

# Process Specification for the Installation of Helical Coil Inserts

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**Engineering Directorate**

**Structural Engineering Division**

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**Lyndon B. Johnson Space Center**  
Houston, Texas

# Process Specification for Installation of Helical Coil Inserts

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REVISIONS		
VERSION	CHANGES	DATE
Baseline	Original version	4/19/99
A	Changed Division name. Added information and requirements for specifying thread class in Usage section, and added verification requirement for proper class of tap to Process Verification section. Moved threadform verification requirement from Process Requirements to Process Verification Section. Moved Work Instructions from section 3.1 to section 6.1 and revised them, restructured section 6.	10/2004
B	Updated document numbers in Section 4.0 (References)	2/2007
C	Clarified the effect of fit on insert performance, made changes in the usage section, including a table for standard insert part numbers, added specification for metric insert installation, added requirements on hole countersinking and tang removal, and tightened up the verification requirements,	11/17/2010
D	Changes to Section 3.2 to clear up confusion with NASM and MS part numbering system.	4/18/2011
E	Updated signatures, added reference to PRC-4004, and added a removal and replacement section (6.3).	5/2020

## **1.0 SCOPE**

This process specification establishes the engineering requirements for the installation of helical coil inserts.

## **2.0 APPLICABILITY**

This specification shall be applicable whenever the installation of helical coil inserts is invoked per section 3.0, "Usage".

## **3.0 USAGE**

### **3.1 BACKGROUND:**

Helical coil inserts are made from a coil of wire with a diamond shaped cross section, which forms both internal and external threads. Typically, the inserts have a tang that is used to install the insert into tapped holes. After installation the tang is broken off and removed to allow the insert to accommodate threaded fasteners. Tangless inserts are also available, however they require special tooling for installation.

In their free state, helical coil inserts are larger than the tapped hole into which they are installed. During assembly, the insert is torqued so that it can be installed in the tapped hole. When the applied torque is removed, the coils expand to provide an interference fit with the tapped threads.

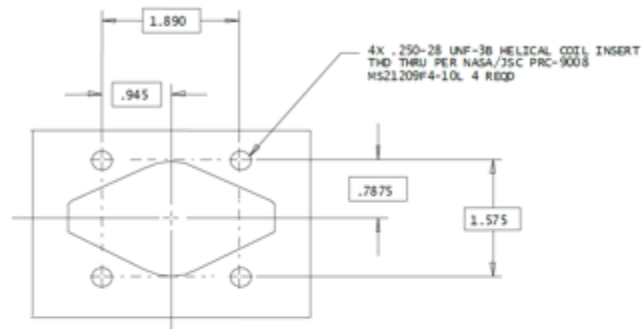
Holes for helical coil inserts are tapped with a special tap known as a Screw Thread Insert (STI) tap. Helical coil STI taps are available in both Class 2B and Class 3B fits. The class of fit of the tapped hole determines the class of fit of the assembled insert. There is only one class of fit for metric series inserts.

### **3.2 USAGE INSTRUCTIONS:**

Wet installation of inserts with corrosion preventative primer is standard for aluminum and dissimilar metal joints. However, in some design cases, (for example, very small helical coil inserts) the use of primer may not be recommended. The decision not to use sealant should be reviewed in advance with a Materials & Processes Engineer.

This process specification, insert part number, and thread class for helical coil inserts shall be specified on the engineering drawing using local notes, general notes, flag notes, or a combination thereof. Some examples of acceptable insert callouts are given in Figure 1 and Figure 2. These figures are guidelines and are not intended to be representative of every possible design concept.

Field of Drawing



General Notes

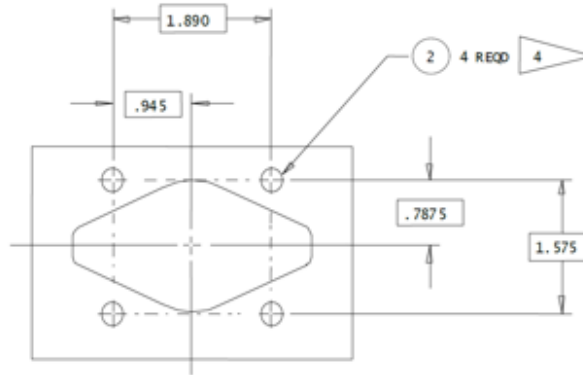
- INSTALL HELICAL COIL INSERTS PER NASA/JSC PRC-9008. SEAL WITH SUPER KOROPON EPOXY PRIMER PER NASA/JAC PRC-4004.

Parts List

AR	515-70 /910-704	SUPER KOROPON EPOXY PRIMER			3
4	MS21209F4-10L	INSERT			2
1	-001	BRACKET	7075-T7351 AL ALLOY 6.00 X 5.75 X 3.75	AMS-QQ-A-250/12	1
-301	SEK51346106	BRACKET ASSY			
QTY	PART NUMBER	DESCRIPTION	MATERIAL	SPECIFICATION	ITEM

Figure 1: Specification of Insert Thread Class Using a Local Note

Field of Drawing



Flag Notes

4 4X .250-28 UNF-3B HELICAL COIL INSERT THREAD THRU PER NASA/JSC-9008 INSTALL INSERTS PER NASA/JSC PRC-9008. SEAL WITH SUPER KODPON EPOXY PRIMER PER NASA/JSC PRC-4004.

Parts List

AR	515-70 /910-704	SUPER KODPON EPOXY PRIMER		3	3
4	MS21209F4-10L	INSERT			2
1	-001	BRACKET	7075-T7351 AL ALLOY 6.00 X 5.75 X 3.75	A95-00-A-250/12	1
-301	SEK51346106	BRACKET ASSY			
QTY	PART NUMBER	DESCRIPTION	MATERIAL	SPECIFICATION	ITEM

Figure 2: Specification of Thread Class Using a Flag Note

Since tang removal after installation of tanged inserts is required by this specification, it is unnecessary to specify the removal of tangs on the engineering drawing.

The standard installation is countersunk as specified in NASM33537 or MA1567. The countersink also affects the depth the insert should be set below the surface. If a different countersink is required, it must be noted on the engineering drawing, along with the new insert depth.

The standard insert part numbers used at JSC are:

	Inch Series	Metric Series
Locking	MS21209	MA3329 MA3330
Free-Running	MS122076-122115 MS122116-122155 MS122156-122195 MS122196-122235 MS122236-122275 MS124651-124690 MS124691-124730 MS124731-124770 MS124771-124810 MS124811-124850	MA3279 MA3280
Tangless	NAS1130	NA0276

Other insert part numbers may be used, but may require special installation instructions to be placed on the engineering drawing. Alternate usage should be reviewed in advance with a Materials & Processes Engineer.

**4.0 REFERENCES**

All documents listed are assumed to be the current revision unless a specific revision is listed.

JPR 8500.4                      *Engineering Drawing System Manual*

NASA/JSC PRC-4004           *Process Specification for the Sealing of Joints and Faying Surfaces*

NASM8846                      *Inserts, Screw Thread, Helical Coil*

NASM33537                    *Insert, Screw Thread, Helical Coil, Inch Series, Coarse and Fine Thread, Standard Assembly*

Verify correct version before use.

*Dimensions for*

MA1567

*Insert, Screw Thread, Helical Coil  
Metric Series, Standard Assembly Dimensions For***5.0 MATERIAL REQUIREMENTS**

None identified.

**6.0 PROCESS REQUIREMENTS****6.1 WORK INSTRUCTIONS**

All work procedures shall be performed to written procedures.

For work performed at JSC facilities, these work procedures shall consist of Detailed Process Instructions (DPI's).

For contracted work, the contractor shall be responsible for preparing and maintaining, and certifying written work procedures that meet the requirements of this specification.

**6.2 GENERAL REQUIREMENTS**

Hole preparation and insert installation shall meet the requirements of NASM33537 or MA1567.

The holes shall be countersunk to the standard dimensions unless specifically called out on the engineering drawing.

Tangs shall be removed from tanged inserts.

**6.3 REMOVAL OR REPLACEMENT**

The manufacturer's tooling shall be used to back out the discrepant helical insert.

The hole shall be re-inspected per section 6.2 before a new helical insert is installed. Helical inserts shall not be reinstalled.

**7.0 PROCESS QUALIFICATION**

The helical coil insert installation, removal, and replacement process shall be qualified and accepted prior to assembly of production parts. This qualification shall provide documented evidence that the installation procedures are capable of meeting the requirements of this process specification and the engineering



drawing. Any change to the procedure, tools, or insert type shall require requalification.

## **8.0 PROCESS VERIFICATION**

Process verification shall be performed according to the requirements of NASM33537 or MA1567. In-process verification is required to assure that the correct STI tap is used (2B or 3B). The minor diameter, countersink, and thread form of the holes shall be verified prior to installation of helical coil inserts. Post-process verification of insert depth and tang count (when tanged inserts are used) is required.

## **9.0 TRAINING AND CERTIFICATION OF PERSONNEL**

This process shall be performed by personnel qualified through training or experience and certified by their supervision to conduct the process.

## **10.0 DEFINITIONS**

None.