

RENNLINE TITANIUM WHEEL HARDWARE

1. UNDERSTANDING TITANIUM WHEEL FASTENERS

Rennline titanium wheel studs and lug nuts are manufactured from 6Al-4V (Grade 5) titanium alloy, the same material used in aerospace and motorsport applications. Compared to factory steel hardware, titanium offers up to 40% weight savings while maintaining exceptional strength.

Material Specifications

6AL-4V TITANIUM PROPERTIES	
Tensile Strength	1,052 MPa
Yield Strength	977 MPa
Thread Pitch	M14 x 1.5
Weight Savings	Up to 35-40% vs. steel

Why Titanium Requires Special Care

Titanium's protective oxide layer makes it corrosion-resistant, but also makes it highly susceptible to **galling** (cold welding) when tightened against dissimilar metals without proper lubrication. Additionally, zinc residue from factory steel fasteners can cause stress cracking in titanium. Following this guide ensures safe, reliable installation.

2. WHAT IS GALLING & HOW TO PREVENT IT

Galling occurs when metal surfaces friction-weld together under pressure during tightening. The threads seize, damaging the fastener and potentially the hub. Titanium is especially prone to this because of how its oxide layer behaves under load.

Prevention Methods

✓ **Nickel-Based Anti-Seize** — The recommended lubricant for titanium. Nickel-based formulas are designed for reactive metals and rated for aerospace use. Apply to threads only.

✓ **High-Pressure Grease** — An acceptable alternative, especially for fasteners removed frequently. Provides galling protection with a more moderate effect on torque values.

✓ **Blue Loctite (Medium-Strength)** — Lubricates threads during installation and cures into a vibration-resistant locking compound. Good for fasteners you want to stay put.

✗ **Copper-Based Anti-Seize** — Do NOT use. Copper promotes galvanic corrosion when in contact with titanium and will damage the fastener over time.

✗ **No Lubrication** — Never install titanium fasteners dry. Galling can occur on the very first installation, permanently damaging threads.

✗ **Red Loctite (Permanent)** — Do not use permanent threadlocker on titanium wheel hardware. Removal requires heat that can compromise the fastener.

CRITICAL — Thread Lubrication Only: Apply anti-seize or lubricant to the **threads only**. Do NOT apply any lubricant to the ball seat, cone seat, or any seating surface where the lug nut contacts the wheel. The friction at the seat is what holds the wheel securely and prevents the fastener from loosening. Lubricating the seat makes torque readings unreliable and can lead to wheel loss.

3. PRE-INSTALLATION: PREPARING THE HUB

ZINC REMOVAL IS MANDATORY: Factory steel wheel bolts are zinc-plated. Zinc residue left in the hub threads reacts with titanium, causing fatigue and stress cracking of the titanium alloy. This step cannot be skipped.

- 1 Remove all factory hardware.** Extract the existing steel wheel bolts or studs from the hub.
- 2 Clean hub threads thoroughly.** Use an M14 x 1.5 thread chaser or a stiff nylon/brass brush with solvent (brake cleaner works well) to remove all traces of zinc plating, corrosion, and debris from the threaded holes in the hub.
- 3 Inspect the threads.** Visually confirm the hub threads are clean and undamaged. If threads are stripped or cross-threaded, repair with a proper thread insert before proceeding.
- 4 Clean the wheel mating surfaces.** Wipe down the hub face and the wheel bore/mating surface. Ensure the ball or cone seat pockets in the wheel are clean and free of corrosion or debris. These surfaces must remain **dry and unlubricated**.

4. STEP-BY-STEP INSTALLATION

A. Installing Titanium Wheel Studs (Bullet Nose Design — SKU# LS07T)

- 1 Apply anti-seize to the hub-side threads.** Put a thin coat of nickel-based anti-seize on the 15mm hub-side thread section of the stud.
- 2 Thread stud into hub by hand.** Start the stud into the hub thread by hand to ensure it is not cross-threading. The bullet-nose design allows the stud to self-center.
- 3 Use double-nut method to seat the stud.** Thread two lug nuts onto the stud, tightened against each other at their seats. Use the outer nut to torque the stud into the hub to approximately 30 ft-lbs.
- 4 Verify stud is fully seated.** Confirm the 8mm unthreaded shoulder sits flush against the brake rotor hat. Remove the two jam nuts.
- 5 Mount the wheel.** Slide the wheel onto the studs and start the lug nuts by hand.

- 6 **Apply anti-seize to lug nut threads.** Before threading each lug nut, apply a thin layer of nickel-based anti-seize to the wheel-side stud threads. Keep the ball seat area of the lug nut clean and dry.
- 7 **Hand-tighten all lug nuts first.** Thread each lug nut on by hand until snug. Never use an impact gun to start titanium fasteners.
- 8 **Torque in a star pattern.** Using a calibrated torque wrench, tighten the lug nuts in a star/cross pattern to the recommended torque value (see Section 5).
- 9 **Re-torque after 25-50 miles.** After the first drive, re-check all lug nut torque values.

B. Installing Titanium Lug Nuts (BMW — SKU# LS14)

- 1 **Verify seat type compatibility.** Ensure your lug nut seat type matches your wheel requirements — conical seat for most aftermarket wheels, ball (R14) seat for OEM Porsche wheels.
- 2 **Clean wheel stud threads.** Wipe down the existing wheel studs to remove any debris or old lubricant residue.
- 3 **Apply anti-seize to threads only.** Apply a thin coat of nickel-based anti-seize to the stud threads. Do NOT apply any lubricant to the conical or ball seat surface of the lug nut.
- 4 **Mount the wheel and hand-start all nuts.** Start each titanium lug nut by hand. Thread gently and slowly — never use power tools to start.
- 5 **Torque in a star pattern.** Tighten to the recommended value using a calibrated torque wrench (see Section 5).
- 6 **Re-torque after 25-50 miles.**

TIP — Slow and Steady: Titanium galling risk increases with installation speed. Always tighten slowly and steadily. If you feel sudden resistance or binding during threading, STOP immediately. Back the fastener out, inspect the threads, re-apply lubricant, and try again. Forcing a galled fastener will cause permanent damage.

5. TORQUE SPECIFICATIONS BY APPLICATION

IMPORTANT — Torque Reduction for Lubricated Threads: The OEM dry torque specifications below assume clean, dry, unlubricated threads. When using anti-seize or any thread lubricant, reduce the torque value by **10-15%** to achieve the correct clamping force. The "Titanium w/ Anti-Seize" column reflects this reduction. Using the full dry torque spec on lubricated threads risks over-stretching or snapping the fastener.

Porsche Applications (M14 x 1.5 — Ball Seat R14)

MODEL	CHASSIS CODES	OEM DRY TORQUE	TITANIUM W/ ANTI-SEIZE (-15%)
911 (2012+)	991 / 992	160 Nm / 118 ft-lbs	136 Nm / 100 ft-lbs
911 (Pre-2012)	996 / 997	130 Nm / 96 ft-lbs	110 Nm / 81 ft-lbs
Boxster / Cayman (2012+)	981 / 982 / 718	160 Nm / 118 ft-lbs	136 Nm / 100 ft-lbs
Boxster / Cayman (Pre-2012)	986 / 987	130 Nm / 96 ft-lbs	110 Nm / 81 ft-lbs
Cayenne	955/957 / 958 / 9Y0	160 Nm / 118 ft-lbs	136 Nm / 100 ft-lbs
Macan	95B	140 Nm / 103 ft-lbs	119 Nm / 88 ft-lbs
Panamera	970 / 971	160 Nm / 118 ft-lbs	136 Nm / 100 ft-lbs

BMW Applications (M14 x 1.25 or M14 x 1.5 — Conical Seat)

APPLICATION	THREAD	OEM DRY TORQUE	TITANIUM W/ ANTI-SEIZE (-15%)
Most Modern BMW (3/4/5/M Series, etc.)	M14 x 1.25	140 Nm / 103 ft-lbs	119 Nm / 88 ft-lbs
BMW with M14 x 1.5 Hubs	M14 x 1.5	140 Nm / 103 ft-lbs	119 Nm / 88 ft-lbs

ALWAYS verify your specific model's torque specification in the vehicle owner's manual. The values above are general guidelines. Some model years and special editions may differ. When in doubt, consult your Porsche or BMW dealer.

6. FREQUENTLY ASKED QUESTIONS

Q: Can I use an impact gun to install titanium lug nuts or studs?

No. Impact guns generate uncontrolled torque and high rotational speed, both of which dramatically increase galling risk with titanium. Always hand-thread first, then use a calibrated torque wrench for final tightening.

Q: Why can't I put anti-seize on the ball seat / cone seat?

The friction at the seating surface is what creates the clamping force that holds your wheel on. When you tighten a lug nut, approximately 50% of the applied torque is consumed by thread friction, roughly 40% by friction at the seat, and only about 10% actually stretches the bolt to create clamp load. Lubricating the seat throws off this relationship — your torque wrench reads "correct" but the actual clamping force may be dangerously high (risking fastener failure) or the fastener may loosen over time due to reduced seat friction.

Q: What if I feel sudden resistance while threading?

STOP immediately. This is a sign of galling or cross-threading. Back the fastener out carefully, inspect both the stud/bolt threads and lug nut threads for damage, re-apply lubricant, and try again slowly. Forcing a galled fastener will weld the threads together permanently.

Q: Do I need to re-torque after installation?

Yes. Re-torque all fasteners after 25-50 miles of driving. This is standard practice for any wheel fastener installation, not unique to titanium. Slight settling of the wheel-to-hub interface can reduce clamp load after the first drive.

Q: Is copper anti-seize acceptable for titanium?

No. Copper and titanium are far apart on the galvanic series, meaning copper anti-seize will promote galvanic corrosion on the titanium surface, especially in the presence of moisture. Use only nickel-based anti-seize. Products like SILCA Nickel Anti-Seize or Ti-Prep are formulated specifically for titanium.

Q: Can I reuse titanium studs and lug nuts?

Yes, titanium fasteners are designed for repeated installation and removal. Clean the threads and re-apply fresh anti-seize before each reinstallation. Inspect for any signs of galling damage before reuse.

Q: Why is zinc removal so important?

Factory steel wheel bolts are zinc-plated for corrosion protection. When zinc transfers to titanium threads, it can cause hydrogen embrittlement and stress corrosion cracking — both of which lead to sudden fastener failure without warning. Thoroughly clean hub threads before installing any titanium hardware.

Q: What seat type do I need?

OEM Porsche wheels use a ball seat (radius 14 / R14). Most aftermarket wheels use a conical (60 degree) seat. Using the wrong seat type will result in improper clamping and is extremely dangerous. Always verify with your wheel manufacturer.

7. QUICK REFERENCE CHECKLIST

BEFORE YOU BEGIN

- Hub threads cleaned of all zinc residue (thread chaser + solvent)
- Hub face and wheel mating surfaces clean and dry

Nickel-based anti-seize on hand (not copper-based)

Calibrated torque wrench available

Correct lug nut seat type confirmed (ball R14 vs. conical)

DURING INSTALLATION

Anti-seize applied to threads ONLY — seat is clean and dry

All fasteners started by hand (no impact gun)

Tightened slowly and steadily — stopped if binding felt

Torqued in star pattern to reduced specification (-15% from dry)

AFTER INSTALLATION

Re-torque all fasteners after 25-50 miles

Periodic inspection for any signs of loosening or corrosion