +4	+12 +6
3 – 6	−30 −60	−20 −38	−10 −22	−4 −12	0 −8	0 −12	0 −30	0 −75	+4 −4	+9 +1	+12 +4	+16 +8	+20 +12
6 – 10	−40 −76	−25 −47	−13 −28	−5 −14	0 −9	0 −15	0 −36	0 −90	+4.5 −4.5	+10 +1	+15 +6	+19 +10	+24 +15
10 – 18	−50 −93	−32 −59	−16 −34	−6 −17	0 −11	0 −18	0 −43	0 −110	+5.5 −5.5	+12 +1	+18 +7	+23 +12	+29 +18
18 – 30	−65 −117	−40 −73	−20 −41	−7 −20	0 −13	0 −21	0 −52	0 −130	+6.5 −6.5	+15 +2	+21 +8	+28 +15	+35 +22
30 – 50	−80 −142	−50 −89	−25 −50	−9 −25	0 −16	0 −25	0 −62	0 −160	+8 −8	+18 +2	+25 +9	+33 +17	+42 +26
50 – 80	−100 −174	−60 −106	−30 −60	−10 −29	0 −19	0 −30	0 −74	0 −190	+9.5 −9.5	+21 +2	+30 +11	+39 +20	+51 +32
80 – 120	−120 −207	−72 −126	−36 −71	−12 −34	0 −22	0 −35	0 −87	0 −220	+11 −11	+25 +3	+35 +13	+45 +23	+59 +37
120 – 180	−145 −245	−85 −148	−43 −83	−14 −39	0 −25	0 −40	0 −100	0 −250	+12.5 −12.5	+28 +3	+40 +15	+52 +27	+68 +43
180 – 250	−170 −285	−100 −172	−50 −96	−15 −44	0 −29	0 −46	0 −115	0 −290	+14.5 −14.5	+33 +4	+46 +17	+60 +31	+79 +50
250 – 315	−190 −320	−110 −191	−56 −108	−17 −49	0 −32	0 −52	0 −130	0 −320	+16 −16	+36 +4	+52 +20	+66 +34	+88 +56
315 – 400	−210 −350	−125 −214	−62 −119	−18 −54	0 −36	0 −57	0 −140	0 −360	+18 −18	+40 +4	+57 +21	+73 +37	+98 +62
400 – 500	−230 −385	−135 −232	−68 −131	−20 −60	0 −40	0 −63	0 −155	0 −400	+20 −20	+45 +5	+63 +23	+80 +40	+108 +68

Choosing a fit

hole-basis system

Fit	Type and typical use	Clearance at Ø25 µm
H9/d9	**Loose running** Wide clearance for slow, loose bearings, idler pulleys, rough parts.	+65 to +169
H8/f7	**Close running** Running fits on accurate machines at moderate speed: spindle and gearbox bearings.	+20 to +74
H7/g6	**Sliding** Parts that move and turn freely with little play: guides, spigots, slide valves.	+7 to +41
H7/h6	**Locational clearance** Snug fit that still assembles by hand: locating spigots, gears on shafts.	0 to +34
H7/k6	**Transition** Accurate location, light tap to assemble: couplings, bearing inner races.	−15 to +19
H7/n6	**Transition, tight** Firmer location, press or mallet: gears and pulleys with keys.	−28 to +6
H7/p6	**Light press** Interference for parts that must not move: bushes, dowels, bearing housings.	−35 to −1

Positive figures are clearance, negative figures are interference. Ø25 sits in the 18–30 mm range.

Standard tolerance grades

IT grade in µm

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

Reading the table

Ø25 H7 hole: 25.000 – 25.021
Ø25 g6 shaft: 24.980 – 24.993

Add the deviations to the nominal size. Capital letters are holes, lower case are shafts. The number is the IT grade: smaller means tighter.

Values per ISO 286-1 and ISO 286-2 for nominal sizes up to 500 mm. Deviations in micrometres (µm); 1 µm = 0.001 mm. Clearances are calculated from the tabulated limits.

(08) 9345 2099 · sales@teravin.tools
19 Delawney Street, Balcatta WA 6021
A guide only. Always check against the tool maker's data and your machine and set-up, and talk to your Teravin sales engineer before relying on it. Terms: teravin.tools/terms