	Technical Guideline	Number	10.8e
B-MT	Documentation and Certificates for Cryostat Vacuum Vessels	Status	2011-04-04

Contents

1. Scope

1) This document lists the certificates, documentation and structure of documentation to be delivered with insulation vacuum vessels, rigid tube-like insulation vacuum shells and related flanges in applications like
   - magnet cryostats,
   - cryogenic supply systems,
   - cryogenic transport systems,
   - cryogenic current lead boxes,
   - auxiliary cryogenic systems

   within FAIR accelerators.
2) This document is NOT related to any other purpose as aforementioned.
3) This document is NOT related to complete cryogenic modules.
4) This document does NOT describe the complete documentation of any other acceptance test.
5) This document is NOT a replacement for any requirements defined by [1] and [2].

2. Definitions

1) A *cryostat* in terms of this guideline is a technical system enclosing another technical system to be operated at temperatures far below room temperature (e.g. 4.5K).
2) A *cryostat vacuum vessel* in terms of this guideline is a vessel, respectively a vessel like or tube like component, associated to the vacuum volume of a cryostat.

3. Codes and Standards

1) The European pressure equipment directive 97/23/EC [1] defines the legal basics for the documentation of pressure equipment.

2) The AD 2000 Code [2] is defining all engineering and documentation requirements related to pressure equipment.
3) DIN EN 10204 [4] defines the requirements on material certificates.

4. Required Documents and Certificates

1) At least the named documentation is required for each type of cryostat vacuum vessel delivered to the contracting entity.
2) Any documentation or certificate not listed but found to be required for any reason must be also delivered. In case, the documentation must be attached to the relevant documentation as defined in 4.1 - 4.6.
3) In case a cryostat vacuum vessel is identified to be of a category lower then I according to 97/23/EC at least all documentation as defined in 97/23/EC – Module A for a device of the category I in terms of 97/23/EC must be delivered.
4) Over pressure safety systems installed on a vacuum vessel must be documented according to 97/23/EC - class IV pressure devices.
5) In case a cryostat vacuum vessel is identified to be of the category I or higher according to 97/23/EC all relevant documentation as defined by [1] and [2] must be delivered.

4.1. Engineering Documentation

1) At least the following engineering documentation must be delivered completely for each cryostat vacuum vessel respectively once for a series of vessels identical in construction:
   - engineering calculations performed within the design and construction of the vacuum vessel,
   - safety relevant calculations which are at least
     a. calculations according to AD 2000,
     b. calculations for any conveying interfaces (e.g. crane lifting eyes, floor conveying interfaces),
     c. calculation of any welds showing safety relevance.

4.2. Documentation of Hazard Analysis

1) In case of pressure equipment, the complete documentation of a hazard analysis must be delivered for each cryostat vacuum vessel respectively once for a series of vessels identical in construction.

4.3. Operation Manual

1) An operation manual as defined by 97/23/EC in GERMAN AND ENGLISH language must be delivered.

4.4. Material related Documentation and Certificates

1) All relevant material certificates of construction materials used for the production of each vacuum vessel, which are at least
   - a 3.1 certificate following [4] confirming at least all relevant material properties
     a. defined by the standards applying the construction materials in use,
     b. defined by AD 2000,
     c. notch impact strength tested in a Charpy Impact Test as defined in [5],
   - a certificate for Transfer of identification,

   must be delivered.
2) These shall also apply to materials of flanges being part of a cryostat vacuum vessel.
3) Certificates for the used welding filler must be delivered.

4.5. Process related Documentation

1) The welder certificates for all welders participated in production of each vacuum vessel must be delivered.
2) The process description for each welding process applied must be delivered for each vacuum vessel respectively once for a series of vessels identical in construction.

4.6. Quality related Documentation

1) The following quality related documentation must be delivered for each vacuum vessel:
   - weld inspection as defined in [2],
   - measurement report of
     a. dimensional check,
     b. shape- and position tolerance check,
     c. surface quality check for sealing surfaces, according to the technical drawings, especially for the interface positions,
   - declaration of conformity with the specified quality and properties.

4.7. Technical Drawings and CAD - Data

1) For any transfer of mechanical engineering data see [3].
2) A full set of technical drawings of the vacuum vessel, released by the contracting entity must be delivered.
3) A full set of technical drawings of special construction tooling and equipment must be delivered.
4) An electronic copy of the full CAD-Model of the vessel must be delivered.

5. Structure of Documentation

1) All documentation and certificates (except mechanical engineering data as described in 4.7) must be transferred into EDMS – documents following the relevant EDMS – guidelines.
2) In case of text, tables, diagrams and pictures the electronic version must be delivered in the PDF-format without any access restrictions.
3) All documentation must be delivered within compiled and structured files, including a table of content.
4) Any certificates must be delivered compiled in files and must be electronically scanned for electronic compilation.
5) Documentation and certificates must be compiled well separated for the content as defined in 4.1 - 4.6.

6. References

[1] Directive 97/23/EC, European parliament and the council of the European Union, http://eur-lex.europa.eu, 1997
[2] AD 2000 Codes, Verband der TÜV e. V., Beuth Verlag GmbH, Berlin, Germany, 2009
[3] Terms and Conditions for the Exchange of Mechanical Engineering Data, GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany, 2009
[4] DIN EN 10204, Metallic products - Types of inspection documents; Deutsches Institut für Normung e.V., Beuth Verlag GmbH, Berlin, Germany, 2004
[5] GSI Technical Guideline 2.3e: Cryostat Vacuum Shell Materials