SLOVENSKI STANDARD
SIST EN 3297:2001

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Aerospace series - Inserts, thin wall, self-locking, MJ threads, in heat resisting nickel base alloy NI-P100HT (Inconel 718) - Technical specification

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Luft- und Raumfahrt - Gewindeeinsätze, dünnwanding, selbstsichernd, MJ-Gewinde, aus hochwarmfester Nickelbasislegierung NI-P100HT (Inconel 718) - Technische Lieferbedingungen

Série aérospatiale - Douilles filetées, a paroi mince, a freinage interne, a filetage MJ, en alliage résistant a chaud a base de nickel NI-P100HT (Inconel 718) - Spécification technique

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49.030.99 Drugi vezni elementi Other fasteners

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English version

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This European Standard was approved by CEN on 18 September 1997.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries and votes carried out in accordance with the rules of this Association, this Standard has successively received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents list

1 Scope

This standard specifies the characteristics, qualification and acceptance requirements for self-locking thin wall inserts with MJ threads in NI-P100HT.

It is applicable whenever referenced.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 2859-1	Sampling procedures for inspection by attributes - Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection
ISO 3452	Non-destructive testing - Penetrant inspection - General principles
ISO 3534-1977	Statistics - Vocabulary and symbols
ISO 4288	Rules and procedures for the measurement of surface roughness using stylus instruments
ISO 5855-2	Aerospace - MJ threads - Part 2: Limit dimensions for bolts and nuts
ISO 8642	Aerospace - Self-locking nuts with maximum operating temperature greater than 425 °C - Test methods
EN 2404	Heat resisting nickel base alloy NI-P100HT - Solution treated and precipitation treated - Bars - Aerospace series [1]
EN 3042	Aerospace series - Quality assurance - EN aerospace products - Qualification procedure
EN 3298	Aerospace series - Inserts, thin wall, self-locking - Installation and removal procedure [2]
EN 3676	Aerospace series - Inserts, thin wall, self-locking - Design standard [2]
ASTM E 112-88	Standard Test Methods for Determining Average Grain Size [3]

1) Published as AECMA Standard at the date of publication of this standard
2) Published as AECMA Prestandard at the date of publication of this standard
3) Published by: American Society for Testing and Materials (ASTM), 1916, Race street, Philadelphia, PA 19103, USA

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 Batch

Quantity of finished thin wall inserts, of the same type and same diameter, produced from a material obtained from the same melt, manufactured in the course of the same production cycle, following the same manufacturing route and having undergone all the relevant heat treatments and surface treatments.

3.2 Surface discontinuities

3.2.1 Crack: rupture in the material which may extend in any direction and which may be intercrystalline or transcrystalline in character

3.2.2 Seam: open surface defect

3.2.3 Lap: surface defect caused by folding over metal fins or sharp corners and then compressing them into the surface.

3.2.4 Inclusions: non-metallic particles originating from the material manufacturing process. These particles may be isolated or arranged in strings.

3.3 Test temperature

Ambient temperature, unless otherwise specified

3.4 Simple random sampling

The taking of *n* items from a population of *N* items in such a way that all possible combinations of *n* items have the same probability of being chosen [4].

3.5 Critical defect

A defect that, according to judgement and experience, is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the considered product, or that is likely to prevent performance of the function of a major end item [4].

3.6 Major defect

A defect other than critical, that is likely to result in a failure or to reduce materially the usability of the considered product for its intended purpose [4].

3.7 Minor defect

A defect that is not likely to reduce materially the usability of the considered product for its intended purpose, or that is a departure from established specification having little bearing on the effective use or operation of this product [4].

3.8 Sampling plan

A plan according to which one or more samples are taken in order to obtain information and possibly to reach a decision [4].

3.9 Limiting quality

In a sampling plan, the quality level which corresponds to the specified 10 % probability of acceptance.

3.10 Acceptable quality level (AQL)

A quality level which in a sampling plan corresponds to a specified but relatively high probability of acceptance.

It is the maximum per cent defective (or the maximum number of defects per hundred units) that, for purposes of sampling inspection can be considered satisfactory as a process average 4).

3.11 Finished thin wall insert

A thin wall insert ready for use, inclusive of any possible treatments and/or surface coatings, as specified in the product standard or definition document

3.12 Definition document

Document specifying all the requirements for finished thin wall inserts

3.13 Self-locking torque

The torque to be applied to the associated bolt to maintain its movement of rotation in relation to the thin wall insert assembly which is under no axial load and the insert locking zone being completely engaged with the bolt (minimum protrusion of two pitches, including the end chamfer).

3.14 Seating torque

The tightening torque to be applied to the thin wall insert and bolt assembly to introduce or to increase the axial load in the assembly

3.15 Unseating torque

The untightening torque to be applied to the thin wall insert and bolt assembly to reduce or remove the axial load in the assembly

3.16 Breakaway torque

The torque required to start unscrewing the associated bolt with respect to the installed thin wall insert, with the insert locking zone still fully engaged on the bolt, but after the axial load in the assembly has been removed by unscrewing half a turn followed by a halt in rotational movement.

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4) Definition taken from ISO 3534

4 Quality assurance

4.1 Qualification

EN 3042

Qualification inspections and tests (requirements, methods, numbers of thin wall inserts) are specified in table 1. They shall be carried out on:

- each type and diameter of thin wall inserts;
- 36 thin wall inserts selected from a single batch by simple random sampling.

The test programme may possibly be reduced, or the qualification be granted without inspection or testing: any such decision shall be based on the results obtained on similar types and diameters of thin wall inserts provided that the design and manufacturing conditions are identical.

Table 2 indicates the allocation of thin wall insert specimens for the inspections and tests.

4.2 Acceptance

4.2.1 Purpose

The purpose of acceptance inspections and tests is to check, as simply as possible, by a method representative of actual use conditions, with the uncertainty inherent to statistical sampling, that the thin wall inserts constituting the batch satisfy the requirements of this standard.

4.2.2 Conditions

Acceptance inspections and tests (requirements, methods, numbers of thin wall inserts) are specified in table 1. They shall be carried out on each batch. Thin wall inserts from the batch to be tested shall be selected by simple random sampling.

Each thin wall insert may be submitted to several inspections or tests.

If a more stringent inspection is deemed necessary, all or part of the qualification inspections and tests may be performed during the acceptance inspection and testing. In this case, the number of thin wall inserts submitted to these inspections and tests is the same as that submitted for qualification inspection and tests.

4.2.3 Responsibility

Acceptance inspections and tests shall be carried out by the manufacturer, or under his responsibility.

4.2.4 Inspection and test report

A test report showing actual numerical values shall be provided if specified in the purchase order.

5 Requirements

See table 1.

Table 1: Technical requirements and test methods

Clause	Characteristic	Requirement	Inspection and test method	Q/A [1]	Sample size
5.1	Material	In accordance with the product standard or definition document	Chemical analysis or certificate of compliance issued by the manufacturer of the semi-finished product	Q A	
5.2	Dimensions, tolerances and tolerances of form and position	In accordance with the product standard or definition document	Standard gauging	Q A	- 36 Tables 3 and 4
5.3	Manufacturing				
5.3.1	Process	Inserts may be manufactured by machining or forming.	Manufacturing method shall be indicated.	Q	
5.3.2	Heat treatment	The heat treatment medium or atmosphere shall not cause any surface contamination. Any scale which will not be removed by subsequent machining shall be removed by abrasive blasting, with an appropriate equipment. The blanks shall be solution treated at a temperature of 930 °C to 1 010 °C, held at the selected temperature within ± 15 °C for not less than 1 h and air cooled or faster. The solution treated blanks shall be precipitation heat treated at (720 ± 5) °C, held at this temperature for 8 h ± 15 min, furnace cooled at (55 ± 5) °C per hour to (620 ± 5) °C, held at 620 °C for 8 h ± 15 min, followed by air cooling or faster. Instead of the 55 °C per hour cooling rate to 620 °C, parts may be furnace cooled at any rate provided the time at 620 °C is adjusted to give a total precipitation time of 18 h min.	Calibration of the heat treatment equipment shall be confirmed. Visual examination Examination of the heat treatment specification	Q	
5.3.3	Thread deformation (form out-of-round)	Threads in the locking zone may be deformed in any manner provided that insert meets the requirements of this standard. The finished inserts shall allow the "GO" thread plug gauge to enter a minimum of three quarters of a turn, when gauged from the counterbore side.	Standard gauging	Q A	36 Tables 3 and 4

continued

Table 1 (continued)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [1]	Sample size
5.3.3.1	**Insertion test**	The maximum torque at insertion of insert shall not exceed 0,5 Nm.	Insert shall be installed to EN 3298. The maximum dimensions of the installation hole shall be the minimum dimensions of the installation hole to EN 3676.	A	Tables 3 and 4
5.3.4	**Surface roughness**	In accordance with the product standard or definition document	ISO 4288 Visual examination	Q A	3 Tables 3 and 4
5.3.5	**Surface coating**	In accordance with the product standard or definition document	See applicable coating standard.	Q A	33 Tables 3 and 4
5.4	**Mechanical properties**				
5.4.1	**Rotational resistance**	Inserts shall withstand the torque without rotation.	Inserts shall be installed into test block shown in annex A by the method given in EN 3298. The values shown in table 5 shall apply. The installed inserts shall be tested with a counter clock-wise rotational direction of the torque wrench as shown in annex B.	Q	5
5.4.2	**Reusability**	General: After testing, inserts shall not show any indications of distortion, galling or scratches of such a depth as to prevent reassembly of bolts freely, by hand, up to the self-locking zone. Bolt threads shall remain serviceable and permit assembly with a new insert freely, by hand, up to the self-locking zone.	Test assembly see annex C. A new bolt shall be used for each complete three, 15 and 25 cycle test. The pitch diameter of the bolts selected shall be from the minimum ISO 5855-2 pitch diameter to 0,01 mm above. During testing, the pitch diameter of the bolts may be checked and if found to be below the minimum the bolt shall be replaced. A new bolt within the above stated limits shall be used. Bolts shall be lubricated with clean engine oil at the beginning of each cycle during testing. The seating and unseating torque shall be recorded for each cycle.		

continued

Table 1 (continued)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [1)]	Sample size
5.4.2.1	**Self-locking torque at ambient temperature** (15 cycles)	Shall be between the minimum breakaway torque and the maximum self-locking torque, see table 6, for each cycle.	a) Install the insert into test block shown in annex A by the method given in EN 3298. b) Assemble the bolt and spacer onto the test assembly ensuring that the bolt thread is lubricated with clean engine oil and protrudes at least two pitches beyond the self-locking zone. Measure the self-locking torque using a torque wrench. c) Apply the seating torque stipulated in table 6. d) Remove the load by unscrewing at least one half turn and stop. Again unscrew and measure the breakaway torque, using the same procedure. Remove the bolt from the insert. Repeat above a total of 15 times.	Q	10
5.4.2.2	**Self-locking torque at ambient temperature after 550 °C baking** (25 cycles)	Shall be between the minimum breakaway torque and the maximum self-locking torque, see table 6, for each cycle.	As 5.4.2.1 a) and b). The assembly shall be loaded to 517 MPa and heated in a furnace to (550 ± 5) °C and held at this temperature for 6 h ± 15 min, removed from the furnace and cooled to ambient temperature. Then proceed as 5.4.2.1 d), except cycles. Repeat above a total of 25 times.	Q	10
5.4.2.3	**Self-locking torque at ambient temperature** (three cycles)	Shall be between the minimum breakaway torque and the maximum self-locking torque, see table 6, for each cycle.	As 5.4.2.1 Repeat above a total of three times.	A	Table 7, column B
5.4.3	**Hardness**	After final heat treatment the hardness shall be 45 HRC max.	ISO 8642	Q A	5 Table 7, column B

continued