Threaded Insert Troubleshooting Guide

Diagnostic Solutions for Optimal Installation Performance

a PennEngineering® Company

ABOUT SI®

SI® brand inserts provide strong, reusable, permanent threads in plastic assemblies across countless applications. Available in brass, stainless steel, and aluminum, SI inserts install via press-in, molded-in, or heat/ultrasonic installation methods.

How to Use this Guide:

- Have a problem? Jump to the related troubleshooting section
- Planning installation? Review the Pre-Installation Checklist
- Need quick answers? Use the Quick Reference chart

PRE-INSTALLATION CHECKLIST

✓ Hole Preparation

- Diameter: +0.003/-0.000 tolerance (press-in); verify specs by insert type
- Depth: Meet minimum per product tables (see catalog)
- Boss diameter: 2× insert diameter minimum
- Wall thickness: Adequate to prevent cracking

✓ Material & Insert Selection

- Confirm plastic compatibility with installation method
- Thread size matches assembly requirements
- Insert length provides adequate engagement
- Material (brass/stainless/aluminum) suits application environment

✓ Equipment Setup

- Ultrasonic: Horn properly coupled; equipment tuned
- Press-in: Adequate force available; proper tooling
- Molded-in: Core pins sized correctly; proper mold temperature

PREVENTION TIP:

Most failures trace to incorrect hole size or inadequate boss design. Verify your hole prep specifications first.

TROUBLESHOOTING: MECHANICAL PERFORMANCE

Insufficient Pull-Out or Torque Strength

ROOT CAUSE: Inadequate plastic flow around insert retention features can be caused by insufficient energy, oversized holes, or inadequate depth.

SOLUTIONS:

Ultrasonic/Heat-Staking:

- Increase weld time (0.1-0.2 sec increments)
- Increase amplitude (change booster ratio)
- Decrease pressure (allows more plastic flow time)
- Decrease down speed

All Methods:

- Verify hole is at minimum spec (not oversized)
- Increase hole depth
- Reduce screw length if bottoming out

QUICK FIX:

Oversized hole by 0.005” can reduce pull-out strength 30-40%. Check diameter first.

Partial Insertion / Insert Depth Issues

ROOT CAUSE: Insufficient force/energy, hole too small/shallow, fixturing misalignment, or equipment stroke limitation.

SOLUTIONS:

- Increase pressure or press force
- Increase weld time
- Decrease down speed
- Verify hole depth (minimum spec + 0.010" clearance)
- Check positive stop adjustment
- Inspect fixturing alignment
- Confirm adequate horn stroke

CRITICAL:
Proper installation leaves insert flush or max 0.005" (0.13mm) above surface. Never below surface.

Insert Jack-Out

ROOT CAUSE: Almost always design/assembly issue – the mating component clearance hole is larger than insert diameter, or insert is installed below surface.

SOLUTIONS:

- Increase hold time (allows plastic solidification)
- Verify mating component hole is larger than screw but smaller than insert diameter
- Check installation depth (flush or slightly proud)
- Consider flanged insert (IUTF series) for reverse-entry applications

ASSEMBLY DESIGN:
Jack-out is rarely an installation problem. Verify the mating component clearance hole is smaller than the insert's outer diameter to prevent pull-through.

TROUBLESHOOTING: INSTALLATION PROCESS

Excessive Cycle Time

ROOT CAUSE: Over-processing from excessive weld/hold time, high amplitude, or insert/hole mismatch.

SOLUTIONS:

- Decrease weld time (0.1-0.2 sec increments)
- Decrease hold time (typically 0.5-1.5 sec sufficient)
- Decrease amplitude
- Increase pressure
- Increase down speed
- Verify hole size (too small increases resistance)
- Check fixturing
- Assess power supply capacity

EFFICIENCY TIP:
Reduce cycle time by optimizing weld and hold times first. Small adjustments can improve throughput without compromising quality.

Noise / System Overloads

ROOT CAUSE: System overloads often indicate mechanical problems, not parameters. Inspect equipment assembly first.

NOISE SOLUTIONS:

- Start ultrasonics just before horn contacts insert
- Contact plastic rather than insert (if possible)
- Decrease amplitude
- Increase pressure and down speed
- Use sound enclosure/hearing protection

OVERLOAD SOLUTIONS:

- Decrease pressure, down speed, amplitude
- Tune power supply per manufacturer specs
- Check for loose studs in horn/booster/converter
- Inspect coupling integrity
- Verify power supply capacity is adequate for insert size

EQUIPMENT CHECK:
System overloads often indicate mechanical problems, not parameters. Inspect equipment assembly and coupling before adjusting settings.

TROUBLESHOOTING: MATERIAL/INTERFACE FAILURES

Plastic Cracks

ROOT CAUSE: Excessive stress from thin walls, fast insertion, high pressure, or inadequate ultrasonic energy.

SOLUTIONS:

- Ensure ultrasonics is ON before insertion
- Decrease pressure
- Increase weld time (ensures plastic softening)
- Decrease amplitude and down speed
- Decrease amplitude and down speed
- Enlarge hole diameter slightly (within tolerance)
- Design review: Verify walls meet minimum thickness (typically insert diameter × 0.5)

DESIGN CHECK:
If cracking persists after parameter optimization,
contact SI applications engineering at si@pemnet.com

Plastic Fills Threads

ROOT CAUSE: Molten plastic flows into insert threads during installation due to inadequate hole depth, insert/hole size mismatch, or insert too long for application.

SOLUTIONS:

- Increase hole depth to provide clearance for displaced plastic
- Verify insert is not too large or hole too small for application
- Check insert length against hole depth specification
- Review hole preparation: Bottom of hole should provide 0.010” minimum clearance beyond insert pilot end

PREVENTION TIP:
Always verify hole depth exceeds insert length by at least 0.010”.
Inadequate clearance is the #1 cause of thread filling.

Plastic Flows Over Insert

ROOT CAUSE: Excessive plastic displacement causes material to flow over the insert flange or top surface, potentially interfering with assembly or creating cosmetic issues.

SOLUTIONS:

- Adjust positive stop to limit insertion depth
- Decrease weld time to reduce plastic softening
- Verify insert size matches hole specification
- Check hole diameter: Oversized holes allow more plastic displacement

QUICK FIX:
Plastic overflow usually indicates excessive weld time or oversized hole.
Check hole diameter tolerance before adjusting other parameters.

Insert Damage

ROOT CAUSE: Insert threads damaged, knurls collapsed, or body deformed during installation due to excessive mechanical force or energy input.

SOLUTIONS:

- Decrease weld time to reduce energy input
- Decrease amplitude to lower vibration intensity
- Increase pressure for faster insertion with less total energy
- Increase down speed to reduce ultrasonic exposure time
- Verify insert material is appropriate for application (brass more susceptible to damage than stainless steel)

MATERIAL CONSIDERATION:
If brass inserts consistently damage, consider switching
to stainless steel inserts (IUC, IUTC, ISC series).

Horn Wear

ROOT CAUSE: Excessive horn temperature or wear indicates improper energy transfer or mechanical interference between horn and insert/plastic.

SOLUTIONS:

- Decrease amplitude to reduce vibration intensity and heat generation
- Air cool the horn with directed airflow
- Contact plastic rather than insert if horn design permits
- Check horn/booster/converter coupling for proper torque and alignment
- Use hardened steel or carbide-faced horn for abrasive plastics or high-volume applications
- Verify insert/hole sizing: Oversized inserts or undersized holes increase horn wear

MAINTENANCE:
For glass-filled or abrasive plastics, expect accelerated horn wear.
Schedule preventive horn replacement and keep hardened backup horns in inventory.

QUICK REFERENCE CHART

SYMPTOM	FIRST CHECK	PRIMARY SOLUTION
Low pullout/torque	Hole diameter	↑ Weld time, ↑ Amplitude
Partial insertion	Hole depth	↑ Pressure, Check fixturing
Jack-out	Mating part hole	↑ Hold time, Check assembly
Long cycle time	Weld/hold times	↓ Times, ↑ Pressure
Noise	Horn contact	Delay start, ↓ Amplitude
Overload	Equipment	↓ Pressure, Tune supply
Cracks	Boss thickness	↓ Pressure, ↑ Weld time
Thread fill	Hole depth	↑ Depth, Check clearance
Plastic overflow	Hole size	Adjust stop, ↓ Weld time
Insert damage	Energy input	↓ Weld time, ↓ Amplitude
Horn wear	Contact/material	↓ Amplitude, Harden horn

Legend: ↑ = Increase | ↓ = Decrease

RESOURCES & SUPPORT

SI PRODUCT CATALOG
Specifications, performance data, hole preparation guidelines

PRODUCT FINDER
Interactive tool for insert selection

COMPRESSION LIMITERS
Non-threaded inserts for compressive load applications

TECHNICAL SUPPORT
For application-specific questions and troubleshooting support, contact si@pemnet.com

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