INVAR TUNING ELEMENTS AND SCREWS

RoHS Compliant

OBJECTIVES:

Increasing demands in Tuning Elements for high frequency Space Applications pushed us to develop a range of tuning elements based on Invar. Nowadays, and especially in space applications, working frequencies are shifting to higher values. This requires very precise tuning elements matching with smaller cavity filters working in Ka, Ku or even Q bands. In order to provide an efficient response to those constraints, **EXXELIA** has developed an innovative and unrivaled solution: Invar Tuning Elements with Self-Locking System.

STATEMENT

Invar-36 is a unique alloy Iron-Nickel which has for main properties a very low thermal coefficient of expansion at a precise composition (64 % Fe / 36 % Ni).

With 1.1 ppm. K^{-1} between 0°C and 100°C, Invar-36 is about 17 times more stable than Brass which is the traditional and most used alloy to make Tuning Elements.

The working range of temperatures is so wide in Space that this property becomes essential for a reliable and stable cavity filter tuning.

Self-locking system is a technology commonly used on Tuning Element made of Brass or other alloys easy to machine.

This mechanism consists of two threaded segments separated by two parallel slots. After cutting the both parallel slots, the rotor is compressed in its length in order to create a plastic deformation. Thus, we have induced an offset between both threaded segments that generates a constant tensile stress in the rotor as soon as both threaded segments are screwed.

The spring effect created by the self-locking system has several advantages: controlled torque (no need to add a locking nut), high electrical contacts, size reduction and precision of the setting by avoiding any slack while tuning.

Our wide range of customer in aerospace and defence application are using our screws.

ABILITIES

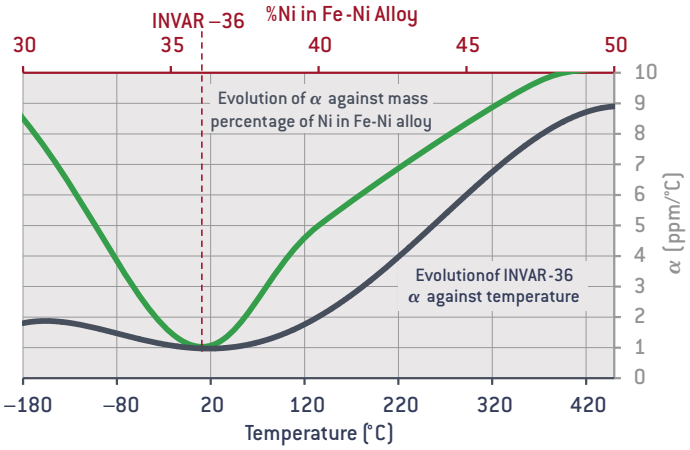
Despite the high difficulty to machine Invar, we are now able to manufacture a complete Invar rotor with self-locking system. All our Invar rotors are customized and made under specific request. Our flexibility and our experience with Invar allow us to now respond to almost every request.

Our common abilities are displayed in the below table, valid with or without self-locking system:

Beyond those values, we can make every intermediate diameters and even bigger than 2.0 mm. Given maximum lengths can be overtaken after a debug step.

If you need a complete Tuning Element with its bushing, we can design specific Brass or Invar bushing that will fit exactly with the Invar rotor. This will guarantee the best «setting drift» and therefore, the screwing torque will be perfectly controlled.

EXXELIA has a very long space history with numerous companies. This new range of product has already been qualified by some of them. We escort our customers from the earliest step of design-in to the industrialization and we are always ready to take up new challenges.



INVAR (ALLOY 36) TUNING ELEMENTS

The performance of a microwave filter over temperature is becoming more and more important, especially for narrow bandwidth high frequency filters.

Invar alloy offers very good Coefficient of Thermal Expansion (CTE) and can achieve the desired temperature characteristics.

This alloy can become difficult to machine especially with fine pitch threads. With more than 40 years experience, **EXXELIA** offers a complete range of standard products and is particularly able to work on specific request for custom designs with its prototyping dedicated team and R&D equipment.

EXXELIA has designed several types of invar screws in order to answer to specific request from customers. These screws are now “space” qualified as flight model for KA and Ku band filters. In some cases, the fine pitch resolution has halved the technician tuning time.

INVAR 36 TUNING SCREWS

Invar tuning elements consist of an Invar screw and its brass nut. Screw can be gold or silver plated. We can offer different size, style and types of head (hex, slotted, pan). The array below is an example of Invar tuning elements already designed and qualified for space applications.

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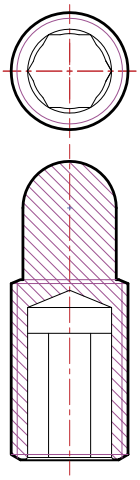
EXAMPLES INVAR TUNING SCREWS



APPLICATION RANGE

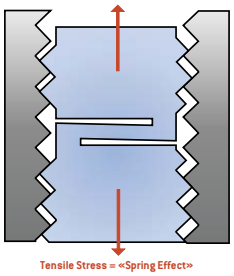
Diameter in mm (inches)	1.2- 3.5 (0.05- 0.14)
Thread in mm (inches)	0,25- 0.45 (0.01- 0.02)
Application	Microwave filters
Markets	Space Combine and inter-digital filters Coaxial structures Waveguide circuitry

CHARACTERISTICS

EXXELIA masters the challenging machining of Invar 36. This work of high precision allows you a fine tuning resolution with a high stability over the temperature and over the time (available with self-locking system). **EXXELIA** is able to produce customized design including options like gold or silver plating or Hi-Rel versions. Our Invar screws are “space” qualified as flight models for KA, Ku up to Q band filters.

FEATURES

Very low coefficient of thermal expansion (CTE) for demanding applications



Self-Locking System operating principle

EXAMPLES INVAR TUNING SCREWS

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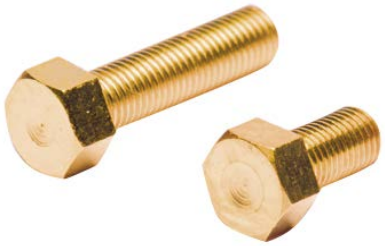

Can also be produced in aluminum

DESCRIPTION

High precision
High resolution tuning
Very low coefficient of thermal expansion
Available with gold or silver plating
Available with locking nut or “self locking system”
Adjustments in applications from Ka, KU, Q band and beyond
High Reliability versions are available on special order
Custom design upon request
RoHS compliant

APPLICATIONS

Comb-line and inter-digital filters
Coaxial structures
Waveguide circuitry
Space applications

MODELS AND DIMENSIONS

Metric Screws mm (inches)			
Ø diameter	**thread**	**length**	**tolerances**
M1.5	0.25 (0.01)	up to 5 (0,197)	6H
M2	0.25 (0.01)	up to 9 (0,354)	6H
M2	0.4 (0,016)	up to 9 (0,354)	6H
M2.5	0.25 (0.01)	up to 11 (0,433)	6H
M2.3	0.25 (0.01)	up to 11 (0,433)	6H
M2.5	0.45 (0,018)	up to 11 (0,433)	6H
M3.5	0.35 (0,0138)	up to 11 (0,433)	6H

Rotor diameter	Finest Thread	Max. Length	Tolerances
mm (inches)			
1.2 (0.05)	0.25 (0.01)	8 (0.31)	6H
1.5 (0.06)	0.25 (0.01)	9 (0.35)	6H
2.0 (0.08)	0.25 (0.01)	11 (0.43)	6H

Custom dimensions are available upon request

PACKAGING

Parts are delivered in bulk.

NOTES