

## VIBRATION RESISTANCE TESTING OF LOCKNUTS DIN 25201-4 ANNEX B *by Roy Motz*

### Introduction

All-metal locknuts attain their vibration or loosening resistance through a precision thread deformation process. This displaces some of the threads from their normal location and causes controlled thread interference when assembled with the mating bolt. The resulting prevailing torque must then be within the applicable torque range of IFI 100/107, 2002. These specs include proof loads, clamp loads and prevailing torque. It is assumed that if the locknuts meet the correct prevailing torque specs, adequate vibration resistance exists.

However, prevailing torque is not an adequate predictor of vibration resistance for bolted joints subject to dynamic transverse stresses. DIN standard 65151 covers the general test set-up.



### Vibration Verification

Locknut Technology has recently purchased a Junker test machine from Vibrationmaster to be able to carry out engineering verification tests. A locknut & test bolt are installed on the vibration tester and the nut is tightened to recommended clamp load. It is equipped with a computer screen to record all test parameters and results. The nut/bolt is then subjected to a rigorous test that simulates conditions found in actual bolted joints. Parameters measured include: starting clamp load of the tightened nut, amplitude, and the number of cycles to failure. Failure is defined as the joint losing more than 20% of its starting clamp load during the first 1200 cycles. The effectiveness of the locknut can then be judged from a graph of the pre-stressing force against a number of load cycles.

### Verification Tests

Six automation style locknuts were tested to compare performance. Three were manufactured by Locknut

Technology and three were Taiwan imports from different manufacturers, including the leading brand.

### Size & Description:

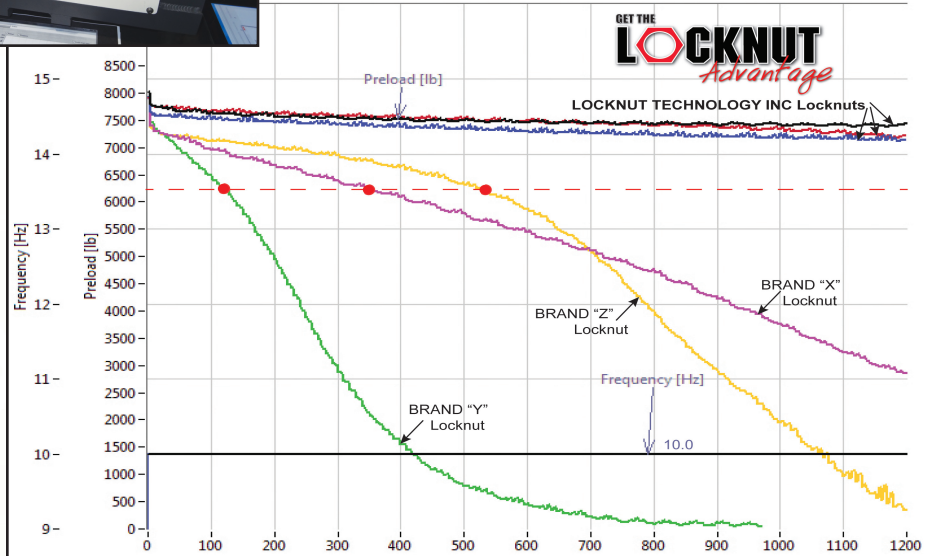
3/8-24 thread automation style locknuts, grade "C", plated & waxed

### Test identification codes:

Locknut Technology - L  
Taiwan import - X, Y, Z

### Test parameters:

Frequency (HZ) - 10.0  
Initial preload - 7,900 Lbs.  
Amplitude - 2mm  
Failure at - 6320 lbs



### Test Results

As can be seen by the test results in the accompanying graphical illustration, all locknuts are not created equal. All six locknuts tested met the prevailing torque specifications of IFI 100/107. However, actual vibration resistance was markedly different. None of the imported brands survived the rigorous Junkers vibration tests. Brand "Z" failed at approximately 550 cycles, brand "Y" failed at approximately 130 cycles and brand "X" failed at approximately 360 cycles. All 3 Locknut Technology locknuts passed with minimal loss of initial clamp load. 