	Technical Guideline	Number	13.2e
Department	Handling-, Packaging and Storage of MLI - Blankets	Status	2011-05-19

Contents

1. Scope

1) This document defines the requirements on handling, packaging and storage of Multi Layer Insulation blankets being applied in applications like
   - magnet cryostats
   - cryogenic supply systems
   - cryogenic transport systems
   - cryogenic current lead boxes
   - auxiliary cryogenic systems

   within FAIR accelerators.

2. Definitions

1) A *Multi Layer Insulation (MLI) blanket* in terms of this document means a sewed package of stacked layers of superinsulation foil interleaved by spacer fabric.

3. Codes and Standards

1) DIN 55473 and 55474 are defining the technical delivery conditions and the calculation methods for the application of desiccant in bags.

4. Handling of MLI blankets

1) MLI blankets must be handled only within closed rooms providing a clean, low dust surrounding and showing a low relative humidity.
2) Personnel which handle MLI blankets must wear clean, oil- and grease free clothing. The use of one-way paper overalls is recommended but at least clean lab coats must be worn.
3) For MLI handling clean, lint- and dust free gloves must be worn. MLI must not be touched with bare hands and must not touch bare skin.
4) The contamination of MLI blankets with any liquids, grease, dust or other substances must be strictly avoided. MLI blankets being contaminated with liquids, greases, dust or other unspecified substances will be rejected.
5) The catching of MLI fabric layers by any rough or sharp objects must be avoided. In case of uncovered fabric layers, the catching of the fabric by hook and loop closures is

very probable and must be strictly avoided by adequate measures. In case of a damage of fabric layers, the MLI blanket will be rejected.

5. Packaging of MLI blankets

1) In case an MLI blanket is not built in to its dedicated cryostat for shipment or storage, each blanket must be packed separately within a suitable package.
2) MLI blankets must be packed in dust and water-vapour-proof packaging, equipped with suitable and sufficient desiccant bags as defined by [1]. The amount of required desiccant can be calculated as defined by [2].
3) The catching of MLI fabric layers by any rough or sharp objects must be avoided. In case of uncovered fabric layers, the catching of the fabric by hook and loop closures is very probable and must be strictly avoided by adequate measures. In case of damage of fabric layers by catching, the MLI blanket will be rejected.
4) The packaging must not induce any damage or remaining deformation; like breaks or sharp kinks; to the MLI. The packaging must provide this function permanently during any shipment and storage process. For this purpose at least an additional outer packaging, e.g. a sufficiently stable card board box, must be applied. Damaged MLI blankets will be rejected.
5) All packages must be clearly ladled. The labelling must allow the clear correlation between the packed blanket and the device it is dedicated to. An explicit reference number for the correlated device must be stated on the label. Unlabeled packages will be rejected.

6. Storage of MLI blankets

1) For storage of MLI – blankets, only rooms providing a clean, low dust and dry surrounding are permitted.
2) As long as not built in to its dedicated cryostat, an MLI blanket must be packed separately within a suitable package (see chapter 5).
3) Folded MLI blankets must not be stacked without sufficient protection form being compressed. No other objects must be placed on folded blankets.
4) Remaining deformation due to wrong storage, like breaks or sharp kinks must be avoided. Damaged MLI blankets will be rejected.

7. References

[1] DIN 55473, Auxiliary means of packaging – Desiccant in bag – Technical delivery conditions; Deutsche Institut für Normung e. V, Beuth Verlag GmbH, Berlin, Germany, 2008

[2] 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