1. Application area

These guidelines apply to all cold traps (e.g. Meissner traps, baffles) and the refrigerant pipes, i.e. the connection pipes to the cryo-generator. The scope of application covers the design, manufacturing, testing as well as the specifications in the drawings.

2. Purpose

This BLOA standard describes the activities, materials and preconditions required for a technically correct manufacturing and testing of cold traps and refrigerant pipes that are conform to the Pressure Equipment Directive (97/23/EC).

3. Basics

This standard describes the design, manufacturing and testing for **category I**.
Criteria that indicate that a cold trap has to be designed, built and tested according to **category I** are listed in the standard LHH-N 090.218.

4. Layout and design

The ***refrigerant pipes*** are designed and manufactured according to sound engineering practice.
Pressure tests and CE mark are not required

The design documents for the ***cold traps*** must be archived.

5. Manufacturing

5.1 Cold traps made of pipes (Pipe design)

Qualification of Personnel: Persons in charge of brazing joints of cold traps or refrigerant pipes have to complete a test in the context of a procedure test according to VdTÜV guideline 1160 including the technical test according to DIN ISO 11745.

Brazing:

Brazing material: Fontargen **AF 314** (Mat.-No. 102135879) for copper-to-copper and copper-to-stainless steel joints

- All pipe ends must be deburred very carefully and loose parts, e.g. shavings, must be removed.
- Thoroughly clean all surfaces to be connected to each other to bare metal (until the material is free of oxide layers).
- Working temperature at approx. 650°C. Do not exceed 700°C!
- While brazing and until cooling down of the joint to below 200°C, the pipes must be purged with nitrogen or argon

Cleaning:

Remove flux residue!

Outer side: Clean with a damp cloth while the brazed joint is still hot.

Inner side: *Cold trap:* Rinse for 3 hours with warm water (approx. 80°C). A low flow rate is sufficient.

Refrigerant pipes: Remove the flux residue carefully (rinse). Carefully dry after cleaning.

Exceptional cases: During final assembly cleaning of inaccessible joints can be omitted.

5.2 Cold trap made of stainless steel plates (Plate design)

Qualification of Personnel: Persons in charge of welding of cold traps have to complete a qualification test according to DIN EN 287-1.

Welding procedure: Procedure test for laser welding required.

Cleaning:

Outer side: Pickled and render passive after welding.

Inner side: Purge with forming gas while welding.

6. Test

1. Water pressure test at 45 bar (1.43 x operating pressure) according to LHH-N 090.216. Pressure must be exerted for 30 minutes. The component complies with the requirements when there is no visible leak, the test pressure remains constant for the test duration and no permanent deformations are present.
2. Blow through with oil-free compressed air
3. Vacuum test: Evacuation of air to 1 x 10^{-2} mbar.

Warming the cold trap may help to speed up the test (removal of residual moisture).

4. Leak test with helium (HV2, see LHH-N 000.320).
5. Venting with nitrogen or inert gas.
6. Close openings!

Note: No pressure test is conducted on refrigerant pipes, but the entire system must be tested for leaks after completion.

7. Drawing specifications

Drawings must show the following specifications:

- Manufactured and tested according to LHH-N 090.013.
- The location of the serial number identification must be specified in the drawing.

8. Traceability of cold traps

- Each cold trap must be identified by a serial number.
- The manufacturer has to keep test logs and archive them for a duration set by regulations.

9. Specifications in parts list

Enter a label and 4 blind rivets in the parts list for the cold trap. In addition, enter the contents of the fields as a text position under the position of the empty label.

To keep the parts list independent of the date of manufacturing, *"Enter current year"* is entered as text in the "year of manufacturing" field: