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Aerospace series — Metric series pipe coupling 8°30' up to 28 000 kPa dynamic beam seal — Technical specification

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by the Aerospace and Defence Industries Association of Europe – Standardization (ASD-STAN) as EN 3275:2019 and drafted in accordance with its editorial rules. It was assigned to Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 10, *Aerospace fluid systems and components* and adopted, without modification other than those given below, under the "fast-track procedure".

The main changes compared to EN 3275:2019 are as follows:

— the title was changed to have no more than three elements;

— Clause 2, normative references, was updated to only list references cited normatively in the text;

— Clause 3, terms and definitions, was updated to follow the rules of ISO/IEC Directives, Part 2, 2018;

— the tables were renumbered to follow the rules of ISO/IEC Directives, Part 2, 2018;

— Example 3 in A.1.3 was changed to normal body text as it contains a requirement;

— Figure 4 and Figure 7 were changed to be language neutral.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Aerospace series — Metric series pipe coupling 8°30' up to 28 000 kPa dynamic beam seal — Technical specification

1 Scope

This document specifies the required characteristics, inspection and test methods, quality assurance and procurement requirements for metric series 8°30' dynamic beam seal pipe couplings, for temperature ranges type II and III according to ISO 6771 and nominal pressure up to 28 000 kPa.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2813, *Aerospace series — Aluminium alloy AL-P-6061- — T6 — Drawn tube for pressure applications — 0,6 mm ≤ a ≤ 12,5 mm*

EN 3120, *Aerospace series — Titanium alloy TI-P64003 — Cold worked and stress relieved — Seamless tube for pressure systems — 4 mm ≤ D ≤ 51 mm, 690 MPa ≤ R_m ≤ 1 030 MPa*

EN 10204, *Metallic products — Types of inspection documents*

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 5855 (all parts), *Aerospace — MJ threads*

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 7257, *Aircraft — Hydraulic tubing joints and fittings — Rotary flexure test*

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

ISO 9538, *Aerospace series — Hydraulic tubing joints and fittings — Planar flexure test*

TR 2674,[1)] Design and construction of pipeline for fluids in liquid or gaseous condition — Rigid lines, installation

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8625-1 and the following apply.

1) Published as ASD-STAN Technical Report at the date of publication of this standard by AeroSpace and Defence industries Association of Europe – Standardization (ASD-STAN) (www.asd-stan.org).

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

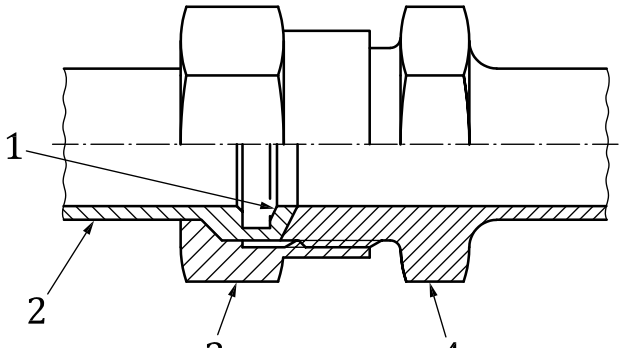
— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1 Coupling

3.1.1
coupling assembly
assembled and torque-tightened nut, ferrule and pipe mating with e.g. unions, tees or elbows

Note 1 to entry: See Figure 1.



Key
1 dynamic beam seal
2 ferrule
3 nut
4 union end

Figure 1 — Example of coupling assembly

3.1.2
shaped part
forged part
coupling machined out of individual forging blank

Note 1 to entry: For crosses, tees and elbows machined out of bar or plate stock the term “shaped” may be used.

3.2 Surface defects

3.2.1
surface irregularity
nonconformity with general surface appearance, possible defect

3.2.2
crack
clean (crystalline) fracture passing through or across the grain boundaries that possibly follows inclusions of foreign elements

Note 1 to entry: 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.

3.2.3
fold
doubling over of metal, which can occur during the forging operation

Note 1 to entry: Folds can occur at or near the intersection of diameter changes and are especially prevalent with non-circular necks, shoulders and heads.

3.2.4
lap
fold (3.2.3) -like machining defect

3.2.5
seam
surface opening or *crack* (3.2.2) or extraneous material resulting from a defect obtained during e.g. casting or forging

3.2.6
pit
void or hole in the surface as caused, for example, by corrosion

3.3 Quality assurance

3.3.1
production batch
definite quantity of some commodity or service produced at one time under conditions that are presumed uniform

3.3.2
delivery batch
batch consisting of couplings with the same identity block which may come from different *production batches* (3.3.1)

3.3.3
acceptable quality level
AQL
quality level which for the purposes of sampling inspection is the limit of a satisfactory process average, when a continuing series of lots is considered

3.3.4
qualification
testing required to demonstrate successful performance of the *coupling assembly* (3.1.1) in simulated service (overload, destructive and fatigue tests)

3.3.5
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

3.3.6
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 Symbols

A	Elongation, in percent [%]
D_0	Actual outside diameter of pipe, in millimetres [mm]
D_1	Actual inside diameter of pipe, in millimetres [mm]
DN	Nominal outside diameter of pipe
P	Working pressure, in megapascals [MPa]
R_m	Tensile strength, in megapascals [MPa]
$R_{p0,2}$	0,2 % proof stress, in megapascals [MPa]
σ_x	Axial stress due to pressure, in megapascals [MPa]

5 Requirements, inspection and test methods

5.1 Test conditions and preparation of specimens for qualification

5.1.1 General

For requirements, inspection and test methods see Table 1.

5.1.2 Tests fluids

Unless otherwise specified, tests shall be carried out using e.g. a petroleum base hydraulic fluid according to MIL-H-5606 for coupling assemblies of type II temperature range and a silicate ester base hydraulic fluid according to MIL-H-8446 for those of type III temperature range. Water may be used, whenever practical, for proof, burst, stress corrosion and re-use capability testing. For other than hydraulic system applications, it is preferable to use system fluid for leakage (gaseous pressure) and proof testing. When specified in the test method, the test fluid is used as a lubricant.

5.1.3 Specimen preparation

Shaped parts shall be machined with the grain flow of the bar or plate in the direction of the fluid. Specimens shall be assembled as illustrated in Table 3. Installations on the pipe end shall be in accordance with TR 2674. Prior to testing, all couplings shall be assembled using the maximum specified torque. Except, when specified in Table 3, the coupling shall be assembled using the minimum installation torque for at least half of the specimens, and maximum torques for the remainder.

5.1.4 Pipe assembly

The method of joining the pipe to the coupling end (brazing, welding, mechanical attachment, etc.) shall not be detrimental to the properties, strength or geometry of the pipe and the coupling end. 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

Sub-clause	Characteristic	Requirement	Inspection and test method	Q	A
5.2[a]	Materials	Conformity with the product standards	Chemical analysis or certificate of compliance according to EN 10204 issued by the semi-finished product manufacturer.	X 100 %	X 100 %
5.3[a]	Dimensions	Conformity with the product standards	Suitable measuring instruments	X 100 %	X 50 %
	Fluid passages	Conformity with the product standards	A ball with a diameter 0,5 mm less than the minimum diameter specified for the passage shall pass through the coupling.	X 100 %	X 20 %
5.4[a]	Product identification	Marking shall be according to product standards and definition documents including batch identification of Annex A. It shall be legible and shall not adversely affect the material or the functioning of the products.	Visual examination	X 100 %	X 100 %
5.5[a]	Surface roughness	Conformity with the product standards Interpreted in accordance with ISO 1302	Suitable measuring instruments or visual-tactile samples	X 100 %	X 100 %
5.6[a]	Surface treatment	Conformity with the product standards	Visual examination The thread shall be tested using a gauge with a tolerance class of 4h6h.	X 100 %	X 100 %

Key

Q qualification

A acceptance

[a] Applicable to parts prior to assembly.

Table 1 *(continued)*

Sub-clause	Characteristic	Requirement	Inspection and test method	Q	A
5.7[a]	Surface defects	Parts shall be free from surface defects indicated in 3.3 liable to have an adverse effect on their characteristics and endurance.	Visual inspection using suitable methods	X 100 %	X 100 %
			Visual examination	X 100 %	X 100 %
	Threads	Threads may be cut, rolled or ground, except titanium alloys which shall be cut or rolled. The external threads of couplings should be rolled and, if machined, shall have an arithmetical mean deviation, Ra, of the profile of 3,2 µm or smoother in accordance with ISO 1302. The grain flow in rolled threads shall be continuous and follow the general thread contour with the maximum density at the thread root. Laps, cracks, surface irregularities and seams (see 3.2) 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 2, are acceptable on the crest and the non-pressure thread flank above the pitch diameter.	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.	X 10 %	X 5 %
5.8	Proof pressure	The coupling assembly shall withstand a pressure equal to twice the nominal pressure of the fluid system for 5 min at ambient temperature without leakage and shall not show any evidence of permanent deformation or other malfunction when using the specified torque values.	The coupling assembly shall be connected to a pressure source with one end free to move. Rate of pressure increase shall be (150 000 ± 37 500) kPa/min.	X	
5.9	Gaseous pressure	The coupling assembly shall withstand a gaseous pressure equal to the nominal pressure for 5 min, at ambient temperature. There shall be no visible formation of bubbles after 1 min at pressure or other malfunction that would affect assembly or disassembly when using the torque values specified.	The coupling assembly shall be solvent cleaned and air dried prior to testing. It shall be assembled and tightened to the minimum torques specified in Table 4. It shall then be pressurized with nitrogen to the nominal pressure. This pressure shall be maintained for 5 min while the specimens are immersed in water or suitable oil (see Figure 2).	X	
5.10	Hydraulic impulse resistance	The coupling assembly shall withstand 200 000 impulse pressure cycles without leakage.	The coupling assembly shall be impulse tested at the temperatures and in the sequence specified in ISO 6772.	X	

Key

Q qualification

A acceptance

[a] Applicable to parts prior to assembly.

Table 1 *(continued)*

Sub-clause	Characteristic	Requirement	Inspection and test method	Q	A
5.11	Minimum burst pressure	The coupling assembly shall withstand a pressure equal to four times the nominal pressure of the fluid system for 5 min, when tested at ambient temperature. There shall be no leakage or burst. Pipe expansion is permissible. The coupling assemblies need not meet any disassembly or assemblies requirements after this test.	The coupling assembly shall be connected to a pressure source with one end free to move. Rate of pressure increase shall be (150 000 ± 37 500) kPa/min.	X	
5.12	Flexure fatigue resistance	Coupling assembly welded to pipes shall achieve a target minimum flexure fatigue stress of 130 MPa for 10^7 cycles. For other methods of joining the coupling to the pipe the minimum flexure fatigue levels for each DN size shall be as shown in Table 5 or Table 6. Specimens according to Figure 3 shall pass this test without leakage from the coupling assembly or the pipe/coupling interface. Recorded S/N curves shall show characteristics equal to or greater than those of Figure 4. Thrust wire coupling assemblies shall achieve the flexure fatigue stress of 130 MPa for 10^7 cycles, measured at the pipe/coupling joint.	Shall be in accordance with either ISO 7257 or ISO 9538. The bending stress shall be determined prior to the application of internal pressure. In order to obtain the true bending stress, it is always necessary to measure the strain dynamically at the flexure test frequency. The tolerance for the specified bending stress shall be from 0 % to 10 %. NOTE If it is desired to express the stress in terms of combined pressure and bending stress, the axial pressure stress is calculated by the formula: $\sigma_x = P \cdot \frac{D_1^2}{D_0^2 - D_1^2}$	X	
5.13	Stress corrosion resistance	The coupling assembly shall withstand salt spray exposure without any of the following defects:	The coupling assembly shall be installed in a test apparatus (see Figure 5) which imposes a bending stress level equal to (85 ± 5) % of $R_{p0,2}$ of the pipe material at the beam seal interface.	X	

Key

Q qualification

A acceptance

[a] Applicable to parts prior to assembly.