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ISO 286 Fits and Tolerances — H7, g6, k6 and the Common Fit Pairs (with Tables)

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IT tolerance values for IT6–IT11 by size range, what H7/g6, H7/k6, H7/p6 and other common ISO 286 fit pairs mean in practice, and clearance/interference numbers for the shaft-and-hole sizes used in bearings, bushings and couplings.

The system in one paragraph

ISO 286 describes a limit-and-fit system: a letter positions the tolerance zone relative to the nominal size (capital letters for holes, lower-case for shafts; H starts exactly at nominal and goes plus, h goes minus; letters before h/H give clearance, after give interference) and the IT number gives the width of the zone. Most machine design is hole-basis: the hole is H7 and the shaft letter chooses the fit.

IT grade values (µm)

Over–incl. (mm) | IT6 | IT7 | IT8 | IT9 | IT11 |

3–6 | 8 | 12 | 18 | 30 | 75 |

6–10 | 9 | 15 | 22 | 36 | 90 |

10–18 | 11 | 18 | 27 | 43 | 110 |

18–30 | 13 | 21 | 33 | 52 | 130 |

30–50 | 16 | 25 | 39 | 62 | 160 |

50–80 | 19 | 30 | 46 | 74 | 190 |

80–120 | 22 | 35 | 54 | 87 | 220 |

120–180 | 25 | 40 | 63 | 100 | 250 |

Common fit pairs and what they do

Fit | Character | Typical use | Ø25 example (µm) |

H7/g6 | Close running clearance | Bushes, sliding spindles, drylin liners | +7 … +41 clearance |

H7/h6 | Locational clearance | Spigots, covers, light press-by-hand | 0 … +34 clearance |

H7/k6 | Light transition | Ball-bearing inner rings on shafts, pulleys | " 15 … +19 |

H7/n6 | Firm transition | Gears, couplings that must not fret | " 28 … +6 |

H7/p6 | Light interference (press) | Bearing bushes in housings, dowel seats | " 35 … " 1 interference |

H7/s6 | Heavy interference (shrink) | Permanent hubs, valve-seat rings | " 56 … " 22 interference |

Example read-out, Ø25 H7/g6: the hole is 25.000/25.021, the shaft 24.980/24.993, so the assembly always slides with 7–41 µm clearance. Rolling-bearing seats have their own convention — rotating-load rings sit on k6/m6 shafts and stationary rings in H7/J7 housings; dimensions for the bearings themselves are in the deep-groove bearing chart (e.g. SKF 6205 ETN9), and plain-bearing shafts for polymer bushings follow h6–h9 as described by igus for its drylin ranges.

Measuring to grade

Verifying IT6–IT7 work needs instruments an order of magnitude finer than the tolerance: a 1 µm-reading bore gauge or micrometer for Ø25 H7 (21 µm zone). Digital calipers (±20–30 µm) only screen IT11 and coarser — see measuring and assembly tools and the calibration-class guide for tool accuracy classes.

Frequently asked questions

What is the tolerance of a 25 mm H7 hole?Ø25 H7 means +0/+21 µm: the hole must measure between 25.000 and 25.021 mm.What fit is H7/g6?A close running clearance fit — the shaft is always smaller than the hole by 7–41 µm at Ø25, suitable for bushes and sliding parts.Which shaft tolerance for a ball-bearing seat?For a rotating shaft load, k6 is the standard seat for small and medium deep-groove bearings (m6 for heavier duty); the housing is usually H7 when the outer ring is stationary.What is the difference between H7 and h7?Capital H is a hole zone starting at nominal and going plus; lower-case h is a shaft zone starting at nominal and going minus. Ø20 H7 = 20.000/20.021; Ø20 h7 = 19.979/20.000.Is H7/p6 a press fit?Yes — a light interference fit of roughly 1–35 µm at Ø25, assembled with a press or thermal differential, used for bushes and dowel seats.

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