
CERN

Cryogenic Safety Rules and Guidelines at CERN

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GSI-M-4 Cryogenic Equipment

- In accordance with its intergovernmental status, CERN establishes and updates Safety Rules to implement its Safety Policy
- Prior to 2015, pressurised cryogenic equipment was covered by the General Safety Instruction for pressure equipment
- In the June 2015 refresh of the mechanical safety rules General Safety Instruction GSI-M-4 was released, as a response to the specific needs of cryogenic equipment at CERN
- Available on the CERN Safety Rules website: www.cern.ch/safety-rules

GSI-M-4 Cryogenic Equipment

- Defines the minimum safety requirements related to the life cycle of cryogenic equipment
  - Cradle to grave approach
- Pressurised and non-pressurised equipment used at a temperature equal to or lower than 123.15 K
- Valid for all new equipment and equipment brought onto the CERN site from elsewhere
  - Cryogenic equipment already present on the CERN site when GSI-M-4 came into force requires implementing its provisions by June 2017
- Defines and requires an equipment “Safety File”
- Aligned, as far as possible, to existing standards

GSI-M-4 Cryogenic Equipment

- Design, manufacture and procurement
  - Primarily based on European Directives for pressure equipment and transportable pressure equipment
  - Use of harmonised European standards
    - Use of other technical standards is subject to approval by HSE Unit
  - CE marking
  - Declaration of conformity
  - Factory acceptance tests, where applicable
  - Instruction manual

GSI-M-4 Cryogenic Equipment

- Installation, acceptance, commissioning and use
  - Protection by safety devices against overpressure
  - Risk assessment for oxygen deficiency hazards
    - Compensatory measures in place before use
  - Checks and proof tests
    - By HSE Unit if maximum allowable pressure PS > 0.5 bar
    - By owning organic unit for others
  - Allocation of a CERN identification number
  - Operating procedures in compliance with the instruction manual and with emergency procedures
  - Use by authorised, competent and trained persons only
  - Operated within its normal operating parameters and within its next inspection/requalification date

GSI-M-4 Cryogenic Equipment

- Periodic inspections
  - External visual inspection
  - Requalification for transportable pressurised cryogenic equipment
  - Functional test of safety valves
    - Test-bench verification of set pressure and leak tightness
    - 3 or 5 year interval depending on fluid, external fouling, flammability, type of equipment that is being protected, type of relief valve.
- Maintenance
- Recommissioning
  - Part of Management of Change
- Decommissioning / dismantling

Major Safety Implications

- Specialists from the HSE Unit can decide to specifically define equipment and installations as being ‘liable to have major safety implications’
  - This decision cannot be made by the Departments themselves
- May include cryogenic equipment
  - Not compliant with the applicable European directives, or
  - of a highly complex design, or
  - using reduced safety factors, or
  - requiring special conditions of use, or
  - using unconventional materials or manufacturing technologies, or
  - presenting a high-level hazard for people, the environment or other installations in the event of failure.
- Requires HSE Unit approval for each stage of the lifecycle and specific safety checks
- HSE Unit can define additional safety requirements in collaboration with the owning organic unit
- Requires formal Safety Clearance from the HSE Unit prior to operation

Safety Guidelines

- Safety Guideline SG-M-4-0-1 *Cryogenic Equipment* issued in August 2016 to support GSI-M-4
- Provides guidance on the following aspects:
  - Cryogenic hazards
    - Personal safety
      - Asphyxiation
      - Effect of cold temperatures
    - Process safety and asset integrity
      - Overpressure
      - Brittle fracture
      - Icing
      - Oxygen enrichment
  - Risk assessment
  - Prevention / protection
  - Equipment compliance
- Available on the CERN Safety Rules website: www.cern.ch/safety-rules

Safety Guidelines

- Safety Guideline SG-M-4-0-2 *Oxygen Deficiency Hazards* to be published soon
- Provides guidance on the following aspects:
  - Risk assessment methodology and aspects to consider
  - Control and mitigation measures
  - Effects of exposure to oxygen deficient atmospheres
  - Definition of evacuation time
- Will be made available on the CERN Safety Rules website: www.cern.ch/safety-rules


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