

INCH-POUND

A-A-59375

27 June 2000

SUPERSEDING

MIL-F-80258A

28 October 1986

COMMERCIAL ITEM DESCRIPTION

FURNACES, HEAT-TREATING, ELECTRIC, NATURAL ATMOSPHERE, BOX TYPE

The General Services Administration has authorized the use of this commercial item description for all federal agencies.

1. **SCOPE.** This commercial item description (CID) covers electric box type furnaces intended for use in heat-treating shops for hardening, tempering, normalizing, and annealing metal parts in a natural atmosphere. Furnaces covered by this CID are not intended for atmosphere control use.
2. **CLASSIFICATION.** The furnaces shall be of the following types, styles, classes, and sizes. The type, style, class, and size to be furnished shall be as specified (see 7.2(b)). The chamber depth for the type I furnace shall be as specified (see 7.2(c)).

Type I - Single chamber (style A or style B)

Type II - Double chamber (style A lower chamber and style B upper chamber)

Style A - Forced air convection design

Class 1 - 1200 °F to 1250 °F maximum operating temperature

Class 2 - 1400 °F maximum operating temperature

Style B - Radiation design

Class 2 - 1400 °F maximum operating temperature

Class 3 - 2000 °F maximum operating temperature

Class 4 - 2200 °F to 2300 °F maximum operating temperature

Class 5 - 2750 °F maximum operating temperature

Size and depth - The chamber width, height, and depth are shown in tables I through III.

Beneficial comments, recommendations, additions, deletions, clarifications, etc., and any data which may improve this document should be sent to: Defense Supply Center Richmond, ATTN: DSCR-VBD, 8000 Jefferson Davis Highway, Richmond, VA 23297-5610.

AMSC N/A

FSC 3424

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

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TABLE I. Sizes of type I, style A furnaces.

Size	Class	Chamber dimensions, inches									
		Width	Height	Depth							
				12	24	36	42	48	54	60	72
01	1	12	12	X							
02		18	18		X	X		X			
03		24	24			X		X		X	
04		30	30					X			X
05		36	36					X		X	X
06		42	42				X	X	X	X	
07		48	48					X	X	X	X
08		54	54					X	X	X	X
09		60	60							X	X
10	2	12	12	X							
11		18	18		X	X		X			
12		24	24			X		X		X	
13		30	30					X			X
14		36	36					X		X	X
15		42	42				X	X	X	X	
16		48	48					X	X	X	X
17		54	54					X	X	X	X
18		60	60							X	X

TABLE II. Sizes of type I, style B furnaces.

Size	Class	Chamber dimensions, inches										
		Width	Height	Depth								
				15	18	24	30	36	40	48	60	72
01	2	12	10	X								
02		16	10	X		X	X					
03		20	27			X						
04		24	21				X					
05		30	27					X				
06		36	33							X	X	
07		36	36									X
08	3	7	6	X								
09		12	8		X	X	X	X				
10		12	12	X		X	X	X	X			
11		16	12	X	X	X	X					
12		18	12		X	X		X	X	X		
13		18	18		X	X		X				
14		24	18			X		X	X	X	X	
15		24	24			X			X	X		
16		30	24					X	X	X		
17		30	30							X	X	
18		36	24						X		X	X
19		36	36							X	X	X
20		48	48							X		X

TABLE II. Sizes of type I, style B furnaces (continued).

Size	Class	Chamber dimensions, inches										
		Width	Height	Depth								
				15	18	24	30	36	40	48	60	72
21	4	7	6	X								
22		12	12	X	X	X		X	X			
23		18	12		X	X		X	X	X		
24		18	18		X	X		X		X		
25		24	18			X		X		X	X	
26		24	24			X		X	X	X		X
27		31	27					X		X	X	X
28		36	36					X		X		X
29	5	7	6	X								
30		12	12	X		X			X			
31		18	12		X	X			X	X		
32		18	18		X	X		X				
33		24	24			X		X	X	X		
34		31	24						X	X		

TABLE III. Sizes of type II furnaces.

Size	Lower furnace					Upper furnace				
	Style	Class	Chamber dimensions, inches			Style	Class	Chamber dimensions, inches		
			Width	Height	Depth			Width	Height	Depth
01	A	2	12	12	11	B	3	12	12	12
02		2	12	12	17		3	12	12	18
03		2	12	12	23		3	12	12	24
04		2	12	12	29		3	12	12	30
05		2	18	18	24		3	18	18	24
06		2	18	18	36		3	18	18	36
07		1	19	12	19		3	19	12	19
08		1	10	10	24		4	10	10	24
09		1	12	12	36		4	12	12	36
10		1	19	12	19		4	19	12	19
11		1	24	18	36		4	24	18	36

3. SALIENT CHARACTERISTICS

3.1 General requirements. The furnace shall be new and one of the manufacturer's current models capable of operation in accordance with the requirements herein. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair. The furnace shall be a box design having electrical heating elements, a hearth to support the load, and a single opening in the end of the chamber for loading and unloading on a horizontal plane.

3.1.1 Furnace type. The type I furnace shall have a single chamber of either a style A forced air convection design or a style B radiation design. The type II furnace shall have a double chamber (over/under) with a style A lower chamber and a style B upper chamber.

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3.1.2 Furnace style. The style A furnace shall use forced air convection to heat the load. Air shall be heated in an area separated from the load and blown into the chamber by one or more fans. The load shall not be exposed to radiant heat from the electrical heating elements. The style B furnace shall use radiation to heat the load by direct exposure to the electrical heating elements.

3.2 Components. All the furnaces shall include, as a minimum, the following components:

3.2.1 Frame. The furnace shall have a structural frame that shall provide stable support for the chamber, hearth, and maximum rated load. A floor-mounted furnace shall have provisions for being lifted by a forklift.

3.2.2 Shell. The outer shell of the furnace shall be constructed of reinforced sheet steel and have welded or riveted joints to provide a rigid structure.

3.2.3 Hearth. Unless otherwise specified (see 7.2(d)), the hearth shall be constructed of heat-conducting material considered by the manufacturer as standard. The hearth shall be capable of supporting rated loads at the furnace maximum operating temperature without permanent distortion. If required, rollers or slide rails shall be provided for moving the load in and out of the chamber as specified (see 7.2(e)). If required, the furnace shall be provided with the number and arrangement of removable shelves as specified (see 7.2(f)).

3.2.4 Lining. The furnace chamber and door lining shall be rated for the furnace maximum operating temperature and shall have insulating properties that maintain the furnace exterior surface temperature at or below the temperature shown in table IV.

3.2.5 Door. The furnace shall have a door-operated interlock switch that turns off the power to the heating elements when the door is opened. The door of a class 1 or 2 furnace shall be mounted on hinges and swing open. The door of a class 3, 4, or 5 furnace shall open by being lifted vertically either by manual means with a suitable counterweight(s) or by a power-operated system as specified (see 7.2(g)). The door mechanism shall move the door away from the face of the furnace a sufficient distance to prevent damage to the chamber perimeter seal or to the lining during lifting and lowering. The door hot side shall face away from the operator at all times during lifting and lowering.

3.2.6 Temperature controller. Unless otherwise specified (see 7.2(h)), the furnace shall have a microprocessor-based programmable temperature controller that meets the requirements of sections 5-3 and 5-18.2 of National Fire Protection Association (NFPA) 86, "Standard for Ovens and Furnaces" (DoD adopted). The temperature controller shall maintain the furnace chamber's temperature at the control thermocouple within ± 2 °F of the set temperature. If required, ramp and soak period software programs for process temperature control shall be provided as specified (see 7.2(i)). The temperature controller shall have an external dual 120-volt, single-phase, 60-hertz outlet for powering a process data recorder or other process monitor.

3.2.7 Excess temperature controller. Unless otherwise specified (see 7.2(j)), an excess temperature controller independent of the temperature controller shall be provided. The excess temperature controller shall automatically turn off the heating elements when the chamber temperature rises above the set temperature by an incremental temperature selectable within a range of 50 °F to 100 °F.

3.2.8 Electrical system. Unless otherwise specified (see 7.2(k)), the electrical system shall conform to the NFPA 70, "National Electrical Code" (DoD adopted), and NFPA 86 sections 4-6 and 5-18. The furnace shall be wired for operation from a 230- or 460-volt, 3-phase, 60-hertz circuit as specified (see 7.2(l)).

3.2.9 Optional accessories. Optional accessories shall be provided as specified (see 7.2(m)).

3.3 Performance. Unless otherwise specified (see 7.2(n)), the furnace shall be capable of operating continuously with the maximum rated load at any set temperature within the operating range considered by the manufacturer as standard.

3.3.1 Exterior surface temperature. Unless otherwise specified (see 7.2(o)), the furnace exterior allowable maximum surface temperature is shown in table IV when operating at the chamber maximum rated temperature.

TABLE IV. Furnace exterior surface temperatures.

Style	Class	Maximum rated temperature (MRT), °F	Maximum surface temperature at MRT, °F
A	1	1200-1250	Ambient + 60
	2	1400	Ambient + 80
B	2	1400	Ambient + 80
	3	2000	Ambient + 140
	4	2200-2300	Ambient + 160
	5	2750	Ambient + 200

3.3.2 Recovery rate and heating capacity. The furnace shall have a recovery rate for not less than the weight of iron or steel per square foot of hearth area per hour heated to the temperature shown in table V. The furnace shall have a heating capacity of not less than the weight of iron or steel per square foot of hearth area heated to the temperature shown in table VI.

TABLE V. Recovery rate.

Style	Class	Chamber temperature, °F	Recovery rate, pounds/square foot/hour
A	1	1200	60
	2	1400	60
B	2	1400	60
	3	2000	60
	4	2150	50
	5	2150	50

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TABLE VI. Heating capacity.

Style	Class	Chamber temperature, °F	Heat capacity, pounds/square foot
A	1	1200	100
	2	1400	100
B	2	1400	100
	3	2000	100
	4	2300	80
	5	2750	60

3.4 Furnace dimensions and weight. If required, the maximum exterior dimensions (length, width, and height) and weight shall not exceed the restrictions specified (see 7.2(p)).

3.5 Safety and health requirements. The furnace shall be designed and manufactured in accordance with NFPA 86. If required to process volatile substances, combustible materials, or finished or oil-coated metal parts, the furnace shall meet the requirements of NFPA 86, class A ovens as specified (see 7.2(q)). Otherwise, the furnace shall meet the requirements of NFPA 86, class B ovens. The manufacturer shall ensure that the furnace and all equipment and accessories used on the furnace shall be in compliance with Occupational Safety and Health Administration's (OSHA) Title 29 of the Code of Federal Regulations (CFR), Part 1910, "Occupational Safety and Health Standards". If a conflict arises between the NFPA and OSHA standards, the OSHA standards shall apply.

3.6 System of units. The U.S. Customary System of Units (US) or the International System of Units (SI) shall be used to graduate measuring and indicating devices. When only one system of graduation is acceptable, the particular graduation required shall be as specified (see 7.2(r)). Regardless of the measurement system used, all measuring and indicating devices on the furnace shall be graduated in the same system. When specified (see 7.2(s)), measuring and indicating devices shall be graduated in both the US and SI system of measurements.

3.7 Nameplate. A nameplate shall be securely attached to the furnace. Unless otherwise specified (see 7.2(t)), the nameplate shall contain the following information:

- a. Nomenclature.
- b. Manufacturer's name.
- c. Serial number.
- d. Furnace model designation.
- e. Power input (volts, total amperes, phase, and frequency).
- f. Short-circuit/over-current rating.
- g. Contract number or order number.
- h. National stock number.
- i. Date of manufacture.

3.8 Lubrication plate or chart. When specified (see 7.2(u)), a lubrication plate or chart shall be attached to the furnace. The information provided on the plate or chart shall include:

- a. Points of lubricant application.
- b. Servicing interval.
- c. Type of lubricant(s) with SAE number or lubricant identifier.

4. REGULATORY REQUIREMENTS

4.1 Recovered materials. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

4.2 Environmental protection. The item shall meet all applicable Environmental Protection Agency (EPA) restrictions in effect on the date of the contract. These regulations apply to the emission of materials hazardous to the environment or the user's health and shall be adhered to during the manufacturing, service, transportation, storage, and operation/use of the item.

5. PRODUCT CONFORMANCE PROVISIONS

5.1 Product conformance. The products provided shall meet the salient characteristics of this commercial item description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The government reserves the right to require proof of such conformance.

5.2 Inspection. The furnace shall be inspected to determine compliance with all requirements specified in this CID.

5.3 Testing. Unless otherwise specified (see 7.2(v)), the furnace shall be tested in accordance with sections 5.3.1 through 5.3.6.

5.3.1 Test setup and conditions. Unless otherwise specified (see 7.2(w)), the manufacturer shall be responsible for supplying all tooling and material(s) and shall conduct all tests required by the Government. The manufacturer shall provide test instruments and equipment with calibration traceable to the National Institute of Standards and Technology (NIST) and shall provide certification of calibration as specified (see 7.2(x)). Unless otherwise specified (see 7.2(y)), the furnace shall be tested at an ambient temperature of $80^{\circ}\text{F} \pm 20^{\circ}\text{F}$.

5.3.2 Operational test. The furnace shall be operated in accordance with the manufacturer's standard operational procedures for furnace startup and refractory cure. The furnace shall be operated at the chamber maximum rated temperature for not less than 8 hours. Proper operation of all controls and features shall be verified during the trial period.

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5.3.3 Surface temperature test. The chamber shall be stabilized at its maximum operating temperature, and the exterior surface temperatures of the furnace and door shall be measured at random locations. The exterior surfaces shall not exceed the temperature shown in table IV for the furnace provided.

5.3.4 Performance test. With the chamber temperature stabilized at the temperature shown in table V, the furnace shall be loaded with an ambient-temperature batch of iron or steel equivalent to the hourly recovery weight for the style and class of furnace. A temperature survey shall be recorded in accordance with Society of Automotive Engineers/Aerospace Material Specification SAE/AMS 2750, "Pyrometry" (DoD adopted), during the recovery cycle, and at the end of 1 hour the temperature shall have recovered within ± 10 °F of the initial temperature. From the time the recovery cycle is initiated until thermal equilibrium is reached, no temperature reading shall exceed the target recovery temperature by more than 10 °F. The results of the test shall be compared with the requirements specified in paragraphs 3.3 through 3.3.2.

5.3.5 Temperature uniformity. After the load and chamber in section 5.3.4 performance test have reached thermal equilibrium, a temperature survey shall be taken every 5 minutes for 30 minutes in accordance with SAE/AMS 2750. The temperature at the control thermocouple shall not vary more than ± 2 °F from the set temperature, and the temperature variation between the chamber test points and the control thermocouple shall not exceed ± 10 °F.

5.3.6 Optional tests. Optional tests shall be conducted as specified (see 7.2(z)).

5.4 Acceptance criteria. Unless otherwise specified (see 7.2(aa)), preliminary and final testing as specified in 5.3.1 through 5.3.6 shall be conducted at the government site. Failure of the furnace to meet these requirements shall be cause for rejection.

5.5 Warranty. Unless otherwise specified (see 7.2(bb)), the manufacturer's standard commercial warranty, terms, and conditions shall apply.

6. PACKAGING

6.1 Preservation, packing, and marking. For acquisition purposes, the products shall be preserved, packed, and marked as specified in the acquisition order (see 7.2(cc)).

7. NOTES

7.1 Sources of referenced documents.

7.1.1 Government documents. Copies of CFR and FAR may be obtained from the U.S. Government Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328. Electronic copies of CFR documents may be obtained from <http://www.access.gpo.gov>.

7.1.2 NFPA standards. Copies of NFPA standards may be obtained from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101.

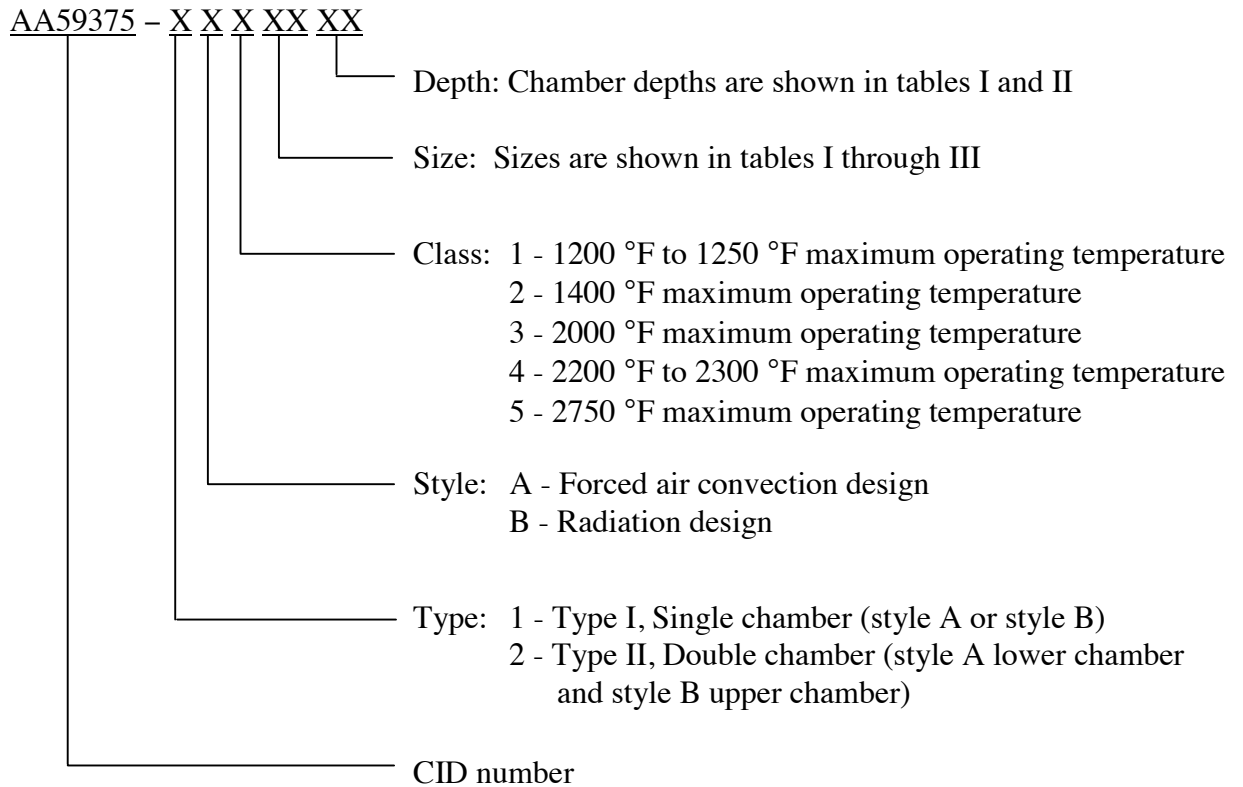
7.1.3 SAE/AMS standards. Copies of SAE/AMS standards may be sent to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001

7.2 Ordering data. Acquisition documents must specify the following:

- a. CID document number, revision, and CID PIN.
- b. Type, style, class, and size of furnace required (see 2).
- c. Type I furnace chamber depth, as specified (see 2).
- d. Hearth material, if different (see 3.2.3).
- e. Hearth rollers or slide rails, as specified (see 3.2.3).
- f. Removable shelves, number and arrangement, as specified (see 3.2.3).
- g. Door, manual or power operated, as specified (see 3.2.5).
- h. Temperature controller, if different (see 3.2.6).
- i. Ramp and soak period software programs, as specified (see 3.2.6).
- j. Excess temperature controller, if different (see 3.2.7).
- k. Electrical system industrial standard, if different (see 3.2.8).
- l. Electrical system voltage, as specified (see 3.2.8).
- m. Optional accessories, as specified (see 3.2.9).
- n. Furnace performance, if different (see 3.3).
- o. Exterior surface temperature, if different (see 3.3.1).
- p. Furnace dimensions and weight, as specified (see 3.4).
- q. NFPA 86, class A oven, as specified (see 3.5).
- r. System of units required (see 3.6).
- s. Dual system of units, if required (see 3.6).
- t. Nameplate, if different (see 3.7).
- u. Lubrication plate or chart, if required (see 3.8).
- v. Testing, if different (see 5.3).
- w. Test responsibility, if different (see 5.3.1).
- x. Certification of calibration, as specified (5.3.1).
- y. Test environmental conditions, if different (see 5.3.1).
- z. Optional tests, as specified (see 5.3.6).
- aa. Acceptance criteria, if different (see 5.4).
- bb. Warranty, if different (see 5.5).
- cc. Packaging requirements, if different (see 6.1).

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7.3 Part or identification number (PIN). The following part or identification numbering procedure is for government purposes and does not constitute a requirement for the contractor.



MILITARY INTERESTS:

Custodians:

Army - AL

Navy - AS

Air Force - 99

Reviewers:

Army - AV, CR, SM

Air Force - 84

CIVIL AGENCY COORDINATING ACTIVITY:

GSA - 6FET

Preparing activity:

DLA - GS

(Project 3424-0156)