



WHITE PAPER: STAINLESS STEEL THREAD GALLING

HOLD THE CABLES. HUG THE RUNG.[®]

US 8,757,560 • CA 2,806,535 • Other Patents Pending

web: HugTheRung.com
phone: +1 985 956 7600

Executive Summary: Galling of stainless steel threaded fasteners is a common occurrence within the electrical industry. Galling occurs when excessive friction between mating threads erodes the oxide layer protecting the surface of the steel. The resulting thread damage delays the installation and increases cost. Although Talon[®] Cable Cleats are designed to minimize thread galling, understanding the phenomenon and applying the correct installation technique(s) greatly improves the chances for a problem-free installation.

Details: Although it affects aluminum and titanium, in the electrical industry, galling is most often encountered when installing threaded stainless steel fasteners. Stainless steels are characterized by a naturally-occurring surface oxide layer that protects the metal substrate. During fastener tightening, frictional heating occurs on the surfaces of the mating threads. If the friction is excessive, the protective oxides can break down, filling the threads with metal particles and exposing the unprotected threaded metal surfaces to one another. While galling initially results in binding. In extreme cases, galling can result in complete thread seizure. Changing installation technique(s) has proven to be the most effective solution for thread galling.

Primary Causes of Thread Galling (ranked from most frequent to least frequent):

1. Failure to follow Talon[®] Cable Cleat installation guides
2. Installation using impact wrenches, which are responsible for more galling complaints than any other cause and should not be used on stainless steel fasteners
3. Electric installation tools adjusted for high rotational-speed or high torque
4. Dirty threads (e.g. site debris accumulation)
5. Substituting stainless steel prevailing torque locknuts (e.g. nylon-insert locknuts, which are highly susceptible to thread galling)

Other Factors Contributing to Thread Galling:

- Failure to apply an appropriate anti-galling thread lubricant
- Applying excessive axial pressure on the flange nut while rotating
- High hardware temperatures (thermal expansion decreases the gap between threads)
- Damaged threads (contact Talon products immediately for warranty claims)
- Thread pitch and length (fine threads are more susceptible to galling than coarse threads; the longer the thread length, the greater the risk of thread galling)
- Installer training and experience (incidents of thread galling are frequently correlated to inexperienced staff, temporary workers, etc.)



Figure 1 – Thread Galling Example

Recommendations:

1. Follow the Talon[®] Cable Cleat Installation Guide
2. Store cable cleats in a clean, shaded and well-ventilated area
3. Utilize fasteners furnished by Talon Products
4. Ensure threads are clean and undamaged
5. Apply an appropriate anti-galling thread lubricant
6. Reduce the speed and torque of installation rotation
7. Limit the axial pressure applied during tightening
8. STOP if a fastener begins to bind
 - a) Wait at least 90 seconds for frictional heat to dissipate
 - b) SLOWLY disassemble and remove the fastener
 - c) Inspect internal and external threads for damage (do not reuse fasteners with damaged threads)
 - d) If threads are clean and undamaged, try again with a new nut

FAQ's:

Q: Does the occurrence of thread galling indicate faulty hardware?

A: Thread galling is typically an installation problem that can be mitigated through training and by modifying the installation technique. Faulty hardware can generally only be blamed if the fastener threads are damaged. Talon Products provides this white paper to educate specifiers and installers on the phenomenon of thread galling.

Q: What is the frequency of thread galling?

A: Despite the large number of Talon® cable cleats furnished with stainless steel gripping bolts, Talon Products receives an average of less than one customer complaint per year related to potential hardware galling. Talon® cable cleats are designed to minimize thread galling.

Q: Is thread galling predictable?

A: Talon Products' lab technicians are able to consistently replicate thread galling (e.g. using extreme measures that are contrary to the Talon® Cable Cleat Installation Guide) on stainless steel fasteners from any single hardware lot or combination of lots. However, when following the applicable Talon® Cable Cleat Installation Guide, our technicians are unable to effect thread galling.

Q: Can fasteners be inspected by the hardware manufacturer to minimize the occurrence of thread galling?

A: Since it isn't clear which material characteristics are most critical, hardware suppliers have not devised an inspection method to predict which fasteners may be susceptible to galling.

Q: If there is no axial load on the nut (e.g. nut is free-spinning on the bolt threads), can it still gall?

A: Galling does not usually occur when the connection can be pulled together without using the mechanical advantage of the threads (i.e. when there is no back-pressure on the nut). However, if the threads are damaged or dirty, the potential for galling is significantly increased.

Q: Is it possible to mix two different grades of stainless steel to eliminate thread galling?

A: Although some hardware suppliers recommend combining one grade of stainless steel bolt with another grade of nut will minimize thread galling, our experience differs. Talon Products' lab technicians have been able to gall threads when mixing two different grades of stainless steel.

Q: Is fastener size a significant factor for galling potential?

A: There is no correlation between the size of the fastener and the occurrence of galling.

Q: Is one type of thread more susceptible to galling?

A: The incidence of galling is higher with fine threads than coarse threads. Talon® cable cleat gripping hardware comprises coarse threads and is highly specified for strength, corrosion resistance and surface finish.

Q: Is one type of nut more susceptible to galling?

A: The incidence of galling is significantly higher with prevailing torque locknuts (e.g. nylon insert locknuts; distorted thread lock nuts) than with free-spinning nuts (e.g. flange nuts). Talon® cable cleats utilize ASTM specified stainless steel cap screws and flange nuts for optimum cable cleat security. When thread locking is desired, Talon Products recommends using an appropriate thread locking compound or jam nut.