SLOVENSKI STANDARD
SIST EN 4560:2004

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Aerospace series - Pipe coupling 37°, spherical, up to 21000 kPa - Inch series - Technical specification

Aerospace series - Pipe coupling 37°, spherical, up to 21000 kPa - Inch series - Technical specification

Luft- und Raumfahrt - Rohrverschraubung 37° mit Kugelbuchse, bis 21 000 kPa - Inch-Reihe - Technische Lieferbedingungen

Série aérospatiale - Systeme de raccordement sphérique 37°, jusqu'a 21000 kPa - Série inch - Spécification technique

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49.080	Letalski in vesoljski hidravliļ ni sistemi in deli	Aerospace fluid systems and components

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Aerospace series - Pipe coupling 37°, spherical, up to 21000 kPa - Inch series - Technical specification

Série aérospatiale - Système de raccordement sphérique 37°, jusqu'à 21000 kPa - Série inch - Spécification technique

This European Standard was approved by CEN on 14 September 2002.

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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 Management Centre 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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document EN 4560:2003 has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has 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of an identical text or by endorsement, at the latest by August 2003, and conflicting national standards shall be withdrawn at the latest by August 2003.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This standard specifies the required characteristics, inspection and test methods, quality assurance and procurement requirements for inch series, pipe couplings, 37° spherical, for temperature ranges from type II to type V according to ISO 6771 and nominal pressure up to 21 000 kPa.

In addition to the requirements of this technical specification, the coupling assemblies shall be qualified in accordance with equipment or component specification requirements.

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 (including amendments).

ISO 1302 *Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation.*

ISO 2685 *Aircraft - Environmental test procedure for airborne equipment - Resistance to fire in designated fire zones.*

ISO 2859-1 *Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot-inspection.*

ISO 6771 *Aerospace - Fluid systems and components - Pressure and temperature classifications.*

ISO 6772 *Aerospace - Fluid systems - Impulse testing of hydraulic hose, tubing and fitting assemblies.*

ISO 7137 *Aircraft - Environmental conditions and test procedures for airborne equipment.*

ISO 8625-1 *Aerospace - Fluid systems - Vocabulary - Part 1 : General terms and definitions related to pressure.*

EN 2951 *Aerospace series - Metallic materials - Test method - Micrographic determination of content of non-metallic inclusions* [1].

EN 9133 *Aerospace series – Quality management systems – Qualification procedure for aerospace standard parts.*

EN 10204 *Metallic products - Types of inspection documents.*

TR 2674 *Aerospace series - Design and construction of pipelines for fluids in liquid or gaseous condition - Rigid lines, installation* [2].

MIL-L-23699 *Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number 0-156* [3].

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
pressure
nominal pressure, proof pressure, impulse pressure, burst pressure according to ISO 8625-1

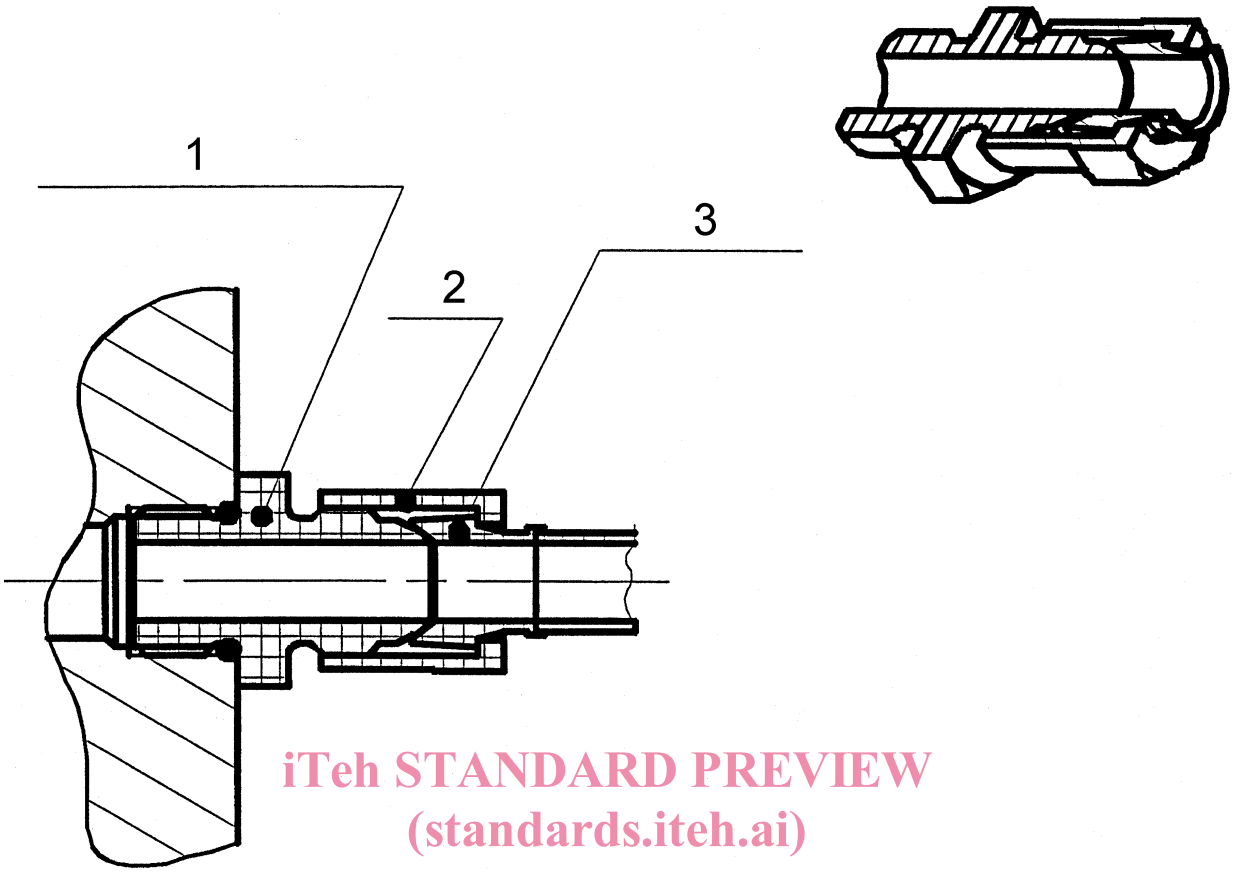
3.2 Coupling and assembling

3.2.1
coupling assembly
assembled nut, ferrule and pipe mating with e.g. nipple, union, elbow, see Figure 1

1) Published as AECMA Prestandard at the date of publication of this standard

2) Published as AECMA Technical Report at the date of publication of this standard

3) Published by : Department of Defense (DoD), the Pentagon, Washington, D.C. 20301, USA



Key
1 Straight union
2 Nut
3 Ferrule

Figure 1 – Example of coupling assembly

3.2.2
dimensional code
corresponds to the nominal diameter given in 16th of inches within two digits.

3.2.3
snug
moment when positive resistance to rotation is observed during assembling

3.3 Surface defects

3.3.1
surface irregularity
nonconformity with general surface appearance, possible defect

3.3.2
crack
clean (crystalline) fracture passing through or across the grain boundaries that possibly follows inclusions of foreign elements. Cracks are normally caused by overstressing the metal during forging or other forming operations, or during heat treatment. Where parts are subject to significant reheating, cracks are usually discoloured by scale.

3.3.3
fold
doubling over of metal, which can occur during the forging operation. Folds can occur at or near the intersection of diameter changes and are especially prevalent with non-circular necks, shoulders and heads.

3.3.4
lap
fold-like machining defect

3.3.5
seam
(1) usually a surface opening or crack resulting from a defect obtained during casting or forging
(2) extraneous material, stringer in the material, which is not homogeneous with base metal

3.3.6
pit
void or hole in the surface as caused, for example, by corrosion.

3.4 Quality assurance

3.4.1
production batch
definite quantity of some commodity or service produced at one time under conditions that are presumed uniform

3.4.2
delivery batch
batch consisting of couplings with the same identity block which may come from different production batches

3.4.3
acceptance quality limit
AQL
when a continuing series of lots is considered, a quality level which for the purposes of sampling inspection is the limit of a satisfactory process average

3.4.4
qualification
testing required to demonstrate successful performance of the coupling assembly in simulated service (overload, destructive and fatigue tests)

3.4.5
major defect
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

3.4.6
minor defect
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 Requirements, inspection and test methods

See Table 1 and Table 2.

Qualification tests given from 4.12 to 4.15 shall only be made when required. Complementary qualification tests may be determined in direct relation with the application (e.g. vibration test, thermal shock test).

The coupling shown on the figures of this standard are for information only. The test specimens shall be assembled with the part to test (e.g. elbow fitting instead of straight fitting).

Non removable coupling (e.g. welded elbow, welded reducer) shall be tested on sample pipes in combination with removable (threaded) couplings.

4.1 Test conditions and preparation of specimens for qualification

4.1.1 Test fluids

Unless otherwise specified, tests shall be carried out using e.g. oil compatible with the test temperature range. Water may be used, whenever practical, for proof, burst, stress corrosion and re-use capability testing.

4.1.2 Specimen preparation

Shaped parts shall be machined with the grain flow of the bar or plate in the direction of the fluid. Installations on the coupling shall be in accordance with TR 2674. The coupling shall not be lubricated prior the first assembling. For the next assembling they shall be lubricated with engine oil (e.g. according to MIL-L-23699) at the interface between the nut and the ferrule.

Prior to testing, and unless otherwise specified, all couplings with dimensional code up to 12 shall be assembled using either of the following methods. For couplings with dimensional code greater than 12 the assembling shall be made by using the torque tightening method:

- torque tightening method:

A torque value comprised between the minimum and the maximum given in Table 3 shall be applied to the nut per TR 2674.

- angle tightening method:

The following sequence shall be applied :

1 tighten the nut with a wrench to snug;

2 turn the nut an additional 60° (see Figure 2a);

3 loosen the nut; (for new parts assembling only);

4 retighten the nut with a wrench to snug;

5 turn the nut an additional 30° (see Figure 2b). Figure 2c gives also a checking method by using and returning an open end wrench with a 15° offset.

The torque tightening method used for the test and value applied shall be recorded.

4.1.3 Pipe assembly

The method of joining the pipe to the coupling (brazing, welding, mechanical attachment, etc.) shall not be detrimental to the properties, strength or geometry of the pipe assembly. The joint shall be in accordance with the design instructions and shall be inspected by direct measurement, X-ray or other non-destructive methods.

Table 1 – Requirements, inspection and test methods

<table>
<tr><th>Clause</th><th>Characteristic</th><th>Requirement</th><th>Inspection and test method</th><th>Q [a]</th><th>A [a]</th></tr>
<tr><td>4.2 [b]</td><td>Materials</td><td>Metallic materials shall meet the acceptance criteria given in EN 2951.
Conformity with the product standards</td><td>Metallic materials shall be tested in accordance with EN 2951.
Certificate of compliance to EN 10204 issued by the semi-finished product manufacturer</td><td>X
100 %</td><td>X
100 %</td></tr>
<tr><td>4.3 [b]</td><td>Dimensions</td><td>Conformity with the product standards</td><td>Suitable measuring instruments</td><td>X
100 %</td><td>X
20 %</td></tr>
<tr><td>4.4 [b]</td><td>Product identification</td><td>Marking according to product standards. It shall be legible and shall not adversely affect the material or the functioning of the products.</td><td>Visual examination</td><td>X
100 %</td><td>X
100 %</td></tr>
<tr><td>4.5 [b]</td><td>Surface roughness</td><td>Conformity with the product standards
Interpreted in accordance with ISO 1302</td><td>Suitable measuring instruments or visual-tactile samples</td><td>X
100 %</td><td>X
200 %</td></tr>
<tr><td>4.6 [b]</td><td>Surface coating or treatment</td><td>Conformity with the product standards</td><td>Visual examination</td><td>X
100 %</td><td>X
50 %</td></tr>
<tr><td rowspan="3">4.7 [b]</td><td>Surface defects</td><td>Parts shall be free from surface defects indicated in 3.3 liable to have an adverse affect on their characteristics and endurance.</td><td>Visual inspection using suitable methods</td><td>X
100 %</td><td>X
100 %</td></tr>
<tr><td>Threads</td><td>The external threads of couplings should be rolled and, if machined, shall have a maximal value of 1,6 µm for R_a in accordance with ISO 1302.
Laps, cracks, surface irregularities and seams (see 3.3) are not acceptable on any part of the pressure thread flank, in the thread root or on the non-pressure thread flank.
Laps and seams, depths of which are within the limits of table, are acceptable on the crest and the non-pressure thread flank above the pitch diameter.
<table>
<tr><th>Dimensional Code</th><th>Depth mm</th></tr>
<tr><td>03</td><td>0,15</td></tr>
<tr><td>04</td><td>0,18</td></tr>
<tr><td>05</td><td>0,18</td></tr>
<tr><td>06</td><td>0,2</td></tr>
<tr><td>08</td><td>0,23</td></tr>
<tr><td>10 to 16</td><td>0,25</td></tr>
</table>
Threads may be cut or rolled.</td><td>Visual examination</td><td>X
100 %</td><td>X
100 %</td></tr>
<tr><td>The grain flow in rolled threads shall be continuous and follow the general thread contour with the maximum density at the thread root.</td><td>Thread flanks in rolled threads shall be examined by micro-examination. Specimens shall be taken from the finished part by sectioning on a longitudinal plane across the threaded area. The specimens shall be polished and etched to reveal the surface defects.</td><td>X
2
specimens</td><td></td></tr>
</table>

continued