

INCH-POUND

MIL-DTL-32235

12 February 2007

DETAIL SPECIFICATION

HEATER MODULE, GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification describes the performance and design of a self-heating heater module consisting of polymeric food trays, flameless heaters, activation fluid, heating trays and an activation mechanism. The heater module is used by the Department of Defense as a component of the Unitized Group Ration-Express (UGR-E) operational group ration to provide hot meals to eighteen individuals.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4 or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4 or 5 of this specification, whether or not they are listed.

Comments, suggestions or questions on this document should be addressed to US Army Research, Development and Engineering Command, Natick Soldier Research, Development and Engineering Center, AMSRD-NSC-CF-F, 15 Kansas St., Natick, MA 01760-5018 or emailed to Raymond.Valvano@natick.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil/>.

AMSC N/A

FSC 8970

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2.2 Government documents.

MIL-DTL-32235

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-32004 – Packaging of Food in Polymeric Trays

MIL-DTL-32235/1 – Heater Module, Type I: Magnesium and Iron Heater, Assembly Required

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Federal Food, Drug and Cosmetic Act and regulations (21 Code of Federal Regulations (CFR), Parts 170-189)

(Copies of this document are available online at www.access.gpo.gov/nara or from the Superintendent of Documents, ATTN: New Orders, P.O. Box 371954, Pittsburgh, PA 15250-7954.)

2.3 Non-Government publications. The following documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 1974 – Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes

D 5118/D 5118M – Standard Practice for Fabrication of Fiberboard Shipping Boxes

(Copies of these documents are available at www.astm.org or from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959)

MIL-DTL-32235

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets) the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.3 Materials.

3.3.1 Components and ingredients. The contractor shall select materials capable of meeting the interface, interoperability, environmental, operating and support requirements. The active ingredients, additives and activation fluids shall be uniform chemicals and compounds and shall meet all requirements of this document. The materials cited are recommended.

3.3.1.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.4 Interface and interoperability requirements.

3.4.1 Heater.

3.4.1.1 Heater elements. The active ingredients and additives shall be uniformly blended and distributed in a matrix that, when the heater is triggered by the activation fluid, shall allow for uniform heating of the polymeric trays of food. (See 3.1)

3.4.1.2 Heater design. The heater elements shall be contained in a gas and water permeable material which, upon the introduction of the activation fluid, shall promote the heating process. (See 3.1)

3.4.1.3 Protection of the heater. The heater(s) shall be packaged in barrier material to avoid premature chemical reaction or degradation of the heater. (See 3.1)

MIL-DTL-32235

3.4.2 Activation fluid. The activation fluid shall be of a chemical constitution and adequate volume which, when combined with the heater, shall safely initiate and propagate an exothermic reaction. (See 3.1)

3.4.2.1 Activation fluid unit design. Activation fluid shall be packaged in a barrier material to avoid premature release or degradation of the fluid. (See 3.1)

3.4.3 Polymeric food tray. The polymeric food trays shall be in accordance with MIL-PRF-32004.

3.4.4 Heating tray. The heating tray shall be designed to contain the heater, activation fluid, and the polymeric food tray in a structure that shall allow the consistent initiation of the exothermic heating process and uniform and complete heating of the polymeric trays of food. (See 3.1)

3.4.5 Activation mechanism. The activation mechanism shall be designed so that, when triggered, there shall be simultaneous initiation of the heating of the four polymeric trays of food. (See 3.1)

3.4.6 Heater module.

3.4.6.1 Construction of the heater module. The heater module shall consist of one or more heaters, one or more activation fluid units, one or more activation mechanisms, four polymeric food trays, four heating trays and additional components, as applicable. All components shall be constructed into a heater module that facilitates ease of use, optimum performance and allows venting of gases. The preferred stacking orientation of the polymeric food trays is main entrée, starch, vegetable, and dessert (or least dense food tray), from bottom to top. Instructions shall be included with each heater module. (See 3.1)

3.4.6.2 Design and dimensions of heater module box. The heater module box shall accommodate the components. The packaged heater module shall fit in the UGR-E box. (See 3.1)

3.4.6.3 Activated heater module. The by-products of the activated heater module shall be non-toxic and safe. Disposal of the activated heater module shall be unrestricted. Activated heaters shall be safe for disposal as unregulated consumer waste.

3.5 Environmental requirements.

3.5.1 Shelf life. The shelf life of all heater module components (except polymeric food trays) shall be not less than 24 months at 80°F.

MIL-DTL-32235

3.5.2 Temperature range of operation. The heater module shall be capable of withstanding extreme temperatures in storage and transport ranging from -20°F to 160°F. At the time of use, the module shall be capable of operating at temperatures ranging from 10°F to 160°F. At temperatures below 32°F (i.e., frozen food products), the heater module shall be operational and capable of thawing the polymeric food trays. At ambient temperatures ranging from 35°F to 120°F, the heater module shall perform as intended and raise the temperature of the food in the polymeric food trays by no less than 100°F. The heater module components shall exhibit no failures, major deformities or degradation as a result of the heating process.

3.6 Operating requirements.

3.6.1 Chemical and physical properties. The heater module shall be capable of heating four polymeric food trays, each containing approximately 6 pounds of food. The heater module shall be self-contained and shall be activated without requiring additional materials.

3.6.2 Use. The heater module shall require no specific training to use. Instructions (see 3.1), located on the top of the heater module, shall provide guidance and the sequence of actions. The heater module shall be easily activated, easily opened and allow food to be easily served from the polymeric food trays. (See 3.1)

3.6.3 Food safety. The materials used in the heater module and their by-products shall be safe for use with food in accordance with 21 CFR, Parts 170-189, applicable material safety data sheets, or other recognized health standards and regulations.

3.6.4 Heating performance. The activated heater module shall be capable of providing a 100°F minimum temperature rise in the bottom three water filled polymeric food trays in 45 minutes or less and a 75°F minimum temperature rise in the top water filled polymeric food tray in 45 minutes or less.

3.7 Support requirements.

3.7.1 Heater by-products. The heater module shall operate without emission of any objectionable odors such as burning plastic or metal or sulfurous odors. After the polymeric food trays are removed, there shall be no evidence of precipitate or residue, except on the bottom of polymeric food trays in direct contact with the heater. There shall be no more than 10 ml of fluid remaining in each heating tray after the heating reaction. The heater module shall be designed to allow escape of gases generated by the heating reaction. The heater by-products shall be of an amount and nature that incidental contact with food shall not render food unsafe.

3.7.2 Health hazard assessment. If requested, the contractor shall furnish the formulation of the heater and the activation fluid to the U.S. Army Environmental Hygiene Agency, ATTN: HSHB-MO, Aberdeen Proving Ground, MD 21010-5422. The formulation

MIL-DTL-32235

shall detail the exact percentages of the chemicals and compounds used in the heater and the activation fluid, including the chemical composition of trade name ingredients.

3.7.3 Workmanship. The end item shall be free of defects that could adversely affect performance or durability, and shall have a good general appearance. The end item shall conform to the quality established by this document.

3.8 Labeling.

3.8.1 Heater. Each heater (heater elements in a matrix) shall be correctly and legibly labeled. The label shall contain the following information:

- (1) Date 1/
- (2) Contractor's name and address
- (3) "Do Not Eat" pictogram. The pictogram shall be printed in three colors; a black figure of a person on a white background with a red circle and a bar (prohibition sign). The minimum outside diameter of the pictogram circle shall be 7/8 inch. (See Figure 1)

1/ Each heater shall have the date of pack noted by using a four digit code beginning with the final digit of the current year followed by the three digit Julian day code. For example, 14 February 2007 would be coded as 7045. The Julian day code shall represent the day the heater was manufactured.

3.8.2 Packaged heater. The heater(s) in a barrier package shall be correctly and legibly labeled. The label shall contain the following information:

- (1) Name
- (2) Contents
- (3) Ingredients with proper chemical names
- (4) Date 1/
- (5) Contractor's name and address and emergency phone number
- (6) Instructions, as applicable (See 3.1)

1/ Each package of heater(s) shall have the date of pack noted by using a four digit code beginning with the final digit of the current year followed by the three digit Julian day code. For example, 14 February 2007 would be coded as 7045. The Julian day code shall represent the day the heater(s) was packaged.

3.8.3 Activation fluid unit. Each activation fluid unit shall be correctly and legibly labeled. The label shall contain the following information:

- (1) Name

MIL-DTL-32235

- (2) Ingredients with proper chemical names
- (3) Date 1/
- (4) Contractor's name and address

1/ Each activation fluid unit shall have the date of pack noted by using a four digit code beginning with the final digit of the current year followed by the three digit Julian day code. For example, 14 February 2007 would be coded as 7045. The Julian day code shall represent the day the activation fluid was packaged.

3.8.4 Heater module. One side of the heater module box shall be correctly and legibly printed or labeled. The label shall contain the following information:

- (1) Name and Type (see 3.1)
- (2) Contents
- (3) UGR-E and Menu Number
- (4) Date 1/
- (5) Instructions for use and caution statements. (See 3.1)

1/ Each heater module shall have the date of pack noted by using a four digit code beginning with the final digit of the current year followed by the three digit Julian day code. For example, 14 February 2007 would be coded as 7045. The Julian day code shall represent the day the heater module was assembled.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 First article inspection. The first article shall be inspected in accordance with the provisions of this document and evaluated for overall performance. Any failure to conform to the requirements shall be cause for rejection of the lot. Defense Supply Center Philadelphia (DSCP) shall select sample units during production of contracts and submit them to the following address for evaluation:

US Army Research, Development and Engineering Command
Natick Soldier Research, Development and Engineering Center
AMSRD-NSC-CF-F
15 Kansas Street
Natick, MA 01760-5018

MIL-DTL-32235

Three (3) sample units (heater modules) produced shall be randomly selected from that one production lot. The three (3) sample units shall be shipped to Natick within five working days from the end of the production month and upon completion of all inspection requirements. The sample units shall be evaluated for materials, interface, interoperability, environmental, operating, support and labeling requirements.

4.3 Conformance inspection. Conformance inspection shall include the tests specified in Table I and the examination of 4.4.

TABLE I. Verification methods

Title	Requirement	Verification
Interface and interoperability	3.4	4.5.2
Heater elements	3.4.1.1	4.5.4.1, 4.5.4.3
Heater design	3.4.1.2	4.4, 4.5.4.1, 4.5.4.3
Protection of the heater	3.4.1.3	4.4
Activation fluid	3.4.2	4.5.4.3
Activation fluid unit design	3.4.2.1	4.4, 4.5.4.1, 4.5.4.3
Polymeric food tray	3.4.3	4.5.2.1
Heating tray	3.4.4	4.4, 4.5.4.1, 4.5.4.3
Activation mechanism	3.4.4	4.4, 4.5.4.1, 4.5.4.3
Construction of heater module	3.4.6.1	4.4
Design and dimensions of heater module	3.4.6.2	4.4
Activated heater module	3.4.6.3	4.5.2.2
Environmental	3.5	4.5.3
Shelf life	3.5.1	4.5.3.1
Temperature range of operation	3.5.2	4.5.3.2
Operating	3.6	4.5.4
Chemical and physical properties	3.6.1	4.5.4.3
Use	3.6.2	4.5.4.1, 4.5.4.3
Food safety	3.6.3	4.5.4.2
Heating performance	3.6.4	4.5.4.3
Support	3.7	4.5.5
Heater by-products	3.7.1	4.5.4.3
Health hazard assessment	3.7.2	4.5.5.1
Workmanship	3.7.3	4.4

TABLE I. Verification methods - Continued

Title	Requirement	Verification
Labeling	3.8	
Heater	3.8.1	4.4
Packaged heater	3.8.2	4.4

MIL-DTL-32235

Activation fluid unit	3.8.3	4.4
Heater module	3.8.4	4.4

4.4 Heater module examination. Each heater module shall be examined for conformance with the requirements specified in 3.3 through 3.8. Defects and defect classifications are listed in Table II.

TABLE II. Heater module defects 1/ 2/

Category			Defect
<u>Critical</u>	<u>Major</u>	<u>Minor</u>	
1			Missing polymeric food tray or tray damaged to expose food.
2			Missing or severely damaged heater.
	101		Incomplete heater or slightly damaged heater.
		201	Heater(s) not packaged in barrier material.
3			Activation fluid missing or leaking.
	102		Activation fluid unit not properly installed or damaged.
	103		Activation fluid not of adequate volume.
4			Activation mechanism missing.
	104		Activation mechanism damaged.
		202	Activation fluid not packaged in barrier material.
	105		Heater module box or component not clean.
	106		Heater module design does not facilitate ease of use.
		203	Heater module does not allow venting of gases.

TABLE II. Heater module defects 1/ 2/ - Continued

Category			Defect
<u>Critical</u>	<u>Major</u>	<u>Minor</u>	
	107		Heater module box not as specified.
	108		Heating tray damaged or not as specified.

MIL-DTL-32235

109	Heater module not constructed properly.
204	Precipitate or residue remaining after heating reaction.
205	More than 10 ml of fluid remaining in heater tray after heating reaction.
206	Instructions missing or incorrect or illegible.
207	Labels missing or incorrect or illegible.
208	Pictogram on heater missing or incorrect or illegible.

1/ Presence of any foreign materials such as, but not limited to dirt, insect parts, hair, wood, glass, metal, or any foreign odors such as, but not limited to burnt, scorched, shall be cause for rejection of the lot.

2/ Any evidence of rodent or insect infestation shall be cause for rejection of the lot.

4.5 Verification methods. The types of methods included in this section are visual inspection and measurement, sample tests, full-scale demonstration, engineering evaluation, component properties analysis and similarity to previously approved designs.

4.5.1 Verification alternatives. The manufacturer may propose alternative test methods, techniques or equipment, including application of statistical process control, tool control or cost effective sampling procedures to verify performance.

4.5.2 Interface and interoperability verification.

4.5.2.1 Polymeric food tray. The polymeric food trays shall demonstrate conformance to 3.4.3, when examined in accordance with MIL-PRF-32004.

4.5.2.2 Activated heater module. The activated heater module shall demonstrate conformance to 3.4.6.3, when all applicable disposal standards are verified.

4.5.3 Environmental verification.

4.5.3.1 Shelf life. All heater module components (except polymeric food trays) shall demonstrate conformance to 3.5.1, when tested in a storage study.

MIL-DTL-32235

4.5.3.2 Temperature range of operation. The heater module shall demonstrate conformance to 3.5.2, when heater module is exposed to temperature extremes.

4.5.4 Operating verification.

4.5.4.1 Heater module use test. A heater module shall be activated by following the instructions. Any unclear instructions, failure for heater module to perform, or any unsafe conditions shall be a failure.

4.5.4.2 Food safety. The heater module shall demonstrate conformance to 3.6.3, when all applicable health standards are verified.

4.5.4.3 Heating performance test. The activated heater module shall be capable of providing a 100°F minimum temperature rise in the bottom three water filled polymeric food trays in 45 minutes or less and a 75°F minimum temperature rise in the top water filled polymeric food tray in 45 minutes or less. Thermocoupled polymeric trays (filled and sealed in accordance with MIL-PRF-32004) containing 96 ounces of water shall be used. The heater module, conforming to 3.4.6 (water trays in lieu of food trays), shall be assembled and conditioned at 35°F to 40°F for a minimum of 24 hours prior to testing. The test shall be conducted at an ambient temperature of 72°F \pm 2°F in an explosion-proof exhaust fume hood or sufficiently ventilated environment, away from open flame or potential ignition sources. The thermocouples shall be connected to a data recorder or computer and the initial temperatures of the trays recorded prior to activating the heater module. The heater module shall be activated by following the instructions on the heater module. The temperature rise at minimum time intervals of 1 minute shall be recorded and observation continued through 45 minutes. Failure to meet the requirements shall be a failure. A failure shall be classified as a critical defect and shall be cause for rejection of the lot.

4.5.5 Support verification.

4.5.5.1 Health hazard assessment. Health hazard assessment shall demonstrate conformance to 3.7.2, when all applicable hazardous material standards are verified.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military services' system commands. Packaging data retrieval is available from the

MIL-DTL-32235

managing Military Department or Defense Agency's automated packaging files, CD-ROM products or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The heater module covered by this specification is intended for use as a component in UGR-E operational group ration. The heater module is used for direct heating of polymeric trays of food. The heater module is military unique since it must withstand high temperatures when heated, be capable of heating food to an acceptable temperature in an austere environment and be easily operated by the user.

6.2 Acquisition requirements. Acquisition documents should specify:

- a. Title, number and date of this specification.
- b. When first article is required (see 3.2).
- c. Packaging requirements (see 5.1).

6.3 Sources of supply.

6.3.1 Thermocoupled polymeric trays. Water filled thermocoupled polymeric trays or instructions on how to construct them are available from:

US Army Research, Development and Engineering Command
Natick Soldier Research, Development and Engineering Center
AMSRD-NSC-CF-G
15 Kansas Street
Natick, MA 01760-5018
508-233-4939

6.4 Shelf life. This specification covers items where shelf life is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order. The shelf-life codes are contained in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M; Shelf-life Management Manual, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points (ICPs), and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: <http://www.shelflife.hq.dla.mil/>.

MIL-DTL-32235

6.5 Subject term (key word) listing.

Ration
Unitized Group Ration
Self-heating



FIGURE 1. "DO NOT EAT" Pictogram.

Custodians:

Army – GL
Navy – SA
Air Force – 35

Preparing activity:

Army – GL
(Project 8970-2007-001)

Review Activities:

Army – MD, QM
Navy – MC

MIL-DTL-32235

DLA – SS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using ASSIST Online database at <http://assist.daps.dla.mil/>.