GSI FAIR	Technical Guideline	Number	7.30e
B-MT	Acceptance Test for the Cryogenics Related Quality of Cryogenic Modules	Status	2011-04-04

Contents

1. Scope

1) This document defines requirements and tests to be executed for the acceptance of the cryogenics related quality of complete cryogenic modules in applications like
   - cryo-magnetic modules,
   - cryogenic supply systems,
   - cryogenic transport systems,
   - cryogenic current lead boxes,
   - auxiliary cryogenic systems

   within FAIR accelerators.
2) This document does NOT define any test of specific functions a module is dedicated to. This document is directed only to the cryogenics related quality and documentation status of the module, independent of any specific function.
3) This document does NOT represent a replacement for the relevant standards for pressure equipment.
4) This document is NOT related to any other purpose as aforementioned.

2. Definitions

1) *Cryogenic modules* in terms of this document are assembly like cryogenic equipment being fit for installation on site of operation.

3. Codes and Standards

1) The European pressure equipment directive 97/23/EC [1] defines the legal standards for components and assemblies being recognised as pressure equipment.
2) The AD 2000 Code [2] defines the engineering and documentation standards in terms of pressure equipment.

4. Basic Requirements

4.1. Surrounding conditions

1) The acceptance test must be performed in a clean, low dust and dry surrounding.
2) The general light conditions at the working place must be adequate for visual inspections.

4.2. Required Documentation

1) The certificate for a passed incoming goods inspection as defined by [3] must be available on site at the date of testing.
2) The documentation and certificates as defined by [4] must be completely available on site at the date of testing.
3) A set of technical drawings, showing valid release note of the contracting entity, of the cryogenic module must be available on site at the date of testing.

4.3. Equipment and Tooling

1) A set of appropriate and well calibrated measurement tools for geometrical measurements at the cryostat must be prepared.
2) Equipment for the safety system test as defined by [6].
3) Lint-free technical tissues and lint-free gloves.
4) An additional light source with high illuminance (e.g. gooseneck lamp) must be available.
5) A suitable digital camera for photographic documentation must be available.

5. Checks and Tests

1) Within the acceptance test procedure at least all tests and checks as defined in the chapter 5.1 to 5.9 must be executed.

5.1. Label Plate Check

1) The label plate identifying the complete cryogenic module must be checked for existence and completeness in terms of [5].
2) Identification numbers found on the label plates must correspond with the identification numbers of the dedicated documentation. In case the identification numbers are not matching, the test must be declared as failed.

3) All other label plates must be checked for existence in dependence of the specific function of the cryogenic module.
4) In case of missing label plates or incorrect information the test must NOT be declared as fully passed. All non conformities must be documented in detail.

5.2. Document and Certification Check

1) The documentation as defined by [4] must be checked for completeness. In case of incomplete documentation, the test must NOT be declared as fully passed. The missing documents must be listed within the test report.

5.3. Cursory inspection

1) All accessible entities building the cryogenic module must be checked at least for
   - completeness
   - correct orientation
   - visible damages
   - visible deformations

   and any other obvious or visible non-conformities related to the drawings.
2) In case of any non-conformity the test must NOT be declared as fully passed. All non conformities must be documented in detail within the test report.

5.4. Dimensional Tests

1) The documentation of dimensional tests, performed within the quality tests during production must be checked for completeness.
2) Functional dimensions, tolerances and positions of the most important interfaces e.g.
   - electrical interfaces
   - MLI interfaces
   - flanges
   - support structures
   - conveying interfaces

   must be cross checked.
3) All check sizes of the accessible entities, stated within the technical drawings must be rechecked. The approval of check sizes of non accessible entities must be cross-checked in the production related quality documentation, being delivered.
4) All non conformities must be documented in detail.
5) In case of non-conformities of functional relevance or check sizes, the test must be declared as failed.
6) In case of non conformities of minor relevance the test must NOT be declared as fully passed.

5.5. Cleanliness Test

1) All accessible components must be checked for cleanliness. No contamination with any organic or inorganic material permitted.
2) In case of severe or extensive contaminations, the test must be declared as failed.
3) In case of contaminations of minor relevance, those must be documented in detail and must be removed immediately.

5.6. Instrumentation Test

1) All temperature sensors and sensor cabling must be checked for completeness, basic functionality and correct installation by adequate measurements and tests.
2) In case of faulty or damaged cabling or sensors not being installed correctly, the test must be declared as failed. All non conformities must be documented in detail.

5.7. Safety System Test

1) A safety system test as defined by [6] must be performed for the cryostat related over pressure safety system.

6. Documentation

1) Any measured values, detected failures, faulty entities or other non-conformity must be documented in writing and also photographic if possible.
2) All described checks and tests must be documented in a testing form agreed with the contracting entity.

6.1. Testing Protocol Requirements

1) The testing protocol must show comprehensible structure and content documenting each single test executed.
2) The following information must be at least be documented within the cover sheet:
   - Test identification,
   - Address of Company or Institute,
   - Identification of Department,
   - Names of testing personnel,
   - Name of quality testing leader,
   - Date and time,
   - Identification of tested object,
   - Serial number of tested object,
   - Test result,
   - Number of pages (including photo prints).
3) The measurement equipment in use must be documented at least with
   - device identification,

- serial number,
- date of last calibration,
- used measuring range.

4) All tests, described in the chapter 5 must be documented at least with
   - brief description of testing process,
   - test schemes if applicable (e.g. electrical scheme),
   - relevant device settings,
   - registered non-conformities,
   - nominal values,
   - measured values,
   - photographies of non-conformities (if applicable),
   - single ratings,
   - full test rating

   in clearly separated chapters.
5) All defined tests and procedures must be signed by the executing personnel.
6) A conclusion page must indicate the all over test result clearly. In case the acceptance test failed, an explanation must be stated.
7) In case the acceptance test was not fully passed, explanations and adequate correction measures must be stated.
8) The protocol must be crosschecked and signed by a person, responsible for the product quality of cryostat vacuum vessels.
9) The original testing protocol must be handed out to the contracting entity.
10) A digital version must be stored in EDMS following the relevant guidelines for EDMS access and usage. The EDMS storage must be agreed with contracting entity.

6.2. Photographic Documentation

1) Wherever the visual inspection of entities was showing a non conformity, a photography clearly documenting the situation must be taken.
2) In case of deformations, scratches, visible contaminations etc. an adequate scale must be shown for comparison within the picture.

7. References

[1] Directive 97/23/EC, European parliament and the council of the European Union, http://eur-lex.europa.eu, 1997

[2] AD 2000-Code; Verband der TÜV e. V.; Beuth Verlag GmbH; Berlin; Germany; 2009

[3] Technical Guideline No. F-TG-K-7.29e: Incoming Goods Inspection for Cryogenic Modules and Components, F-TG-K-7.29e_Incoming_Goods_Inspection_Cryogenic_Modules_Components_20110404

[4] Technical Guideline No. F-TG-K-10.16e: Documentation and Certificates for Cryogenic Modules, F-TG-K-10.16e_Documentation_and_Certificates_for_Cryogenic_Modules_20101222

[5] Technical Guideline No. F-TG-K-10.7e: Cryostat Label Plates, F-TG-K-10.7e_Cryostat_Label_Plates_20101029

[6] Technical Guideline No. F-TG-K-7.16e: Acceptance Test for Cryostat Vacuum Vessels, F-TG-K-7.16e_Acceptance_Test_for_Cryostat_Vacuum_Vessels_20101028