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which is the best stainless steel grade for a cast exhaust manifold application, 316L, 321 or 347?



For a cast exhaust manifold, **321 stainless steel or 347 stainless steel** are the superior choices due to their stability at high temperatures. Grade **316L** is not recommended for this application, as its strength decreases significantly when exposed to the high temperatures found in exhaust systems. [↗](#)

Comparison of stainless steel grades

Feature ↗	321 Stainless Steel	347 Stainless Steel	316L Stainless Steel
Primary Stabilizer	Titanium	Niobium (also known as Columbium)	Extra-low carbon content (L stands for Low)
High-Temperature Stability	Excellent, for prolonged exposure to temperatures up to 1,600°F (870°C). Prevents carbide precipitation and	Excellent, for service at temperatures up to 1,500°F (815°C). Prevents intergranular corrosion.	Poor. Continuous exposure to high temperatures (425–850°C) causes sensitization, leading to intergranular corrosion.

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construction.

temperature exhaust systems.

Corrosion Resistance

Good general resistance, but can show localized attack in aggressive or chloride-rich environments.

Offers excellent resistance to intergranular corrosion.

Superior resistance to pitting and crevice corrosion, especially in saltwater and chemical environments, due to molybdenum content.

Best For

Forced induction systems, aircraft collector rings, and heat exchangers that endure repeated thermal cycling.

High-temperature equipment, heavy-duty exhaust systems, and components in the petroleum and refinery industries.

Marine and harsh chemical environments, not exhaust manifolds.

Why 321 or 347 are better for exhaust manifolds

Exhaust manifolds are subjected to constant high temperatures and repeated thermal cycling, causing ordinary stainless steels to suffer from a process called sensitization. [↗](#)

- **Carbide precipitation:** When 300-series stainless steels are heated to between 800°F and 1500°F (427°C and 816°C), chromium carbides can form and migrate to the grain boundaries. This depletes the area of chromium, which is necessary for the

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market for automotive applications like turbo manifolds. [↗](#)

Why 316L is a poor choice

While 316L is a low-carbon grade with excellent corrosion resistance, this advantage does not apply to the high-heat demands of an exhaust manifold. [↗](#)

- **Marine vs. heat resistance:** The molybdenum in 316L provides superior resistance to saltwater and harsh chemicals, but it does not prevent the sensitization caused by exhaust temperatures. The "L" (low-carbon) designation helps with weldability at lower temperatures but is insufficient for continuous high-temperature use.
- **Risk of failure:** Using 316L for a high-temperature applicati manifold carries a significant risk of intergranular corrosion, failure. [↗](#)

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↳ What are the typical operating temps for exhaust manifolds?

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