

Enclosure to the Criteria of ZVEI/VDMA for Refrigeration Appliances

1. Area of application

This enclosure establishes specific requirements for the area of refrigeration appliances recycling, which have to be checked in addition to the general requirements of the criteria catalogue of ZVEI/VDMA for the certification of recycling companies for electric and electronic products.

2. Definition

2.1 Recycling Step I

The entirety of all technological and technical measures, which are necessary to remove and separate refrigerants and other fuels from the refrigerant cycle of the appliances.

2.2 Recycling Step II

The entirety of all technological and technical measures, which are necessary to mechanically cut up appliances and components, which possess gas-foamed isolations, separate them into the material components and recover environmentally hazardous gases.

3. Entry area

Components containing hazardous material have to be removed (e.g. Hg switches, PCB capacitors),

The incoming appliances have to be classified (e.g. design, technology).

The loose, easily removable parts (e.g. glass) have to be dismantled and separately collected, if it is necessary for a more efficient recycling.

4. Technological and technical requirements for the recycling step I

The removal has to be done only with the designated devices which have to fulfill the requirements.

The refrigerant removal system has to be produced and set up technically in such a way that leaking water-endangering materials can not get into the drinking water.

The general efficiency and function of the systems for the level 1 has to be guaranteed (e.g. piercing pliers, inclinable desks).

4.1 Connection Systems

The connection systems (pliers, suction devices) have to be designed in such a way that no refrigerant can leak out during the removal of the refrigerant.

The procedure has to ensure that an emptying of the remaining refrigerant is carried out (removal at the lowest point).

Independent of the suction system it has to be ensured that the connected suction systems can only be removed from the suction area if

- a) the suction process is terminated automatically (compulsory system)
- or
- b) no oil movement in the show glass is recognizable,
- or
- c) the negative pressure has reached the value of 0,7 bar (absolute pressure 0,3 bar).

4.2 Safety requirements

According to type of the refrigerant, the demanded safety requirements have to be kept. When removing refrigerants of the groups L2 or L3, only such connection systems are to be used which fulfill the appliance technical prerequisites.

4.3 Preparation

The removed refrigerants have to be prepared immediately after the removal for further treatment:

- The refrigerant-oil mixtures have to be divided into the separate components and have to be stored separately.
- The recycled quantity of refrigerant has to be documented.

The total halogen amount in the oil may not exceed 0.2 % in case of re-use of the material, alternatively the oil has to be subjected to a suitable thermal treatment.

5. Technological and technical requirements for the recycling step II

The refrigeration appliances (also cases, housing, components and foams) have to be cut into pieces mechanically and separated into the individual materials by adequate sorting and deviding procedures.

The installation has to be set up totally enclosed and operated in negative pressure.

The cut up refrigeration appliances have to be separated into groups of Fe-metals, non-ferrous metals, PUR-FOAM and plastic.

The exhaust air purification has to be examined concerning the keeping of the TA-air or the permissible values (either by a permanent measurement at the installation or by measurements each quarter by a technical expert)

By means of matrix and/or pore degassing or comparable procedures the propellants have to be loosened from the foam, vacuumed off with suitable systems, separated and collected.

During the recycling of pentane or other L3-foam appliance housings and components in general, an inertization of the cutting up level is to be designated by means of inert gas. If no complete inertization takes place, sufficiently suitable preventive measures are to be designated against explosions (e.g. gas warning system / nitrogen shower / pressure relief mechanism).

The following quality parameters are at least to be reached:

- remaining and foreign adherings to metal fractions < 3.0 Gew.%
- remaining CFC content in the PUR-foam < 0.5 Gew.%(in case of re-use)
- CFC recycling factor from raw gas flow > 98.0 Gew.%

The above mentioned parameters have to be examined annually by suitable experts.

The total recycling quota has to be > 90%¹ (material and thermal).

¹ This quota has to be verified by the manufacturers in ZVEI, alternatively the requirement for a total recycling quota will be deleted