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Insulated means of transport for temperature sensitive goods - Requirements and testing - Part 2: Equipment

Wärme gedämmte Transportmittel für temperaturempfindliche Produkte - Anforderungen und Prüfung - Teil 2: Einrichtungen

Moyens de transport isothermes pour les marchandises sensibles à la température - Exigences et essais - Partie 2 : Equipement

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 17066-2:2023) has been prepared by Technical Committee CEN/TC 413 “Insulated means of transport for temperature sensitive goods with or without cooling and/or heating device”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

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1 Scope

The document applies to thermally insulated means of transport used for temperature sensitive goods equipped with a cooling and/or heating device.

This document specifies the terminology, the requirements for thermal insulation, air tightness, dimensioning of equipment with cooling and/or heating device for long distance and distribution transport.

This document does not specify further land transport requirements with regard to dimensions, weights, etc. Further this standard does not cover safety requirements or special requirements for thermal containers covered by ISO 1496-2.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12830, *Temperature recorders for the transport, storage and distribution of temperature sensitive goods — Tests, performance, suitability*

EN 13485, *Thermometers for measuring the air and product temperature for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice cream — Tests, performance, suitability*

EN 13486, *Temperature recorders and thermometers for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice cream — Periodic verification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 General

3.1.1

compartment

insulated part of a container built for the carriage of the goods equipped or not with a cooling and/or heating device

3.1.2

unconditioned compartment

compartment considered to have no evaporator or other cooling and/or heating devices or for which they are inactive

3.1.3

distribution transport

tour including at least 2 locations of delivery and/or collection of goods

3.1.4

long-distance transport

uninterrupted transport of goods from a collection point to a delivery point without intermediate loading and unloading

3.1.5

refrigerant

fluid used for heat transfer in a refrigerating system, which absorbs heat at low temperature and a low pressure and rejects heat at a higher temperature and a higher pressure usually involving changes of the state of the fluid

3.1.6

eutectic elements

elements (e.g. plates, tubes, etc.) intended for cold or heat charging, containing an inside eutectic solution having the characteristic to change phase at a specific temperature

Note 1 to entry: Fixed eutectic elements are cooled or heated with a cooling and/or heating device. Movable eutectic elements are cooled or heated in a temperature-controlled space at a temperature sufficient to achieve the phase change.

3.1.7

goods

temperature sensitive products to be transported within a defined temperature range

3.2 Equipment

3.2.1

equipment

container equipped with a cooling and/or heating device in one or more compartments

3.2.2

multi-temperature equipment

container divided by insulated partition walls in two or more compartments and equipped with a cooling and/or heating device for maintaining different temperatures

3.2.3

non-mechanically refrigerated equipment

equipment which, using a source of cold (natural ice, with or without the addition of salt, eutectic plates, dry ice, with or without sublimation control, liquefied gases, with or without evaporation control, etc.) other than a mechanical or absorption cooling device is capable of lowering the inside temperature at a nominal outside temperature of a compartment, and thereafter maintaining it, at the required inside temperature

Note 1 to entry: Some nominal outside and inside temperature are proposed in in Annex B.

3.2.4

mechanically refrigerated equipment

equipment either fitted with a cooling device, or served jointly with other units of transport equipment by such an appliance, (fitted with either a mechanical compressor, or an absorption cooling device etc.) which is capable of lowering the inside temperature at a nominal outside temperature of a compartment, and thereafter maintaining it, at the required inside temperature

prEN 17066-2:2023 (E)**3.2.5****heated equipment**

equipment fitted with a heating device, which is capable of raising the inside temperature of a compartment to, and thereafter maintaining it at a minimum temperature of + 12 °C, with a nominal outside temperature

3.2.6**partition wall**

fixed or movable, longitudinal or transversal, insulated wall also known as bulkhead between different conditioned and/or unconditioned compartments inside a compartment

3.2.7**cooling device**

system which lowers and/or maintains temperature in a compartment

3.2.8**heating device**

system which increases and/or maintains temperature in a compartment

3.2.9**start/stop operation**

automatic and usually electronic process which stops the thermal engine of the refrigeration system when one temperature limit is reached and starts when the other one is exceeded

Note 1 to entry: In this mode besides the controller the refrigeration compressor, fans of the condenser and evaporator are stopped.

3.2.10**mean surface area**

S_m

geometrical mean of the projected internal surface area S_i and the projected external surface area S_e in m^2

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$$S_m = \sqrt{S_i \cdot S_e}$$

(1)

Note 1 to entry: Refer to EN 17066-1.

3.3 Testing**3.3.1****cooling down process/ heating up process**

process by which the mean internal temperature of the equipment, including the internal surface layer and half of the insulation thickness, is cooled down or heated up to the specified temperature

3.3.2**conditioned test room**

room where the test conditions can be maintained at a constant level

4 Requirements for equipment

4.1 General (user instructions and limits)

Instructions for use shall be prepared and supplied by the manufacturer of the container and by the manufacturer of the cooling and/or heating device.

In order to prevent the temperature variation from exceeding the limit values permitted, the load space and goods shall be brought to the required temperature prior to loading. Depending on goods and temperature limits, modulation of the air circulation including start-/stop operation is possible.

The dimensioning of the cooling and/or heating devices for transport equipment in accordance with this document intends to maintain the goods concerned during transport at the required temperature. This shall compensate for heat transfer including door openings for multiple loading and unloading.

For certain goods the required minimum and maximum limiting temperature has to be considered.

To minimize energy consumption the air leakage rate should be considered taking into account the recommendations in the informative Annex C.

4.2 Non-mechanically refrigerated and/or heated equipment

For non-mechanically refrigerated and/or heated equipment, except those built for small containers, including one or more compartments, the cooling and/or heating device shall be filled and/or charged from outside.

4.3 Internal air circulation

4.3.1 General

The following requirement does not apply to natural convection cooling or heating devices.

In order to ensure proper air distribution, equipment with forced ventilation requires defined air circulation. The design air flow V_a should be selected in consideration to the required temperature and product type as indicated in the informative Annex D.

Heated cargo may require alternative air flow and/or air distribution system to ensure warm air is forced uniformly throughout the load space.

Start/stop operation of the unit when the evaporator fans are not in use is less critical for goods transported at temperatures lower than $-18\text{ }^{\circ}\text{C}$.

Start/stop operation is not recommended under any of the following circumstances:

- sensitive chilled goods (flowers, cheese,);
- high temperature difference between ambient and goods;
- low temperature tolerance of goods;
- low mass and/or low specific heat capacity of the goods;
- distribution transport with multiple door openings.

Under these circumstances the air flow has to be maintained. During cooling down or heating up a continuous air flow is recommended.

As indicated in Annex D the air flow rate can be modulated if the indicated temperature range has been reached except for certain sensitive goods.

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The delivered air pressure of the forced ventilation shall be designed so that the additional pressure loss to be expected due to loading, any internal equipment (e.g. air duct) and evaporator should be compensated for.

4.3.2 Air handling and distribution**4.3.2.1 General**

A container with a cooling and/or heating device shall provide air circulation around the goods, a minimum air flow and shall avoid air short cycling and hot spots with additional accessories:

4.3.2.2 Air supply

The air supply, roof mounted or roof/floor incorporated, shall ensure the air distribution to reach all parts of the container. A minimum air velocity of 1,0 m/s at a distance no more than 10 % of internal length measured from the rear end of the container (compartment) and not less than 80 % of the internal height shall be provided.

Air ducts should be used for containers (compartment) exceeding 6 m in length.

The design of the air ducts should be in accordance with the recommendations of the manufacturer of the cooling and/or heating devices.

To prevent excessive pressure drops the cross-sectional area of the air ducting shall be greater than the air outlet of the above-mentioned device, the length should not be less than 20 % and no more than 75 % of the length of the compartment. For flexible air duct systems, the cross-sectional area shall be provided over the complete length of the duct by design measures in order to reach the objective in 4.3.2.1.

The air-ducting system should generate the minimum pressure-drop (compatible with cooling or heating device). For semitrailers and rigid trucks exceeding 8 m internal length the roof mounted air duct should have air outlets located with a minimum distance of 2,5 m from the front wall to avoid short circuits.

Any transversal partitioning stored in an upper position shall not restrict the air flow either.

4.3.2.3 Air return

Air return panel or grid/bulkhead shall be designed so to facilitate the air return to the cooling or heating device. The cross-sectional area shall correlate the free space beneath the load. The design of the air ducts should be in accordance with the recommendations of the manufacturer of the cooling and/or heating devices. Particular attention should be paid to avoid blocking the air return and to allow easy physical regular inspection and maintenance for any potential blockage. The air return panel or grid should cover the entire inner width of the container and generate the minimum pressure-drop (compatible with the cooling or heating device). When vertical distance profiles are used, the air flow shall be maintained homogeneous along the width of the air return due to air flow in transverse direction ensured by design features like for example perforated or interrupted distance profiles.

4.4 Temperature recording

Transport equipment for deep-/quick frozen foodstuffs shall be fitted with a suitable recording instrument to monitor, at frequent and regular intervals, the air temperatures to which the foodstuffs are subjected to. In this case the temperature recorder shall comply to EN 12830 and EN 13485. The measuring instrument shall be periodically validated according to the EN 13486.

Transport equipment for other goods should be fitted with a suitable recording instrument to monitor, at frequent and regular intervals, the air temperatures to which the goods are subjected to. In this case the temperature recorder should comply to EN 12830 and EN 13485. The measuring instrument should be periodically validated according to the EN 13486.