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Implementation of the Wassenaar Arrangement List of Dual-Use Items: Revisions to Categories 1, 2, 3, 4, 5, 6, 7 and 9 of the Commerce Control List and Revisions to Reporting Requirements; Final Rule

DEPARTMENT OF COMMERCE

Bureau of Export Administration

15 CFR Parts 743, 752, 772 and 774

[Docket No. 011026261–1261–01]

RIN 0694–AC44

Implementation of the Wassenaar Arrangement List of Dual-Use Items: Revisions to Categories 1, 2, 3, 4, 5, 6, 7 and 9 of the Commerce Control List and Revisions to Reporting Requirements

AGENCY: Bureau of Export Administration, Commerce

ACTION: Final rule.

SUMMARY: The Bureau of Export Administration (BXA) maintains the Commerce Control List (CCL), which identifies items subject to Department of Commerce export controls. This final rule revises certain entries controlled for national security reasons in Categories 1, 2, 3, 4, 5 Part I (telecommunications), 6, 7 and 9 to conform with changes in the List of Dual-Use Goods and Technologies maintained and agreed to by governments participating in the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (Wassenaar Arrangement). The Wassenaar Arrangement controls strategic items with the objective of improving regional and international security and stability.

The purpose of this final rule is to make the necessary changes to the Commerce Control List to implement revisions to the Wassenaar List that were agreed upon in the December 1, 2000 meeting and to make necessary revisions to reporting requirements. The majority of the changes that affected Category 4 items will be published in a separate rule.

DATES: This rule is effective January 3, 2002.

FOR FURTHER INFORMATION CONTACT: Tanya Hodge Mottley in the Office of Strategic Trade and Foreign Policy Controls, Bureau of Export Administration, U.S. Department of Commerce at (202) 482–1837.

SUPPLEMENTARY INFORMATION:

Background

In July 1996, the United States and thirty-two other countries gave final approval to the establishment of a new multilateral export control arrangement, called the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (Wassenaar Arrangement). The Wassenaar Arrangement contributes to regional and international security and stability by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing destabilizing accumulations of such items. Participating states have committed to exchange information on exports of dual-use goods and technologies to non-participating states for the purposes of enhancing transparency and assisting in developing common understandings of the risks associated with the transfers of these items.

This final rule revises a number of national security controlled entries on the Commerce Control List (CCL) to conform with December 1, 2000 revisions to the Wassenaar List of Dual-Use Goods and Technologies. This rule also revises language to provide a complete or more accurate description of controls. A detailed description of the revisions to the CCL is provided below.

Specifically, this rule makes the following amendments to the Commerce Control List:

Category 1—Materials, Chemicals, Microorganisms, and Toxins

1A002—amended by:

(1) Moving the exception contained in the NS control language for finished or semifinished items specially designed for civilian applications to two separate notes under paragraphs a. and b. of this entry. This revision clarifies that this entry does not control finished or semifinished items specially designed for purely civilian applications, as follows: sporting goods, automotive industry, machine tool industry, and medical applications; and

(2) Correcting a typographical error in note 2 of the Related Controls paragraph of this entry.

1B002—amended by:

(1) Clarifying that the equipment described by this entry is used for producing the highest performance ductile metal alloys in the entry heading; and

(2) Replacing the reference to controlled materials with a reference to the critical processes listed in 1C002.c.2. in the entry heading.

1C002—amended by:

(1) Reformatting the entry to specify the types of materials controlled (material in solid forms and powders/particulates suitable for making them). Specifically, each subparagraph has been revised to identify the main classes of controlled material, as follows:

(i) 1C002.a for aluminides;

(ii) 1C002.b for alloys made by powder metallurgy techniques;

(iii) 1C002.c for alloy powders suitable for re-melting to make controlled alloys; and

(iv) 1C002.d for material that has been refined to the correct composition for controlled alloys, which needs only to be mechanically reduced to powder in order to be suitable for re-melting to make controlled alloys; and

(2) Moving the Technical Notes that were after a.2.e to the beginning of the List of Items Controlled for this entry.

1C007—amended by:

(1) Clarifying that ceramic-ceramic ''composite'' materials are controlled when made from the listed ''materials'' instead of ''systems'' in paragraph (c);

(2) Clarifies that all the parameters in paragraph (c) must be met for the item to be subject to control; and

(3) Reformatting paragraph (c) to be consistent with the Wassenaar Information System.

Category 2—Material Processing

2A001—amended by revising the tolerance standards for ball bearings and solid roller bearings described in 2A001.a and 2A002.b. These tolerance standards are revised to add greater precision. Specifically, in 2A001.a, the following standards ''ABEC 7, ABEC 7P, ABEC 7T or ISO Standard Class 4, or national equivalents, or better'' are revised to read ''ISO Tolerance Class 4 (or ANSI/ABMA Std 20 Tolerance Class ABEC–7 or RBEC–7, or other national equivalents), or better''. In 2A001.b, the following standards ''ABEC 9, ABEC 9P or ISO Standard Class 2, or national equivalents'' are revised to read ''ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC–9 or RBEC–9, or other national equivalents), or better''.

Technical Notes to Category 2 B—amended by:

(1) Redesignating technical notes 2 through 5 as technical notes 3 though 6; and

(2) Adding a new technical note 2 to clarify the meaning of the term ''contouring control''.

2B001—amended by:

(1) Adding two notes to decontrol special purpose machine tools that produce certain type parts. Specifically, Note 1 specifies that 2B001 does not control special purpose machine tools limited to the manufacture of gears. Note 2 specifies that 2B001 does not control special purpose machine tools limited to the manufacture of crank shafts or cam shafts, tools or cutters, extruder worms, or engraving or facetted jewelry parts;

(2) Adding a new national security control for fly cutting machine tools, as described by 2B001.b.4. This new

control introduces new parameters for the control of fly cutting machines, such as a spindle run-out and angular deviation of slide movement (2B001.b.4); and

(3) Adding clarifying text to paragraph (e), machine tools for removing metals, ceramics or ''composites'', to be consistent with the Wassenaar Information System.

2B008—amended by:

(1) Removing the reference to the term ''inserts'' in the entry heading. The term ''inserts'' has been removed because no inserts are contained in the List of Items Controlled;

(2) Replacing the phrase ''for equipment controlled by 2B006 or 2B007'' with the phrase ''dimensional inspection or measuring systems and equipment'' in the entry heading. The phrase referencing equipment controlled by 2B007 has been removed because the items listed in 2B008 are not key elements of robots controlled by 2B007; and

(3) Replacing the reference to 2B006 with the phrase ''dimensional inspection or measuring systems and equipment'' in the entry heading, in order to reduce the number of unnecessary cross-references to other entries.

2D002—amended by removing controls for ''real-time processing'' of data to modify tool path, feed rate and spindle data, during machining operation, by deleting 2D002.b. No such software currently is available. The parameters set forth in 2D002.a have been included in the entry heading and the List of Items Controlled has been removed.

2E003—Materials Processing Table for Deposition Techniques—Notes—amended by revising Note 17 to the Table by removing the exclusion from control for technology specially designed to deposit diamond like carbon on polycarbonate eyeglasses, bakery equipment and high quality lenses designed for cameras or telescopes.

Category 3—Electronics

3A001—amended by revising the following subparagraphs:

3A001.a.3.c—amended by clarifying that the control for this subparagraph applies only to the capability of processors directly interconnected with each other and by relaxing controls on the external interconnect transfer rate from 2.5 Mbytes/s to 150 Mbyte/s.

3A001.a.5.a.1—amended by relaxing controls for analog-to-digital converters by lowering the conversion time from 10 ns to 5 ns.

3A001.a.10—amended by:

(1) Relaxing controls for custom integrated circuits by increasing the control threshold on the number of terminals from 208 to 1,000 (3A001.a.10.a); and

(2) Decreasing the control threshold for basic gate propagation delay time from 0.35 ns to 0.1 ns (3A001.a.10.b).

3A001.a.12—amended by:

(1) Modifying the subparagraph to reflect advancements in Fast Fourier Transform (FFT) processors. The formula for determining the control parameters for FFT processors has been modified. This modification relaxes controls over the execution time from 1 millisecond to 500 microseconds for a 1024 point complex FFT; and

(2) Deleting the control parameter for butterfly throughput, because it is a software algorithm and does not describe performance levels of currently produced FFT processors.

3A001.b.1, b.2 and b.8—amended by revising the decontrol notes in these subparagraphs to clarify that bands within the frequency range between 0 to 31 GHz are not subject to national security controls.

3A001.b.1.a.1—amended by revising the phrase ''higher than 31 GHz'' to read ''exceeding 31 GHz''.

3A001.b.1.a.3—amended by replacing the term ''instantaneous bandwidth'' with ''fractional bandwidth''. The term ''fractional bandwidth'' more accurately reflects the appropriate control for this entry.

3A001.b.2—amended by:

(1) Adding the phrase ''having one or more active elements'' to further define the control of microwave integrated circuits and modules (3A001.b.2.a); and

(2) Adding a new decontrol note for certain satellite broadcast equipment.

3A002.b—amended by revising the phrase ''assemblies'' to read ''electronic assemblies'', to be consistent with the Wassenaar Arrangement.

3A002.c.2—amended by:

(1) Modifying controls for dynamic signal analyzers by increasing the control parameter for real-time bandwidth from 25.6 kHz to 500 kHz; and

(2) Moving the text of the technical note under paragraph c. (Constant percentage bandwidth filters are also known as octave or fractional octave filters) to the ''Related Definitions'' paragraph for the entry.

3A991—amended by:

(1) Adding a new parameter in paragraph (a) related to external interconnection for ''Microprocessor microcircuits'', ''microcomputer microcircuits'', and microcontroller microcircuits;

(2) Adding a new paragraph (c) to include analog-to-digital converters having a resolution of 8 bit or more, but less than 12 bit, with a total conversion time of less than 10 ns;

(3) Adding a new paragraph (e) to include Fast Fourier Transform (FFT) processors having a rated execution time for a 1,024 point complex FFT of less than 1 ms; and

(4) Redesignating paragraph (c) as paragraph (d), and paragraphs (d) through (l) as paragraphs (f) through (n).

3B002—amended by:

(1) Adding to the heading the phrase ''as follows (see List of Items Controlled)'';

(2) Modifying the note to 3B002.b to clarify that equipment to test memories are not controlled by 3B002.b; and

(3) Revising the phrase ''assemblies'' to read ''electronic assemblies'' to be consistent with the Wassenaar Arrangement.

3B991—amended by revising the phrase ''assemblies'' to read ''electronic assemblies'' in paragraph 3B991.b.

3B992—amended by revising the phrase ''assemblies'' to read ''electronic assemblies'' in paragraphs 3B992.b, 3B992.b.4.b, and in Note 1 to 3B992.b.4.b.

3C001—amended by:

(1) Adding silicon carbide to the list of controlled hetero-epitaxtial materials. Like silicon and germanium, silicon carbide is a Group IV material capable of producing strategic items (3C001.c); and

(2) Adding a note to clarify that equipment or material whose functionality has been unalterably disabled are not controlled by 3C001.

3D003—amended by modifying the control language to clarify the intent of computer-aided-design (CAD) software controls in order to remove any ambiguities in interpretation whether CAD software supplied without design rule libraries are subject to control under 3D003. Exports of CAD software with or without design rule libraries are both subject to national security controls.

3E001—amended by moving the Notes in the Related Controls paragraph to the List of Items Controlled to be consistent with the Wassenaar List.

3E002 and 3E003—amended by:

(1) Redesignating 3E002.a through 3E002.f as new ECCN 3E003;

(2) In the new ECCN 3E003, expanding eligibility under License Exception TSR to include silicon-on-insulator (SOI) technology as described in the new 3E003.e;

(3) Adding a Note to describe what 3E002 does not control to the List of Items Controlled in 3E002; and

(4) Redesignating 3E002.g as new ECCN 3E002.

Category 4—Computers

4D003—amended by removing national security controls for expert system software as described by 4D003.b.

Category 5—Telecommunications, Part I

5D001—amended by removing national security controls for software which provides the capability of recovering ''source code'' of telecommunications ''software'' controlled by 5D001 (5D001.c).

5E001—amended by adding a decontrol note to 5E001.c.4.b specifying that this entry does not control ''technology'' for the ''development'' or ''production'' of equipment designed or modified for operation in any frequency band which is ''allocated by the ITU'' for radio-communications services, but not for radio-determination.

Category 6—Sensors and Lasers

6A003—amended by:

(1) Revising the controls on instrumentation cameras specified in 6A003.a to include specially designed components therefor and by revising the note to 6A003.a to replace the term ''electronic assemblies'' with ''plug-ins''. This change is necessary to make the controls for instrumental cameras more complete, as plug-in modules are specially designed components of controlled cameras. Complementing this revision to 6A003.a, a new subparagraph 6A003.a.6 has been added to describe the control parameters for ''plug-ins''. In addition, License Exception LVS has been modified to exclude the new control for 6A003.a.6 ''plug-ins'' from eligibility; and

(2) Adding a new technical note to 6A003.b.1 to clarify that digital video cameras should be evaluated by the maximum number of ''active pixels'' used for capturing moving images.

6A005—amended by:

(1) Removing the phrase ''or CW'' from the control parameter for excimer lasers and metal vapor lasers, as described in 6A005.a.1 and 6A005.a.2. The deletion of the term ''CW'' from these subparagraphs more accurately describes the technical nature of control, as both excimer and metal vapor lasers are not physically capable of working the CW mode;

(2) Revising the control text for semiconductor lasers described by 6A005.b. Previously in 6A005.b.2, individual multiple-transverse mode semiconductor lasers and individual arrays of individual semiconductor lasers were controlled using the same threshold. However, since the output power of an array of semiconductor laser is greater than that of an individual semiconductor lasers it should be subject to a different control threshold. Therefore, a new subparagraph 6A005.b.3 has been added describing the control threshold for individual arrays of individual semiconductor lasers.

6A995—amended by correcting an abbreviation for a parameter for semiconductor lasers in b.1.a by revising ''MW'' to read ''mW'.

6C002—amended by revising 6C002.b to adopt the term ''percent by mole fraction'' rather than the term ''percent by weight'' for the control of zinc in cadmium zinc telluride (CdZnTe) substrates. The previous control language in 6C002.b incorrectly referred to the zinc percentage by weight. The formula for CdZnTe is an atomic formula which specifies the number of atoms of each constituent. Therefore, specifying the zinc percentage in terms of mole fraction percentage correctly relates the concentration of zinc to the concentration of cadmium in CdZnTe. In addition, a technical note is added to paragraph 6C002.b to define ''mole fraction''. Also, in 6C002.b text is added to clarify that Single crystals includes epitaxial wafers.

6C992—amended by revising the heading to adopt the term ''percent by mole fraction'' rather than the term ''percent by weight'' and adding the definition of ''mole fraction'' to the Related Definitions paragraph, to conform with changes to ECCN 6C002.

Category 7—Avionics

7A001—amended by:

(1) Revising the entry heading to limit control of this entry to certain linear accelerometers, rather than a broad category of accelerometers; and

(2) Adding a reference specifying that angular or rotational accelerometers are controlled under 7A002 in the Related Controls section.

7A002—amended by:

(1) Revising the entry heading to control certain angular or rotational accelerometers. Previously, accelerometers were controlled under 7A001; and

(2) Adding a reference specifying that linear accelerometers are controlled under 7A001 to the Related Controls section.

Category 9—Propulsion Systems, Space Vehicles and Related Equipment

9B001—amended by:

(1) Revising the entry heading to remove the phrase ''or measuring''. In 1999, the subparagraph that specifically referenced measuring equipment was deleted; and

(2) Removing the corresponding reference in the entry heading.

9E003—amended by:

(1) Removing the control for ''overhaul'' technology for gas turbine engine components or systems described in 9E003.a; and

(2) Revising the phrase ''of the following commercial aircraft engines, components or systems'' to read ''of any of the following gas turbine engine components or systems'' to more accurately describe the controls of paragraph a.

Reformatting and conforming revisions to the structure of the entries on the CCL This final rule makes a number of reformatting revisions to the CCL in order to conform certain entries and subparagraphs to the new Wassenaar Automated Information System (WAIS). These conforming revisions do not affect or change the scope of control, but merely provide standard consistency in structure within the CCL. Specific revisions on the CCL include: ECCNs 2B001.b.1, 2B001.c.1, 2B001.e, 2B001.e.1, 9E003.d and 9E003.e.

Items placed under control by this rule will be subject to both national security (NS) and antiterrorism (AT) controls. These actions are taken in consultation with the Departments of State and Defense and pursuant to agreements reached in the Wassenaar Arrangement.

All items removed from national security (NS) controls as a result of changes to the Wassenaar List of Dual-Use Goods and Technologies will continue to be controlled for antiterrorism (AT) reasons.

This final rule also revises the reporting and recordkeeping provisions of the Wassenaar Arrangement in § 743.1 by requiring reports for exports of sensitive list items made under the Special Comprehensive License Procedure. Conforming revisions are also made to the recordkeeping provisions in § 752.12. Extending Wassenaar Arrangement reporting requirements to the Special Comprehensive Licensing Procedure is necessary in order for the U.S. to fulfill its obligations in complying with the objectives of the regime.

This final rule also amends part 772 by adding two new definitions to § 772.1, they are ''Allocated by the ITU'' and ''Fractional bandwidth.'' These definitions are added pursuant to agreements reached in the Wassenaar Arrangement.

Although the Export Administration Act expired on August 20, 2001, the

President, through Executive Order 13222 of August 17, 2001 (66 Fed. Reg. 44025 (August 22, 2001)), has continued the Export Administration Regulations in effect under the International Emergency Economic Powers Act.

Saving Clause

Shipments of items removed from eligibility for export or reexport without a license, under a particular License Exception authorization or the designator NLR, as a result of this regulatory action, may continue to be exported or reexported under that License Exception authorization or designator until February 4, 2002. In addition, this rule revises the numbering and structure of certain entries on the Commerce Control List. For items under such entries and for April 3, 2002, BXA will accept license applications for items described either by the entries in effect immediately before January 3, 2002 or the entries described in this rule.

Rulemaking Requirements

1. This final rule has been determined to be not significant for purposes of E.O. 12866.

2. Notwithstanding any other provision of law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with a collection of information, subject to the requirements of the Paperwork Reduction Act (PRA), unless that collection of information displays a currently valid OMB Control Number. This rule involves collections of information subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*) These collections has been approved by the Office of Management and Budget under control numbers 0694–0106, ''Reporting and Recordkeeping Requirements under the Wassenaar Arrangement,'' which carries a burden hour estimate of 5 minutes to record the information for each export and 1 minute to submit the report twice a year to BXA; and 0694–0088, ''Multi-Purpose Application,'' which carries a burden hour estimate of 40 minutes to prepare and submit electronically and 45 minutes to submit manually on form BXA–748P. Send comments regarding these burden estimates or any other aspect of these collections of information, including suggestions for reducing the burden, to OMB Desk Officer, New Executive Office Building, Washington, DC 20503; and to the Regulatory Policy Division, Bureau of Export Administration, Department of Commerce, P.O. Box 273, Washington, DC 20044

3. This rule does not contain policies with Federalism implications as this term is defined in Executive Order 13132.

4. The provisions of the Administrative Procedure Act (5 U.S.C. 553) requiring notice of proposed rulemaking, the opportunity for public participation, and a delay in effective date, are inapplicable because this regulation involves a military and foreign affairs function of the United States (Sec. 5 U.S.C. 553(a)(1)). Further, no other law requires that a notice of proposed rulemaking and an opportunity for public comment be given for this final rule. Because a notice of proposed rulemaking and an opportunity for public comment are not required to be given for this rule under 5 U.S.C. or by any other law, the analytical requirements of the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) are not applicable.

List of Subjects

15 CFR Parts 743 and 752

Administrative practice and procedure, Exports, Foreign trade, Reporting and recordkeeping requirements.

15 CFR Part 772

Exports, Foreign trade.

15 CFR Part 774

Exports, Foreign Trade, Reporting and recordkeeping requirements.

Accordingly, parts 743, 752, 772 and 774 of the Export Administration Regulations (15 CFR parts 730 through 799) are amended as follows:

1. The authority citation for part 743 is revised to read as follows:

Authority: 50 U.S.C. app. 2401 *et seq;* Pub.L. 106–508; 50 U.S.C. 1701 *et seq;* E.O. 13206, 66 FR 18397, April 9, 2001.

2. The authority citation for parts 752 and 772 are revised to read as follows:

Authority: 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; E.O. 13020, 61 FR 54079, 3 CFR, 1996 Comp. p. 219; E.O. 13222, 66 FR 44025, August 22, 2001.

3. The authority citation for part 774 continues to read as follows:

Authority: 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 10 U.S.C. 7420; 10 U.S.C. 7430(e); 18 U.S.C. 2510 *et seq.*; 22 U.S.C. 287c, 22 U.S.C. 3201 *et seq.*, 22 U.S.C. 6004; 30 U.S.C. 185(s), 185(u); 42 U.S.C. 2139a; 42 U.S.C. 6212; 43 U.S.C. 1354; 46 U.S.C. app. 466c; 50 U.S.C. app. 5; E.O. 13026, 61 FR 58767, 3 CFR, 1996 Comp., p. 228; E.O. 13222, 66 FR 44025, August 22, 2001.

PART 743—[AMENDED]

4. Section 743.1 is amended by adding a note immediately following paragraph (a) and by revising paragraph (b) to read as follows:

§ 743.1 Wassenaar Arrangement.

(a) * * *

Note to paragraph (a) of this section: For purposes of part 743, the term ''you'' has the same meaning as the term ''exporter'', as defined in part 772 of the EAR.

(b) *Requirements.* You must submit two (2) copies of each report required under the provisions of this section and maintain accurate supporting records (see § 762.2(b) of the EAR) for all exports of items specified in paragraph (c) of this section for the following:

(1) *Exports authorized under License Exceptions GBS, CIV, TSR, LVS, CTP and GOV* (see part 740 of the EAR). Note that exports of technology and source code under License Exception TSR to foreign nationals located in the U.S. should not be reported; and

(2) Exports authorized under the Special Comprehensive License procedure (see part 752 of the EAR).

* * * * *

PART 752—[AMENDED]

5. Section 752.12 is amended by redesignating paragraph (b) as paragraph (c) and by adding a new paragraph (b) to read as follows:

§ 752.12 Recordkeeping requirements.

* * * * *

(b) *SCL holder.* The SCL holder is responsible for complying with the special reporting requirements for exports of certain commodities, software and technology under the Wassenaar Arrangement as described in § 743.1 of the EAR.

* * * * *

PART 772—[AMENDED]

6. Part 772 is amended by adding a new definition ''Allocated by the ITU'' and a new definition ''Fractional bandwidth'' in alphabetical order to § 772.1, to read as follows:

§ 772.1 Definitions of terms as used in the Export Administration Regulations (EAR).

* * * * *

''*Allocated by the ITU*''. (Cat 3 and Cat 5 part 1)—The allocation of frequency bands according to the ITU Radio Regulations (Edition 1998) for primary, permitted and secondary services.

N.B. Additional and alternative allocations are not included.

* * * * *

''*Fractional bandwidth*''. (Cat 3)—The ''instantaneous bandwidth'' divided by

the center frequency, expressed as a percentage.

* * * * *

PART 774—[AMENDED]

7. In Supplement No. 1 to part 774 (the Commerce Control List), Category 1—Materials, Chemicals, Microorganisms, and Toxins, Export Control Classification Numbers (ECCNs) are amended:

a. By revising the License Requirements section and the List of Items Controlled section for ECCNs 1A002 and 1C002;

b. By revising the entry heading for ECCN 1B002; and

c. By revising the List of Items Controlled section for ECCN 1C007, to read as follows:

1A002 ''Composite'' Structures or Laminates, Having Any of the Following (See List of Items Controlled)

License Requirements

Reason for Control: NS, NP, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
NP applies to 1A002.b.1 in the form of tubes with an inside diameter between 75 mm and 400 mm.	NP Column 1.
1 AT applies to entire entry	AT Column 1.

License Requirement Notes: See § 743.1 of the EAR for reporting requirements for exports under License Exceptions.

* * * * *

List of Items Controlled

Unit: Kilograms.

Related Controls: (1) See also 1A202, 9A010, and 9A110. (2) Composite structures that are specially designed for missile application (including specially designed subsystems and components) are controlled by 9A110.

Related Definitions: N/A.

Items:

a. An organic ''matrix'' and made from materials controlled by 1C010.c, 1C010.d or 1C010.e; or

Note: 1A002.a does not control finished or semifinished items specially designed for purely civilian applications as follows:

a. Sporting goods;

b. Automotive industry;

c. Machine tool industry; and

d. Medical applications.

b. A metal or carbon ''matrix'' and made from:

b.1. Carbon ''fibrous or filamentary materials'' with:

b.1.a. A ''specific modulus'' exceeding 10.15×10^6 m; and

b.1.b. A ''specific tensile strength'' exceeding 17.7×10^4 m; or

b.2. Materials controlled by 1C010.c.

Note: 1A002.b does not control finished or semifinished items specially designed for purely civilian applications as follows:

a. Sporting goods;

b. Automotive industry;

c. Machine tool industry; and

d. Medical applications.

Technical Notes: (1) Specific modulus: Young's modulus in pascals, equivalent to N/m^2 divided by specific weight in N/m^3, measured at a temperature of (296±2) K ((23±2) °C) and a relative humidity of (50±5)%. (2) Specific tensile strength: ultimate tensile strength in pascals, equivalent to N/m^2 divided by specific weight in N/m^3, measured at a temperature of (296±2) K ((232) °C) and a relative humidity of (50±5)%.

Note: 1A002 does not control composite structures or laminates made from epoxy resin impregnated carbon ''fibrous or filamentary materials'' for the repair of aircraft structures of laminates, provided that the size does not exceed one square meter ($1 m^2$).

1B002 Equipment for Producing Metal Alloys, Metal Alloy Powder or Alloyed Materials, Specially Designed to Avoid Contamination and Specially Designed for Use in One of the Processes Specified in 1C002.c.2

* * * * *

1C002 Metal Alloys, Metal Alloy Powder and Alloyed Materials, As Follows (See List of Items Controlled)

License Requirements

Reason for Control: NS, NP, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
NP applies to 1C002.b.3 or b.4 if they exceed the parameters stated in 1C202.	NP Column 1.
AT applies to entire entry	AT Column 1.

* * * * *

List of Items Controlled

Unit: Kilograms.

Related Controls: See also 1C202.

Related Definition: N/A.

Items:

Note: 1C002 does not control metal alloys, metal alloy powder or alloyed materials for coating substrates.

Technical Note 1: The metal alloys in 1C002 are those containing a higher percentage by weight of the stated metal than of any other element.

Technical Note 2: Stress-rupture life should be measured in accordance with ASTM standard E–139 or national equivalents.

Technical Note 3: Low cycle fatigue life should be measured in accordance with ASTM Standard E–606 ''Recommended Practice for Constant-Amplitude Low-Cycle Fatigue Testing'' or national equivalents. Testing should be axial with an average stress ratio equal to 1 and a stress-concentration factor (K_t) equal to 1. The average stress is defined as maximum stress minus minimum stress divided by maximum stress.

a. Aluminides, as follows:

a.1. Nickel aluminides containing a minimum of 15 weight percent aluminum, a maximum of 38 weight percent aluminum and at least one additional alloying element;

a.2. Titanium aluminides containing 10 weight percent or more aluminum and at least one additional alloying element;

b. Metal alloys, as follows, made from material controlled by 1C002.c:

b.1. Nickel alloys with:

b.1.a. A stress-rupture life of 10,000 hours or longer at 923 K (650 °C) at a stress of 676 MPa; or

b.1.b. A low cycle fatigue life of 10,000 cycles or more at 823 K (550 °C) at a maximum stress of 1,095 MPa;

b.2. Niobium alloys with:

b.2.a. A stress-rupture life of 10,000 hours or longer at 1,073 K (800 °C) at a stress of 400 MPa; or

b.2.b. A low cycle fatigue life of 10,000 cycles or more at 973 K (700 °C) at a maximum stress of 700 MPa;

b.3. Titanium alloys with:

b.3.a. A stress-rupture life of 10,000 hours or longer at 723 K (450 °C) at a stress of 200 MPa; or

b.3.b. A low cycle fatigue life of 10,000 cycles or more at 723 K (450 °C) at a maximum stress of 400 MPa;

b.4 Aluminum alloys with a tensile strength of:

b.4.a. 240 MPa or more at 473 K (200 °C); or

b.4.b. 415 MPa or more at 298 K (25 °C);

b.5. Magnesium alloys with:

b.5.a. A tensile strength of 345 MPa or more; and

b.5.b. A corrosion rate of less than 1 mm/year in 3% sodium chloride aqueous solution measured in accordance with ASTM standard G–31 or national equivalents;

c. Metal alloy powder or particulate material, having all of the following characteristics:

c.1. Made from any of the following composition systems:

Technical Note: X in the following equals one or more alloying elements.

c.1.a. Nickel alloys (Ni-Al-X, Ni-X-Al) qualified for turbine engine parts or components, i.e. with less than 3 non-metallic particles (introduced during the manufacturing process) larger than 100 µ in 10^9 alloy particles;

c.1.b. Niobium alloys (Nb-Al-X or Nb-X-Al, Nb-Si-X or Nb-X-Si, Nb-Ti-X or Nb-X-Ti);

c.1.c. Titanium alloys (Ti-Al-X or Ti-X-Al);

c.1.d. Aluminum alloys (Al-Mg-X or Al-X-Mg, Al-Zn-X or Al-X-Zn, Al-Fe-X or Al-X-Fe); or

c.1.e. Magnesium alloys (Mg-Al-X or Mg-X-Al); and

c.2. Made in a controlled environment by any of the following processes:

c.2.a. ''Vacuum atomization'';

c.2.b. ''Gas atomization'';

c.2.c. ''Rotary atomization'';

c.2.d. ''Splat quenching'';

c.2.e. ''Melt spinning'' and ''comminution'';

c.2.f. ''Melt extraction'' and ''comminution''; or

c.2.g. ''Mechanical alloying'';

d. Alloyed materials, having all the following characteristics:

d.1. Made from any of the composition systems specified in 1C002.c.1;

d.2. In the form of uncomminuted flakes, ribbons or thin rods; *and*

d.3. Produced in a controlled environment by any of the following:

d.3.a. ''Splat quenching'';

d.3.b. ''Melt spinning''; or

d.3.c. ''Melt extraction''.

* * * * *

1C007 Ceramic Base Materials, Non-''Composite'' Ceramic Materials, Ceramic-''Matrix'' ''Composite'' Materials and Precursor Materials, As Follows (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: Kilograms.

Related Controls: See also 1C107.

Related Definitions: N/A.

Items:

a. Base materials of single or complex borides of titanium having total metallic impurities, excluding intentional additions, of less than 5,000 ppm, an average particle size equal to or less than 5 μm and no more than 10% of the particles larger than 10 μm;

b. Non-''composite'' ceramic materials in crude or semi-fabricated form, composed of borides of titanium with a density of 98% or more of the theoretical density;

Note: 1C007.b does not control abrasives.

c. Ceramic-ceramic ''composite'' materials with a glass or oxide-''matrix'' and reinforced with fibers having all the following:

c.1 Made from any of the following materials:

c.1.a. Si-N;

c.1.b. Si-C;

c.1.c. Si-Al-O-N; or

c.1.d. Si-O-N; and

c.2. Having a ''specific tensile strength'' exceeding 12.7 x 10^3 m;

d. Ceramic-ceramic ''composite'' materials, with or without a continuous metallic phase, incorporating particles, whiskers or fibers, where carbides or nitrides of silicon, zirconium or boron form the ''matrix'';

e. Precursor materials (i.e., special purpose polymeric or metallo-organic materials) for producing any phase or phases of the materials controlled by 1C007.c, as follows:

e.1. Polydiorganosilanes (for producing silicon carbide);

e.2. Polysilazanes (for producing silicon nitride);

e.3. Polycarbosilazanes (for producing ceramics with silicon, carbon and nitrogen components);

f. Ceramic-ceramic ''composite'' materials with an oxide or glass ''matrix'' reinforced with continuous fibers from any of the following systems:

f.1. Al_2O_3; or

f.2. Si-C-N.

Note: 1C007.f does not control ''composites'' containing fibers from these systems with a fiber tensile strength of less than 700 MPa at 1,273 K (1,000 °C) or fiber tensile creep resistance of more than 1% creep strain at 100 MPa load and 1,273 K (1,000 °C) for 100 hours.

* * * * *

8. In Supplement No. 1 to part 774 (the Commerce Control List), Category 2—Materials Processing, Export Control Classification Numbers (ECCNs) are amended:

a. By revising the List of Items Controlled section for ECCNs 2A001 and 2B001;

b. By adding the entry heading and Notes for Category 2B—Test, Inspection and Production Equipment immediately following ECCN 2A999;

c. By revising the entry heading for ECCN 2B008;

d. By revising the entry heading, the License Requirements section and the List of Items Controlled section for ECCN 2D002; and

e. By revising Note 17 of the Notes to ''Category 2E—Materials Processing Table; Deposition Techniques'', that follows ECCN 2E003, to read as follows:

2A001 Anti-Friction Bearings and Bearing Systems, As Follows, (See List of Items Controlled) and Components Therefor

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: (1) See also 2A991. (2) Quiet running bearings are subject to the export licensing authority of the Department of State, Office of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: Annular Bearing Engineers Committee (ABEC).

Items:

Note: 2A001 does not control balls with tolerance specified by the manufacturer in accordance with ISO 3290 as grade 5 or worse.

a. Ball bearings and solid roller bearings having tolerances specified by the manufacturer in accordance with ISO 492 Tolerance Class 4 (or ANSI/ABMA Std 20 Tolerance Class ABEC–7 or RBEC–7, or other national equivalents), or better, and having rings, balls or rollers made from monel or beryllium;

Note: 2A001.a does not control tapered roller bearings.

b. Other ball bearings and solid roller bearings having tolerances specified by the manufacturer in accordance with ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC–9 or RBEC–9, or other national equivalents), or better;

Note: 2A001.b does not control tapered roller bearings.

c. Active magnetic bearing systems using any of the following:

c.1. Materials with flux densities of 2.0 T or greater and yield strengths greater than 414 MPa;

c.2. All-electromagnetic 3D homopolar bias designs for actuators; or

c.3. High temperature (450 K (177°C) and above) position sensors.

B. Test, Inspection and Production Equipment

Technical Notes for 2B001 to 2B009:

1. Secondary parallel contouring axes, (e.g., the w-axis on horizontal boring mills or a secondary rotary axis the center line of which is parallel to the primary rotary axis) are not counted in the total number of contouring axes. Rotary axes need not rotate over 360o. A rotary axis can be driven by a linear device (e.g., a screw or a rack-and-pinion).

2. The number of axes which can be co-ordinated simultaneously for ''contouring control'' is the number of axes which affect relative movement between any one workpiece and a tool, cutting head or grinding wheel which is cutting or removing material from the workpiece. This does not include any additional axes which affect other relative movement within the machine. Such axes include:

2.a. Wheel-dressing systems in grinding machines;

2.b. Parallel rotary axes designed for mounting of separate workpieces;

2.c. Co-linear rotary axes designed for manipulating the same workpiece by holding it in a chuck from different ends.

3. Axis nomenclature shall be in accordance with International Standard

ISO 841, ''Numerical Control Machines—Axis and Motion Nomenclature''.

4. A''tilting spindle'' is counted as a rotary axis.

5. Guaranteed ''positioning accuracy'' levels instead of individual test protocols may be used for each machine tool model using the agreed ISO test procedure.

6. The positioning accuracy of ''numerically controlled'' machine tools is to be determined and presented in accordance with ISO 230/2 (1988).

2B001 Machine Tools and Any Combination Thereof, for Removing (or Cutting) Metals, Ceramics or ''Composites'', Which, According to the Manufacturer's Technical Specification, Can Be Equipped With Electronic Devices for ''Numerical Control''

* * * * *

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value.

Related Controls: (1.) See also 2B290 and 2B991; (2.) See also 1B101.d for cutting equipment designed or modified for removing prepregs and preforms controlled by 9A110.

Related Definitions: N/A.

Items:

Note 1: 2B001 does not control special purpose machine tools limited to the manufacture of gears. For such machines, see 2B003.

Note 2: 2B001 does not control special purpose machine tools limited to the manufacture of any of the following parts:

a. Crank shafts or cam shafts;

b. Tools or cutters;

c. Extruder worms;

d. Engraved or facetted jewellery parts.

a. Machine tools for turning, having all of the following characteristics:

a.1. Positioning accuracy with ''all compensations available'' of less (better) than 6 μm along any linear axis; and

a.2. Two or more axes which can be coordinated simultaneously for ''contouring control'';

Note: 2B001.a does not control turning machines specially designed for the production of contact lenses.

b. Machine tools for milling, having any of the following characteristics:

b.1. Having all of the following:

b.1.a. Positioning accuracy with ''all compensations available'' of less (better) than 6 μm along any linear axis; and

b.1.b. Three linear axes plus one rotary axis which can be coordinated simultaneously for ''contouring control'';

b.2. Five or more axes which can be coordinated simultaneously for ''contouring control'';

b.3. A positioning accuracy for jig boring machines, with ''all compensations available'', of less (better) than 4 μm along any linear axis; or

b.4. Fly cutting machines, having all of the following characteristics: b.4.a. Spindle ''run-out'' and ''camming'' less (better) than 0.0004 mm TIR; *and*

b.4.b. Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over 300 mm of travel.

c. Machine tools for grinding, having any of the following characteristics:

c.1. Having all of the following:

c.1.a. Positioning accuracy with ''all compensations available'' of less (better) than 4 μm along any linear axis; and c.1.b. Three or more axes which can be coordinated simultaneously for ''contouring control''; or

c.2. Five or more axes which can be coordinated simultaneously for ''contouring control'';

Notes: 2B001.c does not control grinding machines, as follows:

1. Cylindrical external, internal, and external-internal grinding machines having all the following characteristics:

a. Limited to cylindrical grinding; and

b. Limited to a maximum workpiece capacity of 150 mm outside diameter or length.

2. Machines designed specifically as jig grinders having any of following characteristics:

a. The c-axis is used to maintain the grinding wheel normal to the work surface; or

b. The a-axis is configured to grind barrel cams.

3. Tool or cutter grinding machines limited to the production of tools or cutters.

4. Crank shaft or cam shaft grinding machines.

5. Surface grinders.

d. Electrical discharge machines (EDM) of the non-wire type which have two or more rotary axes which can be coordinated simultaneously for ''contouring control'';

e. Machine tools for removing metals, ceramics or ''composites'' having all of the following characteristics:

e.1. Removing material by means of any of the following:

e.1.a. Water or other liquid jets, including those employing abrasive additives;

e.1.b. Electron beam; or

e.1.c. ''Laser'' beam; and

e.2. Having two or more rotary axes which:

e.2.a. Can be coordinated simultaneously for ''contouring control''; and

e.2.b. Have a positioning accuracy of less (better) than 0.003°;

f. Deep-hole-drilling machines and turning machines modified for deep-hole-drilling, having a maximum depth-of-bore capability exceeding 5,000 mm and specially designed components therefor.

2B008 Assemblies or Units, Specially Designed for Machine Tools, or Dimensional Inspection or Measuring Systems and Equipment, as Follows (See List of Items Controlled)

* * * * *

2D002 ''Software'' for Electronic Devices, Even When Residing in an Electronic Device or System, Enabling Such Devices or Systems to Function as a ''Numerical Control'' Unit, Capable of Coordinating Simultaneously More Than 4 Axes for ''Contouring Control''

License Requirements

Reason for Control: NS, NP, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: See also 2D202.

Related Definitions: N/A.

Items:

Note: 2D002 does not control ''software'' specially designed or modified for the operation of machine tools not controlled by Category 2.

The list of items controlled is contained in the ECCN heading.

* * * * *

Category 2E—Materials Processing Table; Deposition Techniques

* * * * *

Notes to Table on Deposition Techniques

* * * * *

17. ''Technology'' specially designed to deposit diamond-like carbon on any of the following is not controlled: magnetic disk drives and heads, equipment for the manufacture of disposables valves for faucets, acoustic diaphragms for speakers, engine parts for automobiles, cutting tools, punching-pressing dies, office automation equipment, microphones or medical devices.

* * * * *

9. In Supplement No. 1 to part 774 (the Commerce Control List), Category 3—Electronics, Export Control Classification Numbers (ECCNS) are amended:

a. By revising the List of Items Controlled section for ECCNs 3A001, 3A002, 3A991, 3B991, 3B992, 3C001, and 3E001;

b. By revising the entry heading and the List of Items Controlled section for ECCNs 3B002 and 3D003;

c. By revising the entire entry for ECCN 3E002; and

d. By adding a new entry for ECCN 3E003, to read as follows:

3A001 Electronic Components, As Follows (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: Number.

Related Controls: See also 3A101, 3A201, and 3A991.

Related Definitions: For the purposes of integrated circuits in 3A001.a.1, 5 x 10^3 Gy(Si) = 5 x 10^5 Rads (Si); 5 x 10^6 Gy (Si)/s = 5 x 10^8 Rads (Si)/s.

Items:

a. General purpose integrated circuits, as follows:

Note 1: The control status of wafers (finished or unfinished), in which the function has been determined, is to be evaluated against the parameters of 3A001.a.

Note 2: Integrated circuits include the following types:

''Monolithic integrated circuits'';

''Hybrid integrated circuits'';

''Multichip integrated circuits'';

''Film type integrated circuits'', including silicon-on-sapphire integrated circuits;

''Optical integrated circuits''.

a.1. Integrated circuits, designed or rated as radiation hardened to withstand any of the following:

a.1.a. A total dose of 5 x 10^3 Gy (Si), or higher; or

a.1.b. A dose rate upset of 5 x 10^6 Gy (Si)/s, or higher;

a.2. ''Microprocessor microcircuits'', ''microcomputer microcircuits'', microcontroller microcircuits, storage integrated circuits manufactured from a compound semiconductor, analog-to-digital converters, digital-to-analog converters, electro-optical or ''optical integrated circuits'' designed for ''signal processing'', field programmable logic devices, neural network integrated circuits, custom integrated circuits for which either the function is unknown or the control status of the equipment in which the integrated circuit will be used in unknown, Fast Fourier Transform (FFT) processors, electrical erasable programmable read-only memories (EEPROMs), flash memories or static random-access memories (SRAMs), having any of the following:

a.2.a. Rated for operation at an ambient temperature above 398 K (125 °C);

a.2.b. Rated for operation at an ambient temperature below 218 K (−55 °C); or

a.2.c. Rated for operation over the entire ambient temperature range from 218 K (−55 °C) to 398 K (125 °C);

Note: 3A001.a.2 does not apply to integrated circuits for civil automobile or railway train applications.

a.3. ''Microprocessor microcircuits'', ''micro-computer microcircuits'' and microcontroller microcircuits, having any of the following characteristics:

Note: 3A001.a.3 includes digital signal processors, digital array processors and digital coprocessors.

a.3.a. A ''composite theoretical performance'' (''CTP'') of 6,500 million theoretical operations per second (MTOPS) or more and an arithmetic logic unit with an access width of 32 bit or more;

a.3.b. Manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz; or

a.3.c. More than one data or instruction bus or serial communication port that provides a direct external interconnection between parallel ''microprocessor microcircuits'' with a transfer rate exceeding 150 Mbyte/s;

a.4. Storage integrated circuits manufactured from a compound semiconductor;

a.5. Analog-to-digital and digital-to-analog converter integrated circuits, as follows:

a.5.a. Analog-to-digital converters having any of the following:

a.5.a.1. A resolution of 8 bit or more, but less than 12 bit, with a total conversion time of less than 5 ns;

a.5.a.2. A resolution of 12 bit with a total conversion time of less than 200 ns; or

a.5.a.3. A resolution of more than 12 bit with a total conversion time of less than 2 μs;

a.5.b. Digital-to-analog converters with a resolution of 12 bit or more, and a ''settling time'' of less than 10 ns;

Technical Note:

1. A resolution of n bit corresponds to a quantization of 2^n levels.

2. Total conversion time is the inverse of the sample rate.

a.6. Electro-optical and ''optical integrated circuits'' designed for ''signal processing'' having all of the following:

a.6.a. One or more than one internal ''laser'' diode;

a.6.b. One or more than one internal light detecting element; and

a.6.c. Optical waveguides;

a.7. Field programmable logic devices having any of the following:

a.7.a. An equivalent usable gate count of more than 30,000 (2 input gates);

a.7.b. A typical ''basic gate propagation delay time'' of less than 0.4 ns; or

a.7.c. A toggle frequency exceeding 133 MHz;

Note: 3A001.a.7 includes: Simple Programmable Logic Devices (SPLDs), Complex Programmable Logic Devices (CPLDs), Field Programmable Gate Arrays (FPGAs), Field Programmable Logic Arrays (FPLAs), and Field Programmable Interconnects (FPICs).

N.B.: Field programmable logic devices are also known as field programmable gate or field programmable logic arrays.

a.8. Reserved.

a.9. Neural network integrated circuits;

a.10. Custom integrated circuits for which the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following:

a.10.a. More than 1,000 terminals;

a.10.b. A typical ''basic gate propagation delay time'' of less than 0.1 ns; or

a.10.c. An operating frequency exceeding 3 GHz;

a.11. Digital integrated circuits, other than those described in 3A001.a.3 to 3A001.a.10 and 3A001.a.12, based upon any compound semiconductor and having any of the following:

a.11.a. An equivalent gate count of more than 3,000 (2 input gates); or

a.11.b. A toggle frequency exceeding 1.2 GHz;

a.12. Fast Fourier Transform (FFT) processors having a rated execution time for an N-point complex FFT of less than $(N \log_2 N)/20{,}480$ ms, where N is the number of points;

Technical Note: When N is equal to 1,024 points, the formula in 3A001.a.12 gives an execution time of 500 μs.

b. Microwave or millimeter wave components, as follows:

b.1. Electronic vacuum tubes and cathodes, as follows:

Note: 3A001.b.1 does not control tubes designed or rated for operation in any frequency band which meets all of the following characteristics:

(a) Does not exceed 31 GHz; *and*

(b) Is ''allocated by the ITU'' for radio-communications services, but not for radio-determination.

b.1.a. Traveling wave tubes, pulsed or continuous wave, as follows:

b.1.a.1. Operating at frequencies exceeding 31 GHz;

b.1.a.2. Having a cathode heater element with a turn on time to rated RF power of less than 3 seconds;

b.1.a.3. Coupled cavity tubes, or derivatives thereof, with a ''fractional bandwidth'' of more than 7% or a peak power exceeding 2.5 kW;

b.1.a.4. Helix tubes, or derivatives thereof, with any of the following characteristics:

b.1.a.4.a. An ''instantaneous bandwidth'' of more than one octave, and average power (expressed in kW) times frequency (expressed in GHz) of more than 0.5;

b.1.a.4.b. An ''instantaneous bandwidth'' of one octave or less, and average power (expressed in kW) times frequency (expressed in GHz) of more than 1; *or*

b.1.a.4.c. Being ''space qualified'';

b.1.b. Crossed-field amplifier tubes with a gain of more than 17 dB;

b.1.c. Impregnated cathodes designed for electronic tubes producing a continuous emission current density at rated operating conditions exceeding 5 A/cm^2;

b.2. Microwave integrated circuits or modules having all of the following:

b.2.a. Containing ''monolithic integrated circuits'' having one or more active circuit elements; *and*

b.2.b. Operating at frequencies above 3 GHz;

Note 1: 3A001.b.2 does not control circuits or modules for equipment designed or rated to operate in any frequency band which meets all of the following characteristics: (a.) Does not exceed 31 GHz; *and* (b.) Is ''allocated by the ITU'' for radio-communications services, but not for radio-determination.

Note 2: 3A001.b.2 does not control broadcast satellite equipment designed or rated to operate in the frequency range of 40.5 to 42.5 GHz. b.3.

Microwave transistors rated for operation at frequencies exceeding 31 GHz;

b.4. Microwave solid state amplifiers, having any of the following:

b.4.a. Operating frequencies exceeding 10.5 GHz and an ''instantaneous bandwidth'' of more than half an octave; *or*

b.4.b. Operating frequencies exceeding 31 GHz;

b.5. Electronically or magnetically tunable band-pass or band-stop filters having more than 5 tunable resonators capable of tuning across a 1.5:1 frequency band (f_{max}/f_{min}) in less than 10 μs having any of the following:

b.5.a. A band-pass bandwidth of more than 0.5% of center frequency; *or*

b.5.b. A band-stop bandwidth of less than 0.5% of center frequency;

b.6. Microwave ''assemblies'' capable of operating at frequencies exceeding 31 GHz;

b.7. Mixers and converters designed to extend the frequency range of equipment described in 3A002.c, 3A002.e or 3A002.f beyond the limits stated therein;

b.8. Microwave power amplifiers containing tubes controlled by 3A001.b and having all of the following:

b.8.a. Operating frequencies above 3 GHz;

b.8.b. An average output power density exceeding 80 W/kg; *and*

b.8.c. A volume of less than 400 cm^3;

Note: 3A001.b.8 does not control equipment designed or rated for operation in any frequency band which is ''allocated by the ITU'' for radio-communications services, but not for radio-determination.

c. Acoustic wave devices, as follows, and specially designed components therefor:

c.1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices (*i.e.,* ''signal processing'' devices employing elastic waves in materials), having any of the following:

c.1.a. A carrier frequency exceeding 2.5 GHz;

c.1.b. A carrier frequency exceeding 1 GHz, but not exceeding 2.5 GHz, and having any of the following:

c.1.b.1. A frequency side-lobe rejection exceeding 55 dB;

c.1.b.2. A product of the maximum delay time and the bandwidth (time in μs and bandwidth in MHz) of more than 100;

c.1.b.3. A bandwidth greater than 250 MHz; or

c.1.b.4. A dispersive delay of more than 10 μs; or

c.1.c. A carrier frequency of 1 GHz or less, having any of the following:

c.1.c.1. A product of the maximum delay time and the bandwidth (time in μs and bandwith in MHz) of more than 100;

c.1.c.2. A dispersive delay of more than 10 μs; or

c.1.c.3. A frequency side-lobe rejection exceeding 55 dB and a bandwidth greater than 50 MHz;

c.2. Bulk (volume) acoustic wave devices (i.e., ''signal processing'' devices employing elastic waves) that permit the direct processing of signals at frequencies exceeding 1 GHz;

c.3. Acoustic-optic ''signal processing'' devices employing interaction between acoustic waves (bulk wave or surface wave) and light waves that permit the direct processing of signals or images, including spectral analysis, correlation or convolution;

d. Electronic devices and circuits containing components, manufactured from ''superconductive'' materials specially designed for operation at temperatures below the ''critical temperature'' of at least one of the ''superconductive'' constituents, with any of the following:

d.1. Current switching for digital circuits using ''superconductive'' gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than 10^{-14} J; or

d.2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000;

e. High energy devices, as follows:

e.1. Batteries and photovoltaic arrays, as follows:

Note: 3A001.e.1 does not control batteries with volumes equal to or less than 27 cm^3 (e.g., standard C-cells or R14 batteries).

e.1.a. Primary cells and batteries having an energy density exceeding 480 Wh/kg and rated for operation in the temperature range from below 243 K (−30 °C) to above 343 K (70°C);

e.1.b. Rechargeable cells and batteries having an energy density exceeding 150 Wh/kg after 75 charge/discharge cycles at a discharge current equal to C/5 hours (C being the nominal capacity in ampere hours) when operating in the temperature range from below 253 K (−20 °C) to above 333 K (60 °C);

Technical Note: Energy density is obtained by multiplying the average power in watts (average voltage in volts times average current in amperes) by the duration of the discharge in hours to 75% of the open circuit voltage divided by the total mass of the cell (or battery) in kg.

e.1.c. ''Space qualified'' and radiation hardened photovoltaic arrays with a specific power exceeding 160 W/m^2 at an operating temperature of 301 K (28 °C) under a tungsten illumination of 1 kW/m^2 at 2,800 K (2,527 °C);

e.2. High energy storage capacitors, as follows:

e.2.a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) having all of the following:

e.2.a.1. A voltage rating equal to or more than 5 kV;

e.2.a.2. An energy density equal to or more than 250 J/kg; and

e.2.a.3. A total energy equal to or more than 25 kJ;

e.2.b. Capacitors with a repetition rate of 10 Hz or more (repetition rated capacitors) having all of the following:

e.2.b.1. A voltage rating equal to or more than 5 kV;

e.2.b.2. An energy density equal to or more than 50 J/kg;

e.2.b.3. A total energy equal to or more than 100 J; and

e.2.b.4. A charge/discharge cycle life equal to or more than 10,000;

e.3. ''Superconductive'' electromagnets and solenoids specially

designed to be fully charged or discharged in less than one second, having all of the following:

Note: 3A001.e.3 does not control ''superconductive'' electromagnets or solenoids specially designed for Magnetic Resonance Imaging (MRI) medical equipment.

e.3.a. Energy delivered during the discharge exceeding 10 kJ in the first second;

e.3.b. Inner diameter of the current carrying windings of more than 250 mm; and

e.3.c. Rated for a magnetic induction of more than 8 T or ''overall current density'' in the winding of more than 300 A/mm^2;

f. Rotary input type shaft absolute position encoders having any of the following:

f.1. A resolution of better than 1 part in 265,000 (18 bit resolution) of full scale; or

f.2. An accuracy better than ± 2.5 seconds of arc.

3A002 General Purpose Electronic Equipment, as follows (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: Number.

Related Controls: See also 3A292 and 3A992.

Related Definitions: Constant percentage bandwidth filters are also known as octave or fractional octave filters.

Items:

a. Recording equipment, as follows, and specially designed test tape therefor:

a.1. Analog instrumentation magnetic tape recorders, including those permitting the recording of digital signals (e.g., using a high density digital recording (HDDR) module), having any of the following:

a.1.a. A bandwidth exceeding 4 MHz per electronic channel or track;

a.1.b. A bandwidth exceeding 2 MHz per electronic channel or track and having more than 42 tracks; or

a.1.c. A time displacement (base) error, measured in accordance with applicable IRIG or EIA documents, of less than ± 0.1 μs;

Note: Analog magnetic tape recorders specially designed for civilian video purposes are not considered to be instrumentation tape recorders.

a.2. Digital video magnetic tape recorders having a maximum digital interface transfer rate exceeding 360 Mbit/s;

Note: 3A002.a.2 does not control digital video magnetic tape recorders specially designed for television recording using a signal format, which may include a compressed signal format, standardized or recommended by the ITU, the IEC, the SMPTE, the EBU or the IEEE for civil television applications.

a.3. Digital instrumentation magnetic tape data recorders employing helical scan techniques or fixed head techniques, having any of the following:

a.3.a. A maximum digital interface transfer rate exceeding 175 Mbit/s; or

a.3.b. Being ''space qualified'';

Note: 3A002.a.3 does not control analog magnetic tape recorders equipped with HDDR conversion electronics and configured to record only digital data.

a.4. Equipment, having a maximum digital interface transfer rate exceeding 175 Mbit/s, designed to convert digital video magnetic tape recorders for use as digital instrumentation data recorders;

a.5. Waveform digitizers and transient recorders having all of the following:

N.B.: See also 3A292.

a.5.a. Digitizing rates equal to or more than 200 million samples per second and a resolution of 10 bits or more; and

a.5.b. A continuous throughput of 2 Gbit/s or more;

Technical Note: For those instruments with a parallel bus architecture, the continuous throughput rate is the highest word rate multiplied by the number of bits in a word. Continuous throughput is the fastest data rate the instrument can output to mass storage without the loss of any information while sustaining the sampling rate and analog-to-digital conversion.

b. ''Frequency synthesizer'', ''electronic assemblies'' having a ''frequency switching time'' from one selected frequency to another of less than 1 ms;

c. ''Signal analyzers'', as follows:

c.1. ''Signal analyzers'' capable of analyzing frequencies exceeding 31 GHz;

c.2. ''Dynamic signal analyzers'' having a ''real-time bandwidth'' exceeding 500 kHz;

Note: 3A002.c.2 does not control those ''dynamic signal analyzers'' using only constant percentage bandwidth filters (also known as octave or fractional octave filters).

d. Frequency synthesized signal generators producing output frequencies, the accuracy and short term and long term stability of which are controlled, derived from or disciplined by the internal master frequency, and having any of the following:

d.1. A maximum synthesized frequency exceeding 31 GHz;

d.2. A ''frequency switching time'' from one selected frequency to another of less than 1 ms; or

d.3. A single sideband (SSB) phase noise better than $-(126 + 20 \log_{10}F - 20 \log_{10}f)$ in dBc/Hz, where F is the off-set from the operating frequency in Hz and f is the operating frequency in MHz;

Note: 3A002.d does not control equipment in which the output frequency is either produced by the addition or subtraction of two or more crystal oscillator frequencies, or by an addition or subtraction followed by a multiplication of the result.

e. Network analyzers with a maximum operating frequency exceeding 40 GHz;

f. Microwave test receivers having all of the following:

f.1. A maximum operating frequency exceeding 40 GHz; and

f.2. Being capable of measuring amplitude and phase simultaneously;

g. Atomic frequency standards having any of the following:

g.1. Long-term stability (aging) less (better) than 1×10^{-11}/month; or

g.2. Being ''space qualified''.

Note: 3A002.g.1 does not control non-''space qualified'' rubidium standards.

3A991 Electronic Devices and Components Not Controlled by 3A001

* * * * *

List of Items Controlled

Unit: Equipment in number.

Related Controls: N/A.

Related Definitions: N/A.

Items:

a. ''Microprocessor microcircuits'', ''microcomputer microcircuits'', and microcontroller microcircuits having any of the following:

a.1. A clock frequency rate exceeding 25 MHz; or

a.2. More than one date or instruction bus or serial communication port that provides a direct external interconnection between parallel ''microprocessor microcircuits'' with a transfer rate of 2.5 Mbyte/s.

b. Storage integrated circuits, as follows:

b.1. Electrical erasable programmable read-only memories (EEPROMs) with a storage capacity;

b.1.a. Exceeding 16 Mbits per package for flash memory types; or

b.1.b. Exceeding either of the following limits for all other EEPROM types:

b.1.b.1. Exceeding 1 Mbit per package; or

b.1.b.2. Exceeding 256 kbit per package and a maximum access time of less than 80 ns;

b.2. Static random access memories (SRAMs) with a storage capacity:

b.2.a. Exceeding 1 Mbit per package; or

b.2.b. Exceeding 256 kbit per package and a maximum access time of less than 25 ns;

c. Analog-to-digital converters having a resolution of 8 bit or more, but less

than 12 bit, with a total conversion time of less than 10 ns;

d. Field programmable logic devices having either of the following:

d.1. An equivalent gate count of more than 5000 (2 input gates); or

d.2. A toggle frequency exceeding 100 MHz;

e. Fast Fourier Transform (FFT) processors having a rated execution time for a 1,024 point complex FFT of less than 1 ms.

f. Custom integrated circuits for which either the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following:

f.1. More than 144 terminals; or

f.2. A typical ''basic propagation delay time'' of less than 0.4 ns.

g. Travelling wave tubes, pulsed or continuous wave, as follows:

g.1. Coupled cavity tubes, or derivatives thereof;

g.2. Helix tubes, or derivatives thereof, with any of the following:

g.2.a. An ''instantaneous bandwidth'' of half an octave or more; and

g.2.b. The product of the rated average output power (expressed in kW) and the maximum operating frequency (expressed in GHz) of more than 0.2;

g.2.c. An ''instantaneous bandwidth'' of less than half an octave; and

g.2.d. The product of the rated average output power (expressed in kW) and the maximum operating frequency (expressed in GHz) of more than 0.4;

h. Flexible waveguides designed for use at frequencies exceeding 40 GHz;

i. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices (i.e., ''signal processing'' devices employing elastic waves in materials), having either of the following:

i.1. A carrier frequency exceeding 1 GHz; or

i.2. A carrier frequency of 1 GHz or less; and

i.2.a. A frequency side-lobe rejection exceeding 55 Db;

i.2.b. A product of the maximum delay time and bandwidth (time in microseconds and bandwidth in MHz) of more than 100; or

i.2.c. A dispersive delay of more than 10 microseconds.

j. Batteries, as follows:

Note: 3A991.j does not control batteries with volumes equal to or less than 26 cm^3 (e.g., standard C-cells or UM–2 batteries).

j.1. Primary cells and batteries having an energy density exceeding 350 Wh/kg and rated for operation in the temperature range from below 243 K (−30 °C) to above 343 K (70 °C);

j.2. Rechargeable cells and batteries having an energy density exceeding 150 Wh/kg after 75 charge/discharge cycles at a discharge current equal to C/5 hours (C being the nominal capacity in ampere hours) when operating in the temperature range from below 253 K (−20 °C) to above 333 K (60 °C);

Technical Note: Energy density is obtained by multiplying the average power in watts (average voltage in volts times average current in amperes) by the duration of the discharge in hours to 75 percent of the open circuit voltage divided by the total mass of the cell (or battery) in kg.

k. ''Superconductive'' electromagnets or solenoids specially designed to be fully charged or discharged in less than one minute, having all of the following:

Note: 3A991.k does not control ''superconductive'' electromagnets or solenoids designed for Magnetic Resonance Imaging (MRI) medical equipment.

k.1. Maximum energy delivered during the discharge divided by the duration of the discharge of more than 500 kJ per minute;

k.2. Inner diameter of the current carrying windings of more than 250 mm; and

k.3. Rated for a magnetic induction of more than 8T or ''overall current density'' in the winding of more than 300 A/mm^2.

l. Circuits or systems for electromagnetic energy storage, containing components manufactured from ''superconductive'' materials specially designed for operation at temperatures below the ''critical temperature'' of at least one of their ''superconductive'' constituents, having all of the following:

l.1. Resonant operating frequencies exceeding 1 MHz;

l.2. A stored energy density of 1 MJ/M^3 or more; and

l.3. A discharge time of less than 1 ms;

m. Hydrogen/hydrogen-isotope thyratrons of ceramic-metal construction and rate for a peak current of 500 A or more;

n. Digital integrated circuits based on any compound semiconductor having an equivalent gate count of more than 300 (2 input gates).

3B002 ''Stored Program Controlled'' Test Equipment, Specially Designed for Testing Finished or Unfinished Semiconductor Devices, As Follows (See List of Items Controlled), and Specially Designed Components and Accessories Therefor

* * * * *

List of Items Controlled

Unit: Number.
Related Controls: See also 3B992.
Related Definitions: N/A.
Items:

a. For testing S-parameters of transistor devices at frequencies exceeding 31 GHz;

b. For testing integrated circuits capable of performing functional (truth table) testing at a pattern rate of more than 333 MHz;

Note: 3B002.b does not control test equipment specially designed for testing:

1. ''Electronic assemblies'' or a class of ''electronic assemblies'' for home or entertainment applications;

2. Uncontrolled electronic components, ''electronic assemblies'' or integrated circuits;

3. Memories.

Technical Note: For purposes of 3B002.b, pattern rate is defined as the maximum frequency of digital operation of a tester. It is therefore equivalent to the highest data rate that a tester can provide in non-multiplexed mode. It is also referred to as test speed, maximum digital frequency or maximum digital speed.

c. For testing microwave integrated circuits controlled by 3A001.b.2.

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3B991 Equipment Not Controlled by 3B001 for the Manufacture of Electronic Components and Materials, and Specially Designed Components and Accessories Therefor

* * * * *

List of Items Controlled

Unit: Equipment in number.
Related Controls: N/A.
Related Definitions: N/A.
Items:

a. Equipment specially designed for the manufacture of electron tubes, optical elements and specially designed components therefor controlled by 3A001 or 3A991;

b. Equipment specially designed for the manufacture of semiconductor devices, integrated circuits and ''electronic assemblies'', as follows, and systems incorporating or having the characteristics of such equipment:

Note: 3B991.b also controls equipment used or modified for use in the manufacture of other devices, such as imaging devices, electro-optical devices, acoustic-wave devices.

b.1. Equipment for the processing of materials for the manufacture of devices and components as specified in the heading of 3B991.b, as follows:

Note: 3B991 does not control quartz furnace tubes, furnace liners, paddles, boats (except specially designed caged boats), bubblers, cassettes or crucibles specially designed for the processing equipment controlled by 3B991.b.1.

b.1.a. Equipment for producing polycrystalline silicon and materials controlled by 3C001;

b.1.b. Equipment specially designed for purifying or processing III/V and II/VI semiconductor materials controlled by 3C001, 3C002, 3C003, or 3C004, except crystal pullers, for which see 3B991.b.1.c below;

b.1.c. Crystal pullers and furnaces, as follows:

Note: 3B991.b.1.c does not control diffusion and oxidation furnaces.

b.1.c.1. Annealing or recrystallizing equipment other than constant temperature furnaces employing high rates of energy transfer capable of processing wafers at a rate exceeding 0.005 m^2 per minute;

b.1.c.2. ''Stored program controlled'' crystal pullers having any of the following characteristics:

b.1.c.2.a. Rechargeable without replacing the crucible container;

b.1.c.2.b. Capable of operation at pressures above 2.5×10^5 Pa; or

b.1.c.2.c. Capable of pulling crystals of a diameter exceeding 100 mm;

b.1.d. ''Stored program controlled'' equipment for epitaxial growth having any of the following characteristics:

b.1.d.1. Capable of producing a layer thickness uniformity across the wafer of equal to or better than ±3.5%; *or*

b.1.d.2. Rotation of individual wafers during processing;

b.1.e. Molecular beam epitaxial growth equipment;

b.1.f. Magnetically enhanced ''sputtering'' equipment with specially designed integral load locks capable of transferring wafers in an isolated vacuum environment;

b.1.g. Equipment specially designed for ion implantation, ion-enhanced or photo-enhanced diffusion, having any of the following characteristics:

b.1.g.1. Patterning capability;

b.1.g.2. Beam energy (accelerating voltage) exceeding 200 keV;

b.1.g.3. Optimized to operate at a beam energy (accelerating voltage) of less than 10 keV; or

b.1.g.4. Capable of high energy oxygen implant into a heated ''substrate'';

b.1.h. ''Stored program controlled'' equipment for the selective removal (etching) by means of anisotropic dry methods (e.g., plasma), as follows:

b.1.h.1. Batch types having either of the following:

b.1.h.1.a. End-point detection, other than optical emission spectroscopy types; or

b.1.h.1.b. Reactor operational (etching) pressure of 26.66 Pa or less;

b.1.h.2. Single wafer types having any of the following:

b.1.h.2.a. End-point detection, other than optical emission spectroscopy types;

b.1.h.2.b. Reactor operational (etching) pressure of 26.66 Pa or less; or

b.1.h.2.c. Cassette-to-cassette and load locks wafer handling;

Notes: 1. ''Batch types'' refers to machines not specially designed for production processing of single wafers. Such machines can process two or more wafers simultaneously with common process parameters, e.g., RF power, temperature, etch gas species, flow rates.

2. ''Single wafer types'' refers to machines specially designed for production processing of single wafers. These machines may use automatic wafer handling techniques to load a single wafer into the equipment for processing. The definition includes equipment that can load and process several wafers but where the etching parameters, e.g., RF power or end point, can be independently determined for each individual wafer.

b.1.i. ''Chemical vapor deposition'' (CVD) equipment, e.g., plasma-enhanced CVD (PECVD) or photo-enhanced CVD, for semiconductor device manufacturing, having either of the following capabilities, for deposition of oxides, nitrides, metals or polysilicon:

b.1.i.1. ''Chemical vapor deposition'' equipment operating below 10^5 Pa; or

b.1.i.2. PECVD equipment operating either below 60 Pa (450 millitorr) or having automatic cassette-to-cassette and load lock wafer handling;

Note: 3B991.b.1.i does not control low pressure ''chemical vapor deposition'' (LPCVD) systems or reactive ''sputtering'' equipment.

b.1.j. Electron beam systems specially designed or modified for mask making or semiconductor device processing having any of the following characteristics:

b.1.j.1. Electrostatic beam deflection;

b.1.j.2. Shaped, non-Gaussian beam profile;

b.1.j.3. Digital-to-analog conversion rate exceeding 3 MHz;

b.1.j.4. Digital-to-analog conversion accuracy exceeding 12 bit; or

b.1.j.5. Target-to-beam position feedback control precision of 1 micrometer or finer;

Note: 3B991.b.1.j does not control electron beam deposition systems or general purpose scanning electron microscopes.

b.1.k. Surface finishing equipment for the processing of semiconductor wafers as follows:

b.1.k.1. Specially designed equipment for backside processing of wafers thinner than 100 micrometer and the subsequent separation thereof; or

b.1.k.2. Specially designed equipment for achieving a surface roughness of the active surface of a processed wafer with a two-sigma value of 2 micrometer or less, total indicator reading (TIR);

Note: 3B991.b.1.k does not control single-side lapping and polishing equipment for wafer surface finishing.

b.1.l. Interconnection equipment which includes common single or multiple vacuum chambers specially designed to permit the integration of any equipment controlled by 3B991 into a complete system;

b.1.m. ''Stored program controlled'' equipment using ''lasers'' for the repair or trimming of ''monolithic integrated circuits'' with either of the following characteristics:

b.1.m.1. Positioning accuracy less than ± 1 micrometer; or

b.1.m.2. Spot size (kerf width) less than 3 micrometer.

b.2. Masks, mask ''substrates'', mask-making equipment and image transfer equipment for the manufacture of devices and components as specified in the heading of 3B991, as follows:

Note: The term ''masks'' refers to those used in electron beam lithography, X-ray lithography, and ultraviolet lithography, as well as the usual ultraviolet and visible photo-lithography.

b.2.a. Finished masks, reticles and designs therefor, except:

b.2.a.1. Finished masks or reticles for the production of unembargoed integrated circuits; or

b.2.a.2. Masks or reticles, having both of the following characteristics:

b.2.a.2.a. Their design is based on geometries of 2.5 micrometer or more; and

b.2.a.2.b. The design does not include special features to alter the intended use by means of production equipment or ''software'';

b.2.b. Mask ''substrates'' as follows:

b.2.b.1. Hard surface (e.g., chromium, silicon, molybdenum) coated ''substrates'' (e.g., glass, quartz, sapphire) for the preparation of masks having dimensions exceeding 125 mm x 125 mm; or

b.2.b.2. ''Substrates'' specially designed for X-ray masks;

b.2.c. Equipment, other than general purpose computers, specially designed for computer aided design (CAD) of semiconductor devices or integrated circuits;

b.2.d. Equipment or machines, as follows, for mask or reticle fabrication:

b.2.d.1. Photo-optical step and repeat cameras capable of producing arrays larger than 100 mm x 100 mm, or capable of producing a single exposure larger than 6 mm x 6 mm in the image (i.e., focal) plane, or capable of producing line widths of less than 2.5 micrometer in the photoresist on the ''substrate'';

b.2.d.2. Mask or reticle fabrication equipment using ion or ''laser'' beam

lithography capable of producing line widths of less than 2.5 micrometer; or

b.2.d.3. Equipment or holders for altering masks or reticles or adding pellicles to remove defects;

Note: 3B991.b.2.d.1 and b.2.d.2 do not control mask fabrication equipment using photo-optical methods which was either commercially available before the 1st January, 1980, or has a performance no better than such equipment.

b.2.e. ''Stored program controlled'' equipment for the inspection of masks, reticles or pellicles with:

b.2.e.1. A resolution of 0.25 micrometer or finer; and

b.2.e.2. A precision of 0.75 micrometer or finer over a distance in one or two coordinates of 63.5 mm or more;

Note: 3B991.b.2.e does not control general purpose scanning electron microscopes except when specially designed and instrumented for automatic pattern inspection.

b.2.f. Align and expose equipment for wafer production using photo-optical or X-ray methods, including both projection image transfer equipment and step and repeat (direct step on wafer) or step and scan (scanner) equipment, capable of performing any of the following functions:

Note: 3B991.b.2.f does not control photo-optical contact and proximity mask align and expose equipment or contact image transfer equipment.

b.2.f.1. Production of a pattern size of less than 2.5 micrometer;

b.2.f.2. Alignment with a precision finer than ± 0.25 micrometer (3 sigma);

b.2.f.3. Machine-to-machine overlay no better than ±+ 0.3 micrometer; or

b.2.f.4. A light source wavelength shorter than 400 nm;

b.2.g. Electron beam, ion beam or X-ray equipment for projection image transfer capable of producing patterns less than 2.5 micrometer;

Note: For focussed, deflected-beam systems (direct write systems), see 3B991.b.1.j or b.10.

b.2.h. Equipment using ''lasers'' for direct write on wafers capable of producing patterns less than 2.5 micrometer.

b.3. Equipment for the assembly of integrated circuits, as follows:

b.3.a. ''Stored program controlled'' die bonders having all of the following characteristics:

b.3.a.1. Specially designed for ''hybrid integrated circuits'';

b.3.a.2. X–Y stage positioning travel exceeding 37.5 x 37.5 mm; and

b.3.a.3. Placement accuracy in the X–Y plane of finer than ± 10 micrometer;

b.3.b. ''Stored program controlled'' equipment for producing multiple bonds in a single operation (e.g., beam lead bonders, chip carrier bonders, tape bonders);

b.3.c. Semi-automatic or automatic hot cap sealers, in which the cap is heated locally to a higher temperature than the body of the package, specially designed for ceramic microcircuit packages controlled by 3A001 and that have a throughput equal to or more than one package per minute.

Note: 3B991.b.3 does not control general purpose resistance type spot welders.

b.4. Filters for clean rooms capable of providing an air environment of 10 or less particles of 0.3 micrometer or smaller per 0.02832 m^3 and filter materials therefor.

3B992 Equipment Not Controlled by 3B002 for the Inspection or Testing of Electronic Components and Materials, and Specially Designed Components and Accessories Therefor

* * * * *

List of Items Controlled

Unit: Equipment in number.

Related Controls: N/A.

Related Definitions: N/A.

Items:

a. Equipment specially designed for the inspection or testing of electron tubes, optical elements and specially designed components therefor controlled by 3A001 or 3A991;

b. Equipment specially designed for the inspection or testing of semiconductor devices, integrated circuits and ''electronic assemblies'', as follows, and systems incorporating or having the characteristics of such equipment:

Note: 3B992.b also controls equipment used or modified for use in the inspection or testing of other devices, such as imaging devices, electro-optical devices, acoustic-wave devices.

b.1. ''Stored program controlled'' inspection equipment for the automatic detection of defects, errors or contaminants of 0.6 micrometer or less in or on processed wafers, ''substrates'', other than printed circuit boards or chips, using optical image acquisition techniques for pattern comparison;

Note: 3B992.b.1 does not control general purpose scanning electron microscopes, except when specially designed and instrumented for automatic pattern inspection.

b.2. Specially designed ''stored program controlled'' measuring and analysis equipment, as follows:

b.2.a. Specially designed for the measurement of oxygen or carbon content in semiconductor materials;

b.2.b. Equipment for line width measurement with a resolution of 1 micrometer or finer;

b.2.c. Specially designed flatness measurement instruments capable of measuring deviations from flatness of 10 micrometer or less with a resolution of 1 micrometer or finer.

b.3. ''Stored program controlled'' wafer probing equipment having any of the following characteristics:

b.3.a. Positioning accuracy finer than 3.5 micrometer;

b.3.b. Capable of testing devices having more than 68 terminals; or

b.3.c. Capable of testing at a frequency exceeding 1 GHz;

b.4. Test equipment as follows:

b.4.a. ''Stored program controlled'' equipment specially designed for testing discrete semiconductor devices and unencapsulated dice, capable of testing at frequencies exceeding 18 GHz;

Technical Note: Discrete semiconductor devices include photocells and solar cells.

b.4.b. ''Stored program controlled'' equipment specially designed for testing integrated circuits and ''electronic assemblies'' thereof, capable of functional testing:

b.4.b.1. At a pattern rate exceeding 20 MHz; or

b.4.b.2. At a pattern rate exceeding 10 MHz but not exceeding 20 MHz and capable of testing packages of more than 68 terminals;

Note: 3B992.b.4.b does not control equipment specially designed for testing integrated circuits not controlled by 3A001 or 3A991.

Notes: 1. 3B992.b.4.b does not control test equipment specially designed for testing ''assemblies'' or a class of ''electronic assemblies'' for home and entertainment applications.

2. 3B992.b.4.b does not control test equipment specially designed for testing electronic components, ''assemblies'' and integrated circuits not controlled by 3A001 or 3A991 provided such test equipment does not incorporate computing facilities with ''user accessible programmability''.

b.4.c. Equipment specially designed for determining the performance of focal-plane arrays at wavelengths of more than 1,200 nm, using ''stored program controlled'' measurements or computer aided evaluation and having any of the following characteristics:

b.4.c.1. Using scanning light spot diameters of less than 0.12 mm;

b.4.c.2. Designed for measuring photosensitive performance parameters and for evaluating frequency response, modulation transfer function, uniformity of responsivity or noise; or

b.4.c.3. Designed for evaluating arrays capable of creating images with more than 32 x 32 line elements;

b.5. Electron beam test systems designed for operation at 3 keV or below, or ''laser'' beam systems, for non-

contactive probing of powered-up semiconductor devices having any of the following:

b.5.a. Stroboscopic capability with either beam blanking or detector strobing;

b.5.b. An electron spectrometer for voltage measurements with a resolution of less than 0.5 V; or

b.5.c. Electrical tests fixtures for performance analysis of integrated circuits;

Note: 3B992.b.5 does not control scanning electron microscopes, except when specially designed and instrumented for non-contactive probing of a powered-up semiconductor device.

b.6. ''Stored program controlled'' multifunctional focused ion beam systems specially designed for manufacturing, repairing, physical layout analysis and testing of masks or semiconductor devices and having either of the following characteristics:

b.6.a. Target-to-beam position feedback control precision of 1 micrometer or finer; or

b.6.b. Digital-to-analog conversion accuracy exceeding 12 bit;

b.7. Particle measuring systems employing ''lasers'' designed for measuring particle size and concentration in air having both of the following characteristics:

b.7.a. Capable of measuring particle sizes of 0.2 micrometer or less at a flow rate of 0.02832 m^3 per minute or more; and

b.7.b. Capable of characterizing Class 10 clean air or better.

3C001 Hetero-Epitaxial Materials Consisting of a ''Substrate'' Having Stacked Epitaxially Grown Multiple Layers of Any of the Following (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: This entry does not control equipment or material whose functionality has been unalterably disabled are not controlled.

Related Definitions: III/V compounds are polycrystalline or binary or complex monocrystalline products consisting of elements of groups IIIA and VA of Mendeleyev's periodic classification table (e.g., gallium arsenide, gallium-aluminium arsenide, indium phosphide).

Items:

a. Silicon;

b. Germanium;

c. Silicon Carbide; *or*

d. III/V compounds of gallium or indium.

3D003 Computer-Aided-Design (CAD) ''Software'', Having all of the Following (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: 3D003 does not control ''software'' specially designed for schematic entry, logic simulation, placing and routing, layout verification or pattern generation tape.

Related Definitions: (1.) Libraries, design attributes or associated data for the design of semiconductor devices or integrated circuits are considered as ''technology''. (2.) A lithographic processing simulator is a ''software'' package used in the design phase to define the sequence of lithographic, etching and deposition steps for translating masking patterns into specific topographical patterns in conductors, dielectrics or semiconductor material.

Items:

a. Designed for the ''development'' of semiconductor devices or integrated circuits; and

b. Designed to perform or use any of the following:

b.1. Design rules or circuit verification rules;

b.2. Simulation of the physically laid out circuits; or

b.3. Lithographic processing simulators for design.

3E001 ''Technology'' According to the General Technology Note for the ''Development'' or ''Production'' of Equipment or Materials Controlled by 3A (Except 3A292, 3A980, 3A981, 3A991 or 3A992), 3B (except 3B991 and 3B992) or 3C

* * * * *

List of Items Controlled

Unit: N/A.

Related Controls: See also 3E101 and 3E201.

Related Definition: N/A.

Items:

The list of items controlled is contained in the ECCN heading.

Note: 3E001 does not control ''technology'' for the ''development'' or ''production'' of:

(a) Microwave transistors operating at frequencies below 31 GHz;

(b) Integrated circuits controlled by 3A001.a.3 to a.12, having all of the following:

(b.1) Using ''technology'' of 0.7 micrometer or more; and

(b.2) Not incorporating multi-layer structures.

Technical Note: The term multi-layer structures in Note b.2 does not include devices incorporating a maximum of two metal layers and two polysilicon layers.

3E002 ''Technology'' According to the General Technology Note Other Than That Controlled in 3E001 for the ''Development'' or ''Production'' of ''Microprocessor Microcircuits'', ''Micro-Computer Microcircuits'' and Microcontroller Microcircuits Having a ''Composite Theoretical Performance'' (''CTP'') of 530 Million Theoretical Operations Per Second (MTOPS) or More and an Arithmetic Logic Unit With an Access Width of 32 Bits or More

License Requirements

Reason for Control: NS, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

License Exceptions

CIV: N/A.

TSR: Yes.

List of Items Controlled

Unit: N/A.

Related Controls: N/A.

Related Definitions: N/A.

Items:

The list of items controlled is contained in the ECCN heading.

Note: 3E002 does not control ''technology'' for the ''development'' or ''production'' of:

(a) Microwave transistors operating at frequencies below 31 GHz;

(b) Integrated circuits controlled by 3A001.a.3 to a.12, having all of the following:

(b.1) Using ''technology'' of 0.7 micrometer or more; and

(b.2) Not incorporating multi-layer structures.

Technical Note: The term multi-layer structures in Note b.2 does not include devices incorporating a maximum of two metal layers and two polysilicon layers.

3E003 Other ''Technology'' for the ''Development'' or ''Production'' of Items Described in the List of Items Controlled

License Requirements

Reason for Control: NS, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

License Exceptions

CIV: N/A.

TSR: Yes, except .f.

List of Items Controlled

Unit: N/A.

Related Controls: See 3E001 for silicon-on-insulation (SOI) technology for the ''development'' or ''production''

related to radiation hardening of integrated circuits.

Related Definitions: N/A.

Items:

a. Vacuum microelectronic devices;

b. Hetero-structure semiconductor devices such as high electron mobility transistors (HEMT), hetero-bipolar transistors (HBT), quantum well and super lattice devices;

c. ''Superconductive'' electronic devices;

d. Substrates of films of diamond for electronic components;

e. Substrates of silicon-on-insulator (SOI) for integrated circuits in which the insulator is silicon dioxide;

f. Substrates of silicon carbide for electronic components.

10. In Supplement No. 1 to part 774 (the Commerce Control List), Category 4—Computers, Export Control Classification Number (ECCN) 4D003 is amended by revising the List of Items Controlled Section, to read as follows:

4D003 Specific ''Software'', As Follows (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: N/A.

Related Definitions: N/A.

Items:

a. Operating system ''software'', ''software'' development tools and compilers specially designed for ''multi-data-stream processing'' equipment, in ''source code'';

b. [Reserved]

c. ''Software'' having characteristics or performing functions exceeding the limits in Category 5, Part 2 (''Information Security'');

d. Operating systems specially designed for ''real time processing'' equipment that guarantees a ''global interrupt latency time'' of less than 20 μs.

11. In Supplement No. 1 to part 774 (the Commerce Control List), Category 5—Telecommunications and ''Information Security'', Part I—Telecommunications is amended by revising the List of Items Controlled section for Export Control Classification Numbers (ECCNs) 5D001 and 5E001, to read as follows:

5D001 ''Software'', As Described in the List of Items Controlled

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: See also 5D991.

Related Definitions: N/A.

Items:

a. ''Software'' specially designed or modified for the ''development'', ''production'' or ''use'' of equipment, functions or features controlled by 5A001 or 5B001.

b. ''Software'' specially designed or modified to support ''technology'' controlled by 5E001.

c. Specific ''software'' as follows:

c.1. ''Software'' specially designed or modified to provide characteristics, functions or features of equipment controlled by 5A001 or 5B001;

c.2. [Reserved];

c.3. ''Software'', other than in machine-executable form, specially designed for ''dynamic adaptive routing''.

d. ''Software'' specially designed or modified for the ''development'' of any of the following telecommunication transmission or ''stored program controlled'' switching equipment:

d.1. Equipment employing digital techniques, including ''Asynchronous Transfer Mode'' (''ATM''), designed to operate at a ''total digital transfer rate'' exceeding 1.5 Gbit/s;

d.2. Equipment employing a ''laser'' and having any of the following:

d.2.a. A transmission wavelength exceeding 1750 nm; or

d.2.b. Employing analog techniques and having a bandwidth exceeding 2.5 GHz;

Note: 5D001.d.2.b. does not control ''software'' specially designed or modified for the ''development'' of commercial TV systems.

d.3. Equipment employing ''optical switching''; or

d.4. Radio equipment employing quadrature-amplitude-modulation (QAM) techniques above level 128;

5E001 ''Technology'', (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: See also 5E101 and 5E991.

Related Definitions: N/A.

Items:

a. ''Technology'' according to the General Technology Note for the ''development'', ''production'' or ''use'' (excluding operation) of equipment, functions or features or ''software'' controlled by 5A001, 5B001 or 5D001.

b. Specific ''technologies'', as follows:

b.1. ''Required'' ''technology'' for the ''development'' or ''production'' of telecommunications equipment specially designed to be used on board satellites;

b.2. ''Technology'' for the ''development'' or ''use'' of ''laser'' communication techniques with the capability of automatically acquiring and tracking signals and maintaining communications through exoatmosphere or sub-surface (water) media;

b.3. ''Technology'' for the ''development'' of digital cellular radio systems;

b.4. ''Technology'' for the ''development'' of ''spread spectrum'' techniques, including ''frequency hopping'' techniques.

c. ''Technology'' according to the General Technology Note for the ''development'' or ''production'' of any of the following telecommunication transmission or ''stored program controlled'' switching equipment, functions or features:

c.1. Equipment employing digital techniques, including ''Asynchronous Transfer Mode'' (''ATM''), designed to operate at a ''total digital transfer rate'' exceeding 1.5 Gbit/s;

c.2. Equipment employing a ''laser'' and having any of the following:

c.2.a. A transmission wavelength exceeding 1750 nm;

c.2.b. Performing ''optical amplification'' using praseodymium-doped fluoride fiber amplifiers (PDFFA);

c.2.c. Employing coherent optical transmission or coherent optical detection techniques (also called optical heterodyne or homodyne techniques);

c.2.d. Employing wavelength division multiplexing techniques exceeding 8 optical carriers in a single optical window; or

c.2.e. Employing analog techniques and having a bandwidth exceeding 2.5 GHz;

Note: 5E001. c.2.e. does not control ''technology'' for the ''development'' or ''production'' of commercial TV systems.

c.3. Equipment employing ''optical switching'';

c.4. Radio equipment having any of the following:

c.4.a. Quadrature-amplitude-modulation (QAM) techniques above level 128; or

c.4.b. Operating at input or output frequencies exceeding 31 GHz; or

Note: 5E001.c.4.b. does not control ''technology'' for the ''development'' or ''production'' of equipment designed or modified for operation in any frequency band which is ''allocated by the ITU'' for radio-communications services, but not for radio-determination.

c.5. Equipment employing ''common channel signalling'' operating in either non-associated or quasi-associated mode of operation.

12. In Supplement No. 1 to part 774 (the Commerce Control List), Category

6—Sensors, the following Export Control Classification Numbers (ECCNs) are amended:

a. By revising the License Exception and List of Items Controlled sections for ECCNs 6A003 and 6A005;

b. By revising the List of Items Controlled section for ECCNs 6A995 and 6C002; and

c. By revising the Heading and the List of Items Controlled section for ECCN 6C992, to read as follows:

6A003 Cameras

* * * * *

License Exceptions

LVS: $1500, except N/A for 6A003.a.2 through a.6, b.1, b.3 and b.4.

GBS: Yes for 6A003.a.1.

CIV: Yes for 6A003.a.1.

List of Items Controlled

Unit: Number.

Related Controls: See also 6A203. See 8A002.d and .e for cameras specially designed or modified for underwater use.

Related Definitions: N/A.

Items:

a. Instrumentation cameras and specially designed components therefor, as follows:

Note: Instrumentation cameras, controlled by 6A003.a.3 to 6A003.a.5, with modular structures should be evaluated by their maximum capability, using plug-ins available according to the camera manufacturer's specifications.

a.1. High-speed cinema recording cameras using any film format from 8 mm to 16 mm inclusive, in which the film is continuously advanced throughout the recording period, and that are capable of recording at framing rates exceeding 13,150 frames/s;

Note: 6A003.a.1 does not control cinema recording cameras designed for civil purposes.

a.2. Mechanical high speed cameras, in which the film does not move, capable of recording at rates exceeding 1,000,000 frames/s for the full framing height of 35 mm film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights;

a.3. Mechanical or electronic streak cameras having writing speeds exceeding 10 mm/μs;

a.4. Electronic framing cameras having a speed exceeding 1,000,000 frames/s;

a.5. Electronic cameras, having all of the following:

a.5.a. An electronic shutter speed (gating capability) of less than 1 μs per full frame; and

a.5.b. A read out time allowing a framing rate of more than 125 full frames per second.

a.6. Plug-ins, having all of the following characteristics:

a.6.a. Specially designed for instrumentation cameras which have modular structures and that are controlled by 6A003.a; *and*

a.6.b. Enabling these cameras to meet the characteristics specified in 6A003.a.3, 6A003.a.4 or 6A003.a.5, according to the manufacturer's specifications.

b. Imaging cameras, as follows:

Note: 6A003.b does not control television or video cameras specially designed for television broadcasting.

b.1. Video cameras incorporating solid state sensors, having any of the following:

b.1.a. More than 4 x 106 ''active pixels'' per solid state array for monochrome (black and white) cameras;

b.1.b. More than 4 x 106 ''active pixels'' per solid state array for color cameras incorporating three solid state arrays; or

b.1.c. More than 12 x 106 ''active pixels'' for solid state array color cameras incorporating one solid state array;

Technical Note: For the purposes of this entry, digital video cameras should be evaluated by the maximum number of ''active pixels'' used for capturing moving images.

b.2. Scanning cameras and scanning camera systems, having all of the following:

b.2.a. Linear detector arrays with more than 8,192 elements per array; and

b.2.b. Mechanical scanning in one direction;

b.3. Imaging cameras incorporating image intensifier tubes having the characteristics listed in 6A002.a.2.a;

b.4. Imaging cameras incorporating ''focal plane arrays'' having the characteristics listed in 6A002.a.3.

Note: 6A003.b.4 does not control imaging cameras incorporating linear ''focal plane arrays'' with twelve elements or fewer, not employing time-delay-and-integration within the element, designed for any of the following:

a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;

b. Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;

c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;

d. Equipment specially designed for laboratory use; or

e. Medical equipment.

6A005 ''Lasers'', Components and Optical Equipment, As Follows (See List of Items Controlled)

* * * * *

License Exceptions

LVS: N/A for NP items. $3000 for all other items.

GBS: Yes, for 6A005.d (except d.2.c), CO_2 or CO/CO_2 ''lasers'' having an output wavelength in the range from 9,000 to 11,000 nm and having a pulsed output not exceeding 2 J per pulse and a maximum rated average single or multimode output power not exceeding 5 kW; CO ''lasers'' having a CW maximum rated single or multimode output power not exceeding 10 kW; CO_2 ''lasers'' controlled by 6A005.a.4 that operate in CW multiple-transverse mode; and having a CW output power not exceeding 15 kW; Neodymium-doped (other than glass), pulse-excited, ''Q-switched lasers'' controlled by 6A005.c.2.b.2.b having a pulse duration equal to or more than 1 ns; and a multiple-transverse mode output with a ''peak power'' not exceeding 400 MW; Neodymium-doped (other than glass) ''lasers'' controlled by 6A005.c.2.b.3.b or 6A005.c.2.b.4.b that have an output wavelength exceeding 1,000 nm, but not exceeding 1,100 nm; and an average or CW output power not exceeding 2 kW; and operate in a pulse-excited, non-''Q-switched'' multiple-transverse mode; or in a continuously excited, multiple-transverse mode; and 6A005.f.1.

CIV: Yes, for 6A005.d (except d.2.c), CO_2 or CO/CO_2 ''lasers'' having an output wavelength in the range from 9,000 to 11,000 nm and having a pulsed output not exceeding 2 J per pulse and a maximum rated average single or multimode output power not exceeding 5 kW; CO ''lasers'' having a CW maximum rated single or multimode output power not exceeding 10 kW; CO_2 ''lasers'' controlled by 6A005.a.4 that operate in CW multiple-transverse mode; and having a CW output power not exceeding 15 kW; Neodymium-doped (other than glass), pulse-excited, ''Q-switched lasers'' controlled by 6A005.c.2.b.2.b having a pulse duration equal to or more than 1 ns; and a multiple-transverse mode output with a ''peak power'' not exceeding 400 MW; Neodymium-doped (other than glass) ''lasers'' controlled by 6A005.c.2.b.3.b or 6A005.c.2.b.4.b that have an output wavelength exceeding 1,000 nm, but not exceeding 1,100 nm; and an average or CW output power not exceeding 2 kW; and operate in a pulse-excited, non-''Q-switched'' multiple-transverse mode; or in a continuously excited, multiple-transverse mode; and 6A005.f.1.

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value.

Related Controls: (1.) See also 6A205, 6A995, 0B001.g.5 and 0B001.b.6. (2.) Shared aperture optical elements, capable of operating in ''super-high power laser'' applications are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: (1.) Pulsed ''lasers'' include those that run in a continuous wave (CW) mode with pulses superimposed. (2.) Pulse-excited ''lasers'' include those that run in a continuously excited mode with pulse excitation superimposed. (3.) The control status of Raman ''lasers'' is determined by the parameters of the pumping source ''lasers''. The pumping source ''lasers'' can be any of the ''lasers'' described as follows:

Items:

a. Gas ''lasers'', as follows:

a.1. Excimer ''lasers'', having any of the following:

a.1.a. An output wavelength not exceeding 150 nm and having any of the following:

a.1.a.1. An output energy exceeding 50 mJ per pulse; or

a.1.a.2. An average output power exceeding 1 W;

a.1.b. An output wavelength exceeding 150 nm but not exceeding 190 nm and having any of the following:

a.1.b.1. An output energy exceeding 1.5 J per pulse; or

a.1.b.2. An average output power exceeding 120 W;

a.1.c. An output wavelength exceeding 190 nm but not exceeding 360 nm and having any of the following:

a.1.c.1. An output energy exceeding 10 J per pulse; or

a.1.c.2. An average output power exceeding 500 W; or

a.1.d. An output wavelength exceeding 360 nm and having any of the following:

a.1.d.1. An output energy exceeding 1.5 J per pulse; or

a.1.d.2. An average output power exceeding 30 W;

N.B. For excimer ''lasers'' specially designed for lithography equipment, see 3B001.

a.2. Metal vapor ''lasers'', as follows:

a.2.a. Copper (Cu) ''lasers'' having an average output power exceeding 20 W;

a.2.b. Gold (Au) ''lasers'' having an average output power exceeding 5 W;

a.2.c. Sodium (Na) ''lasers'' having an output power exceeding 5 W;

a.2.d. Barium (Ba) ''lasers'' having an average output power exceeding 2 W;

a.3. Carbon monoxide (CO) ''lasers'' having any of the following:

a.3.a. An output energy exceeding 2 J per pulse and a pulsed ''peak power'' exceeding 5 kW; or

a.3.b. An average or CW output power exceeding 5 kW;

a.4. Carbon dioxide (CO_2) ''lasers'' having any of the following:

a.4.a. A CW output power exceeding 15 kW;

a.4.b. A pulsed output having a ''pulse duration'' exceeding 10 μs and having any of the following:

a.4.b.1. An average output power exceeding 10 kW; or

a.4.b.2. A pulsed ''peak power'' exceeding 100 kW; or

a.4.c. A pulsed output having a ''pulse duration'' equal to or less than 10 μs; and having any of the following:

a.4.c.1. A pulse energy exceeding 5 J per pulse; or

a.4.c.2. An average output power exceeding 2.5 kW;

a.5. ''Chemical lasers'', as follows:

a.5.a. Hydrogen Fluoride (HF) ''lasers'';

a.5.b. Deuterium Fluoride (DF) ''lasers'';

a.5.c. ''Transfer lasers'', as follows:

a.5.c.1. Oxygen Iodine (O_2-I) ''lasers'';

a.5.c.2. Deuterium Fluoride-Carbon dioxide (DF-CO_2) ''lasers'';

a.6. Krypton ion or argon ion ''lasers'' having any of the following:

a.6.a. An output energy exceeding 1.5 J per pulse and a pulsed ''peak power'' exceeding 50 W; or

a.6.b. An average or CW output power exceeding 50 W;

a.7. Other gas ''lasers'', having any of the following:

Note: 6A005.a.7 does not control nitrogen ''lasers''.

a.7.a. An output wavelength not exceeding 150 nm and having any of the following:

a.7.a.1. An output energy exceeding 50 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or

a.7.a.2. An average or CW output power exceeding 1 W;

a.7.b. An output wavelength exceeding 150 nm but not exceeding 800 nm and having any of the following:

a.7.b.1. An output energy exceeding 1.5 J per pulse and a pulsed ''peak power'' exceeding 30 W; or

a.7.b.2. An average or CW output power exceeding 30 W;

a.7.c. An output wavelength exceeding 800 nm but not exceeding 1,400 nm and having any of the following:

a.7.c.1. An output energy exceeding 0.25 J per pulse and a pulsed ''peak power'' exceeding 10 W; or

a.7.c.2. An average or CW output power exceeding 10 W; or

a.7.d. An output wavelength exceeding 1,400 nm and an average or CW output power exceeding 1 W.

b. Semiconductor ''lasers'', as follows:

b.1. Individual single-transverse mode semiconductor ''lasers'' having all of the following:

b.1.a. A wavelength of less than 950 nm or more than 2000 nm; *and*

b.1.b. An average or CW output power exceeding 100 mW;

b.2. Individual, multiple-transverse mode semiconductor ''lasers'', having all of the following:

b.2.a. A wavelength of less than 950 nm or more than 2000 nm; *and*

b.2.b. An average or CW output power exceeding 10 W.

b.3. Individual arrays of individual semiconductor ''lasers'', having any of the following:

b.3.a. A wavelength of less than 950 nm and an average or CW output power exceeding 60 W; *or*

b.3.b. A wavelength equal to or greater than 2000 nm and an average or CW output power exceeding 10 W;

Technical Note: Semiconductor ''lasers'' are commonly called ''laser'' diodes.

Note 1: 6A005.b includes semiconductor ''lasers'' having optical output connectors (e.g. fiber optic pigtails).

Note 2: The control status of semiconductor ''lasers'' specially designed for other equipment is determined by the control status of the other equipment.

c. Solid state ''lasers'', as follows:

c.1. ''Tunable'' ''lasers'' having any of the following:

Note: 6A005.c.1 includes titanium—sapphire (Ti: Al_2O_3), thulium—YAG (Tm: YAG), thulium—YSGG (Tm: YSGG), alexandrite (Cr: $BeAl_2O_4$) and color center ''lasers''.

c.1.a. An output wavelength less than 600 nm and having any of the following:

c.1.a.1. An output energy exceeding 50 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or

c.1.a.2. An average or CW output power exceeding 1 W;

c.1.b. An output wavelength of 600 nm or more but not exceeding 1,400 nm and having any of the following:

c.1.b.1. An output energy exceeding 1 J per pulse and a pulsed ''peak power'' exceeding 20 W; or

c.1.b.2. An average or CW output power exceeding 20 W; or

c.1.c. An output wavelength exceeding 1,400 nm and having any of the following:

c.1.c.1. An output energy exceeding 50 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or

c.1.c.2. An average or CW output power exceeding 1 W;

c.2. Non-''tunable'' ''lasers'', as follows:

Note: 6A005.c.2 includes atomic transition solid state ''lasers''.

c.2.a. Neodymium glass ''lasers'', as follows:

c.2.a.1. ''Q-switched lasers'' having any of the following:

c.2.a.1.a. An output energy exceeding 20 J but not exceeding 50 J per pulse and an average output power exceeding 10 W; or

c.2.a.1.b. An output energy exceeding 50 J per pulse;

c.2.a.2. Non-''Q-switched lasers'' having any of the following:

c.2.a.2.a. An output energy exceeding 50 J but not exceeding 100 J per pulse and an average output power exceeding 20 W; or

c.2.a.2.b. An output energy exceeding 100 J per pulse;

c.2.b. Neodymium-doped (other than glass) ''lasers'', having an output wavelength exceeding 1,000 nm but not exceeding 1,100 nm, as follows:

N.B.: For neodymium-doped (other than glass) ''lasers'' having an output wavelength not exceeding 1,000 nm or exceeding 1,100 nm, see 6A005.c.2.c.

c.2.b.1. Pulse-excited, mode-locked, ''Q-switched lasers'' having a ''pulse duration'' of less than 1 ns and having any of the following:

c.2.b.1.a. A ''peak power'' exceeding 5 GW;

c.2.b.1.b. An average output power exceeding 10 W; or

c.2.b.1.c. A pulsed energy exceeding 0.1 J;

c.2.b.2. Pulse-excited, ''Q-switched lasers'' having a pulse duration equal to or more than 1 ns, and having any of the following:

c.2.b.2.a. A single-transverse mode output having:

c.2.b.2.a.1. A ''peak power'' exceeding 100 MW;

c.2.b.2.a.2. An average output power exceeding 20 W; or

c.2.b.2.a.3. A pulsed energy exceeding 2 J; or

c.2.b.2.b. A multiple-transverse mode output having:

c.2.b.2.b.1. A ''peak power'' exceeding 400 MW;

c.2.b.2.b.2. An average output power exceeding 2 kW; or

c.2.b.2.b.3. A pulsed energy exceeding 2 J;

c.2.b.3. Pulse-excited, non-''Q-switched lasers'', having:

c.2.b.3.a. A single-transverse mode output having:

c.2.b.3.a.1. A ''peak power'' exceeding 500 kW; or

c.2.b.3.a.2. An average output power exceeding 150 W; or

c.2.b.3.b. A multiple-transverse mode output having:

c.2.b.3.b.1. A ''peak power'' exceeding 1 MW; or

c.2.b.3.b.2. An average power exceeding 2 kW;

c.2.b.4. Continuously excited ''lasers'' having:

c.2.b.4.a. A single-transverse mode output having:

c.2.b.4.a.1. A ''peak power'' exceeding 500 kW; or

c.2.b.4.a.2. An average or CW output power exceeding 150 W; or

c.2.b.4.b. A multiple-transverse mode output having:

c.2.b.4.b.1. A ''peak power'' exceeding 1 MW; or

c.2.b.4.b.2. An average or CW output power exceeding 2 kW;

c.2.c. Other non-''tunable'' ''lasers'', having any of the following:

c.2.c.1. A wavelength less than 150 nm and having any of the following:

c.2.c.1.a. An output energy exceeding 50 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or

c.2.c.1.b. An average or CW output power exceeding 1 W;

c.2.c.2. A wavelength of 150 nm or more but not exceeding 800 nm and having any of the following:

c.2.c.2.a. An output energy exceeding 1.5 J per pulse and a pulsed ''peak power'' exceeding 30 W; or

c.2.c.2.b. An average or CW output power exceeding 30 W;

c.2.c.3. A wavelength exceeding 800 nm but not exceeding 1,400 nm, as follows:

c.2.c.3.a. ''Q-switched lasers'' having:

c.2.c.3.a.1. An output energy exceeding 0.5 J per pulse and a pulsed ''peak power'' exceeding 50 W; or

c.2.c.3.a.2. An average output power exceeding:

c.2.c.3.a.2.a. 10 W for single-mode ''lasers'';

c.2.c.3.a.2.b. 30 W for multimode ''lasers'';

c.2.c.3.b. Non-''Q-switched lasers'' having:

c.2.c.3.b.1. An output energy exceeding 2 J per pulse and a pulsed ''peak power'' exceeding 50 W; or

c.2.c.3.b.2. An average or CW output power exceeding 50 W; or

c.2.c.4. A wavelength exceeding 1,400 nm and having any of the following:

c.2.c.4.a. An output energy exceeding 100 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or

c.2.c.4.b. An average or CW output power exceeding 1 W;

d. Dye and other liquid ''lasers'', having any of the following:

d.1. A wavelength less than 150 nm and:

d.1.a. An output energy exceeding 50 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or

d.1.b. An average or CW output power exceeding 1 W;

d.2. A wavelength of 150 nm or more but not exceeding 800 nm and having any of the following:

d.2.a. An output energy exceeding 1.5 J per pulse and a pulsed ''peak power'' exceeding 20 W;

d.2.b. An average or CW output power exceeding 20 W; or

d.2.c. A pulsed single longitudinal mode oscillator having an average output power exceeding 1 W and a repetition rate exceeding 1 kHz if the ''pulse duration'' is less than 100 ns;

d.3. A wavelength exceeding 800 nm but not exceeding 1,400 nm and having any of the following:

d.3.a. An output energy exceeding 0.5 J per pulse and a pulsed ''peak power'' exceeding 10 W; or

d.3.b. An average or CW output power exceeding 10 W; or

d.4. A wavelength exceeding 1,400 nm and having any of the following:

d.4.a. An output energy exceeding 100 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or

d.4.b. An average or CW output power exceeding 1 W;

e. Components, as follows:

e.1. Mirrors cooled either by active cooling or by heat pipe cooling;

Technical Note: Active cooling is a cooling technique for optical components using flowing fluids within the subsurface (nominally less than 1 mm below the optical surface) of the optical component to remove heat from the optic.

e.2. Optical mirrors or transmissive or partially transmissive optical or electro-optical components specially designed for use with controlled ''lasers'';

f. Optical equipment, as follows:

N.B. For shared aperture optical elements, capable of operating in ''Super-High Power Laser'' (''SHPL'') applications, see the U.S. Munitions List (22 CFR part 121).

f.1. Dynamic wavefront (phase) measuring equipment capable of mapping at least 50 positions on a beam wavefront having any the following:

f.1.a. Frame rates equal to or more than 100 Hz and phase discrimination of at least 5% of the beam's wavelength; or

f.1.b. Frame rates equal to or more than 1,000 Hz and phase discrimination of at least 20% of the beam's wavelength;

f.2. ''Laser'' diagnostic equipment capable of measuring ''SHPL'' system angular beam steering errors of equal to or less than 10 μrad;

f.3. Optical equipment and components specially designed for a phased-array ''SHPL'' system for coherent beam combination to an

accuracy of lambda/10 at the designed wavelength, or 0.1 μm, whichever is the smaller;

f.4. Projection telescopes specially designed for use with ''SHPL'' systems.

6A995 ''Lasers'', Not Controlled by 6A005 or 6A205

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List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value.

Related Controls: N/A.

Related Definitions: N/A.

Items:

a. Carbon dioxide (CO_2) ''lasers'' having any of the following:

a.1. A CW output power exceeding 10 kW;

a.2. A pulsed output with a ''pulse duration'' exceeding 10 microseconds; and

a.2.a. An average output power exceeding 10 kW; or

a.2.b. A pulsed ''peak power'' exceeding 100 kW; or

a.3. A pulsed output with a ''pulse duration'' equal to or less than 10 microseconds; and

a.3.a. A pulse energy exceeding 5 J per pulse and ''peak power'' exceeding 2.5 kW; or

a.3.b. An average output power exceeding 2.5 kW;

b. Semiconductor lasers, as follows:

b.1. Individual, single-transverse mode semiconductor ''lasers'' having:

b.1.a. An average output power exceeding 100 mW; or

b.1.b. A wavelength exceeding 1,050 nm;

b.2. Individual, multiple-transverse mode semiconductor ''lasers'', or arrays of individual semiconductor ''lasers'', having a wavelength exceeding 1,050 nm;

c. Solid state, non-''tunable'' ''lasers'', as follows:

c.1. Ruby ''lasers'' having an output energy exceeding 20 J per pulse;

c.2. Neodymium-doped (other than glass) ''lasers'', as follows, with an output wavelength exceeding 1,000 nm but not exceeding 1,100 nm:

c.2.a. Pulse-excited, ''Q-switched lasers'', with a pulse duration equal to or more than 1 ns, and a multiple-transverse mode output with any of the following:

c.2.a.1. A ''peak power'' exceeding 200 MW; or

c.2.a.2. An average output power exceeding 50 W;

c.2.b. Pulse-excited, non-''Q-switched lasers'', having a multiple-transverse mode output with an average power exceeding 500 W; or

c.2.c. Continuously excited ''lasers'' having a multiple-transverse mode output with an average or CW output power exceeding 500 W;

d. Free electron ''lasers''.

C. Materials

6C002 Optical Sensor Materials, As Follows (See List of Items Controlled)

* * * * *

List of Items Controlled

Unit: Number.

Related Controls: See also 6C992.

Related Definitions: N/A.

Items:

a. Elemental tellurium (Te) of purity levels of 99.9995% or more;

b. Single crystals (including epitaxial wafers) of any of the following:

b.1. Cadmium zinc telluride (CdZnTe), with zinc content less than 6% by mole fraction;

b.2. Cadmium telluride (CdTe) of any purity level; *or*

b.3. Mercury cadmium telluride (HgCdTe) of any purity level.

Technical Note: Mole fraction is defined as the ratio of moles of ZnTe to the sum of the moles of CdTe and ZnTe present in the crystal.

6C992 Optical Sensing Fibers Not Controlled by 6A002.d.3 Which Are Modified Structurally To Have a ''Beat Length'' of Less Than 500 mm (High Birefringence) or Optical Sensor Materials Not Described in 6C002.b and Having a Zinc Content of Equal to or More Than 6% by Mole Fraction

* * * * *

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value.

Related Controls: N/A.

Related Definitions: Mole fraction is defined as the ratio of moles of ZnTe to the sum of the moles of CdTe and ZnTe present in the crystal.

Items:

The list of items controlled is contained in the ECCN heading.

13. In Supplement No. 1 to part 774 (the Commerce Control List), Category 7—Navigation and Avionics, is amended by revising the entry heading and the List of Items Controlled section for ECCNs 7A001 and 7A002, to read as follows:

7A001 Linear Accelerometers Designed for Use in Inertial Navigation or Guidance Systems and Having Any of the Following Characteristics (See List of Items Controlled), and Specially Designed Components Therefor

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: See also 7A101 and 7A994. For angular or rotational accelerometers, see 7A002. MT controls do not apply to accelerometers that are specially designed and developed as Measurement While Drilling (MWD) sensors for use in downhole well service applications.

Related Definitions: N/A.

Items:

a. A ''bias'' ''stability'' of less (better) than 130 micro g with respect to a fixed calibration value over a period of one year;

b. A ''scale factor'' ''stability'' of less (better) than 130 ppm with respect to a fixed calibration value over a period of one year; or

c. Specified to function at linear acceleration levels exceeding 100 g.

7A002 Gyros, and Angular or Rotational Accelerometers, Having Any of the Following Characteristics (See List of Items Controlled), and Specially Designed Components Therefor

* * * * *

List of Items Controlled

Unit: $ value.

Related Controls: See also 7A102 and 7A994. For linear accelerometers, see 7A001.

Related Definitions: N/A.

Items:

a. A ''drift rate'' ''stability'', when measured in a 1 g environment over a period of three months and with respect to a fixed calibration value, of:

a.1. Less (better) than 0.1° per hour when specified to function at linear acceleration levels below 10 g; or

a.2. Less (better) than 0.5° per hour when specified to function at linear acceleration levels from 10 g to 100 g inclusive; or

b. Specified to function at linear acceleration levels exceeding 100 g.

14. In Supplement No. 1 to part 774 (the Commerce Control List), Category 9—Propulsion Systems, Space Vehicles and Related Equipment, the following Export Control Classification numbers (ECCNs) are amended:

a. By revising the entry heading for ECCN 9B001; and

b. By revising the License Requirement section and the List of Items Controlled section for ECCN 9E003, to read as follows:

9B001 Specially Designed Equipment, Tooling and Fixtures, As Follows (See List of Items Controlled), for Manufacturing Gas Turbine Blades, Vanes or Tip Shroud Castings

* * * * *

9E003 Other ''Technology'', As Follows (See List of Items Controlled)

License Requirements

Reason for Control: NS, SI, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
SI applies to 9E003.a.1 through a.11, and h. See § 742.14 of the EAR for additional information..	
AT applies to entire entry	AT Column 1.

License Requirement Notes: See § 743.1 of the EAR for reporting requirements for exports under License Exceptions.

* * * * *

List of Items Controlled

Unit: N/A.

Related Controls: (1.) Hot section ''technology'' specifically designed, modified, or equipped for military uses or purposes, or developed principally with U.S. Department of Defense funding, is subject to the licensing authority of the U.S. Department of State. (2.) ''Technology'' is subject to the EAR when actually applied to a commercial aircraft engine program. Exporters may seek to establish commercial application either on a case-by-case basis through submission of documentation demonstrating application to a commercial program in requesting an export license from the Department Commerce in respect to a specific export, or in the case of use for broad categories of aircraft, engines, or components, a commodity jurisdiction determination from the Department of State.

Related Definitions: N/A.

Items:

a. ''Technology'' ''required'' for the ''development'', ''production''of any of the following gas turbine engine components or systems:

a.1. Gas turbine blades, vanes or tip shrouds made from directionally solidified (DS) or single crystal (SC) alloys having (in the 001 Miller Index Direction) a stress-rupture life exceeding 400 hours at 1,273 K (1,000 °C) at a stress of 200 MPa, based on the average property values;

a.2. Multiple domed combustors operating at average burner outlet temperatures exceeding 1,813 K (1,540 ° C) or combustors incorporating thermally decoupled combustion liners, non-metallic liners or non-metallic shells;

a.3. Components manufactured from any of the following:

a.3.a. Organic ''composite'' materials designed to operate above 588 K (315 °C);

a.3.b. Metal ''matrix'' ''composite'', ceramic ''matrix'', intermetallic or intermetallic reinforced materials controlled by 1C007; or

a.3.c. ''Composite'' material controlled by 1C010 and manufactured with resins controlled by 1C008.

a.4. Uncooled turbine blades, vanes, tip-shrouds or other components designed to operate at gas path temperatures of 1,323 K (1,050 °C) or more;

a.5. Cooled turbine blades, vanes or tip-shrouds, other than those described in 9E003.a.1, exposed to gas path temperatures of 1,643 K (1,370 °C) or more;

a.6. Airfoil-to-disk blade combinations using solid state joining;

a.7. Gas turbine engine components using ''diffusion bonding'' ''technology'' controlled by 2E003.b;

a.8. Damage tolerant gas turbine engine rotating components using powder metallurgy materials controlled by 1C002.b;

a.9. Full authority digital electronic engine control (FADEC) for gas turbine and combined cycle engines and their related diagnostic components, sensors and specially designed components;

a.10. Adjustable flow path geometry and associated control systems for:

a.10.a. Gas generator turbines;

a.10.b. Fan or power turbines;

a.10.c. Propelling nozzles; *or*

Note 1: Adjustable flow path geometry and associated control systems in 9E003.a.10 do not include inlet guide vanes, variable pitch fans, variable stators or bleed valves for compressors.

Note 2: 9E003.a.10 does not control ''development'' or ''production'' ''technology'' for adjustable flow path geometry for reverse thrust.

a.11. Wide chord hollow fan blades without part-span support;

b. ''Technology'' ''required'' for the ''development'' or ''production'' of any of the following:

b.1. Wind tunnel aero-models equipped with non-intrusive sensors capable of transmitting data from the sensors to the data acquisition system; or

b.2. ''Composite'' propeller blades or propfans capable of absorbing more than 2,000 kW at flight speeds exceeding Mach 0.55;

c. ''Technology'' ''required'' for the ''development'' or ''production'' of gas turbine engine components using ''laser'', water jet, ECM or EDM hole drilling processes to produce holes having any of the following sets of characteristics:

c.1. All of the following:

c.1.a. Depths more than four times their diameter;

c.1.b. Diameters less than 0.76 mm; and

c.1.c. Incidence angles equal to or less than 25°; or

c.2. All of the following:

c.2.a. Depths more than five times their diameter;

c.2.b. Diameters less than 0.4 mm; and

c.2.c. Incidence angles of more than 25°;

Technical Note: For the purposes of 9E003.c, incidence angle is measured from a plane tangential to the airfoil surface at the point where the hole axis enters the airfoil surface.

d. ''Technology'' ''required'' for the ''development'' or ''production'' of helicopter power transfer systems or tilt rotor or tilt wing ''aircraft'' power transfer systems;

e. ''Technology'' for the ''development'' or ''production'' of reciprocating diesel engine ground vehicle propulsion systems having all of the following:

e.1. A box volume of 1.2 m^3 or less;

e.2. An overall power output of more than 750 kW based on 80/1269/EEC, ISO 2534 or national equivalents; and

e.3. A power density of more than 700 kW/m^3 of box volume;

Technical Note: Box volume: the product of three perpendicular dimensions measured in the following way:

Length: The length of the crankshaft from front flange to flywheel face;

Width: The widest of the following:

a. The outside dimension from valve cover to valve cover;

b. The dimensions of the outside edges of the cylinder heads; or

c. The diameter of the flywheel housing;

Height: The largest of the following:

a. The dimension of the crankshaft center-line to the top plane of the valve cover (or cylinder head) plus twice the stroke; or

b. The diameter of the flywheel housing.

f. ''Technology'' ''required'' for the ''production'' of specially designed components, as follows, for high output diesel engines:

f.1. ''Technology'' ''required'' for the ''production'' of engine systems having all of the following components employing ceramics materials controlled by 1C007:

f.1.a Cylinder liners;

f.1.b. Pistons;

f.1.c. Cylinder heads; and

f.1.d. One or more other components (including exhaust ports, turbochargers, valve guides, valve assemblies or insulated fuel injectors);

f.2. ''Technology'' ''required'' for the ''production'' of turbocharger systems, with single-stage compressors having all of the following:

f.2.a. Operating at pressure ratios of 4:1 or higher;

f.2.b. A mass flow in the range from 30 to 130 kg per minute; and

f.2.c. Variable flow area capability within the compressor or turbine sections;

f.3. ''Technology'' ''required'' for the ''production'' of fuel injection systems with a specially designed multifuel (e.g., diesel or jet fuel) capability covering a viscosity range from diesel fuel (2.5 cSt at 310.8 K (37.8 °C)) down to gasoline fuel (0.5 cSt at 310.8 K (37.8 °C)), having both of the following:

f.3.a. Injection amount in excess of 230 mm^3 per injection per cylinder; and

f.3.b. Specially designed electronic control features for switching governor characteristics automatically depending on fuel property to provide the same torque characteristics by using the appropriate sensors;

g. ''Technology'' ''required'' for the development'' or ''production'' of high output diesel engines for solid, gas phase or liquid film (or combinations thereof) cylinder wall lubrication, permitting operation to temperatures exceeding 723 K (450 °C), measured on the cylinder wall at the top limit of travel of the top ring of the piston.

h. ''Technology'' not otherwise controlled in 9E003.a.1 through a.10 and currently used in the ''development'', ''production'', or overhaul of hot section parts and components of civil derivatives of military engines controlled on the U.S. Munitions List.

Dated: December 17, 2001.

James J. Jochum,

Assistant Secretary for Export Administration.

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