

**Aerospace series - Welded and brazed assemblies for  
aerospace construction - Joints of metallic materials by  
electron beam welding - Part 001: Quality of welded  
assemblies**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

|                                                                                                                     |                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| See Eesti standard EVS-EN 4677-001:2012 sisaldab Euroopa standardi EN 4677-001:2012 ingliskeelset teksti.           | This Estonian standard EVS-EN 4677-001:2012 consists of the English text of the European standard EN 4677-001:2012.                |
| Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.                                                  | This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation. |
| Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 16.05.2012. | Date of Availability of the European standard is 16.05.2012.                                                                       |
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ICS 25.160.40; 49.035

English Version

**Aerospace series - Welded and brazed assemblies for  
aerospace construction - Joints of metallic materials by electron  
beam welding - Part 001: Quality of welded assemblies**

Série aérospatiale - Assemblages soudés et brasés pour  
constructions aérospatiales - Assemblages de matériaux  
métalliques soudés par faisceau d'électrons - Partie 001:  
Qualité des assemblages soudés

Luft- und Raumfahrt - Schweiß- und Lötverbindungen für  
die Luft- und Raumfahrt - Verbindungen metallischer  
Werkstoffe mittels Elektronenstrahlschweißen - Teil 001:  
Qualität der Schweißverbindungen

This European Standard was approved by CEN on 16 January 2010.

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**Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## Foreword

This document (EN 4677-001:2012) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

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 ASD, 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 November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

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## 1 Scope

This European Standard defines the rules to be satisfied to ensure the quality of joints of metallic materials by electron beam welding (reference number 51 according to EN ISO 4063).

It applies unreservedly to the manufacturing of new parts or for repair, these operations being under the responsibility of an approved manufacturer or supplier. The final responsibility is with the design authority

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 875, *Destructive tests on welds in metallic materials — Impact tests — Test specimen location, notch orientation and examination*

EN 895, *Destructive tests on welds in metallic materials — Transverse tensile test*

EN 910, *Destructive tests on welds in metallic materials — Bend tests*

EN 4632-001, *Aerospace series — Welded and brazed assemblies for aerospace constructions — Weldability and brazeability of materials — Part 001: General requirements*

EN 4632-002, *Aerospace series — Welded and brazed assemblies for aerospace constructions — Weldability and brazeability of materials — Part 002: Homogeneous assemblies aluminium and aluminium alloys*

EN 4632-003, *Aerospace series — Weldability and brazeability of materials in aerospace constructions — Part 003: Welding and brazing of homogeneous assemblies of unalloyed and low alloy steels*

EN 4632-004, *Aerospace series — Welded and brazed assemblies for aerospace constructions — Weldability and brazeability of materials — Part 004: Homogeneous assemblies highly alloyed steels*

EN 4632-005, *Aerospace series, Weldability and brazeability of materials in aerospace constructions — Homogeneous assemblies of heat resisting Ni or Co base alloys*

EN 4632-006, *Welded and brazed assemblies for aerospace constructions — Weldability and brazeability of materials — Part 006: Homogeneous assemblies titanium alloys*

EN ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers (ISO 4063)*

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817)*

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1)*

EN ISO 6947, *Welding and allied processes — Welding positions (ISO 6947)*

EN ISO 10042, *Welding — Arc-welded joints in aluminium and its alloys — Quality levels for imperfections (ISO 10042)*

EN ISO 14731, *Welding coordination — Tasks and responsibilities (ISO 14731)*

EN ISO 14744-1, *Welding — Acceptance inspection of electron beam welding machines — Part 1: Principles and acceptance conditions (ISO 14744-1)*

EN ISO 14744-2, *Welding — Acceptance inspection of electron beam welding machines — Part 2: Measurement of accelerating voltage characteristics (ISO 14744-2)*

EN ISO 14744-3, *Welding — Acceptance inspection of electron beam welding machines — Part 3: Measurement of beam current characteristics (ISO 14744-3)*

EN ISO 14744-6, *Welding — Acceptance inspection of electron beam welding machines — Part 6: Measurement of stability of spot position (ISO 14744-6)*

EN ISO 15609-3, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 3: Electron beam welding*

EN ISO 17659:2004, *Welding — Multilingual terms for welded joints with illustrations (ISO 17659:2002)*

ISO 857-1:1998, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes*

ISO 4969, *Steel — Macroscopic examination by etching with strong mineral acids*

ISO 22826, *Destructive tests on welds in metallic materials — Hardness testing of narrow joints welded by laser and electron beam (Vickers and Knoop hardness tests)*

ISO 24394, *Welding for aerospace applications — Qualification test for welders and welding operators — Fusion welding of metallic components*

ISO/TR 25901, *Welding and related processes — Vocabulary*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 857-1:1998 and EN ISO 17659:2004 and the following apply.

#### 3.1 General

##### 3.1.1 Electron beam welding

fusion welding process using the transformation of the kinetic energy of beam electrons into thermal energy when they strike the material

Note 1 to entry: The electrons are obtained from a cathode heated under a secondary vacuum (1 Pa to  $10^{-4}$  Pa).

Note 2 to entry: The welding operation may be performed under a controlled atmosphere, generally under a primary vacuum (100 Pa to 1 Pa) or secondary vacuum.

#### 3.2 Technical terms

##### 3.2.1 Welding parameters

###### 3.2.1.1

###### run-out

interval encompassing all geometrical irregularities of the joint plane

Note 1 to entry: This interval is measured on the detail parts, positioned in their welding setup, and is used as a reference to determine the minimum width of the weld zone.

###### 3.2.1.2

###### beam centering

alignment of the beam axis on the joint plane