GSI FAIR	Technical Guideline	Number	9.11e
B-MT	Packaging of Cryogenic Modules and Components	Status	2011-04-04

Contents

1. Scope

1) This document defines requirements on packaging for shipment and transportation of cryogenic modules and components of cryogenic modules like
   - cryo-magnetic modules
   - cryogenic supply systems
   - cryogenic transport systems
   - cryogenic current lead boxes
   - auxiliary cryogenic systems

   within FAIR accelerators.
2) This document must NOT be considered as a replacement for [1].
3) 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.
2) *Cryogenic components* in terms of this document are any components of cryogenic equipment, foreseen for being assembled to a cryogenic module.
3) *Transportation* in terms of this document means any moving, lifting or conveying process applied to a cryogenic module or component, packed or un-packed.
4) *Shipment* in terms of this document means the process of shipping a cryogenic module or component from any location to any other location over any route outside FAIR or GSI premises.

3. Codes and Standards

1) The general requirements on packaging of components and equipment for transport-tation to - or on the FAIR site are defined in [1] and must be adhered.

4. Special Requirements on Packaging

1) In addition to the requirements specified in [1] the packaging of any cryogenic module or component has to fulfil the further specifications as follows.
2) The supplier must perform a detailed analysis of hazards being expected during shipment and transportation processes, e.g. tilting, excitation of resonance frequencies, mechanical impacts, humidity and dust contamination, etc..
3) Adequate measures for protection of cryogenic modules and components must be derived from the results gained from the hazard analysis.

4.1. Protection against Mechanical Damage

1) Any part belonging to a cryogenic component or module must be sufficiently protected from being damaged due to any possible mechanical cause of damage during shipment and transportation processes.
2) Any additional mechanical damping-, support or protection component, being necessary during shipment and transportation, mounted outside or inside cryogenic modules or components must be clearly marked as such and must be documented for installation and un-installation processes within a reasonable timescale.
3) Additional damping-, support- or protection components must not contaminate the cryogenic equipment with any organic or inorganic residuals.

4.2. Protection against Contamination and Climatic Influences

1) All exterior and interior parts of cryogenic modules and components must be protected from dust- and humidity by adequate measures.
2) For the protection of exterior, an adequate outer packaging must be foreseen. For additional protection desiccant bags as defined by [2] and [3] shall be applied.
3) All openings and flanges, as long as not sealed with adjacent components, must be sealed dust-, water- and water-vapour-proof.
4) All volumes of cryogenic modules and components must be slightly evacuated and then filled with dry gaseous Nitrogen. Any over pressure safety system must not respond during this process.
5) Any electrical connector must be protected from contamination with dust or humidity by applying adequate dust-, water- and water-vapour-proof protection caps.

4.3. Over Pressure Safety Systems

1) The penetration of humidity or dust through an installed over pressure safety system must be avoided.
2) In case a safety system was locked for shipment and transportation purposes, it must be clearly marked by a warning notice close to the affected safety system. In addition, a clear warning notice must be stated within the handling instructions and within the operation manual of the cryogenic module, respectively cryogenic component.

3) In case of 4.3.2) also a detailed instruction for the removal of the locking must be stated within the handling instructions and within the operation manual of the cryogenic module, respectively cryogenic component.
4) It must be assured, that any safety system can not be inhibited after removal of a lock.
5) Any locking of safety systems must be completely removed latest after installation at the site of operation.

5. Labelling

1) In addition to the requirements specified in [1] the labelling of any packaging of cryogenic modules or components has to fulfil the further specifications as follows.
2) For prevention of any damage or contamination, adequate preferably non-verbal, labelling showing internationally understandable pictograms must be applied. In case of verbal labelling is required, internationally understandable labelling must be applied.
3) As a result of a hazard analysis, an adequate set of indicators (e.g. Shock-Watch®, Tilt-Watch®, TrekView-H® etc.) must be defined and applied to the packaging.

6. Documentation

1) In addition to the documentation as defined by [1] further documentation as defined by 6.2) to 4) must be delivered 20 working days prior to the date of delivery.
2) Within the documentation, detailed loading-, unloading- and handling instructions must be delivered.
3) A detailed instruction for the installation and removal of any protection system must be stated within the handling instructions of the cryogenic module or component. Within this documentation all necessary precautions and warnings must be listed to avoid damage to personnel and cryogenic modules or components.
4) The position of any protection component must be documented in detail in writing and in adequate drawings or photographic pictures.
5) The supplier must assure that a copy of the named documentation is delivered together with the shipment and being available outside of the packaging at the delivery date on site of delivery.

7. References

[1] Technical Guideline F-TG-T-01e_Transport_20101101; 2010
[2] DIN 55473, Auxiliary means of packaging - Desiccant in bag - Technical delivery conditions; Deutsche Institut für Normung e. V, Beuth Verlag GmbH, Berlin, Germany, 2008
[3] DIN 55474: Auxiliary means of packaging - Desiccants in bag - Application, calculation of the required number of desiccant units; Deutsche Institut für Normung e. V, Beuth Verlag GmbH, Berlin, Germany; 1997