

# Stainless Steel 304 vs 316 — Composition, Corrosion Resistance and Marine Selection

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The real difference between AISI 304/A2 and 316/A4 stainless: composition, PREN, where each survives, when 316L is mandatory, duplex upgrades, and the equivalent designations across EN, ASTM and fastener classes.

## Composition and designations

Grade | EN | Fastener class | Cr % | Ni % | Mo % | PREN<sup>H</sup> |

304 | 1.4301 | A2 | 18–19.5 | 8–10.5 | — | 18–20 |

304L | 1.4307 | A2 (L) | 17.5–19.5 | 8–10.5 | — | 18–20 |

316 | 1.4401 | A4 | 16.5–18.5 | 10–13 | 2.0–2.5 | 24–26 |

316L | 1.4404 | A4 (L) | 16.5–18.5 | 10–13 | 2.0–2.5 | 24–26 |

Duplex 2205 | 1.4462 | — | 22–23 | 4.5–6.5 | 3.0–3.5 | 34–36 |

PREN (= %Cr + 3.3 × %Mo + 16 × %N) ranks resistance to pitting in chloride media: 304 <sup>H</sup> 19, 316 <sup>H</sup> 25, duplex 2205 <sup>H</sup> 35. The molybdenum in 316 is the whole story — it slows chloride pitting and crevice attack that 304 cannot resist.

## Where each grade survives

304 / A2: dry interiors, food plants, fresh water, inland atmospheres. On a ship it belongs inside — accommodation, dry stores. In coastal air it tea-stains; in seawater it pits.

316 / A4: splash zones, deck hardware, railing, fasteners outdoors near the sea — the default marine grade (see A2 bolt ranges for interior work and 316L/A4-80 jack bolts for cargo-area duty, plus 316 valves).

316L: the low-carbon (<sup>H</sup>0.03 % C) variant, mandatory where parts are welded and then exposed to corrosives — standard 316's carbon can sensitise the heat-affected zone and invite intergranular attack.

Not even 316: permanently immersed seawater at low flow, heated chloride media and tight crevices (under washers, in rope terminals) exceed 316's limits — that is duplex, super-duplex or 6Mo territory.

## Practical selection notes

Strength: A2-70 and A4-70 are mechanically identical (700 N/mm<sup>2</sup> tensile, 450 N/mm<sup>2</sup> proof) — A4 buys corrosion resistance, not strength; A4-80 adds strength (800/600 N/mm<sup>2</sup>). Magnetism is a poor field test: cold-worked 304 and 316 are both slightly magnetic. Galling: all austenitics gall — lubricate threads (see the torque chart's stainless section). Carbon steel contamination: grinding sparks and shared tooling embed free iron that rusts on the surface; pickle or passivate after fabrication. Cost difference 304!316 is typically 20–30 % — rarely worth optimising against on safety-relevant marine hardware.

### Frequently asked questions

What is the main difference between 304 and 316 stainless steel? 316 contains 2–2.5 % molybdenum, which raises its pitting resistance (PREN <sup>H</sup> 25 vs <sup>H</sup> 19) and makes it suitable for chloride and marine exposure where 304 pits. Are A2 and A4 bolts the same as 304 and 316? Yes in composition terms: A2 fasteners are 304-type and A4 are 316-type austenitic stainless; the -70/-80 suffix gives the strength class. When do I need 316L instead of 316? Whenever the component is welded and then exposed to corrosive service: the L (<sup>H</sup>0.03 % carbon) grade prevents sensitisation and intergranular corrosion at the weld zone. Is 316 stainless seawater-proof? It handles splash and spray zones well, but in stagnant or warm seawater immersion it suffers crevice and pitting attack — duplex 2205 or higher-alloyed grades are used there. Is the magnet test reliable for identifying 304 vs 316? No — both grades are austenitic and weakly magnetic when cold-worked; only composition (certificate or XRF analysis) separates them.

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