

SAE 45° Flare Joints — Making Reliable Flares and Navigating the U1/UR/US/N/P Brass Fitting System

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The flare joint done right — cut, deburr, correct projection, torque — and a reference to the brass fitting designation system stocked in the catalogue: U1 half-unions, U2 unions, UR2/UR3 reducers, US4/US5 swivels, N5/NS4 nuts, P2/P3 plugs, E1/E2 elbows and T2 tees.

The joint itself

An SAE 45° flare seals metal-to-metal: the tube's flared cone clamped between fitting nose and nut. Its reliability is entirely workmanship:

Cut square with a sharp wheel cutter; renew worn wheels (spares: 206-FB screw, TC-1050 screw).

Deburr inside without coning the end; chips out (hold tube mouth-down).

Slip the nut on first — the eternal classic — then flare to the tool's stated projection so the cone fills the nut seat: thin flares split, over-deep flares wrinkle.

Inspect: even width, no cracks, no score lines; a drop of refrigeration oil on the cone's back (never on threads as a leak-stopper).

Torque per size with two wrenches — counterhold the fitting body. Finger-tight plus the maker's fraction-of-turn is the field method; a torque wrench settles disputes.

Flares that weep after thermal cycling were almost always under-projected or scored. Remake rather than muscle them: brass threads gall long before a bad cone seals.

The designation system

Prefix | Family | Stocked examples |

U1 | Half-union, male flare × male NPT | U1-6B 3/8"×1/4", U1-10E 5/8"×3/4" |

U2 | Union, flare both ends | U2-8 1/2", U2-12 3/4" |

UR2 | Reducing union, male × male | UR2-86 1/2"×3/8", UR2-108 |

UR3 | Reducing adapter, female × male | UR3-46, UR3-108 |

US4 / US5 | Swivel nuts / swivel-to-solder adapters | US4-06, US5-88 |

N5 / NS4 / NRS4 | Blanking nuts / forged nuts / reducing nuts | N5-6, NS4-6, NRS4-0064 |

P2 / P3 | Flare plugs / NPT plugs | P2-4, P3-B |

E1 / E2 | 90° elbows flare×NPT / flare×flare | E1-6B, E2-6 |

T2 | Equal flare tees | T2-6, T2-8 |

NFT5 / FAS | Flare caps / flare-solder adapters | NFT5-6 cap, FAS-4 |

The size digits are sixteenths of an inch (" 4 = 1/4", " 6 = 3/8", " 8 = 1/2", " 10 = 5/8", " 12 = 3/4"), with letter suffixes for the NPT end on U1/E1 (A = 1/8" ... E = 3/4"). NPT threads seal with an approved sealant on the taper (never on flare cones); flare ends seal dry.

Service kit logic

A van stocked with U2 unions in 1/4–5/8", UR3 step adapters, NS4 nuts, P2 plugs and N5 blanking nuts closes out the overwhelming majority of flare-side service: gauge ports capped (caps with seals), disconnected lines blanked (N5 includes gasketless versions — note the listing), adapters bridging the odd 5/16" appliance connection (UR2-54). Service valves with flare ports and piercing valves for retrofit access live alongside — see the access-port practice in the purge guide.

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