MIL-D-80118B
22 June 1979

SUPERSEDING
MIL-D-80118A
13 January 1970

MILITARY SPECIFICATION

DEPOSITION SYSTEMS, VACUUM EVAPORATION, RESISTANCE TYPE AND ELECTRON BEAM TYPE

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

1. SCOPE

1.1 Scope. This specification covers vacuum deposition systems with completely self-contained vacuum systems including all components and accessories required for thin film deposition of conductive, refractory, and dielectric material by vacuum evaporation.

1.2 Classification. The deposition systems covered by this specification shall be of the following types and sizes as specified (see 6.2.1).

Type I - Resistance heater. Equipped for evaporation by resistance heating only. Complete with resistance heater power supply.

Type II -Electron beam. Equipped for evaporation by electron beam only. Complete with electron gun and necessary power supplies.

Type III - Combination resistance heater and electron beam. Equipped for evaporation by resistance heating and electron beam. Complete with resistance heater power supply, electron gun, and electron gun power supplies.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Industrial Plant Equipment Center, Memphis, Tennessee 38114, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 3433

Size	Baseplate Diameter (Inches)	Vacuum Chamber Diameter (Inches)	Vacuum Chamber Height (Inches)
1	16	12	12
2	20	14	24
3	20	18	30
4	20	19	30
5	26	24	30
6	26	25	30

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

SPECIFICTIONS

MILITARY

MIL-STD-1188 Commercial Packaging of Supplies and Equipment

STANDARDS

FEDERAL

FED-STD-H28 Screw-Thread Standard for Federal Services

MILITARY

MIL-STD-461 Electromagnetic Interference Characteristics Requirements for Equipment

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other Publications. The following documents form a part of this specification to the extent specified herein. Unless other wise indicated the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

Z210.1 - Metric Practice (ASTM-E-380)

(Application for copies should be addressed to the American National Standards Institute, ATTN: Sale Dept., 1340 Broadway, New York, NY 10018.

U. S. DEPARTMENT OF LABOR

OSHA Safety and Health Standards
(29 CFR 1910, General Industry)

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

3. REQUIREMENTS

* 3.1 First article. When specified (see 6.2.1), the contractor shall furnish one complete deposition system for first article inspection and approval (see 4.2. and 6.3).

* 3.2 Design. The deposition system shall be new and one of the manufacturers current models, which meets the requirements of this specification. The deposition system shall be designed for thin film deposition of conductive, refractory, and dielectric materials applicable to the type system specified. The deposition system shall consist basically of a complete self-contained high vacuum system and the necessary power supplies required for the type of deposition system specified. The machine shall include all components, parts, and features necessary to meet the performance requirements specified herein. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement and repair.

* 3.2.1 Measurement systems. Unless otherwise specified, either the U.S Customary System of Units (US) or the International System of Units (SI) shall be used in the design and construction of the machine. When only one system of measurements is acceptable, the particular system required shall be as specified (see 6.2.1). In this specification, all measurements, dimensions, sizes and capacities are given in the U.S. Customary System of Units (US). These measurements may be converted to the International System

of Units (SI) through the use of the conversion factors and methods specified in ANSI Z210.1.

* 3.2.1. 1 Measuring and indicating device calibrations. When specified (see 6.2.1), measuring and indicating devices such as scales, stops, dial indicators, pressure gauges, temperature indicators, and all other similar devices shall be graduated in the specified system (US and SI) of measurements. Regardless of the measurement system used, all measuring and indicating devices on the machine shall be graduated in the same system.

* 3.2.1.2 Dual Calibrations. When specified (see 6.2.1), measuring and indicating devices shall be graduated in both the US and the SI System of Measurements. When a dual US and SI system is furnished, dials shall have independent zero adjustments and both dials shall be calibrated in such a manner that the last dial graduation progresses into and is continuous with the first dial graduation as the dial is rotated through the zero position.

* 3.2.2 Reclaimed materials. The machine shall contain reclaimed materials to the maximum extent possible without jeopardizing its intended use and performance. The reclaimed materials shall have been reprocessed, remanufactured, or recycled in a manner which restores them to the same chemical composition and physical properties as the materials originally selected for use on the machine. Reclaimed materials shall include iron, steel, copper, brass, aluminum, fiber products, plastics and elastomers that have been collected from discarded solid, liquid, semi-solid, or gaseous waste such as garbage, refuse or sludge.

* 3.2.3 Controls. All operating controls shall be located convenient to the operator at his normal work station.

* 3.2.4 Safety and health requirements. Covers, guards, or other safety devices shall be provide for all parts of the deposition system that present safety hazards. The safety devices shall not interfere with operation of machine. The safety devices shall prevent unintentional contact with the guarded part, and shall be removable to facilitate inspection, maintenance and repair of the parts. Electrical interlock safety switches shall be provided for all cabinet access doors and panels (except for bolted panels), the opening of which would expose personnel to voltages of 460 volts or more. Provisions shall be made for electrically grounding the entire deposition system. All deposition parts, components, mechanism, and assemblies furnished on the unit, whether or not specifically required herein, shall comply with all of the requirements of "OSHA Safety and Health Standards (29CFR 1910), General Industry" that are applicable to the deposition system itself.

Additional safety and health requirements shall be as specified (see 6.2.1).

3.2.5 Protective devices. The deposition systems and all components shall be provided with adequate protective devices to assure maximum and proper operation, and maximum protection against all normally expected contingencies. Unless otherwise specified (see 6.2.1), the following mimimum protective devices shall be included.

3.2.5.1 Electrical system.

a. A vacuum switch or automatic valve controller to disconnect electric power to the vacuum chamber when internal pressure exceed a predetermined level.

b. Automatic overload protection for variable transformer, filament circuit, control, and all power supply circuits.

3.2.5.2 Vacuum system.

a. Vaccum interlocks to prevent improper sequencing of the system on systems with automatically sequencing valves.

b. Interlock to prevent operation of the diffusion pump until the mechanical pump has evacuated to a preset vacuum.

c. Interlock to prevent exposure of hot diffusion pump oil to atmosphere on systems with automatically sequencing valves.

d. Thermostatically protected diffusion pump water jacket and control valves to protect diffusion pump.

* 3.2.5.3 Cooling system.

a. Means to prevent operation of the vacuum system without proper cooling of all necessary components.

b. Reset control to prevent automatic re-energizing of the power supply of diffusion pump in event of improper cooling.

* 3.2.6 Lubrication. Means shall be provided to insure adequate lubrication for all moving parts that require lubrication. Each recirculating system shall include a filter which is cleanable or replaceable. Each lubricant reservior shall have means for determining fluid level. All oil holes, grease fittings, and filler caps shall be accessible.

* 3.2.7 Interchangeability. To provide for replacement of worn, or damaged parts, all parts shall be manufactured to definite dimensions and tolerances.

* 3.3 Construction. The deposition system shall be constructed of parts which are new, without defects and free of repairs. The structure shall be capable of withstanding all forces encountered during operation of the machine to its maximum rating and capacity without permanent distortion.

3.3.1 Castings and forgings. All castings and forgings shall be free of scale and mismatching. No process such as welding, peening, plugging, or filling with solder or paste shall be used for reclaiming any defective part.

* 3.3.2 Welding, brazing, or soldering. Welding, brazing, or soldering shall be employed only where specified in the original design. None of these operations shall be employed as a repair measure for any defective part. Soft solder shall not be used to attach cooling coils on diffusion pumps.

* 3.3.3 Fastening devices. All screws, pins, bolts, and other fasteners shall be installed in a manner that prevents change of tightness. Those subject to removal or adjustment shall not be swaged, peened, staked or otherwise permanently installed. Where blind holes are necessary in the high vacuum environment, provision shall be made for venting gas pockets.

3.3.4 Surfaces. All surfaces shall be cleaned and free of sand, dirt, fins, sprues, flash, scale, flux and other harmful or extraneous materials. All edges shall be either rounded or beveled unless sharpness is required to perform a necessary function. Except as otherwise specified herein, the condition and finish of all surfaces shall be in accordance with the manufacturer's commercial practice.

3.3.5 Painting. Unless otherwise specified (see 6.2.1), the deposition system shall be painted in accordance with the manufacturer's commercial practice, provided that all surfaces to be painted shall be cleaned of all foreign matter detrimental to painting, and at least one cost of primer and one coat of finish are applied.

* 3.3.6 Threads. All threaded parts used on the machine and its related attachments and accessories shall conform to FED-STD-H28 and the applicable "Detailed Standard" section referenced therein.

* 3.3.7 Instruction marking and indicating plates. All words in instruction and on indicating plates shall be in the English language. Characters shall be engraved, etched, embossed or stamped in boldface on a contrasting background. When these methods are not practicable, the instructions shall be applied directly on the item by environmentally protected decalcomania transfer, metal wrap-around tag, stencil, silk screen, or by any other method suitable for the use intended which shall be as permanent as the normal life expectancy of the item on or to which it is applied and capable of withstanding the environmental tests and cleaning procedures spe ified for the item.

3.4 Components.

3.4.1 Vacuum pumping system. The pumping system shall include the mechanical or roughing pump, oil diffusion pump with oil heater, baffles, and necessary valves. The vacuum system shall be equipped with a baffle suitable for use with an external coolant as specified (see 6.2.1). Unless otherwise specified (see 6.2.1) the baffle shall be removable from the system for cleaning without dismantling any other system components. All necessary devices to assure rapid pump down to the design holding and working pressure capability specified shall be included. Unless otherwise specified (see 6.2.1), the vacuum system shall be capable of evacuating the vacuum chamber filled with dry nitrogen at not less than 85 degrees F - DB (dry bulb), or at not less than 85 degrees F - DB and 75 degrees F - WB (wet bulb) at atmospheric pressure to a vacuum pressure of 1×10^{-6} Torr in not more than seven minutes and shall maintain the pressure. The system shall be capable of an ultimate pressure of 4×10^{-8} Torr, when using a liquid nitrogen cooled baffle. All components shall be of such material, design, and fabrication to assure compability with the required operations and to minimize backstreaming. All components operating under high vacuum conditions shall be designed and constructed to assure that leakage into the evacuated spaces shall not exceed 1×10^{-2} Torr in one hour, starting at a pressure of 1×10^{-6} Torr with a clean, dry, empty, outgassed vacuum system and with the pumping system of. A high vacuum valve shall close off the system to allow loading of the vacuum chamber while maintaining high vacuum conditions within the pumping system. The design shall permit access to those parts requiring maintenance and cleaning. Mounting of the mechanical pump shall be such that vibration transmitted to the deposition system will be reduced to the level necessary to eliminate interference with proper operation of the system.

3.4.1.1 Valve control. Unless otherwise specified (see 6.2.1), valves in the vacuum system shall be manually controlled.

3.4.2 Cooling system. The cooling system shall assure that all components of the deposition systems shall be capable of continuous operation

at rated capacity without exceeding design temperature conditions. Enclosures shall be ventilated as required. Force air cooling system shall operate satisfactorily in an ambient air temperature up to and including 96 degrees F and shall include replaceable air filters. Water cooling systems shall operate satisfactorily with input water temperatures of 75 degrees F to 85 degrees F and pressures of 30 to 75 PSIG. The cooling water system shall be designed to withstand 100 PSIG pressure, to allow smooth water flow, to prevent air pockets, and to facilitate drainage. The cooling water systems shall be constructed of corrosion resistant, nonferrous components. Valves shall be connected by unions and shall allow water flow only as required during operations. The nameplate, or a data plate at the input water connection, shall cite the water pressure, temperature and flow requirements.

3.4.3 Vacuum chamber. Unless otherwise specified (see 3.6.2), the vacuum chamber shall be fabricated of heavy duty, transparent pyrex. The size shall be as specified in 1.2. The design and construction shall be compatible with vacuum coating operations specified herein. All pyrex vacuum chambers shall be equipped with a perforated metal chamber guard. Perforations in the guard shall be such that the area inside the chamber is fully visible.

3.4.4 Base plate. The vaccum chamber base plate shall be made of nonmagnetic stainless steel, and the size shall be as specified in 1.2. The design and mounting of the base plate shall provide for convenient access to the underside to facilitate making connections to all feed-through connectors. In addition to the pumping port, the base plate shall contain sufficient holes of the proper size for feed-throughs for connection of electrical equipment, instrumentation, and mounting of holding fixtures required. All unused feed-through holes shall be vaccum sealed with removeable plugs. Except for the pumping ports, plugs shall be furnished for all holes in the base plate. The base plate and vacuum chamber fixtures, electrodes, and accessories shall be as specified (see 6.2.1).

* 3.4.5 Vacuum chamber hoist. The deposition system shall be equipped with an electrically driven, hydraulically or counterbalance type operated chamber hoist or manually operated hinge assembly for access to the chamber. The type required shall be as specified (see 6.2.1). When a chamber hoist is furnished, the hoist shall be equipped with automatic limit switch stop control at each end of travel. The hoist or hinge assembly shall permit raising bell jar type chambers to a height sufficient to allow full access to the work area and to permit cleaning and removal of the chamber.

* 3.4.6 Vacuum system controls. Operator's controls on manually operated systems shall be conveniently located on the cabinet. All controls shall be functionally identified by permanent marking. All electrical and

mechanical controls necessary for proper control of the vacuum system shall be included. Systems with automatic control shall have panel mounted controls and system condition monitoring devices. Indicating lights shall show the position of valves in the vacuum system at all times during operation.

* 3.4.7 Vacuum system instrumentation. Instruments and indictor lights shall be furnished as necessary to monitor operation of the system. All monitoring instruments shall be located so as to provide good visibility to the operator located in the normal operating position. Thermocouple and ionization type vacuum gauges shall be included as required to monitor vacuum conditions. The degree of accuracy of all gages and meters shall be as required to maintain the pressure necessary for the process involved. Special gauges required shall be as specified (see 6.2.1). Lights shall be included to indicate when power is applied to the mechanical vacuum pump, diffusion pump, and diffusion pump oil heater. All instruments shall be complete with all necessary operating controls, and shall have the capacity to monitor operating conditions to be encountered in the vacuum system. All instruments and indicating lights shall be functionally identified by permanent marking in accordance with the manufacturer's standard commerical practice. Meters and gauges shall be calibrated directly in the units being measured and shall be permanently marked and graduated in accordance with standard commercial practice. Gage controls shall provide for log and linear readouts.

3.4.8 Power supplies, filament and direct current (DC). The input voltage required for the resistance heater power supply shall be the same as required for the operation of the vacuum system. DC power supplies for the electron gun shall be designed for operation from the power sources specified (see 3.4.11.1).

3.4.8.1 Resistance heater power supply. The resistance heater power supply shall be designed for vacuum deposition application and shall have a continuous duty output rating of at least 2 KVA. The supply shall be of the variable output type and capable of supplying a current of at least 50 amperes at maximum rated output voltage. Output current shall be controlled and monitored by a panel mounted control and ammeter.

3.4.8.2 Electron gun power supplies. All power supplies required for operation of the electron beam system shall be furnished. Power supplies shall be designed for continuous duty operation at rated load voltage and current. The current shall be regulated and have the necessary protective circuits to limit maximum current to prevent overloading. Output voltage shall be regulated to 5 percent or better. The output of the DC supplies shall be filtered as required to assure proper performance of the deposition

system under all operating conditions. Power output from the power supplies shall be continually varible from zero to maximum. The rated continuous duty output voltage and current capability of each power supply shall be sufficient to provide the power required for operation and control of the electron gun and beam when operating the gun at full rated capacity.

* 3.4.8.2.1 Power supply control and instrumentation. Each electron gun power supply shall be equipped with an input power "on-off" switch, output power control, and other power supply controls necessary for control of the electron beam. DC voltmeters and milliammeters shall be provide for measuring output voltage and current and indicator lights shall be included to indicate when input power is applied. Controls and instruments shall be mounted on a control panel located on the front of the power supply cabinet. All meters shall have a minimum scale length of 2.5 inches and shall be calibrated directly in volts, kilovolts, amperes, or milliamperes as applicable. All meters shall have an accuracy of ±5 percent of full scale. All controls and instruments shall be functionally indentified by permanent marking.

* 3.4.9 Electron gun. The electron gun shall be designed for vacuum evaporation and deposition of conductive, refractory, and dielectric material. When the type of materials for evaporation and deposition are known, they should be specified (see 6.2.1). Unless otherwise specified (see 6.2.1), the rated electron beam power of the gun shall be not less than 3 KW. The gun shall be useful for all types of thin film deposition including optics, electronics, and micro-electronics. All features required for production and control of an electron beam of uniform density and sharp definition shall be included. The gun shall be capable of concentrating the beam into a spot not to exceed 1/8 inch in diameter on the evaporant material. The guns shall be equipped with replaceable filaments. Filament removal and installation time shall not exceed 30 minutes. The Filament shall be optically shielded from both evaporant source and substrate to prevent evaporant contamination. Materials used in the manufacture of the guns, including electrical components and insulating material, shall be suitable for use under vacuum chamber pressures and temperatures encountered in vacuum evaporator processes. Physical dimensions of the gun shall permit complete utilization within the vacuum chamber specified.

* 3.4.10 Cabinets. The deposition systems shall be housed in cabinets, functionally designed to facilitate operation. The frame shall be formed of steel or aluminum and constructed to support all components, except the mechanical pump which may be shock mounted to eliminate transfer of vibriation. The side and front panels may be hinged or removable to permit access to the system for servicing. Access panels shall be equipped

with quick disconnect fasterners. Adequate ventilation shall be provided for all components. Power supplies may be enclosed in individual cabinets or may be mounted in cabinet racks.

* 3.4.11 Electrical system. The deposition system shall be furnished complete with all transformer, rectifiers, timers, contactors, controls, relays, meters, suitable circuit protections, disconnect switches and all controls as required for installation and operation. Each sub-panel shall be arranged so that it may be removed independently of any other sub-panel. Solid state circuit shall be required where applicable. All terminals and units shall be clearly identifiable from the deposition systems electrical wiring diagram. An identified terminal for grounding the system when installed shall be mounted in or near the disconnect switch.

* 3.4.11.1 Electric service requirements. The primary electrical service required to operate the deposition system, including all power supplies, shall be as specified (see 6.2.1)

*3.4.11.2 Motors. Motors shall be the continuous duty type and shall have sealed, permanently lubricated ball or roller bearings. Motors horsepower and speed shall provide for maximum load operating conditions.

3.5 Performance. The deposition system shall be capable of depositing thin film coatings without malfunctions or evidence of unstable operation. When equipped with the necessary vacuum chamber fixtures and power supplies, the systems shall perform as specified herein, using either the resistance heater or the electron gun for evaporation. All subsystems and components shall perform as specified in 3.4 and as required to perform all functions for which the system was designed. The equipment shall be capable of continuous operation at rated electrical and mechanical capacity without exceeding the rated operating capacities of any components. All controls and monitoring devices shall provide for complete control and monitoring of conditions within the deposition system from no load to full rated load operating conditions. Meters and other instrumentation shall indicate all conditions necessary to provide for maximum efficiency under all operating conditions.

3.6 Equipment.

3.6.1 Standard equipment. Unless otherwise specified (see 6.2.1), the following equipment shall be furnished with each depostion system:

A. One set of tools normally furnished by the manufacturer.

* 3.6.2 Optional equipment. When required (see 6.2.1), the following optional equipment shall be furnished as specified:

a. High capacity mechanical vacuum pump (in lieu of standard).

b. Vacuum chamber feed thru rings.

c. Film thickness monitor.

d. Non-magnetic stainless steel vacuum chamber.

3. Thermal overload circit breakers with conveniently located manual reset control for installation in the power line.

f. Sputtering source and sputtering power supply.

g. Other options as required.

3.7 Repair parts. Such repair parts as are specified (see 6.2.1), shall be furnished.

3.8 Electromagnetic interference control. When specified (see 6.2.1), equipment procured under this specification shall comply with the requirements of MIL-STD-461.

3.9 Nameplate. Unless otherwise specified (see 6.2.1), a corrosion-resistant metal nameplate shall be securely attached to each deposition system. The nameplate shall contain the information listed below. If the deposition system is a special model, the model designation shall include the model of the basic standard deposition system and a suffix keyed to the manufacturer's permanent records. The captions listed may be shortened or abbreviated,provided that the entry for each caption is clear as to its identity.

Nomenclature
Manufacturer's name
Manufacturer's model designation
Manufacturer's serial number
Power input characteristics and ratings
Coolant pressure, temperature, and volume requirements
Date of manufacture
Contract number or order number
National Stock Number or Plant Equipment Code
U S

3.10 Technical data. Technical data shall be furnished as specified (see 6.2.2).

3.11 Workmanship. Workmanship of the deposition system and its accessories shall be commensurate with the requirements specified herein, and shall be of a quality prevailing among manufacturers normally producing equipment of the type specified herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

* 4.2 First article inspection. First article inspection shall be applied to the first article when required in accordance with 3.1. Unless otherwise specified (see 6.2.1), first article inspection shall consist of the examination in 4.4 and the tests in 4.5. Failure of the first article to pass the examination or any first article test shall be cause for rejection.

*4.3 Quality conformance inspection. Quality conformance inspection shall be applied to each machine prior to being offered for acceptance under the contract. Unless otherwise specified (see 6.2.1), quality conformance inspection shall consist of the examination in 4.4, the test in 4.5.1, and the inspection in 4.5.4. Failure of the machine to pass the examination, test or inspection shall be cause for rejection.

* 4.4 Examination. The deposition system and equipment shall be examined to determine compliance with the requirements of 3.2 through 3.4.11 and 3.6 through 3.11.

4.5 Tests. The test requirements indicated below shall supplement, but not supersede or replace, the supplier's standard equipment test procedures. Prior to performing the following tests, each system shall be conditioned by continuous high vacuum pumping for at least 24 hours.

4.5.1 Operational test. The deposition system, including sub-assemblies shall be tested to verify conformance to the requirements of this specification.

4.5.1.1 Vacuum system test. With the vacuum system filled with dry nitrogen at not less than 85 degrees F - DB, or air at a temperature of not less than 85 degrees F - DB, and 75 degrees F - WB at atmospheric pressure, the pumping system shall be started. The pumping system shall evacuate the vacuum chamber as required in 3.4.1.

4.5.1.1.1 Vacuum system pressure rise. With a clean , dry, empty, outgassed system, at a pressure of 1×10^{-6} Torr, and with the pumping system off, the rate of pressure rise shall be measured. The pressure rise shall be measured over a period on one hour. During the one hour period, leakage into the evecuated area shall not exceed 1×10^{-2} Torr.

4.5.1.1.2 Vacuum system safety and protective equipment. All safety and protective equipment shall be tested to assure proper functioning.

4.5.1.1.3 Vacuum system, miscellaneous. All controls, timers, motors, adjusting mechanisms, vacuum sequencing systems, gauges, meters, and indicating lights shall be tested to verify proper control and monitoring of the operation of the deposition system. The diffusion pump oil heater shall be checked to determine that the oil is being maintained at the proper operating temperature. The vacuum chamber hoist, electrical system, cooling system, and gas supply system, shall be tested to assure proper operation.

4.5.1.2 Power supply tests. All controls, safety devices, and monitoring instruments on each power supply shall be tested to verify proper operation.

4.5.1.2.1 Power supplies, DC. Each power supply shall be tested with the AC line input voltage and frequency within ±5 percent of rated value. Each power supply shall be operated for a period of at least 5 minutes under full rated load conditions. With a stable input voltage, the value of the load resistance shall be varied from no load to full rated load conditions. Output voltage regulation shall be 5 percent or better.

4.5.2 Performance test. The performance capability of the complete deposition system shall be verified. The system, complete with AC and DC power supplies, as applicable, shall be connected to an appropriate electric power and coolant sources. The required vacuum chamber fixtures, baseplate feed throughs, and accessories shall be installed for the type of system involved. Evaporant material and the substrate (see 4.5.2.1) shall be placed in the chamber and the system placed in operation and adjusted as required by the manufacturer's operating manual. After evacuation of the chamber to the required pressure, the evaporation process shall be started and shall continue until the surface of the substrate has been completely covered. The substrate shall then be removed from the vacuum chamber and examined for any

defects indicating deficiencies in the system. Any evidence of malfunction or unstable operation shall be cause for rejection. When testing Type III deposition systems, the test shall be performed using the filament for evaporation, and repeated using the electron beam.

4.5.2.1 Evaporant and substrate. Unless otherwise specified (see 6.2.1), the evaporant and substrate material and geometry used in the tests described in 4.5.2 shall be as determine by the manufacturer.

* 4.5.3 Electromagnetic interference control tests. Equipment requiring electromagnetic interference control testing shall be tested for compliance with 3.8.

4.5.4 Packaging inspection. Packaging shall be inspected to determine compliance with the requirements of Section 5.

5. PACKAGING

5.1 Preservation, packing, and marking. Unless otherwise specified (see 6.2.1), preservation, packing, and marking shall conform to the requirements of MIL-STD-1188.

6. NOTES

6.1 Intended use. This equipment is intended for use in any facility having a requirement for thin film deposition of a wide range of conducting and dielectric materials under high vacuum conditions. This equipment is designed for use in the fields of metallurgy, optics, film plating, microelectronics, and integrated circuits.

6.2 Ordering data.

6.2.1 Procurement requirements. Purchasers should specify their requirements in procurement documents, including whether each choice is required or not required by entering an appropriate statement identified to each of the following:

a. Title, number, and date of this specification.
b. Type, and size required (see 1.2).
c. When a first article is required for inspection and approval (see 3.1, 4.2, and 6.3).
d. If machine is required to be configured in a specific measurement system (US or SI), state required system (see 3.2.1).
e. If measuring and indicating devices are required to be graduated in a specific measurement system (US or SI) state required system (see 3.2.1.1).

f. Dual calibrations (US and SI); if required,(see 3.2.1.2).
g. Specify additional safety and health requirements, (see 3.2.4).
h. Protective devices, if different (see 3.2.5).
i. Painting, if different (see 3.3.5).
j. Type of baffle required (see 3.4.1).
K. Baffle removable, if different (see 3.4.1).
l. Vacuum pressure required, if different (see 3.4.1).
m. Automatic valve control, if required (see 3.4.1.1).
n. Vacuum chamber, if different (see 3.4.3).
o. Vacuum chamber electrodes, fixtures and accessories required (see 3.4.4).
p. Type vacuum chamber hoist, required (see 3.4.5).
q. Special gauges, if required (see 3.4.7).
r. Electron gun rated electron beam power, if different (see 3.4.9).
s. Type materials for evaporation and deposition, if known (see 3.4.9).
t. Primary electrical input service requirements for complete system (see 3.4.11.1).
u. Standard equipment, if different (see 3.6.1).
v. Optional equipment, if required; fully describe required optional equipment (see 3.6.2).
w. Repair parts, if required (see 3.7).
x. Electromagnetic interference control, if required (see 3.8).
u. Nameplate, if different (see 3.9).
z. First article inspection, if different (see 4.2).
aa. Quality conformance inspection, if different (see 4.3).
bb. Evaporant and substrate material and geometry, if different (see 4.5.2.1).
cc. Level of preservation, packaging, and packing required (see 5.1).

6.2.2 Contract data requirements. Required technical data such as operator manuals,parts lists, foundation and anchor bolt plans, wiring diagrams and instructions for operation and maintenance as identified on a numbered DD Form 1664, should be specified on a DD Form 1423 incorporated into the contract.

* 6.3. First article. When a first article is required, it shall be tested and approved under the appropriate provisions of 7-104.55 of the Defense Acquisition Regulation. A first article comprises a preproduction item or a standard production item from the contractor's current inventory. The contracting officer should include specific instructions in all procurement instruments, regarding arrangement for examination, test and approval of the first article.

* 6.4 Mercury prohibited. When the use of mercury or its compounds in the equipment and its components and accessories is to be prohibited, procure-

ment documents should include a statement to that effect.

6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only, and the government assumes no liablility whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements in this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

Custodians:
Navy - SH
Army - AL
Air Force - 99

Preparing activity:
DLA-IP

Project Number:
3433-0082

Review activities:
Navy -SH
Army - AL, EL
Air Force - 99
DLA - GS

User activities
Navy- MC
Army - SM, MU
Air Force - 99
DLA - GS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

NOTE: This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

DOCUMENT IDENTIFIER *(Number)* AND TITLE

MIL-D-80118B

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1. ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY *(Printed or typed name and address — Optional)*	TELEPHONE NO.
	DATE

DD FORM 1426 1 OCT 76

EDITION OF 1 JAN 72 MAY BE USED UNTIL EXHAUSTED

FOLD

HEADQUARTERS
DEFENSE INDUSTRIAL PLANT EQUIPMENT CENTER
MEMPHIS, TENNESSEE 38114

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
DEFENSE LOGISTICS AGENCY
DoD-304

Commander
Defense Industrial Plant Equipment Center
ATTN: DIPEC-TF
Memphis, Tennessee 38114

FOLD