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"H |

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 "H 19, 316 "H 25, duplex 2205 "H 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 ("d0.03 % 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/mm² tensile, 450 N/mm² proof) — A4 buys corrosion resistance, not strength; A4-80 adds strength (800/600 N/mm²). 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 "H 25 vs "H 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 ("d0.03 % 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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