



**TITLE: Water-pack freezer: absorption cycle**

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<i>Product verification protocol:</i>	E003/FZ02-VP.2
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**1. Scope:**

This specification defines the requirements for absorption-cycle water-pack freezers. Three temperature zone designations are described: [moderate zone](#), [temperate zone](#) and [hot zone](#). These units are not suitable for storing vaccine.

**2. Normative references:**

- BS2869:2006: *Specification for fuel oils for agricultural, domestic and industrial engines and boilers.*
- DIN 8985: 1983-05: *Testing the surfaces of installed refrigerators and freezers.*
- EMAS: *European Union Eco-Management and Audit Scheme.*
- IEC 60335-2-24: 2007 - *Household and similar electrical appliances - Safety - Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers.*
- IEC 62552: 2007: *Household refrigerating appliances – Characteristics and test methods.*
- ISO 9001: *Quality Management Systems – Requirements.*
- ISO 14001: 2004: *Environmental management systems - Requirements with guidance for use.*
- ISO/IEC 17025: 2005: *General requirements for the competence of testing and calibration laboratories.*
- ISO 20282-1: 2006: *Ease of operation of everyday products - Part 1: Context of use and user characteristics.*
- WHO/PQS/E006/TH02.2: *Fixed gas or vapour pressure dial thermometer.*

**3. Terms and definitions:**

[Holdover time](#): The time in hours during which the warmest point in the water-pack freezing compartment of the freezer remain below -3°C, at the maximum ambient temperature of the temperature zone for which the appliance is rated, after the fuel supply has been disconnected.

[Hot zone](#): Hot zone appliances must operate at a steady +43°C ambient temperature and over a +43°C/+25°C day/night cycling temperature range.

[In writing](#): means communication by letter, fax or email.

[Legal Manufacturer](#): The natural or legal person with responsibility for the design, manufacture, packaging and labelling of a product or device before it is placed on the market under his own name, regardless of whether these

operations are carried out by that person himself or on his behalf by a third party.

Moderate zone: Moderate zone appliances must operate at a steady +27°C ambient temperature and over a +27°C/+10°C day/night cycling temperature range.

Montreal Protocol: Montreal Protocol on Substances that Deplete the Ozone Layer.

Reseller: A commercial entity, licensed to act on behalf of a Legal Manufacturer, and which carries product liability and warranty responsibilities no less onerous than those carried by the Legal Manufacturer.

Temperate zone: Temperate zone appliances must operate at a steady +32°C ambient temperature and over a +32°C/+15°C day/night cycling temperature range.

Water-pack freezing capacity: The maximum weight of water-packs which can be frozen, in one batch, during a 24 hour freezing cycle. During this period the temperature of the water-pack freezing compartment must remain below -3°C, except during the actual freezing process after unfrozen water-packs have been loaded.

#### **4. Requirements:**

##### **4.1 General:**

Absorption-cycle water-pack freezers are used primarily in areas without a reliable electricity supply (i.e. less than 8 hours of continuous electricity per typical day). Manufacturers may offer products suitable for one or more temperature zones. Fuel supply is natural gas, propane or kerosene. These units are not suitable for storing vaccine. Supplementary electric power is allowed but not required. If it is offered, performance under electrical power may be tested by prior agreement between WHO and the manufacturer.

##### **4.2 Performance:**

###### **4.2.1 Operating temperature range:**

As indicated on the temperature zone rating sticker attached to the product (see Annex 1).

###### **4.2.2 Refrigeration cycle:**

Absorption-cycle unit designed to operate on natural gas, propane or kerosene. Multi-fuelled products, including an electric-powered option are allowed but not required.

###### **4.2.3 Water-pack freezing:**

Not less than 2.4 kg of water-packs must be frozen per 24 hours. The freezer should accommodate a minimum of 8.4 kg of frozen water-packs.

###### **4.2.4 Temperature control:**

No specific requirement, subject to achieving the performance described in clause 4.2.3.

###### **4.2.5 Thermostat/flame control device:**

An adjustable thermostat is permitted for gas-fuelled units. Kerosene-fuelled units must have an easy-to-operate flame adjustment control and/or a two position day-night regulator. All units should be designed to minimise the need for further intervention by the operator once an optimum internal temperature setting has been achieved at the installation site.

- 4.2.6 *Flame failure device (gas units)*  
Natural gas and propane units must be fitted with an automatic flame failure device.
- 4.2.7 *Holdover time:*  
No standard set; however performance data will be published.
- 4.2.8 *Lock:*  
The door or lid must be fitted with a lock. Two keys are to be supplied with every unit.
- 4.2.9 *Fuel quality:*  
If kerosene is used see Annex 2 for recommended fuel quality.
- 4.2.10 *Fuel consumption:*  
No standard set; however performance data will be published.
- 4.2.11 *Corrosion resistance:*  
Internal and external cabinet, lid and frame protected against corrosion to DIN 8985.
- 4.2.12 *Thermometer:*  
A thermometer is not specifically required. However, if an externally readable cabinet-mounted thermometer is fitted it must be a gas or vapour pressure dial thermometer complying with PQS specification **E006/TH02**.
- 4.2.13 *Electrical safety rating:*  
For products with relevant electrical components only: Manufacturer to certify compliance with IEC 60335-1 and IEC 60335-2-24.
- 4.2.14 *Markings:*  
The freezer cabinet must be permanently marked with the chemical name of the refrigerant, or with the refrigerant number, formula or proportion (for blended refrigerants). If units contain hexavalent chromium as a corrosion inhibitor there must be an appropriate hazard warning label on the cabinet to indicate its presence. The label must comply with the Globally Harmonized System for the Classification and Labelling of Chemicals.
- 4.2.15 *Vaccine storage advice:*  
All units must carry a factory-fitted non-removable label, designed to last the lifetime of the appliance, carrying the words: 'Do not store vaccine in this freezer' in letters a minimum of 20mm high. The label should be fixed to the lid of chest freezers and near the top of the door on upright freezers. The wording should be in one of the languages specified in clause 4.11, as indicated by the purchaser at the time of ordering.
- 4.3 *Environmental requirements:*
- 4.3.1 *Ambient temperature range during transport and storage:*  
-30°C to +55°C when the product is inactivated.
- 4.3.2 *Ambient humidity range during transport, storage and use:*  
5% to 95% RH, non-condensing.
- 4.4 *Physical characteristics:*
- 4.4.1 *Overall dimensions:*  
To allow for manoeuvring through corners, corridors and doorways, the minimum dimension of the product (length, width or height) should not exceed 710mm; exceptionally a minimum dimension up to 830mm can be accepted, but this will restrict the number of sites where the appliance can be

installed. The maximum dimension must not exceed 1700mm and the maximum diagonal (corner to corner) dimension must not exceed 1850mm.

4.4.2 *Weight:*

Mechanical lifting equipment will typically not be available at the installation sites. It is recommended that the refrigerator and any associated components should be designed for lifting in such a way that no single worker is required to carry more than 25 kg whilst working on their own, or in a group.

4.5 *Interface requirements:*

4.5.1 *Power lead:*

If the product is supplied with an electrical power lead it must have a sealed-on plug compatible with the electricity socket standard in the country where the equipment is to be installed. The power lead must be at least 1.5 meters and not more than 2.0 meters in length.

4.6 *Human factors:*

4.6.1 *Generally:*

The product must be useable by the widest practicable range of active health workers, regardless of age, gender, size or minor disability, including colour blind users and long long-sighted people without glasses, in accordance with the general principles laid out in ISO 20282-1: 2006.

4.6.2 *Control panel:*

The control panel and thermostat may be positioned on the front of the unit; preferably as close to eye level as possible. Alternatively they may be mounted on top of the unit at a height not exceeding 1.3 metres. If a low level position is essential, the display should be aligned so that it can easily be read without the user having to squat or kneel down. The gas isolating valve/kerosene burner control knob must be easily accessible to the operator without need to move the unit.

4.7 *Materials:*

4.7.1 *Refrigerant:*

Ammonia-water. CFC (chlorofluorocarbon) and HCFC (hydrochlorofluorocarbon) gases are not acceptable. The suitability of alternative refrigerant gases will continue to be assessed and preference will be given to products that use gases with low global warming potential (GWP).

4.7.2 *Thermal insulation foaming agents:*

Any gas complying with the limitations and deadlines set by the [Montreal Protocol](#) on the elimination of ozone-depleting chemicals.

4.7.3 *Other restricted materials:*

The product and its constituent components must not contain lead, mercury, cadmium, polybrominated biphenyls (PBB) or polybrominated biphenyl ethers (PBDE). Hexavalent chromium is permitted as a corrosion inhibitor in absorption cycle freezers, but for no other purpose.

4.8 *Warranty:*

The product is to be covered by a two year replacement warranty in the event of any component failure arising from defective design, materials or workmanship.

- 4.9 Servicing provision:  
The product is to be designed to achieve a maintenance-free life of not less than 10 years apart from re-fueling, wick replacement and trimming (kerosene units), gas burner maintenance (gas units), flue cleaning, routine de-frosting and cleaning.
- 4.10 Disposal and recycling:  
The manufacturer is to provide information to the buyer on the hazardous materials contained within the system and suggestions for resource recovery/recycling and/or environmentally safe disposal.
- 4.11 Instructions:  
User and maintenance instructions in Arabic, English, French, Mandarin Chinese, Russian and Spanish. The instructions are to be written for users and repair technicians and are to cover the following topics:
- installation procedures;
  - temperature adjustments (if applicable);
  - simple daily, weekly and monthly maintenance tasks;
  - periodic preventative maintenance checks;
  - diagnostic and repair procedures;
  - itemized list of spare parts including part numbers;
  - end-of-life resource recovery and recycling procedures.
- 4.12 Training:  
Not required.
- 4.13 Verification:  
In accordance with PQS Verification Protocol **E003/FZ02-VP.2.**
- 5. Packaging:**  
Materials used for packaging the finished product are to be free of ozone-depleting compounds as defined in the [Montreal Protocol](#). The general specification of shipping containers will be subject to agreement with the individual procurement agencies.
- 6. On-site installation:**  
Not required.
- 7. Product dossier:**  
The [legal manufacturer](#) or [reseller](#) is to provide WHO with a pre-qualification dossier containing the following:
- Dossier examination fee in US dollars.
  - General information about the [legal manufacturer](#), including name and address.
  - Unique identification reference for the product type.
  - Brand name of the product.
  - Full specifications of the product being offered, covering all the requirements set out in this document, including details of product marking and traceability.

- A comprehensive set of photographs showing all external surfaces of the unit, the interior layout, the compressor and a close-up of the thermometer, the thermostat and the burner controls.
- Certified photocopies of all type-approvals obtained for the product, including CE marking and the like.
- Certified photocopies of the legal manufacturer's ISO 9001 quality system certification.
- Where relevant, certified photocopies of the [legal manufacturer's](#) ISO 14001 certification, EMAS registration or registration with an equivalent environmental audit scheme. Conformity with an environmental audit scheme is not mandatory; however preference will be given to manufacturers who are able to demonstrate compliance with good environmental practice.
- Where available, laboratory test report(s) proving conformity with the product specifications.
- Indicative cost of the product per unit, per 10 units and per 100 units, EXW (Incoterms 2000).

**8. On-site maintenance:**

Maintenance will be carried out by the end-user and/or his agents.

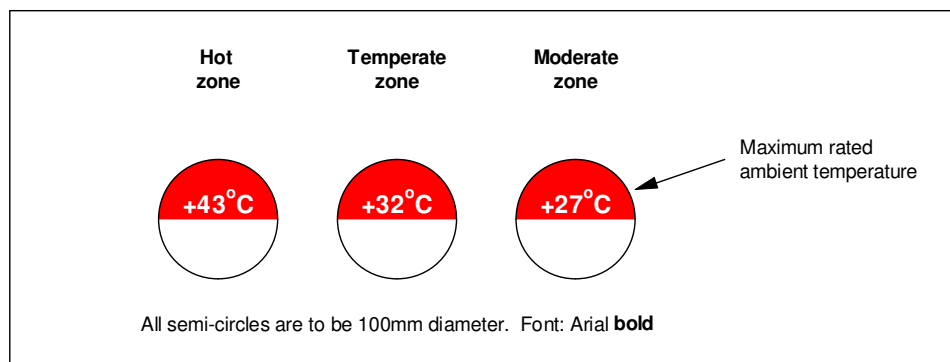
**9. Change notification:**

The [legal manufacturer](#) or [reseller](#) is to advise WHO [in writing](#) of any changes which adversely affect the performance of the product after PQS pre-qualification has taken place. Any change that WHO considers would alter the test results obtained against the PQS verification protocol **E003/FZ02-VP.2** will result in a request for the product to be re-tested.

**10. Defect reporting:**

The [legal manufacturer](#) or [reseller](#) is to advise WHO and the UN purchasing agencies [in writing](#) in the event of safety-related product recalls, component defects and other similar events. If requested to do so by WHO/UNICEF, the manufacturer is to submit a report to WHO/UNICEF stating the number of affected systems and the number of component repairs/replacements provided, together with copies of any associated field reports.

## Annex 1 – Temperature zone symbol for freezers



## Annex 2 – Kerosene quality

The quality of kerosene recommended for wick burning stoves and refrigerators should have the following characteristics:

Minimum smoke point:	35 mm
Maximum char value:	10 mg/kg
Distillation: maximum % recovery at 200°C:	60%
Flock test:	Negative
Maximum sulphur content:	0.04%

**Note:** Specification details for kerosene to BS2869, Class C1 have been altered in the current 2006 version of the standard. After consultation with industry, and to reflect field conditions in the developing world, the standard set out in the 1998 PIS Annex 6 has been retained as the minimum required. Kerosene to this old standard should be used for testing appliances.



<b>Revision history:</b>			
<b>Date</b>	<b>Change summary</b>	<b>Reason for change</b>	<b>Approved</b>
23.05.2007	General edit with additional clauses plus Annexes 1, 2 and 3.	Final revisions to PQS format.	UK
31.05.2007	SMc comments incorporated. 4.2.4: Temperature control method clarified.		UK
02.08.2007	4.2.7: Lock spec changed. 4.4.1: Dims clarified. Annex 3 wording changed back to 1998 PIS wording. Clarification note added	In response to comments from manufacturers.	UK
06.07.2010	'Icepack' changed to 'water-pack'. 2: Normative references updated. IEC 60335 added. 3: Holdover clarified and temperature changed to -3°C. Water-pack freezing capacity definition added. 4.1: Conditions for testing supplementary electrical power added. 4.2.3: Title changed. 4.2.4: Requirement for non-adjustable control system removed. 4.2.5: Thermostat/flame control device clause added. 4.2.9: Typo. 4.2.12: Clause amended. 4.2.13: Clause added. 4.2.14: Requirement for hexavalent chromium hazard warning label added. 4.4.1: Clause amended. 4.4.2: Clause amended. 4.5.1: Clause added. 4.6.1: Clause amended. 4.6.2: Clause amended. 4.7.1: Ammonia-water refrigerant permitted. GWP amendment. 4.7.3: Hexavalent chromium allowed as corrosion inhibitor. 4.9: Gas burners added. 4.13: VP reference updated. 7: ISO 9001 waiver omitted. Annex 2: Omitted. Annex 3: Renumbered.	Response to comments from manufacturers, testing laboratories and others.	