AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

Use. (All categories and General Technology Note)—Operation, installation (including on-site installation), maintenance (checking), repair, overhaul and refurbishing.

User-accessible programmability. (Cat 4, 5, and 6)—The facility allowing a user to insert, modify, or replace ''programs'' by means other than:

(a) A physical change in wiring or interconnections; or

(b) The setting of function controls including entry of parameters.

Utilization facility. (a) As defined by 10 CFR 110.2 of the Nuclear Regulatory Commission Regulations, utilization facility means a nuclear reactor, other than one that is a production facility, any of the following major components of a nuclear reactor: Pressure vessels designed to contain the core of a nuclear reactor, other than one that is a production facility, and the following major components of a nuclear reactor:

(1) Primary coolant pumps;

(2) Fuel charging or discharging machines; and

(3) Control rods.

(b) Utilization facility does not include the steam turbine generator portion of a nuclear power plant.

Vacuum Atomization. (Cat 1)—A process to reduce a molten stream of metal to droplets of a diameter of 500 micrometer or less by the rapid evolution of a dissolved gas upon exposure to a vacuum.

Variable geometry airfoils. (Cat 7)—Use trailing edge flaps or tabs, or leading edge slats or pivoted nose droop, the position of which can be controlled in flight.

Vector Rate. (Cat 4)—See: ''Two dimensional Vector Rate''; ''Three dimensional Vector Rate''.

You. Any person, including a natural person, including a citizen of the United States or any foreign country; any firm; any government, government agency, government department, or government commission; any labor union; any fraternal or social organization; and any other association or organization whether or not organized for profit.

[61 FR 12925, Mar. 25, 1996]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §772.1, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at *www.fdsys.gov*.

PART 774—THE COMMERCE CONTROL LIST

Sec.
774.1 Introduction.
774.2 [Reserved]
SUPPLEMENT NO. 1 TO PART 774—THE COMMERCE CONTROL LIST
SUPPLEMENT NO. 2 TO PART 774—GENERAL TECHNOLOGY AND SOFTWARE NOTES
SUPPLEMENT NO. 3 TO PART 774—STATEMENT OF UNDERSTANDING
SUPPLEMENT NO. 4 TO PART 774 [RESERVED]
SUPPLEMENT NO. 5 TO PART 774—ITEMS CLASSIFIED UNDER ECCNS 0A521, 0B521, 0C521, 0D521 AND 0E521

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); 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; 15 U.S.C. 1824a; 50 U.S.C. app. 5; 22 U.S.C. 7201 *et seq.;* 22 U.S.C. 7210; E.O. 13026, 61 FR 58767, 3 CFR, 1996 Comp., p. 228; E.O. 13222, 66 FR 44025, 3 CFR, 2001 Comp., p. 783; Notice of August 15, 2012, 77 FR 49699 (August 16, 2012).

SOURCE: 61 FR 12937, Mar. 25, 1996, unless otherwise noted.

§774.1 Introduction.

(a) In this part, references to the EAR are references to 15 CFR chapter VII, subchapter C. The Bureau of Industry and Security (BIS) maintains the Commerce Control List (CCL) that describes items (i.e., commodities, software, and technology) subject to the jurisdiction of the EAR. The CCL does not include those items exclusively controlled for export by another department or agency of the U.S. Government. In instances where other agencies administer controls over related items, entries in the CCL will contain a reference to these controls. Those items subject to the EAR but not specified on the CCL are identified by the designator ''EAR99.'' See §734.2(a) of the EAR for items that are ''subject to the EAR.'' You should consult part 738 of the EAR for an explanation of the organization of the CCL and its relationship to the Country Chart.

(b) Items that warrant control on the CCL, but for which a classification has yet to be determined, are temporarily classified under one of the 0Y521 ECCNs (i.e., 0A521, 0B521, 0C521, 0D521 or

0E521), according to their respective product group, pursuant to § 742.6(a)(7) of the EAR, while a determination is made as to whether classification under a revised or new ECCN, or an EAR99 designation, is appropriate. The technical description and list of such items appear in Supplement No. 5 to part 774—Items Classified Under ECCNs 0A521, 0B521, 0C521, 0D521 and 0E521. Items that the U.S. Government determines are more appropriately captured under the United States Munitions List (USML) Category XXI (Miscellaneous Articles) or other USML control, as part of the 0Y521 review process will be controlled as such.

(c) The CCL is contained in Supplement No. 1 to this part, and Supplement No. 2 to this part contains the General Technology and Software Notes relevant to entries contained in the CCL.

[77 FR 22199, Apr. 13, 2012]

§ 774.2 [Reserved]

SUPPLEMENT NO. 1 TO PART 774—THE COMMERCE CONTROL LIST

CATEGORY 0—NUCLEAR MATERIALS, FACILITIES, AND EQUIPMENT [AND MISCELLANEOUS ITEMS]

A. SYSTEMS, EQUIPMENT AND COMPONENTS

0A001 "Nuclear reactors", i.e., reactors capable of operation so as to maintain a controlled, self-sustaining fission chain reaction, and equipment and components specially designed or prepared for use in connection with a "nuclear reactor", including (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0A001 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items: a. Pressure vessels, i.e. metal vessels as complete units or X parts therefor, which are specially designed or prepared to contain the core of a ''nuclear reactor'' and are capable of withstanding the operating pressure of the primary coolant, including the top plate for a reactor pressure vessel;

b. Fuel element handling equipment, including reactor fuel charging and discharging machines;

c. Control rods specially designed or prepared for the control of the reaction rate in a ''nuclear reactor'', including the neutron absorbing part and the support or suspension structures therefore, and control rod guide tubes;

d. Electronic controls for controlling the power levels in ''nuclear reactors'', including reactor control rod drive mechanisms and radiation detection and measuring instruments to determine neutron flux levels;

e. Pressure tubes specially designed or prepared to contain fuel elements and the primary coolant in a ''nuclear reactor'' at an operating pressure in excess of 5.1 MPa;

f. Tubes or assemblies of tubes, made from zirconium metal or alloy in which the ratio of hafnium to zirconium is less than 1:500 parts by weight, specially designed or prepared for use in a ''nuclear reactor'';

g. Coolant pumps specially designed or prepared for circulating the primary coolant of ''nuclear reactors'';

h. Internal components specially designed or prepared for the operation of a ''nuclear reactor'', including core support structures, thermal shields, baffles, core grid plates and diffuser plates;

i. Heat exchangers.

0A002 Power generating or propulsion equipment specially designed for use with space, marine or mobile "nuclear reactors". (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

0A018 Items on the Wassenaar Munitions List.

LICENSE REQUIREMENTS

Reason for Control: NS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $5,000 for 0A018.a

$3,000 for 0A018.b

$1,500 for 0A018.c and .d

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: 0A018.a, and .b in $ value; 0A018.c and .d in number.

Related Controls: See 0A979, 0A988, and 22 CFR 121.1 Categories I(a), III(b–d), and X(a).

Related Definitions: N/A

Items: a. Construction equipment built to military specifications, including equipment specially designed for airborne transport; and specially designed parts and accessories for such construction equipment, including crew protection kits used as protective cabs;

b. Specially designed components and parts for ammunition, except cartridge cases, powder bags, bullets, jackets, cores, shells, projectiles, boosters, fuses and components, primers, and other detonating devices and ammunition belting and linking machines (all of which are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls). (See 22 CFR parts 120 through 130);

c. Muzzle loading (black powder) firearms with a caliber less than 20 mm that were manufactured later than 1937 and that are not reproductions of firearms manufactured earlier than 1890;

NOTE: 0A018.c does not control weapons used for hunting or sporting purposes that were not specially designed for military use and are not of the fully automatic type, but see ECCN 0A984 concerning shotguns.

d. Military helmets, except:

d.1. Conventional steel helmets other than those described by 0A018.d.2 of this entry.

d.2. Helmets, made of any material, equipped with communications hardware, optional sights, slewing devices or mechanisms to protect against thermal flash or lasers.

NOTE: Helmets described in 0A018.d.1 are controlled by 0A988. Helmets described in 0A018.d.2 are controlled by the U.S. Department of State, Directorate of Defense Trade Controls (See 22 CFR part 121, Category X).

0A521 Any commodity subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0A521 commodities are subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under §740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0A521. The list of commodities determined to be classified under ECCN 0A521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0A521 are set forth in §742.6(a)(7) of the EAR.

0A918 Miscellaneous Military Equipment Not on the Wassenaar Munitions List

LICENSE REQUIREMENTS

Reason for Control: RS, AT, UN

Control(s)	Country chart
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $5,000 for 0A918.a
$1,500 for 0A918.b

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: 0A918.a in $ value; 0A918.b in number.

Related Controls: N/A

Related Definitions: N/A

Items: a. Power controlled searchlights and control units therefor, designed for military use, and equipment mounting such units; and specially designed parts and accessories therefor;

b. Bayonets.

0A919 "Military commodities" as follows (see list of items controlled).

License Requirements

Reasons for Control: RS, AT, UN.

Control(s)	*Country chart*
RS applies to entire entry	RS Column 1, see §742.6(a)(3) for license requirements.
AT applies to entire entry	AT Column 1.

License Exceptions

LVS: N/A.
GBS: N/A.
CIV: N/A.

List of Items Controlled

Unit: $ value.

Related Controls: (1) Military commodities are subject to the export licensing jurisdiction of the Department of State if they incorporate items that are subject to the International Traffic in Arms Regulations (ITAR) (22 CFR Parts 120–130). (2) Military commodities described in this paragraph are subject to the export licensing jurisdiction of the Department of State if such commodities are described on the United States Munitions List (22 CFR Part 121) and are in the United States. (3) The furnishing of assistance (including training) to foreign persons, whether in the United States or abroad in the design, development, engineering, manufacture, production, assembly, testing, repair, maintenance, modification, operation, demilitarization, destruction, processing, or use of defense articles that are subject to the ITAR; or the furnishing to foreign persons of any technical data controlled under 22 CFR 121.1 whether in the United States or abroad are under the licensing jurisdiction of the

Department of State. (4) Brokering activities (as defined in 22 CFR 129.9) of military commodities that are subject to the ITAR are under the licensing jurisdiction of the Department of State.

Related Definitions: N/A.

Items: ''Military commodities'' with all of the following characteristics:

a. Described on either the United States Munitions List (22 CFR Part 121) or the Munitions List that is published by the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (as set out on its Web site at *http://www.wassenaar.org*), but not any item listed in any Export Control Classification Number for which the last three characters are 018;

b. Produced outside the United States;

c. Not subject to the International Traffic in Arms Regulations (22 CFR Parts 120–130) for a reason other than presence in the United States; and

d. Incorporate one or more cameras controlled under ECCN 6A003.b.3, .b.4.b, or .b.4.c.

0A978 Law enforcement striking weapons, including saps, police batons, side handle batons, tonfas, sjamboks, and whips.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country chart
CC applies to entire entry	CC Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

0A979 Police helmets and shields; and parts, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country chart
CC applies to entire entry	CC Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

0A980 Horses by sea.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

0A981 Equipment designed for the execution of human beings (See list of items controlled).

LICENSE REQUIREMENTS

Reason for Control: CC.

Control(s): CC applies to entire entry. A license is required for ALL destinations regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See §742.7 of the EAR for additional information.)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A.

Related Definitions: N/A.

Items: a. Gallows and guillotines.

b. Electric chairs for the purpose of executing human beings.

c. Air tight vaults designed for the execution of human beings by the administration of a lethal gas or substance.

d. Automatic drug injection systems designed for the execution of human beings by administration of a lethal substance.

0A982 Law enforcement restraint devices, including leg irons, shackles, and handcuffs; straight jackets; stun cuffs; shock belts; shock sleeves; multipoint restraint devices such as restraint chairs; and parts and accessories, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)

CC applies to entire entry. A license is required for ALL destinations, except Canada, regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information.)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

*Related Controls:*Thumbcuffs and fingercuffs are classified under ECCN 0A983, specially

designed implements of torture. Restraint devices that electronically monitor or report the location of confined persons for law enforcement or penal reasons are controlled under ECCN 3A981.

Related Definitions: N/A

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

NOTE TO ECCN 0A982. This ECCN applies to restraint devices used in law enforcement activities. It does not apply to medical devices that are equipped to restrain patient movement during medical procedures. It does not apply to devices that confine memory impaired patients to appropriate medical facilities. It does not apply to safety equipment such as safety belts or child automobile safety seats.

0A983 Specially designed implements of torture, including thumbscrews, thumbcuffs, fingercuffs, spiked batons, and parts and accessories, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s): CC applies to entire entry. A license is required for ALL destinations, regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information.)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

NOTE TO ECCN 0A983. In this ECCN, ''torture'' has the meaning set forth in Section 2340(1) of Title 18, United States Code.

0A984 Shotguns with barrel length 18 inches (45.72 cm) or over; receivers; barrels of 18 inches (45.72 cm) or longer but not longer than 24 inches (60.96 cm); complete trigger mechanisms; magazines and magazine extension tubes; complete breech mechanisms; buckshot shotgun shells; except equipment used exclusively to treat or tranquilize animals, and except arms designed solely for signal, flare, or saluting use.

LICENSE REQUIREMENTS

Reason for Control: CC, FC, UN

Control(s)	Country chart
FC applies to entire entry	FC Column 1.
CC applies to shotguns with a barrel length greater than or equal to 18 in. (45.72 cm), but less than 24 in. (60.96 cm), shotgun parts controlled by this entry, and buckshot shotgun shells controlled by this entry, regardless of end-user.	CC Column 1.
CC applies to shotguns with a barrel length greater than or equal to 24 in. (60.96 cm), regardless of end-user.	CC Column 2.
CC applies to shotguns with a barrel length greater than or equal to 24 in. (60.96 cm) if for sale or resale to police or law enforcement.	CC Column 3.
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: This entry does not control shotguns with a barrel length of less than 18 inches (45.72 cm). (See 22 CFR part 121.) These items are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls.

Related Definitions: N/A

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

0A985 Discharge type arms and devices to administer electric shock, for example, stun guns, shock batons, shock shields, electric cattle prods, immobilization guns and projectiles; except equipment used exclusively to treat or tranquilize animals, and except arms designed solely for signal, flare, or saluting use; and parts, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC, UN

Control(s)	Country chart
CC applies to entire entry. A license is required for ALL destinations, except Canada, regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information.)	
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: Law enforcement restraint devices that administer an electric shock

are controlled under ECCN 0A982. Electronic devices that monitor and report a person's location to enforce restrictions on movement for law enforcement or penal reasons are controlled under ECCN 3A981.

Related Definitions: N/A

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

0A986 Shotgun shells, except buckshot shotgun shells, and parts.

LICENSE REQUIREMENTS

Reason for Control: AT, FC, UN

Control(s)	
AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.	
FC applies to entire entry	FC Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

0A987 Optical sighting devices for firearms (including shotguns controlled by 0A984); and parts (See list of items controlled).

LICENSE REQUIREMENTS

Reason for Control: FC, CC, UN

Control(s)	Country chart
FC applies to optical sights for firearms, including shotguns described in ECCN 0A984, and related parts.	FC Column 1.
CC applies to entire entry	CC Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items:

a. Telescopic sights.

b. Holographic sights.

c. Reflex or ''red dot'' sights.

d. Reticle sights.

e. Other sighting devices that contain optical elements.

f. Laser pointing devices designed for use on firearms.

g. Lenses, other optical elements and adjustment mechanisms for articles in paragraphs a, b, c, d or e.

0A988 Conventional military steel helmets as described by 0A018.d.1

LICENSE REQUIREMENTS

Reason for Control: UN

Control(s)	
UN applies to entire entry.	See § 746.1(b) for UN controls.

NOTE: Exports from the U.S. and transhipments to Iran must be licensed by the Department of Treasury, Office of Foreign Assets Control. (See § 746.7 of the EAR for additional information on this requirement.)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

0A999 Specific Processing Equipment, as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT.

Control(s).

Country Chart.

AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: N/A

Related Definitions: N/A

Items: a. Ring Magnets;

b. Reserved.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

0B001 Plant for the separation of isotopes of "natural uranium" and "depleted uranium", "special fissile materials" and "other fissile materials", and specially designed or prepared equipment and components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control:
Control(s): Items described in 0B001 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).
LICENSE EXCEPTIONS,
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: N/A
Related Definitions: ''*Materials resistant to corrosion by* UF_6'' may be copper, stainless steel, aluminum, aluminum oxide, aluminum alloys, nickel or alloy containing 60 weight percent or more nickel and UF_6-resistant fluorinated hydrocarbon polymers, as appropriate for the type of separation process.
Items: a. Plant specially designed for separating isotopes of ''natural uranium'' and ''depleted uranium'', ''special fissile materials'' and ''other fissile materials'', as follows:
a.1. Gaseous diffusion separation plant;
a.2. Gas centrifuge separation plant;
a.3. Aerodynamic separation plant;
a.4. Chemical exchange separation plant;
a.5. Ion-exchange separation plant;
a.6. Atomic vapor ''laser'' isotopic separation plant;
a.7. Molecular ''laser'' isotopic separation plant;
a.8. Plasma separation plant;
a.9. Electro magnetic separation plant;
b. Equipment and components, specially designed or prepared for gaseous diffusion separation process, as follows:
b.1. Bellow valves made of or protected by materials resistant to UF_6 (e.g., aluminum, aluminum alloys, nickel or alloy containing 60 weight percent or more nickel), with a diameter of 40 mm to 1500 mm;
b.2.a. Compressors (positive displacement, centrifugal and axial flowtypes) or gas blowers with a suction volume capacity of 1 m^3/min or more of UF_6, and discharge pressure up to 666.7 kPa, made of or protected by materials resistant to UF_6 (e.g. aluminum, aluminum alloys, nickel or alloy containing 60 weight percent or more nickel);
b.2.b. Rotary shaft seals for compressors or blowers specified in 0B001.b.2.a. and designed for a buffer gas in-leakage rate of less than 1,000 cm^3/min.;
b.3. Gaseous diffusion barriers made of porous metallic, polymer or ceramic materials resistant to corrosion by UF_6 with a pore size of 10 to 100 nm, a thickness of 5 mm or less, and, for tubular forms, a diameter of 25 mm or less;
b.4. Gaseous diffuser housings made of or protected by materials resistant to corrosion by UF_6;
b.5. Heat exchangers made of aluminum, copper, nickel, or alloys containing more than 60 weight percent nickel, or combinations of these metals as clad tubes, designed to operate at sub-atmospheric pressure with a leak rate that limits the pressure rise to less than 10 Pa per hour under a pressure differential of 100 kPa;
c. Equipment and components, specially designed or prepared for gas centrifuge separation process, as follows:
c.1. Gas centrifuges;
c.2. Complete rotor assemblies consisting of one or more rotor tube cylinders;
c.3. Rotor tube cylinders with a thickness of 12 mm or less, a diameter of between 75 mm and 400 mm, made from any of the following high strength-to-density ratio materials:
c.3.a. Maraging steel capable of an ultimate tensile strength of 2,050 MPa or more;
c.3.b. Aluminum alloys capable of an ultimate tensile strength of 460 MPa or more; *or*
c.3.c. ''Fibrous or filamentary materials'' with a ''specific modulus'' of more than 3.18×10^6 m and a ''specific tensile strength'' greater than 76.2×10^3 m;
c.4. Magnetic suspension bearings consisting of an annular magnet suspended within a housing made of UF_6 resistant materials (e.g. aluminum, aluminum alloys, nickel or alloy containing 60 weight percent or more nickel) containing a damping medium and having the magnet coupling with a pole piece or second magnet fitted to the top cap of the rotor;
c.5. Specially prepared bearings comprising a pivot-cup assembly mounted on a damper;
c.6. Rings or bellows with a wall thickness of 3 mm or less and a diameter of between 75 mm and 400 mm and designed to give local support to a rotor tube or to join a number together, made from any of the following high strength-to-density ratio materials;
c.6.a. Maraging steel capable of an ultimate tensile strength of 2050 MPa or more;
c.6.b. Aluminum alloys capable of an ultimate tensile strength of 460 MPa or more; *or*
c.6.c. ''Fibrous or filamentary materials'' with a ''specific modulus'' of more than 3.18×10^6 m and a ''specific tensile strength'' greater than 76.2×10^3 m;''.
c.7. Baffles of between 75 mm and 400 mm diameter for mounting inside a rotor tube, made from any of the following high strength-to-density ratio materials:
c.7.a. Maraging steel capable of an ultimate tensile strength of 2050 MPa or more;
c.7.b. Aluminum alloys capable of an ultimate tensile strength of 460 MPa or more; *or*
c.7.c. ''Fibrous or filamentary materials'' with a ''specific modulus'' of more than 3.18×10^6 m and a ''specific tensile strength'' greater than 76.2×10^3 m;''.
c.8. Top and bottom caps of between 75 mm and 400 mm diameter to fit the ends of a rotor tube, made from any of the following high strength-to-density ratio materials:

c.8.a. Maraging steel capable of an ultimate tensile strength of 2050 MPa or more; *or*

c.8.b. Aluminum alloys capable of an ultimate tensile strength of 460 MPa or more;

c.8.c. ''Fibrous or filamentary materials'' with a ''specific modulus'' of more than 3.18 $\times 10^6$ m and a ''specific tensile strength'' greater than 76.2×10^3 m.

c.9. Molecular pumps comprised of cylinders having internally machined or extruded helical grooves and internally machined bores;

c.10. Ring-shaped motor stators for multiphase AC hysteresis (or reluctance) motors for synchronous operation within a vacuum in the frequency range of 600 to 2,000 Hz and a power range of 50 to 1,000 Volt-Amps;

c.11. Frequency changers (converters or inverters) specially designed or prepared to supply motor stators for gas centrifuge enrichment, having all of the following characteristics, and specially designed components therefor:

c.11.a. Multiphase output of 600 to 2000 Hz;

c.11.b. Frequency control better than 0.1%;

c.11.c. Harmonic distortion of less than 2%; *and*

c.11.d. An efficiency greater than 80%;

c.12. Centrifuge housing/recipients to contain the rotor tube assembly of a gas centrifuge, consisting of a rigid cylinder of wall thickness up to 30 mm with precision machined ends and made of or protected by UF_6 resistant materials;

c.13. Scoops consisting of tubes of up to 12 mm internal diameter for the extraction of UF_6 gas from within a centrifuge rotor tube by a Pitot tube action, made of or protected by UF_6 resistant materials;

d. Equipment and components, specially designed or prepared for aerodynamic separation process, as follows:

d.1. Separation nozzles consisting of slit-shaped, curved channels having a radius of curvature less than 1 mm and having a knife-edge contained within the nozzle which separates the gas flowing through the nozzle into two streams;

d.2. Tangential inlet flow-driven cylindrical or conical tubes (vortex tubes), made of or protected by UF_6 resistant materials with a diameter of between 0.5 cm and 4 cm and a length to diameter ratio of 20:1 or less and with one or more tangential inlets;

d.3. Compressors (positive displacement, centrifugal and axial flow types) or gas blowers with a suction volume capacity of 2 m^3/min, made of or protected by materials resistant to UF_6 (e.g., aluminum, aluminum alloys, nickel or alloy containing 60 weight percent or more nickel), and rotary shaft seals therefor;

d.4. Aerodynamic separation element housings, made of or protected by materials resistant to UF_6 to contain vortex tubes or separation nozzles;

d.5. Heat exchangers made of aluminum, copper, nickel, or alloy containing more than 60 weight percent nickel, or combinations of these metals as clad tubes, designed to operate at pressures of 600 kPa or less;

d.6. Bellows valves made of or protected by UF_6 resistant materials with a diameter of 40 to 1500 mm;

d.7. Process systems for separating UF_6 from carrier gas (hydrogen or helium) to 1 ppm UF_6 content or less, including:

d.7.a. Cryogenic heat exchangers and cryoseparators capable of temperatures of −120 °C or less;

d.7.b. Cryogenic refrigeration units capable of temperatures of −120 °C or less;

d.7.c. Separation nozzle or vortex tube units for the separation of UF_6 from carrier gas;

d.7.d. UF_6 cold traps capable of temperatures of −20 °C or less;

e. Equipment and components, specially designed or prepared for chemical exchange separation process, as follows:

e.1. Fast-exchange liquid-liquid centrifugal contactors with stage residence time of 30 seconds or less and resistant to concentrated hydrochloric acid (e.g., made of or lined with suitable plastic materials such as fluorocarbon polymers or lined with glass);

e.2. Fast-exchange liquid-liquid pulse columns with stage residence time of 30 seconds or less and resistant to concentrated hydrochloric acid (e.g., made of or lined with suitable plastic materials such as fluorocarbon polymers or lined with glass);

e.3. Electrochemical reduction cells designed to reduce uranium from one valence state to another;

e.4. Electrochemical reduction cells feed equipment to take U^{+4} from the organic stream and, for those parts in contact with the process stream, made of or protected by suitable materials (e.g., glass, fluorocarbon polymers, polyphenyl sulphate, polyether sulfone and resin-impregnated graphite);

e.5. Feed preparation systems for producing high purity uranium chloride solution consisting of dissolution, solvent extraction and/or ion exchange equipment for purification and electrolytic cells for reducing the uranium U^{+6} or U^{+4} to U^{+3};

e.6. Uranium oxidation systems for oxidation of U^{+3} to U^{+4};

f. Equipment and components, specially designed or prepared for ion-exchange separation process, as follows:

f.1. Fast reacting ion-exchange resins, pellicular or porous macro-reticulated resins in which the active chemical exchange groups are limited to a coating on the surface of an inactive porous support structure, and other composite structures in any suitable form, including particles or fibers, with diameters of 0.2 mm or less, resistant to concentrated hydrochloric acid and designed to have an exchange rate half-time of less than

10 seconds and capable of operating at temperatures in the range of 100 °C to 200 °C;

f.2. Ion exchange columns (cylindrical) with a diameter greater than 1000 mm, made of or protected by materials resistant to concentrated hydrochloric acid (e.g., titanium or fluorocarbon plastics) and capable of operating at temperatures in the range of 100 °C to 200 °C and pressures above 0.7 MPa;

f.3. Ion exchange reflux systems (chemical or electrochemical oxidation or reduction systems) for regeneration of the chemical reducing or oxidizing agents used in ion exchange enrichment cascades;

g. Equipment and components, specially designed or prepared for atomic vapor ''laser'' isotopic separation process, as follows:

g.1. High power electron beam guns with total power of more than 50 kW and strip or scanning electron beam guns with a delivered power of more than 2.5 kW/cm for use in uranium vaporization systems;

g.2. Trough shaped crucibles and cooling equipment made of or protected by materials resistant to heat and corrosion of molten uranium or uranium alloys (e.g., tantalum, yttria-coated graphite, graphite coated with other rare earth oxides or mixtures thereof);

N.B: See also 2A225.

g.3. Product and tails collector systems made of or lined with materials resistant to the heat and corrosion of uranium vapor, such as yttria-coated graphite or tantalum;

g.4. Separator module housings (cylindrical or rectangular vessels) for containing the uranium metal vapor source, the electron beam gun and the product and tails collectors;

g.5. ''Lasers'' or ''laser'' systems for the separation of uranium isotopes with a spectrum frequency stabilizer for operation over extended periods of time;

N.B.: See also 6A005 and 6A205.

h. Equipment and components, specially designed or prepared for molecular ''laser'' isotopic separation process, as follows:

h.1. Supersonic expansion nozzles for cooling mixtures of UF_6 and carrier gas to 150 K or less and made from UF_6 resistant materials;

h.2. Uranium fluoride (UF_5) product collectors consisting of filter, impact, or cyclone-type collectors or combinations thereof, and made of UF_5/UF_6 resistant materials (e.g. aluminum, aluminum alloys, nickel or alloys containing 60 weight percent of nickel and UF_6 resistant fully fluorinated hydrocarbon polymers);

h.3. Equipment for fluorinating UF_5 to UF_6;

h.4. Compressors made of or protected by materials resistant to UF_6 (e.g., aluminum, aluminum alloys, nickel or alloy containing 60 weight percent or more nickel), and rotary shaft seals therefor;

h.5. Process systems for separating UF_6 from carrier gas (e.g., nitrogen or argon) including:

h.5.a. Cryogenic heat exchangers and cryoseparators capable of temperatures of −120 °C or less;

h.5.b. Cryogenic refrigeration units capable of temperatures of −120 °C or less;

h.5.c. UF6 cold traps capable of temperatures of −20 °C or less;

h.6. ''Lasers'' or ''laser'' systems for the separation of uranium isotopes with a spectrum frequency stabilizer for operation over extended periods of time;

N.B.: See also 6A005 and 6A205.

i. Equipment and components, specially designed or prepared for plasma separation process, as follows:

i.1. Product and tails collectors made of or protected by materials resistant to the heat and corrosion of uranium vapor such as yttria-coated graphite or tantalum;

i.2. Radio frequency ion excitation coils for frequencies of more than 100 kHz and capable of handling more than 40 kW mean power;

i.3. Microwave power sources and antennae for producing or accelerating ions, with an output frequency greater than 30 GHz and mean power output greater than 50 kW;

i.4. Uranium plasma generation systems;

i.5. Liquid uranium metal handling systems consisting of crucibles, made of or protected by suitable corrosion and heat resistant materials (e.g., tantalum, yttria-coated graphite, graphite coated with other rare earth oxides or mixtures thereof), and cooling equipment for the crucibles;

N.B.: See also 2A225.

i.6. Separator module housings (cylindrical) for containing the uranium plasma source, radio-frequency drive coil and the product and tails collectors and made of a suitable non-magnetic material (e.g. stainless steel);

j. Equipment and components, specially designed or prepared for electromagnetic separation process, as follows:

j.1. Ion sources, single or multiple, consisting of a vapor source, ionizer, and beam accelerator made of suitable materials (e.g., graphite, stainless steel, or copper) and capable of providing a total ion beam current of 50 mA or greater;

j.2. Ion collector plates for collection of enriched or depleted uranium ion beams, consisting of two or more slits and pockets and made of suitable non-magnetic materials (e.g., graphite or stainless steel);

j.3. Vacuum housings for uranium electromagnetic separators made of non-magnetic materials (e.g. graphite or stainless steel) and designed to operate at pressures of 0.1 Pa or lower;

j.4. Magnet pole pieces with a diameter greater than 2 m;

j.5. High voltage power supplies for ion sources, having all of the following characteristics:

j.5.a. Capable of continuous operation;

j.5.b. Output voltage of 20,000 V or greater;

j.5.c. Output current of 1 A or greater;

j.5.d. Voltage regulation of better than 0.01% over a period of 8 hours;

N.B.: See also 3A227.

j.6. Magnet power supplies (high power, direct current) having all of the following characteristics:

j.6.a. Capable of continuous operation with a current output of 500 A or greater at a voltage of 100 V or greater;

j.6.b. Current or voltage regulation better than 0.01% over a period of 8 hours.

N.B.: See also 3A226.

0B002 Specially designed or prepared auxiliary systems, equipment and components, as follows, (see List of Items Controlled) for isotope separation plant specified in 0B001, made of or protected by UF_6 resistant materials.

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0B002 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items: a. Feed autoclaves, ovens or systems used for passing UF_6 to the enrichment process;

b. Desublimers or cold traps, used to remove UF_6 from the enrichment process for subsequent transfer upon heating;

c. Product and tails stations for transferring UF_6 into containers;

d. Liquefaction or solidification stations used to remove UF_6 from the enrichment process by compressing and converting UF_6 to a liquid or solid form;

e. Piping systems and header systems specially designed for handling UF_6 within gaseous diffusion, centrifuge or aerodynamic cascades made of or protected by UF_6 resistant materials;

e.1. Vacuum manifolds or vacuum headers having a suction capacity of 5 m^3/minute or more; *or*

e.2. Vacuum pumps specially designed for use in UF_6 bearing atmospheres;

f. UF_6 mass spectrometers/ion sources specially designed or prepared for taking on-line samples of feed, product or tails from UF_6 gas streams and having all of the following characteristics:

f.1. Unit resolution for mass of more than 320 amu;

f.2. Ion sources constructed of or lined with nichrome or monel, or nickel plated;

f.3. Electron bombardment ionization sources; and

f.4. Collector system suitable for isotopic analysis.

0B003 Plant for the conversion of uranium and equipment specially designed or prepared therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control

Control(s): Items described in 0B003 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items: a. Systems for the conversion of uranium ore concentrates to UO_3;

b. Systems for the conversion of UO_3 to UF_6;

c. Systems for the conversion of UO_3 to UO_2;

d. Systems for the conversion of UO_2 to UF_4;

e. Systems for the conversion of UF_4 to UF_6;

f. Systems for the conversion of UF_4 to uranium metal;

g. Systems for the conversion of UF_6 to UO_2;

h. Systems for the conversion of UF_6 to UF_4;

i. Systems for the conversion of UO_2 to UCl_4.

0B004 Plant for the production of heavy water, deuterium or deuterium compounds, and specially designed or prepared equipment and components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0B004 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items: a. Plant for the production of heavy water, deuterium or deuterium compounds, as follows:

a.1. Hydrogen sulphide-water exchange plants;

a.2. Ammonia-hydrogen exchange plants;

a.3. Hydrogen distillation plants;

b. Equipment and components, as follows, designed for:

b.1. Hydrogen sulphide-water exchange process:

b.1.a. Tray exchange towers;

b.1.b. Hydrogen sulphide gas compressors;

b.2. Ammonia-hydrogen exchange process:

b.2.a. High-pressure ammonia-hydrogen exchange towers;

b.2.b. High-efficiency stage contactors;

b.2.c. Submersible stage recirculation pumps;

b.2.d. Ammonia crackers designed for pressures of more than 3 MPa;

b.3. Hydrogen distillation process:

b.3.a. Hydrogen cryogenic distillation towers and cold boxes designed for operation below 35 K (−238 °C);

b.3.b. Turboexpanders or turboexpander-compressor sets designed for operation below 35 K (−238 °C);

b.4. Heavy water concentration process to reactor grade level (99.75 weight percent deuterium oxide):

b.4.a. Water distillation towers containing specially designed packings;

b.4.b. Ammonia distillation towers containing specially designed packings;

b.4.c. Catalytic burners for conversion of fully enriched deuterium to heavy water;

b.4.d. Infrared absorption analyzers capable of on-line hydrogen-deuterium ratio analysis where deuterium concentrations are equal to or more than 90 weight percent.

0B005 Plant specially designed for the fabrication of "nuclear reactor" fuel elements and specially designed equipment therefor.

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0B005 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: A plant for the fabrication of ''nuclear reactor'' fuel elements includes equipment which: (a) Normally comes into direct contact with or directly processes or controls the production flow of nuclear materials; (b) Seals the nuclear materials within the cladding; (c) Checks the integrity of the cladding or the seal; *and* (d) Checks the finish treatment of the solid fuel

Items: The List of Items Controlled is contained in the ECCN heading

0B006 Plant for the reprocessing of irradiated "nuclear reactor" fuel elements, and specially designed or prepared equipment and components therefor, including (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0B006 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items: a. Fuel element chopping or shredding machines, i.e. remotely operated equipment to cut, chop, shred or shear irradiated ''nuclear reactor'' fuel assemblies, bundles or rods;

b. Dissolvers, critically safe tanks (e.g. small diameter, annular or slab tanks) specially designed or prepared for the dissolution of irradiated ''nuclear reactor'' fuel, which are capable of withstanding hot, highly corrosive liquids, and which can be remotely loaded and maintained;

c. Counter-current solvent extractors and ion-exchange processing equipment specially designed or prepared for use in a plant for the reprocessing of irradiated ''natural uranium'', ''depleted uranium'' or ''special fissile materials'' and ''other fissile materials'';

d. Process control instrumentation specially designed or prepared for monitoring or controlling the reprocessing of irradiated ''natural uranium'', ''depleted uranium'' or ''special fissile materials'' and ''other fissile materials'';

e. Holding or storage vessels specially designed to be critically safe and resistant to the corrosive effects of nitric acid;

NOTE: Critically safe tanks may have the following features:

1. Walls or internal structures with a boron equivalent of at least two percent;

2. A maximum diameter or 175 mm for cylindrical vessels; or

3. A maximum width of 75 mm for either a slab or annular vessel.

f. Complete systems specially designed or prepared for the conversion of plutonium nitrate to plutonium oxide;

g. Complete systems specially designed or prepared for the production of plutonium metal.

NOTE: Plant for the reprocessing of irradiated ''nuclear reactor'' fuel elements includes equipment and components which normally come into direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams.

0B521 Any commodity subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0B521 commodities are subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under §740.11(b)(2)(ii) of the EAR, or an item- specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0B521. The list of commodities determined to be classified under ECCN 0B521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0B521 are set forth in §742.6(a)(7) of the EAR.

0B986 Equipment specially designed for manufacturing shotgun shells; and ammunition hand-loading equipment for both cartridges and shotgun shells.

LICENSE REQUIREMENTS

Reason for Control: AT, UN.

Control(s): AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. *See* §742.19 of the EAR for additional information.

UN applies to entire entry. See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

0B999 Specific Processing Equipment, as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS.

Control(s)	Country chart
AT applies to entire entry.	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See §742.19 of the EAR for additional information.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: N/A

Related Definitions: N/A

Items: a. Hot cells;

b. Glove boxes suitable for use with radioactive materials.

C. MATERIALS

0C001 "Natural uranium" or "depleted uranium" or thorium in the form of metal, alloy, chemical compound or concentrate and any other material containing one or more of the foregoing.

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0C001 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) See also 1A290. (2) This entry does not control: (a) Four grams or less of ''natural uranium'' or ''depleted uranium'' when contained in a sensing component in instruments (see 10 CFR part 110); or (b) ''Depleted uranium'' specially

fabricated for the following civil non-nuclear applications: Shielding; Packaging; Ballasts; or Counter-weights

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

0C002 "Special fissile materials" and "other fissile materials"; except, four "effective grams" or less when contained in a sensing component in instruments.

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0C002 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

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

0C004 Deuterium, heavy water, deuterated paraffins and other compounds of deuterium, and mixtures and solutions containing deuterium, in which the isotopic ratio of deuterium to hydrogen exceeds 1:5000.

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0C004 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

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

0C005 Graphite, having a purity level of less than 5 parts per million "boron equivalent" as measured according to ASTM standard C–1233–98 and intended for use in a nuclear reactor.

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0C005 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: Graphite intended for a use other than in a nuclear reactor, and that meets certain density parameters, is classified under ECCN 1C107.High-purity graphite with a boron content of less than 5 parts per million and a density greater than 1.5 grams per cubic centimeter, is classified under ECCN 1C298.

Related Definitions: N/A

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

0C006 Nickel powder or porous nickel metal, specially prepared for the manufacture of gaseous diffusion barriers, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0C006 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 1C240

Related Definitions: N/A

Items: a. Powder with a nickel purity content of 99.9 weight percent or more and a mean particle size of less than 10 micrometers measured by American Society for Testing and Materials (ASTM) B330 standard and a high degree of particle size uniformity; *or*

b. Porous nickel metal produced from materials specified in 0C006.a.

0C201 Specially prepared compounds or powders, other than nickel, resistant to corrosion by UF_6 (e.g. aluminum oxide and fully fluorinated hydrocarbon polymers), for the manufacture of gaseous diffusion barriers, having a purity of 99.9 weight percent or more and a mean particle size of less than 10 micrometers measured by American Society for Testing and Materials (ASTM) B330 standard and a high degree of particle size uniformity.

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 0C201 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110)

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

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.

0C521 Any material subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0C521 materials are subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under §740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0C521. The list of materials determined to be classified under ECCN 0C521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0C521 are set forth in §742.6(a)(7) of the EAR.

D. SOFTWARE

0D001 "Software" specially designed or modified for the "development", "production", or "use" of items described in 0A001, 0A002, 0B (except 0B986 and 0B999), or 0C.

LICENSE REQUIREMENTS

Reason for Control

Control(s): ''Software'' for items described in 0A001, 0B001, 0B002, 0B003, 0B004, 0B005, 0B006, 0C001, 0C002, 0C004, 0C005, 0C006, or 0C201 is subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

''Software'' for items described in 0A002 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (*see* 22 CFR part 121).

License Exceptions

CIV: N/A

TSR: N/A

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.

0D521 Any software subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0D521 software is subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under §740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0D521. The list of software determined to be classified under ECCN 0D521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0D521 are set forth in §742.6(a)(7) of the EAR.

0D999 Specific Software, as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS.

Control(s)	Country chart
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See §742.19 of the EAR for additional information.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: N/A

Related Definitions: N/A

Items: a. Software for neutronic calculations/modeling;

b. Software for radiation transport calculations/modeling;

c. Software for hydrodynamic calculations/modeling.

E. TECHNOLOGY

0E001 "Technology," according to the Nuclear Technology Note, for the "development", "production", or "use" of items described in 0A001, 0A002, 0B (except 0B986 and 0B999), 0C, or 0D001.

LICENSE REQUIREMENTS

Reason for Control

Control(s): ''Technology'' for items described in 0A001, 0B001, 0B002, 0B003, 0B004, 0B005, 0B006, 0C001, 0C002, 0C004, 0C005, 0C006, 0C201, or 0D001 (applies to ''software'' in 0D001 for all items except those described in 0A002) is subject to the export licensing authority of the Department of Energy (see 10 CFR part 810).

''Technology'' for items described in 0A002 and 0D001 (applies to ''software'' in 0D001 for

items described in 0A002 only) is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).
License Exceptions
CIV: N/A
TSR: N/A
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.

0E018 "Technology" for the "development", "production", or "use" of items controlled by 0A018.

LICENSE REQUIREMENTS
Reason for Control: NS, UN, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.
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

0E521 Any technology subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0E521 technology is subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under § 740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0E521. The list of technologies determined to be classified under ECCN 0E521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0E521 are set forth in § 742.6(a)(7) of the EAR.

0E918 "Technology" for the "Development", "Production", or "Use" of Bayonets.

LICENSE REQUIREMENTS
Reason for Control: RS, UN, AT.

Control(s)	Country chart
RS applies to entire entry	RS Column 2.
UN applies to entire entry	See § 746.1(b) for UN controls.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

0E982 "Technology" exclusively for the "development" or "production" of equipment controlled by 0A982 or 0A985.

LICENSE REQUIREMENTS
Reason for Control: CC
Control(s)
CC applies to ''technology'' for items controlled by 0A982 or 0A985. A license is required for ALL destinations, except Canada, regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information.)
LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

0E984 "Technology" for the "development" or "production" of shotguns controlled by 0A984 and buckshot shotgun shells.

LICENSE REQUIREMENTS
Reason for Control: CC, UN

Control(s)	Country chart
CC applies to ''technology'' for shotguns with a barrel length over 18 in. (45.72 cm), and for shotgun shells controlled by ECCN 0A984..	CC Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

CATEGORY 1—SPECIAL MATERIALS AND RELATED EQUIPMENT, CHEMICALS, ''MICROORGANISMS,'' AND ''TOXINS''

NOTE: The Food and Drug Administration (FDA) and the Drug Enforcement Administration (DEA) may control exports of items subject to the EAR and on the Commerce Control List. BIS provides cross references to these other agency controls for convenience only. Therefore, please consult relevant FDA and DEA regulations for guidance related to the item you wish to export and do not rely solely on the EAR for information about other agency export control requirements. See Supplement No. 3 to part 730 (Other U.S. Government Departments and Agencies with Export Control Responsibilities) for more information.

A. SYSTEMS, EQUIPMENT AND COMPONENTS

1A001 Components made from fluorinated compounds, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $5000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms.

Related Controls: (1) Items specially designed or modified for missiles or for items on the U.S. Munitions List are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR 121.1 Category XXI). (2) See also 1C009.

Related Definitions: N/A

Items:

a. Seals, gaskets, sealants or fuel bladders, specially designed for ''aircraft'' or aerospace use, made from more than 50% by weight of any of the materials controlled by 1C009.b or 1C009.c;

b. Piezoelectric polymers and copolymers, made from vinylidene fluoride (CAS 75–38–7) materials, controlled by 1C009.a, having all of the following:

b.1. In sheet or film form; *and*

b.2. With a thickness exceeding 200 μm;

c. Seals, gaskets, valve seats, bladders or diaphragms, having all of the following:

c.1. Made from fluoroelastomers containing at least one vinylether group as a constitutional unit; and

c.2. Specially designed for ''aircraft'', aerospace or missile use.

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.

License Exceptions

LVS: $1,500; N/A for NP; N/A for ''composite'' structures or laminates controlled by 1A002.a, having an organic ''matrix'' and made from materials controlled by 1C010.c or 1C010.d.

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship any item in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Kilograms.

Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Also see ECCNs 1A202, 1C010, 1C210, 9A010, and 9A110. (3) ''Composite'' structures specially designed for missile applications (including specially designed subsystems and components) are controlled by ECCN 9A110. (4) ''Composite'' structures or laminates specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items:

a. Consisting of an organic ''matrix'' and materials controlled by 1C010.c 1C010.d, or 1C010.e *or*

b. Consisting of a metal or carbon ''matrix'', and any of the following:

b.1. Carbon ''fibrous or filamentary materials'' having all of the following:

b.1.a. A ''specific modulus'' exceeding 10.15 $\times 10^6$ m; *and*

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

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

NOTE 1: 1A002 does not control composite structures or laminates made from epoxy resin impregnated carbon ''fibrous or filamentary materials,'' for the repair of ''civil aircraft'' structures or laminates, having all of the following:

a. An area not exceeding 1 m^2;

b. A length not exceeding 2.5 m; *and*

c. A width exceeding 15 mm.

NOTE 2: 1A002 does not control semi-finished items, specially designed for purely civilian applications as follows:

a. Sporting goods;

b. Automotive industry;

c. Machine tool industry;

d. Medical applications.

NOTE 3: 1A002.b.1 does not apply to semi-finished items containing a maximum of two dimensions of interwoven filaments and specially designed for applications as follows:

a. Metal heat-treatment furnaces for tempering metals;

b. Silicon boule production equipment.

NOTE 4: 1A002 does not apply to finished items specially designed for a specific application.

1A003 Manufactures of non-"fusible" aromatic polyimides in film, sheet, tape or ribbon form having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $200

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: This entry does not control manufactures when coated or laminated with copper and designed for the production of electronic printed circuit boards. For ''fusible'' aromatic polyimides in any form, see 1C008.a.3.

Related Definitions: N/A

Items: a. A thickness exceeding 0.254 mm; or

b. Coated or laminated with carbon, graphite, metals or magnetic substances.

1A004 Protective and detection equipment and components, not specially designed for military use, as follows (see List of Items Controlled)..

LICENSE REQUIREMENTS

Reason for Control: NS, CB, RS, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
CB applies to chemical detection systems and. dedicated detectors therefor, in 1A004.c, that also have the technical characteristics described in 2B351.a.	CB Column 2.
RS apply to 1A004.d	RS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCNs 1A995, 2B351, and 2B352. (2) See ECCN 1D003 for ''software'' specially designed or modified to enable equipment to perform the functions of equipment controlled under section 1A004.c (Nuclear, biological and chemical (NBC) detection systems). (3) See ECCN 1E002.g for control libraries (parametric technical databases) specially designed or modified to enable equipment to perform the functions of equipment controlled under 1A004.c (Nuclear, biological and chemical (NBC) detection systems).(4) Chemical and biological protective and detection equipment specifically designed, developed, modified, configured, or adapted for military applications is subject to the export licensing jurisdiction of the Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121, category XIV(f)), as is commercial equipment that incorporates components or parts controlled under that category unless those components or parts are: (1) Integral to the device; (2) inseparable from the device; and (3) incapable of replacement without compromising the effectiveness of the device, in which case the equipment is subject to the export licensing jurisdiction of the Department of Commerce under ECCN 1A004.

Related Definitions: (1) 'Adapted for use in war' means: Any modification or selection (such as altering purity, shelf life, virulence, dissemination characteristics, or resistance to UV radiation) designed to increase the effectiveness in producing casualties in humans or animals, degrading equipment or damaging crops or the environment. (2) 'Riot control agents' are substances which, under the expected conditions of use for riot control purposes, produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure. (Tear gases are a subset of 'riot control agents'.)

Items:

a. Gas masks, filter canisters and decontamination equipment therefor, designed or modified for defense against any of the following, and specially designed components therefor:

NOTE: *1A004.a includes Powered Air Purifying Respirators (PAPR) that are designed or modified for defense against agents or materials, listed in 1A004.a.*

a.1. Biological agents 'adapted for use in war';

a.2. Radioactive materials 'adapted for use in war';

a.3. Chemical warfare (CW) agents; *or*

a.4. 'Riot control agents', as follows:

a.4.a. α-Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (CAS 5798–79–8);

a.4.b. [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenemalononitrile) (CS) (CAS 2698–41–1);

a.4.c. 2-Chloro-1-phenylethanone, Phenylacyl chloride (ω-chloroacetophenone) (CN) (CAS 532–27–4);

a.4.d. Dibenz-(b,f)-1,4-oxazephine, (CR) (CAS 257–07–8);

a.4.e. 10-Chloro-5,10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (CAS 578–94–9);

a.4.f. N-Nonanoylmorpholine, (MPA) (CAS 5299–64–9);

b. Protective suits, gloves and shoes, specially designed or modified for defense against any of the following:

b.1. Biological agents 'adapted for use in war';

b.2. Radioactive materials 'adapted for use in war'; *or*

b.3. Chemical warfare (CW) agents;

c. Detection systems, specially designed or modified for detection or identification of any of the following, and specially designed components therefor:

c.1. Biological agents 'adapted for use in war ';

c.2. Radioactive materials 'adapted for use in war '; *or*

c.3. Chemical warfare (CW) agents;

d. Electronic equipment designed for automatically detecting or identifying the presence of ''explosives'' (as listed in the annex at the end of Category 1) residues and utilizing 'trace detection' techniques (*e.g.*, surface acoustic wave, ion mobility spectrometry, differential mobility spectrometry, mass spectrometry).

TECHNICAL NOTE: 'Trace detection' is defined as the capability to detect less than 1 ppm vapor, or 1 mg solid or liquid.

NOTE 1: 1A004.d. does not apply to equipment specially designed for laboratory use.

NOTE 2: 1A004.d. does not apply to non-contact walk-through security portals.

NOTE: 1A004 does not control:

a. Personal radiation monitoring dosimeters;

b. Equipment limited by design or function to protect against hazards specific to residential safety or civil industries, including:

1. Mining;
2. Quarrying;
3. Agriculture;
4. Pharmaceutical;
5. Medical;
6. Veterinary;
7. Environmental;
8. Waste management;
9. Food industry.

TECHNICAL NOTES: 1. 1A004 includes equipment and components that have been identified, successfully tested to national standards or otherwise proven effective, for the detection of or defense against radioactive materials ''adapted for use in war'', biological agents ''adapted for use in war'', chemical warfare agents, 'simulants' or ''riot control agents'', even if such equipment or components are used in civil industries such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or the food industry.

2. 'Simulant': A substance or material that is used in place of toxic agent (chemical or biological) in training, research, testing or evaluation.

1A005 Body armor and components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, UN, AT.

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
UN applies to entire entry	See § 746.1(b) for UN controls.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: Yes, except UN

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) Bulletproof and bullet resistant vests (body armor) NIJ levels III and IV, are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR 121.1 Categories X(a) and XIV(f, h)). (2) For ''fibrous or filamentary materials'' used in the manufacture of body armor, see ECCN 1C010.

Related Definitions: NA

Items:

a. Soft body armor not manufactured to military standards or specifications, or to their equivalents, and specially designed components therefor;

b. Hard body armor plates providing ballistic protection equal to or less than level IIIA (NIJ 0101.06, July 2008) or national equivalents.

NOTES TO ECCN 1A005:

1. This entry does not control body armor when accompanying its user for the user's own personal protection.

2. This entry does not control body armor designed to provide frontal protection only from both fragment and blast from non-military explosive devices.

3. This entry does not apply to body armor designed to provide protection only from knife, spike, needle or blunt trauma.

1A006 Equipment, specially designed or modified for the disposal of improvised

explosive devices, as follows (see List of Items Controlled), and specially designed components and accessories therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE REQUIREMENT NOTE: 1A006 does not apply to equipment when accompanying its operator.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: Equipment specially designed for military use for the disposal of improvised explosive devices is subject to the export licensing jurisdiction of the Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121, Category IV).

Related Definitions: 'Disruptors'—Devices specially designed for the purpose of preventing the operation of an explosive device by projecting a liquid, solid or frangible projectile.

Items:

a. Remotely operated vehicles;

b. 'Disruptors'

1A007 Equipment and devices, specially designed to initiate charges and devices containing energetic materials, by electrical means, 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 1A007.b, as well as 1A007.a when the detonator firing set meets or exceeds the parameters of 3A229.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: High explosives and related equipment specially designed for military use is subject to the export licensing jurisdiction of the Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121). This entry does not control detonators using only primary explosives, such as lead azide. See also 3A229. See 1E001 for ''development'' and ''production'' technology controls, and 1E201 for ''use'' technology controls.

Related Definitions: N/A

Items:

a. Explosive detonator firing sets designed to drive explosive detonators specified by 1A007.b;

b. Electrically driven explosive detonators as follows:

b.1. Exploding bridge (EB);

b.2. Exploding bridge wire (EBW);

b.3. Slapper;

b.4. Exploding foil initiators (EFI).

TECHNICAL NOTES

1. The word initiator or igniter is sometimes used in place of the word detonator.

2. For the purpose of 1A007.b the detonators of concern all utilize a small electrical conductor (bridge, bridge wire, or foil) that explosively vaporizes when a fast, high-current electrical pulse is passed through it. In nonslapper types, the exploding conductor starts a chemical detonation in a contacting high explosive material such as PETN (pentaerythritoltetranitrate). In slapper detonators, the explosive vaporization of the electrical conductor drives a flyer or slapper across a gap, and the impact of the slapper on an explosive starts a chemical detonation. The slapper in some designs is driven by magnetic force. The term exploding foil detonator may refer to either an EB or a slapper-type detonator.

1A008 Charges, devices and components, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT, UN.

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $3000 for .a through .c; $6000 for .d.

GBS: N/A.

CIV: N/A.

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: (1) All of the following are subject to the export licensing jurisdiction of the Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121):

a. High explosives and related equipment specially designed for military use;

b. Explosive devices or charges in this entry that utilize USML controlled energetic materials (See 22 CFR 121.1 Category V), if they have been specifically designed, developed, configured, adapted, or modified for a military application;

c. Shaped charges that have all of the following a uniform shaped conical liner with an included angle of 90 degrees or less, more than 2.0 kg of controlled materials, and a diameter exceeding 4.5 inches;

d. Detonating cord containing greater than 0.1 kg per meter (470 grains per foot) of controlled materials;

e. Cutters and severing tools containing greater than 10 kg of controlled materials;

f. With the exception of cutters and severing tools, devices or charges controlled by this entry where the USML controlled materials can be easily extracted without destroying the device or charge; and

g. Individual USML controlled energetic materials in this entry, even when compounded with other materials, when not incorporated into explosive devices or charges controlled by this entry or 1C992.

(2) See also ECCNs 1C011, 1C018, 1C111, and 1C239 for additional controlled energetic materials. See ECCN1E001 for the ''development'' or ''production'' ''technology'' for the commodities controlled by ECCN 1A008, but not for explosives or commodities that are under the jurisdiction of U.S. Department of State, Directorate of Defense Trade Controls.

Related Definitions: N/A.

Items:

a. 'Shaped charges' having all of the following:

a.1. Net Explosive Quantity (NEQ) greater than 90 g; *and*

a.2. Outer casing diameter equal to or greater than 75 mm;

b. Linear shaped cutting charges having all of the following, and specially designed components therefor:

b.1. An explosive load greater than 40 g/m; *and*

b.2. A width of 10 mm or more;

c. Detonating cord with explosive core load greater than 64 g/m;

d. Cutters, other than those specified by 1A008.b, and severing tools, having a NEQ greater than 3.5 kg.

TECHNICAL NOTE: 'Shaped charges' are explosive charges shaped to focus the effects of the explosive blast.

NOTE: The only charges and devices specified in 1A008 are those containing ''explosives'' (see list of explosives in the Annex at the end of Category 1) and mixtures thereof.

1A101 Devices for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures, for applications usable in "missiles" and their subsystems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 1C101. For commodities that meet the definition of defense articles under 22 CFR 120.3 of the International Traffic in Arms Regulations (ITAR), see also 22 CFR 121.16, Item 17-Category II of the (ITAR), which describes similar commodities under the jurisdiction of the Department of State, Directorate of Defense Trade Controls.

Related Definitions: N/A

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

1A102 Resaturated pyrolized carbon-carbon components designed for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300km. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121).

1A202 Composite structures, other than those controlled by 1A002, in the form of tubes and having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) See ECCNs 1E201 (''use'') and 1E202 (''development'' and ''production'') for technology for items controlled by this entry. (2) Also see ECCNs 1A002, 1C010, 1C210, 9A010, and 9A110. (3) ''Composite'' structures specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. An inside diameter of between 75 mm and 400 mm; *and*

b. Made with any of the ''fibrous or filamentary materials'' specified in 1C010.a or .b or 1C210.a or with carbon prepreg materials specified in 1C210.c.

1A225 Platinized catalysts specially designed or prepared for promoting the hydrogen isotope exchange reaction between hydrogen and water for the recovery of tritium from heavy water or for the production of heavy water.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) See ECCNs 1E201 (''use'') and 1E202 (''development'' and ''production'') for technology for items controlled by this entry. (2) Equipment specially designed or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

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

1A226 Specialized packings, which may be used in separating heavy water from ordinary water, having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCNs 1E201 (''use'') and 1E202 (''development'' and ''production'') for technology for items controlled by this entry. (2) Equipment specially designed or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Made of phosphor bronze mesh chemically treated to improve wettability; *and*

b. Designed to be used in vacuum distillation towers.

1A227 High-density (lead glass or other) radiation shielding windows, having all of the following characteristics (see List of Items Controlled), and specially designed frames therefor.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCNs 1E201 (''use'') and 1E202 (''development'' and ''production'') for technology for items controlled by this entry. (2) Equipment specially designed or prepared for nuclear reactors and reprocessing facilities is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: In 1A227.a, the term ''cold area'' means the viewing area of the window exposed to the lowest level of radiation in the design application.

Items: a. A ''cold area'' greater than 0.09 m^2;

b. A density greater than 3 g/cm^3; and

c. A thickness of 100 mm or greater.

1A290 Depleted uranium (any uranium containing less than 0.711% of the isotope U–235) in shipments of more than 1,000 kilograms in the form of shielding contained in X-ray units, radiographic exposure or teletherapy devices, radioactive thermoelectric generators, or packaging for the transportation of radioactive materials.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) This entry does not control depleted uranium in fabricated forms for use in munitions. See 22 CFR part 121 for depleted uranium subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (2) Depleted uranium that is not fabricated for use in munitions or fabricated into commodities solely to take advantage of its high density (e.g., aircraft, ship, or other counterweights) or in the forms listed in this entry are subject to the export

licensing authority of the Nuclear Regulatory Commission. (See 10 CFR part 110.)

(3) See also 0C001

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1A984 Chemical agents, including tear gas formulation containing 1 percent or less of orthochlorobenzalmalononitrile (CS), or 1 percent or less of chloroacetophenone (CN) except in individual containers with a net weight of 20 grams or less; liquid pepper except when packaged in individual containers with a net weight of 3 ounces (85.05 grams) or less; smoke bombs; non-irritant smoke flares, canisters, grenades and charges; and other pyrotechnic articles having dual military and commercial use.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country chart
CC applies to entire entry	CC Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

1A985 Fingerprinting powders, dyes, and inks.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country chart
CC applies to entire entry	CC Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

1A995 Protective and detection equipment and components not specially designed for military use and not controlled by ECCN 1A004 or ECCN 2B351, as follows (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related controls: See ECCNs 1A004, 2B351, and 2B352.

Related Definitions: N/A

Items: a. Personal radiation monitoring dosimeters;

b. Equipment limited by design or function to protect against hazards specific to civil industries, such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or to the food industry.

NOTE: This entry (1A995) does not control items for protection against chemical or biological agents that are consumer goods, packaged for retail sale or personal use, or medical products, such as latex exam gloves, latex surgical gloves, liquid disinfectant soap, disposable surgical drapes, surgical gowns, surgical foot covers, and surgical masks. Such items are classified as EAR99.

1A999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT.

Control(s).

Country Chart.

AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See §742.19 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: N/A

Related Definitions: N/A

Items: a. Radiation detection, monitoring and measurement equipment, n.e.s.;

b. Radiographic detection equipment such as x-ray converters, and storage phosphor image plates.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

1B001 Equipment for the production or inspection of "composite" structures or laminates controlled by 1A002 or "fibrous or filamentary materials" controlled by 1C010, as follows (see List of Items Controlled), and specially designed components and accessories therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
MT applies to entire entry, except 1B001.d.4, e and f.	MT Column 1.
NOTE: MT applies to equipment in 1B001.d that meet or exceed the parameters of 1B101.	
NP applies to filament winding machines described in 1B001.a that are capable of winding cylindrical rotors having a diameter between 75 mm (3 in) and 400 mm (16 in) and lengths of 600 mm (24 in) or greater; AND coordinating and programming controls and precision mandrels for these filament winding machines.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A for MT and for 1B001.a; $5,000 for all other items

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCN 1D001 for software for items controlled by this entry and see ECCNs 1E001 (''development'' and ''production'') and 1E101 (''use'') for technology for items controlled by this entry. (2) Also see ECCNs 1B101 and 1B201.

Related Definitions: N/A

Items:

a. Filament winding machines, of which the motions for positioning, wrapping and winding fibers are coordinated and programmed in three or more 'primary servo positioning' axes, specially designed for the manufacture of ''composite'' structures or laminates, from ''fibrous or filamentary materials'';

b. Tape-laying machines, of which the motions for positioning and laying tape or sheets are coordinated and programmed in five or more 'primary servo positioning' axes, specially designed for the manufacture of ''composite'' airframe or ''missile'' structures;

c. Multidirectional, multidimensional weaving machines or interlacing machines, including adapters and modification kits, specially designed or modified for weaving, interlacing or braiding fibers for ''composite'' structures;

TECHNICAL NOTE: For the purposes of 1B001.c the technique of interlacing includes knitting.

d. Equipment specially designed or adapted for the production of reinforcement fibers, as follows:

d.1. Equipment for converting polymeric fibers (such as polyacrylonitrile, rayon, pitch or polycarbosilane) into carbon fibers or silicon carbide fibers, including special equipment to strain the fiber during heating;

d.2. Equipment for the chemical vapor deposition of elements or compounds, on heated filamentary substrates, to manufacture silicon carbide fibers;

d.3. Equipment for the wet-spinning of refractory ceramics (such as aluminum oxide);

d.4. Equipment for converting aluminum containing precursor fibers into alumina fibers by heat treatment;

e. Equipment for producing prepregs controlled by 1C010.e by the hot melt method;

f. Non-destructive inspection equipment specially designed for ''composite'' materials, as follows:

f.1. X-ray tomography systems for three dimensional defect inspection;

f.2. Numerically controlled ultrasonic testing machines of which the motions for positioning transmitters or receivers are simultaneously coordinated and programmed in four or more axes to follow the three dimensional contours of the component under inspection.

g. Tow-placement machines, of which the motions for positioning and laying tows or sheets are coordinated and programmed in two or more 'primary servo positioning' axes, specially designed for the manufacture of ''composite'' airframe or missile structures.

TECHNICAL NOTE: For the purpose of 1B001, 'primary servo positioning' axes control, under computer program direction, the position of the end effector (i.e., head) in space relative to the work piece at the correct orientation and direction to achieve the desired process.

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

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $5000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1B003 Tools, dies, molds or fixtures, for "superplastic forming" or "diffusion

bonding" titanium, aluminum or their alloys, specially designed for the manufacture of any of the following (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $5000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Tools in number; dies, molds, or fixtures in $ value

Related Controls: For specially designed production equipment of systems, sub-systems and components controlled by 9A005 to 9A009, 9A011, 9A101, 9A105 to 9A109, 9A111, and 9A116 to 9A120 usable in ''missiles'', see 9B115.

Related Definitions: N/A

Items: a. Airframe or aerospace structures;

b. ''Aircraft'' or aerospace engines; *or*

c. Specially designed components for structures specified by 1B003.a or for engines specified by 1B003.b.

1B018 Equipment on the Wassenaar Arrangement Munitions List.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to equipment for the ''production'' of rocket propellants.	MT Column 1.
RS applies to 1B018.a	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $3000 for 1B018.a for countries WITHOUT an ''X'' in RS Column 2 on the Country Chart contained in Supplement No. 1 to part 738 of the EAR;

$5000 for 1B018.b.

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: N/A

Related Definitions: N/A

Items: a. Equipment for the ''production'' of military explosives and solid propellants.

a.1. Complete installations;

a.2. Specialized components (for example, dehydration presses; extrusion presses for the extrusion of small arms, cannon and rocket propellants; cutting machines for the sizing of extruded propellants; sweetie barrels (tumblers) 6 feet and over in diameter and having over 500 pounds product capacity; and continuous mixers for solid propellants); or

a.3. Nitrators, continuous types; and

a.4. Specially designed parts and accessories therefor.

b. Environmental chambers capable of pressures below (10^{-4}) Torr, and specially designed components therefor.

1B101 Equipment, other than that controlled by 1B001, for the "production" of structural composites, fibers, prepregs or preforms, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems, as follows (see List of Items Controlled); and specially designed components, and accessories therefor.

LICENSE REQUIREMENTS

*Reason for Control:*MT, NP, AT

Control(s)	Country Chart
MT applies to entire entry	MT Column 1.
NP applies to filament winding machines described in 1B101.a that are capable of winding cylindrical rotors having a diameter between 75 mm (3 in.) and 400 mm (16 in.) and lengths of 600 mm (24 in.) or greater AND to coordinating and programming controls and precision mandrels for these filament winding machines.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See ECCN 1D101 for software for items controlled by this entry and see ECCNs 1E001 (''development'' and ''production'') and 1E101 (''use'') for technology for items controlled by this entry. Also see 1B201.

Related Definitions: Examples of components and accessories for the machines controlled by this entry are molds, mandrels, dies, fixtures and tooling for the preform pressing, curing, casting, sintering or bonding of composite structures, laminates and manufactures thereof.

Items: a. Filament winding machines or fiber placement machines, of which the motions for positioning, wrapping and winding fibers can be coordinated and programmed in three or more axes, designed to fabricate composite structures or laminates from fibrous or filamentary materials, and coordinating and programming controls;

b. Tape-laying machines of which the motions for positioning and laying tape and sheets can be coordinated and programmed

in two or more axes, designed for the manufacture of composite airframe and ''missile'' structures;

c. Equipment designed or modified for the ''production'' of ''fibrous or filamentary materials'' as follows:

c.1. Equipment for converting polymeric fibers (such as polyacrylonitrile, rayon or polycarbosilane) including special provision to strain the fiber during heating;

c.2. Equipment for the vapor deposition of elements or compounds on heated filament substrates; and

c.3. Equipment for the wet-spinning of refractory ceramics (such as aluminum oxide);

d. Equipment designed or modified for special fiber surface treatment or for producing prepregs and preforms controlled by 9A110.

NOTE: Equipment covered in 1B101.d includes but is not limited to, rollers, tension stretchers, coating equipment, cutting equipment and clicker dies.

1B102 Metal powder "production equipment," other than that specified in 1B002, and components as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number; components in $ value

Related Controls: 1.) See also 1B115.b.

Related Definitions: N/A

Items: a. Metal power ''production equipment usable for the ''production,'' in a controlled environment, of spherical or atomized materials specified in 1C011.a, 1C011.b, 1C111.a.1, 1C111.a.2, or on the U.S. Munitions List.

b. Specially designed components for ''production equipment'' specified in 1B002 or 1B102.a.

NOTE: 1B102 includes:

a. Plasma generators (high frequency arcjet) usable for obtaining sputtered or spherical metallic powders with organization of the process in an argon-water environment;

b. Electroburst equipment usable for obtaining sputtered or spherical metallic powders with organization of the process in an argon-water environment;

c. Equipment usable for the ''production'' of spherical aluminum powders by powdering a melt in an inert medium (*e.g.*, nitrogen).

1B115 "Equipment, other than that controlled in 1B002 or 1B102, for the "production" of propellant or propellant constituents, and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number; components in $ value

Related Controls: For the control of batch mixers, continuous mixers and fluid energy mills, see 1B117, 1B118 and 1B119.

Related Definitions: N/A

Items: a. ''Production equipment'' for the ''production'', handling or acceptance testing of liquid propellants or propellant constituents controlled by 1C011.a, 1C011.b, 1C111 or on the U.S. Munitions List;

b. ''Production equipment,'' for the production, handling, mixing, curing, casting, pressing, machining, extruding or acceptance testing of solid propellants or propellant constituents described in 1C011.a, 1C011.b or 1C111, or on the U.S. Munitions List.

NOTE: 1B115.b does not control batch mixers, continuous mixers or fluid energy mills. For the control of batch mixers, continuous mixers and fluid energy mills see 1B117, 1B118, and 1B119.

NOTE 1: [Reserved]

NOTE 2: 1B115 does not control equipment for the ''production,'' handling and acceptance testing of boron carbide.

1B116 Specially designed nozzles for producing pyrolitically derived materials formed on a mold, mandrel or other substrate from precursor gases which decompose in the 1,573 K (1,300 °C) to 3,173 K (2,900 °C) temperature range at pressures of 130 Pa to 20 kPa.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1B117 "Batch mixers with provision for mixing under vacuum in the range from zero to 13.326 kPa and with temperature control capability of the mixing chamber and having all of the following characteristics (see List of Items Controlled), and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: MT, AT.

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; components in $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. A total volumetric capacity of 110 liters (30 gallons) or more; and
b. At least one mixing/kneading shaft mounted off center.

1B118 Continuous mixers with provision for mixing under vacuum in the range from zero to 13.326 kPa and with temperature control capability of the mixing chamber and having all of the following characteristics (see List of Items Controlled), and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; components in $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. Two or more mixing/kneading shafts; or
b. A single rotating shaft which oscillates and has kneading teeth/pins on the shaft as well as inside the casing of the mixing chamber.

1B119 Fluid energy mills usable for grinding or milling propellant or propellant constituents specified in 1C011.a, 1C011.b or 1C111, or on the U.S. Munitions List, and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; components in $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1B201 Filament winding machines, other than those controlled by ECCN 1B001 or 1B101, and related equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCN 1D201 for software for items controlled by this entry and see ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. Also see ECCN 1E203 for technology for the ''development'' of software controlled by ECCN 1D201.
Related Definitions: N/A
Items: a. Filament winding machines having all of the following characteristics:
a.1. Having motions for positioning, wrapping, and winding fibers coordinated and programmed in two or more axes;
a.2. Specially designed to fabricate composite structures or laminates from ''fibrous or filamentary materials''; *and*
a.3. Capable of winding cylindrical rotors of diameter between 75 mm (3 in.) and 400 mm (16 in.) and lengths of 600 mm (24 in.) or greater;
b. Coordinating and programming controls for filament winding machines controlled by 1B201.a;
c. Precision mandrels for filament winding machines controlled by 1B201.a.

1B225 Electrolytic cells for fluorine production with a production capacity greater than 250 g of fluorine per hour.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1B226 Electromagnetic isotope separators designed for, or equipped with, single or multiple ion sources capable of providing a total ion beam current of 50 mA or greater.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Electromagnetic isotope separators specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
ECCN Controls: This entry includes separators capable of enriching stable isotopes and separators with the ion sources and collectors both in the magnetic field and those configurations in which they are external to the field.
Items: The list of items controlled is contained in the ECCN heading.

1B227 Ammonia synthesis converters or ammonia synthesis units in which the synthesis gas (nitrogen and hydrogen) is withdrawn from an ammonia/hydrogen high-pressure exchange column and the synthesized ammonia is returned to that column.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Equipment specially designed or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1B228 Hydrogen-cryogenic distillation columns having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Equipment specially designed or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: ''Fine-grain stainless steels'' in this entry are defined to be fine-grain austenitic stainless steels with an ASTM (or equivalent standard) grain size number of 5 or greater
Items: a. Designed to operate with internal temperatures of 35 K (−238 °C) or less;
b. Designed to operate at an internal pressure of 0.5 to 5 MPa (5 to 50 atmospheres);
c. Constructed of ''fine-grain stainless steels'' of the 300 series with low sulphur content or equivalent cryogenic and H_2-compatible materials; *and*
d. With internal diameters of 1 m or greater and effective lengths of 5 m or greater.

1B229 Water-hydrogen sulphide exchange tray columns and "internal contactors", as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Equipment specially designed or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: The ''internal contactors'' controlled by 1B229.b are segmented trays that have an effective assembled diameter of 1.8 m (6 ft.) or greater, are designed to facilitate countercurrent contacting, and are constructed of stainless steels with a carbon content of 0.03% or less. These may be sieve trays, valve trays, bubble cap trays, or turbogrid trays.
Items: a. Water-hydrogen sulphide exchange tray columns, having all of the following characteristics:
a.1. Can operate at pressures of 2 MPa or greater;
a.2. Constructed of carbon steel having an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; *and*
a.3. With a diameter of 1.8 m (6 ft.) or greater;
b. ''Internal contactors'' for the water-hydrogen sulphide exchange tray columns controlled by 1B229.a.

1B230 Pumps capable of circulating solutions of concentrated or dilute potassium amide catalyst in liquid ammonia (KNH_2/NH_3), having all of the following characteristics (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Equipment specially designed or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: a. Airtight (i.e., hermetically sealed);
b. A capacity greater than 8.5 m^3/h; *and*
c. Either of the following characteristics:
c.1. For concentrated potassium amide solutions (1% or greater), an operating pressure of 1.5 to 60 MPa (15–600 atmospheres); *or*
c.2. For dilute potassium amide solutions (less than 1%), an operating pressure of 20 to 60 MPa (200–600 atmospheres).

1B231 Tritium facilities or plants, and equipment therefor, as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Tritium, tritium compounds, and mixtures containing tritium are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: a. Facilities or plant for the production, recovery, extraction, concentration, or handling of tritium;
b. Equipment for tritium facilities or plant, as follows:
b.1. Hydrogen or helium refrigeration units capable of cooling to 23 K (−250 C) or less, with heat removal capacity greater than 150 watts; *or*
b.2. Hydrogen isotope storage and purification systems using metal hydrides as the storage, or purification medium.

1B232 Turboexpanders or turboexpander-compressor sets having both of the following characteristics (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A

LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Equipment specially designed or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: a. Designed for operation with an outlet temperature of 35 K (−238 °C) or less; *and*
b. Designed for a throughput of hydrogen gas of 1,000 kg/h or greater.

1B233 Lithium isotope separation facilities or plants, and equipment therefor, as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

Control(s)	Country Chart
NP applies to 1B233.b	NP Column 1
AT applies to 1B233.b	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) See ECCN 1E001 (''development'' and ''production'') and ECCN 1E201 (''use'') for technology for items described in this entry. (2) Facilities and plants described in 1B233.a are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).
Related Definitions: N/A
Items: a. Facilities or plants for the separation of lithium isotopes;
b. Equipment for the separation of lithium isotopes, as follows:
b.1. Packed liquid-liquid exchange columns specially designed for lithium amalgams;
b.2. Mercury and/or lithium amalgam pumps;
b.3. Lithium amalgam electrolysis cells;
b.4. Evaporators for concentrated lithium hydroxide solution.

1B999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: AT, RS.

Control(s)	Country chart
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See §742.19 of the EAR for additional information.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: See also 1B001, 1B101, 1B201, 1B225 and 1D999.
Related Definitions: N/A
Items: a. Electrolytic cells for fluorine production, n.e.s.;
b. Particle accelerators;
c. Industrial process control hardware/systems designed for power industries, n.e.s.;
d. Freon and chilled water cooling systems capable of continuous cooling duties of 100,000 BTU/hr (29.3 kW) or greater;
e. Equipment for the production of structural composites, fibers, prepregs and preforms, n.e.s.

C. MATERIALS

TECHNICAL NOTE: Metals and alloys: Unless provision to the contrary is made, the words ''metals'' and ''alloys'' in 1C001 to 1C012 cover crude and semi-fabricated forms, as follows:
Crude forms: Anodes, balls, bars (including notched bars and wire bars), billets, blocks, blooms, brickets, cakes, cathodes, crystals, cubes, dice, grains, granules, ingots, lumps, pellets, pigs, powder, rondelles, shot, slabs, slugs, sponge, sticks;
Semi-fabricated forms (whether or not coated, plated, drilled or punched):

a. Wrought or worked materials fabricated by rolling, drawing, extruding, forging, impact extruding, pressing, graining, atomizing, and grinding, i.e.: angles, channels, circles, discs, dust, flakes, foils and leaf, forging, plate, powder, pressings and stampings, ribbons, rings, rods (including bare welding rods, wire rods, and rolled wire), sections, shapes, sheets, strip, pipe and tubes (including tube rounds, squares, and hollows), drawn or extruded wire;

b. Cast material produced by casting in sand, die, metal, plaster or other types of molds, including high pressure castings, sintered forms, and forms made by powder metallurgy.

The object of the control should not be defeated by the export of non-listed forms alleged to be finished products but representing in reality crude forms or semi-fabricated forms.

1C001 Materials specially designed for use as absorbers of electromagnetic waves, or intrinsically conductive polymers, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship any item in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Kilograms.

Related Controls: See also 1C101.

Related Definitions: N/A

Items: a. Materials for absorbing frequencies exceeding 2×10^8 Hz but less than 3×10^{12} Hz.

NOTE 1: 1C001.a does not control:

a. Hair type absorbers, constructed of natural or synthetic fibers, with non-magnetic loading to provide absorption;

b. Absorbers having no magnetic loss and whose incident surface is non-planar in shape, including pyramids, cones, wedges and convoluted surfaces;

c. Planar absorbers, having all of the following:

1. Made from any of the following:

a. Plastic foam materials (flexible or non-flexible) with carbon-loading, or organic materials, including binders, providing more than 5% echo compared with metal over a bandwidth exceeding ±15% of the center frequency of the incident energy, and not capable of withstanding temperatures exceeding 450 K (177 °C); *or*

b. Ceramic materials providing more than 20% echo compared with metal over a bandwidth exceeding ±15% of the center frequency of the incident energy, and not capable of withstanding temperatures exceeding 800 K (527 °C);

TECHNICAL NOTE: Absorption test samples for 1C001.a. Note 1.c.1 should be a square at least 5 wavelengths of the center frequency on a side and positioned in the far field of the radiating element.

2. Tensile strength less than 7×10^6 N/m^2; *and*

3. Compressive strength less than 14×10^6 N/m^2;

d. Planar absorbers made of sintered ferrite, having all of the following:

1. A specific gravity exceeding 4.4; *and*

2. A maximum operating temperature of 548 K (275 °C).

NOTE 2: Nothing in Note 1 releases magnetic materials to provide absorption when contained in paint.

b. Materials for absorbing frequencies exceeding 1.5×10^{14} Hz but less than 3.7×10^{14} Hz and not transparent to visible light;

c. Intrinsically conductive polymeric materials with a 'bulk electrical conductivity' exceeding 10,000 S/m (Siemens per meter) or a 'sheet (surface) resistivity' of less than 100 ohms/square, based on any of the following polymers:

c.1. Polyaniline;

c.2. Polypyrrole;

c.3. Polythiophene;

c.4. Poly phenylene-vinylene; *or*

c.5. Poly thienylene-vinylene.

TECHNICAL NOTE: 'Bulk electrical conductivity' and 'sheet (surface) resistivity' should be determined using ASTM D–257 or national equivalents.

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.

LICENSE EXCEPTIONS

LVS: $3,000; N/A for NP

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms.

Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Also see ECCN 1C202. (3) Aluminum alloys and titanium alloys in

physical forms and finished products specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definition: N/A

Items:

NOTE: 1C002 does not control metal alloys, metal alloy powder and 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% by weight aluminum, a maximum of 38% by weight aluminum and at least one additional alloying element;

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

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

b.1. Nickel alloys having any of the following:

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 having any of the following:

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 having any of the following:

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 having any of the following:

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

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

b.5. Magnesium alloys having all the following:

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:

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 μm 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);

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''; *and*

c.3. Capable of forming materials controlled by 1C002.a or 1C002.b;

d. Alloyed materials, having all the following:

d.1. Made from any of the composition systems specified by 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''.

1C003 Magnetic metals, of all types and of whatever form, having any of the following (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: N/A
Related Definitions: N/A
Items:

a. Initial relative permeability of 120,000 or more and a thickness of 0.05 mm or less;

TECHNICAL NOTE: Measurement of initial relative permeability must be performed on fully annealed materials.

b. Magnetostrictive alloys having any of the following:

b.1. A saturation magnetostriction of more than 5×10^{-4}; or

b.2. A magnetomechanical coupling factor (k) of more than 0.8; or

c. Amorphous or 'nanocrystalline' alloy strips, having all of the following:

c.1. A composition having a minimum of 75% by weight of iron, cobalt or nickel;

c.2. A saturation magnetic induction (B_s) of 1.6 T or more; and

c.3. Any of the following:

c.3.a. A strip thickness of 0.02 mm or less; or

c.3.b. An electrical resistivity of 2×10^{-4}; ohm cm or more.

TECHNICAL NOTE: 'Nanocrystalline' materials in 1C003.c are those materials having a crystal grain size of 50 nm or less, as determined by X-ray diffraction.

1C004 Uranium titanium alloys or tungsten alloys with a "matrix" based on iron, nickel or copper, having all of the following (*see* List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $3000
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See also 1C117 and 1C226.
Related Definitions: N/A
Items: a. A density exceeding 17.5 g/cm^3;

b. An elastic limit exceeding 880 MPa;

c. An ultimate tensile strength exceeding 1,270 MPa; *and*

d. An elongation exceeding 8%.

1C005 "Superconductive" "composite" conductors in lengths exceeding 100 m or with a mass exceeding 100 g, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $1500
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: N/A
Related Definitions: N/A
Items:

a. ''Superconductive'' ''composite'' conductors containing one or more niobium-titanium 'filaments', having all of the following:

a.1. Embedded in a ''matrix'' other than a copper or copper-based mixed ''matrix''; and

a.2. Having a cross-section area less than 0.28×10^{-4} mm^2 (6 μm in diameter for circular 'filaments');

b. ''Superconductive'' ''composite'' conductors consisting of one or more ''superconductive'' 'filaments' other than niobium-titanium, having all of the following:

b.1. A ''critical temperature'' at zero magnetic induction exceeding 9.85 K (−263.31 °C); and

b.2. Remaining in the ''superconductive'' state at a temperature of 4.2 K (−268.96 °C) when exposed to a magnetic field oriented in any direction perpendicular to the longitudinal axis of conductor and corresponding to a magnetic induction of 12 T with critical current density exceeding 1750 A/mm^2 on overall cross-section of the conductor.

c. ''Superconductive'' ''composite'' conductors consisting of one or more ''superconductive'' 'filaments' which remain ''superconductive'' above 115 K (−158.16 °C).

TECHNICAL NOTE: For the purpose of 1C005, 'filaments' may be in wire, cylinder, film, tape or ribbon form.

1C006 Fluids and lubricating materials, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $3000
GBS: Yes for 1C006.d
CIV: Yes for 1C006.d
LIST OF ITEMS CONTROLLED
Unit: Barrels (55 U.S. gallons/209 liters).
Related Controls: See also 1C996.
Related Definitions: N/A
Items:

a. Hydraulic fluids containing, as their principal ingredients, any of the following:

a.1. Synthetic 'silahydrocarbon oils', having all of the following:

TECHNICAL NOTE: For the purpose of 1C006.a.1, 'silahydrocarbon oils' contain exclusively silicon, hydrogen and carbon.

a.1.a. A 'flash point' exceeding 477 K (204 °C);

a.1.b. A 'pour point' at 239 K (−34 °C) or less;

a.1.c. A 'viscosity index' of 75 or more; and

a.1.d. A 'thermal stability' at 616 K (343 °C); or

a.2. 'Chlorofluorocarbons', having all of the following:

TECHNICAL NOTE: For the purpose of 1C006.a.2, 'chlorofluorocarbons' contain exclusively carbon, fluorine and chlorine.

a.2.a. No 'flash point';

a.2.b. An 'autogenous ignition temperature' exceeding 977 K (704 °C);

a.2.c. A 'pour point' at 219 K (−54 °C) or less;

a.2.d. A 'viscosity index' of 80 or more; and

a.2.e. A boiling point at 473 K (200 °C) or higher;

TECHNICAL NOTE: For the purpose of 1C006.a the following determinations apply:

1. 'Flash point' is determined using the Cleveland Open Cup Method described in ASTM D–92 or national equivalents;

2. 'Pour point' is determined using the method described in ASTM D–97 or national equivalents;

3. 'Viscosity index' is determined using the method described in ASTM D–2270 or national equivalents;

4. 'Thermal stability' is determined by the following test procedure or national equivalents:

Twenty ml of the fluid under test is placed in a 46 ml type 317 stainless steel chamber containing one each of 12.5 mm (nominal) diameter balls of M–10 tool steel, 52100 steel and naval bronze (60% Cu, 39% Zn, 0.75% Sn);

The chamber is purged with nitrogen, sealed at atmospheric pressure and the temperature raised to and maintained at 644 ±6 K (371 ±6 °C) for six hours;

The specimen will be considered thermally stable if, on completion of the above procedure, all of the following conditions are met:

a. The loss in weight of each ball is less than 10 mg/mm^2 of ball surface;

b. The change in original viscosity as determined at 311 K (38 °C) is less than 25%; and

c. The total acid or base number is less than 0.40;

5. 'Autogenous ignition temperature' is determined using the method described in ASTM E–659 or national equivalents.

b. Lubricating materials containing, as their principal ingredients, any of the following:

b.1. Phenylene or alkylphenylene ethers or thio-ethers, or their mixtures, containing more than two ether or thio-ether functions or mixtures thereof; or

b.2. Fluorinated silicone fluids with a kinematic viscosity of less than 5,000 mm^2/s (5,000 centistokes) measured at 298 K (25 °C);

c. Damping or flotation fluids having all of the following:

c.1. Purity exceeding 99.8%;

c.2. Containing less than 25 particles of 200 µm or larger in size per 100 ml; and

c.3. Made from at least 85% of any of the following:

c.3.a. Dibromotetrafluoroethane (CAS 25497 30-7, 124-73-2, 27336-23- 8);

c.3.b. Polychlorotrifluoroethylene (oily and waxy modifications only); *or*

c.3.c. Polybromotrifluoroethylene;

d. Fluorocarbon electronic cooling fluids having all of the following:

NOTE: *1C006.d does not apply to materials specified and packaged as medical products.*

d.1. Containing 85% by weight or more of any of the following, or mixtures thereof:

d.1.a. Monomeric forms of perfluoropolyalkylether- triazines or perfluoroaliphatic-ethers;

d.1.b. Perfluoroalkylamines;

d.1.c. Perfluorocycloalkanes; or

d.1.d. Perfluoroalkanes;

d.2. Density at 298 K (25 °C) of 1.5 g/ml or more;

d.3. In a liquid state at 273 K (0 °C); and

d.4. Containing 60% or more by weight of fluorine;

1C007 Ceramic base materials, non-"composite" ceramic materials, ceramic-"matrix" "composite" materials and precursor materials, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
MT applies to items in 1C007.d and .f when the dielectric constant is less than 6 at any frequency from 100 MHz to 100 GHz for use in "missile" radomes.	MT Column 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.

LICENSE EXCEPTIONS

LVS: $5000, except N/A for MT and for 1C007.e

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship any item in 1C007.c or d to any of the eight destinations listed in §740.20(c)(2) of the EAR.

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 12.7×10^3 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 (CAS 1344–28–1); *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.

1C008 Non-fluorinated polymeric substances as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $200

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: See also 1A003.

Related Definitions: N/A

Items: a. Non-fluorinated polymeric substances, as follows:

a. Imides as follows:

a.1. Bismaleimides;

a.2. Aromatic polyamide-imides (PAI) having a 'glass transition temperature (T_g)' exceeding 563 K (290 °C);

a.3. Aromatic polyimides;

a.4. Aromatic polyetherimides having a 'glass transition temperature (Tg)' exceeding 563 K (290 °C);

NOTE: 1C008.a controls the substances in liquid or solid ''fusible'' form, including resin, powder, pellet, film, sheet, tape, or ribbon.

N.B.: For non-''fusible'' aromatic polyimides in film, sheet, tape, or ribbon form, see ECCN 1A003.

b. Thermoplastic liquid crystal copolymers having a heat distortion temperature exceeding 523 K (250 °C) measured according to ISO 75–2 (2004), method A, or national equivalents, with a load of 1.80 N/mm^2 and composed of:

b.1. Any of the following compounds:

b.1.a. Phenylene, biphenylene or naphthalene; *or*

b.1.b. Methyl, tertiary-butyl or phenyl substituted phenylene, biphenylene or naphthalene; *and*

b.2. Any of the following acids:

b.2.a. Terephthalic acid (CAS 100–21–0);

b.2.b. 6-hydroxy-2 naphthoic acid (CAS 16712–64–4); *or*

b.2.c. 4-hydroxybenzoic acid (CAS 99–96–7);

c. [Reserved]

d. Polyarylene ketones;

e. Polyarylene sulphides, where the arylene group is biphenylene, triphenylene or combinations thereof;

f. Polybiphenylenethersulphone having a 'glass transition temperature (Tg)' exceeding 563 K (290 °C).

TECHNICAL NOTE: The 'glass transition temperature (T_g)' for 1C008 materials is determined using the method described in ISO 11357–2 (1999) or national equivalents. In addition, for 1C008.a.2 materials,'glass transition temperature (T_g)' is determined on a PAI test specimen having initially been cured at a minimum temperature of 310 °C for a minimum of 15 minutes.

1C009 Unprocessed fluorinated compounds as follows (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $5000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See also 1A001.
Related Definitions: N/A
Items: a. Copolymers of vinylidene fluoride having 75% or more beta crystalline structure without stretching;
b. Fluorinated polyimides containing 10% by weight or more of combined fluorine;
c. Fluorinated phosphazene elastomers containing 30% by weight or more of combined fluorine.

1C010 "Fibrous or filamentary 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 1C010.a (aramid "fibrous or filamentary materials", .b (carbon "fibrous and filamentary materials"), and e.1 for "fibrous and filamentary materials" that meet or exceed the control criteria of ECCN 1C210.	NP Column 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.

LICENSE EXCEPTIONS
LVS: $1500, N/A for NP
GBS: N/A
CIV: N/A
STA: License Exception STA may not be used to ship any item in 1C010.c or d to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Also see ECCNs 1C210 and 1C990. (3) See also 9C110 for material not controlled by 1C010.e, as defined by notes 1 or 2.
Related Definitions: (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 ((23±2) C) and a relative humidity of (50±5)%
Items:
a. Organic ''fibrous or filamentary materials'', having all of the following:
a.1. ''Specific modulus'' exceeding 12.7×10^6 m; and
a.2. ''Specific tensile strength'' exceeding 23.5×10^4 m;
NOTE: 1C010.a does not control polyethylene.
b. Carbon ''fibrous or filamentary materials'', having all of the following:
b.1. ''Specific modulus'' exceeding 14.65×10^6 m; *and*
b.2. ''Specific tensile strength'' exceeding 26.82×10^4 m;
NOTE: 1C010.b does not control:
a. ''Fibrous or filamentary materials'', for the repair of ''civil aircraft'' structures or laminates, having all of the following:
1. An area not exceeding 1 m^2;
2. A length not exceeding 2.5 m; and
3. A width exceeding 15 mm.
b. Mechanically chopped, milled or cut carbon ''fibrous or filamentary materials'' 25.0 mm or less in length.
TECHNICAL NOTE: Properties for materials described in 1C010.b should be determined using SACMA recommended methods SRM 12 to 17, ISO 10618 (2004) 10.2.1 Method A or national equivalent tow tests, and based on lot average.
c. Inorganic ''fibrous or filamentary materials'', having all of the following:
c.1. ''Specific modulus'' exceeding 2.54×10^6 m; *and*
c.2. Melting, softening, decomposition or sublimation point exceeding 1,922 K (1,649 °C) in an inert environment;
NOTE: 1C010.c does not control:
a. Discontinuous, multiphase, polycrystalline alumina fibers in chopped fiber or random mat form, containing 3% by weight or more silica, with a ''specific modulus'' of less than 10×10^6 m;
b. Molybdenum and molybdenum alloy fibers;
c. Boron fibers;
d. Discontinuous ceramic fibers with a melting, softening, decomposition or sublimation point lower than 2,043 K (1,770 °C) in an inert environment.
d. ''Fibrous or filamentary materials'', having any of the following:
d.1. Composed of any of the following:
d.1.a. Polyetherimides controlled by 1C008.a; or
d.1.b. Materials controlled by 1C008.b to 1C008.f; or
d.2. Composed of materials controlled by 1C010.d.1.a or 1C010.d.1.b and ''commingled'' with other fibers controlled by 1C010.a, 1C010.b or 1C010.c;
e. Fully or partially resin-impregnated or pitch-impregnated ''fibrous or filamentary materials'' (prepregs), metal or carbon-coated ''fibrous or filamentary materials'' (preforms) or ''carbon fiber preforms'', having all of the following:
e.1. Having any of the following:
e.1.a. Inorganic ''fibrous or filamentary materials'' controlled by 1C010.c; or
e.1.b. Organic or carbon ''fibrous or filamentary materials'', having all of the following:

e.1.b.1. ''Specific modulus'' exceeding 10.15×10^6 m; *and*

e.1.b.2 ''Specific tensile strength'' exceeding 17.7×10^4 m; *and*

e.2. Having any of the following:

e.2.a. Resin or pitch controlled by 1C008 or 1C009.b;

e.2.b. 'Dynamic Mechanical Analysis glass transition temperature (DMA T_g)' equal to or exceeding 453 K (180 °C) and having a phenolic resin; *or*

e.2.c. 'Dynamic Mechanical Analysis glass transition temperature (DMA T_g)' equal to or exceeding 505 K (232 °C) and having a resin or pitch, not specified by 1C008 or 1C009.b, and not being a phenolic resin;

NOTE 1: Metal or carbon-coated ''fibrous or filamentary materials'' (preforms) or ''carbon fiber preforms'', not impregnated with resin or pitch, are specified by ''fibrous or filamentary materials'' in 1C010.a, 1C010.b or 1C010.c.

NOTE 2: 1C010.e does not apply to:

a. Epoxy resin ''matrix'' impregnated carbon ''fibrous or filamentary materials'' (prepregs) for the repair of ''civil aircraft'' structures or laminates, having all of the following:

1. An area not exceeding 1 m^2;

2. A length not exceeding 2.5 m; *and*

3. A width exceeding 15 mm;

b. Fully or partially resin-impregnated or pitch-impregnated mechanically chopped, milled or cut carbon ''fibrous or filamentary materials'' 25.0 mm or less in length when using a resin or pitch other than those specified by 1C008 or 1C009.b.

TECHNICAL NOTE: The 'Dynamic Mechanical Analysis glass transition temperature (DMA T_g)' for materials controlled by 1C010.e is determined using the method described in ASTM D 7028–07, or equivalent national standard, on a dry test specimen. In the case of thermoset materials, degree of cure of a dry test specimen shall be a minimum of 90% as defined by ASTM E 2160 04 or equivalent national standard.

1C011 Metals and compounds, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	*Country chart*
NS applies to entire entry	NS Column 1
MT applies to 1C011.a	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) See also 1C018 and 1C111.

(2.) The following are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR 121.1 Category V): a) Materials controlled by 1C011.a, and metal fuels in particle form, whether spherical, atomized, spheroidal, flaked or ground, manufactured from material consisting of 99 percent or more of items controlled by 1C011.b; and b) Metal powders mixed with other substances to form a mixture formulated for military purposes.

Related Definitions: N/A

Items:

a. Metals in particle sizes of less than 60 μm whether spherical, atomized, spheroidal, flaked or ground, manufactured from material consisting of 99% or more of zirconium, magnesium and alloys thereof;

TECHNICAL NOTE: The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.

NOTE: The metals or alloys specified by 1C011.a also refer to metals or alloys encapsulated in aluminum, magnesium, zirconium or beryllium.

b. Boron or boron alloys, with a particle size of 60 μm or less, as follows:

b.1. Boron with a purity of 85% by weight or more;

b.2. Boron alloys with a boron content of 85% by weight or more;

NOTE: The metals or alloys specified by 1C011.b also refer to metals or alloys encapsulated in aluminum, magnesium, zirconium or beryllium.

c. Guanidine nitrate (CAS 506–93–4);

d. Nitroguanidine (NQ) (CAS 556–88–7).

1C012 Materials, as Follows (See List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control:

Control(s): Items described in 1C012 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110, item 9A)).

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship any item in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 0C002.

Related Definitions: These materials are typically used for nuclear heat sources.

Items:

a. Plutonium in any form with a plutonium isotopic assay of plutonium-238 of more than 50% by weight;

NOTE: 1C012.a does not control:

a. Shipments with a plutonium content of 1 g or less;

b. Shipments of 3 ''effective grams'' or less when contained in a sensing component in instruments.

b. ''Previously separated'' neptunium-237 in any form.

NOTE: 1C012.b does not control shipments with a neptunium-237 content of 1 g or less.

1C018 Commercial Charges and Devices Containing Energetic Materials on the Wassenaar Arrangement Munitions List and Certain Chemicals as Follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT, UN

Control(s)	Country chart
NS applies to entire entry, except as noted in 1C018.m.	NS Column 1.
MT applies to 1C018.m, except as noted therein.	MT Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $3000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number.

Related Controls: (1) Explosive devices or charges in paragraphs .c through .k of this entry that utilize USML controlled energetic materials (See 22 CFR 121.1 Category V) are subject to the licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls if they have been specifically designed, developed, configured, adapted, or modified for a military application. (2) With the exception of slurries if the USML controlled materials utilized in devices and charges controlled by paragraphs .c through .k of this entry can be easily extracted without destroying the device or charge, then they are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (3) Commercial prefabricated slurries and emulsions containing greater than 35% of USML controlled energetic materials are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (4) The individual USML controlled energetic materials in paragraphs .c through .k of this entry, even when compounded with other materials, remain subject to the export licensing authority of the Department of State when not incorporated into explosive devices or charges controlled by this entry or 1C992. (5) The chemicals in paragraphs .l and .m of this entry, when incorporated into items listed on the United States Munitions List, become subject to the licensing jurisdiction of the U.S. Department of State, Directorate of Defense Trade Controls. (6) See also ECCNs 1C011, 1C111, and 1C239 for additional controlled energetic materials. (7) See ECCN 1C238 for additional controls on chlorine trifluoride (ClF_3). (8) See ECCN 1A008 for shaped charges, detonating cord, and cutters and severing tools. (9) See ECCN1E001 for the ''development'' or ''production'' ''technology'' for the commodities controlled by ECCN 1C018, but not explosives or energetic materials that are under the jurisdiction of U.S. Department of State, Directorate of Defense Trade Controls.

Related Definitions: (1) For purposes of this entry, the term ''controlled materials'' means controlled energetic materials (*see* ECCNs 1C011, 1C111, 1C239 and 22 CFR 121.1 Category V). (2) For purposes of this entry, the mass of aluminum powder, potassium perchlorate, and any of the substances listed in the note to the USML (*see* 22 CFR 121.1 Category V) (such as ammonium pictrate, black powder, etc.) contained in commercial explosive devices and in the charges are omitted when determining the total mass of controlled material.

Items: a. [Reserved]

b. Shock tubes containing greater than 0.064 kg per meter (300 grains per foot), but not more than 0.1 kg per meter (470 grains per foot) of controlled materials;

c. Cartridge power devices containing greater than 0.70 kg, but not more than 1.0 kg of controlled materials;

d. Detonators (electric or nonelectric) and assemblies thereof containing greater than 0.01 kg, but not more than 0.1 kg of controlled materials;

e. Igniters containing greater than 0.01 kg, but not more than 0.1 kg of controlled materials;

f. Oil well cartridges containing greater than 0.015 kg, but not more than 0.1 kg of controlled materials;

g. Commercial cast or pressed boosters containing greater than 1.0 kg, but not more than 5.0 kg of controlled materials;

h. Commercial prefabricated slurries and emulsions containing greater than 10 kg and less than or equal to thirty-five percent by weight of USML controlled materials;

i. [Reserved]

j. Pyrotechnic devices when designed exclusively for commercial purposes (e.g., theatrical stages, motion picture special effects, and fireworks displays), and containing greater than 3.0 kg, but not more than 5.0 kg of controlled materials; or

k. Other commercial explosive devices and charges, not controlled by 1C018.c through .g above, when used for commercial applications and containing greater than 1.0 kg, but not more than 5.0 kg of controlled materials.

l. Propyleneimine (2-methylaziridine) (CAS 75–55–8); or

m. Any oxidizer or mixture thereof that is a compound composed of fluorine and one or more of the following—other halogens, oxygen, or nitrogen.

NOTE: Nitrogen trifluoride (NF_3) in a gaseous state is controlled by ECCN 1C992 and not by 1C018.

NOTE: National security is not a reason for control for chlorine trifluoride.

NOTE: If a chemical in paragraphs .1 or .m of 1C018 is incorporated into a commercial charge or device described in paragraphs .c through .k of ECCN 1C018 or in 1C992, the classification of the commercial charge or device applies to the item.

1C101 Materials for Reduced Observables such as Radar Reflectivity, Ultraviolet/Infrared Signatures and Acoustic Signatures (i.e., Stealth Technology), Other than Those Controlled by 1C001, for applications usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300km, and their subsystems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) Materials controlled by this entry include structural materials and coatings (including paints), specially designed for reduced or tailored reflectivity or emissivity in the microwave, infrared or ultraviolet spectra. (2) This entry does not control coatings (including paints) when specially used for the thermal control of satellites. (3) For commodities that meet the definition of defense articles under 22 CFR 120.3 of the International Traffic in Arms Regulations (ITAR), see 22 CFR 121.16, Item 17-Category II of the (ITAR), which describes similar commodities under the jurisdiction of the Department of State, Directorate of Defense Trade Controls.

Related Definitions: N/A

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

1C102 Resaturated pyrolized carbon-carbon materials designed for space launch vehicles specified in 9A004 or sounding rockets specified in 9A104. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

1C107 Graphite and Ceramic Materials, Other Than Those Controlled by 1C007, Which Can be Machined to Any of the Following Products as Follows (See List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms.

Related Controls: (1) See also 0C005, 1C004, and 1C298. (2) For commodities that meet the definition of defense articles under 22 CFR 120.3 of the ITAR, see 22 CFR 121.16, Item 8-Category II of the International Traffic in Arms Regulations (ITAR), which describes similar commodities under the jurisdiction of the Department of State, Directorate of Defense Trade Controls.

Related Definitions: N/A

Items: a. Fine grain graphites with a bulk density of 1.72 g/cm^3 or greater, measured at 15 °C, and having a grain size of 100 micrometers or less, usable for rocket nozzles and reentry vehicle nose tips as follows:

a.1. Cylinders having a diameter of 120 mm or greater and a length of 50 mm or greater;

a.2. Tubes having an inner diameter of 65 mm or greater and a wall thickness of 25 mm or greater and a length of 50 mm or greater;

a.3. Blocks having a size of 120 mm × 120 mm × 50 mm or greater.

b. Pyrolytic or fibrous reinforced graphites, usable for rocket nozzles and reentry vehicle nose tips;

c. Ceramic composite materials (dielectric constant is less than 6 at any frequency from 100 MHz to 100 GHz) for use in radomes useable in rockets, missiles, and unmanned aerial vehicles capable of achieving a ''range'' equal to or greater than 300 km; *or*

d. Silicon-Carbide materials, useable in rockets, missiles, and unmanned aerial vehicles capable of achieving a ''range'' equal to or greater than 300 km, as follows:

d.1. Bulk machinable silicon-carbide reinforced unfired ceramic, usable for nose tips.

d.2. Reinforced silicon-carbide ceramic composites usable for nose tips, re-entry vehicles, nozzle flaps.

1C111 Propellants and constituent chemicals for propellants, other than those specified in 1C011, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms.
Related Controls: (1) Butacene as defined by 1C111.c.1 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR 121.12(b)(6), other ferrocene derivatives). (2) See 1C018 for controls on oxidizers that are composed of fluorine and one or more of the following—other halogens, oxygen, or nitrogen. Solid oxidizer substances are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (See 22 CFR 121.1 Category V). (3) See 1C011.b for controls on boron and boron alloys.
Related Definitions: N/A
Items:
a. Propulsive substances:
a.1. Spherical aluminum powder, other than that specified on the U.S. Munitions List, with particles of uniform diameter of less than 200 micrometer and an aluminum content of 97% by weight or more, if at least 10 percent of the total weight is made up of particles of less than 63 micrometer, according to ISO 2591:1988 or national equivalents such as JIS Z8820.

TECHNICAL NOTE: A particle size of 63 micrometer (ISO R–565) corresponds to 250 mesh (Tyler) or 230 mesh (ASTM standard E–11).

a.2. Metal fuels, other than that controlled by the U.S. Munitions List, in particle sizes of less than 60×10^{-6} m (60 micrometers), whether spherical, atomized, spheroidal, flaked or ground, as follows:
a.2.a. Consisting of 97% by weight or more of any of the following:
a.2.a.1. Zirconium;
a.2.a.2. Beryllium;
a.2.a.3. Magnesium; or
a.2.a.4. Alloys of the metals specified by a.2.a.1 to a.2.a.3 above.

TECHNICAL NOTE: The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.

a.3. Oxidizer substances usable in liquid propellant rocket engines, as follows:
a.3.a. Dinitrogen trioxide;
a.3.b. Nitrogendioxide/dinitrogen tetroxide;
a.3.c. Dinitrogen pentoxide;
a.3.d Mixed oxides of nitrogen (MON); a.3.e Inhibited red fuming nitric acid (IRFNA);

TECHNICAL NOTE: Mixed oxides of nitrogen (MON) are solutions of nitric oxide (NO) in dinitrogen tetroxide/nitrogen dioxide($N_2O_4NO_2$-) that can be used in missile systems. There are a range of compositions that can be denoted as MONi or MONij, where i and j are integers representing the percentage of nitric oxide in the mixture (e.g., MON3 contains 3% nitric oxide, MON25 25% nitric oxide. An upper limit is MON40, 40% by weight).

b. Polymeric substances:
b.1. Carboxy—terminated polybutadiene (including carboxyl—terminated polybutadiene) (CTPB);
b.2. Hydroxy—terminated polybutadiene (including hydroxyl—terminated polybutadiene) (HTPB);
b.3. Polybutadiene-acrylic acid (PBAA);
b.4. Polybutadiene-acrylic acid -acrylonitrile (PBAN);
b.5 Polytetrahydrofuran polyethylene glycol (TPEG).

TECHNICAL NOTE: Polytetrahydrofuran polyethylene glycol (TPEG) is a block co-polymer of poly 1,4-Butanediol and polyethylene glycol (PEG).

c. Other propellant additives and agents:
c.1. Butacene;
c.2. Triethylene glycol dinitrate (TEGDN);
c.3. 2-Nitrodiphenylamine;
c.4. Trimethylolethane trinitrate (TMETN);
c.5. Diethylene glycol dinitrate (DEGDN).

1C116 Maraging steels (iron alloys generally characterized by high nickel, very low carbon content and the use of substitutional elements or precipitates to produce strengthening and age-hardening of the alloy) having an ultimate tensile strength equal to or greater than 1.5 GPa, measured at 293 K (20 °C), in the form of sheet, plate or tubing with a wall or plate thickness equal to or less than 5 mm.

LICENSE REQUIREMENTS
Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1
NP applies to items that meet or exceed the parameters of 1C216.	NP Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E101 (''use'') for technology for items controlled by this entry. (2) Also see ECCN 1C216. (3) Maraging steel, in physical forms and finished products and specially designed or prepared for use in separating uranium isotopes, is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1C117 Materials for the Fabrication of Missile Components for Rockets or Missiles Capable of Achieving a "Range" Equal to or Greater Than 300 km, as Follows (See List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: N/A

Related Definitions: N/A

Items:

a. Tungsten and alloys in particulate form with a tungsten content of 97% by weight or more and a particle size of 50×10^{-6} m (50 μm) or less;

b. Molybdenum and alloys in particulate form with a molybdenum content of 97% by weight or more and a particle size of 50×10^{-6} m (50 μm) or less;

c. Tungsten materials in the solid form having all of the following:

c.1. Any of the following material compositions:

c.1.a. Tungsten and alloys containing 97% by weight or more of tungsten;

c.1.b. Copper infiltrated tungsten containing 80% by weight or more of tungsten; *or*

c.1.c. Silver infiltrated tungsten containing 80% by weight or more of tungsten; *and*

c.2. Able to be machined to any of the following products:

c.2.a. Cylinders having a diameter of 120 mm or greater and a length of 50 mm or greater;

c.2.b. Tubes having an inner diameter of 65 mm or greater and a wall thickness of 25 mm or greater and a length of 50 mm or greater; *or*

c.2.c. Blocks having a size of 120 mm × 120 mm × 50 mm or greater.

1C118 Titanium-stabilized duplex stainless steel (Ti-DSS), having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms.

Related Controls: N/A

Related Definitions: N/A

Items:

a. Having all of the following characteristics:

a.1. Containing 17.0–23.0 weight percent chromium and 4.5–7.0 weight percent nickel;

a.2. Having a titanium content of greater than 0.10 weight percent; and

a.3. A ferritic-austenitic microstructure (also referred to as a two-phase microstructure) of which at least 10 percent is austenite by volume (according to ASTM E–1181–87 or national equivalents), and

b. Having any of the following forms:

b.1. Ingots or bars having a size of 100 mm or more in each dimension;

b.2. Sheets having a width of 600 mm or more and a thickness of 3 mm or less; or

b.3. Tubes having an outer diameter of 600 mm or more and a wall thickness of 3 mm or less.

1C202 Alloys other than those controlled by 1C002.b.3 or 1C002.b.4 as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) *See* ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Also see ECCN 1C002. (3) Aluminum alloys and titanium alloys, in physical forms and finished products and specially designed or prepared for use in separating uranium isotopes, are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: The phrase ''capable of'' refers to aluminum alloys and titanium alloys either before or after heat treatment.

Items: a. Aluminum alloys having both of the following characteristics:

a.1. ''Capable of'' an ultimate tensile strength of 460 MPa or more at 293 K (20 °C); *and*

a.2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm;

b. Titanium alloys having both of the following characteristics:

b.1. ''Capable of'' an ultimate tensile strength of 900 MPa or more at 293 K (20 °C); *and*

b.2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm.

1C210 "Fibrous or filamentary materials" or prepregs, other than those controlled by 1C010.a, .b or .e, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Also see ECCNs 1C010 and 1C990.

Related Definitions: For the purpose of this entry, the term ''fibrous or filamentary materials'' is restricted to continuous ''monofilaments'', ''yarns'', ''rovings'', ''tows'', or ''tapes''. Definitions for other terms used in this entry:

Filament or Monofilament is the smallest increment of fiber, usually several µm in diameter.

Strand is a bundle of filaments (typically over 200) arranged approximately parallel.

Roving is a bundle (typically 12–120) of approximately parallel strands.

Yarn is a bundle of twisted strands.

Tow is a bundle of filaments, usually approximately parallel.

Tape is a material constructed of interlaced or unidirectional filaments, strands, rovings, tows, or yarns, etc., usually preimpregnated with resin.

Specific modulus is the Young's modulus in N/m^2 divided by the specific weight in N/m^3, measured at a temperature of (296 ±2) K ((23 ±2) °C) and a relative humidity of 50 ±5 percent.

Specific tensile strength is the ultimate tensile strength in 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 percent.

Items: a. Carbon or aramid ''fibrous or filamentary materials'' having a ''specific modulus'' of 12.7×10^6 m or greater or a ''specific tensile strength'' of 235×10^3 m or greater *except* Aramid ''fibrous or filamentary materials'' having 0.25 percent or more by weight of an ester based fiber surface modifier;

b. Glass ''fibrous or filamentary materials'' having a ''specific modulus'' of 3.18×10^6 m or greater and a ''specific tensile strength'' of 76.2×10^3 m or greater; *or*

c. Thermoset resin impregnated continuous ''yarns'', ''rovings'', ''tows'' or ''tapes'' with a width no greater than 15 mm (prepregs), made from carbon or glass ''fibrous or filamentary materials'' controlled by 1C210.a or .b.

TECHNICAL NOTE: The resin forms the matrix of the composite.

1C216 Maraging steel, other than that controlled by 1C116, "capable of" an ultimate tensile strength of 2,050 MPa or more, at 293 K (20 °C).

LICENSE REQUIREMENTS

Reason for Control: NP, AT.

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Also see ECCN 1C116. (3) Maraging steel, in physical form and finished products specially designed or prepared for use in separating uranium isotopes, is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: The phrase ''capable of'' in the ECCN heading refers to maraging steel either before or after heat treatment.

ECCN Controls: This entry does not control forms in which all linear dimensions are 75 mm or less.

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

1C225 Boron enriched in the boron-10 (^{10}B) isotope to greater than its natural isotopic abundance, as follows: elemental boron, compounds, mixtures containing boron, manufactures thereof, waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: In this entry, mixtures containing boron include boron-loaded materials.
Items: The list of items controlled is contained in the ECCN heading.

TECHNICAL NOTE: The natural isotopic abundance of boron-10 is approximately 18.5 weight percent (20 atom percent).

1C226 Tungsten, tungsten carbide, and alloys containing more than 90% tungsten by weight, having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
ECCN Controls: This entry does not control manufactures specially designed as weights or gamma-ray collimators.
Items: a. In forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100 and 300 mm; *and*

b. A mass greater than 20 kg.

1C227 Calcium having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: a. Containing less than 1,000 parts per million by weight of metallic impurities other than magnesium; *and*

b. Containing less than 10 parts per million by weight of boron.

1C228 Magnesium having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilogram
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: a. Containing less than 200 parts per million by weight of metallic impurities other than calcium; *and*

b. Containing less than 10 parts per million by weight of boron.

1C229 Bismuth having both of the following characteristics (see List of Items Controlled)

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: a. A purity of 99.99% or greater by weight; *and*

b. Containing less than 10 parts per million by weight of silver.

1C230 Beryllium metal, alloys containing more than 50% beryllium by weight, beryllium compounds, manufactures thereof, and waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
ECCN Controls: This entry does not control the following:

a. Metal windows for X-ray machines, or for bore-hole logging devices;

b. Oxide shapes in fabricated or semi-fabricated forms specially designed for electronic component parts or as substrates for electronic circuits;

c. Beryl (silicate of beryllium and aluminum) in the form of emeralds or aquamarines.

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

1C231 Hafnium metal, hafnium alloys and compounds containing more than 60% hafnium by weight, manufactures thereof, and waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1C232 Helium-3 (^{3}He), mixtures containing helium-3, and products or devices containing any of the foregoing.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Liters
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
ECCN Controls: This entry does not control a product or device containing less than 1 g of helium-3.
Items: The list of items controlled is contained in the ECCN heading.

1C233 Lithium enriched in the lithium-6 (^{6}Li) isotope to greater than its natural isotopic abundance, and products or devices containing enriched lithium, as follows: elemental lithium, alloys, compounds, mixtures containing lithium, manufactures thereof, and waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Facilities or plants specially designed or prepared for the separation of lithium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).
Related Definitions: The natural isotopic abundance of lithium-6 is approximately 6.5 weight percent (7.5 atom percent).
ECCN Controls: This entry does not control thermoluminescent dosimeters.
Items: The list of items controlled is contained in the ECCN heading.

1C234 Zirconium with a hafnium content of less than 1 part hafnium to 500 parts zirconium by weight, as follows: metal, alloys containing more than 50% zirconium by weight, compounds, manufactures thereof, and waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Zirconium metal and alloys in the form of tubes or assemblies of tubes, specially designed or prepared for use in a reactor, are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).
Related Definitions: N/A
ECCN Controls: This entry does not control zirconium in the form of foil having a thickness of 0.10 mm (0.004 in.) or less.
Items: The list of items controlled is contained in the ECCN heading.

1C235 Tritium, tritium compounds, mixtures containing tritium in which the ratio of tritium to hydrogen atoms exceeds 1 part in 1,000, and products or devices containing any of the foregoing.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Also see ECCN 1B231. (3) Tritium that is byproduct material (*e.g.*, produced in a nuclear reactor) is subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).
Related Definitions: N/A
ECCN Controls: (1) This entry does not control tritium, tritium compounds, and mixtures that are byproduct material (e.g., produced in a nuclear reactor)—such materials are subject to the licensing jurisdiction of the Nuclear Regulatory Commission (see Related Controls paragraph for this entry). (2) This entry does not control a product or device containing less than 1.48×10^3 GBq (40 Ci) of tritium.
Items: The list of items controlled is contained in the ECCN heading.

1C236 Alpha-emitting radionuclides having an alpha half-life of 10 days or greater, but less than 200 years, in the following forms (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Gigabecquerels
Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Certain alpha-emitting radionuclides are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).
Related Definitions: N/A
ECCN Controls: This entry does not control a product or device containing less than 3.7 GBq (100 millicuries) of alpha activity.
Items:
a. Elemental;
b. Compounds having a total alpha activity of 37 GBq/kg (1 Ci/kg) or greater;
c. Mixtures having a total alpha activity of 37 GBq/kg (1 Ci/kg) or greater;
d. Products or devices containing any of the items in 1C236.a, .b., or .c.

1C237 Radium-226 (^{226}Ra), radium-226 alloys, radium-226 compounds, mixtures containing radium-226, manufactures thereof, and products or devices containing any of the foregoing.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Gigabecquerels
Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry.
Related Definitions: N/A
ECCN Controls: This entry does not control the following:
a. Medical applicators;
b. A product or device containing less than 0.37 GBq (10 millicuries) of radium-226.
Items: The list of items controlled is contained in the ECCN heading.

1C238 Chlorine trifluoride (ClF_3).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. See 1C018 for additional controls on Chlorine trifluoride (ClF_3).

Related Definitions: N/A

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

1C239 High explosives, other than those controlled by the U.S. Munitions List, or substances or mixtures containing more than 2% by weight thereof, with a crystal density greater than 1.8 g/cm^3 and having a detonation velocity greater than 8,000 m/s.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) See ECCNs 1C018 (commercial charges and devices containing energetic materials on the Wassenaar Arrangement Munitions List and certain chemicals as follows) and 1C992 (commercial charges and devices containing energetic materials, n.e.s and nitrogen trifluoride in a gaseous state). (3) High explosives for military use are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (*see* 22 CFR part 121.12).

Related Definitions: N/A

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

1C240 Nickel powder or porous nickel metal, other than those described in 0C006, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) See ECCNs 1E001 (''development'' and ''production'') and 1E201 (''use'') for technology for items controlled by this entry. (2) Nickel powder and porous nickel metal, specially designed or prepared for use in separating uranium isotopes, are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: N/A

ECCN Controls: This entry does not control the following:

a. Filamentary nickel powders;

b. Single porous nickel sheets with an area of 1,000 cm^2 per sheet or less.

Items: a. Nickel powder having both of the following characteristics:

a.1. A nickel purity content of 99.0% or greater by weight; and

a.2. A mean particle size of less than 10 micrometers measured by American Society for Testing and Materials (ASTM) B330 standard;

b. Porous nickel metal produced from materials controlled by 1C240.a.

TECHNICAL NOTE: 1C240.b refers to porous metal formed by compacting and sintering the materials in 1C240.a to form a metal material with fine pores interconnected throughout the structure.

1C298 Graphite with a boron content of less than 5 parts per million and a density greater than 1.5 grams per cubic centimeter that is intended for use other than in a nuclear reactor.

LICENSE REQUIREMENTS

Reason for Control: NP.

Control(s)	Country chart
NP applies to entire entry	NP Column 2

License Requirement Note: This entry does not control graphite intended for use in a nuclear reactor. Such graphite is subject to the export licensing authority of the Nuclear Regulatory Commission (see ECCN 0C005 and 10 CFR part 110).

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 1C107 and 0C005.

Related Definitions: For the purpose of this entry, graphite with a purity level better than 5 parts per million boron equivalent is determined according to ASTM standard C1233–98. In applying ASTM standard C1233–98, the boron equivalence of the element carbon is not included in the boron equivalence calculation, since carbon is not considered an impurity.

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

1C350 Chemicals that may be used as precursors for toxic chemical agents.

LICENSE REQUIREMENTS

Reason for Control: CB, CW, AT

Control(s)	Country chart
CB applies to entire entry	CB Column 2.

CW applies to 1C350 .b, and .c. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons. A license is required, for CW reasons, to export or reexport Schedule 2 chemicals and mixtures identified in 1C350.b to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR). A license is required, for CW reasons, to export Schedule 3 chemicals and mixtures identified in 1C350.c to States not Party to the CWC, unless an End-Use Certificate issued by the government of the importing country has been obtained by the exporter prior to export. A license is required, for CW reasons, to reexport Schedule 3 chemicals and mixtures identified in 1C350.c from a State not Party to the CWC to any other State not Party to the CWC. (See §742.18 of the EAR for license requirements and policies for toxic and precursor chemicals controlled for CW reasons. See §745.2 of the EAR for End-Use Certificate requirements that apply to exports of Schedule 3 chemicals to countries not listed in Supplement No. 2 to part 745 of the EAR.)

AT applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for AT reasons in 1C350. A license is required, for AT reasons, to export or reexport items controlled by 1C350 to a country in Country Group E:1 of Supplement No. 1 to part 740 of the EAR. (See part 742 of the EAR for additional information on the AT controls that apply to Iran, North Korea, Sudan, and Syria. See part 746 of the EAR for additional information on sanctions that apply to Cuba, Iran, North Korea, and Syria.)

LICENSE REQUIREMENT NOTES 1. *Sample Shipments:* Subject to the following requirements and restrictions, a license is not required for sample shipments when the cumulative total of these shipments does not exceed a 55-gallon container or 200 kg of a single chemical to any one consignee during a calendar year. A consignee that receives a sample shipment under this exclusion may not resell, transfer, or reexport the sample shipment, but may use the sample shipment for any other legal purpose unrelated to chemical weapons.

a. *Chemicals Not Eligible:*

A. [Reserved]

B. *CWC Schedule 2 chemicals (States not Party to the CWC).* No CWC Schedule 2 chemical or mixture identified in 1C350.b is eligible for sample shipment to *States not Party to the CWC* (destinations not listed in Supplement No. 2 to part 745 of the EAR) without a license.

b. *Countries Not Eligible:* Countries in Country Group E:1 of Supplement No. 1 to part 740 of the EAR are not eligible to receive sample shipments of any chemicals controlled by this ECCN without a license.

c. *Sample shipments that require an End-Use Certificate for CW reasons:* No CWC Schedule 3 chemical or mixture identified in 1C350.c is eligible for sample shipment to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR) without a license, unless an End-Use Certificate issued by the government of the importing country is obtained by the exporter prior to export (see §745.2 of the EAR for End-Use Certificate requirements).

d. *Sample shipments that require a license for reasons set forth elsewhere in the EAR:* Sample shipments, as described in this Note 1, may require a license for reasons set forth elsewhere in the EAR. See, in particular, the end-use/end-user restrictions in part 744 of the EAR, and the restrictions that apply to embargoed countries in part 746 of the EAR.

e. *Quarterly report requirement.* The exporter is required to submit a quarterly written report for shipments of samples made under this Note 1. The report must be on company letterhead stationery (titled ''Report of Sample Shipments of Chemical Precursors'' at the top of the first page) and identify the chemical(s), Chemical Abstract Service Registry (C.A.S.) number(s), quantity(ies), the ultimate consignee's name and address, and the date exported. The report must be sent, via courier, to the U.S. Department of Commerce, Bureau of Industry and Security, 14th and Pennsylvania Ave., NW., Room 2099B, Washington, DC 20230, Attn: ''Report of Sample Shipments of Chemical Precursors''.

2. *Mixtures:*

a. Mixtures that contain precursor chemicals identified in ECCN 1C350, in concentrations that are below the levels indicated in 1C350.b through .d, are controlled by ECCN 1C395 or 1C995 and are subject to the licensing requirements specified in those ECCNs.

b. A license is not required under this ECCN for a mixture, when the controlled chemical in the mixture is a normal ingredient in consumer goods packaged for retail sale for personal use. Such consumer goods

are designated EAR99. However, a license may be required for reasons set forth elsewhere in the EAR.

NOTE TO MIXTURES: Calculation of concentrations of AG-controlled chemicals:

a. *Exclusion*. No chemical may be added to the mixture (solution) for the sole purpose of circumventing the Export Administration Regulations;

b. *Percent Weight Calculation*.When calculating the percentage, by weight, of components in a chemical mixture, include all components of the mixture, including those that act as solvents.

3. *Compounds*. Compounds created with any chemicals identified in this ECCN 1C350 may be shipped NLR (No License Required), without obtaining an End-Use Certificate, unless those compounds are also identified in this entry or require a license for reasons set forth elsewhere in the EAR.

4. *Testing Kits:* Certain medical, analytical, diagnostic, and food testing kits containing small quantities of chemicals identified in this ECCN 1C350, are excluded from the scope of this ECCN and are controlled under ECCN 1C395 or 1C995. (Note that replacement reagents for such kits are controlled by this ECCN 1C350 if the reagents contain one or more of the precursor chemicals identified in 1C350 in concentrations equal to or greater than the control levels for mixtures indicated in 1C350.)

TECHNICAL NOTES: 1. For purposes of this entry, a ''mixture'' is defined as a solid, liquid or gaseous product made up of two or more components that do not react together under normal storage conditions.

2. The scope of this control applicable to Hydrogen Fluoride (see 1C350.d.7 in the List of Items Controlled) includes its liquid, gaseous, and aqueous phases, and hydrates.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

List of Items Controlled

Unit: Liters or kilograms, as appropriate.

Related Controls: The chemicals 0-Ethyl-2-diisopropylaminoethyl methyl phosphonite (QL) (C.A.S. #57856–11–8); Ethyl phosphonyl difluoride (C.A.S. #753–98–0); and Methyl phosphonyl difluoride. (C.A.S. #676–99–3); methylphosphinyl dichloride (C.A.S. 676–83–5); methylphosphinyl difluoride (C.A.S. #753–59–3); and methylphosphonyl dichloride (C.A.S. #676–97–1) are subject to the licensing jurisdiction of the Directorate of Defense Trade Controls, U.S. Department of State.

Related Definitions: See §770.2(k) of the EAR for synonyms for the chemicals listed in this entry.

Items: a. [Reserved]

b. Australia Group-controlled precursor chemicals also identified as Schedule 2 chemicals under the CWC, as follows, and mixtures in which at least one of the following chemicals constitutes 30 percent or more of the weight of the mixture:

b.1. (C.A.S. #7784–34–1) Arsenic trichloride;

b.2. (C.A.S. #76–93–7) Benzilic acid;

b.3. (C.A.S. #78–38–6) Diethyl ethylphosphonate;

b.4. (C.A.S. #15715–41–0) Diethyl methylphosphonite;

b.5. (C.A.S. #2404–03–7) Diethyl-N,N-dimethylphosphoroamidate;

b.6. (C.A.S. #5842–07–9) N,N-Diisopropyl-beta-aminoethane thiol;

b.7. (C.A.S. #4261–68–1) N,N-Diisopropyl-beta-aminoethyl chloride hydrochloride;

b.8. (C.A.S. #96–80–0) N,N-Diisopropyl-beta-aminoethanol;

b.9. (C.A.S. #96–79–7), N,N-Diisopropyl-beta-aminoethyl chloride;

b.10. (C.A.S. #6163–75–3) Dimethyl ethylphosphonate;

b.11. (C.A.S. #756–79–6) Dimethyl methylphosphonate;

b.12. (C.A.S. #1498–40–4) Ethyl phosphonous dichloride [Ethyl phosphinyl dichloride];

b.13. (C.A.S. #430–78–4) Ethyl phosphonus difluoride [Ethyl phosphinyl difluoride];

b.14. (C.A.S. #1066–50–8) Ethyl phosphonyl dichloride;

b.15. [Reserved]

b.16. [Reserved]

b.17. [Reserved]

b.18. (C.A.S. #464–07–3) Pinacolyl alcohol;

b.19. (C.A.S. #1619–34–7) 3-Quinuclidinol;

b.20. (C.A.S. #111–48–8) Thiodiglycol;

b.21. (C.A.S. #993–13–5) Methylphosphonic acid;

b.22. (C.A.S. #683–08–9) Diethyl methylphosphonate;

b.23. (C.A.S. #677–43–0) N,N-dimethylamino-phosphoryl dichloride;

b.24. (C.A.S. #676–98–2) Methylphosphonothioic dichloride.

c. Australia Group-controlled precursor chemicals also identified as Schedule 3 chemicals under the CWC, as follows, and mixtures in which at least one of the following chemicals constitutes 30 percent or more of the weight of the mixture:

c.1. (C.A.S. #762–04–9) Diethyl phosphite;

c.2. (C.A.S. #868–85–9) Dimethyl phosphite (dimethyl hydrogen phosphite);

c.3. (C.A.S. #10025–87–3) Phosphorus oxychloride;

c.4. (C.A.S. #10026–13–8) Phosphorus pentachloride;

c.5. (C.A.S. #7719–12–2) Phosphorus trichloride;

c.6. (C.A.S. #10025–67–9) Sulfur monochloride;

c.7. (C.A.S. #10545–99–0) Sulfur dichloride;

c.8. (C.A.S. #7719–09–7) Thionyl chloride;

c.9. (C.A.S. #102–71–6) Triethanolamine;

c.10. (C.A.S. #122–52–1) Triethyl phosphite;

c.11. (C.A.S. #121–45–9) Trimethyl phosphite;

c.12. (C.A.S. #139–87–7) Ethyldiethanolamine.

d. Other Australia Group-controlled precursor chemicals not also identified as Schedule 1, 2, or 3 chemicals under the CWC, as follows, and mixtures in which at least one of the following chemicals constitutes 30 percent or more of the weight of the mixture:

d.1. (C.A.S. #1341–49–7) Ammonium hydrogen fluoride;

d.2. (C.A.S. #107–07–3) 2-Chloroethanol;

d.3. (C.A.S. #100–37–8) N,N-Diethylaminoethanol;

d.4. (C.A.S. #108–18–9) Di-isopropylamine;

d.5. (C.A.S. #124–40–3) Dimethylamine;

d.6. (C.A.S. #506–59–2) Dimethylamine hydrochloride;

d.7. (C.A.S. #7664–39–3) Hydrogen fluoride;

d.8. (C.A.S. #3554–74–3) 3-Hydroxyl-1-methylpiperidine;

d.9. (C.A.S. #76–89–1) Methyl benzilate;

d.10. (C.A.S. #1314–80–3) Phosphorus pentasulfide;

d.11. (C.A.S. #75–97–8) Pinacolone;

d.12. (C.A.S. #151–50–8) Potassium cyanide;

d.13. (C.A.S. #7789–23–3) Potassium fluoride;

d.14. (C.A.S. #7789–29–9) Potassium bifluoride;

d.15. (C.A.S. #3731–38–2) 3-Quinuclidone;

d.16. (C.A.S. #1333–83–1) Sodium bifluoride;

d.17. (C.A.S. #143–33–9) Sodium cyanide;

d.18. (C.A.S. #7681–49–4) Sodium fluoride;

d.19. (C.A.S. #1313–82–2) Sodium sulfide;

d.20. (C.A.S. #637–39–8) Triethanolamine hydrochloride;

d.21. (C.A.S. #116–17–6) Tri-isopropyl phosphite;

d.22. (C.A.S. #2465–65–8) O,O-diethyl phosphorothioate;

d.23. (C.A.S. #298–06–6) O,O-diethyl phosphorodithioate;

d.24. (C.A.S. #16893–85–9) Sodium hexafluorosilicate.

1C351 Human and zoonotic pathogens and "toxins", as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, CW, AT

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

CW applies to 1C351.d.11 and d.12 and a license is required for CW reasons for all destinations, including Canada, as follows: CW applies to 1C351.d.11 for ricin in the form of (1) Ricinus Communis $Agglutinin_{II}$ (RCA_{II}), also known as ricin D or Ricinus Communis $Lectin_{III}$ (RCL_{III}) and (2) Ricinus Communis $Lectin_{IV}$ (RCL_{IV}), also known as ricin E. CW applies to 1C351.d.12 for saxitoxin identified by C.A.S. #35523–89–8. See §742.18 of the EAR for licensing information pertaining to chemicals subject to restriction pursuant to the Chemical Weapons Convention (CWC). The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons.

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

LICENSE REQUIREMENT NOTES

1. All vaccines and ''immunotoxins'' are excluded from the scope of this entry. Certain medical products and diagnostic and food testing kits that contain biological toxins controlled under paragraph (d) of this entry, with the exception of toxins controlled for CW reasons under d.11 and d.12, are excluded from the scope of this entry. Vaccines, ''immunotoxins'', certain medical products, and diagnostic and food testing kits excluded from the scope of this entry are controlled under ECCN 1C991.

2. For the purposes of this entry, only saxitoxin is controlled under paragraph d.12; other members of the paralytic shellfish poison family (*e.g.* neosaxitoxin) are designated EAR99.

3. Clostridium perfringens strains, other than the epsilon toxin-producing strains of Clostridium perfringens described in c.9, are excluded from the scope of this entry, since they may be used as positive control cultures for food testing and quality control.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: (1) Certain forms of ricin and saxitoxin in 1C351.d.11. and d.12 are CWC Schedule 1 chemicals (see §742.18 of the EAR). The U.S. Government must provide advance notification and annual reports to the OPCW of all exports of Schedule 1 chemicals. See §745.1 of the EAR for notification procedures. See 22 CFR part 121, Category XIV and §121.7 for additional CWC Schedule 1 chemicals controlled by the Department of State. (2) The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, and the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, maintain controls on the possession, use, and transfer within the United States of certain items controlled by this ECCN (for APHIS, see 7 CFR 331.3(b), 9 CFR 121.3(b), and 9 CFR 121.4(b); for CDC, see 42 CFR 73.3(b) and 42 CFR 73.4(b)).

Related Definitions: (1) For the purposes of this entry ''immunotoxin'' is defined as an antibody-toxin conjugate intended to destroy specific target cells (e.g., tumor cells) that bear antigens homologous to the antibody. (2) For the purposes of this

entry ''subunit'' is defined as a portion of the ''toxin''.

Items:

a. Viruses, as follows:

a.1. Andes virus;

a.2. Chapare virus;

a.3. Chikungunya virus;

a.4. Choclo virus;

a.5. Congo-Crimean haemorrhagic fever virus (a.k.a. Crimean-Congo haemorrhagic fever virus);

a.6. Dengue fever virus;

a.7. Dobrava-Belgrade virus;

a.8. Eastern equine encephalitis virus;

a.9. Ebola virus;

a.10. Guanarito virus;

a.11. Hantaan virus;

a.12. Hendra virus (Equine morbillivirus);

a.13. Japanese encephalitis virus;

a.14. Junin virus;

a.15. Kyasanur Forest virus;

a.16. Laguna Negra virus;

a.17. Lassa fever virus;

a.18. Louping ill virus;

a.19. Lujo virus;

a.20. Lymphocytic choriomeningitis virus;

a.21. Machupo virus;

a.22. Marburg virus;

a.23. Monkey pox virus;

a.24. Murray Valley encephalitis virus;

a.25. Nipah virus;

a.26. Omsk haemorrhagic fever virus;

a.27. Oropouche virus;

a.28. Powassan virus;

a.29. Rift Valley fever virus;

a.30. Rocio virus;

a.31. Sabia virus;

a.32. Seoul virus;

a.33. Sin nombre virus;

a.34. St. Louis encephalitis virus;

a.35. Tick-borne encephalitis virus (Russian Spring-Summer encephalitis virus);

a.36. Variola virus;

a.37. Venezuelan equine encephalitis virus;

a.38. Western equine encephalitis virus; or

a.39. Yellow fever virus.

b. [Reserved]

c. Bacteria, as follows:

c.1. Bacillus anthracis;

c.2. Brucella abortus;

c.3. Brucella melitensis;

c.4. Brucella suis;

c.5. Burkholderia mallei (Pseudomonas mallei);

c.6. Burkholderia pseudomallei (Pseudomonas pseudomallei);

c.7. Chlamydophila psittaci (formerly known as Chlamydia psittaci);

c.8. Clostridium botulinum;

c.9. Clostridium perfringens, epsilon toxin producing types;

c.10. Coxiella burnetii;

c.11. Enterohaemorrhagic Escherichia coli, serotype O157 and other verotoxin producing serotypes;

c.12. Francisella tularensis;

c.13. Rickettsia prowasecki (a.k.a. Rickettsia prowazekii);

c.14. Salmonella typhi;

c.15. Shigella dysenteriae;

c.16. Vibrio cholerae; or

c.17. Yersinia pestis.

d. ''Toxins'', as follows, and ''subunits'' thereof:

d.1. Abrin;

d.2. Aflatoxins;

d.3. Botulinum toxins;

d.4. Cholera toxin;

d.5. Clostridium perfringens toxins;

d.6. Conotoxin;

d.7. Diacetoxyscirpenol toxin;

d.8. HT–2 toxin;

d.9. Microcystin (Cyanginosin);

d.10. Modeccin toxin;

d.11. Ricin;

d.12. Saxitoxin;

d.13. Shiga toxin;

d.14. Staphylococcus aureus toxins;

d.15. T–2 toxin;

d.16. Tetrodotoxin;

d.17. Verotoxin and other Shiga-like ribosome inactivating proteins;

d.18. Viscum Album Lectin 1 (Viscumin); or

d.19. Volkensin toxin.

e. ''Fungi'', as follows:

e.1. Coccidioides immitis; or

e.2. Coccidioides posadasii.

1C352 Animal pathogens, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

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

LICENSE REQUIREMENT NOTE

All vaccines are excluded from the scope of this ECCN. See ECCN 1C991 for vaccines.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, and the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, maintain controls on the possession, use, and transfer within the United States of certain items controlled by this ECCN (for APHIS, see 7 CFR 331.3(b), 9 CFR 121.3(b), and 9 CFR 121.4(b); for CDC, see 42 CFR 73.3(b) and 42 CFR 73.4(b)).

Related Definitions: N/A

Items: a. *Viruses, as follows:*

a.1. African swine fever virus;

a.2. Avian influenza (AI) viruses identified as having high pathogenicity (HP), as follows:

a.2.a. AI viruses that have an intravenous pathogenicity index (IVPI) in 6-week-old chickens greater than 1.2; or

a.2.b. AI viruses that cause at least 75% mortality in 4- to 8-week-old chickens infected intravenously.

NOTE: Avian influenza (AI) viruses of the H5 or H7 subtype that do not have either of the characteristics described in 1C352.a.2 (specifically, 1C352.a.2.a or a.2.b) should be sequenced to determine whether multiple basic amino acids are present at the cleavage site of the haemagglutinin molecule (HA0). If the amino acid motif is similar to that observed for other HPAI isolates, then the isolate being tested should be considered as HPAI and the virus is controlled under 1C352.a.2.

a.3. Bluetongue virus;

a.4. Foot and mouth disease virus;

a.5. Goat pox virus;

a.6. Porcine herpes virus (Aujeszky's disease);

a.7. Swine fever virus (Hog cholera virus);

a.8. Lyssa virus (a.k.a. Rabies);

a.9. Newcastle disease virus;

a.10. Peste des petits ruminants virus;

a.11. Porcine enterovirus type 9 (swine vesicular disease virus);

a.12. Rinderpest virus;

a.13. Sheep pox virus;

a.14. Teschen disease virus;

a.15. Vesicular stomatitis virus;

a.16. Lumpy skin disease virus;

a.17. African horse sickness virus.

b. Bacteria, as follows:

b.1. Mycoplasma mycoides, as follows:

b.1.a. Mycoplasma mycoides subspecies mycoides SC (small colony) (a.k.a. contagious bovine pleuropneumonia);

b.1.b. Mycoplasma capricolum subspecies capripneumoniae (''strain F38'').

b.2. [Reserved]

1C353 Genetic elements and genetically modified organisms, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

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

LICENSE REQUIREMENT NOTE

Vaccines that contain genetic elements or genetically modified organisms identified in this ECCN are controlled by ECCN 1C991.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, and the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, maintain controls on the possession, use, and transfer within the United States of certain items controlled by this ECCN, including (but not limited to) genetic elements, recombinant nucleic acids, and recombinant organisms associated with the agents or toxins in ECCN 1C360 (for APHIS, see 7 CFR 331.3(c), 9 CFR 121.3(c), and 9 CFR 121.4(c); for CDC, see 42 CFR 73.3(c) and 42 CFR 73.4(c)).

Related Definition: N/A

Items: a. Genetic elements, as follows:

a.1. Genetic elements that contain nucleic acid sequences associated with the pathogenicity of microorganisms controlled by 1C351.a to .c, 1C352, 1C354, or 1C360;

a.2. Genetic elements that contain nucleic acid sequences coding for any of the ''toxins'' controlled by 1C351.d or ''sub-units of toxins'' thereof.

b. Genetically modified organisms, as follows:

b.1. Genetically modified organisms that contain nucleic acid sequences associated with the pathogenicity of microorganisms controlled by 1C351.a to .c, 1C352, 1C354, or 1C360;

b.2. Genetically modified organisms that contain nucleic acid sequences coding for any of the ''toxins'' controlled by 1C351.d or ''sub-units of toxins'' thereof.

TECHNICAL NOTE: 1. ''Genetic elements'' include, inter alia, chromosomes, genomes, plasmids, transposons, and vectors, whether genetically modified or unmodified.

2. This ECCN does not control nucleic acid sequences associated with the pathogenicity of enterohaemorrhagic Escherichia coli, serotype O157 and other verotoxin producing strains, except those nucleic acid sequences that contain coding for the verotoxin or its sub-units.

3. ''Nucleic acid sequences associated with the pathogenicity of any of the microorganisms controlled by 1C351.a to .c, 1C352, 1C354, or 1C360'' means any sequence specific to the relevant controlled microorganism that:

a. In itself or through its transcribed or translated products represents a significant hazard to human, animal or plant health; or

b. Is known to enhance the ability of a microorganism controlled by 1C351.a to .c, 1C352, 1C354, or 1C360, or any other organism into which it may be inserted or otherwise integrated, to cause serious harm to human, animal or plant health.

4. ''Genetically modified organisms'' include organisms in which the genetic material (nucleic acid sequences) has been altered

in a way that does not occur naturally by mating and/or natural recombination, and encompasses those produced artificially in whole or in part.

1C354 Plant pathogens, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

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

LICENSE REQUIREMENT NOTE

All vaccines are excluded from the scope of this ECCN. See ECCN 1C991 for vaccines.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, maintains controls on the possession, use, and transfer within the United States of certain items controlled by this ECCN (see 7 CFR 331.3(c), 9 CFR 121.3(c), and 9 CFR 121.4(c)).

Related Definitions: N/A

Items a. Bacteria, as follows:

a.1. *Xanthomonas albilineans*;

a.2. *Xanthomonas campestris* pv. *citri* including strains referred to as *Xanthomonas campestris* pv. *citri* types A,B,C,D,E or otherwise classified as *Xanthomonas citri, Xanthomonas campestris* pv. *aurantifolia* or *Xanthomonas campestris* pv. *citrumelo*;

a.3. *Xanthomonas oryzae* pv. *oryzae* (syn. *Pseudomonas campestris* pv. *oryzae*);

a.4. *Clavibacter michiganensis* subspecies *sepedonicus* (syn. *Corynebacterium michiganensis* subspecies *sepedonicum* or *Corynebacterium sepedonicum*);

a.5. *Ralstonia solanacearum* Races 2 and 3 (syn. *Pseudomonas solanacearum* Races 2 and 3 or *Burkholderia solanacearum* Races 2 and 3);

b. Fungi, as follows:

b.1. *Colletotrichum coffeanum* var. *virulans* (*Colletotrichum kahawae*);

b.2. *Cochliobolus miyabeanus* (*Helminthosporium oryzae*);

b.3. *Microcyclus ulei* (syn. *Dothidella ulei*);

b.4. *Puccinia graminis* (syn. *Puccinia graminis* f. sp. *tritici*);

b.5. *Puccinia striiformis* (syn. *Puccinia glumarum*);

b.6. *Magnaporthe grisea* (*pyricularia grisea/pyricularia oryzae*);

c. Viruses, as follows:

c.1. Potato Andean latent tymovirus;

c.2. Potato spindle tuber viroid.

1C355 Chemical Weapons Convention (CWC) Schedule 2 and 3 chemicals and families of chemicals not controlled by ECCN 1C350 or by the Department of State under the ITAR.

LICENSE REQUIREMENTS

Reason for Control: CW, AT

Control(s): CW applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons. A license is required to export or reexport CWC Schedule 2 chemicals and mixtures identified in 1C355.a to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR). A license is required to export CWC Schedule 3 chemicals and mixtures identified in 1C355.b to States not Party to the CWC, unless an End-Use Certificate issued by the government of the importing country is obtained by the exporter, prior to export. A license is required to reexport CWC Schedule 3 chemicals and mixtures identified in 1C355.b from a State not Party to the CWC to any other State not Party to the CWC. (See §742.18 of the EAR for license requirements and policies for toxic and precursor chemicals controlled for CW reasons.)

AT applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for AT reasons in 1C355. A license is required, for AT reasons, to export or reexport items controlled by 1C355 to a country in Country Group E:1 of Supplement No. 1 to part 740 of the EAR. (See part 742 of the EAR for additional information on the AT controls that apply to Iran, North Korea, Sudan, and Syria. See part 746 of the EAR for additional information on sanctions that apply to Cuba, Iran, North Korea, and Syria.)

LICENSE REQUIREMENTS NOTES

1. *Mixtures:*

a. Mixtures containing toxic and precursor chemicals identified in ECCN 1C355, in concentrations that are below the control levels indicated in 1C355.a and .b, are controlled by ECCN 1C995 and are subject to the license requirements specified in that ECCN.

b. Mixtures containing chemicals identified in this entry are not controlled by ECCN 1C355 when the controlled chemical is a normal ingredient in consumer goods packaged for retail sale for personal use or packaged for individual use. Such consumer goods are classified as EAR99.

NOTE TO MIXTURES: Calculation of concentrations of CW-controlled chemicals:

a. *Exclusion*. No chemical may be added to the mixture (solution) for the sole purpose of circumventing the Export Administration Regulations;

b. *Percent Weight Calculation*. When calculating the percentage, by weight, of components in a chemical mixture, include all components of the mixture, including those that act as solvents.

2. *Compounds:* Compounds created with any chemicals identified in this ECCN 1C355 may be shipped NLR (No License Required), without obtaining an End-Use Certificate, unless those compounds are also identified in this entry or require a license for reasons set forth elsewhere in the EAR.

TECHNICAL NOTES: For purposes of this entry, a ''mixture'' is defined as a solid, liquid or gaseous product made up of two or more components that do not react together under normal storage conditions.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Liters or kilograms, as appropriate.

Related Controls: See also ECCNs 1C350 1C351, 1C395, and 1C995. See §§742.18 and 745.2 of the EAR for End-Use Certification requirements.

Related Definitions: N/A

Items: a. CWC Schedule 2 chemicals and mixtures containing Schedule 2 chemicals:

a.1. Toxic chemicals, as follows, and mixtures containing toxic chemicals:

a.1.a. PFIB: 1,1,3,3,3-Pentafluoro-2-(trifluoromethyl)-1-propene (C.A.S. 382–21–8) and mixtures in which PFIB constitutes more than 1 percent of the weight of the mixture;

a.1.b. [Reserved]

a.2. Precursor chemicals, as follows, and mixtures in which at least one of the following precursor chemicals constitutes more than 10 percent of the weight of the mixture:

a.2.a. Chemicals, except for those listed in Schedule 1, containing a phosphorus atom to which is bonded one methyl, ethyl, or propyl (normal or iso) group but not further carbon atoms.

NOTE: 1C355.a.2.a does *not* control Fonofos: O-Ethyl S-phenyl ethylphosphonothiolothionate (C.A.S. 944–22–9).

a.2.b. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) phosphoramidic dihalides;

a.2.c. FAMILY: Dialkyl (Me, Et, n-Pr or i-Pr) N,N-Dialkyl (Me, Et, n-Pr, or i-Pr)-phosphoramidates;

a.2.d. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethyl-2-chlorides and corresponding protonated salts;

a.2.e. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethane-2-ols and corresponding protonated salts;

NOTE: 1C355.a.2.e. does *not* control N,N-Dimethylaminoethanol and corresponding protonated salts (C.A.S. 108–01–0) or N,N-Diethylaminoethanol and corresponding protonated salts (C.A.S. 100–37–8).

a.2.f. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethane-2-thiols and corresponding protonated salts.

b. CWC Schedule 3 chemicals and mixtures containing Schedule 3 chemicals:

b.1. Toxic chemicals, as follows, and mixtures in which at least one of the following toxic chemicals constitutes 30 percent or more of the weight of the mixture:

b.1.a. Phosgene: Carbonyl dichloride (C.A.S. 75–44–5);

b.1.b. Cyanogen chloride (C.A.S. 506–77–4);

b.1.c. Hydrogen cyanide (C.A.S. 74–90–8);

b.1.d. Chloropicrin: Trichloronitromethane (C.A.S. 76–06–2).

b.2. Precursor chemicals, as follows, and mixtures in which at least one of the following precursor chemicals constitutes 30 percent or more of the weight of the mixture:

b.2.a. [Reserved];

b.2.b. Methyldiethanolamine (C.A.S. 105–59–9).

1C360 Select agents not controlled under ECCN 1C351, 1C352, or 1C354.

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Controls	Country chart
CB applies to entire entry	CB Column 1
AT applies to entire entry	AT Column 1

LICENSE REQUIREMENT NOTE

All vaccines are excluded from the scope of this ECCN. See ECCN 1C991 for vaccines.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

List of Items Controlled

Unit: $ value.

Related Controls: (1) Also see ECCNs 1C351 (AG-controlled human and zoonotic pathogens and ''toxins''), 1C352 (AG-controlled animal pathogens), and 1C354 (AG-controlled plant pathogens). (2) The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, and the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, maintain controls on the possession, use, and transfer within the United States of items controlled by this ECCN (for APHIS, see 7 CFR 331.3(b), 9 CFR 121.3(b), and 9 CFR 121.4(b); for CDC, see 42 CFR 73.3(b) and 42 CFR 73.4(b)).

Related Definitions: N/A

Items:

NOTE: The control status of items listed in this ECCN is not affected by the exemptions or exclusions contained in the domestic possession, use, and transfer regulations maintained by APHIS (at 7 CFR part 331 and 9 CFR part 121) and/or CDC (at 42 CFR part 73).

a. Human and zoonotic pathogens, as follows:

a.1. Viruses, as follows:

a.1.a. Central European tick-borne encephalitis viruses, as follows:
a.1.a.1. Absettarov;
a.1.a.2. Hanzalova;
a.1.a.3. Hypr;
a.1.a.4. Kumlinge;
a.1.b. Cercopithecine herpesvirus 1 (Herpes B virus);
a.1.c. Flexal virus;
a.1.d. Reconstructed replication competent forms of the 1918 pandemic influenza virus containing any portion of the coding regions of all eight gene segments;
a.2. [Reserved];
b. Animal pathogens, as follows:
b.1. Viruses, as follows:
b.1.a. Akabane virus;
b.1.b. Bovine spongiform encephalopathy agent;
b.1.c. Camel pox virus;
b.1.d. Malignant catarrhal fever virus;
b.1.e. Menangle virus;
b.2. Mycoplasma, as follows:
b.2.a. Mycoplasma capricolum, except subspecies capripneumoniae (see ECCN 1C352.b.1.b);
b.2.b. Mycoplasma mycoides capri;
b.3. Rickettsia, as follows:
b.3.a. Erhlichia ruminantium (a.k.a. Cowdria ruminantium);
b.3.b. [Reserved]
c. Plant pathogens, as follows:
c.1. Bacteria, as follows:
c.1.a. Rathayibacter toxicus;
c.1.b. Xylella fastidiosa pv. citrus variegated chlorosis (CVC);
c.2. Fungi, as follows:
c.2.a. Peronosclerospora philippinensis (a.k.a. Peronosclerospora sacchari);
c.2.b. Sclerophthora rayssiae var. zeae;
c.2.c. Synchytrium endobioticum;
c.2.d. Phoma glycinicola (formerly Pyrenochaeta glycines).

1C395 Mixtures and Medical, Analytical, Diagnostic, and Food Testing Kits Not Controlled by ECCN 1C350, as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, CW, AT

Control(s): CB applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CB reasons in 1C395. A license is required, for CB reasons, to export or reexport mixtures controlled by 1C395.a and test kits controlled by 1C395.b to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR).

CW applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons. A license is required for CW reasons, as follows, to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR): (1) Exports and reexports of mixtures controlled by 1C395.a, (2) exports and reexports of test kits controlled by 1C395.b that contain CWC Schedule 2 chemicals controlled by ECCN 1C350, (3) exports of test kits controlled by 1C395.b that contain CWC Schedule 3 chemicals controlled by ECCN 1C350, except that a license is not required, for CW reasons, to export test kits containing CWC Schedule 3 chemicals if an End-Use Certificate issued by the government of the importing country is obtained by the exporter prior to export, and (4) reexports from States not Party to the CWC of test kits controlled by 1C395.b that contain CWC Schedule 3 chemicals. (*See* §742.18 of the EAR for license requirements and policies for toxic and precursor chemicals controlled for CW reasons.)

AT applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for AT reasons in 1C395. A license is required, for AT reasons, to export or reexport items controlled by 1C395 to a country in Country Group E:1 of Supplement No. 1 to part 740 of the EAR. (See part 742 of the EAR for additional information on the AT controls that apply to Iran, North Korea, Sudan, and Syria. See part 746 of the EAR for additional information on sanctions that apply to Cuba, Iran, North Korea, and Syria.)

LICENSE REQUIREMENTS NOTES 1. 1C395.b does not control mixtures that contain precursor chemicals identified in ECCN 1C350.b or .c in concentrations below the control levels for mixtures indicated in 1C350.b or .c. 1C395.a and 1C995.a.1 and a.2.a control such mixtures, unless they are consumer goods, as described in License Requirements Note 2 of this ECCN.

2. This ECCN does not control mixtures when the controlled chemicals are normal ingredients in consumer goods packaged for retail sale for personal use. Such consumer goods are classified as EAR99.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: 1. ECCN 1C350 controls mixtures containing 30 percent or higher concentrations, by weight, of any single CWC Schedule 2 chemical identified in ECCN 1C350.b; ECCN 1C995 controls such mixtures containing concentrations of 10 percent or less. 2. ECCN 1C995 controls ''medical, analytical, diagnostic, and food testing kits'' (as defined in the Related Definitions paragraph of this ECCN) that contain precursor chemicals listed in ECCN 1C350.d. ECCN 1C350 controls any such kits in which the amount of any single chemical listed in 1C350.b, .c, or .d exceeds 300 grams by weight.

Related Definitions: For the purpose of this entry, ''medical, analytical, diagnostic, and food testing kits'' are pre-packaged materials of defined composition that are specifically developed, packaged and marketed for medical, analytical, diagnostic, or public health purposes. Replacement reagents for medical, analytical, diagnostic, and food testing kits described in 1C395.b are controlled by ECCN 1C350 if the reagents contain at least one of the precursor chemicals identified in that ECCN in concentrations equal to or greater than the control levels for mixtures indicated in 1C350.b. or .c.

Items: a. Mixtures containing more than 10 percent, but less than 30 percent, by weight of any single CWC Schedule 2 chemical identified in ECCN 1C350.b (For controls on other mixtures containing these chemicals, see Note 1 in the Related Controls paragraph of this ECCN.).

b. ''Medical, analytical, diagnostic, and food testing kits'' (as defined in the Related Definitions for this ECCN) that contain CWC Schedule 2 or 3 chemicals controlled by ECCN 1C350.b or .c in an amount *not* exceeding 300 grams per chemical. (For controls on other such test kits containing these and other controlled chemicals, see Note 2 in the Related Controls paragraph of this ECCN.)

1C980 Inorganic chemicals listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Unit: Barrels/Liters

Related Controls: N/A

Related Definitions: N/A

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

1C981 Crude petroleum including reconstituted crude petroleum, tar sands & crude shale oil listed in Supplement No. 1 to part 754 of the EAR.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Unit: Barrels/Liters

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1C982 Other petroleum products listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1C983 Natural gas liquids and other natural gas derivatives listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons.

LIST OF ITEMS CONTROLLED

Unit: Barrels/Liters

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1C984 Manufactured gas and synthetic natural gas (except when commingled with natural gas and thus subject to export authorization from the Department of Energy) listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Unit: Millions of cubic feet

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1C988 Western red cedar (thuja plicata), logs and timber, and rough, dressed and worked lumber containing wane listed in Supplement No. 2 to part 754 of the EAR.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Unit: Million board feet scribner

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1C990 Fibrous and filamentary materials, not controlled by 1C010 or 1C210, for use in "composite" structures and with a specific modulus of 3.18×10^6 m or greater and a specific tensile strength of 7.62×10^4 m or greater.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

1C991 Vaccines, immunotoxins, medical products, diagnostic and food testing kits, as follows (see List of Items controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT.

Control(s)	Country Chart
CB applies to 1C991.d	CB Column 3
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) Medical products containing ricin or saxitoxin, as follows, are controlled for CW reasons under ECCN 1C351:

(a) Ricinus Communis Agglutinin_{II} (RCA_{II}), also known as ricin D, or Ricinus Communis Lectin_{III} (RCL_{III});

(b) Ricinus Communis Lectin_{IV} (RCL_{IV}), also known as ricin E; or

(c) Saxitoxin identified by C.A.S. #35523–89–8.

(2) The export of a ''medical product'' that is an ''Investigational New Drug'' (IND), as defined in 21 CFR 312.3, is subject to certain U.S. Food and Drug Administration (FDA) requirements that are independent of the export requirements specified in this ECCN or elsewhere in the EAR. These FDA requirements are described in 21 CFR 312.110 and must be satisfied in addition to any requirements specified in the EAR.

(3) Also see 21 CFR 314.410 for FDA requirements concerning exports of new drugs and new drug substances.

Related Definitions: For the purpose of this entry, ''immunotoxin'' is defined as an antibody-toxin conjugate intended to destroy specific target cells (e.g., tumor cells) that bear antigens homologous to the antibody. For the purpose of this entry, ''medical products'' are: (1) Pharmaceutical formulations designed for testing and human administration in the treatment of medical conditions, (2) prepackaged for distribution as clinical or medical products, and (3) approved by the U.S. Food and Drug Administration either to be marketed as clinical or medical products or for use as an ''Investigational New Drug'' (IND) (see 21 CFR part 312). For the purpose of this entry, ''diagnostic and food testing kits'' are specifically developed, packaged and marketed for diagnostic or public health purposes. Biological toxins in any other configuration, including bulk shipments, or for any other end-uses are controlled by ECCN 1C351 or ECCN 1C360. For the purpose of this entry, ''vaccine'' is defined as a medicinal (or veterinary) product in a pharmaceutical formulation, approved by the U.S. Food and Drug Administration or the U.S. Department of Agriculture to be marketed as a medical (or veterinary) product or for use in clinical trials, that is intended to stimulate a protective immunological response in humans or animals in order to prevent disease in

those to whom or to which it is administered.

Items:

a. Vaccines against items controlled by ECCN 1C351, 1C352, 1C353, 1C354, or 1C360;

b. Immunotoxins containing items controlled by 1C351.d;

c. Medical products containing botulinum toxins controlled by ECCN 1C351.d.3 or conotoxins controlled by ECCN 1C351.d.6;

d. Medical products containing items controlled by ECCN 1C351.d (except botulinum toxins controlled by ECCN 1C351.d.3, conotoxins controlled by ECCN 1C351.d.6, and items controlled for CW reasons under 1C351.d.11 or .d.12);

e. Diagnostic and food testing kits containing items controlled by ECCN 1C351.d (except items controlled for CW reasons under ECCN 1C351.d.11 or .d.12).

1C992 Commercial charges and devices containing energetic materials, n.e.s and nitrogen trifluoride in a gaseous state

LICENSE REQUIREMENTS

Reason for Control: AT, RS.

Control(s)	Country chart
AT applies to entire entry	AT Column 1.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq and transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: (1) Commercial charges and devices containing USML controlled energetic materials that exceed the quantities noted or that are not covered by this entry are controlled under 1C018. (2) Nitrogen trifluoride when not in a gaseous state is controlled under 1C018.

Related Definitions: (1) Items controlled by this entry 1C992 are those materials not subject to the licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121) or controlled by ECCN 1C018. (2) For purposes of this entry, the term ''controlled materials'' means controlled energetic materials (see ECCNs 1C011, 1C111, 1C239 and 22 CFR 121.1, Category V). (3) The individual USML controlled energetic materials, even when compounded with other materials, remain subject to the export licensing authority of the Department of State when not incorporated into explosive devices or charges controlled by this entry. (4) Commercial prefabricated slurries and emulsions containing greater than 35% of USML controlled energetic materials are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (5) For purposes of this entry, the mass of aluminum powder, potassium perchlorate, and any of the substances listed in the note to the USML (see 22 CFR 121.12) (such as ammonium pictrate, black powder, etc.) contained in commercial explosive devices and in the charges are omitted when determining the total mass of controlled material.

Items: a. Shaped charges specially designed for oil well operations, utilizing one charge functioning along a single axis, that upon detonation produce a hole, and

a.1. Contain any formulation of controlled materials;

a.2. Have only a uniform shaped conical liner with an included angle of 90 degrees or less;

a.3. Contain more than 0.010 kg but less than or equal to 0.090 kg of controlled materials; and

a.4. Have a diameter not exceeding 4.5 inches;

b. Shaped charges specially designed for oil well operations containing less than or equal to 0.010 kg of controlled materials;

c. Detonation cord or shock tubes containing less than or equal to 0.064 kg per meter (300 grains per foot) of controlled materials;

d. Cartridge power devices, that contain less than or equal to 0.70 kg of controlled materials in the deflagration material;

e. Detonators (electric or nonelectric) and assemblies thereof, that contain less than or equal to 0.01 kg of controlled materials;

f. Igniters, that contain less than or equal to 0.01 kg of controlled materials;

g. Oil well cartridges, that contain less than or equal to 0.015 kg of controlled energetic materials;

h. Commercial cast or pressed boosters containing less than or equal to 1.0 kg of controlled materials;

i. Commercial prefabricated slurries and emulsions containing less than or equal to 10.0 kg and less than or equal to thirty-five percent by weight of USML controlled materials;

j. Cutters and severing tools containing less than or equal to 3.5 kg of controlled materials;

k. Pyrotechnic devices when designed exclusively for commercial purposes (*e.g.*, theatrical stages, motion picture special effects,

and fireworks displays) and containing less than or equal to 3.0 kg of controlled materials; or

l. Other commercial explosive devices and charges not controlled by 1C992.a through .k containing less than or equal to 1.0 kg of controlled materials.

NOTE: 1C992.l includes automotive safety devices; extinguishing systems; cartridges for riveting guns; explosive charges for agricultural, oil and gas operations, sporting goods, commercial mining, or public works purposes; and delay tubes used in the assembly of commercial explosive devices.

m. Nitrogen trifluoride (NF_3) in a gaseous state.

1C995 Mixtures not controlled by ECCN 1C350, ECCN 1C355 or ECCN 1C395 that contain chemicals controlled by ECCN 1C350 or ECCN 1C355 and medical, analytical, diagnostic, and food testing kits not controlled by ECCN 1C350 or ECCN 1C395 that contain chemicals controlled by ECCN 1C350.d, as follows (see List of Items controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS

Control(s)	Country chart
AT applies to entire entry	AT Column 1.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE REQUIREMENT NOTES 1. This ECCN does not control mixtures containing less than 0.5% of any single toxic or precursor chemical controlled by ECCN 1C350.b, .c, or .d or ECCN 1C355 as unavoidable by-products or impurities. Such mixtures are classified as EAR99.

2. 1C995.c does not control mixtures that contain precursor chemicals identified in 1C350.d in concentrations below the levels for mixtures indicated in 1C350.d. 1C995.a.2.b controls such mixtures, unless they are consumer goods as described in License Requirements Note 3 of this ECCN.

3. This ECCN does not control mixtures when the controlled chemicals are normal ingredients in consumer goods packaged for retail sale for personal use. Such consumer goods are classified as EAR99.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: 1. ECCN 1C350 controls mixtures containing 30 percent or higher concentrations of any single CWC Schedule 2 chemical identified in ECCN 1C350.b. ECCN 1C395 controls mixtures containing concentrations of more than 10 percent, but less than 30 percent, of any single CWC Schedule 2 chemical identified in ECCN 1C350.b. 2. ECCN 1C350 controls mixtures containing chemicals identified in ECCN 1C350.c or .d that exceed the concentration levels indicated in 1C995.a.2. 3. ECCN 1C355 controls mixtures containing chemicals identified in ECCN 1C355 that exceed the concentration levels indicated in 1C995.b. 4. ECCN 1C395 controls ''medical, analytical, diagnostic, and food testing kits'' (as defined in the Related Controls paragraph of this ECCN) that contain CWC Schedule 2 or 3 chemicals listed in 1C350.b or .c. ECCN 1C350 controls any such testing kits in which the amount of any single chemical listed in 1C350.b, .c., or .d exceeds 300 grams by weight.

Related Definitions: For the purpose of this entry, ''medical, analytical, diagnostic, and food testing kits'' are pre-packaged materials of defined composition that are specifically developed, packaged and marketed for medical, analytical, diagnostic, or public health purposes. Replacement reagents for medical, analytical, diagnostic, and food testing kits described in 1C995.c are controlled by ECCN 1C350 if the reagents contain at least one of the precursor chemicals identified in that ECCN in concentrations equal to or greater than the control levels for mixtures indicated in 1C350.d.

Items: a. Mixtures containing the following concentrations of precursor chemicals controlled by ECCN 1C350 (For controls on other mixtures containing these chemicals, see Notes 1 and 2 in the Related Controls paragraph of this ECCN.):

a.1. Mixtures containing 10 percent or less, by weight, of any single CWC Schedule 2 chemical controlled by ECCN 1C350.b;

a.2. Mixtures containing less than 30 percent, by weight, of:

a.2.a. Any single CWC Schedule 3 chemical controlled by ECCN 1C350.c; or

a.2.b. Any single precursor chemical controlled by ECCN 1C350.d.

b. Mixtures containing the following concentrations of toxic or precursor chemicals controlled by ECCN 1C355 (For controls on other mixtures containing these chemicals, see Note 3 in the Related Controls paragraph of this ECCN.):

b.1. Mixtures containing the following concentrations of CWC Schedule 2 chemicals controlled by ECCN 1C355.a:

b.1.a. Mixtures containing 1 percent or less, by weight, of any single CWC Schedule 2 chemical controlled by ECCN 1C355.a.1 (i.e., mixtures containing PFIB); or

b.1.b. Mixtures containing 10 percent or less, by weight, of any single CWC Schedule 2 chemical controlled by 1C355.a.2;

b.2. Mixtures containing less than 30 percent, by weight, of any single CWC Schedule 3 chemical controlled by ECCN 1C355.b.

c. ''Medical, analytical, diagnostic, and food testing kits'' (as defined in the Related Definitions for this ECCN) that contain precursor chemicals controlled by ECCN 1C350.d in an amount *not* exceeding 300 grams per chemical. (For controls on other such test kits containing these and other controlled chemicals, see Note 4 in the Related Controls paragraph of this ECCN.)

1C996 Hydraulic fluids containing synthetic hydrocarbon oils, having all the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

*Reason for Control:*AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Barrels (55 U.S. gallons/209 liters)

Related Controls: N/A

Related Definitions: N/A

Items: a. A flash point exceeding 477 K (204 °C);

b. A pour point at 239 K (−-34 °C) or less;

c. A viscosity index of 75 or more; *and*

d. A thermal stability at 616 K (343 °C).

1C997 Ammonium Nitrate, Including Fertilizers and Fertilizer Blends Containing More Than 15% by Weight Ammonium Nitrate, Except Liquid Fertilizers (Containing Any Amount of Ammonium Nitrate) or Dry Fertilizers Containing Less Than 15% by Weight Ammonium Nitrate

LICENSE REQUIREMENTS

Reason for Control: AT, RS.

Control(s)	Country chart
AT applies to entire entry	AT Column 1.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms.

Related Controls: N/A

Related Definitions: N/A

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

1C998 Non-fluorinated polymeric substances, not controlled by 1C008, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: N/A

Related Definitions: N/A

Items: a. Polyarylene ether ketones, as follows:

a.1 Polyether ether ketone (PEEK);

a.2. Polyether ketone ketone (PEKK);

a.3. Polyether ketone (PEK);

a.4. Polyether ketone ether ketone ketone (PEKEKK);

b. [Reserved]

1C999 Specific Materials, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS.

Control(s)	Country chart
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See §742.19 of the EAR for additional information.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: See also 1C236.
Related Definitions: N/A
Items: a. Hardened steel and tungsten carbide precision ball bearings (3mm or greater diameter);
b. 304 and 316 stainless steel plate, n.e.s.;
c. Monel plate;
d. Tributyl phosphate;
e. Nitric acid in concentrations of 20 weight percent or greater;
f. Fluorine;
g. Alpha-emitting radionuclides, n.e.s.

1D001 "Software" specially designed or modified for the "development", "production" or "use" of equipment controlled by 1B001 to 1B003.
LICENSE REQUIREMENTS
Reason for Control: NS, MT, NP, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies to "software" for the "development", "production", or "use" of items controlled by 1B001 for MT reasons.	MT Column 1
NP applies to "software" for the "development", "production" or "use" of items controlled by 1B001 for NP reasons.	NP Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: Yes, except N/A for MT
TSR: Yes, except N/A for MT
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) See ECCNs 1E101 ("use") and 1E102 ("development" and "production") for technology for items controlled by this entry. (2) Also see 1D002, 1D101, 1D201, and 1D999.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1D002 "Software" for the "development" of organic "matrix", metal "matrix" or carbon "matrix" laminates or "composites".
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 REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under Exceptions.
LICENSE EXCEPTIONS
CIV: Yes
TSR: Yes
STA: License Exception STA may not be used to ship or transmit "software" for the "development" of organic "matrix", metal "matrix" or carbon "matrix" laminates or "composites" specified in ECCN 1A002 to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: "Software" for items controlled by 1A102 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

1D003 "Software" specially designed or modified to enable equipment to perform the functions of equipment controlled under 1A004.c or 1A004.d.
LICENSE REQUIREMENTS
Reason for Control: NS, RS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
RS applies to software for equipment controlled by 1A004.d.	RS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A

Related Definitions: N/A
Items:
The list of items controlled is contained in the ECCN heading.

1D018 "Software" specially designed or modified for the "development", "production", or "use" of items controlled by 1B018.

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to "software" for the "development", "production", or "use" of items controlled by 1B018 for MT reasons.	MT Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

1D101 "Software" specially designed or modified for the "use" of commodities controlled by 1B101, 1B102, 1B115, 1B117, 1B118, or 1B119.

LICENSE REQUIREMENTS
Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1.
NP applies to "software" for the "use" of items controlled by 1B101.a.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCNs 1E101 (''use'') and 1E102 (''development'' and ''production'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1D103 "Software" specially designed for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures, for applications usable in "missiles" or their subsystems.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) This entry includes ''software'' specially designed for analysis of signature reduction. (2) For software that meets the definition of defense articles under 22 CFR 120.3 of the International Traffic in Arms Regulations (ITAR), see 22 CFR 121.16, Item 17-Category II of the (ITAR), which describes similar software that are under the jurisdiction of the Department of State, Directorate of Defense Trade Controls.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

1D201 "Software" specially designed or modified for the "use" of items controlled by 1B201.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCNs 1E201 (''use'') and 1E203 (''development'' and ''production'') for technology for items controlled by this entry.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1D390 "Software" for process control that is specifically configured to control or initiate "production" of chemicals controlled by 1C350.

LICENSE REQUIREMENTS
Reason for Control: CB, AT

Control(s)	Country chart
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A

Related Definitions: See Section 772.1 of the EAR for the definitions of ''software,'' ''program,'' and ''microprogram.''
Items: The list of items controlled is contained in the ECCN heading

1D993 "Software" specially designed for the "development", "production", or "use" of equipment or materials controlled by 1C210.b or 1C990.

LICENSE REQUIREMENTS
Reason for Control: AT

Control(s)	Country Chart
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

1D999 Specific Software, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: AT.
Control(s).
Country Chart.
AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See §742.19 of the EAR for additional information.
LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: See also 1B999.
Related Definitions: N/A
Items: a. Software specially designed for industrial process control hardware/systems controlled by 1B999, n.e.s.;
b. Software specially designed for equipment for the production of structural composites, fibers, prepregs and preforms controlled by 1B999, n.e.s.

E. TECHNOLOGY

1E001 "Technology" According to the General Technology Note for the "Development" or "Production" of Items Controlled by 1A001.b, 1A001.c, 1A002, 1A003, 1A004, 1A005, 1A006.b, 1A007, 1A008, 1A101, 1B (except 1B999), or 1C (except 1C355, 1C980 to 1C984, 1C988, 1C990, 1C991, 1C995 to 1C999).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, NP, CB, RS, AT

Control(s)	Country chart
NS applies to "technology" for items controlled by 1A001.b and .c, 1A002, 1A003, 1A005, 1A006.b, 1A007, 1A008, 1B001 to 1B003, 1B018, 1C001 to 1C011, or 1C018.	NS Column 1.
NS applies to "technology" for items controlled by 1A004.	NS Column 2
MT applies to "technology" for items controlled by 1A101, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C007, 1C011, 1C101, 1C102, 1C107, 1C111, 1C116, 1C117, or 1C118 for MT reasons.	MT Column 1.
NP applies to "technology" for items controlled by 1A002, 1A007, 1B001, 1B101, 1B201, 1B225 to 1B233, 1C002, 1C010, 1C116, 1C202, 1C210, 1C216, 1C225 to 1C240 for NP reasons.	NP Column 1.
CB applies to "technology" for items controlled by 1C351, 1C352, 1C353, 1C354, or 1C360.	CB Column 1.
CB applies to "technology" for materials controlled by 1C350 and for chemical detection systems and dedicated detectors therefor, in 1A004.c, that also have the technical characteristics described in 2B351.a.	CB Column 2.
RS applies to technology for equipment controlled in 1A004.d.	RS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE REQUIREMENTS NOTE: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes, except for the following:
(1) Items controlled for MT reasons; or
(2) Exports and reexports to destinations outside of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, or the United Kingdom of ''technology'' for the ''development'' or production'' of the following:
(a) Items controlled by 1C001; or
(b) Items controlled by 1A002.a which are composite structures or laminates having an organic ''matrix'' and being made from materials listed under 1C010.c or 1C010.d.
STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''development'' or ''production'' of equipment and materials specified by ECCNs 1A002, 1C001, 1C007.c or d, 1C010.c or d or 1C012 to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: (1) Also see ECCNs 1E101, 1E201, and 1E202. (2) See ECCN 1E002.g for control libraries (parametric technical databases) specially designed or modified

to enable equipment to perform the functions of equipment controlled under 1A004.c (Nuclear, biological and chemical (NBC) detection systems). (3) ''Technology'' for lithium isotope separation (see related ECCN 1B233) and ''technology'' for items described in ECCN 1C012 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (4) ''Technology'' for items described in ECCN 1A102 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

Related Definitions: N/A

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

1E002 Other "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, AT

Control(s)	Country Chart
NS applies to entire entry, except 1E002.g.	NS Column 1.
NS applies to 1E002.g	NS Column 2.
MT applies to 1E002.e	MT Column 1.
NP applies to "technology" for items controlled by 1A002 for NP reasons.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE REQUIREMENT NOTE

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except for 1E002.e

STA: License Exception STA may not be used to ship or transmit any item in 1E002.e or .f to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 1E001, 1E101,1E102, 1E202, and 1E994 for ''technology'' related to 1E002.e or .f.

Related Definitions: N/A

Items: a. ''Technology'' for the ''development'' or ''production'' of polybenzothiazoles or polybenzoxazoles;

b. ''Technology'' for the ''development'' or ''production'' of fluoroelastomer compounds containing at least one vinylether monomer;

c. ''Technology'' for the design or ''production'' of the following base materials or non-''composite'' ceramic materials:

c.1. Base materials having all of the following:

c.1.a. Any of the following compositions:

c.1.a.1. Single or complex oxides of zirconium and complex oxides of silicon or aluminum;

c.1.a.2. Single nitrides of boron (cubic crystalline forms);

c.1.a.3. Single or complex carbides of silicon or boron; or

c.1.a.4. Single or complex nitrides of silicon;

c.1.b. Any of the following total metallic impurities (excluding intentional additions):

c.1.b.1. Less than 1,000 ppm for single oxides or carbides; or

c.1.b.2. Less than 5,000 ppm for complex compounds or single nitrides; and

c.1.c. Being any of the following:

c.1.c.1. Zirconia (CAS 1314–23–4) with an average particle size equal to or less than 1 μm and no more than 10% of the particles larger than 5 μm;

c.1.c.2. Other base materials with an average particle size equal to or less than 5 μm and no more than 10% of the particles larger than 10 μm; *or*

c.1.c.3. Having all of the following:

c.1.c.3.a. Platelets with a length to thickness ratio exceeding 5;

c.1.c.3.b. Whiskers with a length to diameter ratio exceeding 10 for diameters less than 2 μm; *and*

c.1.c.3.c. Continuous or chopped fibers less than 10 μm in diameter;

c.2. Non-''composite'' ceramic materials composed of the materials described in 1E002.c.1;

NOTE: 1E002.c.2 does not control technology for the design or production of abrasives.

d. ''Technology'' for the ''production'' of aromatic polyamide fibers;

e. ''Technology'' for the installation, maintenance or repair of materials controlled by 1C001;

f. ''Technology'' for the repair of ''composite'' structures, laminates or materials controlled by 1A002, 1C007.c or 1C007.d;

NOTE: 1E002.f does not control ''technology'' for the repair of ''civil aircraft'' structures using carbon ''fibrous or filamentary materials'' and epoxy resins, contained in aircraft manufacturers' manuals.

g. 'Libraries' (parametric technical databases) specially designed or modified to enable equipment to perform the functions of equipment controlled under 1A004.c or 1A004.d.

TECHNICAL NOTE: For the purpose of 1E002.g, 'library' (parametric technical database) means a collection of technical information, reference to which may enhance the performance of relevant equipment or systems.

1E101 "Technology", in accordance with the General Technology Note, for the "use" of commodities and software controlled by 1A101, 1A102, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C007, 1C011, 1C101, 1C107, 1C111, 1C116, 1C117, 1C118, 1D001, 1D101, or 1D103.

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1.
NP applies to ''technology'' for items controlled by 1B001, 1B101, 1C116, 1D001, and 1D101 for NP reasons.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: ''Technology'' for items controlled by 1A102 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1E102 "Technology" according to the General Technology Note for the "development" of software controlled by 1D001, 1D101 or 1D103.
LICENSE REQUIREMENTS
Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1.
NP applies to ''technology'' for items controlled by 1D001 and 1D101 for NP reasons.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: This entry includes databases specially designed for analysis of signature reduction.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1E103 "Technical data" (including processing conditions) and procedures for the regulation of temperature, pressure or atmosphere in autoclaves or hydroclaves, when used for the "production" of "composites" or partially processed "composites", usable for equipment or materials specified in 1C007, 1C102, 1C107, 1C116, 1C117, 1C118, 9A110, and 9C110.
LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: See also 1E203
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

1E104 "Technology" for the "production" of pyrolytically derived materials formed on a mold, mandrel or other substrate from precursor gases which decompose in the 1,573 K (1,300 °C) to 3,173 K (2,900 °C) temperature range at pressures of 130 Pa (1 mm Hg) to 20 kPa (150 mm Hg), including "technology" for the composition of precursor gases, flow-rates and process control schedules and parameters.
LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

1E201 "Technology" according to the General Technology Note for the "use" of items controlled by 1A002, 1A007, 1A202, 1A225 to 1A227, 1B201, 1B225 to 1B232, 1B233.b, 1C002.b.3 and b.4, 1C010.a, 1C010.b, 1C010.e.1, 1C202, 1C210, 1C216, 1C225 to 1C240 or 1D201.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry, for items controlled for NP reasons.	NP Column 1.
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

1E202 "Technology" according to the General Technology Note for the "development" or "production" of goods controlled by 1A202 or 1A225 to 1A227.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

1E203 "Technology" according to the General Technology Note for the "development" or "production" of "software" controlled by 1D201.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

1E350 "Technology" according to the "General Technology Note" for facilities designed or intended to produce chemicals controlled by 1C350.

LICENSE REQUIREMENTS
Reason for Control: CB, AT

Control(s)	Country chart
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

1E351 "Technology" according to the "General Technology Note" for the disposal of chemicals or microbiological materials controlled by 1C350, 1C351, 1C352, 1C353, 1C354 or 1C360.

LICENSE REQUIREMENTS
Reason for Control: CB, AT

Control(s)	Country chart
CB applies to "technology" for the disposal of items controlled by 1C351, 1C352, 1C353, 1C354, or 1C360.	CB Column 1.
CB applies to "technology" for the disposal of items controlled by 1C350.	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

1E355 Technology for the production of Chemical Weapons Convention (CWC) Schedule 2 and 3 chemicals, as follows (see List of Items Controlled):

LICENSE REQUIREMENTS
Reason for Control: CW, AT.

Control(s)	Country chart
CW applies to entire entry. A license is required for CW reasons to CWC non-States Parties (destinations not listed in Supplement No. 2 to part 745), except for Israel and Taiwan. See §742.18 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons.	
AT applies to the entire entry	AT Column 1

LICENSE EXCEPTIONS
TSR: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: N/A
Related Definitions: N/A
Items: a. Technology for the production of the following CWC Schedule 2 toxic chemicals:

a.1. PFIB: 1,1,3,3,3-Pentafluoro-2-(trifluoromethyl)-1-propene (382–21–8);

a.2. [Reserved]

b. Technology for the production of the following CWC Schedule 3 toxic chemicals:

b.1. Phosgene: Carbonyl dichloride (75–44–5);

b.2. Cyanogen chloride (506–77–4);

b.3. Hydrogen cyanide (74–90–8).

1E994 "Technology" for the "development", "production", or "use" of fibrous and filamentary materials controlled by 1C990.

LICENSE REQUIREMENTS
Reason for Control: AT

Control(s)	Country Chart
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

1E998 "Technology" for the "development" or "production" of processing equipment controlled by 1B999, and materials controlled by 1C996, 1C997, 1C998, or 1C999.
LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

EAR99 Items Subject to the EAR That Are *Not* Elsewhere Specified in This CCL Category *or* in Any Other Category in the CCL Are Designated by the Number EAR99.

ANNEX TO CATEGORY 1

List of Explosives (See ECCNs 1A004 and 1A008)

1. ADNBF (aminodinitrobenzofuroxan or 7-amino-4,6-dinitrobenzofurazane-1-oxide) (CAS 97096–78–1);
2. BNCP (cis-bis (5-nitrotetrazolato) tetra amine-cobalt (III) perchlorate) (CAS 117412–28–9);
3. CL–14 (diamino dinitrobenzofuroxan or 5,7-diamino-4,6-dinitrobenzofurazane-1-oxide) (CAS 117907–74–1);
4. CL–20 (HNIW or Hexanitrohexaazaisowurtzitane) (CAS 135285–90–4); chlathrates of CL–20;
5. CP (2-(5-cyanotetrazolato) penta amine-cobalt (III) perchlorate) (CAS 70247–32–4);
6. DADE (1,1-diamino-2,2-dinitroethylene, FOX7) (CAS 145250–81–3);
7. DATB (diaminotrinitrobenzene) (CAS 1630–08–6);
8. DDFP (1,4-dinitrodifurazanopiperazine);
9. DDPO (2,6-diamino-3,5-dinitropyrazine-1-oxide, PZO) (CAS 194486–77–6);
10. DIPAM (3,3′-diamino-2,2′,4,4′,6,6′-hexanitrobiphenyl or dipicramide) (CAS 17215–44–0);
11. DNGU (DINGU or dinitroglycoluril) (CAS 55510–04–8);
12. Furazans as follows:
a. DAAOF (diaminoazoxyfurazan);
b. DAAzF (diaminoazofurazan) (CAS 78644–90–3);
13. HMX and derivatives, as follows:
a. HMX (Cyclotetramethylenetetranitramine, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazine, 1,3,5,7-tetranitro-1,3,5,7-tetraza-cyclooctane, octogen or octogene) (CAS 2691–41–0);
b. difluoroaminated analogs of HMX;
c. K–55 (2,4,6,8-tetranitro-2,4,6,8-tetraazabicyclo [3,3,0]-octanone-3, tetranitrosemiglycouril or keto-bicyclic HMX) (CAS 130256–72–3);
14. HNAD (hexanitroadamantane) (CAS 143850–71–9);
15. HNS (hexanitrostilbene) (CAS 20062–22–0);
16. Imidazoles as follows:
a. BNNII (Octahydro-2,5-bis(nitroimino)imidazo [4,5-d]imidazole);
b. DNI (2,4-dinitroimidazole) (CAS 5213–49–0);
c. FDIA (1-fluoro-2,4-dinitroimidazole);
d. NTDNIA (N-(2-nitrotriazolo)-2,4-dinitroimidazole);
e. PTIA (1-picryl-2,4,5-trinitroimidazole);
17. NTNMH (1-(2-nitrotriazolo)-2-dinitromethylene hydrazine);
18. NTO (ONTA or 3-nitro-1,2,4-triazol-5-one) (CAS 932–64–9);
19. Polynitrocubanes with more than four nitro groups;
20. PYX (2,6-Bis(picrylamino)-3,5-dinitropyridine) (CAS 38082–89–2);
21. RDX and derivatives, as follows:
a. RDX (cyclotrimethylenetrinitramine, cyclonite, T4, hexahydro-1,3,5-trinitro-1,3,5-triazine, 1,3,5-trinitro-1,3,5-triaza-cyclohexane, hexogen or hexogene) (CAS 121–82–4);
b. Keto-RDX (K–6 or 2,4,6-trinitro-2,4,6-triazacyclohexanone) (CAS 115029–35–1);
22. TAGN (triaminoguanidinenitrate) (CAS 4000–16–2);
23. TATB (triaminotrinitrobenzene) (CAS 3058–38–6);
24. TEDDZ (3,3,7,7-tetrabis(difluoroamine) octahydro-1,5-dinitro-1,5-diazocine);
25. Tetrazoles as follows:
a. NTAT (nitrotriazol aminotetrazole);
b. NTNT (1-N-(2-nitrotriazolo)-4-nitrotetrazole);
26. Tetryl (trinitrophenylmethylnitramine) (CAS 479–45–8);
27. TNAD (1,4,5,8-tetranitro-1,4,5,8-tetraazadecalin) (CAS 135877–16–6);
28. TNAZ (1,3,3-trinitroazetidine) (CAS 97645–24–4);
29. TNGU (SORGUYL or tetranitroglycoluril) (CAS 55510–03–7);
30. TNP (1,4,5,8-tetranitro-pyridazino[4,5-d]pyridazine) (CAS 229176–04–9);
31. Triazines as follows:

a. DNAM (2-oxy-4,6-dinitroamino-s-triazine) (CAS 19899–80–0);

b. NNHT (2-nitroimino-5-nitro-hexahydro-1,3,5-triazine) (CAS 130400–13–4);

32. Triazoles as follows:

a. 5-azido-2-nitrotriazole;

b. ADHTDN (4-amino-3,5-dihydrazino-1,2,4-triazole dinitramide) (CAS 1614–08–0);

c. ADNT (1-amino-3,5-dinitro-1,2,4-triazole);

d. BDNTA ([bis-dinitrotriazole]amine);

e. DBT (3,3′-dinitro-5,5-bi-1,2,4-triazole) (CAS 30003–46–4);

f. DNBT (dinitrobistriazole) (CAS 70890–46–9);

g. [Reserved]

h. NTDNT (1-N-(2-nitrotriazolo) 3,5-dinitrotriazole);

i. PDNT (1-picryl-3,5-dinitrotriazole);

j. TACOT (tetranitrobenzotriazolobenzotriazole) (CAS 25243–36–1);

33. ''Explosives'' not listed elsewhere in this list having a detonation velocity exceeding 8,700 m/s, at maximum density, or a detonation pressure exceeding 34 GPa (340 kbar);

34. Organic ''explosives'' not listed elsewhere in this list yielding detonation pressures of 25 GPa (250 kbar) or more that will remain stable at temperatures of 523 K (250 °C) or higher, for periods of 5 minutes or longer;

35. Nitrocellulose (containing more than 12.5% nitrogen) (CAS 9004–70–0);

36. Nitroglycol (CAS 628–96–6);

37. Pentaerythritol tetranitrate (PETN) (CAS 78–11–5);

38. Picryl chloride (CAS 88–88–0);

39. 2,4,6–Trinitrotoluene (TNT) (CAS 118–96–7);

40. Nitroglycerine (NG) (CAS 55–63–0);

41. Triacetone Triperoxide (TATP) (CAS 17088–37–8);

42. Guanidine nitrate (CAS 506–93–4);

43. Nitroguanidine (NQ) (CAS 556–88–7).

CATEGORY 2—MATERIALS PROCESSING

NOTE: For quiet running bearings, see the U.S. Munitions List.

A. SYSTEMS, EQUIPMENT AND COMPONENTS

2A001 Anti-friction bearings and bearing systems, as follows, (see List of Items Controlled) and components therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
MT applies to radial ball bearings having all tolerances specified in accordance with ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC–9, or other national equivalents) or better and having all the following characteristics: An inner ring bore diameter between 12 and 50 mm; an outer ring outside diameter between 25 and 100 mm; and a width between 10 and 20 mm..	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: $3000, N/A for MT

GBS: Yes, for 2A001.a, N/A for MT

CIV: Yes, for 2A001.a, N/A for MT

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, Directorate of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: Annular Bearing Engineers Committee (ABEC).

Items:

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

a. Ball bearings and solid roller bearings, having all tolerances specified by the manufacturer in accordance with ISO 492 Tolerance Class 4 (or national equivalents), or better, and having both rings and rolling elements (ISO 5593), made from monel or beryllium;

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

b. [Reserved]

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.

2A101 Radial Ball Bearings Having all Tolerances Specified in Accordance With ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC-9 or Other National Equivalents), or Better and Having all the Following Characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
List of Items Controlled
Unit: $ value
Related Controls: See ECCN 2A001.
Related Definitions: N/A
Items:
a. An inner ring bore diameter between 12 and 50 mm;
b. An outer ring outside diameter between 25 and 100 mm; and
c. A width between 10 and 20 mm.

2A225 Crucibles made of materials resistant to liquid actinide metals, as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry.
Related Definitions: N/A
Items: a. Crucibles having both of the following characteristics:
a.1. A volume of between 150 cm^3 and 8,000 cm^3; and
a.2. Made of or coated with any of the following materials, having a purity of 98% or greater by weight:
a.2.a. Calcium fluoride (CaF_2);
a.2.b. Calcium zirconate (metazirconate) ($CaZrO_3$);
a.2.c. Cerium sulphide (Ce_2S_3);
a.2.d. Erbium oxide (erbia) (Er_2O_3);
a.2.e. Hafnium oxide (hafnia) (HfO_2);
a.2.f. Magnesium oxide (MgO);
a.2.g. Nitrided niobium-titanium-tungsten alloy (approximately 50% Nb, 30% Ti, 20% W);
a.2.h. Yttrium oxide (yttria) (Y_2O_3); *or*
a.2.i. Zirconium oxide (zirconia) (ZrO_2);
b. Crucibles having both of the following characteristics:
b.1. A volume of between 50 cm^3 and 2,000 cm^3; *and*
b.2. Made of or lined with tantalum, having a purity of 99.9% or greater by weight;
c. Crucibles having all of the following characteristics:
c.1. A volume of between 50 cm^3 and 2,000 cm^3;
c.2. Made of or lined with tantalum, having a purity of 98% or greater by weight; *and*
c.3. Coated with tantalum carbide, nitride, boride, or any combination thereof.

2A226 Valves having all of the following characteristics (see List of Items Controlled).
LICENSE REQUIREMENTS
*Reason for Control:*NP, CB, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 1.
CB applies to valves that also meet or exceed the technical parameters in 2B350.g.	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (2) Also see ECCNs 2A292 and 2B350.g. (3) Valves specially designed or prepared for certain nuclear uses are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).
Related Definitions: For valves with different inlet and outlet diameters, the ''nominal size'' in 2A226 refers to the smallest diameter.
Items: a. A ''nominal size'' of 5 mm or greater;
b. Having a bellows seal; *and*
c. Wholly made of or lined with aluminum, aluminum alloy, nickel, or nickel alloy containing more than 60% nickel by weight.

2A290 Generators and other equipment specially designed, prepared, or intended for use with nuclear plants.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) *See* ECCN 2D290 for software for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E290 (''use'') for technology for items controlled under this entry. (3) Also see ECCN 2A291. (4) Certain nuclear equipment specially designed or prepared for use in nuclear plants is subject to the export licensing authority of

the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: N/A

Items: a. Generators, turbine-generator sets, steam turbines, heat exchangers, and heat exchanger type condensers designed or intended for use in a nuclear reactor;

b. Process control systems intended for use with the equipment controlled by 2A290.a.

2A291 Equipment, except items controlled by 2A290, related to nuclear material handling and processing and to nuclear reactors.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: (1) *See* ECCN 2D290 for software for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E290 (''use'') for technology for items controlled under this entry. (3) Also see ECCN 2A290. (4) Certain equipment specially designed or prepared for use in a nuclear reactor or in nuclear material handling is subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110). (5) Nuclear radiation detection and measurement devices specially designed or modified for military purposes are subject to the export licensing authority of the Department of State (*see* 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: a. Process control systems intended for use with nuclear reactors.

b. Simulators specially designed for ''nuclear reactors''.

c. Casks that are specially designed for transportation of high-level radioactive material and that weigh more than 1,000 kg.

d. Commodities, parts and accessories specially designed or prepared for use with nuclear plants (*e.g.*, snubbers, airlocks, pumps, reactor fuel charging and discharging equipment, containment equipment such as hydrogen recombiner and penetration seals, and reactor and fuel inspection equipment, including ultrasonic or eddy current test equipment).

e. Radiation detectors and monitors specially designed for detecting or measuring ''special nuclear material'' (as defined in 10 CFR part 110) or for nuclear reactors.

Technical Notes: 1. 2A291.e does not control neutron flux detectors and monitors. These are subject to the export licens ing authority of the Nuclear Regulatory Commission, pursuant to 10 CFR part 110.

2. 2A291.e does not control general purpose radiation detection equipment, such as geiger counters and dosimeters. These items are controlled by ECCN 1A999.

2A292 Piping, fittings and valves made of, or lined with, stainless steel, copper-nickel alloy or other alloy steel containing 10% or more nickel and/or chromium.

LICENSE REQUIREMENTS

*Reason for Control:*NP, CB, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2.
CB applies to valves that meet or exceed the technical parameters described in 2B350.g.	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Pressure tubes, pipes, and fittings in kilograms; valves in number; parts and accessories in $ value

Related Controls: (1) *See* ECCN 2D290 for software for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E290 (''use'') for technology for items controlled under this entry. (3) Also *see* ECCN 2A226. (4) Piping, fittings, and valves specially designed or prepared for certain nuclear uses are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: N/A

Items: a. Pressure tube, pipe, and fittings of 200 mm (8 in.) or more inside diameter, and suitable for operation at pressures of 3.4 MPa (500 psi) or greater;

b. Pipe valves having all of the following characteristics:

b.1. A pipe size connection of 200 mm (8 in.) or more inside diameter; *and*

b.2. Rated at 10.3 MPa (1,500 psi) or more.

2A293 Pumps designed to move molten metals by electromagnetic forces.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number
Related Controls: (1) *See* ECCN 2D290 for software for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E290 (''use'') for technology for items controlled under this entry. (3) Pumps for use in liquid-metal-cooled reactors are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2A983 Explosives or detonator detection equipment, both bulk and trace based, consisting of an automated device, or combination of devices for automated decision making to detect the presence of different types of explosives, explosive residue, or detonators; and parts and components, n.e.s.

LICENSE REQUIREMENTS
Reason for Control: RS, AT

Control(s)	Country chart
RS applies to entire entry	RS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number
Related Controls: Also see 1A004 and 1A995.
Related Definitions: (1) For the purpose of this entry, automated decision making is the ability of the equipment to detect explosives or detonators at the design or operator-selected level of sensitivity and provide an automated alarm when explosives or detonators at or above the sensitivity level are detected. This entry does not control equipment that depends on operator interpretation of indicators such as inorganic/organic color mapping of the items(s) being scanned.

(2) Explosives and detonators include commercial charges and devices controlled by 1C018 and 1C992 and energetic materials controlled by ECCNs 1C011, 1C111, 1C239 and 22 CFR 121.1 Category V.
Items:

NOTE: Explosives or detonation detection equipment in 2A983 includes equipment for screening people, documents, baggage, other personal effects, cargo and/or mail.

a. Explosives detection equipment for automated decision making to detect and identify bulk explosives utilizing, but not limited to, x-ray (*e.g.,* computed tomography, dual energy, or coherent scattering), nuclear (*e.g.,* thermal neutron analysis, pulse fast neutron analysis, pulse fast neutron transmission spectroscopy, and gamma resonance absorption), or electromagnetic techniques (*e.g.,* quadropole resonance and dielectrometry).

b. [Reserved]

c. Detonator detection equipment for automated decision making to detect and identify initiation devices (*e.g.* detonators, blasting caps) utilizing, but not limited to, x-ray (*e.g.* dual energy or computed tomography) or electromagnetic techniques.

2A984 Concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution of 0.5 milliradian up to and including 1 milliradian at a standoff distance of 100 meters; and parts and components, n.e.s.

LICENSE REQUIREMENTS
Reason for Control: RS, AT

Control(s)	Country chart
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.5 milliradian (a lower milliradian number means a more accurate image resolution) at a standoff distance of 100 meters is under the export licensing authority of the U.S. Department of State (22 CFR parts 120 through 130). (2) Concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters is designated as EAR99. (3) See ECCNs 2D984 and 2E984 for related software and technology controls.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

NOTE: Concealed object detection equipment includes but is not limited to equipment for screening people, documents, baggage, other personal effects, cargo and/or mail.

TECHNICAL NOTE: The range of frequencies span what is generally considered as the millimeter-wave, submillimeter-wave and terahertz frequency regions.

2A991 Bearings and bearing systems not controlled by 2A001.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) This entry does not control balls with tolerance specified by the manufacturer in accordance with ISO 3290 as grade 5 or worse. (2) Quiet running bearings are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121)
Related Definitions: (1) (a) DN is the product of the bearing bore diameter in mm and the bearing rotational velocity in rpm. (b) Operating temperatures include those temperatures obtained when a gas turbine engine has stopped after operation. (2) Annular Bearing Engineers Committee (ABEC); American National Standards Institute (ANSI); Anti-Friction Bearing Manufacturers Association (AFBMA)
Items: a. Ball bearings or Solid ball bearings (except tapered roller bearings), having tolerances specified by the manufacturer in accordance with ABEC 7, ABEC 7P, or ABEC 7T or ISO Standard Class 4 or better (or equivalents) and having any of the following characteristics.

a.1. Manufactured for use at operating temperatures above 573 K (300 °C) either by using special materials or by special heat treatment; *or*

a.2. With lubricating elements or component modifications that, according to the manufacturer's specifications, are specially designed to enable the bearings to operate at speeds exceeding 2.3 million DN.

b. Solid tapered roller bearings, having tolerances specified by the manufacturer in accordance with ANSI/AFBMA Class 00 (inch) or Class A (metric) or better (or equivalents) and having either of the following characteristics.

b.1. With lubricating elements or component modifications that, according to the manufacturer's specifications, are specially designed to enable the bearings to operate at speeds exceeding 2.3 million DN; *or*

b.2. Manufactured for use at operating temperatures below 219 K (−54 °C) or above 423 K (150 °C).

c. Gas-lubricated foil bearing manufactured for use at operating temperatures of 561 K (288 °C) or higher and a unit load capacity exceeding 1 MPa.

d. Active magnetic bearing systems.

e. Fabric-lined self-aligning or fabric-lined journal sliding bearings manufactured for use at operating temperatures below 219 K (−54 °C) or above 423 K (150 °C).

2A994 Portable electric generators and specially designed parts.
LICENSE REQUIREMENTS
Reason for Control: AT.
Control(s).

AT applies to entire entry. A license is required for items controlled by this entry to Cuba, Iran and North Korea. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information on Cuba and Iran. See §742.19 of the EAR for additional information on North Korea.
LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 2D994 and 2E994.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

2A999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: AT.
Control(s).
Country Chart.

AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See §742.19 of the EAR for additional information.
LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: See also 2A226, 2B350.
Related Definitions: N/A
Items: a. Bellows sealed valves;

b. Reserved.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

TECHNICAL NOTES FOR 2B001 TO 2B009, 2B201, 2B290 AND 2B991 TO 2B999: *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 360°. 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 coordinated simultaneously for ''contouring control'' is the number of axes along or around which, during processing of the workpiece, simultaneous and interrelated motions are performed

between the workpiece and a tool. This does not include any additional axes along or around which other relative motions within the machine are performed, such as:

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. 'Stated positioning accuracy' derived from measurements made according to ISO 230/2 (2006) may be used for each specific machine model as an alternative to individual machine tests. 'Stated positioning accuracy' means the accuracy value provided to BIS as representative of the accuracy of a specific machine model.

NOTE TO PARAGRAPH 5: *Determination of 'Stated Positioning Accuracy':*

a. Select five machines of a model to be evaluated;

b. Measure the linear axis accuracies according to ISO 230/2 (2006);

c. Determine the A-values for each axis of each machine. The method of calculating the A-value is described in the ISO standard;

*d. Determine the mean value of the A-value of each axis. This mean value A becomes the stated value of each axis for the model (x y * * *);*

e. Since the Category 2 list refers to each linear axis there will be as many stated values as there are linear axes;

f. If any axis of a machine model not controlled by 2B001.a. to 2B001.c. has a stated accuracy of 5 μm for grinding machines and 6.5 μm for milling and turning machines or better, the builder should be required to reaffirm the accuracy level once every eighteen months.

6. *Measurement uncertainty for the positioning accuracy of machine tools, as defined in the International Standard ISO 230/2 (2006), shall not be considered.*

2B001 Machine tools and any combination thereof, for removing (or cutting) metals, ceramics or "composites", which, according to the manufacturer's technical specifications, can be equipped with electronic devices for "numerical control"; and specially designed components 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 2B001.a, .b, .c, and .d, EXCEPT: (1) turning machines under 2B001.a with a capacity no greater than 35 mm diameter; (2) bar machines (Swissturn), limited to machining only bar feed through, if maximum bar diameter is equal to or less than 42 mm and there is no capability of mounting chucks. (Machines may have drilling and/or milling capabilities for machining parts with diameters less than 42 mm); or (3) milling machines under 2B001.b with x-axis travel greater than two meters and overall positioning accuracy according to ISO 230/2 (2006) on the x-axis more (worse) than 22.5 μm.	NP Column 1.
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Machine tools in number; components in $ value

Related Controls: (1) See ECCN 2B002 for optical finishing machines. (2) See ECCNs 2D001 and 2D002 for software for items controlled under this entry. (3) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (4) Also see ECCNs 2B201, 2B290, and 2B991.

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:

a. Crank shafts or cam shafts;

b. Tools or cutters;

c. Extruder worms; or

d. Engraved or faceted jewellery parts.

NOTE 3: A machine tool having at least two of the three turning, milling or grinding capabilities (e.g., a turning machine with milling capability), must be evaluated against each applicable entry 2B001.a., b. or c.

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

a.1. Positioning accuracy according to ISO 230/2 (2006) with ''all compensations available'' equal to or less (better) than 4.5 μm along one or more 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 PRODUCING CONTACT LENSES, HAVING ALL OF THE FOLLOWING: a. Machine controller limited to

using ophthalmic based software for part programming data input; and

b. No vacuum chucking.

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

b.1. Having all of the following:

b.1.a. Positioning accuracy according to ISO 230/2 (2006) with ''all compensations available'' of less (better) than 4.5 μm along one or more 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 according to ISO 230/2 (2006) for jig boring machines, with ''all compensations available'', of less (better) than 3.0 μm along any linear axis; or

b.4. Fly cutting machines having all of the following:

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:

c.1. Having all of the following:

c.1.a. Positioning accuracy according to ISO 230/2 (2006) with ''all compensations available'' of less (better) than 3.0 μm along one or more 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:*

a. Cylindrical external, internal, and external-internal grinding machines, having all of the following:

a.1. Limited to cylindrical grinding; and

a.2. Limited to a maximum workpiece capacity of 150 mm outside diameter or length.

b. Machines designed specifically as jig grinders that do not have a z-axis or a w-axis, with a positioning accuracy according to ISO 230/2 (2006) with ''all compensations available'' less (better) than 3 μm.

c. 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:

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. At least two rotary axes having all of the following:

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

e.2.b. 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 m and specially designed components therefor.

2B002 Numerically controlled optical finishing machine tools equipped for selective material removal to produce non-spherical optical surfaces having all of the following characteristics (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number.

Related Controls: See also 2B001.

Related Definitions: For the purposes of 2B002, 'MRF' is a material removal process using an abrasive magnetic fluid whose viscosity is controlled by a magnetic field. 'ERF' is a removal process using an abrasive fluid whose viscosity is controlled by an electric field. 'Energetic particle beam finishing' uses Reactive Atom Plasmas (RAP) or ion-beams to selectively remove material. 'Inflatable membrane tool finishing' is a process that uses a pressurized membrane that deforms to contact the workpiece over a small area.'Fluid jet finishing' makes use of a fluid stream for material removal.

Items:

a. Finishing the form to less (better) than 1.0 μm;

b. Finishing to a roughness less (better) than 100 nm rms;

c. Four or more axes which can be coordinated simultaneously for ''contouring control''; *and*

d. Using any of the following processes:

d.1. 'Magnetorheological finishing (MRF)';

d.2. 'Electrorheological finishing (ERF)';

d.3. 'Energetic particle beam finishing';

d.4. 'Inflatable membrane tool finishing'; *or*

d.5. 'Fluid jet finishing'.

2B003 "Numerically controlled" or manual machine tools, and specially designed components, controls and accessories

therefor, specially designed for the shaving, finishing, grinding or honing of hardened (R_c = 40 or more) spur, helical and double-helical gears with a pitch diameter exceeding 1,250 mm and a face width of 15% of pitch diameter or larger finished to a quality of AGMA 14 or better (equivalent to ISO 1328 class 3).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS: $5000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Machine Tools in number; components, controls and accessories in $ value

Related Controls: See also 2B993

Related Definitions: N/A

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

2B004 Hot "isostatic presses" having all of the characteristics described in the List of Items Controlled, and specially designed components and accessories therefor.

LICENSE REQUIREMENTS

*Reason for Control:*NS, MT NP, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
MT applies to entire entry	MT Column 1.
NP applies to entire entry, except 2B004.b.3 and presses with maximum working pressures below 69 MPa.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Presses in number; components and accessories in $ value

Related Controls: (1) See ECCN 2D001 for software for items controlled under this entry. (2) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E101 (''use'') for technology for items controlled under this entry. (3) For specially designed dies, molds and tooling, see ECCNs 1B003, 2B018, 9B004, and 9B009. (4) For additional controls on dies, molds and tooling, see ECCNs 1B101.d, 2B104 and 2B204. (5) Also see ECCNs 2B117 and 2B999.a.

Related Definitions: N/A

Items: a. A controlled thermal environment within the closed cavity and possessing a chamber cavity with an inside diameter of 406 mm or more; *and*

b. Having any of the following:

b.1. A maximum working pressure exceeding 207 MPa;

b.2. A controlled thermal environment exceeding 1,773 K (1,500 °C); *or*

b.3. A facility for hydrocarbon impregnation and removal of resultant gaseous degradation products.

TECHNICAL NOTE: The inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber, depending on which of the two chambers is located inside the other.

2B005 Equipment specially designed for the deposition, processing and in-process control of inorganic overlays, coatings and surface modifications, as follows, for non-electronic substrates, by processes shown in the Table and associated Notes following 2E003.f, and specially designed automated handling, positioning, manipulation and control components therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $1000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) This entry does not control chemical vapor deposition, cathodic arc, sputter deposition, ion plating or ion implantation equipment, specially designed for cutting or machining tools. (2) Vapor deposition equipment for the production of filamentary materials are controlled by 1B001 or 1B101. (3) Chemical Vapor Deposition furnaces designed or modified for densification of carbon-carbon composites are controlled by *2B105*. (4) *See also 2B999.i*.

Related Definitions: N/A

Items:

a. Chemical vapor deposition (CVD) production equipment having all of the following:

a.1. A process modified for one of the following:

a.1.a. Pulsating CVD;

a.1.b. Controlled nucleation thermal deposition (CNTD); or

a.1.c. Plasma enhanced or plasma assisted CVD; and

a.2. Having any of the following:

a.2.a. Incorporating high vacuum (equal to or less than 0.01 Pa) rotating seals; or

a.2.b. Incorporating in situ coating thickness control;

b. Ion implantation production equipment having beam currents of 5 mA or more;

c. Electron beam physical vapor deposition (EB–PVD) production equipment incorporating power systems rated for over 80 kW and having any of the following:

c.1. A liquid pool level ''laser'' control system which regulates precisely the ingots feed rate; *or*

c.2. A computer controlled rate monitor operating on the principle of photo-luminescence of the ionized atoms in the evaporant stream to control the deposition rate of a coating containing two or more elements;

d. Plasma spraying production equipment having any of the following:

d.1. Operating at reduced pressure controlled atmosphere (equal or less than 10 kPa measured above and within 300 mm of the gun nozzle exit) in a vacuum chamber capable of evacuation down to 0.01 Pa prior to the spraying process; *or*

d.2. Incorporating in situ coating thickness control;

e. Sputter deposition production equipment capable of current densities of 0.1 mA/mm^2 or higher at a deposition rate 15 μm/h or more;

f. Cathodic arc deposition production equipment incorporating a grid of electromagnets for steering control of the arc spot on the cathode;

g. Ion plating production equipment capable of *in situ* measurement of any of the following:

g.1. Coating thickness on the substrate and rate control; *or*

g.2. Optical characteristics.

2B006 Dimensional inspection or measuring systems, equipment, and "electronic assemblies", 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 2B006.a and .b, except 2B006.b.1.d.	NP Column 1.
AT applies to entire entry	AT Column 1.

NOTE: NP applies to measuring systems in 2B006.b.1.c that maintain, for at least 12 hours, over a temperature range of ±1 K around a standard temperature and at a standard pressure, all of the following: a ''resolution'' over their full scale of 0.1 μm or less (better); *and* a ''measurement uncertainty'' equal to or less (better) than (0.2 + L/2,000) μm (L is the measured length in mm).

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number, electronic assemblies in $ value

Related Controls: (1) *See* ECCNs 2D001 and 2D002 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCNs 2B206 and 2B996.

Related Definitions: N/A

Items:

a. Computer controlled or ''numerically controlled'' Coordinate Measuring Machines (CMM), having a three dimensional length (volumetric) maximum permissible error of length measurement ($E_{0,MPE}$) at any point within the operating range of the machine (*i.e.*, within the length of axes) equal to or less (better) than (1.7 + L/1,000) μm (L is the measured length in mm) according to ISO 10360–2 (2009);

TECHNICAL NOTE: The $E_{0,MPE}$ of the most accurate configuration of the CMM specified by the manufacturer (*e.g.*, best of the following: Probe, stylus length, motion parameters, environment) and with ''all compensations available'' shall be compared to the 1.7 + L/1,000 μm threshold.

b. Linear and angular displacement measuring instruments, as follows:

b.1. 'Linear displacement' measuring instruments having any of the following:

TECHNICAL NOTE:

For the purpose of 2B006.b.1 'linear displacement' means the change of distance between the measuring probe and the measured object.

b.1.a. Non-contact type measuring systems with a ''resolution'' equal to or less (better) than 0.2 μm within a measuring range up to 0.2 mm;

b.1.b. Linear voltage differential transformer systems having all of the following:

b.1.b.1. ''Linearity'' equal to or less (better) than 0.1% within a measuring range up to 5 mm; *and*

b.1.b.2. Drift equal to or less (better) than 0.1% per day at a standard ambient test room temperature ±1 K;

b.1.c. Measuring systems having all of the following:

b.1.c.1. Containing a ''laser''; *and*

b.1.c.2. Maintaining, for at least 12 hours, at a temperature of 20 ±1 °C, all of the following:

b.1.c.2.a. A ''resolution'' over their full scale of 0.1 μm or less (better); *and*

b.1.c.2.b. Capable of achieving a ''measurement uncertainty'', when compensated for the refractive index of air, equal to or less

(better) than (0.2 + L/2,000) μm (L is the measured length in mm); or

b.1.d ''Electronic assemblies'' specially designed to provide feedback capability in systems controlled by 2B006.b.1.c;

NOTE:

2B006.b.1 does not control measuring interferometer systems, with an automatic control system that is designed to use no feedback techniques, containing a ''laser'' to measure slide movement errors of machine-tools, dimensional inspection machines or similar equipment.

b.2. Angular displacement measuring instruments having an ''angular position deviation'' equal to or less (better) than 0.00025°;

NOTE:

2B006.b.2 does not control optical instruments, such as autocollimators, using collimated light (e.g., laser light) to detect angular displacement of a mirror.

c. Equipment for measuring surface irregularities, by measuring optical scatter as a function of angle, with a sensitivity of 0.5 nm or less (better).

NOTE: 2B006 includes machine tools, other than those specified by 2B001, that can be used as measuring machines, if they meet or exceed the criteria specified for the measuring machine function.

2B007 "Robots" having any of the following characteristics described in the List of Items Controlled and specially designed controllers and "end-effectors" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, NP, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
NP applies to equipment that meets or exceeds the criteria in ECCNs 2B207.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: $5000, except 2B007.b and .c

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) *See* ECCN 2D001 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCNs 2B207, 2B225 and 2B997.

Related Definitions: N/A

Items:

a. Capable in real time of full three-dimensional image processing or full three-dimensional 'scene analysis' to generate or modify ''programs'' or to generate or modify numerical program data;

TECHNICAL NOTE:

The 'scene analysis' limitation does not include approximation of the third dimension by viewing at a given angle, or limited grey scale interpretation for the perception of depth or texture for the approved tasks (2½ D).

b. Specially designed to comply with national safety standards applicable to potentially explosive munitions environments;

NOTE: 2B007.b does not apply to ''robots'' specially designed for paint-spraying booths.

c. Specially designed or rated as radiation-hardened to withstand a total radiation dose greater than 5×10^3 Gy (silicon) without operational degradation; *or*

TECHNICAL NOTE: *The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionizing radiation.*

d. Specially designed to operate at altitudes exceeding 30,000m.

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

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: See also 2B998.

Related Definition: N/A

Items:

a. Three or more axes which can be coordinated simultaneously for ''contouring control''; *and*

N.B.: *For ''laser'' systems see also 2B006.b.1.c and d.*

b. Rotary position feedback units having an ''accuracy'' less (better) than 0.00025°;

N.B.: *For ''laser'' systems see also 2B006.b.2.*

NOTE: *2B008.a and 2B008.b apply to units, which are designed to determine the positioning information for feedback control, such as inductive type devices, graduated scales, infrared systems or ''laser'' systems.*

c. ''Compound rotary tables'' and ''tilting spindles'', capable of upgrading, according to the manufacturer's specifications, machine tools to or above the levels controlled by 2B001 to 2B009.

2B009 Spin-forming machines and flow-forming machines, which, according to the manufacturer's technical specifications, can be equipped with "numerical

control" units or a computer control and having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
MT applies to: spin-forming machines combining the functions of spin-forming and flow-forming; and flow-forming machines that meet or exceed the parameters of 2B009.a and 2B109.	MT Column 1
NP applies to flow-forming machines, and spin-forming machines capable of flow-forming functions, that meet or exceed the parameters of 2B209.	NP Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCN 2D001 for ''software'' for items controlled under this entry. (2) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E101 (''use'') for technology for items controlled under this entry. (3) Also see ECCNs 2B109 and 2B209 for additional flow-forming machines for MT and NP reasons.

Related Definitions: N/A

Items: a. Two or more controlled axes of which at least two can be coordinated simultaneously for ''contouring control''; *and*

b. A roller force more than 60 kN.

TECHNICAL NOTE: For the purpose of 2B009, machines combining the function of spin-forming and flow-forming are regarded as flow-forming machines.

2B018 Equipment on the Wassenaar Arrangement Munitions List.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to specialized machinery, equipment, and gear for producing rocket systems (including ballistic missile systems, space launch vehicles, and sounding rockets) and unmanned air vehicle systems (including cruise missile systems, target drones, and reconnaissance drones) usable in systems that are controlled for MT reasons including their propulsion systems and components, and pyrolytic deposition and densification equipment.	MT Column 1.
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $3000.

GBS: Yes, as follows, except N/A for MT-controlled items or destinations for which a license is required for RS reasons: Equipment used to determine the safety data of explosives as required by the International Convention on the Transport of Dangerous Goods (C.I.M.) Articles 3 and 4 in Annex 1 RID, provided that such equipment will be used only by the railway authorities of current C.I.M. members, or by the Government-accredited testing facilities in those countries, for the testing of explosives to transport safety standards, of the following description:

a. Equipment for determining the ignition and deflagration temperatures;

b. Equipment for steel-shell tests;

c. Drophammers not exceeding 20 kg in weight for determining the sensitivity of explosives to shock;

d. Equipment for determining the friction sensitivity of explosives when exposed to charges not exceeding 36 kg in weight.

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: N/A

Related Definitions: N/A

Items: Specialized machinery, equipment, gear, and specially designed parts and accessories therefor, including but not limited to the following, that are specially designed for the examination, manufacture, testing, and checking of arms, appliances, machines, and implements of war:

a. Armor plate drilling machines, other than radial drilling machines;

b. Armor plate planing machines;

c. Armor plate quenching presses;

d. Centrifugal casting machines capable of casting tubes 6 feet (183 cm) or more in length, with a wall thickness of 2 inches (5 cm) and over;

e. Gun barrel rifling and broaching machines, and tools therefor;

f. Gun barrel rifling machines;

g. Gun barrel trepanning machines;

h. Gun boring and turning machines;

i. Gun honing machines of 6 feet (183 cm) stroke or more;

j. Gun jump screw lathes;

k. Gun rifling machines;

l. Gun straightening presses;

m. Induction hardening machines for tank turret rings and sprockets;

n. Jigs and fixtures and other metal-working implements or accessories of the kinds exclusively designed for use in the manufacture of firearms, ordnance, and other stores and appliances for land, sea, or aerial warfare;

o. Small arms chambering machines;

p. Small arms deep hole drilling machines and drills therefor;

q. Small arms rifling machines;
r. Small arms spill boring machines;
s. Tank turret bearing grinding machines.

2B104 "Isostatic presses", other than those controlled by 2B004, having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: MT, NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number
Related Controls: (1) *See* ECCN 2D101 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E101 (''use'') for technology for items controlled under this entry. (3) Also *see* ECCNs 2B004, 2B204, and 2B117.
Related Definitions: The inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated chamber, depending on which of the two chambers is located inside the other.
Items: a. Maximum working pressure equal to or greater than 69 MPa;
b. Designed to achieve and maintain a controlled thermal environment of 873 K (600 °C) or greater; and
c. Possessing a chamber cavity with an inside diameter of 254 mm or greater.

2B105 Chemical vapor deposition (CVD) furnaces, other than those controlled by 2B005.a, designed or modified for the densification of carbon-carbon composites.

LICENSE REQUIREMENTS
*Reason for Control:*MT, AT

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

License Exceptions
LVS: N/A
GBS: N/A
CIV: N/A
List of Items Controlled
Unit: Equipment in number
Related Controls: (1) See ECCN 2D101 for ''software'' for items controlled under this entry. (2) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E101 (''use'') for technology for items controlled under this entry. (3) Also see ECCNs 2B005 and 2B117.
Related Definitions: N/A
Items: The list of items controlled in contained in the ECCN heading.

2B109 Flow-forming machines, other than those controlled by 2B009, and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1.
NP applies to items controlled by this entry that meet or exceed the technical parameters in 2B209.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; components in $ value
Related Controls: (1) See ECCN 2D101 for ''software'' for items controlled under this entry. (2) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E101 (''use'') for technology for items controlled under this entry. (3) Also see ECCNs 2B009 and 2B209.
Related Definitions: N/A
Items: a. Flow-forming machines having all of the following:
a.1. According to the manufacturer's technical specification, can be equipped with ''numerical control'' units or a computer control, even when not equipped with such units at delivery; *and*
a.2. Have more than two axes which can be coordinated simultaneously for ''contouring control.''
b. Specially designed components for flow-forming machines controlled in 2B009 or 2B109.a.

TECHNICAL NOTES: 1. Machines combining the function of spin-forming and flow-forming are for the purpose of 2B109 regarded as flow-forming machines.
2. 2B109 does not control machines that are not usable in the ''production'' of propulsion components and equipment (*e.g.* motor cases) for systems in 9A005, 9A007.a, or 9A105.a.

2B116 Vibration test systems and equipment, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems, and components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1.
NP applies to electrodynamic vibration test systems in 2B116.a and to all items in 2B116.b, .c, and .d.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) *See* ECCN 2D101 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E101 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCN 9B990.
Related Definitions: Vibration test systems incorporating a digital controller are those systems, the functions of which are, partly or entirely, automatically controlled by stored and digitally coded electrical signals.
Items:
a. Vibration test systems employing feedback or closed loop techniques and incorporating a digital controller, capable of vibrating a system at an acceleration equal to or greater than 10 g rms between 20 Hz to 2,000 Hz while imparting forces equal to or greater than 50 kN (11,250 lbs.), measured 'bare table';
b. Digital controllers, combined with specially designed vibration test ''software'', with a 'real-time control bandwidth' greater than 5 kHz and designed for use with vibration test systems described in 2B116.a;
c. Vibration thrusters (shaker units), with or without associated amplifiers, capable of imparting a force equal to or greater than 50 kN (11,250 lbs.), measured 'bare table', and usable in vibration test systems described in 2B116.a;
d. Test piece support structures and electronic units designed to combine multiple shaker units into a complete shaker system capable of providing an effective combined force equal to or greater than 50 kN, measured 'bare table', and usable in vibration test systems described in 2B116.a.

TECHNICAL NOTES: *(1) 'Bare table' means a flat table, or surface, with no fixture or fitting.*
(2) 'Real-time control bandwidth' is defined as the maximum rate at which a controller can execute complete cycles of sampling, processing data and transmitting control signals.

2B117 Equipment and process controls, other than those controlled by 2B004, 2B005.a, 2B104 or 2B105, designed or modified for the densification and pyrolysis of structural composite rocket nozzles and reentry vehicle nose tips.

LICENSE REQUIREMENTS
*Reason for Control:*MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number
Related Controls: (1) *See* ECCN 2D101 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E101 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCN s 2B004, 2B005, 2B104, 2B105, and 2B204.
Related Definitions: N/A
Items: The list of items controlled in contained in the ECCN heading.

2B119 Balancing machines and related equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 7B101.
Related Definitions: N/A
Items: a. Balancing machines having all the following characteristics:
a.1. Not capable of balancing rotors/assemblies having a mass greater than 3 kg;
a.2. Capable of balancing rotors/assemblies at speeds greater than 12,500 rpm;
a.3. Capable of correcting unbalance in two planes or more; and
a.4. Capable of balancing to a residual specific unbalance of 0.2 g mm per kg of rotor mass.

NOTE: 2B119.a. does not control balancing machines designed or modified for dental or other medical equipment.

b. Indicator heads designed or modified for use with machines specified in 2B119.a.

NOTE: Indicator heads are sometimes known as balancing instrumentation.

2B120 Motion simulators or rate tables (equipment capable of simulating motion), having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart
MT applies to entire entry	MT column 1
AT applies to entire entry	AT column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Rate tables not controlled by 2B120 and providing the characteristics of a positioning table are to be evaluated according to 2B121. (2) Equipment that has the characteristics specified in 2B121, which also meets the characteristics of 2B120 will be treated as equipment specified in 2B120. (3) See also 2B008, 2B121, 7B101 and 7B994.
Related Definitions: N/A
Items: a. Two axes or more;

b. Designed or modified to incorporate sliprings or integrated non-contact devices capable of transferring electrical power, signal information, or both; *and*

c. Having any of the following characteristics:

c.1. For any single axis having all of the following:

c.1.a. Capable of rates of rotation of 400 degrees/s or more, or 30 degrees/s or less, *and*

c.1.b. A rate resolution equal to or less than 6 degrees/s and an accuracy equal to or less than 0.6 degrees/s; or

c.2. Having a worst-case rate stability equal to or better (less) than plus or minus 0.05% averaged over 10 degrees or more; *or*

c.3. A positioning ''accuracy'' equal to or better than 5 arc-second.

NOTE: 2B120 does not control rotary tables designed or modified for machine tools or for medical equipment. For controls on machine tool rotary tables see 2B008.

2B121 Positioning tables (equipment capable of precise rotary position in any axis), other than those controlled in 2B120, having all the following characteristics (See List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) Equipment that has the characteristics specified in 2B121, which also meets the characteristics of 2B120 will be treated as equipment specified in 2B120.
(2) See also 2B008, 2B120, 7B101 and 7B994.
Related Definitions: N/A
Items: a. Two axes or more; *and*

b. A positioning ''accuracy'' equal to or better than 5 arc-second.

NOTE: 2B121 does not control rotary tables designed or modified for machine tools or for medical equipment. For controls on machine tool rotary tables see 2B008.

2B122 Centrifuges capable of imparting accelerations above 100 g and designed or modified to incorporate sliprings or integrated non-contact devices capable of transferring electrical power, signal information, or both.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 7B101.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2B201 Machine tools, other than those controlled by 2B001, for removing or cutting metals, ceramics or "composites", which, according to the manufacturer's technical specifications, can be equipped with electronic devices for simultaneous "contouring control" in two or more axes.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; parts and accessories in $ value
Related Controls: (1) See ECCNs 2D002 and 2D202 for ''software'' for items controlled by this entry. ''Numerical control'' units are controlled by their associated ''software''. (2) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled

under this entry. (3) Also see ECCNs 2B001, 2B290, and 2B991.

Related Definitions: N/A

Items:

NOTE: *The identified positioning accuracy values in this entry are based on ISO 230/2 (2006), which equates to the values based on ISO 230/2 (1988) that are used by the Nuclear Supplier's Group (NSG). For 2B201.a and b.1, this results in a change from 6 μm to 4.5 μm, in Note to 2B201.b paragraph .b the change is 30 μm to 22.5 μm, and for 2B201.c the change is from 4 μm to 3 μm.*

a. Machine tools for turning, that have positioning accuracies according to ISO 230/2 (2006) with all compensations available better (less) than 4.5 μm along any linear axis (overall positioning) for machines capable of machining diameters greater than 35 mm;

NOTE: *Item 2B201.a does not control bar machines (Swissturn), limited to machining only bar feed thru, if maximum bar diameter is equal to or less than 42 mm and there is no capability of mounting chucks. Machines may have drilling and/or milling capabilities for machining parts with diameters less than 42 mm.*

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

b.1. Positioning accuracies according to ISO 230/2 (2006) with ''all compensations available'' equal to or less (better) than 4.5 μm along any linear axis (overall positioning); *or*

b.2. Two or more contouring rotary axes.

NOTE: *2B201.b does not control milling machines having the following characteristics:*

a. X-axis travel greater than 2 m; and

b. Overall positioning accuracy according to ISO 230/2 (2006) on the x-axis more (worse) than 22.5 μ*m.*

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

c.1. Positioning accuracies according to ISO 230/2 (2006) with ''all compensations available'' equal to or less (better) than 3 μm along any linear axis (overall positioning); *or*

c.2. Two or more contouring rotary axes.

NOTE: *2B201.c does not control the following grinding machines:*

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

1. Limited to cylindrical grinding;

2. A maximum workpiece outside diameter or length of 150 mm;

3. Not more than two axes that can be coordinated simultaneously for ''contouring control''; and

4. No contouring c-axis.

b. Jig grinders with axes limited to x, y, c and a where c axis is used to maintain the grinding wheel normal to the work surface, and the a axis is configured to grind barrel cams;

c. Tool or cutter grinding machines with ''software'' specially designed for the production of tools or cutters; or

d. Crankshaft or camshaft grinding machines.

2B204 "Isostatic presses", other than those controlled by 2B004 or 2B104, and related equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: (1) *See* ECCN 2D201 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCNs 2B004 and 2B104.

Related Definitions: The inside chamber dimension is that of the chamber in which both the working temperature and working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated chamber, depending on which of the two chambers is located inside the other.

Items: a. ''Isostatic presses'' having both of the following characteristics:

a.1. Capable of achieving a maximum working pressure of 69 MPa or greater; *and*

a.2. A chamber cavity with an inside diameter in excess of 152 mm;

b. Dies, molds and controls, specially designed for ''isostatic presses'' controlled by 2B204.a.

2B206 Dimensional inspection machines, instruments or systems, other than those described in 2B006, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: (1) *See* ECCNs 2D002 and 2D201 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and

2E201 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCNs 2B006 and 2B996.

Related Definitions: N/A

ECCN Controls: (1) Machine tools that can be used as measuring machines are controlled by this entry if they meet or exceed the criteria specified for the machine tool function or the measuring machine function. (2) A machine described in this entry is controlled if it exceeds the control threshold anywhere within its operating range.

Items: a. Computer controlled or numerically controlled dimensional inspection machines having both of the following characteristics:

a.1. Two or more axes; *and*

a.2. A one-dimensional length ''measurement uncertainty'' equal to or less (better) than (1.25 + L/1000) μm tested with a probe of an ''accuracy'' of less (better) than 0.2 μm (L is the measured length in millimeters) (Ref.: VDI/VDE 2617 Parts 1 and 2);

b. Systems for simultaneously linear-angular inspection of hemishells, having both of the following characteristics:

b.1. ''Measurement uncertainty'' along any linear axis equal to or less (better) than 3.5 μm per 5 mm; *and*

b.2. ''Angular position deviation'' equal to or less than 0.02°.

TECHNICAL NOTES: (1) The probe used in determining the measurement uncertainty of a dimensional inspection system shall be described in VDI/VDE 2617 parts 2, 3 and 4.

(2) All parameters of measurement values in this entry represent plus/minus, *i.e.*, not total band.

c. Angular displacement measuring instruments having an ''angular position deviation'' equal to or less (better) than 0.00025°;

NOTE: 2B206.c does not control optical instruments, such as autocollimators, using collimated light to detect angular displacement of a mirror.

2B207 "Robots", "end-effectors" and control units, other than those controlled by 2B007, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) *See* ECCN 2D201 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCNs 2B007, 2B225, and 2B997.

Related Definitions: N/A

ECCN Controls: This entry does not control ''robots'' specially designed for non-nuclear industrial applications, such as automobile paint-spraying booths.

Items: a. ''Robots'' or ''end-effectors'' specially designed to comply with national safety standards applicable to handling high explosives (for example, meeting electrical code ratings for high explosives);

b. Control units specially designed for any of the ''robots'' or ''end-effectors'' controlled by 2B207.a.

2B209 Flow forming machines, spin forming machines capable of flow forming functions, other than those controlled by 2B009 or 2B109, and mandrels, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: (1) *See* ECCN 2D201 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCNs 2B009 and 2B109.

Related Definitions: N/A

Items: a. Machines having both of the following characteristics:

a.1. Three or more rollers (active or guiding); *and*

a.2. According to the manufacturer's technical specifications, can be equipped with ''numerical control'' units or a computer control;

NOTE: 2B209.a includes machines that have only a single roller designed to deform metal, plus two auxiliary rollers that support the mandrel, but do not participate directly in the deformation process.

b. Rotor-forming mandrels designed to form cylindrical rotors of inside diameter between 75 mm and 400 mm.

2B225 Remote manipulators that can be used to provide remote actions in radiochemical separation operations or hot cells, having either of the following

characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (2) *Also see* ECCNs 2B007 and 2B207. (3) Remote manipulators specially designed or prepared for use in fuel reprocessing or for use in a reactor are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: N/A

Items: a. A capability of penetrating 0.6 m or more of hot cell wall (through-the-wall operation); *or*

b. A capability of bridging over the top of a hot cell wall with a thickness of 0.6 m or more (over-the-wall operation).

TECHNICAL NOTE: Remote manipulators provide translation of human operator actions to a remote operating arm and terminal fixture. They may be of ''master/slave'' type or operated by joystick or keypad.

2B226 Controlled atmosphere (vacuum or inert gas) induction furnaces, and power supplies therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (2) Also see ECCN 2B227 and Category 3B.

Related Definitions: N/A

ECCN Controls: 2B226.a does not control furnaces designed for the processing of semiconductor wafers.

Items: a. Furnaces having all of the following characteristics:

a.1. Capable of operation above 1,123 K (850 °C);

a.2. Induction coils 600 mm or less in diameter; *and*

a.3. Designed for power inputs of 5 kW or more;

b. Power supplies, with a specified power output of 5 kW or more, specially designed for furnaces controlled by 2B226.a.

2B227 Vacuum or other controlled atmosphere metallurgical melting and casting furnaces and related equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCN 2D201 for ''software'' for items controlled under this entry. (2) See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (2) Also see ECCN 2B226.

Related Definitions: N/A

Items: a. Arc remelt and casting furnaces having both of the following characteristics:

a.1. Consumable electrode capabilities between 1,000 cm^3 and 20,000 cm^3; *and*

a.2. Capable of operating with melting temperatures above 1,973 K (1,700 °C);

b. Electron beam melting furnaces and plasma atomization and melting furnaces, having both of the following characteristics:

b.1. A power of 50 kW or greater; *and*

b.2. Capable of operating with melting temperatures above 1,473 K (1,200 °C);

c. Computer control and monitoring systems specially configured for any of the furnaces controlled by 2B227.a or .b.

2B228 Rotor fabrication and assembly equipment, rotor straightening equipment, bellows-forming mandrels and dies, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry.
Related Definitions: N/A
Items: a. Rotor assembly equipment for assembly of gas centrifuge rotor tube sections, baffles, and end-caps;

NOTE: 2B228.a includes precision mandrels, clamps, and shrink fit machines.

b. Rotor straightening equipment for alignment of gas centrifuge rotor tube sections to a common axis;

TECHNICAL NOTE: The rotor straightening equipment in 2B228.b normally consists of precision measuring probes linked to a computer that subsequently controls the action of, for example, pneumatic rams used for aligning the rotor tube sections.

c. Bellows-forming mandrels and dies for producing single-convolution bellows.

TECHNICAL NOTE: In 2B228.c, the bellows have all of the following characteristics:
1. Inside diameter between 75 mm and 400 mm;
2. Length equal to or greater than 12.7 mm;
3. Single convolution depth greater than 2 mm; *and*
4. Made of high-strength aluminum alloys, maraging steel or high strength ''fibrous or filamentary materials''.

2B229 Centrifugal multiplane balancing machines, fixed or portable, horizontal or vertical, as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) *See* ECCN 2D201 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry.
Related Definitions: N/A
Items: a. Centrifugal balancing machines designed for balancing flexible rotors having a length of 600 mm or more and having all of the following characteristics:
a.1. Swing or journal diameter greater than 75 mm;
a.2. Mass capability of from 0.9 to 23 kg; *and*
a.3. Capable of balancing speed of revolution greater than 5,000 r.p.m.;
b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor components and having all of the following characteristics:
b.1. Journal diameter greater than 75 mm;
b.2. Mass capability of from 0.9 to 23 kg;
b.3. Capable of balancing to a residual imbalance equal to or less than 0.01 kg × mm/kg per plane; *and*
b.4. Belt drive type.

2B230 "Pressure transducers" capable of measuring absolute pressures at any point in the range 0 to 13 kPa and having both of the following characteristics (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry.
Related Definitions: (1) Pressure transducers are devices that convert pressure measurements into an electrical signal. (2) For purposes of this entry, ''accuracy'' includes non-linearity, hysteresis and repeatability at ambient temperature.
Items: a. Pressure sensing elements made of or protected by aluminum, aluminum alloy, nickel or nickel alloy with more than 60% nickel by weight; *and*
b. Having either of the following characteristics:
b.1. A full scale of less than 13 kPa and an ''accuracy'' of better than ±1% of full-scale; *or*
b.2. A full scale of 13 kPa or greater and an ''accuracy'' of better than ±130 Pa.

2B231 Vacuum pumps having all of the following characteristics (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A

LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry. (2) Vacuum pumps specially designed or prepared for the separation of uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).
Related Definitions: (1) The pumping speed is determined at the measurement point with nitrogen gas or air. (2) The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off.
Items: a. Input throat size equal to or greater than 380 mm;
b. Pumping speed equal to or greater than 15 m^3/s; *and*
c. Capable of producing an ultimate vacuum better than 13.3 mPa.

2B232 Multistage light gas guns or other high-velocity gun systems (coil, electromagnetic, and electrothermal types, and other advanced systems) capable of accelerating projectiles to 2 km/s or greater.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCNs 2E001 (''development''), 2E002 (''production''), and 2E201 (''use'') for technology for items controlled under this entry.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2B290 "Numerically controlled" machine tools not controlled by 2B001 or 2B201.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; parts and accessories in $ value
Related Controls: (1) *See* ECCNs 2D002 and 2D290 for ''software'' for items controlled under this entry. (2) *See* ECCNs 2E001 (''development''), 2E002 (''production''), and 2E290 (''use'') for technology for items controlled under this entry. (3) *Also see* ECCNs 2B001, 2B201, and 2B991.
Related Definition: N/A
Items: a. Turning machines or combination turning/milling machines that are capable of machining diameters greater than 2.5 meters.
b. Reserved.

2B350 Chemical manufacturing facilities and equipment, except valves controlled by 2A226 or 2A292, as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: CB, AT

Control(s)	Country chart
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE REQUIREMENT NOTE:
This ECCN does not control equipment that is both: (1) Specially designed for use in civil applications (e.g., food processing, pulp and paper processing, or water purification) and (2) inappropriate, by the nature of its design, for use in storing, processing, producing or conducting and controlling the flow of the chemical weapons precursors controlled by 1C350.
LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number.
Related Controls: N/A
Related Definitions: For purposes of this entry the term ''chemical warfare agents'' are those agents subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.)
Items: a. Reaction vessels or reactors, with or without agitators, with total internal (geometric) volume greater than 0.1 m^3 (100 liters) and less than 20 m^3 (20,000 liters), where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:
a.1. Alloys with more than 25% nickel and 20% chromium by weight;
a.2. Nickel or alloys with more than 40% nickel by weight;
a.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);
a.4. Glass (including vitrified or enameled coating or glass lining);
a.5. Tantalum or tantalum alloys;
a.6. Titanium or titanium alloys;
a.7. Zirconium or zirconium alloys; *or*

a.8. Niobium (columbium) or niobium alloys.

b. Agitators for use in reaction vessels or reactors described in 2B350.a, and impellers, blades or shafts designed for such agitators, where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:

b.1. Alloys with more than 25% nickel and 20% chromium by weight;

b.2. Nickel or alloys with more than 40% nickel by weight;

b.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

b.4. Glass (including vitrified or enameled coatings or glass lining);

b.5. Tantalum or tantalum alloys;

b.6. Titanium or titanium alloys;

b.7. Zirconium or zirconium alloys; *or*

b.8. Niobium (columbium) or niobium alloys.

c. Storage tanks, containers or receivers with a total internal (geometric) volume greater than 0.1 m^3 (100 liters) where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:

c.1. Alloys with more than 25% nickel and 20% chromium by weight;

c.2. Nickel or alloys with more than 40% nickel by weight;

c.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

c.4. Glass (including vitrified or enameled coatings or glass lining);

c.5. Tantalum or tantalum alloys;

c.6. Titanium or titanium alloys;

c.7. Zirconium or zirconium alloys; *or*

c.8. Niobium (columbium) or niobium alloys.

d. Heat exchangers or condensers with a heat transfer surface area of less than 20 m^2, but greater than 0.15 m^2, and tubes, plates, coils or blocks (cores) designed for such heat exchangers or condensers, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:

d.1. Alloys with more than 25% nickel and 20% chromium by weight;

d.2. Nickel or alloys with more than 40% nickel by weight;

d.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

d.4. Glass (including vitrified or enameled coatings or glass lining);

d.5. Tantalum or tantalum alloys;

d.6. Titanium or titanium alloys;

d.7. Zirconium or zirconium alloys;

d.8. Niobium (columbium) or niobium alloys;

d.9. Graphite or carbon-graphite;

d.10. Silicon carbide; *or*

d.11. Titanium carbide.

e. Distillation or absorption columns of internal diameter greater than 0.1 m, and liquid distributors, vapor distributors or liquid collectors designed for such distillation or absorption columns, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:

e.1. Alloys with more than 25% nickel and 20% chromium by weight;

e.2. Nickel or alloys with more than 40% nickel by weight;

e.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

e.4. Glass (including vitrified or enameled coatings or glass lining);

e.5. Tantalum or tantalum alloys;

e.6. Titanium or titanium alloys;

e.7. Zirconium or zirconium alloys;

e.8. Niobium (columbium) or niobium alloys; *or*

e.9. Graphite or carbon-graphite.

f. Remotely operated filling equipment in which all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:

f.1. Alloys with more than 25% nickel and 20% chromium by weight; *or*

f.2. Nickel or alloys with more than 40% nickel by weight.

g. Valves with nominal sizes greater than 1.0 cm (⅜ in.), and casings (valve bodies) or preformed casing liners designed for such valves, in which all surfaces that come in direct contact with the chemical(s) being produced, processed, or contained are made from any of the following materials:

g.1. Alloys with more than 25% nickel and 20% chromium by weight;

g.2. Nickel or alloys with more than 40% nickel by weight;

g.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

g.4. Glass (including vitrified or enameled coating or glass lining); and

g.5. Tantalum or tantalum alloys;

g.6. Titanium or titanium alloys;

g.7. Zirconium or zirconium alloys;

g.8. Niobium (columbium) or niobium alloys; or

g.9. Ceramic materials, as follows:

g.9.a. Silicon carbide with a purity of 80% or more by weight;

g.9.b. Aluminum oxide (alumina) with a purity of 99.9% or more by weight; or

g.9.c. Zirconium oxide (zirconia).

TECHNICAL NOTE TO 2B350.G: The 'nominal size' is defined as the smaller of the inlet and outlet port diameters

h. Multi-walled piping incorporating a leak detection port, in which all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:

h.1. Alloys with more than 25% nickel and 20% chromium by weight;

h.2. Nickel or alloys with more than 40% nickel by weight;

h.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

h.4. Glass (including vitrified or enameled coatings or glass lining);

h.5. Tantalum or tantalum alloys;

h.6. Titanium or titanium alloys;

h.7. Zirconium or zirconium alloys;

h.8. Niobium (columbium) or niobium alloys; *or*

h.9. Graphite or carbon-graphite.

i. Multiple-seal and seal-less pumps with manufacturer's specified maximum flow-rate greater than 0.6 m^3/hour (600 liters/hour), or vacuum pumps with manufacturer's specified maximum flow-rate greater than 5 m^3/hour (5,000 liters/hour) (under standard temperature (273 K (0 °C)) and pressure (101.3 kPa) conditions), and casings (pump bodies), preformed casing liners, impellers, rotors or jet pump nozzles designed for such pumps, in which all surfaces that come into direct contact with the chemical(s) being processed are made from any of the following materials:

i.1. Alloys with more than 25% nickel and 20% chromium by weight;

i.2. Nickel or alloys with more than 40% nickel by weight;

i.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

i.4. Glass (including vitrified or enameled coatings or glass lining);

i.5. Tantalum or tantalum alloys;

i.6. Titanium or titanium alloys;

i.7. Zirconium or zirconium alloys;

i.8. Niobium (columbium) or niobium alloys.

i.9. Graphite or carbon-graphite;

i.10. Ceramics; *or*

i.11. Ferrosilicon (high silicon iron alloys).

j. Incinerators designed to destroy chemical warfare agents, chemical weapons precursors controlled by 1C350, or chemical munitions having specially designed waste supply systems, special handling facilities and an average combustion chamber temperature greater than 1000 °C in which all surfaces in the waste supply system that come into direct contact with the waste products are made from or lined with any of the following materials:

j.1. Alloys with more than 25% nickel and 20% chromium by weight;

j.2. Nickel or alloys with more than 40% nickel by weight; *or*

j.3. Ceramics.

TECHNICAL NOTE 1: Carbon-graphite is a composition consisting primarily of graphite and amorphous carbon, in which the graphite is 8 percent or more by weight of the composition.

TECHNICAL NOTE 2: For the items listed in 2B350, the term 'alloy,' when not accompanied by a specific elemental concentration, is understood as identifying those alloys where the identified metal is present in a higher percentage by weight than any other element.

TECHNICAL NOTE 3: The materials used for gaskets, packing, seals, screws or washers, or other materials performing a sealing function, do not determine the control status of the items in this ECCN, provided that such components are designed to be interchangeable.

2B351 Toxic gas monitoring systems and their dedicated detecting components (i.e., detectors, sensor devices, and replaceable sensor cartridges), as follows, except those systems and detectors controlled by ECCN 1A004.c (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT.

Control(s)	Country chart
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number.

Related Controls: See ECCN 2D351 for ''software'' for toxic gas monitoring systems and their dedicated detecting components controlled by this ECCN. Also see ECCN 1A004, which controls chemical detection systems and specially designed components therefor that are specially designed or modified for detection or identification of chemical warfare agents, but not specially designed for military use, and ECCN 1A995, which controls certain detection equipment and components not controlled by ECCN 1A004 or by this ECCN.

Related Definitions: (1) For the purposes of this entry, the term ''dedicated'' means committed entirely to a single purpose or device. (2) For the purposes of this entry, the term ''continuous operation'' describes the capability of the equipment to operate on line without human intervention. The intent of this entry is to control toxic gas monitoring systems capable of collection and detection of samples in environments such as chemical plants, rather than those used for batch-mode operation in laboratories.

Items a. Designed for continuous operation and usable for the detection of chemical warfare agents or chemicals controlled by 1C350 at concentrations of less than 0.3 mg/m^3; or

b. Designed for the detection of cholinesterase-inhibiting activity.

2B352 Equipment capable of use in handling biological materials, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country chart
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: See ECCNs 1A004 and 1A995 for protective equipment that is not covered by this entry. Also see ECCN 9A120 for controls on certain ''UAV'' systems designed or modified to dispense an aerosol and capable of carrying elements of a payload in the form of a particulate or liquid, other than fuel components of such vehicles, of a volume greater than 20 liters.

Related Definitions: (1) ''Lighter than air vehicles''—balloons and airships that rely on hot air or on lighter-than-air gases, such as helium or hydrogen, for their lift. (2) ''UAVs''—Unmanned Aerial Vehicles. (3) ''VMD''—Volume Median Diameter.

Items: a. Complete containment facilities at P3 or P4 containment level.

TECHNICAL NOTE: P3 or P4 (BL3, BL4, L3, L4) containment levels are as specified in the WHO Laboratory Biosafety Manual (3rd edition, Geneva, 2004).

b. Fermenters capable of cultivation of pathogenic microorganisms, viruses, or for toxin production, without the propagation of aerosols, having a capacity equal to or greater than 20 liters.

TECHNICAL NOTE: Fermenters include bioreactors, chemostats, and continuous-flow systems.

c. Centrifugal separators capable of the continuous separation of pathogenic microorganisms, without the propagation of aerosols, and having all of the following characteristics:

c.1. One or more sealing joints within the steam containment area;

c.2. A flow rate greater than 100 liters per hour;

c.3. Components of polished stainless steel or titanium; and

c.4. Capable of in-situ steam sterilization in a closed state.

TECHNICAL NOTE: Centrifugal separators include decanters.

d. Cross (tangential) flow filtration equipment and accessories, as follows:

d.1. Cross (tangential) flow filtration equipment capable of separation of pathogenic microorganisms, viruses, toxins or cell cultures having all of the following characteristics:

d.1.a. A total filtration area equal to or greater than 1 square meter (1 m^2); and

d.1.b. Having any of the following characteristics:

d.1.b.1. Capable of being sterilized or disinfected in-situ; or

d.1.b.2. Using disposable or single-use filtration components.

N.B.: 2B352.d.1 does not control reverse osmosis equipment, as specified by the manufacturer.

d.2. Cross (tangential) flow filtration components (*e.g.*, modules, elements, cassettes, cartridges, units or plates) with filtration area equal to or greater than 0.2 square meters (0.2 m^2) for each component and designed for use in cross (tangential) flow filtration equipment controlled by 2B352.d.1.

TECHNICAL NOTE: In this ECCN, ''sterilized'' denotes the elimination of all viable microbes from the equipment through the use of either physical (*e.g.*, steam) or chemical agents. ''Disinfected'' denotes the destruction of potential microbial infectivity in the equipment through the use of chemical agents with a germicidal effect. ''Disinfection'' and ''sterilization'' are distinct from ''sanitization'', the latter referring to cleaning procedures designed to lower the microbial content of equipment without necessarily achieving elimination of all microbial infectivity or viability.

e. Steam sterilizable freeze-drying (lyophilization) equipment with a condenser capacity of 10 kgs of ice or greater in 24 hours (10 liters of water or greater in 24 hours), but less than 1,000 kgs of ice in 24 hours (less than 1,000 liters of water in 24 hours).

f. Protective and containment equipment, as follows:

f.1. Protective full or half suits, or hoods dependant upon a tethered external air supply and operating under positive pressure;

TECHNICAL NOTE: This entry does not control suits designed to be worn with self-contained breathing apparatus.

f.2. Class III biological safety cabinets or isolators with similar performance standards, *e.g.*, flexible isolators, dry boxes, anaerobic chambers, glove boxes or laminar flow hoods (closed with vertical flow).

g. Chambers designed for aerosol challenge testing with microorganisms, viruses, or toxins and having a capacity of 1 m^3 or greater.

h. Spraying or fogging systems and components therefor, as follows:

h.1. Complete spraying or fogging systems, specially designed or modified for fitting to aircraft, ''lighter than air vehicles,'' or ''UAVs,'' capable of delivering, from a liquid suspension, an initial droplet ''VMD'' of less

than 50 microns at a flow rate of greater than 2 liters per minute;

h.2. Spray booms or arrays of aerosol generating units, specially designed or modified for fitting to aircraft, ''lighter than air vehicles,'' or ''UAVs,'' capable of delivering, from a liquid suspension, an initial droplet ''VMD'' of less than 50 microns at a flow rate of greater than 2 liters per minute;

h.3. Aerosol generating units specially designed for fitting to the systems specified in paragraphs h.1 and h.2 of this ECCN.

TECHNICAL NOTES: 1. *Aerosol generating units* are devices specially designed or modified for fitting to aircraft and include nozzles, rotary drum atomizers and similar devices.

2. This ECCN does not control spraying or fogging systems and components, as specified in 2B352.h., that are demonstrated not to be capable of delivering biological agents in the form of infectious aerosols.

3. Droplet size for spray equipment or nozzles specially designed for use on aircraft or ''UAVs'' should be measured using either of the following methods (pending the adoption of internationally accepted standards):

a. Doppler laser method,

b. Forward laser diffraction method.

2B991 Numerical control units for machine tools and "numerically controlled" machine tools, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: Also see ECCNs 2B001, 2B201, and 2B290.

Related Definitions: N/A

Items: a. ''Numerical control'' units for machine tools:

a.1. Having four interpolating axes that can be coordinated simultaneously for ''contouring control''; or

a.2. Having two or more axes that can be coordinated simultaneously for ''contouring control'' and a minimum programmable increment better (less) than 0.001 mm;

a.3. ''Numerical control'' units for machine tools having two, three or four interpolating axes that can be coordinated simultaneously for ''contouring control'', and capable of receiving directly (on-line) and processing computer-aided-design (CAD) data for internal preparation of machine instructions; *or*

b. ''Motion control boards'' specially designed for machine tools and having any of the following characteristics:

b.1. Interpolation in more than four axes;

b.2. Capable of ''real time processing'' of data to modify tool path, feed rate and spindle data, during the machining operation, by any of the following:

b.2.a. Automatic calculation and modification of part program data for machining in two or more axes by means of measuring cycles and access to source data; *or*

b.2.b. ''Adaptive control'' with more than one physical variable measured and processed by means of a computing model (strategy) to change one or more machining instructions to optimize the process.

b.3. Capable of receiving and processing CAD data for internal preparation of machine instructions; *or*

c. ''Numerically controlled'' machine tools that, according to the manufacturer's technical specifications, can be equipped with electronic devices for simultaneous ''contouring control'' in two or more axes and that have both of the following characteristics:

c.1. Two or more axes that can be coordinated simultaneously for contouring control; *and*

c.2. Positioning accuracies according to ISO 230/2 (2006), with all compensations available:

c.2.a. Better than 15 μm along any linear axis (overall positioning) for grinding machines;

c.2.b. Better than 15 μm along any linear axis (overall positioning) for milling machines; *or*

c.2.c. Better than 15 μm along any linear axis (overall positioning) for turning machines; *or*

d. Machine tools, as follows, for removing or cutting metals, ceramics or composites, that, according to the manufacturer's technical specifications, can be equipped with electronic devices for simultaneous ''contouring control'' in two or more axes:

d.1. Machine tools for turning, grinding, milling or any combination thereof, having two or more axes that can be coordinated simultaneously for ''contouring control'' and having any of the following characteristics:

d.1.a. One or more contouring ''tilting spindles'';

NOTE: 2B991.d.1.a. applies to machine tools for grinding or milling only.

d.1.b. ''Camming'' (axial displacement) in one revolution of the spindle less (better) than 0.0006 mm total indicator reading (TIR);

NOTE: 2B991.d.1.b. applies to machine tools for turning only.

d.1.c. ''Run out'' (out-of-true running) in one revolution of the spindle less (better) than 0.0006 mm total indicator reading (TIR);

d.1.d. The ''positioning accuracies'', with all compensations available, are less (better) than: 0.001° on any rotary axis;

d.2. Electrical discharge machines (EDM) of the wire feed type that have five or more axes that can be coordinated simultaneously for ''contouring control''.

2B992 Non-"numerically controlled" machine tools for generating optical quality surfaces, and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: N/A

Related Definitions: N/A

Items: a. Turning machines using a single point cutting tool and having all of the following characteristics:

a.1. Slide positioning accuracy less (better) than 0.0005 mm per 300 mm of travel;

a.2. Bidirectional slide positioning repeatability less (better) than 0.00025 mm per 300 mm of travel;

a.3. Spindle ''run out'' and ''camming'' less (better) than 0.0004 mm total indicator reading (TIR);

a.4. Angular deviation of the slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over full travel; *and*

a.5. Slide perpendicularity less (better) than 0.001 mm per 300 mm of travel;

TECHNICAL NOTE: The bidirectional slide positioning repeatability (R) of an axis is the maximum value of the repeatability of positioning at any position along or around the axis determined using the procedure and under the conditions specified in part 2.11 of ISO 230/2: 1988.

b. Fly cutting machines having all of the following characteristics:

b.1. Spindle ''run out'' and ''camming'' less (better) than 0.0004 mm TIR; *and*

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

2B993 Gearmaking and/or finishing machinery not controlled by 2B003 capable of producing gears to a quality level of better than AGMA 11.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

2B996 Dimensional inspection or measuring systems or equipment not controlled by 2B006.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: N/A

Related Definitions: N/A

Items: a. Manual dimensional inspection machines, having both of the following characteristics:

a.1. Two or more axes; *and*

a.2. A measurement uncertainty equal to or less (better) than (3 + L/300) micrometer in any axes (L measured length in mm).

2B997 "Robots" not controlled by 2B007 or 2B207 that are capable of employing feedback information in real-time processing from one or more sensors to generate or modify "programs" or to generate or modify numerical program data.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

2B998 Assemblies, units or inserts specially designed for machine tools controlled by 2B991, or for equipment controlled by 2B993, 2B996 or 2B997.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: This entry does not control measuring interferometer systems, without closed or open loop feedback, containing a laser to measure slide movement errors of machine-tools, dimensional inspection machines or similar equipment.
Related Definition: N/A
Items: a. Spindle assemblies, consisting of spindles and bearings as a minimal assembly, with radial (''run out'') or axial (''camming'') axis motion in one revolution of the spindle less (better) than 0.0006 mm total indicator reading (TIR);

b. Single point diamond cutting tool inserts, having all of the following characteristics:

b.1. Flawless and chip-free cutting edge when magnified 400 times in any direction;

b.2. Cutting radius from 0.1 to 5 mm inclusive; *and*

b.3. Cutting radius out-of-roundness less (better) than 0.002 mm TIR.

c. Specially designed printed circuit boards with mounted components capable of upgrading, according to the manufacturer's specifications, ''numerical control'' units, machine tools or feedback devices to or above the levels specified in ECCNs 2B991, 2B993, 2B996, 2B997, or 2B998.

2B999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: AT.
Control(s).
Country Chart.

AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See §742.19 of the EAR for additional information.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: See also 0B001, 0B002, 0B004, 1B233, 2A293, 2B001.f, 2B004, 2B009, 2B104, 2B109, 2B204, 2B209, 2B228, 2B229, 2B231, 2B350.
Related Definitions: N/A
Items: a. Isostatic presses, n.e.s.;

b. Bellows manufacturing equipment, including hydraulic forming equipment and bellows forming dies;

c. Laser welding machines;

d. MIG welders;

e. E-beam welders;

f. Monel equipment, including valves, piping, tanks and vessels;

g. 304 and 316 stainless steel valves, piping, tanks and vessels;

h. Mining and drilling equipment, as follows:

h.1. Large boring equipment capable of drilling holes greater than two feet in diameter;

h.2. Large earth-moving equipment used in the mining industry;

i. Electroplating equipment designed for coating parts with nickel or aluminum;

j. Pumps designed for industrial service and for use with an electrical motor of 5 HP or greater;

k. Vacuum valves, piping, flanges, gaskets and related equipment specially designed for use in high-vacuum service, n.e.s.;

l. Spin forming and flow forming machines, n.e.s.;

m. Centrifugal multiplane balancing machines, n.e.s.;

n. Austenitic stainless steel plate, valves, piping, tanks and vessels.

C. MATERIALS [RESERVED]

D. SOFTWARE

2D001 "Software", other than that controlled by 2D002, specially designed or modified for the "development", "production" or "use" of equipment controlled by 2A001 or 2B001 to 2B009.

LICENSE REQUIREMENTS
Reason for Control: NS, MT, NP, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies to "software" for equipment controlled by 2B004 and 2B009 for MT reasons.	MT Column 1
NP applies to specially designed or modified "software" for equipment controlled by 2B001 for NP reasons, and to specially designed "software" for equipment controlled by 2B004, 2B006, 2B007, or 2B009 for NP reasons.	NP Column 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.

LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes, except N/A for MT
STA: License Exception STA may not be used to ship or transmit ''software'', other than that specified by ECCN 2D002, specially designed for the ''development'' or ''production'' of equipment as follows:

ECCN 2B001 entire entry; or ''Numerically controlled'' or manual machine tools as specified in 2B003 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) *See* ECCNs 2E001 (''development'') and 2E101 (''use'') for technology for ''software'' controlled under this entry. (2) *Also see* ECCNs 2D101 and 2D201.

Related Definitions: N/A

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

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.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: (1) *See* ECCNs 2E001 (''development'') and 2E201 (''use'') for technology for ''software'' controlled under this entry. (2) Also see ECCN 2D202.

Related Definitions: N/A

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

NOTE 1: 2D002 does not control ''software'' specially designed or modified for the operation of machine tools not controlled by Category 2.

NOTE 2: 2D002 does not control ''software'' for items controlled by 2B002. See 2D001 for control of ''software'' for items controlled by 2B002.

2D018 "Software" for the "development", "production" or "use" of equipment controlled by 2B018.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to "software" for equipment controlled by 2B018 for MT reasons.	MT Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry.	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

2D101 "Software" specially designed or modified for the "use" of equipment controlled by 2B104, 2B105, 2B109, 2B116, 2B117, or 2B119 to 2B122.

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1.
NP applies to ''software'' specially designed for the use'' of items controlled by 2B104, 2B109, or 2B116 for NP reasons.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) *See* ECCNs 2E001 (''development'') and 2E101 (''use'') for technology for ''software'' controlled under this entry. (2) *Also see* ECCN 9D004.

Related Definitions: N/A

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

2D201 "Software" specially designed for the "use" of equipment controlled by 2B204, 2B206, 2B207, 2B209, 2B227 or 2B229.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCNs 2E001 (''development'') and 2E201 (''use'') for technology for ''software'' controlled under this entry. (2) Also see ECCNs 2D002 and 2D202.

Related Definitions: N/A

ECCN Controls: ''Software'' specially designed for systems controlled by 2B206.b includes software for simultaneous measurements of wall thickness and contour.

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

2D202 "Software" specially designed or modified for the "development", "production" or "use" of equipment controlled by 2B201.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2D290 "Software" specially designed or modified for the "development", "production" or "use" of items controlled by 2A290, 2A291, 2A292, 2A293, or 2B290.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See ECCN 2E001 (''development'') for technology for ''software'' controlled under this entry.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2D351 Dedicated "software" for toxic gas monitoring systems and their dedicated detecting components controlled by ECCN 2B351.

License Requirements
Reason for Control: CB, AT

Control(s)	Country chart
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A.
TSR: N/A.
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: N/A.
Related Definitions: (1) For the purposes of this entry, the term ''dedicated'' means committed entirely to a single purpose or device. (2) See Section 772.1 of the EAR for the definitions of ''software,'' ''program,'' and ''microprogram.''
Items: The list of items controlled is contained in the ECCN heading.

2D983 "Software" specially designed or modified for the "development", "production" or "use" of equipment controlled by 2A983.

LICENSE REQUIREMENTS
*Reason for Control:*RS, AT

Control(s)	Country chart
RS applies to entire entry	RS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2D984 "Software" "required" for the "development", "production" or "use" of concealed object detection equipment controlled by 2A984.

LICENSE REQUIREMENTS
Reason for Control: RS, AT

Control(s)	*Country chart*
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) ''Software'' ''required'' for the ''development'', ''production'' or ''use'' of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.5 milliradian (a lower milliradian number means a more accurate image resolution) at a standoff distance of 100 meters is under the export licensing authority of the U.S. Department of State (22 CFR parts 120 through 130). (2) ''Software'' ''required'' for the ''development'', ''production'' or ''use'' of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian spatial resolution (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters is designated as EAR99. (3) See ECCNs 2A984 and 2E984 for related commodity and technology controls.
Related Definitions: N/A.
Items: The list of items controlled is contained in the ECCN heading.

2D991 "Software" specially designed for the "development", "production", or "use" of

equipment controlled by 2B991, 2B993, or 2B996, 2B997, and 2B998.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2D992 Specific "software", as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. ''Software'' to provide ''adaptive control'' and having both of the following characteristics:

a.1. For ''flexible manufacturing units'' (FMUs) which consist at least of equipment described in b.1 and b.2 of the definition of ''flexible manufacturing unit'' contained in part 772 of the EAR; *and*

a.2. Capable of generating or modifying, in ''real time processing'', programs or data by using the signals obtained simultaneously by means of at least two detection techniques, such as:

a.2.a. Machine vision (optical ranging);

a.2.b. Infrared imaging;

a.2.c. Acoustical imaging (acoustical ranging);

a.2.d. Tactile measurement;

a.2.e. Inertial positioning;

a.2.f. Force measurement; *and*

a.2.g. Torque measurement.

NOTE: 2D992.a does not control ''software'' which only provides rescheduling of functionally identical equipment within ''flexible manufacturing units'' using pre-stored part programs and a pre-stored strategy for the distribution of the part programs.

b. Reserved.

2D994 "Software" specially designed for the "development" or "production" of portable electric generators controlled by 2A994.

LICENSE REQUIREMENTS
Reason for Control: AT.
Control(s): AT applies to entire entry. A license is required for items controlled by this entry to Cuba, Iran and North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information on Cuba and Iran. See §742.19 of the EAR for additional information on North Korea.
LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

E. TECHNOLOGY

2E001 "Technology" according to the General Technology Note for the "development" of equipment or "software" controlled by 2A (except 2A983, 2A984, 2A991, or 2A994), 2B (except 2B991, 2B993, 2B996, 2B997, or 2B998), or 2D (except 2D983, 2D984, 2D991, 2D992, or 2D994).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, NP, CB, AT

Control(s)	Country chart
NS applies to "technology" for items controlled by 2A001, 2B001 to 2B009, 2D001 or 2D002.	NS Column 1.
MT applies to "technology" for items controlled by 2B004, 2B009, 2B018, 2B104, 2B105, 2B109, 2B116, 2B117, 2B119 to 2B122, 2D001, or 2D101 for MT reasons.	MT Column 1.
NP applies to "technology" for items controlled by 2A225, 2A226, 2B001, 2B004, 2B006, 2B007, 2B009, 2B104, 2B109, 2B116, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B232, 2D001, 2D002, 2D101, 2D201 or 2D202 for NP reasons.	NP Column 1.
NP applies to "technology" for items controlled by 2A290 to 2A293, 2B290, or 2D290 for NP reasons.	NP Column 2.
CB applies to "technology" for equipment controlled by 2B350 to 2B352, valves controlled by 2A226 or 2A292 having the characteristics of those controlled by 2B350.g, and software controlled by 2D351.	CB Column 2.
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.
LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes, except N/A for MT

STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''development'' of ''software'' specified in the License Exception STA paragraph in the License Exception section of ECCN 2D001 or for the ''development'' of equipment as follows: ECCN 2B001 entire entry; or ''Numerically controlled'' or manual machine tools as specified in 2B003 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 2E101, 2E201, and 2E301

Related Definitions: N/A

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

NOTE: *ECCN 2E001 includes ''technology'' for the integration of probe systems into coordinate measurement machines specified by 2B006.a.*

2E002 "Technology" according to the General Technology Note for the "production" of equipment controlled by 2A (except 2A983, 2A984, 2A991, or 2A994), or 2B (except 2B991, 2B993, 2B996, 2B997, or 2B998).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, CB, AT

Control(s)	Country chart
NS applies to ''technology'' for equipment controlled by 2A001, 2B001 to 2B009.	NS Column 1.
MT applies to ''technology'' for equipment controlled by 2B004, 2B009, 2B018, 2B104, 2B105, 2B109, 2B116, 2B117, or 2B119 to 2B122 for MT reasons.	MT Column 1.
NP applies to ''technology'' for equipment controlled by 2A225, 2A226, 2B001, 2B004, 2B006, 2B007, 2B009, 2B104, 2B109, 2B116, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B232 for NP reasons.	NP Column 1.
NP applies to ''technology'' for equipment controlled by 2A290 to 2A293, 2B290 for NP reasons.	NP Column 2.
CB applies to ''technology'' for equipment controlled by 2B350 to 2B352 and for valves controlled by 2A226 or 2A292 having the characteristics of those controlled by 2B350.g.	CB Column 2.
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.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except N/A for MT

STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''production'' of equipment as follows: ECCN 2B001 entire entry; or ''Numerically controlled'' or manual machine tools as specified in 2B003 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

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.

2E003 Other "technology", as follows (see 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 2E003.a, .b, .e and .f

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See 2E001, 2E002, and 2E101 for ''development'' and ''use'' technology for equipment that are designed or modified for densification of carbon-carbon composites, structural composite rocket nozzles and reentry vehicle nose tips.

Related Definitions: N/A

Items: a. ''Technology'' for the ''development'' of interactive graphics as an integrated part in ''numerical control'' units for preparation or modification of part programs;

b. ''Technology'' for metal-working manufacturing processes, as follows:

b.1. ''Technology'' for the design of tools, dies or fixtures specially designed for any of the following processes:

b.1.a. ''Superplastic forming'';

b.1.b. ''Diffusion bonding''; *or*

b.1.c. ''Direct-acting hydraulic pressing'';

b.2. Technical data consisting of process methods or parameters as listed below used to control:

b.2.a. ''Superplastic forming'' of aluminum alloys, titanium alloys or ''superalloys'':

b.2.a.1. Surface preparation;

b.2.a.2. Strain rate;

b.2.a.3. Temperature;

b.2.a.4. Pressure;

b.2.b. ''Diffusion bonding'' of ''superalloys'' or titanium alloys:

b.2.b.1. Surface preparation;

b.2.b.2. Temperature;

b.2.b.3. Pressure;

b.2.c. ''Direct-acting hydraulic pressing'' of aluminum alloys or titanium alloys:

b.2.c.1. Pressure;

b.2.c.2. Cycle time;

b.2.d. ''Hot isostatic densification'' of titanium alloys, aluminum alloys or ''superalloys'':

b.2.d.1. Temperature;

b.2.d.2. Pressure;

b.2.d.3. Cycle time;

c. ''Technology'' for the ''development'' or ''production'' of hydraulic stretch-forming machines and dies therefor, for the manufacture of airframe structures;

d. ''Technology'' for the ''development'' of generators of machine tool instructions (e.g., part programs) from design data residing inside ''numerical control'' units;

e. ''Technology for the development'' of integration ''software'' for incorporation of expert systems for advanced decision support of shop floor operations into ''numerical control'' units;

f. ''Technology'' for the application of inorganic overlay coatings or inorganic surface modification coatings (specified in column 3 of the following table) to non-electronic substrates (specified in column 2 of the following table), by processes specified in column 1 of the following table and defined in the Technical Note.

N.B. This table should be read to control the technology of a particular 'Coating Process' only when the resultant coating in column 3 is in a paragraph directly across from the relevant 'Substrate' under column 2. For example, Chemical Vapor Deposition (CVD) 'coating process' technical data are controlled for the application of 'silicides' to 'Carbon-carbon, Ceramic and Metal ''matrix'' ''composites'' substrates, but are not controlled for the application of 'silicides' to 'Cemented tungsten carbide (16), Silicon carbide (18)' substrates. In the second case, the resultant coating is not listed in the paragraph under column 3 directly across from the paragraph under column 2 listing 'Cemented tungsten carbide (16), Silicon carbide (18) '.

CATEGORY 2E—MATERIALS PROCESSING TABLE; DEPOSITION TECHNIQUES

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
A. Chemical Vapor Deposition (CVD)	''Superalloys''	Aluminides for internal passages
	Ceramics (19) and Low-expansion glasses (14).	Silicides Carbides Dielectric layers (15) Diamond Diamond-like carbon (17)
	Carbon-carbon, Ceramic, and Metal ''matrix'' ''composites''.	Silicides Carbides Refractory metals, Mixtures thereof (4) Dielectric layers (15) Aluminides Alloyed aluminides (2) Boron nitride
	Cemented tungsten carbide (16), Silicon Carbide (18).	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric Players (15)
	Beryllium and Beryllium alloys	Dielectric layers (15) Diamond Diamond-like carbon (17)
	Sensor window materials (9)	Dielectric layers (15) Diamond Diamond-like carbon (17)
B. Thermal Evaportation Physical Vapor		
1. Physical Vapor Deposition (PVD): Deposition (TE-PVD) Electron-Beam (EB-PVD).	''Superalloys''	Alloyed silicides Alloyed aluminides (2) McrAlX (5) Modified zirconia (12) Silicides Aluminides Mixtures thereof (4)
	Ceramics (19) and Low-expansion glasses (14).	Dielectric layers (15)
	Corrosion resistant steel (7)	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)
	Carbon-carbon, Ceramic and Metal ''matrix'' ''composites''.	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18).	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)

CATEGORY 2E—MATERIALS PROCESSING TABLE; DEPOSITION TECHNIQUES—Continued

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
	Beryllium and Beryllium alloys	Dielectric layers (15) Borides Beryllium
	Sensor window materials (9)	Dielectric layers (15)
	Titanium alloys (13)	Borides Nitrides
2. Ion assisted resistive heating. Physical Vapor Deposition (PVD) (Ion Plating).	Ceramics (19) and Low-expansion glasses (14).	Dielectric layers (15) Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal ''matrix'' ''composites''.	Dielectric layers (15)
	Cemented tungsten carbide (16), Silicon carbide.	Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
3. Physical Vapor Deposition (PVD): ''Laser'' Vaporization.	Ceramics (19) and Low-expansion glasses (14).	Silicides Dielectric layers (15) Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal ''matrix'' ''composites''.	Dielectric layers (15)
	Cemented tungsten carbide (16), Silicon carbide.	Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon
4. Physical Vapor Deposition (PVD): Cathodic Arc Discharge.	''Superalloys''	Alloyed silicides Alloyed Aluminides (2) MCrAlX (5)
	Polymers (11) and Organic ''matrix'' ''composites''.	Borides Carbides Nitrides Diamond-like carbon (17)
C. Pack cementation (see A above for out-of-pack cementation) (10).	Carbon-carbon, Ceramic and Metal ''matrix'' ''composites''.	Silicides Carbides Mixtures thereof (4)
	Titanium alloys (13)	Silicides Aluminides Alloyed aluminides (2)
	Refractory metals and alloys (8)	Silicides Oxides
D. Plasma spraying	''Superalloys''	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4) Abradable Nickel-Graphite Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester Alloyed aluminides (2)
	Aluminum alloys (6)	MCrAlX (5) Modified zirconia (12) Silicides Mixtures thereof (4)
	Refractory metals and alloys (8), Carbides, Corrosion resistant steel (7).	Aluminides Silicides MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)
	Titanium alloys (13)	Carbides Aluminides Silicides Alloyed aluminides (2)
	Abradable, Nickel-Graphite	Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester
E. Slurry Deposition	Refractory metals and alloys (8)	Fused silicides Fused aluminides except for resistance heating elements
	Carbon-carbon, Ceramic and Metal ''matrix'' ''composites''.	Silicides Carbides Mixtures thereof (4)

CATEGORY 2E—MATERIALS PROCESSING TABLE; DEPOSITION TECHNIQUES—Continued

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
F. Sputter Deposition	"Superalloys"	Alloyed silicides Alloyed aluminides (2) Noble metal modified aluminides (3) McrAlX (5) Modified zirconia (12) Platinum Mixtures thereof (4)
	Ceramics and Low-expansion glasses (14).	Silicides Platinum Mixtures thereof (4) Dielectric layers (15) Diamond-like carbon (17)
	Titanium alloys (13)	Borides Nitrides Oxides Silicides Aluminides Alloyed aluminides (2) Carbides
	Carbon-carbon, Ceramic and Metal "matrix" "Composites".	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18).	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Borides Dielectric layers (15) Beryllium
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
	Refractory metals and alloys (8)	Aluminides Silicides Oxides Carbides
G. Ion Implantation	High temperature bearing steels	Additions of Chromium, Tantalum, or Niobium (Columbium)
	Titanium alloys (13)	Borides Nitrides
	Beryllium and Beryllium alloys	Borides
	Cemented tungsten carbide (16)	Carbides Nitrides

[1] The numbers in parenthesis refer to the Notes following this Table.

Notes to Table on Deposition Techniques

1. The term 'coating process' includes coating repair and refurbishing as well as original coating.

2. The term 'alloyed aluminide coating' includes single or multiple-step coatings in which an element or elements are deposited prior to or during application of the aluminide coating, even if these elements are deposited by another coating process. It does not, however, include the multiple use of single-step pack cementation processes to achieve alloyed aluminides.

3. The term 'noble metal modified aluminide' coating includes multiple-step coatings in which the noble metal or noble metals are laid down by some other coating process prior to application of the aluminide coating.

4. The term 'mixtures thereof' includes infiltrated material, graded compositions, codeposits and multilayer deposits and are obtained by one or more of the coating processes specified in the Table.

5. MCrAlX refers to a coating alloy where M equals cobalt, iron, nickel or combinations thereof and X equals hafnium, yttrium, silicon, tantalum in any amount or other intentional additions over 0.01% by weight in various proportions and combinations, except:

a. CoCrAlY coatings which contain less than 22% by weight of chromium, less than 7% by weight of aluminum and less than 2% by weight of yttrium;

b. CoCrAlY coatings which contain 22 to 24% by weight of chromium, 10 to 12% by

weight of aluminum and 0.5 to 0.7% by weight of yttrium; or

c. NiCrAlY coatings which contain 21 to 23% by weight of chromium, 10 to 12% by weight of aluminum and 0.9 to 1.1% by weight of yttrium.

6. The term 'aluminum alloys' refers to alloys having an ultimate tensile strength of 190 MPa or more measured at 293 K (20 °C).

7. The term 'corrosion resistant steel' refers to AISI (American Iron and Steel Institute) 300 series or equivalent national standard steels.

8. 'Refractory metals and alloys' include the following metals and their alloys: niobium (columbium), molybdenum, tungsten and tantalum.

9. 'Sensor window materials', as follows: alumina, silicon, germanium, zinc sulphide, zinc selenide, gallium arsenide, diamond, gallium phosphide, sapphire and the following metal halides: sensor window materials of more than 40 mm diameter for zirconium fluoride and hafnium fluoride.

10. ''Technology'' for single-step pack cementation of solid airfoils is not controlled by Category 2.

11. 'Polymers', as follows: polyimide, polyester, polysulfide, polycarbonates and polyurethanes.

12. 'Modified zirconia' refers to additions of other metal oxides, (e.g., calcia, magnesia, yttria, hafnia, rare earth oxides) to zirconia in order to stabilize certain crystallographic phases and phase compositions. Thermal barrier coatings made of zirconia, modified with calcia or magnesia by mixing or fusion, are not controlled.

13. 'Titanium alloys' refers only to aerospace alloys having an ultimate tensile strength of 900 MPa or more measured at 293 K (20 °C).

14. 'Low-expansion glasses' refers to glasses which have a coefficient of thermal expansion of 1×10^{-7} K^{-1} or less measured at 293 K (20 °C).

15. 'Dielectric layers' are coatings constructed of multi-layers of insulator materials in which the interference properties of a design composed of materials of various refractive indices are used to reflect, transmit or absorb various wavelength bands. Dielectric layers refers to more than four dielectric layers or dielectric/metal ''composite'' layers.

16. 'Cemented tungsten carbide' does not include cutting and forming tool materials consisting of tungsten carbide/(cobalt, nickel), titanium carbide/(cobalt, nickel), chromium carbide/nickel-chromium and chromium carbide/nickel.

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, medical devices or molds, for casting or molding of plastics, manufactured from alloys containing less than 5% beryllium.

18. 'Silicon carbide' does not include cutting and forming tool materials.

19. Ceramic substrates, as used in this entry, does not include ceramic materials containing 5% by weight, or greater, clay or cement content, either as separate constituents or in combination.

TECHNICAL NOTE TO TABLE ON DEPOSITION TECHNIQUES: Processes specified in Column 1 of the Table are defined as follows:

a. Chemical Vapor Deposition (CVD) is an overlay coating or surface modification coating process wherein a metal, alloy, ''composite'', dielectric or ceramic is deposited upon a heated substrate. Gaseous reactants are decomposed or combined in the vicinity of a substrate resulting in the deposition of the desired elemental, alloy or compound material on the substrate. Energy for this decomposition or chemical reaction process may be provided by the heat of the substrate, a glow discharge plasma, or ''laser'' irradiation.

NOTE 1: CVD includes the following processes: directed gas flow out-of-pack deposition, pulsating CVD, controlled nucleation thermal decomposition (CNTD), plasma enhanced or plasma assisted CVD processes.

NOTE 2: Pack denotes a substrate immersed in a powder mixture.

NOTE 3: The gaseous reactants used in the out-of-pack process are produced using the same basic reactions and parameters as the pack cementation process, except that the substrate to be coated is not in contact with the powder mixture.

b. Thermal Evaporation-Physical Vapor Deposition (TE-PVD) is an overlay coating process conducted in a vacuum with a pressure less than 0.1 Pa wherein a source of thermal energy is used to vaporize the coating material. This process results in the condensation, or deposition, of the evaporated species onto appropriately positioned substrates. The addition of gases to the vacuum chamber during the coating process to synthesize compound coatings is an ordinary modification of the process. The use of ion or electron beams, or plasma, to activate or assist the coating's deposition is also a common modification in this technique. The use of monitors to provide in-process measurement of optical characteristics and thickness of coatings can be a feature of these processes. Specific TE-PVD processes are as follows:

1. Electron Beam PVD uses an electron beam to heat and evaporate the material which forms the coating;

2. Ion Assisted Resistive Heating PVD employs electrically resistive heating sources in combination with impinging ion beam(s) to produce a controlled and uniform flux of evaporated coating species;

3. ''Laser'' Vaporization uses either pulsed or continuous wave ''laser'' beams to vaporize the material which forms the coating;

4. Cathodic Arc Deposition employs a consumable cathode of the material which forms the coating and has an arc discharge established on the surface by a momentary contact of a ground trigger. Controlled motion of arcing erodes the cathode surface creating a highly ionized plasma. The anode can be either a cone attached to the periphery of the cathode, through an insulator, or the chamber. Substrate biasing is used for non line-of-sight deposition.

NOTE: This definition does not include random cathodic arc deposition with non-biased substrates.

5. Ion Plating is a special modification of a general TE-PVD process in which a plasma or an ion source is used to ionize the species to be deposited, and a negative bias is applied to the substrate in order to facilitate the extraction of the species from the plasma. The introduction of reactive species, evaporation of solids within the process chamber, and the use of monitors to provide in-process measurement of optical characteristics and thicknesses of coatings are ordinary modifications of the process.

c. Pack Cementation is a surface modification coating or overlay coating process wherein a substrate is immersed in a powder mixture (a pack), that consists of:

1. The metallic powders that are to be deposited (usually aluminum, chromium, silicon or combinations thereof);

2. An activator (normally a halide salt); *and*

3. An inert powder, most frequently alumina.

NOTE: The substrate and powder mixture is contained within a retort which is heated to between 1,030 K (757 °C) to 1,375 K (1,102 °C) for sufficient time to deposit the coating.

d. Plasma Spraying is an overlay coating process wherein a gun (spray torch) which produces and controls a plasma accepts powder or wire coating materials, melts them and propels them towards a substrate, whereon an integrally bonded coating is formed. Plasma spraying constitutes either low pressure plasma spraying or high velocity plasma spraying.

NOTE 1: Low pressure means less than ambient atmospheric pressure.

NOTE 2: High velocity refers to nozzle-exit gas velocity exceeding 750 m/s calculated at 293 K (20 °C) at 0.1 MPa.

e. Slurry Deposition is a surface modification coating or overlay coating process wherein a metallic or ceramic powder with an organic binder is suspended in a liquid and is applied to a substrate by either spraying, dipping or painting, subsequent air or oven drying, and heat treatment to obtain the desired coating.

f. Sputter Deposition is an overlay coating process based on a momentum transfer phenomenon, wherein positive ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on an appropriately positioned substrate.

NOTE 1: The Table refers only to triode, magnetron or reactive sputter deposition which is used to increase adhesion of the coating and rate of deposition and to radio frequency (RF) augmented sputter deposition used to permit vaporization of non-metallic coating materials.

NOTE 2: Low-energy ion beams (less than 5 keV) can be used to activate the deposition.

g. Ion Implantation is a surface modification coating process in which the element to be alloyed is ionized, accelerated through a potential gradient and implanted into the surface region of the substrate. This includes processes in which ion implantation is performed simultaneously with electron beam physical vapor deposition or sputter deposition.

Accompanying Technical Information to Table on Deposition Techniques:

1. ''Technology'' for pretreatments of the substrates listed in the Table, as follows:

a. Chemical stripping and cleaning bath cycle parameters, as follows:

1. Bath composition;

a. For the removal of old or defective coatings corrosion product or foreign deposits;

b. For preparation of virgin substrates;

2. Time in bath;

3. Temperature of bath;

4. Number and sequences of wash cycles;

b. Visual and macroscopic criteria for acceptance of the cleaned part;

c. Heat treatment cycle parameters, as follows:

1. Atmosphere parameters, as follows:

a. Composition of the atmosphere;

b. Pressure of the atmosphere;

2. Temperature for heat treatment;

3. Time of heat treatment;

d. Substrate surface preparation parameters, as follows:

1. Grit blasting parameters, as follows:

a. Grit composition;

b. Grit size and shape;

c. Grit velocity;

2. Time and sequence of cleaning cycle after grit blast;

3. Surface finish parameters;

4. Application of binders to promote adhesion;

e. Masking technique parameters, as follows:
1. Material of mask;
2. Location of mask;
2. ''Technology'' for in situ quality assurance techniques for evaluation of the coating processes listed in the Table, as follows:
a. Atmosphere parameters, as follows:
1. Composition of the atmosphere;
2. Pressure of the atmosphere;
b. Time parameters;
c. Temperature parameters;
d. Thickness parameters;
e. Index of refraction parameters;
f. Control of composition;
3. ''Technology'' for post deposition treatments of the coated substrates listed in the Table, as follows:
a. Shot peening parameters, as follows:
1. Shot composition;
2. Shot size;
3. Shot velocity;
b. Post shot peening cleaning parameters;
c. Heat treatment cycle parameters, as follows:
1. Atmosphere parameters, as follows:
a. Composition of the atmosphere;
b. Pressure of the atmosphere;
2. Time-temperature cycles;
d. Post heat treatment visual and macroscopic criteria for acceptance of the coated substrates;
4. ''Technology'' for quality assurance techniques for the evaluation of the coated substrates listed in the Table, as follows:
a. Statistical sampling criteria;
b. Microscopic criteria for:
1. Magnification;
2. Coating thickness, uniformity;
3. Coating integrity;
4. Coating composition;
5. Coating and substrates bonding;
6. Microstructural uniformity.
c. Criteria for optical properties assessment (measured as a function of wavelength):
1. Reflectance;
2. Transmission;
3. Absorption;
4. Scatter;
5. ''Technology'' and parameters related to specific coating and surface modification processes listed in the Table, as follows:
a. For Chemical Vapor Deposition (CVD):
1. Coating source composition and formulation;
2. Carrier gas composition;
3. Substrate temperature;
4. Time-temperature-pressure cycles;
5. Gas control and part manipulation;
b. For Thermal Evaporation-Physical Vapor Deposition (PVD):
1. Ingot or coating material source composition;
2. Substrate temperature;
3. Reactive gas composition;
4. Ingot feed rate or material vaporization rate;
5. Time-temperature-pressure cycles;
6. Beam and part manipulation;
7. ''Laser'' parameters, as follows:
a. Wave length;
b. Power density;
c. Pulse length;
d. Repetition ratio;
e. Source;
c. For Pack Cementation:
1. Pack composition and formulation;
2. Carrier gas composition;
3. Time-temperature-pressure cycles;
d. For Plasma Spraying:
1. Powder composition, preparation and size distributions;
2. Feed gas composition and parameters;
3. Substrate temperature;
4. Gun power parameters;
5. Spray distance;
6. Spray angle;
7. Cover gas composition, pressure and flow rates;
8. Gun control and part manipulation;
e. For Sputter Deposition:
1. Target composition and fabrication;
2. Geometrical positioning of part and target;
3. Reactive gas composition;
4. Electrical bias;
5. Time-temperature-pressure cycles;
6. Triode power;
7. Part manipulation;
f. For Ion Implantation:
1. Beam control and part manipulation;
2. Ion source design details;
3. Control techniques for ion beam and deposition rate parameters;
4. Time-temperature-pressure cycles.
g. For Ion Plating:
1. Beam control and part manipulation;
2. Ion source design details;
3. Control techniques for ion beam and deposition rate parameters;
4. Time-temperature-pressure cycles;
5. Coating material feed rate and vaporization rate;
6. Substrate temperature;
7. Substrate bias parameters.

2E018 "Technology" for the "use" of equipment controlled by 2B018.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to ''technology'' for equipment controlled by 2B018 for MT reasons.	MT Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry.	See § 746.1(b) for UN controls.

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.

2E101 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 2B004, 2B009, 2B104, 2B105, 2B109, 2B116, 2B117, 2B119 to 2B122, 2D001, 2D002 or 2D101.

LICENSE REQUIREMENTS
Reason for Control: MT, NP, AT

Control(s)	Country chart
MT applies to "technology" for items controlled by 2B004, 2B009, 2B104, 2B105, 2B109, 2B116, 2B117, 2B119 to 2B122, 2D001, or 2D101 for MT reasons.	MT Column 1
NP applies to "technology" for items controlled by 2B004, 2B009, 2B104, 2B109, 2B116, 2D001, 2D002 or 2D101 for NP reasons.	NP Column 1
AT applies to entire entry.	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: (1) This entry controls only "technology" for 2B009 and 2B109 for spin forming machines combining the functions of spin forming and flow forming, and flow forming machines. (2) Also see 2E201.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2E201 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 2A225, 2A226, 2B001, 2B006, 2B007.b, 2B007.c, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B232, 2D002, 2D201 or 2D202 for NP reasons.

LICENSE REQUIREMENTS
Reason for Control: NP, CB, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 1.
CB applies to "technology" for valves controlled by 2A226 that meet or exceed the technical parameters in 2B350.g.	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: Also see 2E290 and 2E991.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2E290 "Technology" according to the General Technology Note for the "use" of equipment controlled by 2A290, 2A291, 2A292, 2A293, or 2B290.

LICENSE REQUIREMENTS
Reason for Control: NP, CB, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2.
CB applies to "technology" for valves controlled by 2A292 that meet or exceed the technical parameters in 2B350.g.	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

2E301 "Technology" according to the "General Technology Note" for the "use" of items controlled by 2B350, 2B351 and 2B352.

LICENSE REQUIREMENTS
Reason for Control: CB, AT

Control(s)	Country chart
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: N/A
Related Definitions: N/A
Items: The lists of items controlled are contained in the ECCN headings.

2E983 "Technology" specially designed or modified for the "development", "production" or "use" of equipment controlled by 2A983, or the "development" of software controlled by 2D983.

LICENSE REQUIREMENTS
*Reason for Control:*RS, AT

Control(s)	Country chart
RS applies to entire entry	RS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

2E984 "Technology" "required" for the "development", "production" or "use" of equipment controlled by 2A984 or "required" for the "development" of "software" controlled by 2D984.

LICENSE REQUIREMENTS
Reason for Control: RS, AT

Control(s)	*Country chart*
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) ''Technology'' ''required'' for the ''development'', ''production'' or ''use'' of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.5 milliradian (a lower milliradian number means a more accurate image resolution) at a standoff distance of 100 meters or ''required'' for the ''development'' of ''software'' ''required'' for the ''development'', ''production'' or ''use'' of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.5 milliradian at a standoff distance of 100 meters is under the export licensing authority of the U.S. Department of State (22 CFR parts 120 through 130). (2) ''Technology'' ''required'' for the ''development'', ''production'' or ''use'' of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian spatial resolution (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters or ''required'' for the ''development'' of ''software'' ''required'' for the ''development'', ''production'' or ''use'' of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian spatial resolution (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters is designated as EAR99. (3) See ECCNs 2A984 and 2D984 for related commodity and software controls.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

2E991 "Technology" for the "use" of equipment controlled by 2B991, 2B993, 2B996, or 2B997.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

2E994 "Technology" for the "use" of portable electric generators controlled by 2A994.

LICENSE REQUIREMENTS
Reason for Control: AT
Control(s): AT applies to entire entry. A license is required for items controlled by this entry to Cuba, Iran and North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information on Cuba and Iran. See §742.19 of the EAR for additional information on North Korea.
LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

EAR99 Items Subject to the EAR That Are *Not* Elsewhere Specified in This CCL Category *or* in Any Other Category in the CCL Are Designated by the Number EAR99.

CATEGORY 3—ELECTRONICS

A. SYSTEMS, EQUIPMENT AND COMPONENTS

NOTE 1: *The control status of equipment and components described in 3A001 or 3A002, other than those described in 3A001.a.3 to 3A001.a.10, 3A001.a.12 or 3A001.a.13, which are specially designed for or which have the same functional characteristics as other equipment is determined by the control status of the other equipment.*

NOTE 2: *The control status of integrated circuits described in 3A001.a.3 to 3A001.a.9, 3A001.a.12 or 3A001.a.13 that are unalterably programmed or designed for a specific function for other equipment is determined by the control status of the other equipment.*

N.B.: *When the manufacturer or applicant cannot determine the control status of the other equipment, the control status of the integrated*

circuits is determined in 3A001.a.3 to 3A001.a.9, 3A001.a.12 and 3A001.a.13.

3A001 Electronic components and specially designed components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
MT applies to 3A001.a.1.a when usable in "missiles"; and to 3A001.a.5.a when "designed or modified" for military use, hermetically sealed and rated for operation in the temperature range from below −54 °C to above +125 °C.	MT Column 1
NP applies to pulse discharge capacitors in 3A001.e.2 and superconducting solenoidal electromagnets in 3A001.e.3 that meet or exceed the technical parameters in 3A201.a and 3A201.b, respectively.	NP Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A for MT or NP

Yes for:

$1500: 3A001.c

$3000: 3A001.b.1, b.2, b.3, b.9, .d, .e, .f, and .g

$5000: 3A001.a (except a.1.a and a.5.a when controlled for MT), and .b.4 to b.7

GBS: Yes for 3A001.a.1.b, a.2 to a.13 (except .a.5.a when controlled for MT), b.2, b.8 (except for TWTAs exceeding 18 GHz), b.9., b.10, .g, and .h.

CIV: Yes for 3A001.a.3, a.7, and a.11.

LIST OF ITEMS CONTROLLED

Unit: Number.

Related Controls: (1) The following commodities are under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121) when ''space qualified'' and operating at frequencies higher than 31.8 GHz: helix tubes (traveling wave tubes (TWT)) defined in 3A001.b.1.a.4.c; microwave solid state amplifiers defined in 3A001.b.4.b traveling wave tube amplifiers (TWTA) defined in 3A001.b.8; and derivatives thereof; (2) The following commodities are also under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121): (a) ''Space qualified'' solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays and/or solar panels, with a minimum average efficiency of 31% or greater measured at an operating temperature of 301 K (28 °C) under simulated 'AM0' illumination with an irradiance of 1,367 Watts per square meter (W/m^2), and associated solar concentrators, power conditioners and/or controllers, bearing and power transfer assemblies, and deployment hardware/systems; (b) Radiation-hardened microelectronic circuits controlled by Category XV (d) of the United States Munitions List (USML); and (c) All specifically designed or modified systems or subsystems, components, parts, accessories, attachments, and associated equipment controlled by Category XV (e) of the USML. See also 3A101, 3A201, and 3A991. (3) See ECCN 3A982.a for discrete microwave transistors not controlled by paragraph .b.3 of this entry. (4) Packaged microwave ''monolithic integrated circuits'' (packaged MMIC) power amplifiers that operate within the frequency range specified in 3A982.b and that have the dimensional and output power characteristics specified for packaged MMIC power amplifiers specified in ECCN 3A982 are controlled by ECCN 3A982 even if such packaged MMIC power amplifiers also operate within the frequency range specified in ECCN 3A001.b.2.a.

Related Definitions: For the purposes of integrated circuits in 3A001.a.1, 5×10^3 Gy(Si) = 5×10^5 Rads (Si); 5×10^6 Gy (Si)/s = 5×10^8 Rads (Si)/s. Spacecraft/satellite: solar concentrators, power conditioners and or controllers, bearing and power transfer assembly, and or deployment hardware/systems are controlled under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121).

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 5×10^3 Gy (Si), or higher;

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

a.1.c. A fluence (integrated flux) of neutrons (1 MeV equivalent) of 5×10^{13} n/cm^2 or higher on silicon, or its equivalent for other materials;

NOTE: 3A001.a.1.c does not apply to Metal Insulator Semiconductors (MIS).

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, 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 is 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'', ''microcomputer microcircuits'' and microcontroller microcircuits, manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz;

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

a.4. [Reserved]

a.5. Analog-to-Digital Converter (ADC) and Digital-to-Analog Converter (DAC) integrated circuits, as follows:

a.5.a. ADCs having any of the following:

a.5.a.1. A resolution of 8 bit or more, but less than 10 bit, with an output rate greater than 500 million words per second;

a.5.a.2 A resolution of 10 bit or more, but less than 12 bit, with an output rate greater than 300 million words per second;

a.5.a.3. A resolution of 12 bit with an output rate greater than 200 million words per second;

a.5.a.4. A resolution of more than 12 bit but equal to or less than 14 bit with an output rate greater than 125 million words per second; *or*

a.5.a.5. A resolution of more than 14 bit with an output rate greater than 20 million words per second;

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

2. The number of bits in the output word is equal to the resolution of the ADC.

3. The output rate is the maximum output rate of the converter, regardless of architecture or oversampling.

4. For 'multiple channel ADCs', the outputs are not aggregated and the output rate is the maximum output rate of any single channel.

5. For 'interleaved ADCs' or for 'multiple channel ADCs' that are specified to have an interleaved mode of operation, the outputs are aggregated and the output rate is the maximum combined total output rate of all of the outputs.

6. Vendors may also refer to the output rate as sampling rate, conversion rate or throughput rate. It is often specified in megahertz (MHz) or mega samples per second (MSPS).

7. For the purpose of measuring output rate, one output word per second is equivalent to one Hertz or one sample per second.

8. 'Multiple channel ADCs' are defined as devices which integrate more than one ADC, designed so that each ADC has a separate analog input.

9. 'Interleaved ADCs' are defined as devices which have multiple ADC units that sample the same analog input at different times such that when the outputs are aggregated, the analog input has been effectively sampled and converted at a higher sampling rate.

a.5.b. Digital-to-Analog Converters (DAC) having any of the following:

a.5.b.1. A resolution of 10 bit or more with an 'adjusted update rate' of 3,500 MSPS or greater; or

a.5.b.2. A resolution of 12-bit or more with an 'adjusted update rate' of equal to or greater than 1,250 MSPS and having any of the following:

a.5.b.2.a. A settling time less than 9 ns to 0.024% of full scale from a full scale step; or

a.5.b.2.b. A 'Spurious Free Dynamic Range' (SFDR) greater than 68 dBc (carrier) when synthesizing a full scale analog signal of 100 MHz or the highest full scale analog signal frequency specified below 100 MHz.

TECHNICAL NOTES: 1. 'Spurious Free Dynamic Range' (SFDR) is defined as the ratio of the RMS value of the carrier frequency (maximum signal component) at the input of the DAC to the RMS value of the next largest noise or harmonic distortion component at its output.

2. SFDR is determined directly from the specification table or from the characterization plots of SFDR versus frequency.

3. A signal is defined to be full scale when its amplitude is greater than –3 dBfs (full scale).

4. 'Adjusted update rate' for DACs is:

a. For conventional (non-interpolating) DACs, the 'adjusted update rate' is the rate at which the digital signal is converted to an analog signal and the output analog values are changed by the DAC.For DACs where the interpolation mode may be bypassed (interpolation factor of one), the DAC should be considered as a conventional (non-interpolating) DAC.

b. For interpolating DACs (oversampling DACs), the 'adjusted update rate' is defined as the DAC update rate divided by the smallest interpolating factor. For interpolating DACs, the 'adjusted update rate' may be referred to by different terms including:

- Input data rate
- Input word rate
- Input sample rate
- Maximum total input bus rate
- Maximum DAC clock rate for DAC clock input.

a.6. Electro-optical and ''optical integrated circuits'', designed for ''signal processing'' and 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. A maximum number of digital input/outputs greater than 200; *or*

a.7.b. A system gate count of greater than 230,000;

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).

TECHNICAL NOTES: 1. 'Field programmable logic devices' are also known as field programmable gate or field programmable logic arrays.

2. Maximum number of digital input/outputs in 3A001.a.7.a is also referred to as maximum user input/outputs or maximum available input/outputs, whether the integrated circuit is packaged or bare die.

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 1,500 terminals;

a.10.b. A typical ''basic gate propagation delay time'' of less than 0.02 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.

a.13. Direct Digital Synthesizer (DDS) integrated circuits having any of the following:

a.13.a. A Digital-to-Analog Converter (DAC) clock frequency of 3.5 GHz or more and a DAC resolution of 10 bit or more, but less than 12 bit; or

a.13.b. A DAC clock frequency of 1.25 GHz or more and a DAC resolution of 12 bit or more;

TECHNICAL NOTE: *The DAC clock frequency may be specified as the master clock frequency or the input clock frequency*.

b. Microwave or millimeter wave components, as follows:

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

NOTE 1: 3A001.b.1 does not control tubes designed or rated for operation in any frequency band and having all of the following:

a. Does not exceed 31.8 GHz; and

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

NOTE 2: *3A001.b.1 does not control non-''space-qualified'' tubes having all the following:*

(a) An average output power equal to or less than 50 W; and

(b) Designed or rated for operation in any frequency band and having all of the following:

(1) Exceeds 31.8 GHz but does not exceed 43.5 GHz; and

(2) 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. Tubes operating at frequencies exceeding 31.8 GHz;

b.1.a.2. Tubes 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, having any of the following:

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 ''Monolithic Integrated Circuits'' (MMIC) power amplifiers having any of the following:

b.2.a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and with an average output power greater than 4W (36 dBm) with a ''fractional bandwidth'' greater than 15%;

b.2.b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 16 GHz and with an average output power greater than 1W (30 dBm) with a ''fractional bandwidth'' greater than 10%;

b.2.c. Rated for operation at frequencies exceeding 16 GHz up to and including 31.8 GHz and with an average output power greater than 0.8W (29 dBm) with a ''fractional bandwidth'' greater than 10%;

b.2.d. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz and with an average output power greater than 0.1 nW;

b.2.e. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than 0.25W (24 dBm) with a ''fractional bandwidth'' greater than 10%; *or*

b.2.f. Rated for operation at frequencies exceeding 43.5 GHzand with an average output power greater than 0.1 nW.

NOTE 1: [Reserved]

NOTE 2: The control status of the MMIC whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.2.a through 3A001.b.2.f, is determined by the lowest average output power control threshold.

NOTE 3: Notes 1 and 2 following the Category 3 heading for product group A. Systems, Equipment, and Components mean that 3A001.b.2 does not control MMICs if they are specially designed for other applications, *e.g.*, telecommunications, radar, automobiles.

b.3. Discrete microwave transistors having any of the following:

b.3.a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and having an average output power greater than 60W (47.8 dBm);

b.3.b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz and having an average output power greater than 20W (43 dBm);

b.3.c. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz and having an average output power greater than 0.5W (27 dBm);

b.3.d. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and having an average output power greater than 1W (30 dBm); *or*

b.3.e. Rated for operation at frequencies exceeding 43.5 GHz and with an average output power greater than 0.1 nW;

NOTE: The control status of a transistor whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.3.a through 3A001.b.3.e, is determined by the lowest average output power control threshold.

b.4. Microwave solid state amplifiers and microwave assemblies/modules containing microwave solid state amplifiers, having any of the following:

b.4.a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and with an average output power greater than 60W (47.8 dBm) with a ''fractional bandwidth'' greater than 15%;

b.4.b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz and with an average output power greater than 15W (42 dBm) with a ''fractional bandwidth'' greater than 10%;

b.4.c. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz and with an average output power greater than 0.1 nW;

b.4.d. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than 1W (30 dBm) with a ''fractional bandwidth'' greater than 10%;

b.4.e. Rated for operation at frequencies exceeding 43.5 GHz and with an average output power greater than 0.1 nW; *or*

b.4.f. Rated for operation at frequencies above 3.2 GHz and all of the following:

b.4.f.1. An average output power (in watts), P, greater than 150 divided by the maximum operating frequency (in GHz) squared [$P > 150\ W*GHz^2/f_{GHz}^2$];

b.4.f.2. A ''fractional bandwidth'' of 5% or greater; *and*

b.4.f.3. Any two sides perpendicular to one another with length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [$d \leq 15\ cm*GHz/f_{GHz}$];

TECHNICAL NOTE: 3.2 GHz should be used as the lowest operating frequency (f_{GHz}) in the formula in 3A001.b.4.f.3., for amplifiers that have a rated operation range extending downward to 3.2 GHz and below [$d \leq 15cm*GHz/3.2\ f_{GHz}$].

N.B.: MMIC power amplifiers should be evaluated against the criteria in 3A001.b.2.

NOTE 1: [Reserved]

NOTE 2: The control status of an item whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.4.a through 3A001.b.4.e, is determined by the lowest average output power control threshold.

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 and 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. [Reserved]

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

b.8. Microwave power amplifiers containing tubes controlled by 3A001.b.1 and having all of the following:

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

b.8.b. An average output power to mass ratio 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.

b.9. Microwave power modules (MPM) consisting of, at least, a traveling wave tube, a microwave ''monolithic integrated circuit'' and an integrated electronic power conditioner and having all of the following:

b.9.a. A 'turn-on time' from off to fully operational in less than 10 seconds;

b.9.b. A volume less than the maximum rated power in Watts multiplied by 10 cm^3/W; *and*

b.9.c. An ''instantaneous bandwidth'' greater than 1 octave ($f_{max}. > 2f_{min},$) and having any of the following:

b.9.c.1. For frequencies equal to or less than 18 GHz, an RF output power greater than 100 W; *or*

b.9.c.2. A frequency greater than 18 GHz;

TECHNICAL NOTES: 1. To calculate the volume in 3A001.b.9.b., the following example is provided: for a maximum rated power of 20 W, the volume would be: 20 W × 10 cm^3/W = 200 cm^3.

2. The 'turn-on time' in 3A001.b.9.a. refers to the time from fully-off to fully operational, i.e., it includes the warm-up time of the MPM.

b.10. Oscillators or oscillator assemblies, specified to operate with all of the following:

b.10.a. A single sideband (SSB) phase noise, in dBc/Hz, better than $-(126+20\ \log_{10}F-20\ \log_{10}f)$ for 10 Hz <F<10 kHz; *and*

b.10.b. A single sideband (SSB) phase noise, in dBc/Hz, better than $-(114+20\ \log_{10}F-20\ \log_{10}f)$ for 10 kHz ≤ F < 500 kHz;

TECHNICAL NOTE: In 3A001.b.10, F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.

b.11. ''Frequency synthesizer'' ''electronic assemblies'' having a ''frequency switching time'' as specified by any of the following:

b.11.a. Less than 312 ps;

b.11.b. Less than 100 μs for any frequency change exceeding 1.6 GHz within the synthesized frequency range exceeding 3.2 GHz but not exceeding 10.6 GHz;

b.11.c. Less than 250 μs for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 10.6 GHz but not exceeding 31.8 GHz;

b.11.d. Less than 500 μs for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 31.8 GHz but not exceeding 43.5 GHz; *or*

b.11.e. Less than 1 ms for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 43.5 GHz but not exceeding 56 GHz;

b.11.f. Less than 1 ms for any frequency change exceeding 2.2 GHz within the synthesized frequency range exceeding 56 GHz but not exceeding 70 GHz; *or*

b.11.g. Less than 1 ms within the synthesized frequency range exceeding 70 GHz;

N.B.: *For general purpose ''signal analyzers'', signal generators, network analyzers and microwave test receivers, see 3A002.c, 3A002.d, 3A002.e and 3A002.f, respectively.*

N.B.: For general purpose ''signal analysers,'' signal generators, network analysers and microwave test receivers, see 3A002.c, 3A002.d, 3A002.e and 3A002.f, respectively.

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

c.1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices, having any of the following:

c.1.a. A carrier frequency exceeding 6 GHz;

c.1.b. A carrier frequency exceeding 1 GHz, but not exceeding 6 GHz and having any of the following:

c.1.b.1. A 'frequency side-lobe rejection' exceeding 65 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 and having any of the following:

c.1.c.1. A product of the maximum delay time and the bandwidth (time in μs and bandwidth 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 65 dB and a bandwidth greater than 100 MHz;

TECHNICAL NOTE: 'Frequency side-lobe rejection' is the maximum rejection value specified in data sheet.

c.2. Bulk (volume) acoustic wave devices that permit the direct processing of signals at frequencies exceeding 6 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;

NOTE: 3A001.c does not control acoustic wave devices that are limited to a single band pass, low pass, high pass or notch filtering, or resonating function.

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 and having 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. 'Cells' as follows:

e.1.a. 'Primary cells' having an 'energy density' exceeding 550 Wh/kg at 293 K (20 °C);

e.1.b. 'Secondary cells' having an 'energy density' exceeding 300 Wh/kg at 293 K (20 °C);

TECHNICAL NOTES: 1. For the purpose of 3A001.e.1., 'energy density' (Wh/kg) is calculated from the nominal voltage multiplied by the nominal capacity in ampere-hours (Ah) divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in Ohms and the mass in kilograms.

2. For the purpose of 3A001.e.1., a 'cell' is defined as an electrochemical device, which has positive and negative electrodes, an electrolyte, and is a source of electrical energy. It is the basic building block of a battery.

3. For the purpose of 3A001.e.1.a., a 'primary cell' is a 'cell' that is not designed to be charged by any other source.

4. For the purpose of 3A001.e.1.b., a 'secondary cell' is a 'cell' that is designed to be charged by an external electrical source.

NOTE: 3A001.e. does not control batteries, including single-cell batteries.

e.2. High energy storage capacitors as follows:

e.2.a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) and 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) and 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 and 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;

e.4. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are ''space-qualified,'' having a minimum average efficiency exceeding 20% at an operating temperature of 301 K (28 °C) under simulated 'AM0' illumination with an irradiance of 1,367 Watts per square meter (W/m^2);

TECHNICAL NOTE: 'AM0,' or 'Air Mass Zero,' refers to the spectral irradiance of sunlight in the earth's outer atmosphere when the distance between the earth and sun is one astronomical unit (AU).

f. Rotary input type absolute position encoders having an accuracy equal to or less (better) than ±1.0 second of arc;

g. Solid-state pulsed power switching thyristor devices and 'thyristor modules', using either electrically, optically, or electron radiation controlled switch methods and having any of the following:

g.1. A maximum turn-on current rate of rise (di/dt) greater than 30,000 A/μs and off-state voltage greater than 1,100 V; *or*

g.2. A maximum turn-on current rate of rise (di/dt) greater than 2,000 A/μs and having all of the following:

g.2.a. An off-state peak voltage equal to or greater than 3,000 V; *and*

g.2.b. A peak (surge) current equal to or greater than 3,000 A;

NOTE 1: 3A001.g. includes:

—*Silicon Controlled Rectifiers (SCRs)*
—*Electrical Triggering Thyristors (ETTs)*
—Light Triggering Thyristors (LTTs)
—Integrated Gate Commutated Thyristors (IGCTs)
—Gate Turn-off Thyristors (GTOs)
—MOS Controlled Thyristors (MCTs)
—Solidtrons

NOTE 2: *3A001.g. does not control thyristor devices and 'thyristor modules' incorporated into equipment designed for civil railway or ''civil aircraft'' applications.*

TECHNICAL NOTE: For the purposes of 3A001.g, a ''thyristor module'' contains one or more thyristor devices.

h. Solid-state power semiconductor switches, diodes, or 'modules', having all of the following:

h.1. Rated for a maximum operating junction temperature greater than 488 K (215 °C);

h.2. Repetitive peak off-state voltage (blocking voltage) exceeding 300 V; *and*

h.3. Continuous current greater than 1 A.

TECHNICAL NOTE: For the purposes of 3A001.h, 'modules' contain one or more solid-state power semiconductor switches or diodes.

NOTE 1: Repetitive peak off-state voltage in 3A001.h includes drain to source voltage, collector to emitter voltage, repetitive peak reverse voltage and peak repetitive off-state blocking voltage.

NOTE 2: 3A001.h. includes:

—Junction Field Effect Transistors (JFETs)
—Vertical Junction Field Effect Transistors (VJFETs)
—Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)
—Double Diffused Metal Oxide Semiconductor Field Effect Transistor (DMOSFET)
—Insulated Gate Bipolar Transistor (IGBT)
—High Electron Mobility Transistors (HEMTs)
—Bipolar Junction Transistors (BJTs)
—Thyristors and Silicon Controlled Rectifiers (SCRs)
—Gate Turn-Off Thyristors (GTOs)
—Emitter Turn-Off Thyristors (ETOs)
—PiN Diodes
—Schottky Diodes

NOTE 3: 3A001.h. does not apply to switches, diodes, or 'modules' incorporated into equipment designed for civil automobile, civil railway, or ''civil aircraft'' applications.

3A002 General purpose electronic equipment and accessories therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS: $3000: 3A002.a, .e, .f, .g; $5000: 3A002.c to .d.

GBS: Yes for 3A002.a.1.

CIV: Yes for 3A002.a.1 (provided all of the following conditions are met: (1) Bandwidths do not exceed: 4 MHz per track and have up to 28 tracks *or* 2 MHz per track and have up to 42 tracks; (2) Tape speed does not exceed 6.1 m/s; (3) They are not designed for underwater use; (4) They are not ruggedized for military use; *and* (5) Recording density does not exceed 653.2 magnetic flux sine waves per mm).

STA: License Exception STA may not be used to ship any item in 3A002.g.1 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: ''Space-qualified'' atomic frequency standards defined in 3A002.g.1 are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121.1, Category XV). 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 , the ETSI, or the IEEE for civil television applications.

a.3. Digital instrumentation magnetic tape data recorders employing helical scan techniques or fixed head techniques and 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 and 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 NOTES: 1. 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.

2. '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.

a.6. Digital instrumentation data recorders using magnetic disk storage technique and having all of the following:

a.6.a. Digitizing rate equal to or more than 100 million samples per second and a resolution of 8 bits or more; and

a.6.b. A 'continuous throughput' of 1 Gbit/s or more;

b. [Reserved]

c. Radio-frequency ''signal analyzers'' as follows:

c.1. ''Signal analyzers'' having a 3 dB resolution bandwidth (RBW) exceeding 10 MHz anywhere within the frequency range exceeding 31.8 GHz but not exceeding 37.5 GHz;

c.2. ''Signal analyzers'' having Displayed Average Noise Level (DANL) less (better) than −150 dBm/Hz anywhere within the frequency range exceeding 43.5 GHz but not exceeding 70 GHz;

c.3. ''Signal analysers''having a frequency exceeding 70 GHz;

c.4. ''Dynamic signal analyzers'' having a ''real-time bandwidth'' exceeding 40 MHz;

NOTE: 3A002.c.4 does not control those ''dynamic signal analyzers'' using only constant percentage bandwidth filters (also known as octave or fractional octave filters).

d.1. Specified to generate pulses having all of the following, anywhere within the synthesized frequency range exceeding 31.8 GHz but not exceeding 70 GHz:

d.1.a. 'Pulse duration' of less than 100 ns; *and*

d.1.b. On/off ratio equal to or exceeding 65 dB;

d.2. An output power exceeding 100 mW (20 dBm) anywhere within the synthesized frequency range exceeding 43.5 GHz but not exceeding 70 GHz;

d.3. A ''frequency switching time'' as specified by any of the following:

d.3.a. Less than 312 ps;

d.3.b. Less than 100 μs for any frequency change exceeding 1.6 GHz within the synthesized frequency range exceeding 3.2 GHz but not exceeding 10.6 GHz;

d.3.c. Less than 250 μs for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 10.6 GHz but not exceeding 31.8 GHz;

d.3.d. Less than 500 μs for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 31.8 GHz but not exceeding 43.5 GHz;

d.3.e. Less than 1 ms for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 43.5 GHz but not exceeding 56 GHz; *or*

d.3.f. Less than 1 ms for any frequency change exceeding 2.2 GHz within the synthesized frequency range exceeding 56 GHz but not exceeding 70 GHz;

d.4. Single sideband (SSB) phase noise, in dBc/Hz, specified as being all of the following:

d.4.a. Less (better) than—$(126+20 \log_{10} F-20 \log_{10} f)$ for 10 Hz $<F<10$ kHz anywhere within the synthesized frequency range exceeding 3.2 GHz but not exceeding 70 GHz; *and*

d.4.b. Less (better) than—$(114+20 \log_{10} F-20 \log_{10} f)$ for 10 kHz $\leq F<500$ kHz anywhere within the synthesized frequency range exceeding 3.2 GHz but not exceeding 70 GHz; *or*

TECHNICAL NOTE: *In 3A002.d.4, F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.*

d.5. A maximum synthesized frequency exceeding 70 GHz;

NOTE 1: For the purpose of 3A002.d, frequency synthesized signal generators include arbitrary waveform and function generators.

NOTE 2: 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.

TECHNICAL NOTES: *1. The maximum synthesized frequency of an arbitrary waveform or function generator is calculated by dividing the sample rate, in samples/second, by a factor of 2.5.*

2. For the purposes of 3A002.d.1.a, 'pulse duration' is defined as the time interval between the leading edge of the pulse achieving 90% of the peak and the trailing edge of the pulse achieving 10% of the peak.

e. Network analyzers having any of the following:

e.1. Output power exceeding 31.62 mW (15 dBm) anywhere within the operating frequency range exceeding 43.5 GHz but not exceeding 70 GHz; *or*

e.2. Maximum operating frequency exceeding 70 GHz;

f. Microwave test receivers having all of the following:

f.1. A maximum operating frequency exceeding 70 GHz; *and*

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

g. Atomic frequency standards being any of the following:

g.1. ''Space-qualified'';

g.2. Non-rubidium and having a long-term stability less (better) than $1\times10^{-11/month\geq}$ *or*

g.3. Non-''space-qualified'' and having all of the following:

g.3.a. Being a rubidium standard;

g.3.b. Long-term stability less (better) than $1\times10^{-11/month\geq}$ *and*

g.3.c. Total power consumption of less than 1 Watt.

3A003 Spray cooling thermal management systems employing closed loop fluid handling and reconditioning equipment in a sealed enclosure where a dielectric fluid is sprayed onto electronic components using specially designed spray nozzles that are designed to maintain electronic components within their operating temperature range, and specially designed components therefore.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number of systems, components in $

Related Controls: N/A

Related Definitions: N/A

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

3A101 Electronic equipment, devices and components, other than those controlled by 3A001, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: Items controlled in 3A101.a are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (See 22 CFR part 121).

Related Definitions: N/A

Items: a. Analog-to-digital converters, usable in ''missiles'', designed to meet military specifications for ruggedized equipment;

b. Accelerators capable of delivering electromagnetic radiation produced by bremsstrahlung from accelerated electrons of 2 MeV or greater, and systems containing those accelerators, usable for the ''missiles'' or the subsystems of ''missiles''.

NOTE: 3A101.b above does not include equipment specially designed for medical purposes.

3A201 Electronic components, other than those controlled by 3A001, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: (1) *See* ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry. (2) *Also see* 3A001.e.2 (capacitors) and 3A001.e.3 (superconducting electromagnets). (3) Superconducting electromagnets specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: N/A

Items: a. Pulse discharge capacitors having either of the following sets of characteristics:

a.1. Voltage rating greater than 1.4 kV, energy storage greater than 10 J, capacitance greater than 0.5 μF, *and* series inductance less than 50 nH; *or*

a.2. Voltage rating greater than 750 V, capacitance greater than 0.25 μF, *and* series inductance less than 10 nH;

b. Superconducting solenoidal electromagnets having all of the following characteristics:

b.1. Capable of creating magnetic fields greater than 2 T;

b.2. A ratio of length to inner diameter greater than 2;

b.3. Inner diameter greater than 300 mm; *and*

b.4. Magnetic field uniform to better than 1% over the central 50% of the inner volume;

NOTE: 3A201.b does not control magnets specially designed for and exported ''as parts of'' medical nuclear magnetic resonance (NMR) imaging systems. The phrase ''as part

of'' does not necessarily mean physical part in the same shipment; separate shipments from different sources are allowed, provided the related export documents clearly specify that the shipments are dispatched ''as part of'' the imaging systems.

c. Flash X-ray generators or pulsed electron accelerators having either of the following sets of characteristics:

c.1. An accelerator peak electron energy of 500 keV or greater, but less than 25 MeV, *and* with a ''figure of merit'' (K) of 0.25 or greater; *or*

c.2. An accelerator peak electron energy of 25 MeV or greater, *and* a ''peak power'' greater than 50 MW;

NOTE: 3A201.c does not control accelerators that are component parts of devices designed for purposes other than electron beam or X-ray radiation (electron microscopy, for example) nor those designed for medical purposes.

TECHNICAL NOTES: (1) The ''figure of merit'' K is defined as: $K = 1.7 \times 10^3 V^{2.65} Q$. V is the peak electron energy in million electron volts. If the accelerator beam pulse duration is less than or equal to 1 μs, then Q is the total accelerated charge in Coulombs. If the accelerator beam pulse duration is greater than 1 μs, then Q is the maximum accelerated charge in 1 μs. Q equals the intergral of i with respect to t, over the lesser of 1 μs or the time duration of the beam pulse $Q = \int i dt$), where i is beam current in amperes and t is time in seconds.

(2) ''Peak power'' = (peak potential in volts) × (peak beam current in amperes).

(3) In machines based on microwave accelerating cavities, the time duration of the beam pulse is the lesser of 1 μs or the duration of the bunched beam packet resulting from one microwave modulator pulse.

(4) In machines based on microwave accelerating cavities, the peak beam current is the average current in the time duration of a bunched beam packet.

3A225 Frequency changers (also known as converters or inverters) or generators, other than those described in 0B001.c.11, having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: (1) *See* ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry. (2) Frequency changers (also known as converters or inverters) specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: N/A

Items: a. A multiphase output capable of providing a power of 40 W or more;

b. Capable of operating in the frequency range between 600 and 2000 Hz;

c. Total harmonic distortion below 10%; *and*

d. Frequency control better than 0.1%.

3A226 High-power direct current power supplies, other than those described in 0B001.j.6, having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) *See* ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry. (2) Also *see* ECCN 3A227. (3) Direct current power supplies specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).

Related Definitions: N/A

Items: a. Capable of continuously producing, over a time period of 8 hours, 100 V or greater with current output of 500 A or greater; *and*

b. Current or voltage stability better than 0.1% over a time period of 8 hours.

3A227 High-voltage direct current power supplies, other than those described in 0B001.j.5, having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) *See* ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry. (2) Also *see* ECCN 3A226. (3) Direct current power supplies specially designed or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).
Related Definitions: N/A
Items: a. Capable of continuously producing, over a time period of 8 hours, 20 kV or greater with current output of 1 A or greater; *and*
b. Current or voltage stability better than 0.1% over a time period of 8 hours.

3A228 Switching devices, as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: (1) *See* ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry.
(2) Also *see* ECCN 3A991.k.
Related Definitions: N/A
Items: a. Cold-cathode tubes, whether gas filled or not, operating similarly to a spark gap, having all of the following characteristics:
a.1. Containing three or more electrodes;
a.2. Anode peak voltage rating of 2.5 kV or more;
a.3. Anode peak current rating of 100 A or more; *and*
a.4. Anode delay time of 10 μs or less.

TECHNICAL NOTE: 3A228.a includes gas krytron tubes and vacuum sprytron tubes.

b. Triggered spark-gaps having both of the following characteristics:
b.1. An anode delay time of 15 μs or less; *and*
b.2. Rated for a peak current of 500 A or more.
c. Modules or assemblies with a fast switching function having all of the following characteristics:
c.1. Anode peak voltage rating greater than 2 kV;
c.2. Anode peak current rating of 500 A or more; *and*
c.3. Turn-on time of 1 μs or less.

3A229 Firing sets and equivalent high-current pulse generators (for detonators controlled by 3A232), as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: (1) See ECCNs *3E001* and 1E001(''development'' and ''production'') and *3E201* and 1E201 (''use'') for technology for items controlled under this entry. (2) High explosives and related equipment for military use are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).
Related Definitions: In 3A229.b.5, ''rise time'' is defined as the time interval from 10% to 90% current amplitude when driving a resistive load.
ECCN Controls: 3A229.b includes xenon flashlamp drivers.
Items: a. Explosive detonator firing sets designed to drive multiple controlled detonators controlled by 3A232;
b. Modular electrical pulse generators (pulsers) having all of the following characteristics:
b.1. Designed for portable, mobile, or ruggedized use;
b.2. Enclosed in a dust-tight enclosure;
b.3. Capable of delivering their energy in less than 15 μs;
b.4. Having an output greater than 100 A;
b.5. Having a ''rise time'' of less than 10 μs into loads of less than 40 ohms;
b.6. No dimension greater than 254 mm;
b.7. Weight less than 25 kg; *and*
b.8. Specified for use over an extended temperature range 223 K (−50 °C) to 373 K (100 °C) or specified as suitable for aerospace applications.

3A230 High-speed pulse generators having both of the following characteristics (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: See ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry.
Related Definitions: In 3A230.b, ''pulse transition time'' is defined as the time interval between 10% and 90% voltage amplitude.
Items: a. Output voltage greater than 6 V into a resistive load of less than 55 ohms; *and*
b. ''Pulse transition time'' less than 500 ps.

3A231 Neutron generator systems, including tubes, having both of the following characteristics (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number; parts and accessories in $ value
Related Controls: See ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry.
Related Definitions: N/A
Items: a. Designed for operation without an external vacuum system; and
b. Utilizing electrostatic acceleration to induce a tritium-deuterium nuclear reaction.

3A232 Detonators and multipoint initiation systems, as follows (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: (1) See 1A007 for electrically driven explosive detonators. (2) See ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry. (3) High explosives and related equipment for military use are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).
Related Definitions: N/A
ECCN Controls: This entry does not control detonators using only primary explosives, such as lead azide.
Items:
a. [Reserved]
b. Arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface over an area greater than 5,000 mm^2 from a single firing signal with an initiation timing spread over the surface of less than 2.5 μs.
TECHNICAL NOTE: The word initiator is sometimes used in place of the word detonator.

3A233 Mass spectrometers, other than those described in 0B002.g, capable of measuring ions of 230 atomic mass units or greater and having a resolution of better than 2 parts in 230, and ion sources therefor.
LICENSE REQUIREMENTS
Reason for Control: NP, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: (1) *See* ECCNs 3E001 (''development'' and ''production'') and 3E201 (''use'') for technology for items controlled under this entry. (2) Mass spectrometers specially designed or prepared for analyzing on-line samples of UF_6 gas streams are subject to the export licensing authority of the Nuclear Regulatory Commission (*see* 10 CFR part 110).
Related Definitions: N/A
Items: a. Inductively coupled plasma mass spectrometers (ICP/MS);
b. Glow discharge mass spectrometers (GDMS);
c. Thermal ionization mass spectrometers (TIMS);
d. Electron bombardment mass spectrometers that have a source chamber constructed from, lined with or plated with materials resistant to UF_6;
e. Molecular beam mass spectrometers having either of the following characteristics:
e.1. A source chamber constructed from, lined with or plated with stainless steel or molybdenum and equipped with a cold trap capable of cooling to 193 K (−80 °C) or less; *or*

e.2. A source chamber constructed from, lined with or plated with materials resistant to UF_6;

f. Mass spectrometers equipped with a microfluorination ion source designed for actinides or actinide fluorides.

3A292 Oscilloscopes and transient recorders other than those controlled by 3A002.a.5, and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: See ECCN 3E292 (''development'', ''production'', and ''use'') for technology for items controlled under this entry.

Related Definitions: ''Bandwidth'' is defined as the band of frequencies over which the deflection on the cathode ray tube does not fall below 70.7% of that at the maximum point measured with a constant input voltage to the oscilloscope amplifier.

Items: a. Non-modular analog oscilloscopes having a bandwidth of 1 GHz or greater;

b. Modular analog oscilloscope systems having either of the following characteristics:

b.1. A mainframe with a bandwidth of 1 GHz or greater; *or*

b.2. Plug-in modules with an individual bandwidth of 4 GHz or greater;

c. Analog sampling oscilloscopes for the analysis of recurring phenomena with an effective bandwidth greater than 4 GHz;

d. Digital oscilloscopes and transient recorders, using analog-to-digital conversion techniques, capable of storing transients by sequentially sampling single-shot inputs at successive intervals of less than 1 ns (greater than 1 giga-sample per second), digitizing to 8 bits or greater resolution and storing 256 or more samples.

NOTE: Specially designed components controlled by this item are the following, for analog oscilloscopes:

1. Plug-in units;
2. External amplifiers;
3. Pre-amplifiers;
4. Sampling devices;
5. Cathode ray tubes.

3A980 Voice print identification and analysis equipment and parts, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country chart
CC applies to entire entry	CC Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: N/A

Related Definitions: N/A

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

3A981 Polygraphs (except biomedical recorders designed for use in medical facilities for monitoring biological and neurophysical responses); fingerprint analyzers, cameras and equipment, n.e.s.; automated fingerprint and identification retrieval systems, n.e.s.; psychological stress analysis equipment; electronic monitoring restraint devices; and specially designed parts and accessories, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country chart
CC applies to entire entry	CC Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: See ECCN 0A982 for other types of restraint devices.

Related Definitions: N/A

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

NOTE TO ECCN 3A981. In this ECCN, electronic monitoring restraint devices are devices used to record or report the location of confined persons for law enforcement or penal reasons. The term does not include devices that confine memory impaired patents to appropriate medical facilities.

3A982 Microwave or millimeter wave components that operate at frequencies below those controlled by 3A001 as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reasons for Control: RS, AT

Control(s)	*Country chart*
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See ECCN 3A001.b.2 for certain microwave ''monolithic integrated circuits'' (MMIC) power amplifiers other than those controlled by this entry. (2) See ECCN 3A001.b.3 for discrete microwave transistors other than those controlled by this entry. (3) See ECCN 3A001.h for high electron mobility transistors that are solid state semiconductor switches, diodes or modules rather than discrete microwave transistors.

Related Definitions: N/A

Items:

a. Packaged high electron mobility transistors (HEMTs) with physical dimensions less than 43 mm per side, rated for operation at frequencies from 2.7 GHz up to and including 3.2 GHz and having any of the following:

a.1. An average output power equal to or greater than 48 W (46.8 dBm); or

a.2. A pulsed output power equal to or greater than 240 W (53.8 dBm) and a duty cycle of 20 percent or more.

b. Packaged microwave ''monolithic integrated circuits'' (MMIC) power amplifiers with physical dimensions less than 43mm per side, rated for operation at frequencies from 2.7 GHz up to and including 3.2 GHz and having either of the following:

b.1. An average output power equal to or greater than 15W (41.7 dBm); or

b.2. A pulsed output power equal to or greater than 75 W (48.75 dBm) and a duty cycle of 20 percent or more.

3A991 Electronic devices and components not controlled by 3A001.

LICENSE REQUIREMENTS

Reason for Control: AT.

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

LICENSE REQUIREMENTS NOTES: See 744.17 of the EAR for additional license requirements for commodities classified as 3A991.a.1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

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 performance speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more;

a.2. A clock frequency rate exceeding 25 MHz; *or*

a.3. 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 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 any of the following:

c.1. A resolution of 8 bit or more, but less than 12 bit, with an output rate greater than 200 million words per second;

c.2. A resolution of 12 bit with an output rate greater than 105 million words per second;

c.3. A resolution of more than 12 bit but equal to or less than 14 bit withan output rate greater than 10 million words per second; *or*

c.4. A resolution of more than 14 bit with an output rate greater than 2.5 million words per second.

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. Traveling 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. Cells as follows:

j.1. Primary cells having an energy density of 550 Wh/kg or less at 293 K (20 °C);

j.2. Secondary cells having an energy density of 300 Wh/kg or less at 293 K (20 °C).

NOTE: 3A991.j. does not control batteries, including single cell batteries.

Technical Notes: 1. For the purpose of 3A991.j energy density (Wh/kg) is calculated from the nominal voltage multiplied by the nominal capacity in ampere-hours divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in Ohms and the mass in kilograms.

2. For the purpose of 3A991.j, a 'cell' is defined as an electrochemical device, which has positive and negative electrodes, and electrolyte, and is a source of electrical energy. It is the basic building block of a battery.

3. For the purpose of 3A991.j.1, a 'primary cell' is a 'cell' that is not designed to be charged by any other source.

4. For the purpose of 3A991.j.2., a 'secondary cell' is a 'cell' that is designed to be charged by an external electrical source.

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).

o. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are ''space qualified'' and not controlled by 3A001.e.4.

3A992 General purpose electronic equipment not controlled by 3A002.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: N/A

Related Definitions: N/A

Items: a. Electronic test equipment, n.e.s.

b. Digital instrumentation magnetic tape data recorders having any of the following characteristics;

b.1. A maximum digital interface transfer rate exceeding 60 Mbit/s and employing helical scan techniques;

b.2. A maximum digital interface transfer rate exceeding 120 Mbit/s and employing fixed head techniques; or

b.3. ''Space qualified'';

c. Equipment, with a maximum digital interface transfer rate exceeding 60 Mbit/s, designed to convert digital video magnetic tape recorders for use as digital instrumentation data recorders;

3A999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT.

Control(s).

Country Chart.

AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to

determine AT licensing requirements for this entry. See §742.19 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: See also 0B002, 3A225 (for frequency changes capable of operating in the frequency range of 600 Hz and above), 3A233.

Related Definitions: N/A

Items: a. Frequency changers capable of operating in the frequency range from 300 up to 600 Hz, n.e.s;

b. Mass spectrometers n.e.s;

c. All flash x-ray machines, and components of pulsed power systems designed thereof, including Marx generators, high power pulse shaping networks, high voltage capacitors, and triggers;

d. Pulse amplifiers, n.e.s.;

e. Electronic equipment for time delay generation or time interval measurement, as follows:

e.1. Digital time delay generators with a resolution of 50 nanoseconds or less over time intervals of 1 microsecond or greater; *or*

e.2. Multi-channel (three or more) or modular time interval meter and chronometry equipment with resolution of 50 nanoseconds or less over time intervals of 1 microsecond or greater;

f. Chromatography and spectrometry analytical instruments.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

3B001 Equipment for the manufacturing of semiconductor devices or materials, as follows (see List of Items Controlled) and specially designed components and accessories therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS: $500

GBS: Yes, except a.3 (molecular beam epitaxial growth equipment using gas sources), .e (automatic loading multi-chamber central wafer handling systems *only* if connected to equipment controlled by 3B001. a.3, or .f), and .f (lithography equipment).

CIV: Yes for equipment controlled by 3B001.a.1 and a.2.

LIST OF ITEMS CONTROLLED

Unit: Number.

Related Controls: See also 3B991.

Related Definitions: N/A

Items:

a. Equipment designed for epitaxial growth as follows:

a.1. Equipment capable of producing a layer of any material other than silicon with a thickness uniform to less than ±2.5% across a distance of 75 mm or more;

NOTE: 3B001.a.1 includes atomic layer epitaxy (ALE) equipment.

a.2. Metal Organic Chemical Vapor Deposition (MOCVD) reactors specially designed for compound semiconductor crystal growth by the chemical reaction between materials controlled by 3C003 or 3C004;

a.3. Molecular beam epitaxial growth equipment using gas or solid sources;

b. Equipment designed for ion implantation and having any of the following:

b.1. A beam energy (accelerating voltage) exceeding 1MeV;

b.2. Being specially designed and optimized to operate at a beam energy (accelerating voltage) of less than 2 keV;

b.3. Direct write capability; *or*

b.4. A beam energy of 65 keV or more and a beam current of 45 mA or more for high energy oxygen implant into a heated semiconductor material ''substrate'';

c. Anisotropic plasma dry etching equipment having all of the following:

c.1. Designed or optimized to produce critical dimensions of 65 nm or less; and

c.2. Within-wafer non-uniformity equal to or less than 10% 3σ measured with an edge exclusion of 2 mm or less;

d. [Reserved]

e. Automatic loading multi-chamber central wafer handling systems having all of the following:

e.1. Interfaces for wafer input and output, to which more than two functionally different 'semiconductor process tools' controlled by 3B001.a, 3B001.b, or 3B001.c are designed to be connected; and

e.2. Designed to form an integrated system in a vacuum environment for ′sequential multiple wafer processing′;

NOTE: 3B001.e does not control automatic robotic wafer handling systems specially designed for parallel wafer processing.

TECHNICAL NOTES: 1. For the purpose of 3B001.e, 'semiconductor process tools' refers to modular tools that provide physical processes for semiconductor production that are functionally different, such as deposition, etch, implant or thermal processing.

2. For the purpose of 3B001.e, 'sequential multiple wafer processing' means the capability to process each wafer in different 'semiconductor process tools', such as by transferring each wafer from one tool to a second tool and on to a third tool with the

automatic loading multi-chamber central wafer handling systems.

f. Lithography equipment as follows:

f.1. Align and expose step and repeat (direct step on wafer) or step and scan (scanner) equipment for wafer processing using photo-optical or X-ray methods and having any of the following:

f.1.a. A light source wavelength shorter than 245 nm; or

f.1.b. Capable of producing a pattern with a ''Minimum Resolvable Feature size'' (MRF) of 95 nm or less;

TECHNICAL NOTE: The 'Minimum Resolvable Feature size' (MRF) is calculated by the following formula:

$$MRF = \frac{\text{(an exposure light source wavelength in nm) x (K factor)}}{\text{numerical aperture}}$$

where the K factor = 0.35

f.2 Imprint lithography equipment capable of production features of 95 nm or less;

NOTE: 3B001.f.2 includes:

—Micro contact printing tools
—Hot embossing tools
—Nano-imprint lithography tools
—Step and flash imprint lithography (S–FIL) tools

f.3. Equipment specially designed for mask making or semiconductor device processing using direct writing methods, having all of the following:

f.3.a. Using deflected focused electron beam, ion beam or ''laser'' beam; and

f.3.b. Having any of the following:

f.3.b.1. A spot size smaller than 0.2 μm;

f.3.b.2. Being capable of producing a pattern with a feature size of less than 1 μm; or

f.3.b.3. An overlay accuracy of better than ±0.20 μm (3 sigma);

g. Masks and reticles, designed for integrated circuits controlled by 3A001;

h. Multi-layer masks with a phase shift layer;

NOTE: 3B001.h. does not control multi-layer masks with a phase shift layer designed for the fabrication of memory devices not controlled by 3A001.

i. Imprint lithography templates designed for integrated circuits by 3A001.

3B002 "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.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $500

GBS: Yes

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number.

Related Controls: See also 3A999.a and 3B992.

Related Definitions: N/A

Items: a. For testing S-parameters of transistor devices at frequencies exceeding 31.8 GHz;

b. [Reserved]

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

3B991 Equipment not controlled by 3B001 for the manufacture of electronic components and materials, and specially designed components and accessories therefor.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number, and components and accessories in $ value

Related Controls: N/A

Related Definitions: 'Sputtering' is an overlay coating process wherein positively charged ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on the substrate. (NOTE: Triode, magnetron or radio frequency sputtering to increase adhesion of coating and rate of deposition are ordinary modifications of the process.)

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, 3C004, or 3C005 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 silicon layer with a thickness uniform to less than ±2.5% across a distance of 200 mm or more;

b.1.d.2. Capable of producing a layer of any material other than silicon with a thickness uniformity across the wafer of equal to or better than ±3.5%; *or*

b.1.d.3. 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 × 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 × 100 mm, or capable of producing a single exposure larger than 6 mm × 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, *e.g.*, lithography equipment, 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 focused, 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 × 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;

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number.

Related Controls: See also 3A992.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.

NOTES: 3B992.b.4.b does not control test equipment specially designed for testing:

1. memories;

2. ''Assemblies'' or a class of ''electronic assemblies'' for home and entertainment applications; and

3. 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''.

TECHNICAL NOTE: For purposes of 3B992.b.4.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.

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 × 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'' multi-functional 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.

C. MATERIALS

3C001 Hetero-epitaxial materials consisting of a "substrate" having stacked epitaxially grown multiple layers of any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000

GBS: N/A

CIV: N/A

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: N/A

Items:

a. Silicon (Si);

b. Germanium (Ge);

c. Silicon Carbide (SiC); *or*

d. ''III/V compounds'' of gallium or indium.

NOTE: *3C001.d does not apply to a ''substrate'' having one or more P-type epitaxial layers of GaN, InGaN, AlGaN, InAlN, InAlGaN, GaP, InGaP, AlInP or InGaAlP, independent of the sequence of the elements, except if the P-type epitaxial layer is between N-type layers.*

3C002 Resist materials as follows (see List of Items Controlled) and "substrates" coated with the following resists.

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000

GBS: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .e.

CIV: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .e.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: Silylation techniques are defined as processes incorporating oxidation of the resist surface to enhance performance for both wet and dry developing.

Items: a. Positive resists designed for semiconductor lithography specially adjusted (optimized) for use at wavelengths below 245 nm;

b. All resists designed for use with electron beams or ion beams, with a sensitivity of 0.01 μcoulomb/mm^2 or better;

c. All resists designed for use with X-rays, with a sensitivity of 2.5 mJ/mm^2 or better;

d. All resists optimized for surface imaging technologies, including silylated resists.

e. All resists designed or optimized for use with imprint lithography equipment specified by 3B001.f.2. that use either a thermal or photo-curable process.

3C003 Organo-inorganic compounds as follows (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: This entry controls only compounds whose metallic, partly metallic or non-metallic element is directly linked to carbon in the organic part of the molecule.

Related Definition: N/A

Items:

a. Organo-metallic compounds of aluminum, gallium or indium, having a purity (metal basis) better than 99.999%;

b. Organo-arsenic, organo-antimony and organo-phosphorus compounds, having a purity (inorganic element basis) better than 99.999%.

3C004 Hydrides of phosphorus, arsenic or antimony, having a purity better than 99.999%, even diluted in inert gases or hydrogen.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definition: N/A

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

NOTE: This entry does not control hydrides containing 20% molar or more of inert gases or hydrogen.

3C005 Silicon carbide (SiC), gallium nitride (GaN), aluminum nitride (AlN) or aluminum gallium nitride (AlGaN) "substrates", or ingots, boules, or other preforms of those materials, having resistivities greater than 10,000 ohm-cm at 20 °C.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: $3000

GBS: Yes

CIV: Yes

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See ECCN 3E001 for related development and production technology, and ECCN 3B991.b.1.b for related production equipment.

Related Definition: N/A

Items:

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

3C006 "Substrates" specified in 3C005 with at least one epitaxial layer of silicon carbide, gallium nitride, aluminum nitride or aluminum gallium nitride.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: $3000

GBS: Yes

CIV: Yes

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See ECCN 3D001 for related ''development'' or ''production'' ''software'', ECCN 3E001 for related ''development'' and ''production'' ''technology'', and ECCN 3B991.b.1.b for related ''production'' equipment.

Related Definition: N/A

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

3C992 Positive resists designed for semiconductor lithography specially adjusted (optimized) for use at wavelengths between 370 and 245 nm.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

D. SOFTWARE

3D001 "Software" specially designed for the "development" or "production" of equipment controlled by 3A001.b to 3A002.g or 3B (except 3B991 and 3B992).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to "software" for equipment controlled by 3A001.b to 3A001.f, 3A002, and 3B.	NS Column 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.

LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes, except for ''software'' specially designed for the ''development'' or ''production'' of Traveling Wave Tube Amplifiers described in 3A001.b.8 having operating frequencies exceeding 18 GHz.
STA: License Exception STA may not be used to ship or transmit ''software'' specially designed for the ''development'' or ''production'' of equipment specified by 3A002.g.1 or 3B001.a.2 to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: ''Software'' specially designed for the ''development'' or ''production'' of the following equipment is under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121): (1.) When operating at frequencies higher than 31.8 GHz and ''space qualified'': Helix tubes (traveling wave tubes (TWT)) defined in 3A001.b.1.a.4.c; microwave solid state amplifiers defined in 3A001.b.4.b; and traveling wave tube amplifiers (TWTA) defined in 3A001.b.8; (2.) ''Space qualified'' solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays, and/or solar panels, with a minimum average efficiency of 31% or greater at an operating temperature of 301 °K (28 °C) under simulated 'AM0' illumination with an irradiance of 1,367 Watts per square meter (W/m^2), and associated solar concentrators, power conditioners, and/or controllers, bearing and power transfer assemblies, and deployment hardware/systems. (3.) ''Space qualified'' atomic frequency standards defined in 3A002.g.2. See also 3D101.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

3D002 " Software" specially designed for the "use" of equipment controlled by 3B001.a to .f, or 3B002.

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: $ value
Related Controls: Also see 3D991.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

3D003 'Physics-based' simulation "software" specially designed for the "development" of lithographic, etching or deposition processes for translating masking patterns into specific topographical patterns in conductors, dielectrics or semiconductor materials..

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: $ value.
Related Controls: N/A
Related Definitions: (1) Libraries, design attributes or associated data for the design of semiconductor devices or integrated circuits are considered as ''technology''. (2) 'Physics-based' in 3D003 means using computations to determine a sequence of physical cause and effect events based on physical properties (*e.g.*, temperature, pressure,

diffusion constants and semiconductor materials properties).

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

3D004 "Software" specially designed for the "development" of equipment controlled by 3A003.

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: $ value

Related Controls: N/A

Related Definitions: N/A

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

3D101 "Software" specially designed or modified for the "use" of equipment controlled by 3A101.b.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

3D980 "Software" specially designed for the "development", "production", or "use" of items controlled by 3A980 and 3A981.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

3D982 "Software" "specially designed" for the "development" or "production" of microwave or millimeter wave components classified under ECCN 3A982.

LICENSE REQUIREMENTS

Reasons for Control: RS, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is in the ECCN heading.

3D991 "Software" specially designed for the "development", "production", or "use" of electronic devices or components controlled by 3A991, general purpose electronic equipment controlled by 3A992, or manufacturing and test equipment controlled by 3B991 and 3B992; or "software" specially designed for the "use" of equipment controlled by 3B001.g and .h.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

E. TECHNOLOGY

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 3A992, or 3A999), 3B (except 3B991 or 3B992) or 3C (except 3C992).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, AT

Control(s)	Country chart
NS applies to "technology" for items controlled by 3A001, 3A002, 3A003, 3B001, 3B002, or 3C001 to 3C006.	NS Column 1.
MT applies to "technology" for equipment controlled by 3A001 or 3A101 for MT reasons.	MT Column 1.
NP applies to "technology" for equipment controlled by 3A001, 3A201, or 3A225 to 3A233 for NP reasons.	NP Column 1.

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

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except N/A for MT, and ''technology'' specially designed for the ''development'' or ''production'' of: (a) Traveling Wave Tube Amplifiers described in 3A001.b.8, having operating frequencies exceeding 19 Ghz; and (b) solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays and/or solar panels, which are ''space qualified,'' having a minimum average efficiency exceeding 20% but less than 31% described in 3A001.e.4.

STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''development'' or ''production'' of equipment specified by ECCNs 3A002.g.1 or 3B001.a.2 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) See also 3E101 and 3E201. (2)''Technology'' according to the General Technology Note for the ''development'' or ''production'' of the following commodities is under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121): (a) When operating at frequencies higher than 31.8 GHz and ''space qualified'': helix tubes (traveling wave tubes (TWT)) defined in 3A001.b.1.a.4.c; microwave solid state amplifiers defined in 3A001.b.4.b; or traveling wave tube amplifiers (TWTA) defined in 3A001.b.8; (b) ''Space qualified'' solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays, and/or solar panels, with a minimum average efficiency of 31% or greater at an operating temperature of 301 °K (28 °C) under simulated 'AM0' illumination with an irradiance of 1,367 Watts per square meter (W/m^2), and associated solar concentrators, power conditioners, and/or controllers, bearing and power transfer assemblies, and deployment hardware/systems. and (c) ''Space qualified'' atomic frequency standards defined in 3A002.g.2.

Related Definition: N/A

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

NOTE 1: 3E001 does not control ''technology'' for the ''production'' of equipment or components controlled by 3A003.

NOTE 2: 3E001 does not control ''technology'' for the ''development'' or ''production'' of integrated circuits controlled by 3A001.a.3 to a.12, having all of the following:

(a) Using ''technology'' at or above 0.130 μm; and

(b) Incorporating multi-layer structures with three or fewer metal layers.

3E002 "Technology" according to the General Technology Note other than that controlled in 3E001 for the "development" or "production" of a "microprocessor microcircuit", "micro-computer microcircuit" and microcontroller microcircuit core, having an arithmetic logic unit with an access width of 32 bits or more and any of the following features or characteristics (see 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: Yes, for deemed exports, as described in §734.2(b)(2)(ii) of the EAR, of ''technology'' for the ''development'' or ''production'' of general purpose microprocessor cores with a vector processor unit with operand length of 64-bit or less, 64-bit floating operations not exceeding 50 GFLOPS, or 16-bit or more floating-point operations not exceeding 50 GMACS (billions of 16-bit fixed-point multiply-accumulate operations per second). Deemed exports under License Exception CIV are subject to a Foreign National Review (FNR) requirement, see §740.5 of the EAR for more information about the FNR. License Exception CIV does not apply to ECCN 3E002 technology also required for the development or production of items controlled under ECCNs beginning with 3A, 3B, or 3C, or to ECCN 3E002 technology also controlled under ECCN 3E003.

TSR: Yes.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items:

a. A 'vector processor unit' designed to perform more than two calculations on floating-point vectors (one dimensional arrays of 32-bit or larger numbers) simultaneously;

TECHNICAL NOTE: A 'vector processor unit' is a processor element with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously, having at least one vector arithmetic logic unit.

b. Designed to perform more than two 64-bit or larger floating-point operation results per cycle; or

c. Designed to perform more than four 16-bit fixed-point multiply-accumulate results

per cycle (*e.g.*, digital manipulation of analog information that has been previously converted into digital form, also known as digital ''signal processing'').

NOTE: 3E002.c does not control ''technology'' for multimedia extensions.

NOTES: 1. 3E002 does not control ''technology'' for the ''development'' or ''production'' of microprocessor cores, having all of the following:

a. Using ''technology'' at or above 0.130 μm; *and*

b. Incorporating multi-layer structures with five or fewer metal layers.

2. 3E002 includes ''technology'' for digital signal processors and digital array processors.

3E003 Other "technology" for the "development" or "production" of the following (*see* 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. and .g

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) Technology for the ''development'' or ''production'' of ''space qualified'' electronic vacuum tubes operating at frequencies of 31.8 GHz or higher, described in 3E003.g, is under the export license authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121); (2) 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 electronic devices such as high electron mobility transistors (HEMT), hetero-bipolar transistors (HBT), quantum well and super lattice devices;

NOTE: *3E003.b does not control ''technology'' for high electron mobility transistors (HEMT) operating at frequencies lower than 31.8 GHz and hetero-junction bipolar transistors (HBT) operating at frequencies lower than 31.8 GHz.*

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;

g. Electronic vacuum tubes operating at frequencies of 31.8 GHz or higher.

3E101 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 3A001.a.1 or .2, 3A101, or 3D101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

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.

3E102 "Technology" according to the General Technology Note for the "development" of "software" controlled by 3D101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

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.

3E201 "Technology" according to the General Technology Note for the "use" of equipment controlled by 3A001.e.2 or .e.3, 3A201 or 3A225 to 3A233.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart
NP applies to ''technology'' for equipment controlled by 3A001.e.2, or .e.3, 3A201 or 3A225 to 3A233 for NP reasons.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

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.

3E292 "Technology" according to the General Technology Note for the "development", "production", or "use" of equipment controlled by 3A292.

LICENSE REQUIREMENTS
Reason for Control: NP, AT

Control(s)	Country chart
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

3E980 "Technology" specially designed for "development", "production", or "use" of items controlled by 3A980 and 3A981.

LICENSE REQUIREMENTS
Reason for Control: CC, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

3E982 "Technology" "required" for the "development" or "production" of microwave or millimeter wave components classified under ECCN 3A982.

LICENSE REQUIREMENTS
Reasons for Control: RS, AT

Control(s)	*Country chart*
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is in the ECCN heading.

3E991 "Technology" for the "development", "production", or "use" of electronic devices or components controlled by 3A991, general purpose electronic equipment controlled by 3A992, or manufacturing and test equipment controlled by 3B991 or 3B992, or materials controlled by 3C992.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

CATEGORY 4—COMPUTERS

NOTE 1: Computers, related equipment and ''software'' performing telecommunications or ''local area network'' functions must also be evaluated against the performance characteristics of Category 5, Part 1 (Telecommunications).

NOTE 2: Control units that directly interconnect the buses or channels of central processing units, ''main storage'' or disk controllers are not regarded as telecommunications equipment described in Category 5, Part 1 (Telecommunications).

N.B: For the control status of ''software'' specially designed for packet switching, see ECCN 5D001. (Telecommunications).

NOTE 3: Computers, related equipment and ''software'' performing cryptographic, cryptoanalytic, certifiable multi-level security or certifiable user isolation functions, or that limit electromagnetic compatibility (EMC), must also be evaluated against the performance characteristics in Category 5, Part 2 (''Information Security'').

A. SYSTEMS, EQUIPMENT AND COMPONENTS

4A001 Electronic computers and related equipment, having any of the following (*see* List of Items Controlled), and "electronic assemblies" and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT, NP

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
MT applies to items in 4A001.a when the parameters in 4A101 are met or exceeded.	MT Column 1.
AT applies to entire entry	AT Column 1.

NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

LICENSE REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under License Exceptions for 4A001.a.2.

LICENSE EXCEPTIONS

LVS: $5000 for 4A001.a; N/A for MT.

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship any commodity in 4A001.a.2 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Computers and related equipment in number; ''electronic assemblies'' and components in $ value

Related Controls: See also 4A101 and 4A994. See Category 5—Part 2 for electronic computers and related equipment performing or incorporating ''information security'' functions as the primary function. Equipment designed or rated for transient ionizing radiation is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: For the purposes of integrated circuits in 4A001.a.2, 5×10^3 Gy(Si) = 5×10^5 Rads (Si); 5×10^6 Gy (Si)/s = 5×10^8 Rads (Si)/s.

Items:

a. Specially designed to have any of the following:

a.1. Rated for operation at an ambient temperature below 228 K (−45 °C) or above 358 K (85 °C); or

NOTE: 4A001.a.1 does not apply to computers specially designed for civil automobile, railway train or ''civil aircraft'' applications.

a.2. Radiation hardened to exceed any of the following specifications:

a.2.a. A total dose of 5×10^3 Gy (Si);

a.2.b. A dose rate upset of 5×10^6 Gy (Si)/s; *or*

a.2.c. Single Event Upset of $1\times10^{-}$ Error/bit/day;

NOTE: 4A001.a.2 does not apply to computers specially designed for ''civil aircraft'' applications.

b. [Reserved]

4A003 "Digital computers", "electronic assemblies", and related equipment therefor, as follows (see List of Items Controlled) and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, CC, AT, NP.

Control(s)	Country chart
NS applies to 4A003.b and .c	NS Column 1.
NS applies to 4A003.e and .g	NS Column 2.
CC applies to "digital computers" for computerized finger-print equipment.	CC Column 1.
AT applies to entire entry (refer to 4A994 for controls on "digital computers" with a APP > 0.0128 but ≤3.0 WT).	AT Column 1.

NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

NOTE 1: *For all destinations, except those countries in Country Group E:1 of Supplement No. 1 to part 740 of the EAR, no license is required (NLR) for computers with an ''Adjusted Peak Performance'' (''APP'') not exceeding 3.0 Weighted TeraFLOPS (WT) and for ''electronic assemblies'' described in 4A003.c that are not capable of exceeding an ''Adjusted Peak Performance'' (''APP'') exceeding 3.0 Weighted TeraFLOPS (WT) in aggregation, except certain transfers as set forth in §746.3 (Iraq).*

NOTE 2: Special Post Shipment Verification reporting and recordkeeping requirements for exports of computers to destinations in Computer Tier 3 may be found in §743.2 of the EAR.

LICENSE EXCEPTIONS

LVS: $5000; N/A for 4A003.b and .c.

GBS: Yes, for 4A003.e, and .g and specially designed components therefor, exported separately or as part of a system.

APP: Yes, for computers controlled by 4A003.b, and ''electronic assemblies'' controlled by 4A003.c, to the exclusion of other technical parameters, with the exception of 4A003.e (equipment performing analog-to-digital conversions exceeding the limits of 3A001.a.5.a). See §740.7 of the EAR.

CIV: Yes, for 4A003.e, and .g.

LIST OF ITEMS CONTROLLED

Unit: Computers and related equipment in number; ''electronic assemblies'' and components in $ value

Related Controls: See also 4A994 and 4A980

Related Definitions: N/A

Items:

NOTE 1: 4A003 includes the following:

—'Vector processors' (as defined in Note 7 of the ''Technical Note on ''Adjusted Peak Performance'' (''APP'')'');

—Array processors;

—Digital signal processors;

—Logic processors;

—Equipment designed for ''image enhancement'';

—Equipment designed for ''signal processing''.

NOTE 2: The control status of the ''digital computers'' and related equipment described in 4A003 is determined by the control status of other equipment or systems provided:

a. The ''digital computers'' or related equipment are essential for the operation of the other equipment or systems;

b. The ''digital computers'' or related equipment are not a ''principal element'' of the other equipment or systems; and

N.B. 1: The control status of ''signal processing'' or ''image enhancement'' equipment specially designed for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the ''principal element'' criterion.

N.B. 2: For the control status of ''digital computers'' or related equipment for telecommunications equipment, see Category 5, Part 1 (Telecommunications).

c. The ''technology'' for the ''digital computers'' and related equipment is determined by 4E.

a. [Reserved]

b. ''Digital computers'' having an ''Adjusted Peak Performance'' (''APP'') exceeding 3.0 weighted TeraFLOPS (WT);

c. The ''technology'' for the ''digital computers'' and related equipment is determined by 4E.

NOTE 1: 4A003.c applies only to ''electronic assemblies'' and programmable interconnections not exceeding the limit in 4A003.b. when shipped as unintegrated ''electronic assemblies''. It does not apply to ''electronic assemblies'' inherently limited by nature of their design for use as related equipment controlled by 4A003.e.

NOTE 2: 4A003.c does not control ''electronic assemblies'' specially designed for a product or family of products whose maximum configuration does not exceed the limit of 4A003.b.

d. [Reserved]

e. Equipment performing analog-to-digital conversions exceeding the limits in 3A001.a.5;

f. [Reserved]

g. Equipment specially designed for aggregating the performance of ''digital computers'' by providing external interconnections which allow communications at unidirectonal data rates exceeding 2.0 Gbyte/s per link.

NOTE: 4A003.g does not control internal interconnection equipment (e.g., backplanes, buses) passive interconnection equipment, ''network access controllers'' or ''communication channel controllers''.

4A004 Computers as follows (*see* List of Items Controlled) and specially designed related equipment, "electronic assemblies" and components therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $5000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Computers and related equipment in number; ''electronic assemblies'' and components in $ value

Related Controls: N/A

Related Definitions: N/A

Items: a. ''Systolic array computers'';

b. ''Neural computers'';

c. ''Optical computers''.

4A101 Analog computers, "digital computers" or digital differential analyzers, other than those controlled by 4A001 designed or modified for use in "missiles", having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: N/A

Related Definitions: N/A

Items: a. Rated for continuous operation at temperatures from below 228 K (−45 °C) to above 328 K (+55 °C); *or*

b. Designed as ruggedized or 'radiation hardened'.

NOTE: 'Radiation hardened' means that the component or equipment is designed or rated to withstand radiation levels which meet or exceed a total irradiation dose of 5×10^5 rads (Si).

4A102 "Hybrid computers" specially designed for modelling, simulation or design integration of "missiles". (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

4A980 Computers for fingerprint equipment, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED
Unit: Equipment in number
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

NOTE: 4A980 does not control equipment limited to one finger and designed for user authentication or access control.

4A994 Computers, "electronic assemblies", and related equipment not controlled by 4A001, or 4A003, and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; parts and accessories in $ value
Related Controls: N/A
Related Definitions: N /A
Items:

NOTE 1: The control status of the ''digital computers'' and related equipment described in 4A994 is determined by the control status of other equipment or systems provided:

a. The ''digital computers'' or related equipment are essential for the operation of the other equipment or systems;

b. The ''digital computers'' or related equipment are not a ''principal element'' of the other equipment or systems; and,

N.B. 1: The control status of ''signal processing'' or ''image enhancement'' equipment specially designed for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the ''principal element'' criterion.

N.B. 2: For the control status of ''digital computers'' or related equipment for telecommunications equipment, see Category 5, Part 1 (Telecommunications).

c. The ''technology'' for the ''digital computers'' and related equipment is determined by 4E.

a. Electronic computers and related equipment, and ''electronic assemblies'' and specially designed components therefor, rated for operation at an ambient temperature above 343 K (70 °C);

b. ''Digital computers'', including equipment of ''signal processing'' or image enhancement'', having an ''Adjusted Peak Performance'' (''APP'') equal to or greater than 0.0128 Weighted TeraFLOPS (WT);

c. ''Electronic assemblies'' that are specially designed or modified to enhance performance by aggregation of processors, as follows:

c.1. Designed to be capable of aggregation in configurations of 16 or more processors;

c.2. [Reserved];

NOTE 1: 4A994.c applies only to ''electronic assemblies'' and programmable interconnections with a ''APP'' not exceeding the limits in 4A994.b, when shipped as unintegrated ''electronic assemblies''. It does not apply to ''electronic assemblies'' inherently limited by nature of their design for use as related equipment controlled by 4A994.k.

NOTE 2: 4A994.c does not control any ''electronic assembly'' specially designed for a product or family of products whose maximum configuration does not exceed the limits of 4A994.b.

d. [Reserved];

e. [Reserved];

f. Equipment for ''signal processing'' or ''image enhancement'' having an ''Adjusted Peak Performance'' (''APP'') equal to or greater than [0.0128] Weighted TeraFLOPS WT];

g. [Reserved];

h. [Reserved];

i. Equipment containing ''terminal interface equipment'' exceeding the limits in 5A991;

j. Equipment specially designed to provide external interconnection of ''digital computers'' or associated equipment that allows communications at data rates exceeding 80 Mbyte/s.

NOTE: 4A994.j does not control internal interconnection equipment (e.g., backplanes, buses) passive interconnection equipment, ''network access controllers'' or ''communication channel controllers''.

k. ''Hybrid computers'' and ''electronic assemblies'' and specially designed components therefor containing analog-to-digital converters having all of the following characteristics:

k.1. 32 channels or more; and,

k.2. A resolution of 14 bit (plus sign bit) or more with a conversion rate of 200,000 conversions/s or more.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT [RESERVED]

C. MATERIALS [RESERVED]

D. SOFTWARE

NOTE: *The control status of ''software'' for equipment described in other Categories is dealt with in the appropriate Category.*

4D001 "Software" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, CC, AT, NP.

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

Control(s)	Country chart
CC applies to "software" for computerized finger-print equipment controlled by 4A003 for CC reasons.	CC Column 1.
AT applies to entire entry	AT Column 1.

NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except for ''software'' for the ''development'' or ''production'' of commodities with an ''Adjusted Peak Performance'' (''APP'') exceeding 0.5 WT.

APP: Yes to specific countries (see §740.7 of the EAR for eligibility criteria).

STA: License Exception STA may not be used to ship or transmit ''software'' specially designed for the ''development'' or ''production'' of equipment specified by ECCN 4A001.a.2 or for the ''development'' or ''production'' of ''digital computers'' having an 'Adjusted Peak Performance' ('APP') exceeding 0.5 Weighted TeraFLOPS (WT) to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: a. ''Software'' specially designed or modified for the ''development'', ''production'' or ''use'' of equipment or ''software'' controlled by 4A001 to 4A004, or 4D (except 4D980, 4D993 or 4D994).

b. ''Software'', other than that controlled by 4D001.a, specially designed or modified for the ''development'' or ''production'' of equipment as follows:

b.1. ''Digital computers'' having an ''Adjusted Peak Performance'' (''APP'') exceeding 0.25 Weighted TeraFLOPS (WT);

b.2. ''Electronic assemblies'' specially designed or modified for enhancing performance by aggregation of processors so that the ''APP'' of the aggregation exceeds the limit in 4D001.b.1.

4D002 "Software" specially designed or modified to support "technology" controlled by 4E (except 4E980, 4E992, and 4E993).

LICENSE REQUIREMENTS

Reason for Control: NS, AT, NP

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

NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except N/A for ''software'' specifically designed or modified to support ''technology'' for computers requiring a license.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

4D980 "Software" specially designed for the "development", "production", or "use" of items controlled by 4A980.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

4D993 "Program" proof and validation "software", "software" allowing the automatic generation of "source codes", and operating system "software" that are specially designed for real time processing equipment (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: ''Global interrupt latency time'' is the time taken by the computer system to recognize an interrupt due to the event, service the interrupt and perform a context switch to an alternate memory-resident task waiting on the interrupt.

Items: a. ''Program'' proof and validation ''software'' using mathematical and analytical techniques and designed or modified for ''programs'' having more than 500,000 ''source code'' instructions;

b. ''Software'' allowing the automatic generation of ''source codes'' from data acquired on line from external sensors described in the Commerce Control List; *or*

c. Operating system ''software'' specially designed for ''real time processing'' equipment that guarantees a ''global interrupt latency time'' of less than 20 microseconds.

4D994 "Software" Other Than That Controlled in 4D001 Specially Designed or Modified for the "Development", "Production", or "Use" of Equipment Controlled by 4A101 and 4A994.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

E. TECHNOLOGY

4E001 "Technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, CC, AT, NP.

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to "technology" for items controlled by 4A001.a and 4A101 for MT reasons.	MT Column 1.
CC applies to "technology" for computerized fingerprint equipment controlled by 4A003 for CC reasons.	CC Column 1.
AT applies to entire entry	AT Column 1.

NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

LICENSE REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes, except for ''technology'' for the ''development'' or ''production'' of commodities with an ''Adjusted Peak Performance'' (''APP'') exceeding 0.5 WT.
APP: Yes to specific countries (see §740.7 of the EAR for eligibility criteria).
STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''development'' or ''production'' of any of the following equipment or ''software'': a. Equipment specified by ECCN 4A001.a.2; b. ''Digital computers'' having an 'Adjusted Peak Performance' ('APP') exceeding 0.5 Weighted TeraFLOPS (WT); or c. ''software'' specified in the License Exception STA paragraph found in the License Exception section of ECCN 4D001 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: N/A
Related Definitions: N/A
Items: a. ''Technology'' according to the General Technology Note, for the ''development'', ''production'', or ''use'' of equipment or ''software'' controlled by 4A (except 4A980 or 4A994) or 4D (except 4D980, 4D993, 4D994).

b. ''Technology'', other than that controlled by 4E001.a, specially designed or modified for the ''development'' or ''production'' of equipment as follows:

b.1. ''Digital computers'' having an ''Adjusted Peak Performance'' (''APP'') exceeding 0.25 Weighted TeraFLOPS (WT);

b.2. ''Electronic assemblies'' specially designed or modified for enhancing performance by aggregation of processors so that the ''APP'' of the aggregation exceeds the limit in 4E001.b.1.

4E980 "Technology" for the "development", "production", or "use" of items controlled by 4A980.

LICENSE REQUIREMENTS
Reason for Control: CC, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

4E992 " Technology" other than that controlled in 4E001 for the "development," "production," or "use" of equipment controlled by 4A994, or "software" controlled by 4D993 or 4D994.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

4E993 " Technology" for the "development" or "production" of equipment designed for "multi-data-stream processing."

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Technical Note on ''Adjusted Peak Performance'' (''APP'')

''APP'' is an adjusted peak rate at which ''digital computers'' perform 64-bit or larger floating point additions and multiplications.

ABBREVIATIONS USED IN THIS TECHNICAL NOTE

n number of processors in the ''digital computer''
I processor number (i,....n)
ti processor cycle time (ti = 1/Fi)
Fi processor frequency
Ri peak floating point calculating rate
Wi architecture adjustment factor

''APP'' is expressed in Weighted TeraFLOPS (WT) in units of 10^{12} adjusted floating point operations per second.

OUTLINE OF ''APP'' CALCULATION METHOD

1. For each processor i, determine the peak number of 64-bit or larger floating-point operations, FPOi, performed per cycle for each processor in the ''digital computer''.

NOTE: In determining FPO, include only 64-bit or larger floating point additions and/or multiplications. All floating point operations must be expressed in operations per processor cycle; operations requiring multiple cycles may be expressed in fractional results per cycle. For processors not capable of performing calculations on floating-point operands of 64-bits or more the effective calculating rate R is zero.

2. Calculate the floating point rate R for each processor.

$R_i = FPO_i/t_i$.

3. Calculate ''APP'' as

''APP'' = $W_1 \times R_1 + W_2 \times R_2 + * * * + W_n \times R_n$.

4. For 'vector processors', $W_i = 0.9$. For non-'vector processors', $W_i = 0.3$.

NOTE 1: For processors that perform compound operations in a cycle, such as an addition and multiplication, each operation is counted.

NOTE 2: For a pipelined processor the effective calculating rate R is the faster of the pipelined rate, once the pipeline is full, or the non-pipelined rate.

NOTE 3: The calculating rate R of each contributing processor is to be calculated at its maximum value theoretically possible before the ''APP'' of the combination is derived. Simultaneous operations are assumed to exist when the computer manufacturer claims concurrent, parallel, or simultaneous operation or execution in a manual or brochure for the computer.

NOTE 4: Do not include processors that are limited to input/output and peripheral functions (*e.g.*, disk drive, communication and video display) when calculating ''APP''.

NOTE 5: ''APP'' values are not to be calculated for processor combinations (inter)connected by ''Local Area Networks'', Wide Area Networks, I/O shared connections/devices, I/O controllers and any communication interconnection implemented by ''software''.

NOTE 6: *''APP'' values must be calculated for: (1) Processor combinations containing processors specially designed to enhance performance by aggregation, operating simultaneously and sharing memory; or (2) Multiple memory/processor combinations operating simultaneously utilizing specially designed hardware.*

NOTE 7: A 'vector processor' is defined as a processor with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 64-bit or larger numbers) simultaneously, having at least 2 vector functional units and at least 8 vector registers of at least 64 elements each.

CATEGORY 5—TELECOMMUNICATIONS AND ''INFORMATION SECURITY''

PART 1—TELECOMMUNICATIONS

NOTES: 1. The control status of components, test and ''production'' equipment, and ''software'' therefor which are specially designed for telecommunications equipment or systems is determined in Category 5, Part 1.

N.B.1.: For ''lasers'' specially designed for telecommunications equipment or systems, see ECCN 6A005.

N.B.2. See also Category 5, Part 2 for equipment, components, and ''software'', performing or incorporating ''information security'' functions.

2. ''Digital computers'', related equipment or ''software'', when essential for the operation and support of telecommunications equipment described in this Category, are regarded as specially designed components,

provided they are the standard models customarily supplied by the manufacturer. This includes operation, administration, maintenance, engineering or billing computer systems.

A. SYSTEMS, EQUIPMENT AND COMPONENTS

5A001 Telecommunications systems, equipment, components and accessories, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to 5A001.a, .e, .b.5, and .h	NS Column 1.
NS applies to 5A001.b (except .b.5), .c, .d, .f, .g, and .i.	NS Column 2.
SL applies to 5A001.i	A license is required for all destinations, as specified in § 742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR). *Note to SL paragraph:* This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.
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. See § 740.2(a)(3) of the EAR for restrictions on the use of License Exceptions for 5A001.i.*

LICENSE EXCEPTIONS

LVS: N/A for 5A001.a, b.5, e, and h; $5000 for 5A001b.1, b.2, b.3, b.6, d, f, and g; $3000 for 5A001.c.

GBS: Yes, except 5A001.a, b.5, e, and h.

CIV: Yes, except 5A001.a, b.3, b.5, e, and h.

STA: License Exception STA may not be used to ship any commodity in 5A001.b.3, .b.5 or .h to any of the eight destinations listed in § 740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Equipment or antennae in number; cable and fiber in meters/feet, components and accessories in $ value.

Related Controls: Telecommunications equipment defined in 5A001.a.1 through A001.a.3 for use on board satellites is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121). Direction finding equipment defined in 5A001.e is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121). See also 5A101 and 5A991.

Related Definitions: N/A

Items: a. Any type of telecommunications equipment having any of the following characteristics, functions or features:

a.1. Specially designed to withstand transitory electronic effects or electromagnetic pulse effects, both arising from a nuclear explosion;

a.2. Specially hardened to withstand gamma, neutron or ion radiation; *or*

a.3. Specially designed to operate outside the temperature range from 218 K (−55 °C) to 397 K (124 °C);

NOTE: *5A001.a.3 applies only to electronic equipment.*

NOTE: *5A001.a.2 and 5A001.a.3 do not apply to equipment designed or modified for use on board satellites.*

b. Telecommunication systems and equipment, and specially designed components and accessories therefor, having any of the following characteristics, functions or features:

b.1 Being underwater untethered communications systems having any of the following:

b.1.a. An acoustic carrier frequency outside the range from 20 kHz to 60 kHz;

b.1.b. Using an electromagnetic carrier frequency below 30 kHz; *or*

b.1.c. Using electronic beam steering techniques; *or*

b.1.d. Using ''lasers'' or light-emitting diodes (LEDs) with an output wavelength greater than 400 nm and less than 700 nm, in a ''local area network'';

b.2. Being radio equipment operating in the 1.5 MHz to 87.5 MHz band and having all of the following:

b.2.a. Automatically predicting and selecting frequencies and ''total digital transfer rates'' per channel to optimize the transmission; *and*

b.2.b. Incorporating a linear power amplifier configuration having a capability to support multiple signals simultaneously at an output power of 1 kW or more in the frequency range of 1.5 MHz or more but less than 30 MHz, or 250 W or more in the frequency range of 30 MHz or more but not exceeding 87.5 MHz, over an ''instantaneous bandwidth'' of one octave or more and with an output harmonic and distortion content of better than −80 dB;

b.3. Being radio equipment employing ''spread spectrum'' techniques, including

''frequency hopping'' techniques, not controlled in 5A001.b.4 and having any of the following:

b.3.a. User programmable spreading codes; *or*

b.3.b. A total transmitted bandwidth which is 100 or more times the bandwidth of any one information channel and in excess of 50 kHz;

NOTE: *5A001.b.3.b does not control radio equipment specially designed for use with any of the following:*

a. Civil cellular radio-communications systems; or

b. Fixed or mobile satellite Earth stations for commercial civil telecommunications.

NOTE: *5A001.b.3 does not control equipment operating at an output power of 1 W or less.*

b.4. Being radio equipment employing ultra-wideband modulation techniques, having user programmable channelizing codes, scrambling codes, or network identification codes and having any of the following:

b.4.a. A bandwidth exceeding 500 MHz; *or*

b.4.b. A ''fractional bandwidth'' of 20% or more;

b.5. Being digitally controlled radio receivers having all of the following:

b.5.a. More than 1,000 channels;

b.5.b. A ''frequency switching time'' of less than 1 ms;

b.5.c. Automatic searching or scanning of a part of the electromagnetic spectrum; *and*

b.5.d. Identification of the received signals or the type of transmitter; *or*

NOTE: *5A001.b.5 does not control radio equipment specially designed for use with civil cellular radio-communications systems.*

b.6. Employing functions of digital ''signal processing'' to provide 'voice coding' output at rates of less than 2,400 bit/s.

TECHNICAL NOTES: *1. For variable rate 'voice coding', 5A001.b.6 applies to the 'voice coding' output of continuous speech.*

2. For the purpose of 5A001.b.6, 'voice coding' is defined as the technique to take samples of human voice and then convert these samples of human voice into a digital signal taking into account specific characteristics of human speech.

c. Optical fibers of more than 500 m in length and specified by the manufacturer as being capable of withstanding a 'proof test' tensile stress of 2×10^9 N/m^2 or more;

N.B.: For underwater umbilical cables, see 8A002.a.3.

TECHNICAL NOTE: 'Proof Test': on-line or off-line production screen testing that dynamically applies a prescribed tensile stress over a 0.5 to 3 m length of fiber at a running rate of 2 to 5 m/s while passing between capstans approximately 150 mm in diameter. The ambient temperature is a nominal 293 K (20 °C) and relative humidity 40%. Equivalent national standards may be used for executing the proof test.

d. ''Electronically steerable phased array antennae'' operating above 31.8 GHz;

NOTE: *5A001.d does not control ''electronically steerable phased array antennae'' for landing systems with instruments meeting ICAO standards covering Microwave Landing Systems (MLS).*

e. Radio direction finding equipment operating at frequencies above 30 MHz and having all of the following, and specially designed components therefor:

e.1. ''Instantaneous bandwidth'' of 10 MHz or more; and

e.2. Capable of finding a Line Of Bearing (LOB) to non-cooperating radio transmitters with a signal duration of less than 1 ms;

f. Jamming equipment specially designed or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunication services and perform any of the following, and specially designed components therefor:

f.1. Simulate the functions of Radio Access Network (RAN) equipment;

f.2. Detect and exploit specific characteristics of the mobile telecommunications protocol employed (*e.g.*, GSM); or

f.3. Exploit specific characteristics of the mobile telecommunications protocol employed (*e.g.*, GSM);

N.B.: For GNSS jamming equipment see the International Traffic in Arms Regulations (ITAR) (22 CFR Parts 120–130).

g. Passive Coherent Location (PCL) systems or equipment, specially designed for detecting and tracking moving objects by measuring reflections of ambient radio frequency emissions, supplied by non-radar transmitters.

TECHNICAL NOTE: Non-radar transmitters may include commercial radio, television or cellular telecommunications base stations.

NOTE: 5A001.g does not control:

a. Radio-astronomical equipment; or

b. Systems or equipment, that require any radio transmission from the target.

h. Radio Frequency (RF) transmitting equipment designed or modified for prematurely activating or preventing the initiation of Improvised Explosive Devices (IEDs).

N.B.: See also ECCN 5A001.f and Category XI of the International Traffic in Arms Regulations (ITAR) (22 CFR Parts 120–130).

i. Systems or equipment, specially designed or modified to intercept and process the air interface of 'mobile telecommunications', and specially designed components therefor.

NOTE: *5A001.i does not apply to equipment designed for 'mobile telecommunications' network operators, or for the ''development'' or ''production'' of 'mobile telecommunications' equipment or systems.*

TECHNICAL NOTE: *For the purposes of 5A001.i, 'mobile telecommunications' refers to the following telecommunications protocols or standards: GSM, GSM–R, GPRS, IMT–2000, PMR*

(Professional Mobile Radio), Inmarsat, Iridium, Thuraya, VSAT or ACES.

N.B.: *See also 5A001.f, 5A980, and the U.S. Munitions List (22 CFR part 121).*

5A101 Telemetering and telecontrol equipment, including ground equipment, designed or modified for unmanned aerial vehicles or rocket systems (including ballistic missile systems, space launch vehicles, sounding rockets, cruise missile systems, target drones, and reconnaissance drones) capable of a maximum "range" equal to or greater than 300km.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: N/A

Related Definitions: N/A

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

NOTE: 5A101 does not control: 1. Telecontrol equipment specially designed to be used for remote control of recreational model planes, boats or vehicles and having an electric field strength of not more than 200 microvolts per meter at a distance of 500 meters;

2. Equipment designed or modified for manned aircraft or satellites;

3. Ground based equipment designed or modified for terrestrial or marine applications;

4. Equipment designed for commercial, civil, or safety of life (*e.g.*, data integrity or flight safety) Global Navigation Satellite System services.

NOTE: 5A101 does not include items not designed or modified for unmanned aerial vehicles or rocket systems (including ballistic missile systems, space launch vehicles, sounding rockets, cruise missile systems, target drones, and reconnaissance drones) capable of a maximum ''range'' equal to or greater than 300 km (*e.g.*, telemetry circuit cards limited by design to reception only and designed for use in personal computers).

5A980 Devices primarily useful for the surreptitious interception of wire, oral, or electronic communications, other than those controlled under 5A001.i; and parts and accessories therefor

LICENSE REQUIREMENTS

Reason for Control: SL, AT.

Control(s): SL and AT apply to entire entry. A license is required for all destinations, as specified in §742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR).

NOTE: This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED (1) See ECCN 5A001.i for systems or equipment, specially designed or modified to intercept and process the air interface of 'mobile telecommunications', and specially designed components therefor. (2) See ECCN 5D980 for ''software'' for the ''development'', ''production'' or ''use'' of equipment controlled by 5A980. (3) See ECCN 5E980 for the ''technology'' for the ''development'', ''production'', and ''use'' of equipment controlled by 5A980.

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

5A991 Telecommunication equipment, not controlled by 5A001.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: Telecommunication equipment defined in 5A991 for use on board satellites is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121). *See also* 5E001.c, 5E101 and 5E991.

Related Definitions: (1) ''Asynchronous transfer mode'' (''ATM'') is a transfer mode in which the information is organized into cells; it is asynchronous in the sense that the recurrence of cells depends on the required or instantaneous bit rate. (2) ''Bandwidth of one voice channel'' is data communication equipment designed to operate in one voice channel of 3,100 Hz, as defined in CCITT Recommendation G.151. (3) ''Communications channel controller'' is the physical interface that controls the flow of synchronous or asynchronous digital information. It is an assembly that can be integrated into computer or telecommunications equipment to provide communications access. (4) ''Datagram'' is a self-contained, independent entity of data carrying sufficient information to be

routed from the source to the destination data terminal equipment without reliance on earlier exchanges between this source and destination data terminal equipment and the transporting network. (5) ''Fast select'' is a facility applicable to virtual calls that allows data terminal equipment to expand the possibility to transmit data in call set-up and clearing ''packets'' beyond the basic capabilities of a virtual call. (6) ''Gateway'' is the function, realized by any combination of equipment and ''software'', to carry out the conversion of conventions for representing, processing or communicating information used on one system into the corresponding, but different conventions used in another system. (7) ''Integrated Services Digital Network'' (ISDN) is a unified end-to-end digital network, in which data originating from all types of communication (*e.g.*, voice, text, data, still and moving pictures) are transmitted from one port (terminal) in the exchange (switch) over one access line to and from the subscriber. (8) ''Packet'' is a group of binary digits including data and call control signals that is switched as a composite whole. The data, call control signals, and possible error control information are arranged in a specified format.

Items: a. Any type of telecommunications equipment, not controlled by 5A001.a, specially designed to operate outside the temperature range from 219 K (−54 °C) to 397 K (124 °C).

b. Telecommunication transmission equipment and systems, and specially designed components and accessories therefor, having any of the following characteristics, functions or features:

NOTE: Telecommunication transmission equipment:

a. Categorized as follows, or combinations thereof:

1. Radio equipment (*e.g.*, transmitters, receivers and transceivers);
2. Line terminating equipment;
3. Intermediate amplifier equipment;
4. Repeater equipment;
5. Regenerator equipment;
6. Translation encoders (transcoders);
7. Multiplex equipment (statistical mutiplex included);
8. Modulators/demodulators (modems);
9. Transmultiplex equipment (see CCITT Rec. G701);
10. ''Stored program controlled'' digital crossconnection equipment;
11. ''Gateways'' and bridges;
12. ''Media access units''; *and*

b. Designed for use in single or multi-channel communication via any of the following:

1. Wire (line);
2. Coaxial cable;
3. Optical fiber cable;
4. Electromagnetic radiation; or
5. Underwater acoustic wave propagation.

b.1. Employing digital techniques, including digital processing of analog signals, and designed to operate at a ''digital transfer rate'' at the highest multiplex level exceeding 45 Mbit/s or a ''total digital transfer rate'' exceeding 90 Mbit/s;

NOTE: 5A991.b.1 does not control equipment specially designed to be integrated and operated in any satellite system for civil use.

b.2. Modems using the ''bandwidth of one voice channel'' with a ''data signaling rate'' exceeding 9,600 bits per second;

b.3. Being ''stored program controlled'' digital cross connect equipment with ''digital transfer rate'' exceeding 8.5 Mbit/s per port.

b.4. Being equipment containing any of the following:

b.4.a. ''Network access controllers'' and their related common medium having a ''digital transfer rate'' exceeding 33 Mbit/s; *or*

b.4.b. ''Communication channel controllers'' with a digital output having a ''data signaling rate'' exceeding 64,000 bit/s per channel;

NOTE: If any uncontrolled equipment contains a ''network access controller'', it cannot have any type of telecommunications interface, except those described in, but not controlled by 5A991.b.4.

b.5. Employing a ''laser'' and having any of the following characteristics:

b.5.a. A transmission wavelength exceeding 1,000 nm; *or*

b.5.b. Employing analog techniques and having a bandwidth exceeding 45 MHz;

NOTE: 5A991.b.5.b does not control commercial TV systems.

b.5.c. Employing coherent optical transmission or coherent optical detection techniques (also called optical heterodyne or homodyne techniques);

b.5.d. Employing wavelength division multiplexing techniques; *or*

b.5.e. Performing ''optical amplification'';

b.6. Radio equipment operating at input or output frequencies exceeding:

b.6.a. 31 GHz for satellite-earth station applications; *or*

b.6.b. 26.5 GHz for other applications;

NOTE: 5A991.b.6. does not control equipment for civil use when conforming with an International Telecommunications Union (ITU) allocated band between 26.5 GHz and 31 GHz.

b.7. Being radio equipment employing any of the following:

b.7.a. Quadrature-amplitude-modulation (QAM) techniques above level 4 if the ''total digital transfer rate'' exceeds 8.5 Mbit/s;

b.7.b. QAM techniques above level 16 if the ''total digital transfer rate'' is equal to or less than 8.5 Mbit/s;

b.7.c. Other digital modulation techniques and having a ''spectral efficiency'' exceeding 3 bit/s/Hz; or

b.7.d. Operating in the 1.5 MHz to 87.5 MHz band and incorporating adaptive techniques providing more than 15 dB suppression of an interfering signal.

NOTES: 1. 5A991.b.7 does not control equipment specially designed to be integrated and operated in any satellite system for civil use.

2. 5A991.b.7 does not control radio relay equipment for operation in an ITU allocated band:

a. Having any of the following:

a.1. Not exceeding 960 MHz; or

a.2. With a ''total digital transfer rate'' not exceeding 8.5 Mbit/s; and

b. Having a ''spectral efficiency'' not exceeding 4 bit/s/Hz.

c. ''Stored program controlled'' switching equipment and related signaling systems, having any of the following characteristics, functions or features, and specially designed components and accessories therefor:

NOTE: Statistical multiplexers with digital input and digital output which provide switching are treated as ''stored program controlled'' switches.

c.1. ''Data (message) switching'' equipment or systems designed for ''packet-mode operation'' and assemblies and components therefor, n.e.s.

c.2. [Reserved]

c.3. Routing or switching of ''datagram'' packets;

c.4. [Reserved]

NOTE: The restrictions in 5A991.c.3 do not apply to networks restricted to using only ''network access controllers'' or to ''network access controllers'' themselves.

c.5. Multi-level priority and pre-emption for circuit switching;

NOTE: 5A991.c.5 does not control single-level call preemption.

c.6. Designed for automatic hand-off of cellular radio calls to other cellular switches or automatic connection to a centralized subscriber data base common to more than one switch;

c.7. Containing ''stored program controlled'' digital cross connect equipment with ''digital transfer rate'' exceeding 8.5 Mbit/s per port.

c.8. ''Common channel signaling'' operating in either non-associated or quasi-associated mode of operation;

c.9. ''Dynamic adaptive routing'';

c.10. Being packet switches, circuit switches and routers with ports or lines exceeding any of the following:

c.10.a. A ''data signaling rate'' of 64,000 bit/s per channel for a ''communications channel controller''; *or*

NOTE: 5A991.c.10.a does not control multiplex composite links composed only of communication channels not individually controlled by 5A991.b.1.

c.10.b. A ''digital transfer rate'' of 33 Mbit/s for a ''network access controller'' and related common media;

NOTE: 5A991.c.10 does not control packet switches or routers with ports or lines not exceeding the limits in 5A991.c.10.

c.11. ''Optical switching'';

c.12. Employing ''Asynchronous Transfer Mode'' (''ATM'') techniques.

d. Optical fibers and optical fiber cables of more than 50 m in length designed for single mode operation;

e. Centralized network control having all of the following characteristics:

e.1. Receives data from the nodes; *and*

e.2. Process these data in order to provide control of traffic not requiring operator decisions, and thereby performing ''dynamic adaptive routing'';

NOTE: 5A991.e does not preclude control of traffic as a function of predictable statistical traffic conditions.

f. Phased array antennae, operating above 10.5 GHz, containing active elements and distributed components, and designed to permit electronic control of beam shaping and pointing, except for landing systems with instruments meeting International Civil Aviation Organization (ICAO) standards (microwave landing systems (MLS)).

g. Mobile communications equipment, n.e.s., and assemblies and components therefor; or

h. Radio relay communications equipment designed for use at frequencies equal to or exceeding 19.7 GHz and assemblies and components therefor, n.e.s.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

5B001 Telecommunication test, inspection and production equipment, components and accessories, as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS: $5000

GBS: Yes

CIV: Yes

STA: License Exception STA may not be used to ship 5B001.a equipment and specially designed components or accessories

therefor, specially designed for the ''development'', ''production'' or ''use'' of equipment, functions or features specified by in ECCN 5A001.b.3, .b.5 or .h to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Equipment in number; components and accessories in $ value

Related Controls: See also 5B991.

Related Definition: N/A

Items: a. Equipment and specially designed components or accessories therefor, specially designed for the ''development'', ''production'' or ''use'' of equipment, functions or features, controlled by 5A001;

NOTE: 5B001.a does not control optical fiber characterization equipment.

b. Equipment and specially designed components or accessories therefor, specially designed for the ''development'' of any of the following telecommunication transmission or switching equipment:

b.1. [Reserved]

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

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

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

b.2.c. Employing coherent optical transmission or coherent optical detection techniques; *or*

NOTE: *5B001.b.2.c applies to equipment specially designed for the ''development'' of systems using an optical local oscillator in the receiving side to synchronize with a carrier ''laser.''*

TECHNICAL NOTE: *For the purpose of 5B001.b.2.c, these techniques include optical heterodyne, homodyne or intradyne techniques.*

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

NOTE: *5B001.b.2.d. does not include equipment specially designed for the ''development'' of commercial TV systems.*

b.3. [Reserved]

b.4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 256.

5B991 Telecommunications test equipment, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

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

License Exceptions

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

C. MATERIALS

5C991 Preforms of glass or of any other material optimized for the manufacture of optical fibers controlled by 5A991.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

D. SOFTWARE

5D001 "Software" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, SL, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
SL applies to the entire entry as applicable for equipment, functions, features, or characteristics controlled by 5A001.i.	A license is required for all destinations, as specified in §742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR). *Note to SL paragraph:* This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.
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. See §740.2(a)(3) of the EAR for restrictions on the use of License Exceptions for 5D001 (as it applies to 5A001.i or 5E001.a (as it applies to 5A001.i or 5D001.a (as it applies to 5A001.i))).*

LICENSE EXCEPTIONS

CIV: Yes, except for ''software'' controlled by 5D001.a and specially designed for the ''development'' or ''production'' of items controlled by 5A001.b.5 and 5A001.h.

TSR: Yes, except for exports and reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''software'' controlled by 5D001.a and specially designed for items controlled by 5A001.b.5 and 5A001.h.

STA: License Exception STA may not be used to ship or transmit 5D001.a ''software'' specially designed for the ''development'' or ''production'' of equipment, functions or features, specified by ECCN 5A001.b.3, .b.5 or .h; and for 5D001.b. for ''software'' specially designed or modified to support ''technology'' specified by the STA paragraph in the License Exception section of ECCN 5E001 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: See also 5D980 and 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;

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

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

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

d.1. [Reserved]

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

d.2.a. A transmission wavelength exceeding 1,750 nm; *or*

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

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

d.3. [Reserved]

d.4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 256.

5D101 "Software" specially designed or modified for the "use" of items controlled by 5A101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

5D980 Other "software", other than that controlled by 5D001 (for the equipment, functions, features, or characteristics controlled by 5A001.i, or to support certain "technology" controlled by 5E001.a), as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: SL, AT.

Controls: SL and AT apply to entire entry. A license is required for all destinations, as specified in §742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR).

NOTE: This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: See also 5D001.a and .c for software controls for equipment, functions, features or characteristics controlled by 5A001.i and also 5D001.b for controls on ''software'' specially designed or modified to support ''technology'' controlled by 5E001.a (for 5A001.i equipment, functions or features, and for 5D001.a ''software'' for 5A001.i equipment). See 5E980 for ''technology'' for the ''development'', ''production'', and ''use'' of equipment controlled by 5A980 or ''software'' controlled by 5D980.

Related Definitions: N/A

Items: a. ''Software'' primarily useful for the surreptitious interception of wire, oral, and electronic communications.

b. ''Software'' primarily useful for the ''development'', ''production'', or ''use'' of equipment controlled by 5A980.

5D991 "Software" specially designed or modified for the "development", "production" or "use" of equipment controlled by 5A991 and 5B991, and dynamic adaptive routing software as described in the List of Items Controlled.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. ''Software'', other than in machine-executable form, specially designed for ''dynamic adaptive routing''.

b. [Reserved]

E. TECHNOLOGY

5E001 "Technology" as follows (see List of Items Controlled)..

LICENSE REQUIREMENTS
Reason for Control: NS, SL, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
SL applies to "technology" for the "development" or "production" of equipment, functions or features controlled by 5A001.i, or for the "development" or "production" of "software" controlled by ECCN 5D001.a (for 5A001.i).	A license is required for all destinations, as specified in §742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR). *Note to SL paragraph: This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.*
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. See §740.2(a)(3) of the EAR for restrictions on the use of License Exceptions for 5E001.a (as it applies to 5A001.i or 5D001.a (as it applies to 5A001.i)))*.

LICENSE EXCEPTIONS
*CIV:*N/A.
*TSR:*Yes, except for exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''technology'' controlled by 5E001.a for the ''development'' or ''production'' of the following:

(1) Items controlled by 5A001.b.5 or 5A001.h; or

(2) ''Software'' controlled by 5D001.a that is specially designed for the ''development'' or ''production'' of equipment, functions or features controlled by 5A001.b.5 or 5A001.h.

STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''development'' or ''production'' of equipment, functions or features specified by 5A001.b.3, .b.5 or .h; or for ''software'' in 5D001.a that is specified in the STA paragraph in the License Exception section of ECCN 5D001 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: Technology defined in 5E001.b.1, 5E001.b.2, 5E001.b.4, or 5E001.c for use on board satellites is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121). See also 5E101, 5E980 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, controlled by 5A001 or ''software'' controlled by 5D001.a.

b. Specific ''technology'' 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 base station receiving equipment whose reception capabilities that allow multi-band, multi-channel, multi-mode, multi-coding algorithm or multi-protocol operation can be modified by changes in ''software'';

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

NOTE: *5E001.b.4 does not apply to ''technology'' for the ''development'' of any of the following:*

a. Civil cellular radio-communications systems; or

b. Fixed or mobile satellite Earth stations for commercial civil telecommunications.

c. ''Technology'' according the General Technology Note for the ''development'' or ''production'' of any of the following:

c.1. Equipment employing digital techniques designed to operate at a ''total digital transfer rate'' exceeding 120 Gbit/s;

TECHNICAL NOTE: *For telecommunication switching equipment the ''total digital transfer rate'' is the unidirectional speed of a single*

interface, measured at the highest speed port or line.

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

c.2.a. A transmission wavelength exceeding 1,750 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;

NOTE: *5E001.c.2.c applies to ''technology'' specially designed for the ''development'' or ''production'' of systems using an optical local oscillator in the receiving side to synchronize with a carrier ''laser.''*

TECHNICAL NOTE: *For the purpose of 5E001.c.2.c, these techniques include optical heterodyne, homodyne or intradyne techniques.*

c.2.d. Employing wavelength division multiplexing techniques of optical carriers at less than 100 GHz spacing; *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.

N.B.: For ''technology'' for the ''development'' or ''production'' of non-telecommunications equipment employing a ''laser'', see Product Group E of Category 6, e.g., 6E00x.

c.3. Equipment employing ''optical switching'' and having a switching time less than 1 ms; or

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

c.4.a. Quadrature-Amplitude-Modulation (QAM) techniques above level 256; *or*

c.4.b. Operating at input or output frequencies exceeding 31.8 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.4.c. Operating in the 1.5 MHz to 87.5 MHz band and incorporating adaptive techniques providing more than 15 dB suppression of an interfering signal; *or*

c.5. [Reserved]

c.6. Mobile equipment having all of the following:

c.6.a. Operating at an optical wavelength greater than or equal to 200 nm and less than or equal to 400 nm; *and*

c.6.b. Operating as a ''local area network'';

d. ''Technology'' according to the General Technology Note for the ''development'' or ''production'' of Microwave Monolithic Integrated Circuit (MMIC) power amplifiers specially designed for telecommunications and having any of the following:

d.1. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and with an average output power greater than 4 W (36 dBm) with a ''fractional bandwidth'' greater than 15%;

d.2. Rated for operation at frequencies exceeding 6.8 GHz up to and including 16 GHz and with an average output power greater than 1 W (30 dBm) with a ''fractional bandwidth'' greater than 10%;

d.3. Rated for operation at frequencies exceeding 16 GHz up to and including 31.8 GHz and with an average output power greater than 0.8 W (29 dBm) with a ''fractional bandwidth'' greater than 10%;

d.4. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz;

d.5. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than 0.25 W (24 dBm) with a ''fractional bandwidth'' greater than 10%; *or*

d.6. Rated for operation at frequencies exceeding 43.5 GHz;

e. ''Technology'' according to the General Technology Note for the ''development'' or ''production'' of electronic devices and circuits, specially designed for telecommunications and containing components manufactured from ''superconductive'' materials, specially designed for operation at temperatures below the ''critical temperature'' of at least one of the ''superconductive'' constituents and having any of the following:

e.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*

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

5E101 "Technology" according to the General Technology Note for the "development," "production" or "use" of equipment or software controlled by 5A101 or 5D101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

5E980 "Technology", other than that controlled by 5E001.a (for 5A001.i, and for 5D001.a (for 5A001.i)), primarily useful

for the "development", "production", or "use" of equipment, functions or features, of equipment controlled by 5A980 or "software" controlled by 5D980.

LICENSE REQUIREMENTS

Reason for Control: SL, AT.

Controls: SL and AT apply to entire entry. A license is required for all destinations, as specified in §742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR).

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: See also 5D001.a and .c (for 5A001.i equipment), 5D001.b (supporting 5E001.a ''technology'' for 5A001.i equipment, or for 5D001.a ''software'' (for 5A001.i equipment)), and 5E001.a (for 5A001.i equipment, or for 5D001.a ''software'' for 5A001.i equipment).

Related Definitions: N/A

Items:

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

5E991 "Technology" for the "Development", "Production" or "Use" of Equipment Controlled by 5A991 or 5B991, or "Software" Controlled by 5D991, and Other "Technologies" as Follows (see List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: N/A

Related Definitions: (1) ''Synchronous digital hierarchy'' (SDH) is a digital hierarchy providing a means to manage, multiplex, and access various forms of digital traffic using a synchronous transmission format on different types of media. The format is based on the Synchronous Transport Module (STM) that is defined by CCITT Recommendation G.703, G.707, G.708, G.709 and others yet to be published. The first level rate of 'SDH' is 155.52 Mbits/s. (2) 'Synchronous optical network' (SONET) is a network providing a means to manage, multiplex and access various forms of digital traffic using a synchronous transmission format on fiber optics. The format is the North America version of 'SDH' and also uses the Synchronous Transport Module (STM). However, it uses the Synchronous Transport Signal (STS) as the basic transport module with a first level rate of 51.81 Mbits/s. The SONET standards are being integrated into those of 'SDH'.

Items: a. Specific ''technologies'' as follows:

a.1. ''Technology'' for the processing and application of coatings to optical fiber specially designed to make it suitable for underwater use;

a.2. ''Technology'' for the ''development'' of equipment employing 'Synchronous Digital Hierarchy' ('SDH') or 'Synchronous Optical Network' ('SONET') techniques.

PART 2—''INFORMATION SECURITY''

NOTE 1: The control status of ''information security'' equipment, ''software'', systems, application specific ''electronic assemblies'', modules, integrated circuits, components, or functions is determined in Category 5, Part 2 even if they are components or ''electronic assemblies'' of other equipment.

N.B. TO NOTE 1: Commodities and software specially designed for medical end-use that incorporate an item in Category 5, part 2 are not classified in any ECCN in Category 5, part 2.

NOTE 2: Category 5, part 2, encryption products, when accompanying their user for the user's personal use or as tools of trade, are eligible for License Exceptions TMP or BAG, subject to the terms and conditions of these License Exceptions.

NOTE 3: Cryptography Note: ECCNs 5A002 and 5D002 do not control items that meet all of the following:

a. Generally available to the public by being sold, without restriction, from stock at retail selling points by means of any of the following:

1. Over-the-counter transactions;
2. Mail order transactions;
3. Electronic transactions; or
4. Telephone call transactions;

b. The cryptographic functionality cannot be easily changed by the user;

c. Designed for installation by the user without further substantial support by the supplier; and

d. When necessary, details of the items are accessible and will be provided, upon request, to the appropriate authority in the exporter's country in order to ascertain compliance with conditions described in paragraphs (a) through (c) of this note.

N.B. TO NOTE 3 (CRYPTOGRAPHY NOTE): You must submit a classification request or encryption registration to BIS for mass market encryption commodities and software eligible for the Cryptography Note employing a key length greater than 64 bits for the symmetric algorithm (or, for commodities and software not implementing any symmetric algorithms, employing a key length greater than 768 bits for asymmetric algorithms or greater than 128 bits for elliptic

curve algorithms) in accordance with the requirements of §742.15(b) of the EAR in order to be released from the ''EI'' and ''NS'' controls of ECCN 5A002 or 5D002.

NOTE 4: Category 5, Part 2 does not apply to items incorporating or using ''cryptography'' and meeting all of the following:

a. The primary function or set of functions is not any of the following:

1. ''Information security'';

2. A computer, including operating systems, parts and components therefor;

3. Sending, receiving or storing information (except in support of entertainment, mass commercial broadcasts, digital rights management or medical records management); *or*

4. Networking (includes operation, administration, management and provisioning);

b. The cryptographic functionality is limited to supporting their primary function or set of functions; *and*

c. When necessary, details of the items are accessible and will be provided, upon request, to the appropriate authority in the exporter's country in order to ascertain compliance with conditions described in paragraphs a. and b. above.

TECHNICAL NOTE: Parity bits are not included in the key length.

5A002 "Information security" systems, equipment and components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT, EI

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

EI applies to 5A002.a.1, .a.2, .a.5, .a.6, .a.9 and .b. Refer to §742.15 of the EAR.

LICENSE EXCEPTIONS

LVS: Yes: $500 for components and spare parts only. N/A for equipment.

GBS: N/A

CIV: N/A

ENC: Yes for certain EI controlled commodities, see §740.17 of the EAR for eligibility.

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: (1) 5A002 does not control the commodities listed in paragraphs (a), (d), (e), (f), (g), (i) and (j) in the Note in the items paragraph of this entry. These commodities are instead classified under ECCN5A992, and related software and technology are classified under ECCNs 5D992 and 5E992 respectively. (2) After encryption registration to or classification by BIS, mass market encryption commodities that meet eligibility requirements are released from ''EI'' and ''NS'' controls. These commodities are classified under ECCN 5A992.c. *See* §742.15(b) of the EAR.

Related Definitions: N/A

Items:

NOTE: 5A002 does not control any of the following. However, these items are instead controlled under 5A992:

(a) Smart cards and smart card 'readers/writers' as follows:

(1) A smart card or an electronically readable personal document (*e.g.*, token coin, e-passport) that meets any of the following:

a. The cryptographic capability is restricted for use in equipment or systems excluded from 5A002 by Note 4 in Category 5—Part 2 or entries (b) to (i) of this Note, and cannot be reprogrammed for any other use; *or*

b. Having all of the following:

1. It is specially designed and limited to allow protection of 'personal data' stored within;

2. Has been, or can only be, personalized for public or commercial transactions or individual identification; *and*

3. Where the cryptographic capability is not user-accessible;

Technical Note: 'Personal data' includes any data specific to a particular person or entity, such as the amount of money stored and data necessary for authentication.

(2) 'Readers/writers' specially designed or modified, and limited, for items specified by (a)(1) of this Note;

Technical Note: 'Readers/writers' include equipment that communicates with smart cards or electronically readable documents through a network.

(b) [Reserved]

N.B.: See Note 4 in Category 5—Part 2 for items previously specified in 5A002 Note (b).

(c) [Reserved]

N.B.: See Note 4 in Category 5—Part 2 for items previously specified in 5A002 Note (c).

(d) Cryptographic equipment specially designed and limited for banking use or 'money transactions';

Technical Note: The term 'money transactions' includes the collection and settlement of fares or credit functions.

(e) Portable or mobile radiotelephones for civil use (*e.g.*, for use with commercial civil cellular radio communication systems) that are not capable of transmitting encrypted data directly to another radiotelephone or equipment (other than Radio Access Network (RAN) equipment), nor of passing encrypted data through RAN equipment (*e.g.*, Radio Network Controller (RNC) or Base Station Controller (BSC));

(f) Cordless telephone equipment not capable of end-to-end encryption where the maximum effective range of unboosted cordless operation (*i.e.*, a single, unrelayed hop between terminal and home base station) is less than 400 meters according to the manufacturer's specifications;

(g) Portable or mobile radiotelephones and similar client wireless devices for civil use, that implement only published or commercial cryptographic standards (except for anti-piracy functions, which may be non-published) and also meet the provisions of paragraphs b. to d. of the Cryptography Note (Note 3 in Category 5—Part 2), that have been customized for a specific civil industry application with features that do not affect the cryptographic functionality of these original non-customized devices;

(h) [Reserved]

N.B.: See Note 4 in Category 5—Part 2 for items previously specified in 5A002 Note (h).

(i) Wireless ''personal area network'' equipment that implement only published or commercial cryptographic standards and where the cryptographic capability is limited to a nominal operating range not exceeding 30 meters according to the manufacturer's specifications; or

(j) Equipment, having no functionality specified by 5A002.a.2, 5A002.a.4, 5A002.a.7, or 5A002.a.8, where all cryptographic capability specified by 5A002.a meets any of the following:

1. It cannot be used; or

2. It can only be made useable by means of ''cryptographic activation''.

N.B.: See 5A002.a for equipment that has undergone ''cryptographic activation''.

a. Systems, equipment, application specific ''electronic assemblies'', modules and integrated circuits for ''information security'', as follows, and components therefor specially designed for ''information security'':

N.B.: For the control of Global Navigation Satellite Systems (GNSS) receiving equipment containing or employing decryption, *see* ECCN 7A005.

a.1. Designed or modified to use ''cryptography'' employing digital techniques performing any cryptographic function other than authentication or digital signature and having any of the following:

TECHNICAL NOTES: 1. Authentication and digital signature functions include their associated key management function.

2. Authentication includes all aspects of access control where there is no encryption of files or text except as directly related to the protection of passwords, Personal Identification Numbers (PINs) or similar data to prevent unauthorized access.

3. ''Cryptography'' does not include ''fixed'' data compression or coding techniques.

NOTE: 5A002.a.1 includes equipment designed or modified to use ''cryptography'' employing analog principles when implemented with digital techniques.

a.1.a. A ''symmetric algorithm'' employing a key length in excess of 56-bits; *or*

a.1.b. An ''asymmetric algorithm'' where the security of the algorithm is based on any of the following:

a.1.b.1. Factorization of integers in excess of 512 bits (*e.g.*, RSA);

a.1.b.2. Computation of discrete logarithms in a multiplicative group of a finite field of size greater than 512 bits (*e.g.*, Diffie-Hellman over Z/pZ); *or*

a.1.b.3. Discrete logarithms in a group other than mentioned in 5A002.a.1.b.2 in excess of 112 bits (*e.g.*, Diffie-Hellman over an elliptic curve);

a.2. Designed or modified to perform cryptanalytic functions;

a.3. [Reserved]

a.4. Specially designed or modified to reduce the compromising emanations of information-bearing signals beyond what is necessary for health, safety or electromagnetic interference standards;

a.5. Designed or modified to use cryptographic techniques to generate the spreading code for ''spread spectrum'' systems, not controlled in 5A002.a.6., including the hopping code for ''frequency hopping'' systems;

a.6. Designed or modified to use cryptographic techniques to generate channelizing codes, scrambling codes or network identification codes, for systems using ultra-wideband modulation techniques and having any of the following:

a.6.a. A bandwidth exceeding 500 MHz; *or*

a.6.b. A ''fractional bandwidth'' of 20% or more;

a.7. Non-cryptographic information and communications technology (ICT) security systems and devices evaluated to an assurance level exceeding class EAL–6 (evaluation assurance level) of the Common Criteria (CC) or equivalent;

a.8. Communications cable systems designed or modified using mechanical, electrical or electronic means to detect surreptitious intrusion;

NOTE: *5A002.a.8 applies only to physical layer security*.

a.9. Designed or modified to use 'quantum cryptography.'

TECHNICAL NOTES: 1. 'Quantum cryptography' A family of techniques for the establishment of a shared key for ''cryptography'' by measuring the quantum-mechanical properties of a physical system (including those physical properties explicitly governed by quantum optics, quantum field theory, or quantum electrodynamics).

2. 'Quantum cryptography' is also known as Quantum Key Distribution (QKD).

b. Systems, equipment, application specific ''electronic assemblies'', modules and integrated circuits, designed or modified to enable an item to achieve or exceed the controlled performance levels for functionality specified by 5A002.a that would not otherwise be enabled.

5A992 Equipment not controlled by 5A002.

LICENSE REQUIREMENTS

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. Telecommunications and other information security equipment containing encryption.

b. ''Information security'' equipment, n.e.s., (*e.g.*, cryptographic, cryptanalytic, and cryptologic equipment, n.e.s.) and components therefor.

c. Commodities that BIS has received an encryption registration or that have been classified as mass market encryption commodities in accordance with §742.15(b) of the EAR.

5B002 "Information Security" test, inspection and "production" equipment, as follows (see 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
LVS: N/A
GBS: N/A
CIV: N/A
ENC: Yes for certain EI controlled equipment, see §740.17 of the EAR for eligibility.
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. Equipment specially designed for the ''development'' or ''production'' of equipment controlled by 5A002 or 5B002.b;

b. Measuring equipment specially designed to evaluate and validate the ''information security'' functions of equipment controlled by 5A002 or ''software'' controlled by 5D002.a or 5D002.c.

C. MATERIALS [RESERVED]

D. SOFTWARE

5D002 "Software" as follows (see List of Items Controlled)

LICENSE REQUIREMENTS
Reason for Control: NS, AT, EI

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

EI applies to ''software'' in 5D002.a,.c.1, or .d for equipment controlled for EI reasons in ECCN 5A002. Refer to §742.15 of the EAR.

NOTE: Encryption software is controlled because of its functional capacity, and not because of any informational value of such software; such software is not accorded the same treatment under the EAR as other ''software'; and for export licensing purposes, encryption software is treated under the EAR in the same manner as a commodity included in ECCN 5A002.

NOTE: Encryption source code classified under this entry remains subject to the EAR even when made publicly available in accordance with part 734 of the EAR. However, publicly available encryption object code software classified under ECCN 5D002 is not subject to the EAR when the corresponding source code meets the criteria specified in §740.13(e), *see also* §734.3(b)(3) of the EAR.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
ENC: Yes for certain EI controlled software, see §740.17 of the EAR for eligibility.
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: (1) This entry does not control ''software'' ''required'' for the ''use'' of equipment excluded from control under the Related Controls paragraph or the Technical Notes in ECCN 5A002 or ''software'' providing any of the functions of equipment excluded from control under ECCN 5A002. This software is classified as ECCN 5D992.

(2) After an encryption registration has been submitted to BIS or classification by BIS, mass market encryption software that meet eligibility requirements are released from ''EI'' and ''NS'' controls. This software is classified under ECCN 5D992.c. *See* §742.15(b) of the EAR.
Related Definitions: 5D002.a controls ''software'' designed or modified to use ''cryptography'' employing digital or analog techniques to ensure ''information security'.
Items: a. ''Software'' specially designed or modified for the ''development'', ''production'' or ''use'' of equipment controlled by 5A002 or ''software'' controlled by 5D002.c;

b. ''Software'' specially designed or modified to support ''technology'' controlled by 5E002;

c. Specific ''software'' as follows:

c.1. ''Software'' having the characteristics, or performing or simulating the functions of the equipment, controlled by 5A002;

c.2. ''Software'' to certify ''software'' controlled by 5D002.c.1.

d. ''Software'' designed or modified to enable an item to achieve or exceed the controlled performance levels for functionality

specified by 5A002.a that would not otherwise be enabled.

5D992 "Information Security" "software" not controlled by 5D002.

LICENSE REQUIREMENTS

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: This entry does not control ''software'' designed or modified to protect against malicious computer damage, *e.g.*, viruses, where the use of ''cryptography'' is limited to authentication, digital signature and/or the decryption of data or files.
Related Definitions: N/A
Items:

a. ''Software'' specially designed or modified for the ''development,'' ''production,'' or ''use'' of equipment controlled by ECCN 5A992.a or 5A992.b.

b. ''Software'' having the characteristics, or performing or simulating the functions of the equipment controlled by ECCN 5A992.a or 5A992.b.

c. ''Software'' that BIS has received an encryption registration or that have been classified as mass market encryption software in accordance with §742.15(b) of the EAR.

5E002 "Technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT, EI

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

EI applies to ''technology'' for the ''development,'' ''production,'' or ''use'' of commodities or ''software'' controlled for EI reasons in ECCNs 5A002 or 5D002. Refer to §742.15 of the EAR.

LICENSE REQUIREMENT NOTE: When a person performs or provides technical assistance that incorporates, or otherwise draws upon, ''technology'' that was either obtained in the United States or is of US-origin, then a release of the ''technology'' takes place. Such technical assistance, when rendered with the intent to aid in the ''development'' or ''production'' of encryption commodities or software that would be controlled for ''EI'' reasons under ECCN 5A002 or 5D002, may require authorization under the EAR even if the underlying encryption algorithm to be implemented is from the public domain or is not of U.S. origin.
Related Definitions: N/A

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
ENC: Yes for certain EI controlled technology, see §740.17 of the EAR for eligibility.
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: See also 5E992. This entry does not control ''technology'' ''required'' for the ''use'' of equipment excluded from control under the Related Controls paragraph or the Technical Notes in ECCN 5A002 or ''technology'' related to equipment excluded from control under ECCN 5A002. This ''technology'' is classified as ECCN 5E992.
Items:

a. ''Technology'' according to the General Technology Note for the ''development'', ''production'' or ''use'' of equipment controlled by 5A002 or 5B002 or ''software'' controlled by 5D002.a or 5D002.c.

b. ''Technology'' to enable an item to achieve or exceed the controlled performance levels for functionality specified by 5A002.a that would not otherwise be enabled.

5E992 "Information Security" "technology" according to the General Technology Note, not controlled by 5E002.

LICENSE REQUIREMENTS

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: N/A
Related Definitions: N/A
Items: a. ''Technology'' n.e.s., for the ''development'', ''production'' or ''use'' of equipment controlled by 5A992.a, ''information security''or cryptologic equipment controlled by 5A992.b or ''software'' controlled by 5D992.a or b.

b. ''Technology'', n.e.s., for the ''use'' of mass market commodities controlled by 5A992.c or mass market ''software'' controlled by 5D992.c.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

CATEGORY 6—SENSORS AND LASERS

A. SYSTEMS, EQUIPMENT AND COMPONENTS

6A001 Acoustic systems, equipment and components, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS: $3000; N/A for 6A001.a.1.b.1 object detection and location systems having a transmitting frequency below 5 kHz or a sound pressure level exceeding 210 dB (reference 1 μPa at 1 m) for equipment with an operating frequency in the band from 30 kHz to 2 kHz inclusive; 6A001.a.1.e, 6A001.a.2.a.1, a.2.a.2, 6A001.a.2.a.3, a.2.a.5, a.2.a.6, 6A001.a.2.b; processing equipment controlled by 6A001.a.2.c, and specially designed for real time application with towed acoustic hydrophone arrays; a.2.e.1, a.2.e.2; and bottom or bay cable systems controlled by 6A001.a.2.f and having processing equipment specially designed for real time application with bottom or bay cable systems.

GBS: Yes for 6A001.a.1.b.4.

CIV: Yes for 6A001.a.1.b.4.

STA: License Exception STA may not be used to ship commodities in 6A001.a.1.b, 6A001.a.1.e or 6A001.a.2 (except .a.2.a.4) to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: See also 6A991.

Related Definitions: N/A

Items: a. Marine acoustic systems, equipment and specially designed components therefor, as follows:

a.1. Active (transmitting or transmitting-and-receiving) systems, equipment and specially designed components therefor, as follows:

NOTE: 6A001.a.1 does not control equipment as follows:

a. Depth sounders operating vertically below the apparatus, not including a scanning function exceeding ±20°, and limited to measuring the depth of water, the distance of submerged or buried objects or fish finding;

b. Acoustic beacons, as follows:

1. Acoustic emergency beacons;

2. Pingers specially designed for relocating or returning to an underwater position.

a.1.a. Acoustic seabed survey equipment as follows:

a.1.a.1. Surface vessel survey equipment designed for sea bed topographic mapping and having all of the following:

a.1.a.1.a. Designed to take measurements at an angle exceeding 20° from the vertical;

a.1.a.1.b. Designed to measure seabed topography at seabed depths exceeding 600 m;

a.1.a.1.c. ''Sounding resolution' less than 2; *and*

a.1.a.1.d. 'Enhancement' of the depth accuracy through compensation for all the following:

a.1.a.1.d.1. Motion of the acoustic sensor;

a.1.a.1.d.2. In-water propagation from sensor to the seabed and back; *and*

a.1.a.1.d.3. Sound speed at the sensor;

TECHNICAL NOTES: 1. 'Sounding resolution' is the swath width (degrees) divided by the maximum number of soundings per swath.

2. 'Enhancement' includes the ability to compensate by external means.

a.1.a.2. Underwater survey equipment designed for seabed topographic mapping and having all of the following:

a.1.a.2.a. Designed or modified to operate at depths exceeding 300 m; *and*

a.1.a.2.b. 'Sounding rate' greater than 3,800;

TECHNICAL NOTE:

'Sounding rate' is the product of the maximum speed (m/s) at which the sensor can operate and the maximum number of soundings per swath.

a.1.a.3. Side Scan Sonar (SSS) or Synthetic Aperture Sonar (SAS), designed for seabed imaging and having all of the following:

a.1.a.3.a. Designed or modified to operate at depths exceeding 500 m; *and*

a.1.a.3.b. An 'area coverage rate' of greater than 570 m^2/s while operating with both an 'along track resolution' and 'across track resolution' of less than 15 cm.

TECHNICAL NOTES: 1. 'Area coverage rate' (m^2/s) is twice the product of the maximum sonar range (m) and the maximum speed (m/s) at which the sensor can operate.

2. 'Along track resolution' (cm), for SSS only, is the product of azimuth (horizontal) beamwidth (degrees) and maximum sonar range (m) and 0.873.

3. 'Across track resolution' (cm) is 75 divided by the signal bandwidth (kHz).

a.1.b. Systems or transmitting and receiving arrays, designed for object detection or location, having any of the following:

a.1.b.1. A transmitting frequency below 10 kHz;

a.1.b.2. Sound pressure level exceeding 224dB (reference 1μPa at 1 m) for equipment with an operating frequency in the band from 10 kHz to 24 kHz inclusive;

a.1.b.3. Sound pressure level exceeding 235 dB (reference 1 μPa at 1 m) for equipment with an operating frequency in the band between 24 kHz and 30 kHz;

a.1.b.4. Forming beams of less than 1° on any axis and having an operating frequency of less than 100 kHz;

a.1.b.5. Designed to operate with an unambiguous display range exceeding 5,120 m; *or*

a.1.b.6. Designed to withstand pressure during normal operation at depths exceeding 1,000 m and having transducers with any of the following:

a.1.b.6.a. Dynamic compensation for pressure; *or*

a.1.b.6.b. Incorporating other than lead zirconate titanate as the transduction element;

a.1.c. Acoustic projectors, including transducers, incorporating piezoelectric, magnetostrictive, electrostrictive, electrodynamic or hydraulic elements operating individually or in a designed combination and having any of the following:

NOTES: 1. The control status of acoustic projectors, including transducers, specially designed for other equipment is determined by the control status of the other equipment.

2. 6A001.a.1.c does not control electronic sources that direct the sound vertically only, or mechanical (e.g., air gun or vapor-shock gun) or chemical (e.g., explosive) sources.

a.1.c.1. An instantaneous radiated 'acoustic power density' exceeding 0.01 $mW/mm^2/Hz$ for devices operating at frequencies below 10 kHz;

a.1.c.2. A continuously radiated 'acoustic power density' exceeding 0.001 $mW/mm^2/Hz$ for devices operating at frequencies below 10 kHz; *or*

TECHNICAL NOTE: Acoustic power density' is obtained by dividing the output acoustic power by the product of the area of the radiating surface and the frequency of operation.

a.1.c.3. Side-lobe suppression exceeding 22 dB;

a.1.d. Acoustic systems and equipment, designed to determine the position of surface vessels or underwater vehicles and having all of the following, and specially designed components therefor:

a.1.d.1. Detection range exceeding 1,000 m; and

a.1.d.2. Positioning accuracy of less than 10 m rms (root mean square) when measured at a range of 1,000 m;

NOTE: 6A001.a.1.d includes:

a. Equipment using coherent ''signal processing'' between two or more beacons and the hydrophone unit carried by the surface vessel or underwater vehicle;

b. Equipment capable of automatically correcting speed-of-sound propagation errors for calculation of a point.

a.1.e. Active individual sonars, specially designed or modified to detect, locate and automatically classify swimmers or divers, having all of the following:

a.1.e.1. Detection range exceeding 530 m;

a.1.e.2. Positioning accuracy of less than 15 m rms (root mean square) when measured at a range of 530 m; *and*

a.1.e.3. Transmitted pulse signal bandwidth exceeding 3 kHz;

N.B.: For diver detection systems specially designed or modified for military use, see the U.S. Munitions List in the International Traffic in Arms Regulations (ITAR) (22 CFR part 121).

a.2. Passive systems, equipment and specially designed components therefor, as follows:

a.2.a. Hydrophones having any of the following:

NOTE: The control status of hydrophones specially designed for other equipment is determined by the control status of the other equipment.

TECHNICAL NOTE: *Hydrophones consist of one or more sensing elements producing a single acoustic output channel. Those that contain multiple elements can be referred to as a hydrophone group.*

a.2.a.1. Incorporating continuous flexible sensing elements;

a.2.a.2. Incorporating flexible assemblies of discrete sensing elements with either a diameter or length less than 20 mm and with a separation between elements of less than 20 mm;

a.2.a.3. Having any of the following sensing elements:

a.2.a.3.a. Optical fibers;

a.2.a.3.b. 'Piezoelectric polymer films' other than polyvinylidene-fluoride (PVDF) and its co-polymers {P(VDF-TrFE) and P(VDF-TFE)}; *or*

a.2.a.3.c. 'Flexible piezoelectric composites';

a.2.a.4. A 'hydrophone sensitivity' better than −180dB at any depth with no acceleration compensation;

a.2.a.5. Designed to operate at depths exceeding 35 m with acceleration compensation; *or*

a.2.a.6. Designed for operation at depths exceeding 1,000 m;

TECHNICAL NOTES: 1. 'Piezoelectric polymer film' sensing elements consist of polarized polymer film that is stretched over and attached to a supporting frame or spool (mandrel).

2. 'Flexible piezoelectric composite' sensing elements consist of piezoelectric ceramic particles or fibers combined with an electrically insulating, acoustically transparent rubber, polymer or epoxy compound, where the compound is an integral part of the sensing elements.

3. 'Hydrophone sensitivity' is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydrophone sensor, without a pre-amplifier, is placed in a plane wave acoustic field with an rms pressure of 1 μPa. For example, a hydrophone of −160 dB (reference 1 V per μPa) would yield an output voltage of 10^{-8} *V in such a field, while one of* -180 *dB sensitivity would yield only* 10^{-9} V output. Thus, −160 dB is better than −180 dB.

a.2.b. Towed acoustic hydrophone arrays having any of the following:

TECHNICAL NOTE: *Hydrophone arrays consist of a number of hydrophones providing multiple acoustic output channels.*

a.2.b.1. Hydrophone group spacing of less than 12.5 m or 'able to be modified' to have

hydrophone group spacing of less than 12.5 m;

a.2.b.2. Designed or 'able to be modified' to operate at depths exceeding 35m;

TECHNICAL NOTE: 'Able to be modified' in 6A001.a.2.b means having provisions to allow a change of the wiring or interconnections to alter hydrophone group spacing or operating depth limits. These provisions are: spare wiring exceeding 10% of the number of wires, hydrophone group spacing adjustment blocks or internal depth limiting devices that are adjustable or that control more than one hydrophone group.

a.2.b.3. Heading sensors controlled by 6A001.a.2.d;

a.2.b.4. Longitudinally reinforced array hoses;

a.2.b.5. An assembled array of less than 40 mm in diameter;

a.2.b.6. [Reserved]; *or*

a.2.b.7. Hydrophone characteristics controlled by 6A001.a.2.a;

a.2.c. Processing equipment, specially designed for towed acoustic hydrophone arrays, having ''user accessible programmability'' and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

a.2.d. Heading sensors having all of the following:

a.2.d.1. An accuracy of better than ±0.5°; *and*

a.2.d.2. Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m;

a.2.e. Bottom or bay-cable hydrophone arrays having any of the following:

a.2.e.1. Incorporating hydrophones controlled by 6A001.a.2.a; *or*

a.2.e.2. Incorporating multiplexed hydrophone group signal modules having all of the following characteristics:

a.2.e.2.a. Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m; *and*

a.2.e.2.b. Capable of being operationally interchanged with towed acoustic hydrophone array modules;

a.2.f. Processing equipment, specially designed for bottom or bay cable systems, having ''user accessible programmability'' and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

NOTE: 6A001.a.2 also applies to receiving equipment, whether or not related in normal application to separate active equipment, and specially designed components therefor.

b. Correlation-velocity and Doppler-velocity sonar log equipment designed to measure the horizontal speed of the equipment carrier relative to the sea bed, as follows:

b.1. Correlation-velocity sonar log equipment having any of the following characteristics:

b.1.a. Designed to operate at distances between the carrier and the sea bed exceeding 500 m; *or*

b.1.b. Having speed accuracy better than 1% of speed;

b.2. Doppler-velocity sonar log equipment having speed accuracy better than 1% of speed;

NOTE 1: 6A001.b does not apply to depth sounders limited to any of the following:

a. Measuring the depth of water;

b. Measuring the distance of submerged or buried objects; or

c. Fish finding.

NOTE 2: 6A001.b. does not apply to equipment specially designed for installation on surface vessels.

c. [Reserved]

N.B.: For diver deterrent acoustic systems, see 8A002.r.

6A002 Optical sensors or equipment and components therefore, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, CC, RS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
MT applies to optical detectors in 6A002.a.1, or a.3 that are specially designed or modified to protect ''missiles'' against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects), and usable for ''missiles''.	MT Column 1.
RS applies to 6A002.a.1, a.2, a.3 (except a.3.d.2.a and a.3.e for lead selenide based focal plane arrays (FPAs)), and .c.	RS Column 1.
CC applies to police-model infrared viewers in 6A002.c.	CC Column 1.
AT applies to entire entry	AT Column 1.
UN applies to 6A002.a.1, a.2, a.3 and c.	See §746.1(b) for UN controls.

LICENSE REQUIREMENT NOTES: *See §743.1 of the EAR for reporting requirements for exports under License Exceptions.*

LICENSE EXCEPTIONS

LVS: $3,000; except N/A for MT and for 6A002.a.1, a.2, a.3, and .c.

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship to any of the eight destinations listed in §740.20(c)(2) of the EAR any commodity in: 6A002.a.1.a, a.1.b or a.1.c; 6A002.a.3.c, a.3.d, a.3.e, or a.3.f; or 6A002.b.

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: The following commodities are subject to the export licensing authority of U.S. Department of State, Directorate of Defense Trade Controls (22 CFR

part 121): 1.) ''Image intensifiers'' defined in 6A002.a.2 and ''focal plane arrays'' defined in 6A002.a.3 specially designed, modified, or configured for military use and not part of civil equipment; 2.) ''Space qualified'' solid-state detectors defined in 6A002.a.1, ''space qualified'' imaging sensors (*e.g.*, ''monospectral imaging sensors'' and ''multispectral imaging sensors'') defined in 6A002.b.2.b.1, and ''space qualified'' cryocoolers defined in 6A002.d.1, unless, on or after September 23, 2002, the Department of State issues a commodity jurisdiction determination assigning the export licensing authority to the Department of Commerce, Bureau of Industry and Security. See also 6A102, 6A202, and 6A992

NOTE: Exporters may apply for a commodity jurisdiction request with the Department of State, Directorate of Defense Trade Controls for ''space qualified'' solid-state detectors defined in 6A002.a.1 and imaging sensors (*e.g.*, ''monospectral imaging sensors'' and ''multispectral imaging sensors'') defined in 6A002.b.2.b.1 that may have predominant civil application(s).

Related Definitions: N/A

Items: a. Optical detectors, as follows:

a. Optical detectors as follows:

a.1. ''Space-qualified'' solid-state detectors as follows:

NOTE: *For the purpose of 6A002.a.1, solid-state detectors include ''focal plane arrays''.*

a.1.a. ''Space-qualified'' solid-state detectors having all of the following:

a.1.a.1. A peak response in the wavelength range exceeding 10 nm but not exceeding 300 nm; *and*

a.1.a.2. A response of less than 0.1% relative to the peak response at a wavelength exceeding 400 nm;

a.1.b. ''Space-qualified'' solid-state detectors having all of the following:

a.1.b.1. A peak response in the wavelength range exceeding 900 nm but not exceeding 1,200 nm; *and*

a.1.b.2. A response ''time constant'' of 95 ns or less;

a.1.c. ''Space-qualified'' solid-state detectors having a peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;

a.1.d. ''Space-qualified'' ''focal plane arrays'' having more than 2,048 elements per array and having a peak response in the wavelength range exceeding 300 nm but not exceeding 900 nm;

a.2. Image intensifier tubes and specially designed components therefor, as follows:

NOTE: *6A002.a.2 does not control non-imaging photomultiplier tubes having an electron sensing device in the vacuum space limited solely to any of the following:*

a. A single metal anode; or

b. Metal anodes with a center to center spacing greater than 500 μm.

TECHNICAL NOTE: *'Charge multiplication' is a form of electronic image amplification and is defined as the generation of charge carriers as a result of an impact ionization gain process. 'Charge multiplication' sensors may take the form of an image intensifier tube, solid state detector or ''focal plane array''.*

a.2.a. Image intensifier tubes having all of the following:

a.2.a.1. A peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm;

a.2.a.2. Electron image amplification using any of the following:

a.2.a.2.a. A microchannel plate with a hole pitch (center-to-center spacing) of 12 μm or less; *or*

a.2.a.2.b. An electron sensing device with a non-binned pixel pitch of 500 μm or less, specially designed or modified to achieve 'charge multiplication' other than by a microchannel plate; *and*

a.2.a.3. Any of the following photocathodes:

a.2.a.3.a. Multialkali photocathodes (e.g., S–20 and S–25) having a luminous sensitivity exceeding 350 μA/lm;

a.2.a.3.b. GaAs or GaInAs photocathodes; *or*

a.2.a.3.c. Other ''III–V compound'' semiconductor photocathodes having a maximum ''radiant sensitivity'' exceeding 10 mA/W;

a.2.b. Image intensifier tubes having all of the following:

a.2.b.1. A peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,800 nm;

a.2.b.2. Electron image amplification using any of the following:

a.2.b.2.a. A microchannel plate with a hole pitch (center-to-center spacing) of 12 μm or less; *or*

a.2.b.2.b. An electron sensing device with a non-binned pixel pitch of 500 μm or less, specially designed or modified to achieve 'charge multiplication' other than by a microchannel plate; *and*

a.2.b.3. ''III/V compound'' semiconductor (e.g., GaAs or GaInAs) photocathodes and transferred electron photocathodes, having a maximum ''radiant sensitivity'' exceeding 15 mA/W;

a.2.c. Specially designed components as follows:

a.2.c.1. Microchannel plates having a hole pitch (center-to-center spacing) of 12 μm or less;

a.2.c.2. An electron sensing device with a non-binned pixel pitch of 500 μm or less, specially designed or modified to achieve 'charge multiplication' other than by a microchannel plate;

a.2.c.3. ''III–V compound'' semiconductor (e.g., GaAs or GaInAs) photocathodes and transferred electron photocathodes;

NOTE: *6A002.a.2.c.3 does not control compound semiconductor photocathodes designed to*

achieve a maximum ''radiant sensitivity'' of any of the following:

a. 10 mA/W or less at the peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm; or

b. 15 mA/W or less at the peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,800 nm.

a.3. Non-''space-qualified'' ''focal plane arrays'' as follows:

N.B.: *'Microbolometer' non-''space-qualified'' ''focal plane arrays'' are only specified by 6A002.a.3.f.*

TECHNICAL NOTE: *Linear or two-dimensional multi-element detector arrays are referred to as ''focal plane arrays'';*

NOTE 1: *6A002.a.3 includes photoconductive arrays and photovoltaic arrays.*

NOTE 2: *6A002.a.3 does not control:*

a. Multi-element (not to exceed 16 elements) encapsulated photoconductive cells using either lead sulphide or lead selenide;

b. Pyroelectric detectors using any of the following:

b.1. Triglycine sulphate and variants;

b.2. Lead-lanthanum-zirconium titanate and variants;

b.3. Lithium tantalate;

b.4. Polyvinylidene fluoride and variants; or

b.5. Strontium barium niobate and variants.

c. ''Focal plane arrays'' specially designed or modified to achieve 'charge multiplication' and limited by design to have a maximum ''radiant sensitivity'' of 10 mA/W or less for wavelengths exceeding 760 nm, having all of the following:

c.1. Incorporating a response limiting mechanism designed not to be removed or modified; and

c.2. Any of the following:

c.2.a. The response limiting mechanism is integral to or combined with the detector element; or

c.2.b. The ''focal plane array'' is only operable with the response limiting mechanism in place.

TECHNICAL NOTE: *A response limiting mechanism integral to the detector element is designed not to be removed or modified without rendering the detector inoperable.*

a.3.a. Non-''space-qualified'' ''focal plane arrays'' having all of the following:

a.3.a.1. Individual elements with a peak response within the wavelength range exceeding 900 nm but not exceeding 1,050 nm; *and*

a.3.a.2. Any of the following:

a.3.a.2.a. A response ''time constant'' of less than 0.5 ns; *or*

a.3.a.2.b. Specially designed or modified to achieve 'charge multiplication' and having a maximum ''radiant sensitivity'' exceeding 10 mA/W.

a.3.b. Non-''space-qualified'' ''focal plane arrays'' having all of the following:

a.3.b.1. Individual elements with a peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,200 nm; *and*

a.3.b.2. Any of the following:

a.3.b.2.a. A response ''time constant'' of 95 ns or less; *or*

a.3.b.2.b. Specially designed or modified to achieve 'charge multiplication' and having a maximum ''radiant sensitivity'' exceeding 10 mA/W.

a.3.c. Non-''space-qualified'' non-linear (2-dimensional) ''focal plane arrays'' having individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;

N.B.: *Silicon and other material based 'microbolometer' non-''space-qualified'' ''focal plane arrays'' are only specified by 6A002.a.3.f.*

a.3.d. Non-''space-qualified'' linear (1-dimensional) ''focal plane arrays'' having all of the following:

a.3.d.1. Individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 3,000 nm; *and*

a.3.d.2. Any of the following:

a.3.d.2.a. A ratio of 'scan direction' dimension of the detector element to the 'cross-scan direction' dimension of the detector element of less than 3.8; *or*

a.3.d.2.b. Signal PRocessing In The Element (SPRITE);

NOTE: *6A002.a.3.d does not control ''focal plane arrays'' (not to exceed 32 elements) having detector elements limited solely to germanium material.*

TECHNICAL NOTE: *For the purposes of 6A002.a.3.d, 'cross-scan direction' is defined as the axis parallel to the linear array of detector elements and the 'scan direction' is defined as the axis perpendicular to the linear array of detector elements.*

a.3.e. Non-''space-qualified'' linear (1-dimensional) ''focal plane arrays'' having individual elements with a peak response in the wavelength range exceeding 3,000 nm but not exceeding 30,000 nm;

a.3.f. Non-''space-qualified'' non-linear (2-dimensional) infrared ''focal plane arrays'' based on 'microbolometer' material having individual elements with an unfiltered response in the wavelength range equal to or exceeding 8,000 nm but not exceeding 14,000 nm;

TECHNICAL NOTE: *For the purposes of 6A002.a.3.f, 'microbolometer' is defined as a thermal imaging detector that, as a result of a temperature change in the detector caused by the absorption of infrared radiation, is used to generate any usable signal.*

a.3.g. Non-''space-qualified'' ''focal plane arrays'' having all of the following:

a.3.g.1. Individual detector elements with a peak response in the wavelength range exceeding 400 nm but not exceeding 900 nm;

a.3.g.2. Specially designed or modified to achieve 'charge multiplication' and having a maximum ''radiant sensitivity'' exceeding 10 mA/W for wavelengths exceeding 760 nm; *and*

a.3.g.3. Greater than 32 elements.

b. ''Monospectral imaging sensors'' and ''multispectral imaging sensors'', designed

for remote sensing applications and having any of the following:

b.1. An Instantaneous-Field-Of-View (IFOV) of less than 200 μrad (microradians); *or*

b.2. Specified for operation in the wavelength range exceeding 400 nm but not exceeding 30,000 nm and having all the following:

b.2.a. Providing output imaging data in digital format; *and*

b.2.b. Having any of the following characteristics:

b.2.b.1. ''Space-qualified''; *or*

b.2.b.2. Designed for airborne operation, using other than silicon detectors, and having an IFOV of less than 2.5 mrad (milliradians);

NOTE: *6A002.b.1 does not control ''monospectral imaging sensors'' with a peak response in the wavelength range exceeding 300 nm but not exceeding 900 nm and only incorporating any of the following non-''space-qualified'' detectors or non-''space-qualified'' ''focal plane arrays'':*

a. Charge Coupled Devices (CCD) not designed or modified to achieve 'charge multiplication'; or

b. Complementary Metal Oxide Semiconductor (CMOS) devices not designed or modified to achieve 'charge multiplication'.

c. 'Direct view' imaging equipment incorporating any of the following:

c.1. Image intensifier tubes having the characteristics listed in 6A002.a.2.a or 6A002.a.2.b;

c.2. ''Focal plane arrays'' having the characteristics listed in 6A002.a.3; *or*

c.3. Solid state detectors specified by 6A002.a.1.

TECHNICAL NOTE: *'Direct view' refers to imaging equipment that presents a visual image to a human observer without converting the image into an electronic signal for television display, and that cannot record or store the image photographically, electronically or by any other means.*

NOTE: *6A002.c does not control equipment as follows, when incorporating other than GaAs or GaInAs photocathodes:*

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

b. Medical equipment;

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

d. Flame detectors for industrial furnaces;

e. Equipment specially designed for laboratory use.

d. Special support components for optical sensors, as follows:

d.1. ''Space-qualified'' cryocoolers;

d.2. Non-''space-qualified'' cryocoolers having a cooling source temperature below 218K (−55 °C), as follows:

d.2.a. Closed cycle type with a specified Mean-Time-To-Failure (MTTF) or Mean-Time-Between-Failures (MTBF), exceeding 2,500 hours;

d.2.b. Joule-Thomson (JT) self-regulating minicoolers having bore (outside) diameters of less than 8 mm;

d.3. Optical sensing fibers specially fabricated either compositionally or structurally, or modified by coating, to be acoustically, thermally, inertially, electromagnetically or nuclear radiation sensitive.

NOTE: *6A002.d.3 does not apply to encapsulated optical sensing fibers specially designed for bore hole sensing applications.*

6A003 Cameras, systems or equipment, and components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, NP, RS, AT, UN

Control(s)	*Country chart*
NS applies to entire entry	NS Column 2.
NP applies to items controlled in paragraphs 6A003.a.2, a.3 and a.4.	NP Column 1.
RS applies to 6A003.b.3, 6A003.b.4.a, 6A003.b.4.c and to items controlled in 6A003.b.4.b that have a frame rate greater than 60 Hz or that incorporate a focal plane array with more than 111,000 elements, or to items in 6A003.b.4.b when being exported or reexported to be embedded in a civil product. (But see §742.6(a)(2)(iii) and (v) for certain exemptions).	RS Column 1.
RS applies to items controlled in 6A003.b.4.b that have a frame rate of 60 Hz or less and that incorporate a focal plane array with not more than 111,000 elements if not being exported or reexported to be embedded in a civil product.	RS Column 2.
RS applies to 6A003.b.4.b	A license is required to export or reexport these items to Hong Kong. This license requirement does not appear in the Commerce Country Chart.
AT applies to entire entry	AT Column 1.
UN applies to items controlled in 6A003.b.3 and b.4..	See §746.1(b) for UN controls.

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

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.

STA: License Exception STA may not be used to ship any commodity in 6A003.b.3 or b.4 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Number.

Related Controls: (1) See ECCNs 6E001 (''development''), 6E002 (''production''), and 6E201 (''use'') for technology for items controlled under this entry. (2) Also see ECCN 6A203. (3) See ECCN 8A002.d.1 and .e for television and film-based photographic still cameras specially designed or modified for underwater use. (4) See ECCN 0A919 for foreign made military commodities that incorporate cameras described in 6A003.b.3, 6A003.b.4.b, or 6A003.b.4.c. (5) Section 744.9 imposes license requirements on cameras described in 6A003.b.3, 6A003.b.4.b, or 6A003.b.4.c if being exported for incorporation into an item controlled by ECCN 0A919 or for a military end-user.

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 1µs 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 by 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 a peak response in the wavelength range exceeding 10 nm, but not exceeding 30,000 nm and having all of the following:

b.1.a. Having any of the following:

b.1.a.1. More than 4×10^6 ''active pixels'' per solid state array for monochrome (black and white) cameras;

b.1.a.2. More than 4×10^6 ''active pixels'' per solid state array for color cameras incorporating three solid state arrays; *or*

b.1.a.3. More than 12×10^6 ''active pixels'' for solid state array color cameras incorporating one solid state array; *and*

b.1.b. Having any of the following:

b.1.b.1. Optical mirrors controlled by 6A004.a.;

b.1.b.2. Optical control equipment controlled by 6A004.d.; *or*

b.1.b.3. The capability for annotating internally generated 'camera tracking data';

TECHNICAL NOTES: *1. For the purposes of this entry, digital video cameras should be evaluated by the maximum number of ''active pixels'' used for capturing moving images.*

2. For the purpose of this entry, 'camera tracking data' is the information necessary to define camera line of sight orientation with respect to the earth. This includes: 1) the horizontal angle the camera line of sight makes with respect to the earth's magnetic field direction and; 2) the vertical angle between the camera line of sight and the earth's horizon.

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

b.2.a. A peak response in the wavelength range exceeding 10 nm, but not exceeding 30,000 nm;

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

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

NOTE: *6A003.b.2 does not apply to scanning cameras and scanning camera systems, specially designed for any of the following:*

a. Industrial or civilian photocopiers;

b. Image scanners specially designed for civil, stationary, close proximity scanning applications (e.g., reproduction of images or print contained in documents, artwork or photographs); or

c. Medical equipment.

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

b.4. Imaging cameras incorporating ''focal plane arrays'' having any of the following:

b.4.a. Incorporating ''focal plane arrays'' controlled by 6A002.a.3.a to 6A002.a.3.e;

b.4.b. Incorporating ''focal plane arrays'' controlled by 6A002.a.3.f; *or*

b.4.c. Incorporating ''focal plane arrays'' controlled by 6A002.a.3.g;

NOTE 1: *Imaging cameras described in 6A003.b.4 include ''focal plane arrays'' combined with sufficient ''signal processing'' electronics, beyond the read out integrated circuit, to enable*

as a minimum the output of an analog or digital signal once power is supplied.

NOTE 2: *6A003.b.4.a does not control imaging cameras incorporating linear ''focal plane arrays'' with 12 elements or fewer, not employing time-delay-and-integration within the element and 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.

NOTE 3: *6A003.b.4.b does not control imaging cameras having any of the following:*

a. A maximum frame rate equal to or less than 9 Hz;

b. Having all of the following:

1. Having a minimum horizontal or vertical 'Instantaneous-Field-of-View (IFOV)' of at least 10 mrad/pixel (milliradians/pixel);

2. Incorporating a fixed focal-length lens that is not designed to be removed;

3. Not incorporating a 'direct view' display; and

TECHNICAL NOTE: *'Direct view' refers to an imaging camera operating in the infrared spectrum that presents a visual image to a human observer using a near-to-eye micro display incorporating any light-security mechanism.*

4. Having any of the following:

a. No facility to obtain a viewable image of the detected field-of-view; or

b. The camera is designed for a single kind of application and designed not to be user modified; or

TECHNICAL NOTE: *'Instantaneous Field of View (IFOV)' specified in Note 3.b is the lesser figure of the 'Horizontal FOV' or the 'Vertical FOV'.*

'Horizontal IFOV' = horizontal Field of View (FOV)/number of horizontal detector elements

'Vertical IFOV'= vertical Field of View (FOV)/number of vertical detector elements.

c. The camera is specially designed for installation into a civilian passenger land vehicle of less than 3 tonnes (gross vehicle weight) and having all of the following:

1. Is operable only when installed in any of the following:

a. The civilian passenger land vehicle for which it was intended; or

b. A specially designed, authorized maintenance test facility; and

2. Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended.

NOTE: *When necessary, details of the items will be provided, upon request, to the Bureau of Industry and Security in order to ascertain compliance with the conditions described in Note 3.b.4 and Note 3.c in this Note to 6A003.b.4.b.*

NOTE 4: *6A003.b.4.c does not apply to 'imaging cameras' having any of the following characteristics:*

a. Having all of the following:

1. Where the camera is specially designed for installation as an integrated component into indoor and wall-plug-operated systems or equipment, limited by design for a single kind of application, as follows:

a. Industrial process monitoring, quality control, or analysis of the properties of materials;

b. Laboratory equipment specially designed for scientific research;

c. Medical equipment;

d. Financial fraud detection equipment; and

2. Is only operable when installed in any of the following:

a. The system(s) or equipment for which it was intended; or

b. A specially designed, authorized maintenance facility; and

3. Incorporates an active mechanism that forces the camera not to function when it is removed from the system(s) or equipment for which it was intended;

b. Where the camera is specially designed for installation into a civilian passenger land vehicle of less than 3 tonnes (gross vehicle weight), or passenger and vehicle ferries having a length overall (LOA) 65 m or greater, and having all of the following:

1. Is only operable when installed in any of the following:

a. The civilian passenger land vehicle or passenger and vehicle ferry for which it was intended; or

b. A specially designed, authorized maintenance test facility; and

2. Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended;

c. Limited by design to have a maximum ''radiant sensitivity'' of 10 mA/W or less for wavelengths exceeding 760 nm, having all of the following:

1. Incorporating a response limiting mechanism designed not to be removed or modified; and

2. Incorporates an active mechanism that forces the camera not to function when the response limiting mechanism is removed; and

3. Not specially designed or modified for underwater use; or

d. Having all of the following:

1. Not incorporating a 'direct view' or electronic image display;

2. Has no facility to output a viewable image of the detected field of view;

3. The ''focal plane array'' is only operable when installed in the camera for which it was intended; and

4. The ''focal plane array'' incorporates an active mechanism that forces it to be permanently inoperable when removed from the camera for which it was intended.

NOTE: *When necessary, details of the item will be provided, upon request, to the Bureau of Industry and Security in order to ascertain compliance with the conditions described in Note 4 above.*

b.5. Imaging cameras incorporating solid-state detectors specified by 6A002.a.1.

6A004 Optical equipment and components, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
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.

LICENSE EXCEPTIONS

LVS: $3000

GBS: Yes for 6A004.a.1, a.2, a.4, b, d.2, and d.4

CIV: Yes for 6A004.a.1, a.2, a.4, b, d.2, and d.4

STA: Paragraph (c)(2) of License Exception STA may not be used to ship any commodity in 6A004.c or .d to any of the eight destinations in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: (1) For optical mirrors or 'aspheric optical elements' specially designed for lithography equipment, see ECCN 3B001. (2) ''Space qualified'' components for optical systems defined in 6A004.c and optical control equipment defined in 6A004.d.1 are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121). (3) See also 6A994.

Related Definitions: An 'aspheric optical element' is any element used in an optical system whose imaging surface or surfaces are designed to depart from the shape of an ideal sphere.

Items: a. Optical mirrors (reflectors) as follows:

a.1. ''Deformable mirrors'' having either continuous or multi-element surfaces, and specially designed components therefor, capable of dynamically repositioning portions of the surface of the mirror at rates exceeding 100 Hz;

a.2. Lightweight monolithic mirrors having an average ''equivalent density'' of less than 30 kg/m^2 and a total mass exceeding 10 kg;

a.3. Lightweight ''composite'' or foam mirror structures having an average ''equivalent density'' of less than 30 kg/m^2 and a total mass exceeding 2 kg;

a.4. Beam steering mirrors more than 100 mm in diameter or length of major axis, that maintain a flatness of $\lambda/2$ or better (λ is equal to 633 nm) having a control bandwidth exceeding 100 Hz;

b. Optical components made from zinc selenide (ZnSe) or zinc sulphide (ZnS) with transmission in the wavelength range exceeding 3,000 nm but not exceeding 25,000 nm and having any of the following:

b.1. Exceeding 100 cm^3 in volume; *or*

b.2. Exceeding 80 mm in diameter or length of major axis and 20 mm in thickness (depth);

c. ''Space-qualified'' components for optical systems, as follows:

c.1. Components lightweighted to less than 20% ''equivalent density'' compared with a solid blank of the same aperture and thickness;

c.2. Raw substrates, processed substrates having surface coatings (single-layer or multi-layer, metallic or dielectric, conducting, semiconducting or insulating) or having protective films;

c.3. Segments or assemblies of mirrors designed to be assembled in space into an optical system with a collecting aperture equivalent to or larger than a single optic 1 m in diameter;

c.4. Components manufactured from ''composite'' materials having a coefficient of linear thermal expansion equal to or less than 5×10^{-6} in any coordinate direction;

d. Optical control equipment as follows:

d.1. Equipment specially designed to maintain the surface figure or orientation of the ''space-qualified'' components controlled by 6A004.c.1 or 6A004.c.3;

d.2. Equipment having steering, tracking, stabilization or resonator alignment bandwidths equal to or more than 100 Hz and an accuracy of 10 μrad (microradians) or less;

d.3. Gimbals having all of the following:

d.3.a. A maximum slew exceeding 5°;

d.3.b. A bandwidth of 100 Hz or more;

d.3.c. Angular pointing errors of 200 μrad (microradians) or less; and

d.3.d. Having any of the following:

d.3.d.1. Exceeding 0.15 m but not exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 2 rad (radians)/s^2; or

d.3.d.2. Exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 0.5 rad (radians)/s^2;

d.4. Specially designed to maintain the alignment of phased array or phased segment mirror systems consisting of mirrors with a segment diameter or major axis length of 1 m or more;

e. 'Aspheric optical elements' having all of the following:

e.1. Largest dimension of the optical-aperture greater than 400 mm;

e.2. Surface roughness less than 1 nm (rms) for sampling lengths equal to or greater than 1 mm; *and*

e.3. Coefficient of linear thermal expansion's absolute magnitude less than 3×10^{-6}/K at 25 °C.

TECHNICAL NOTE:

1. [See Related Definitions section of this ECCN]

2. Manufacturers are not required to measure the surface roughness listed in 6A004.e.2 unless the optical element was designed or manufactured with the intent to meet, or exceed, the control parameter.

NOTE: 6A004.e does not control 'aspheric optical elements' having any of the following:

a. Largest optical-aperture dimension less than 1 m and focal length to aperture ratio equal to or greater than 4.5:1;

b. Largest optical-aperture dimension equal to or greater than 1 m and focal length to aperture ratio equal to or greater than 7:1;

c. Designed as Fresnel, flyeye, stripe, prism or diffractive optical elements;

d. Fabricated from borosilicate glass having a coefficient of linear thermal expansion greater than $2.5 \times 10^{-6/K}$ at 25 °C; or

e. An x-ray optical element having inner mirror capabilities (e.g., tube-type mirrors).

6A005 "Lasers" (other than those described in 0B001.g.5 or .h.6), components and optical equipment, 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 "lasers" controlled by 6A005.a.2, b.2.b, b.3.a, b.4.b, b.6.b., c.1.b, c.2.b, d.3.c, and d.4.c, as described in the following License Requirements Note.	NP Column 1.
AT applies to entire entry	AT Column 1.

LICENSE REQUIREMENTS NOTE: NP controls apply to the following "lasers" controlled by 6A005:

(a) Pulsed excimer "lasers" controlled by 6A005.d.4.c having all of the following characteristics:

(1) Operating at wavelengths between 240 and 360 nm;

(2) A repetition rate > 250 Hz; and

(3) An average output power > 500 W;

(b) Copper vapor "lasers" controlled by 6A005.b.4.b having all of the following characteristics:

(1) Operating at wavelengths between 500 and 600 nm; and

(2) An average output power ≥ 40 W;

(c) Pulsed carbon dioxide "lasers" controlled by 6A005.d.3.c (except industrial CO_2 lasers used in applications such as cutting and welding), having all of the following characteristics:

(1) Operating at wavelengths between 9,000 and 11,000 nm;

(2)A repetition rate > 250 Hz;

(3) An average output power > 2.5kW; and

(4) A pulse width < 200ns;

(d) Argon ion "lasers" controlled by 6A005.a.2 having all of the following characteristics:

(1) Operating at wavelengths between 400 and 515 nm; and

(2) An average output power ≥ 50 W;

(e) Alexandrite "lasers" controlled by 6A005.c.2.b having all of the following characteristics:

(1) Operating at wavelengths between 720 and 800 nm;

(2) A bandwidth ≤ 0.005 nm;

(3) A repetition rate > 125 Hz; and

(4) Average output power > 30 W;

(f) Pulse-excited, Q-switched neodymium-doped (other than glass) "lasers" controlled by 6A005.b.6.b having all of the following characteristics:

(1) An output wavelength exceeding 1,000 nm, but not exceeding 1,100 nm;

(2) A pulse duration equal to or more than 1 ns; and

(3) A single-transverse mode output having an average power exceeding 40 W or a multiple-transverse mode output having an average power exceeding 50 W;

(g) Neodymium-doped (other than glass) "lasers" controlled by 6A005.a.4, b.2, b.3, b.4, having all of the following characteristics:

(1) Incorporating frequency doubling for output wavelength between 500 and 550 nm; and

(2) Average output power > 40 W;

(h) Tunable pulsed single-mode dye laser oscillators controlled by 6A005.c.1.b or 6A005.c.2.b having all of the following characteristics:

(1) Operating at wavelengths between 300 nm and 800 nm;

(2) An average output power greater than 1 W;

(3) A repetition rate greater than 1 kHz; and

(4) Pulse width less than 100 ns;

(i) Tunable pulsed dye laser amplifiers and oscillators controlled by 6A005.c.1.b or 6A005.c.2.b having all of the following characteristics:

(1) Operating at wavelengths between 300 nm and 800 nm;

(2) An average output power greater than 30 W;

(3) A repetition rate greater than 1 kHz; and

(4) Pulse width less than 100 ns;

NOTE: NP controls do not apply to single mode oscillators.

LICENSE EXCEPTIONS

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

GBS: Neodymium-doped (other than glass) "lasers" controlled by 6A005.b.6.c.2 (except

6A005.b.6.c.2.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 2kW, and operate in a pulse-excited, non-''Q-switched'' multiple-transverse mode, or in a continuously excited, multiple-transverse mode; Dye and Liquid Lasers controlled by 6A005.c.1, c.2 and c.3, except for 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; CO ''lasers'' controlled by 6A005.d.2 having a CW maximum rated single or multimode output power not exceeding 10 kW; CO_2 or CO/CO_2 ''lasers'' controlled by 6A005.d.3 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_2 ''lasers'' controlled by 6A005.d.3 that operate in CW multiple-transverse mode, and having a CW output power not exceeding 15kW; and 6A005.f.1.

CIV: Neodymium-doped (other than glass) ''lasers'' controlled by 6A005.b.6.c.2 (except 6A005.b.6.c.2.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 2kW, and operate in a pulse-excited, non-''Q-switched'' multiple-transverse mode, or in a continuously excited, multiple-transverse mode; Dye and Liquid Lasers controlled by 6A005.c.1, c.2 and c.3, except for 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; CO ''lasers'' controlled by 6A005.d.2 having a CW maximum rated single or multimode output power not exceeding 10 kW; CO_2 or CO/CO_2 ''lasers'' controlled by 6A005.d.3 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_2 ''lasers'' controlled by 6A005.d.3 that operate in CW multiple-transverse mode, and having a CW output power not exceeding 15kW; and 6A005.f.1.

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: (1) See ECCN 6D001 for ''software'' for items controlled under this entry. (2) See ECCNs 6E001 (''development''), 6E002 (''production''), and 6E201 (''use'') for technology for items controlled under this entry. (3) Also see ECCNs 6A205 and 6A995. (4) See ECCN 3B001 for excimer ''lasers'' specially designed for lithography equipment. (5) ''Lasers'' specially designed or prepared for use in isotope separation are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (6) Shared aperture optical elements, capable of operating in ''super-high power laser'' applications, and ''lasers'' specifically designed, modified, or configured for military application are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

Related Definitions: 'Wall-plug efficiency' is defined as the ratio of laser output power (or ''average output power'') to total electrical input power required to operate the ''laser'', including the power supply/conditioning and thermal conditioning/heat exchanger.

Items:

NOTE:

1. Pulsed ''lasers'' include those that run in a continuous wave (CW) mode with pulses superimposed.

2. Eximer, semiconductor, chemical, CO, CO_2, and non-repetitive pulsed Nd:glass ''lasers'' are only specified by 6A005.d.

3. 6A005 includes fiber ''lasers''.

4. The control status of ''lasers'' incorporating frequency conversion (i.e., wavelength change) by means other than one ''laser'' pumping another ''laser'' is determined by applying the control parameters for both the output of the source ''laser'' and the frequency-converted optical output.

5. 6A005 does not control ''lasers'' as follows:

a. Ruby with output energy below 20 J;

b. Nitrogen;

c. Krypton.

a. Non-''tunable'' continuous wave ''(CW) lasers'' having any of the following:

a.1. Output wavelength less than 150 nm and output power exceeding 1W;

a.2. Output wavelength of 150 nm or more but not exceeding 520 nm and output power exceeding 30 W;

NOTE: 6A005.a.2 does not control Argon ''lasers'' having an output power equal to or less than 50 W.

a.3. Output wavelength exceeding 520 nm but not exceeding 540 nm and any of the following:

a.3.a. Single transverse mode output and output power exceeding 50 W; or

a.3.b. Multiple transverse mode output and output power exceeding 150 W;

a.4. Output wavelength exceeding 540 nm but not exceeding 800 nm and output power exceeding 30 W;

a.5. Output wavelength exceeding 800 nm but not exceeding 975 nm and any of the following:

a.5.a. Single transverse mode output and output power exceeding 50 W; or

a.5.b. Multiple transverse mode output and output power exceeding 80 W;

a.6. Output wavelength exceeding 975 nm but not exceeding 1,150 nm and any of the following;

a.6.a. Single transverse mode output and any of the following:

a.6.a.1. 'Wall-plug efficiency' exceeding 12% and output power exceeding 100 W; or

a.6.a.2. Output power exceeding 150 W; or

a.6.b. Multiple transverse mode output and any of the following:

a.6.b.1. 'Wall-plug efficiency' exceeding 18% and output power exceeding 500 W;

or

a.6.b.2. Output power exceeding 2 kW;

NOTE: 6A005.a.6.b does not control multiple transverse mode, industrial ''lasers'' with output power exceeding 2kW and not exceeding 6 kW with a total mass greater than 1,200 kg. For the purpose of this note, total mass includes all components required to operate the ''laser'', e.g., ''laser'', power supply, heat exchanger, but excludes external optics for beam conditioning and/or delivery.

a.7. Output wavelength exceeding 1,150 nm but not exceeding 1,555 nm and any of the following:

a.7.a. Single transverse mode and output power exceeding 50 W; or

a.7.b. Multiple transverse mode and output power exceeding 80 W; or

a.8. Output wavelength exceeding 1,555 nm and output power exceeding 1 W;

b. Non-''tunable'' ''pulsed lasers'' having any of the following;

b.1. Output wavelength less than 150 nm and any of the following:

b.1.a. Output energy exceeding 50 mJ per pulse and ''peak power'' exceeding 1 W; or

b.1.b. ''Average output power'' exceeding 1 W;

b.2. Output wavelength of 150 nm or more but not exceeding 520 nm and any of the following:

b.2.a. Output energy exceeding 1.5 J per pulse and ''peak power'' exceeding 30 W; or

b.2.b. ''Average output power'' exceeding 30 W;

NOTE: 6A005.b.2.b does not control Argon ''lasers'' having an ''average output power'' equal to or less than 50 W.

b.3. Output wavelength exceeding 520 nm, but not exceeding 540 nm and any of the following:

b.3.a. Single transverse mode output and any of the following:

b.3.a.1. Output energy exceeding 1.5 J per pulse and ''peak power'' exceeding 50 W; *or*

b.3.a.2. ''Average output power'' exceeding 50 W; *or*

b.3.b. Multiple transverse mode output and any of the following:

b.3.b.1. Output energy exceeding 1.5 J per pulse and ''peak power'' exceeding 150 W;

or

b.3.b.2. ''Average output power'' exceeding 150 W;

b.4. Output wavelength exceeding 540 nm but not exceeding 800 nm and any of the following:

b.4.a. Output energy exceeding 1.5 J per pulse and ''peak power'' exceeding 30 W; or

b.4.b. ''Average output power'' exceeding 30 W;

b.5. Output wavelength exceeding 800 nm but not exceeding 975 nm and any of the following:

b.5.a. ''Pulse duration'' not exceeding 1 μs and any of the following:

b.5.a.1. Output energy exceeding 0.5 J per pulse and ''peak power'' exceeding 50 W;

b.5.a.2. Single transverse mode output and ''average output power'' exceeding 20 W;

or

b.5.a.3. Multiple transverse mode output and ''average output power'' exceeding 50 W; *or*

b.5.b. ''Pulse duration'' exceeding 1 μs and any of the following:

b.5.b.1. Output energy exceeding 2 J per pulse and ''peak power'' exceeding 50 W;

b.5.b.2. Single transverse mode output and ''average output power'' exceeding 50 W; *or*

b.5.b.3. Multiple transverse mode output and ''average output power'' exceeding 80 W.

b.6. Output wavelength exceeding 975 nm but not exceeding 1,150 nm and any of the following:

b.6.a. ''Pulse duration'' of less than 1 ns and any of the following:

b.6.a.1. Output ''peak power'' exceeding 5 GW per pulse;

b.6.a.2. ''Average output power'' exceeding 10 W; or

b.6.a.3. Output energy exceeding 0.1 J per pulse;

b.6.b. ''Pulse duration'' equal to or exceeding 1 ns but not exceeding 1 μs and any of the following:

b.6.b.1. Single transverse mode output and any of the following:

b.6.b.1.a. ''Peak power'' exceeding 100 MW;

b.6.b.1.b. ''Average output power'' exceeding 20 W limited by design to a maximum pulse repetition frequency less than or equal to 1 kHz;

b.6.b.1.c. 'Wall-plug efficiency' exceeding 12%, ''average output power'' exceeding 100 W and capable of operating at a pulse repetition frequency greater than 1 kHz;

b.6.b.1.d. ''Average output power'' exceeding 150 W and capable of operating at a pulse repetition frequency greater than 1 kHz; *or*

b.6.b.1.e. Output energy exceeding 2 J per pulse; or

b.6.b.2. Multiple transverse mode output and any of the following:

b.6.b.2.a. ''Peak power'' exceeding 400 MW;

b.6.b.2.b. 'Wall-plug efficiency' exceeding 18% and ''average output power'' exceeding 500 W;

b.6.b.2.c. ''Average output power'' exceeding 2 kW; or

b.6.b.2.d. Output energy exceeding 4 J per pulse; or

b.6.c. ''Pulse duration'' exceeding 1 μs and any of the following:

b.6.c.1. Single transverse mode output and any of the following:

b.6.c.1.a. ''Peak power'' exceeding 500 kW;

b.6.c.1.b. 'Wall-plug efficiency' exceeding 12% and ''average output power'' exceeding 100 W; *or*

b.6.c.1.c. ''Average output power'' exceeding 150 W; *or*

b.6.c.2. Multiple transverse mode output and any of the following:

b.6.c.2.a. ''Peak power'' exceeding 1 MW;

b.6.c.2.b. 'Wall-plug efficiency' exceeding 18% and ''average output power'' exceeding 500 W; *or*

b.6.c.2.c. ''Average output power'' exceeding 2 kW;

b.7. Output wavelength exceeding 1,150 nm but not exceeding 1,555 nm and any of the following:

b.7.a. ''Pulse duration'' not exceeding 1 μs and any of the following:

b.7.a.1. Output energy exceeding 0.5 J per pulse and ''peak power'' exceeding 50 W;

b.7.a.2. Single transverse mode output and ''average output power'' exceeding 20 W; *or*

b.7.a.3. Multiple transverse mode output and ''average output power'' exceeding 50 W; *or*

b.7.b. ''Pulse duration'' exceeding 1 μs and any of the following:

b.7.b.1. Output energy exceeding 2 J per pulse and ''peak power'' exceeding 50 W;

b.7.b.2. Single transverse mode output and ''average output power'' exceeding 50 W; *or*

b.7.b.3. Multiple transverse mode output and ''average output power'' exceeding 80 W; *or*

b.8. Output wavelength exceeding 1,555 nm and any of the following:

b.8.a. Output energy exceeding 100 mJ per pulse and ''peak power'' exceeding 1 W; *or*

b.8.b. ''Average output power'' exceeding 1 W;

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

NOTE: 6A005.c includes titanium-sapphire (Ti: Al_20_3), thulium-YAG (Tm: YAG), thulium-YSGG (Tm:YSGG), alexandrite (Cr:$BeAl_20_4$), color center ''lasers'', dye ''lasers'', and liquid ''lasers''.

c.1. Output wavelength less than 600 nm and any of the following:

NOTE: 6A005.c.1 does not apply to dye lasers or other liquid lasers, having a multimode output and a wavelength of 150 nm or more but not exceeding 600 nm and all of the following:

1. Output energy less than 1.5 J per pulse or a ''peak power'' less than 20 W; and

2. Average or CW output power less than 20 W.

c.1.a. Output energy exceeding 50 mJ per pulse and ''peak power'' exceeding 1 W; *or*

c.1.b. Average or CW output power exceeding 1W;

c.2. Output wavelength of 600 nm or more but not exceeding 1,400 nm, and any of the following:

c.2.a. Output energy exceeding 1 J per pulse and ''peak power'' exceeding 20 W; *or*

c.2.b. Average or CW output power exceeding 20 W; *or*

c.3. Output wavelength exceeding 1,400 nm and any of the following:

c.3.a. Output energy exceeding 50 mJ per pulse and ''peak power'' exceeding 1 W; *or*

c.3.b. Average or CW output power exceeding 1 W;

d. Other ''lasers'', not controlled by 6A005.a, 6A005.b, or 6A005.c as follows:

d.1. Semiconductor ''lasers'' as follows:

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

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

d.1. Semiconductor ''lasers'' as follows:

d.1.a. Individual single-transverse mode semiconductor ''lasers'' having any of the following:

d.1.a.1. Wavelength equal to or less than 1,510 nm and average or CW output power, exceeding 1.5 W; *or*

d.1.a.2. Wavelength greater than 1,510 nm and average or CW output power, exceeding 500 mW;

d.1.b. Individual, multiple-transverse mode semiconductor ''lasers'' having any of the following:

d.1.b.1. Wavelength of less than 1,400 nm and average or CW output power, exceeding 15 W;

d.1.b.2. Wavelength equal to or greater than 1,400 nm and less than 1,900 nm and average or CW output power, exceeding 2.5 W; *or*

d.1.b.3. Wavelength equal to or greater than 1,900 nm and average or CW output power, exceeding 1 W;

d.1.c. Individual semiconductor ''laser'' 'bars' having any of the following:

d.1.c.1. Wavelength of less than 1,400 nm and average or CW output power, exceeding 100 W;

d.1.c.2. Wavelength equal to or greater than 1,400 nm and less than 1,900 nm and average or CW output power, exceeding 25 W; *or*

d.1.c.3. Wavelength equal to or greater than 1,900 nm and average or CW output power, exceeding 10 W;

d.1.d. Semiconductor ''laser'' 'stacked arrays' (two-dimensional arrays) having any of the following:

d.1.d.1. Wavelength less than 1,400 nm and having any of the following:

d.1.d.1.a. Average or CW total output power less than 3 kW and having average or CW

output 'power density' greater than 500 W/cm^2;

d.1.d.1.b. Average or CW total output power equal to or exceeding 3 kW but less than or equal to 5 kW, and having average or CW output 'power density' greater than 350W/cm^2;

d.1.d.1.c. Average or CW total output power exceeding 5 kW;

d.1.d.1.d. Peak pulsed 'power density' exceeding 2,500 W/cm^2; *or*

d.1.d.1.e. Spatially coherent average or CW total output power, greater than 150 W;

d.1.d.2. Wavelength greater than or equal to 1,400 nm but less than 1,900 nm, and having any of the following:

d.1.d.2.a. Average or CW total output power less than 250 W and average or CW output 'power density' greater than 150 W/cm^2;

d.1.d.2.b. Average or CW total output power equal to or exceeding 250 W but less than or equal to 500 W, and having average or CW output 'power density' greater than 50W/cm^2;

d.1.d.2.c. Average or CW total output power exceeding 500 W;

d.1.d.2.d. Peak pulsed 'power density' exceeding 500 W/cm^2; *or*

d.1.d.2.e. Spatially coherent average or CW total output power, exceeding 15 W;

d.1.d.3. Wavelength greater than or equal to 1,900 nm and having any of the following:

d.1.d.3.a. Average or CW output 'power density' greater than 50 W/cm^2;

d.1.d.3.b. Average or CW output power greater than 10 W; *or*

d.1.d.3.c. Spatially coherent average or CW total output power, exceeding 1.5 W; or

d.1.d.4. At least one ''laser'' 'bar' specified by 6A005.d.1.c;

TECHNICAL NOTE: For the purposes of 6A005.d.1.d, 'power density' means the total ''laser'' output power divided by the emitter surface area of the 'stacked array'.

d.1.e. Semiconductor ''laser'' 'stacked arrays', other than those specified by 6A005.d.1.d, having all of the following:

d.1.e.1. Specially designed or modified to be combined with other 'stacked arrays' to form a larger 'stacked array'; and

d.1.e.2. Integrated connections, common for both electronics and cooling;

NOTE 1: 'Stacked arrays', formed by combining semiconductor ''laser'' 'stacked arrays' specified by 6A005.d.1.e, that are not designed to be further combined or modified are specified by 6A005.d.1.d.

NOTE 2: 'Stacked arrays', formed by combining semiconductor ''laser'' 'stacked arrays' specified by 6A005.d.1.e, that are designed to be further combined or modified are specified by 6A005.d.1.e.

NOTE 3: 6A005.d.1.e does not apply to modular assemblies of single 'bars' designed to be fabricated into end-to-end stacked linear arrays.

TECHNICAL NOTES: 1. Semiconductor ''lasers'' are commonly called ''laser'' diodes.

2. A 'bar' (also called a semiconductor ''laser'' 'bar', a ''laser'' diode 'bar' or diode 'bar') consists of multiple semiconductor ''lasers'' in a one-dimensional array.

3. A 'stacked array' consists of multiple 'bars' forming a two-dimensional array of semiconductor ''lasers''.

d.2. Carbon monoxide (CO) ''lasers'' having any of the following:

d.2.a. Output energy exceeding 2 J per pulse and ''peak power'' exceeding 5 kW; *or*

d.2.b. Average or CW output power, exceeding 5 kW;

d.3. Carbon dioxide (CO_2) ''lasers'' having any of the following:

d.3.a. CW output power exceeding 15 kW;

d.3.b. Pulsed output with ''pulse duration'' exceeding 10 μs and any of the following:

d.3.b.1. ''Average output power'' exceeding 10 kW; *or*

d.3.b.2. ''Peak power'' exceeding 100 kW; *or*

d.3.c. Pulsed output with a ''pulse duration'' equal to or less than 10 μs and any of the following:

d.3.c.1. Pulse energy exceeding 5 J per pulse; *or*

d.3.c.2. ''Average output power'' exceeding 2.5 kW;

d.4. Excimer ''lasers'' having any of the following:

d.4.a. Output wavelength not exceeding 150 nm and any of the following:

d.4.a.1. Output energy exceeding 50 mJ per pulse; *or*

d.4.a.2. ''Average output power'' exceeding 1 W;

d.4.b. Output wavelength exceeding 150 nm but not exceeding 190 nm and any of the following:

d.4.b.1. Output energy exceeding 1.5 J per pulse; *or*

d.4.b.2. ''Average output power'' exceeding 120 W;

d.4.c. Output wavelength exceeding 190 nm but not exceeding 360 nm and any of the following:

d.4.c.1. Output energy exceeding 10 J per pulse; *or*

d.4.c.2. ''Average output power'' exceeding 500 W; *or*

d.4.d. Output wavelength exceeding 360 nm and any of the following:

d.4.d.1. Output energy exceeding 1.5 J per pulse; *or*

d.4.d.2. ''Average output power'' exceeding 30 W;

NOTE: For excimer ''lasers'' specially designed for lithography equipment, see 3B001.

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

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

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

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

d.5.c.1. Oxygen Iodine (O2-I) ''lasers'';

d.5.c.2. Deuterium Fluoride-Carbon dioxide (DF-CO2) ''lasers'';

d.6. ''Non-repetitive pulsed'' Neodymium (Nd) glass ''lasers'', having any of the following:

d.6.a. A ''pulse duration'' not exceeding 1 μs and an output energy exceeding 50 J per pulse; or

d.6.b. A ''pulse duration'' exceeding 1 μs and an output energy exceeding 100 J per pulse;

NOTE: ''Non-repetitive pulsed'' refers to ''lasers'' that produce either a single output pulse or that have a time interval between pulses exceeding one minute.

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 λ/10 at the designed wavelength, or 0.1 μm, whichever is the smaller;

f.4. Projection telescopes specially designed for use with ''SHPL'' systems;

g. ''Laser acoustic detection equipment'' having all of the following:

g.1. CW laser output power greater than or equal to 20 mW;

g.2. Laser frequency stability equal to or better (less) than 10 MHz;

g.3. Laser wavelengths equal to or exceeding 1,000 nm but not exceeding 2,000 nm;

g.4. Optical system resolution better (less) than 1 nm; *and*

g.5. Optical Signal to Noise ratio equal or exceeding to 10^3.

TECHNICAL NOTE: ''Laser acoustic detection equipment'' is sometimes referred to as a Laser Microphone or Particle Flow Detection Microphone.

6A006 "Magnetometers", "magnetic gradiometers", "intrinsic magnetic gradiometers", underwater electric field sensors, "compensation systems", and specially designed components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS: $1500, N/A for 6A006.a.1; ''Magnetometers'' and subsystems defined in 6A006.a.2 using optically pumped or nuclear precession (proton/Overhauser) having a ''sensitivity'' lower (better) than 2 pT (rms) per square root Hz; 6A006.d, and 6A006.e.

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship any commodity in:

6A006.a.1; or

6A006.a.2; or

6A006.c.1 ''Magnetic gradiometers'' using multiple ''magnetometers'' specified by 6A006.a.1 or 6.A006.a.2; or 6A006.d or .e (only for underwater receivers incorporating magnetometers specified in 6A006.a.1 or 6A006.a.2) to any of the eight destinations listed in §740.20(c)(2) of the EAR

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 6A996. This entry does not control instruments specially designed for fishery applications or biomagnetic measurements for medical diagnostics.

Related Definitions: N/A

Items: a. ''Magnetometers'' and subsystems, as follows:

a.1. ''Magnetometers'' using ''superconductive'' (SQUID) ''technology'' and having any of the following:

a.1.a. SQUID systems designed for stationary operation, without specially designed subsystems designed to reduce in-motion noise, and having a 'sensitivity' equal to or lower (better) than 50 fT (rms) per square root Hz at a frequency of 1 Hz; or

a.1.b. SQUID systems having an in-motion-magnetometer 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz and specially designed to reduce in-motion noise;

a.2. ''Magnetometers'' using optically pumped or nuclear precession (proton/

Overhauser) ''technology'' having a 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz;

a.3. ''Magnetometers'' using fluxgate ''technology'' having a 'sensitivity' equal to or lower (better) than 10 pT (rms) per square root Hz at a frequency of 1 Hz;

a.4. Induction coil ''magnetometers'' having a 'sensitivity' lower (better) than any of the following:

a.4.a. 0.05 nT (rms)/square root Hz at frequencies of less than 1 Hz;

a.4.b. 1×10^{-3} nT (rms)/square root Hz at frequencies of 1 Hz or more but not exceeding 10 Hz; or

a.4.c. 1×10^{-4} nT (rms)/square root Hz at frequencies exceeding 10 Hz;

a.5. Fiber optic ''magnetometers'' having a 'sensitivity' lower (better) than 1 nT (rms) per square root Hz;

b. Underwater electric field sensors having a 'sensitivity' lower (better) than 8 nanovolt per meter per square root Hz when measured at 1 Hz;

c. ''Magnetic gradiometers'' as follows:

c.1. ''Magnetic gradiometers'' using multiple ''magnetometers'' controlled by 6A006.a;

c.2. Fiber optic ''intrinsic magnetic gradiometers'' having a magnetic gradient field 'sensitivity' lower (better) than 0.3 nT/m (rms) per square root Hz;

c.3. ''Intrinsic magnetic gradiometers'', using ''technology'' other than fiber-optic ''technology'', having a magnetic gradient field 'sensitivity' lower (better) than 0.015 nT/m (rms) per square root Hz;

d. ''Compensation systems'' for magnetic and underwater electric field sensors resulting in a performance equal to or better than the control parameters of 6A006.a, 6A006.b, and 6A006.c; and

e. Underwater electromagnetic receivers incorporating magnetic field sensors specified by 6A006.a or underwater electric field sensors specified by 6A006.b.

TECHNICAL NOTE: For the purposes of 6A006, 'sensitivity' (noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.

6A007 Gravity meters (gravimeters) and gravity gradiometers, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
MT applies to 6A007.b and .c when the accuracies in 6A007.b.1 and b.2 are met or exceeded.	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000; N/A for MT

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 6A107 and 6A997

Related Definitions: N/A

Items:

a. Gravity meters designed or modified for ground use and having a static accuracy of less (better) than 10 μgal;

NOTE: 6A007.a does not control ground gravity meters of the quartz element (Worden) type.

b. Gravity meters designed for mobile platforms and having all of the following:

b.1. A static accuracy of less (better) than 0.7 mgal; *and*

b.2. An in-service (operational) accuracy of less (better) than 0.7 mgal having a time-to-steady-state registration of less than 2 minutes under any combination of attendant corrective compensations and motional influences;

c. Gravity gradiometers.

6A008 Radar systems, equipment and assemblies, having any of the following (see List of Items Controlled), and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
MT applies to items that are designed for airborne applications and that are usable in systems controlled for MT reasons.	MT Column 1.
RS applies to 6A008.j.1	RS Column 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.

LICENSE EXCEPTIONS

LVS: $5000; N/A for MT and for 6A008.j.1.

GBS: Yes, for 6A008.b, .c, and l.1 only.

CIV: Yes, for 6A008.b, .c, and l.1 only.

STA: License Exception STA may not be used to ship any commodity in 6A008.d, 6A008.h or 6A008.k to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: This entry does not control: Secondary surveillance radar (SSR); Car radar designed for collision prevention; Displays or monitors used for Air Traffic Control (ATC) having no more than 12 resolvable elements per mm; Meteorological (weather) radar. See also 6A108 and 6A998. ECCN 6A998 controls, *inter alia*, the LIDAR equipment excluded by the note to paragraph j of this ECCN (6A008).

Related Definitions: N/A

Items:

NOTE: 6A008 does not control:

—Secondary surveillance radar (SSR);

—Civil Automotive Radar;

—Displays or monitors used for air traffic control (ATC);

—Meteorological (weather) radar;

—Precision Approach Radar (PAR) equipment conforming to ICAO standards and employing electronically steerable linear (1-dimensional) arrays or mechanically positioned passive antennae.

a. Operating at frequencies from 40 GHz to 230 GHz and having any of the following:

a.1. An ''average output power'' exceeding 100 mW; or

a.2. Locating accuracy of 1 m or less (better) in range and 0.2 degree or less (better) in azimuth;

b. A tunable bandwidth exceeding ±6.25% of the 'center operating frequency';

TECHNICAL NOTE: The 'center operating frequency' equals one half of the sum of the highest plus the lowest specified operating frequencies

c. Capable of operating simultaneously on more than two carrier frequencies;

d. Capable of operating in synthetic aperture (SAR), inverse synthetic aperture (ISAR) radar mode, or sidelooking airborne (SLAR) radar mode;

e. Incorporating electronically steerable array antennae;

f. Capable of heightfinding non-cooperative targets;

g. Specially designed for airborne (balloon or airframe mounted) operation and having Doppler ''signal processing'' for the detection of moving targets;

h. Employing processing of radar signals and using any of the following:

h.1. ''Radar spread spectrum'' techniques; *or*

h.2. ''Radar frequency agility'' techniques;

i. Providing ground-based operation with a maximum ''instrumented range'' exceeding 185 km;

NOTE: 6A008.i does not control:

a. Fishing ground surveillance radar;

b. Ground radar equipment specially designed for en route air traffic control, and having all of the following:

1. A maximum ''instrumented range'' of 500 km or less;

2. Configured so that radar target data can be transmitted only one way from the radar site to one or more civil ATC centers;

3. Contains no provisions for remote control of the radar scan rate from the en route ATC center; and

4. Permanently installed;

c. Weather balloon tracking radars.

j. Being ''laser'' radar or Light Detection and Ranging (LIDAR) equipment and having any of the following:

j.1. ''Space-qualified'';

j.2. Employing coherent heterodyne or homodyne detection techniques and having an angular resolution of less (better) than 20 μrad (microradians); or

j.3. Designed for carrying out airborne bathymetric littoral surveys to International Hydrographic Organization (IHO) Order 1a Standard (5th Edition February 2008) for Hydrographic Surveys or better, and using one or more lasers with a wavelength exceeding 400 nm but not exceeding 600 nm;

NOTE 1: LIDAR equipment specially designed for surveying is only specified by 6A008.j.3.

NOTE 2: 6A008.j does not apply to LIDAR equipment specially designed for meteorological observation.

NOTE 3: Parameters in the IHO Order 1a Standard 5th Edition February 2008 are summarized as follows:

Horizontal Accuracy (95% Confidence Level) = 5 m + 5% of depth.

Depth Accuracy for Reduced Depths (95% Confidence Level) = $\pm\sqrt{(a^2+(b*d)^2)}$ where:

a = 0.5 m = constant depth error, i.e. the sum of all constant depth errors

b = 0.013 = factor of depth dependant error

b*d = depth dependant error, i.e. the sum of all depth dependant errors

d = depth

Feature Detection = Cubic features > 2 m in depths up to 40 m; 10% of depth beyond 40 m.

k. Having ''signal processing'' sub-systems using ''pulse compression'' and having any of the following:

k.1. A ''pulse compression'' ratio exceeding 150; *or*

k.2. A pulse width of less than 200 ns; *or*

l. Having data processing sub-systems and having any of the following:

l.1. ''Automatic target tracking'' providing, at any antenna rotation, the predicted target position beyond the time of the next antenna beam passage; or

NOTE: 6A008.l.1 does not control conflict alert capability in ATC systems, or marine or harbor radar.

l.2. [Reserved]

l.3. [Reserved]

l.4. Configured to provide superposition and correlation, or fusion, of target data within six seconds from two or more ''geographically dispersed'' radar sensors to improve the aggregate performance beyond that of any single sensor specified by 6A008.f, or 6A008.i.

N.B.: See also the U.S. Munitions List (22 CFR part 121).

NOTE: 6A008.l.4 does not apply to systems, equipment and assemblies designed for marine traffic control.

6A102 Radiation hardened detectors, other than those controlled by 6A002, specially designed or modified for protecting against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects) and usable for

"missiles," designed or rated to withstand radiation levels which meet or exceed a total irradiation dose of 5×10^5 rads (silicon).

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Components in number
Related Controls: N/A
Related Definitions: In this entry, a detector is defined as a mechanical, electrical, optical or chemical device that automatically identifies and records, or registers a stimulus such as an environmental change in pressure or temperature, an electrical or electromagnetic signal or radiation from a radioactive material.
Items: The list of items controlled is contained in the ECCN heading.

6A103 Radomes designed to withstand a combined thermal shock greater than 100 cal/sq cm accompanied by a peak over pressure of greater than 50 kPa, usable in protecting "missiles" against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects), and usable for "missiles." (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

6A107 Gravity meters (gravimeters) and specially designed components for gravity meters and gravity gradiometers, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. Gravity meters (gravimeters), other than those controlled by 6A007.b, designed or modified for airborne or marine use, and having a static or operational accuracy of 7×10^{-6} m/s^2 (0.7 milligal) or better, and having a time to steady-state registration of two minutes or less, usable for ''missiles'';

b. Specially designed components for gravity meters controlled in 6A007. b or 6A107.a and gravity gradiometers controlled in 6A007.c.

6A108 Radar systems and tracking systems, other than those controlled by 6A008, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) This entry does not control airborne civil weather radar conforming to international standards for civil weather radars provided that they do not incorporate any of the following: (a) Phased array antennas; (b) Frequency agility; (c) Spread spectrum; or (d) Signal processing specially designed for the tracking of vehicles. (2) Items in 6A108.a that are specially designed or modified for ''missiles'' or for items on the U.S. Munitions List are subject to the export licensing authority of the U.S. Department of State, Defense Trade Controls (see 22 CFR part 121).
Related Definitions: Laser radar systems are defined as those that embody specialized transmission, scanning, receiving and signal processing techniques for utilization of lasers for echo ranging, direction finding and discrimination of targets by location, radial speed and body reflection characteristics.
Items:

a. Radar and laser radar systems designed or modified for use in ''missiles'';

NOTE: 6A108.a includes the following:
a. Terrain contour mapping equipment;
b. Imaging sensor equipment;
c. Scene mapping and correlation (both digital and analog) equipment;
d. Doppler navigation radar equipment.

b. Precision tracking systems, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a ''range'' equal to or greater than 300 km, as follows:

b.1. Tracking systems which use a code translator installed on the rocket or unmanned aerial vehicle in conjunction with either surface or airborne references or navigation satellite systems to provide real-time measurements of in-flight position and velocity;

b.2. Range instrumentation radars including associated optical/infrared trackers with all of the following capabilities:

b.2.a. Angular resolution better than 1.5 milliradians;

b.2.b. Range of 30 km or greater with a range resolution better than 10 m rms;

b.2.c. Velocity resolution better than 3 m/s.

6A202 Photomultiplier tubes having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: See ECCNs 6E001 (''development''), 6E002 (''production''), and 6E201 (''use'') for technology for items controlled under this entry.

Related Definitions: N/A

Items: a. Photocathode area of greater than 20 cm^2; *and*

b. Anode pulse rise time of less than 1 ns.

6A203 Cameras and components, other than those controlled by 6A003, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: (1) See ECCNs 6E001 (''development''), 6E002 (''production''), and 6E201 (''use'') for technology for items controlled under this entry. (2) Also see ECCN 6A003.a.2, a.3, and a.4.

Related Definitions: N/A

Items: a. Mechanical rotating mirror cameras, as follows, and specially designed components therefor:

a.1. Framing cameras with recording rates greater than 225,000 frames per second;

a.2. Streak cameras with writing speeds greater than 0.5 mm per microsecond;

NOTE: Components of cameras controlled by 6A203.a include their synchronizing electronics units and rotor assemblies consisting of turbines, mirrors and bearings.

b. Electronic streak cameras, electronic framing cameras, tubes and devices, as follows:

b.1. Electronic streak cameras capable of 50 ns or less time resolution;

b.2. Streak tubes for cameras controlled by 6A203.b.1;

b.3. Electronic (or electronically shuttered) framing cameras capable of 50 ns or less frame exposure time;

b.4. Framing tubes and solid-state imaging devices for use with cameras controlled by 6A203.b.3, as follows:

b.4.a. Proximity focused image intensifier tubes having the photocathode deposited on a transparent conductive coating to decrease photocathode sheet resistance;

b.4.b. Gated silicon intensifier target (SIT) videcon tubes, where a fast system allows gating the photoelectrons from the photocathode before they impinge on the SIT plate;

b.4.c. Kerr or Pockels cell electro-optical shuttering;

b.4.d. Other framing tubes and solid-state imaging devices having a fast-image gating time of less than 50 ns specially designed for cameras controlled by 6A203.b.3.

c. Radiation-hardened TV cameras, or lenses therefor, specially designed or rated as radiation hardened to withstand a total radiation dose greater than 50×10^3 Gy (silicon) (5×10^6 rad (silicon)) without operational degradation.

TECHNICAL NOTE: The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionizing radiation.

6A205 ''Lasers'', ''laser'' amplifiers and oscillators, other than those controlled by 0B001.g.5, 0B001.h.6, or 6A005, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: (1) See ECCNs 6E001 (''development''), 6E002 (''production''), and 6E201 (''use'') for technology for items controlled under this entry. (2) Also see ECCNs 6A005 and 6A995. (3) See ECCN 6A005.a.2 for additional controls on argon

ion lasers; See ECCN 6A005.b.6.b for additional controls on neodymium-doped lasers. (4) ''Lasers'' specially designed or prepared for use in isotope separation are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Argon ion ''lasers'' having both of the following characteristics:

a.1. Operating at wavelengths between 400 nm and 515 nm; and

a.2. An average output power greater than 40 W;

b. Tunable pulsed single-mode dye laser oscillators having all of the following characteristics:

b.1. Operating at wavelengths between 600 nm and 800 nm;

b.2. Having an average output greater than 1 W;

b.3 A repetition rate greater than 1 kHz; and

b.4. Pulse width less than 100 ns;

c. [Reserved]

d. Pulsed carbon dioxide ''lasers'' having all of the following characteristics:

d.1. Operating at wavelengths between 9,000 nm and 11,000 nm;

d.2. A repetition rate greater than 250 Hz;

d.3. An average output power greater than 500 W; and

d.4. Pulse width of less than 200 ns;

e. Para-hydrogen Raman shifters designed to operate at 16 micrometer output wavelength and at a repetition rate greater than 250 Hz.;

f. Neodymium-doped (other than glass) lasers with an output wavelength between 1000 and 1100 nm having either of the following:

f.1. Pulse-excited and Q-switched with a pulse duration equal to or greater than 1 ns, and having either of the following:

f.1.a. A single-transverse mode output with an average output power greater than 40 W; or

f.1.b. A multiple-transverse mode output with an average output power greater than 50 W; or

f.2. Incorporating frequency doubling to give an output wavelength between 500 and 550 nm with an average output power of greater than 40 W.

6A225 Velocity interferometers for measuring velocities exceeding 1 km/s during time intervals of less than 10 microseconds.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: See ECCNs 6E001 (''development''), 6E002 (''production''), and 6E201 (''use'') for technology for items controlled under this entry.

Related Definitions: N/A

ECCN Controls: 6A225 includes velocity interferometers, such as VISARs (Velocity interferometer systems for any reflector) and DLIs (Doppler laser interferometers).

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

6A226 Pressure sensors, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: See ECCNs 6E001 (''development''), 6E002 (''production''), and 6E201 (''use'') for technology for items controlled under this entry.

Related Definitions: N/A

Items: a. Manganin gauges for pressures greater than 100 kilobars; *or*

b. Quartz pressure transducers for pressures greater than 100 kilobars.

6A991 Marine or terrestrial acoustic equipment, n.e.s., capable of detecting or locating underwater objects or features or positioning surface vessels or underwater vehicles; and specially designed components, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart
AT applies to entire entry	AT Column 2

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

6A992 Optical Sensors, not controlled by 6A002.

LICENSE REQUIREMENTS

Reason for Control: AT, RS

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

RS applies to entire entry. A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§742.6 and 746.3 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: N/A

Related Definitions: N/A

Items: a. Image intensifier tubes and specially designed components therefor, as follows:

a.1. Image intensifier tubes having all the following:

a.1.a. A peak response in wavelength range exceeding 400 nm, but not exceeding 1,050 nm;

a.1.b. A microchannel plate for electron image amplification with a hole pitch (center-to-center spacing) of less than 25 micrometers; *and*

a.1.c. Having any of the following:

a.1.c.1. An S–20, S–25 or multialkali photocathode; *or*

a.1.c.2. A GaAs or GaInAs photocathode;

a.2. Specially designed microchannel plates having both of the following characteristics:

a.2.a. 15,000 or more hollow tubes per plate; *and*

a.2.b. Hole pitch (center-to-center spacing) of less than 25 micrometers.

b. Direct view imaging equipment operating in the visible or infrared spectrum, incorporating image intensifier tubes having the characteristics listed in 6A992.a.1.

6A993 Cameras, not controlled by 6A003 or 6A203, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: N/A

Related Definitions: N/A

Items: a. Cameras that meet the criteria of Note 3 to 6A003.b.4.

b. [Reserved]

6A994 Optics, not controlled by 6A004.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: N/A

Related Definitions: N/A

Items: a. Optical filters:

a.1. For wavelengths longer than 250 nm, comprised of multi-layer optical coatings and having either of the following:

a.1.a. Bandwidths equal to or less than 1 nm Full Width Half Intensity (FWHI) and peak transmission of 90% or more; or

a.1.b. Bandwidths equal to or less than 0.1 nm FWHI and peak transmission of 50% or more;

NOTE: 6A994 does not control optical filters with fixed air gaps or Lyot-type filters.

a.2. For wavelengths longer than 250 nm, and having all of the following:

a.2.a. Tunable over a spectral range of 500 nm or more;

a.2.b. Instantaneous optical bandpass of 1.25 nm or less;

a.2.c. Wavelength resettable within 0.1 ms to an accuracy of 1 nm or better within the tunable spectral range; and

a.2.d. A single peak transmission of 91% or more;

a.3. Optical opacity switches (filters) with a field of view of 30° or wider and a response time equal to or less than 1 ns;

b. ''Fluoride fiber'' cable, or optical fibers therefor, having an attenuation of less than 4 dB/km in the wavelength range exceeding 1,000 nm but not exceeding 3,000 nm.

6A995 "Lasers" (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

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. Ruby ''lasers'' having an output energy exceeding 20 J per pulse;
d. Non-''tunable'' ''pulsed lasers'' having an output wavelength exceeding 975 nm but not exceeding 1,150 nm and having any of the following:
d.1. A ''pulse duration'' equal to or exceeding 1 ns but not exceeding 1 μs, and having any of the following:
d.1.a. A single transverse mode output and having any of the following:
d.1.a.1. A 'wall-plug efficiency' exceeding 12% and an ''average output power'' exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1kHz; *or*
d.1.a.2. An ''average output power'' exceeding 20 W; or
d.1.b. A multiple transverse mode output and having any of the following:
d.1.b.1. A 'wall-plug efficiency' exceeding 18% and an ''average output power'' exceeding 30 W;
d.1.b.2. A ''peak power'' exceeding 200 MW; or
d.1.b.3. An ''average output power'' exceeding 50 W; or
d.2. A ''pulse duration'' exceeding 1 μs and having any of the following:
d.2.a. A single transverse mode output and having any of the following:
d.2.a.1. A 'wall-plug efficiency' exceeding 12% and an ''average output power'' exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1 kHz; or
d.2.a.2. An ''average output power'' exceeding 20 W; or
d.2.b. A multiple transverse mode output and having any of the following:
d.2.b.1. A 'wall-plug efficiency' exceeding 18% and an ''average output power'' exceeding 30 W; or
d.2.b.2. An ''average output power'' exceeding 500 W;
e. Non-''tunable'' continuous wave ''(CW) lasers'', having an output wavelength exceeding 975 nm but not exceeding 1,150 nm and having any of the following:
e.1. A single transverse mode output and having any of the following:
e.1.a. A 'wall-plug efficiency' exceeding 12% and an ''average output power'' exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1 kHz; or
e.1.b. An ''average output power'' exceeding 50 W; or
e.2. A multiple transverse mode output and having any of the following:
e.2.a. A 'wall-plug efficiency' exceeding 18% and an ''average output power'' exceeding 30 W; or
e.2.b. An ''average output power'' exceeding 500 W;

NOTE: 6A995.e.2.b does not control multiple transverse mode, industrial ''lasers'' with output power less than or equal to 2kW with a total mass greater than 1,200kg. For the purpose of this note, total mass includes all components required to operate the ''laser,'' e.g., ''laser,'' power supply, heat exchanger, but excludes external optics for beam conditioning and/or delivery.

f. Non-''tunable'' ''lasers'', having a wavelength exceeding 1,400 nm, but not exceeding 1555 nm and having any of the following:
f.1. An output energy exceeding 100 mJ per pulse and a pulsed ''peak power'' exceeding 1 W; or
f.2. An average or CW output power exceeding 1 W.
g. Free electron ''lasers''.

6A996 "Magnetometers" not controlled by ECCN 6A006, "Superconductive" electromagnetic sensors, and specially designed components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A

Items: a. ''Magnetometers'', n.e.s., having a 'sensitivity' lower (better) than 1.0 nT (rms) per square root Hz.

TECHNICAL NOTE: For the purposes of 6A996, 'sensitivity' (noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.

b. ''Superconductive'' electromagnetic sensors, components manufactured from ''superconductive'' materials:

b.1. Designed for operation at temperatures below the ''critical temperature'' of at least one of their ''superconductive'' constituents (including Josephson effect devices or ''superconductive'' quantum interference devices (SQUIDS));

b.2. Designed for sensing electromagnetic field variations at frequencies of 1 KHz or less; and

b.3. Having any of the following characteristics:

b.3.a. Incorporating thin-film SQUIDS with a minimum feature size of less than 2 μm and with associated input and output coupling circuits;

b.3.b. Designed to operate with a magnetic field slew rate exceeding 1×10^6 magnetic flux quanta per second;

b.3.c. Designed to function without magnetic shielding in the earth's ambient magnetic field; or

b.3.d. Having a temperature coefficient less (smaller) than 0.1 magnetic flux quantum/K.

6A997 Gravity meters (gravimeters) for ground use, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: a. Having a static accuracy of less (better) than 100 microgal; or

b. Being of the quartz element (Worden) type.

6A998 Radar Systems, Equipment and Assemblies, n.e.s., (See List of Items Controlled), and Specially Designed Components Therefor.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart
RS applies to paragraph .b	RS Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: N/A

Related Definitions: N/A

Items: a. Airborne radar equipment, n.e.s., and specially designed components therefor.

b. ''Space-qualified'' ''laser'' radar or Light Detection and Ranging (LIDAR) equipment specially designed for surveying or for meteorological observation.

6A999 Specific Processing Equipment, as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT.

Control(s).

Country Chart.

AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See §742.19 of the EAR for additional information.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: See also 6A203.

Related Definitions: N/A

Items: a. Seismic detection equipment;

b. Radiation hardened TV cameras, n.e.s.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

6B004 Optical equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $5000

GBS: Yes for 6B004.b

CIV: Yes for 6B004.b

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: This entry does not control microscopes.

Related Definitions: N/A

Items: a. Equipment for measuring absolute reflectance to an accuracy of ±0.1% of the reflectance value;

b. Equipment other than optical surface scattering measurement equipment, having an unobscured aperture of more than 10 cm,

specially designed for the non-contact optical measurement of a non-planar optical surface figure (profile) to an ''accuracy'' of 2 nm or less (better) against the required profile.

6B007 Equipment to produce, align and calibrate land-based gravity meters with a static accuracy of better than 0.1 mgal.

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $5000
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

6B008 Pulse radar cross-section measurement systems having transmit pulse widths of 100 ns or less, and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A

STA: License Exception STA may not be used to ship any commodity in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

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

LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: See also 6B108
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

6B108 Systems, other than those controlled by 6B008, specially designed for radar cross section measurement usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

6B995 Specially designed or modified equipment, including tools, dies, fixtures or gauges, and other specially designed components and accessories therefor:

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; parts and accessories in $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. For the manufacture or inspection of:

a.1. Free electron ''laser'' magnet wigglers;

a.2. Free electron ''laser'' photo injectors;

b. For the adjustment, to required tolerances, of the longitudinal magnetic field of free electron ''lasers''.

C. MATERIALS

6C002 Optical sensor materials as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $3000
GBS: N/A
CIV: N/A
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.

6C004 Optical materials as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $1500

GBS: Yes for 6C004.a and .e

CIV: Yes for 6C004.a and .e

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 6C994

Related Definitions: N/A

Items:

a. Zinc selenide (ZnSe) and zinc sulphide (ZnS) ''substrate blanks'', produced by the chemical vapor deposition process and having any of the following:

a.1. A volume greater than 100 cm^3; or

a.2. A diameter greater than 80 mm and a thickness of 20 mm or more;

b. Boules of any of the following electro-optic materials:

b.1. Potassium titanyl arsenate (KTA) (CAS 59400–80–5);

b.2. Silver gallium selenide ($AgGaSe_2$) (CAS 12002–67–4); or

b.3. Thallium arsenic selenide (Tl_3AsSe_3, also known as TAS) (CAS 16142–89–5);

c. Non-linear optical materials having all of the following:

c.1. Third order susceptibility (chi 3) of 10^{-6} m^2/V^2 or more; *and*

c.2. A response time of less than 1 ms;

d. ''Substrate blanks'' of silicon carbide or beryllium beryllium (Be/Be) deposited materials, exceeding 300 mm in diameter or major axis length;

e. Glass, including fused silica, phosphate glass, fluorophosphate glass, zirconium fluoride (ZrF_4) (CAS 7783–64–4) and hafnium fluoride (HfF_4) (CAS 13709–52–9) and having all of the following:

e.1. A hydroxyl ion (OH-) concentration of less than 5 ppm;

e.2. Integrated metallic purity levels of less than 1 ppm; and

e.3. High homogeneity (index of refraction variance) less than 5×10^{-6};

f. Synthetically produced diamond material with an absorption of less than 10^{-5} cm^{-1} for wavelengths exceeding 200 nm but not exceeding 14,000 nm.

6C005 Synthetic crystalline "laser" host material in unfinished form as follows (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $1500

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: N/A

Related Definitions: N/A

Items: a. Titanium doped sapphire;

b. Alexandrite.

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'.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: N/A

Related Definitions: (1) '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. (2) 'Beat length' is the distance over which two orthogonally polarized signals, initially in phase, must pass in order to achieve a 2 Pi radian(s) phase difference.

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

6C994 Optical materials.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: N/A

Related Definitions: (1) 'Fluoride fibers' are fibers manufactured from bulk fluoride compounds. (2) 'Optical fiber preforms' are bars, ingots, or rods of glass, plastic or other materials that have been specially processed for use in fabricating optical fibers. The characteristics of the preform determine the basic parameters of the resultant drawn optical fibers.

Items: a. Low optical absorption materials, as follows:

a.1. Bulk fluoride compounds containing ingredients with a purity of 99.999% or better; *or*

NOTE: 6C994.a.1 controls fluorides of zirconium or aluminum and variants.

a.2. Bulk fluoride glass made from compounds controlled by 6C004.e.1;

b. 'Optical fiber preforms' made from bulk fluoride compounds containing ingredients with a purity of 99.999% or better, specially designed for the manufacture of 'fluoride fibers' controlled by 6A994.b.

D. SOFTWARE

6D001 "Software" specially designed for the "development" or "production" of equipment controlled by 6A004, 6A005, 6A008, or 6B008.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, RS, AT

Control(s)	Country chart
NS applies to "software" for equipment controlled by 6A004, 6A005, 6A008 or 6B008.	NS Column 1.
MT applies to "software" for equipment controlled by 6A008 or 6B008 for MT reasons.	MT Column 1.
NP applies to "software" for equipment controlled by 6A005 for NP reasons.	NP Column 1.
RS applies to "software" for equipment controlled by 6A008.j.1.	RS Column 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.

LICENSE EXCEPTIONS

CIV: N/A

*TSR:*Yes, except for the following:

(1) Items controlled for MT reasons;

(2) ''Software'' specially designed for the ''development'' or ''production'' of ''space qualified'' ''laser'' radar or Light Detection and Ranging (LIDAR) equipment defined in 6A008.j.1; or

(3) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''software'' specially designed for the ''development'' or ''production'' of equipment controlled by 6A004.c or d, 6A008.d, h, or k, or 6B008.

STA: License Exception STA may not be used to ship or transmit ''software'' specially designed for the ''development'' or ''production'' of equipment specified by ECCNs 6A004.c, 6A004.d, 6A008.d, 6A008.h, 6A008.k, or 6B008 to any of the eight destinations listed in §740.20(c)(2) of the EAR

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: ''Software'' specially designed for the ''development'' or ''production'' of ''space qualified'' components for optical systems defined in 6A004.c and ''space qualified'' optical control equipment defined in 6A004.d.1 is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121). See also 6D991, and ECCN 6E001 (''development'') for ''technology'' for items controlled under this entry.

Related Definitions: N/A

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

6D002 "Software" specially designed for the "use" of equipment controlled by 6A002.b, 6A008, or 6B008.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to "software" for equipment controlled by 6A008 or 6B008 for MT reasons.	MT Column 1.
RS applies to "software" for equipment controlled by 6A008.j.1.	RS Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except N/A for the following

(1) Items controlled for MT reasons; or

(2) ''Software'' specially designed for the ''use'' of ''space qualified'' ''laser'' radar or Light Detection and Ranging (LIDAR) equipment defined in 6A008.j.1.

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: ''Software'' specially designed for the ''use'' of ''space qualified'' imaging sensors (*e.g.*, ''monospectral imaging sensors'' and ''multispectral imaging sensors'') defined in 6A002.b.2.b.1 is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121), unless, on or after September 23, 2002, the Department of State issues a commodity jurisdiction determination assigning the export licensing authority to the Department of

Commerce, Bureau of Industry and Security. ''Software'' specially designed for the ''use'' of ''space qualified'' LIDAR equipment specially designed for surveying or for meteorological observation, released from control under the note in 6A008.j, is controlled in 6D991. See also 6D102, 6D991, and 6D992

Related Definitions: N/A

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

6D003 Other "software" as follows (see List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
RS applies to paragraph c	RS Column 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.

LICENSE EXCEPTIONS

CIV: Yes, for 6D003.h.1

TSR: Yes, except for exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''software'' for items controlled by 6D003.a.

STA: License Exception STA may not be used to ship transmit software in 6D003.a to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 6D103 and 6D993

Related Definitions: N/A

Items:

ACOUSTICS

a. ''Software'' as follows:

a.1. ''Software'' specially designed for acoustic beam forming for the ''real time processing'' of acoustic data for passive reception using towed hydrophone arrays;

a.2. ''Source code'' for the ''real time processing'' of acoustic data for passive reception using towed hydrophone arrays;

a.3. ''Software'' specially designed for acoustic beam forming for the ''real time processing'' of acoustic data for passive reception using bottom or bay cable systems;

a.4. ''Source code'' for the ''real time processing'' of acoustic data for passive reception using bottom or bay cable systems;

a.5. ''Software'' or ''source code'', specially designed for all of the following:

a.5.a. ''Real time processing'' of acoustic data from sonar systems controlled by 6A001.a.1.e; and

a.5.b. Automatically detecting, classifying and determining the location of divers or swimmers;

N.B.: For diver detection ''software'' or ''source code'', specially designed or modified for military use, see the U.S. Munitions List of the International Traffic in Arms Regulations (ITAR) (22 CFR part 121).

b. Optical sensors. None.

CAMERAS

c. ''Software'' designed or modified for cameras incorporating ''focal plane arrays'' specified by 6A002.a.3.f and designed or modified to remove a frame rate restriction and allow the camera to exceed the frame rate specified in 6A003.b.4 Note 3.a;

d. Optics. None.

e. Lasers. None

MAGNETIC AND ELECTRIC FIELD SENSORS

f. ''Software'' as follows:

f.1. ''Software'' specially designed for magnetic and electric field ''compensation systems'' for magnetic sensors designed to operate on mobile platforms;

f.2. ''Software'' specially designed for magnetic and electric field anomaly detection on mobile platforms;

f.3. ''Software'' specially designed for ''real time processing'' of electromagnetic data using underwater electromagnetic receivers specified by 6A006.e;

f.4. ''Source code'' for ''real time processing'' of electromagnetic data using underwater electromagnetic receivers specified by 6A006.e;

GRAVIMETERS

g. ''Software'' specially designed to correct motional influences of gravity meters or gravity gradiometers;

RADAR

h. ''Software'' as follows:

h.1. Air Traffic Control (ATC) ''software'' application ''programs'' designed to be hosted on general purpose computers located at Air Traffic Control centers and capable of accepting radar target data from more than four primary radars;

h.2. ''Software'' for the design or ''production'' of radomes and having all of the following:

h.2.a. Specially designed to protect the ''electronically steerable phased array antennae'' controlled by 6A008.e.; *and*

h.2.b. Resulting in an antenna pattern having an 'average side lobe level' more than 40 dB below the peak of the main beam level.

TECHNICAL NOTE: 'Average side lobe level' in 6D003.h.2.b is measured over the entire array excluding the angular extent of the main beam and the first two side lobes on either side of the main beam.

6D102 "Software" specially designed or modified for the "use" of goods controlled by 6A108.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

6D103 "Software" that processes post-flight, recorded data, enabling determination of vehicle position throughout its flight path, specially designed or modified for "missiles".

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Items: The list of items controlled is contained in the ECCN heading.

6D991 "Software" specially designed for the "development", "production", or "use" of equipment controlled by 6A002.a.1.d, 6A991, 6A996, 6A997, or 6A998.

LICENSE REQUIREMENTS
Reason for Control: RS, AT

Control(s)	Country chart
RS applies to ''software'' for equipment controlled by 6A002.a.1.d or 6A998.b.	RS Column 1.
AT applies to entire entry, except ''software'' for equipment controlled by 6A991.	AT Column 1.
AT applies to ''software'' for equipment controlled by 6A991.	AT Column 2.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

6D992 "Software" specially designed for the "development" or "production" of equipment controlled by 6A992, 6A994, or 6A995.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

6D993 Other "software" not controlled by 6D003.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. Air Traffic Control (ATC) ''software'' application ''programs'' hosted on general purpose computers located at Air Traffic Control centers, and capable of automatically handing over primary radar target data (if not correlated with secondary surveillance radar (SSR) data) from the host ATC center to another ATC center;

E. TECHNOLOGY

6E001 "Technology" according to the General Technology Note for the "development" of equipment, materials or "software" controlled by 6A (except 6A991, 6A992, 6A994, 6A995, 6A996, 6A997, or 6A998), 6B (except 6B995), 6C (except 6C992 or 6C994), or 6D (except 6D991, 6D992, or 6D993).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, NP, RS, CC, AT, UN

Control(s)	Country chart
NS applies to ''technology'' for items controlled by 6A001 to 6A008, 6B004 to 6B008, 6C002 to 6C005, or 6D001 to 6D003.	NS Column 1.
MT applies to ''technology'' for items controlled by 6A002, 6A007, 6A008,6A102, 6A107, 6A108, 6B008, 6B108, 6D001, 6D002, 6D102 or 6D103 for MT reasons.	MT Column 1.
NP applies to ''technology'' for equipment controlled by 6A003, 6A005, 6A202,6A203, 6A205, 6A225, 6A226 or 6D001 for NP reasons.	NP Column 1.

Control(s)	Country chart
RS applies to ''technology'' for equipment controlled by 6A002.a.1, .a.2, .a.3, or .c, 6A003.b.3 or .b.4, or 6A008.j.1.	RS Column 1.
CC applies to ''technology'' for equipment controlled by 6A002 for CC reasons.	CC Column 1.
AT applies to entire entry	AT Column 1.
UN applies to ''technology'' for equipment Controlled by 6A002 or 6A003 for UN reasons.	See §746.1(b) for UN controls.

LICENSE REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except for the following:

(1) Items controlled for MT reasons;

(2) ''Technology'' for commodities controlled by 6A002.e, 6A004.e, or 6A008.j.1;

(3) ''Technology'' for ''software'' specially designed for ''space qualified'' ''laser'' radar or Light Detection and Ranging (LIDAR) equipment defined in 6A008.j.1 and controlled by 6D001 or 6D002; or

(4) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''technology'' for the ''development'' of the following: (a) Items controlled by 6A001.a.1.b, 6A001.a.1.e, 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.3, 6A001.a.2.a.5, 6A001.a.2.a.6, 6A001.a.2.b, 6A001.a.2.d, 6A001.a.2.e., 6A002.a.1.a, 6A002.a.1.b, 6A002.a.1.c, 6A002.a.2.a, 6A002.a.2.b, 6A002.a.3, 6A002.b, 6A002.c, 6A003.b.3, 6A003.b.4, 6A004.c, 6A004.d, 6A006.a.2, 6A006.c.1, 6A006.d, 6A006.e, 6A008.d, 6A008.h, 6A008.k, 6B008, 6D003.a; (b) Equipment controlled by 6A001.a.2.c or 6A001.a.2.f when specially designed for real time applications; or (c) ''Software'' controlled by 6D001 and specially designed for the ''development'' or ''production'' of equipment controlled by 6B008, or 6D003.a.

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: ''Technology'' according to the General Technology Note for the ''development'' of the following commodities is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121): ''Space qualified'' (1.) Components for optical systems defined in 6A004.c and optical control equipment defined in 6A004.d.1.; (2.) Solid-state detectors defined in 6A002.a.1, ''imaging sensors'' (e.g., ''monospectral imaging sensors'' and ''multispectral imaging sensors'') defined in 6A002.b.2.b.1, and cryocoolers defined in 6A002.d.1 unless on or after September 23, 2002, the Department of State issues a commodity jurisdiction determination assigning the export licensing authority to the Department of Commerce, Bureau of Industry and Security. See also 6E101, 6E201, and 6E991.

Related Definitions: N/A

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

6E002 "Technology" according to the General Technology Note for the "production" of equipment or materials controlled by 6A (except 6A991, 6A992, 6A994, 6A995, 6A996, 6A997 or 6A998), 6B (except 6B995) or 6C (except 6C992 or 6C994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, RS, CC, AT, UN

Control(s)	Country chart
NS applies to ''technology'' for equipment controlled by 6A001 to 6A008, 6B004 to 6B008, or 6C002 to 6C005.	NS Column 1.
MT applies to ''technology'' for equipment controlled by 6A002, 6A007, 6A008, 6A102, 6A107, 6A108, 6B008, or 6B108 for MT reasons.	MT Column 1.
NP applies to ''technology'' for equipment controlled by 6A003, 6A005, 6A202, 6A203, 6A205, 6A225 or 6A226 for NP reasons.	NP Column 1.
RS applies to ''technology'' for equipment controlled by 6A002.a.1, .a.2, .a.3, or .c, 6A003.b.3 or .b.4, or 6A008.j.1.	RS Column 1
CC applies to ''technology'' for equipment controlled by 6A002 for CC reasons.	CC Column 1.
AT applies to entire entry	AT Column 1.
UN applies to ''technology'' for equipment controlled by 6A002 or 6A003 for UN reasons..	See §746.1(b) for UN controls.

LICENSE REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes, except for the following:

(1) Items controlled for MT reasons;

(2) ''Technology'' for commodities controlled by 6A002.e, 6A004.e, 6A008.j.1; or

(3) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''technology'' for the ''production'' of the following: (a) Items controlled by 6A001.a.1.b, 6A001.a.1.e, 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.3, 6A001.a.2.a.5, 6A001.a.2.a.6, 6A001.a.2.b, 6A002.a.3, 6A002.b, 6A002.c, 6A003.b.3, 6A003.b.4, 6A004.c, 6A004.d, 6A006.a.2, 6A006.c.1, 6A006.d, 6A006.e, 6A008.d, 6A008.h,

6A008.k, 6B008; and (b) Equipment controlled by 6A001.a.2.c and 6A001.a.2.f when specially designed for real time applications.

STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''production'' of equipment specified in the STA exclusion paragraphs found in the License Exception sections of by ECCNs 6A001, 6A002, 6A003, 6A004, 6A006, 6A008, or 6B008 to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: ''Technology'' according to the General Technology Note for the ''production'' of the following commodities is subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121) when intended for use on a satellite: ''Space qualified'' (1.) Components for optical systems defined in 6A004.c and optical control equipment defined in 6A004.d.1.; (2.) Solid-state detectors defined in 6A002.a.1, ''imaging sensors'' (e.g., ''monospectral imaging sensors'' and ''multispectral imaging sensors'') defined in 6A002.b.2.b.1, and cryocoolers defined in 6A002.d.1 unless on or after September 23, 2002, the Department of State issues a commodity jurisdiction determination assigning the export licensing authority to the Department of Commerce, Bureau of Industry and Security. See also 6E992.

Related Definitions: N/A

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

6E003 Other "technology" as follows (*see* 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

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 6E993

Related Definitions: N/A

Items:

a. Acoustics. None.

b. Optical sensors. None.

c. Cameras. None.

OPTICS

d. ''Technology'' as follows:

d.1. Optical surface coating and treatment ''technology'', ''required'' to achieve an 'optical thickness' uniformity of 99.5% or better for optical coatings 500 mm or more in diameter or major axis length and with a total loss (absorption and scatter) of less than 5×10^{-3};

*N.B.:*See also 2E003.f.

TECHNICAL NOTE: 'Optical thickness' is the mathematical product of the index of refraction and the physical thickness of the coating.

d.2. Optical fabrication ''technology'' using single point diamond turning techniques to produce surface finish accuracies of better than 10 nm rms on non-planar surfaces exceeding 0.5 m^2;

e. Lasers. ''Technology'' ''required'' for the ''development'', ''production'' or ''use'' of specially designed diagnostic instruments or targets in test facilities for ''SHPL'' testing or testing or evaluation of materials irradiated by ''SHPL'' beams;

f. Magnetic and Electric Field Sensors. None

g. Gravimeters. None

h. Radar. None

6E101 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 6A002, 6A007.b and .c, 6A008, 6A102, 6A107, 6A108, 6B108, 6D102 or 6D103.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: (1) This entry only controls ''technology'' for equipment controlled by 6A008 when it is designed for airborne applications and is usable in ''missiles''. (2) This entry only controls ''technology'' for items in 6A002.a.1 and a.3 that are specially designed or modified to protect ''missiles'' against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects), and usable for ''missiles.'' (3) This entry only controls ''technology'' for items in 6A007.b and .c when the accuracies in 6A007.b.1 and b.2 are met or exceeded.

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

6E201 "Technology" according to the General Technology Note for the "use" of equipment controlled by 6A003.a.2. 6A003.a.3, 6A003.a.4; 6A005.a.2, 6A005.b.2.b, 6A005.b.3.a, 6A005.b.4.b, 6A005.b.6.b, 6A005.c.1.b, 6A005.c.2.b, 6A005.d.3.c, or 6A005.d.4.c (as described

in the license requirement note to 6A005); 6A202, 6A203, 6A205, 6A225 or 6A226.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

ECCN Controls: This entry only controls ''technology'' for ''lasers'' in 6A005 that are controlled for NP reasons.

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

6E991 "Technology" for the "development", "production" or "use" of equipment controlled by 6A991, 6A996, 6A997, or 6A998.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart
RS applies to ''technology'' for equipment controlled by 6A998.b.	RS Column 1.
AT applies to entire entry except ''technology'' for equipment controlled by 6A991.	AT Column 1.
AT applies to ''technology'' for equipment controlled by 6A991.	AT Column 2.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

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.

6E992 "Technology" for the "development" or "production" of equipment, materials or "software" controlled by 6A992, 6A994, or 6A995, 6B995, 6C992, 6C994, or 6D993.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

6E993 Other "technology", not controlled by 6E003, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items: a. Optical fabrication technologies for serially producing optical components at a rate exceeding 10 m^2 of surface area per year on any single spindle and having all of the following:

a.1. Area exceeding 1 m^2; *and*

a.2. Surface figure exceeding $\lambda/10$ (rms) at the designed wavelength;

b. ''Technology'' for optical filters with a bandwidth equal to or less than 10 nm, a field of view (FOV) exceeding 40° and a resolution exceeding 0.75 line pairs per milliradian;

c. ''Technology'' for the ''development'' or ''production'' of cameras controlled by 6A993;

d. ''Technology'' ''required'' for the ''development'' or ''production'' of non-triaxial fluxgate ''magnetometers'' or non-triaxial fluxgate ''magnetometer'' systems, having any of the following:

d.1. 'Sensitivity' lower (better) than 0.05 nT (rms) per square root Hz at frequencies of less than 1 Hz; or

d.2. 'Sensitivity' lower (better) than 1×10^{-3} nT (rms) per square root Hz at frequencies of 1 Hz or more.

TECHNICAL NOTE: For the purposes of 6E993, 'sensitivity' (or noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

CATEGORY 7—NAVIGATION AND AVIONICS

A. SYSTEMS, EQUIPMENT AND COMPONENTS

N.B. 1: For automatic pilots for underwater vehicles, see Category 8. For radar, see Category 6.

7A001 Accelerometers as follows (*see* List of Items Controlled) and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to commodities that meet or exceed the parameters of 7A101.	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: See also 7A101 and 7A994. For angular or rotational accelerometers, see 7A001.b. 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. Linear accelerometers having any of the following:

a.1. Specified to function at linear acceleration levels less than or equal to 15 g and having any of the following:

a.1.a. A ''bias'' ''stability'' of less (better) than 130 micro g with respect to a fixed calibration value over a period of one year; or

a.1.b. A ''scale factor'' ''stability'' of less (better) than 130 ppm with respect to a fixed calibration value over a period of one year;

a.2. Specified to function at linear acceleration levels exceeding 15 g but less than or equal to 100 g and having all of the following:

a.2.a.A ''bias'' ''repeatability'' of less (better) than 5,000 micro g over a period of one year; and

a.2.b.A ''scale factor'' ''repeatability'' of less (better) than 2,500 ppm over a period of one year; or

a.3. Designed for use in inertial navigation or guidance systems and specified to function at linear acceleration levels exceeding 100 g;

NOTE: 7A001.a.1 and 7A001.a.2 do not apply to accelerometers limited to measurement of only vibration or shock.

b. Angular or rotational accelerometers, specified to function at linear acceleration levels exceeding 100 g.

7A002 Gyros or angular rate sensors, having any of the following (*see* List of Items Controlled) and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to commodities that meet or exceed the parameters of 7A102.	MT Column 1.
AT applies to entire entry	AT Column 1.

License Requirement Note: For the purpose of MT controls only, the term 'stability' is defined as a measure of the ability of a specific mechanism or performance coefficient to remain invariant when continuously exposed to a fixed operating condition. (This definition does not refer to dynamic or servo stability.) (IEEE STD 528–2001 paragraph 2.247)

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: See also 7A102 and 7A994. For angular or rotational accelerometers, see 7A001.b.
Related Definitions: N/A
Items:

a. Specified to function at linear acceleration levels less than or equal to 100 g and having any of the following:

a.1. A rate range of less than 500 degrees per second and having any of the following:

a.1.a. A ''bias'' ''stability'' of less (better) than 0.5 degree per hour,when measured in a 1 g environment over a period of one month, and with respect to a fixed calibration value; *or*

a.1.b. An ''angle random walk'' of less (better) than or equal to 0.0035 degree per square root hour; *or*

NOTE: 7A002.a.1.b does not control 'spinning mass gyros'.

TECHNICAL NOTE: 'Spinning mass gyros' are gyros which use a continually rotating mass to sense angular motion.

a.2. A rate range greater than or equal to 500 degrees per second and having any of the following:

a.2.a. A ''bias'' ''stability'' of less (better) than 40 degrees per hour, when measured in a 1 g environment over a period of three minutes, and with respect to a fixed calibration value; *or*

a.2.b. An ''angle random walk'' of less (better) than or equal to 0.2 degree per square root hour; *or*

NOTE: 7A002.a.2.b does not apply to 'spinning mass gyros'.

b. Specified to function at linear acceleration levels exceeding 100 g.

7A003 Inertial systems and specially designed components, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to commodities in 7A003.d that meet or exceed the parameters of 7A103.	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 7A103 and 7A994. Inertial Navigation Systems (INS) and inertial equipment, and specially designed components therefor specifically designed, modified or configured for military use are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (*See* 22 CFR part 121.)
Related Definitions: ''Data-Based Referenced Navigation'' (''DBRN'') systems are systems which use various sources of previously measured geo-mapping data integrated to provide accurate navigation information under dynamic conditions. Data sources include bathymetric maps, stellar maps, gravity maps, magnetic maps or 3–D digital terrain maps.
Items: a. Inertial Navigation Systems (INS) (gimballed or strapdown) and inertial equipment, designed for ''aircraft'', land vehicles, vessels (surface or underwater) or ''spacecraft'', for navigation, attitude, guidance or control and having any of the following and specially designed components therefor:

a.1. Navigation error (free inertial) subsequent to normal alignment of 0.8 nautical mile per hour (nm/hr) ''Circular Error Probable'' (''CEP'') or less (better); *or*

a.2. Specified to function at linear acceleration levels exceeding 10 g;

b. Hybrid Inertial Navigation Systems embedded with Global Navigation Satellite System(s) (GNSS) or with ''Data-Based Referenced Navigation'' (''DBRN'') System(s) for navigation, attitude, guidance or control, subsequent to normal alignment and having an INS navigation position accuracy, after loss of GNSS or ''DBRN'' for a period of up to 4 minutes, of less (better) than 10 meters ''Circular Error Probable'' (''CEP'');

c. Inertial measurement equipment for heading or True North determination and having any of the following, and specially designed components therefor:

c.1. Designed to have heading or True North determination accuracy equal to, or less (better) than 0.07 deg sec (Lat) (equivalent to 6 arc minutes (rms) at 45 degrees latitude); *or*

c.2. Designed to have a non-operating shock level of 900 g or greater at a duration of 1 msec, or greater;

d. Inertial measurement equipment including Inertial Measurement Units (IMU) and Inertial Reference Systems (IRS), incorporating accelerometers or gyros controlled by 7A001 or 7A002.

NOTE 1: The parameters of 7A003.a and 7A003.b are applicable with any of the following environmental conditions:

a. Input random vibration with an overall magnitude of 7.7 g (rms) in the first 0.5 hour and a total test duration of 1.5 hour per axis in each of the 3 perpendicular axes, when the random vibration meets all of the following:

1. A constant Power Spectral Density (PSD) value of 0.04 g^2/Hz over a frequency interval of 15 to 1,000 Hz; and

2. The PSD attenuates with frequency from 0.04 g^2/Hz to 0.01 g^2/Hz over a frequency interval from 1,000 to 2,000 Hz;

b. An angular rate capability about one or more axes of equal to or more than +2.62 rad/s (150 deg/s); or

c. According to national standards equivalent to a. or b. of this note.

NOTE 2: 7A003 does not control inertial navigation systems which are certified for use on ''civil aircraft'' by civil authorities of a Wassenaar Arrangement Participating State, see Supplement No. 1 to Part 743 for a list of these countries.

NOTE 3: 7A003.c.1 does not control theodolite systems incorporating inertial equipment specially designed for civil surveying purposes.

TECHNICAL NOTE: 7A003.b refers to systems in which an INS and other independent navigation aids are built into a single unit (embedded) in order to achieve improved performance.

7A004 "Star trackers" and components therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 7A104 and 7A994
Related Definitions: N/A
Items:

a. ''Star trackers'' with a specified azimuth accuracy of equal to or less (better) than 20 seconds of arc throughout the specified lifetime of the equipment;

b. Components specially designed for equipment specified in 7A004.a as follows:

b.1. Optical heads or baffles;

b.2. Data processing units.

TECHNICAL NOTE: *'Star trackers' are also referred to as stellar attitude sensors or gyro-astro compasses.*

7A005 Global Navigation Satellite Systems (GNSS) receiving equipment having any

of the following (see List of Items Controlled) and specially designed components therefor.

LICENSE REQUIREMENTS

These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. *See* 22 CFR part 121.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 7A105 and 7A994. For equipment specially designed for military use, see Categories XI and XV of the U.S. Munitions List (22 CFR 121).

Related Definitions: N/A

Items:

a. Employing a decryption algorithm specially designed or modified for government use to access the ranging code for position and time; *or*

b. Employing 'adaptive antenna systems'.

NOTE: 7A005.b does not apply to GNSS receiving equipment that only uses components designed to filter, switch, or combine signals from multiple omni-directional antennae that do not implement adaptive antenna techniques.

TECHNICAL NOTE: For the purposes of 7A005.b 'adaptive antenna systems' dynamically generate one or more spatial nulls in an antenna array pattern by signal processing in the time domain or frequency domain.

7A006 Airborne altimeters operating at frequencies other than 4.2 to 4.4 GHz inclusive and having any of the following (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 7A106, 7A994 and Category 6 for controls on radar.

Related Definitions: N/A

Items: a. ''Power management''; or

b. Using phase shift key modulation.

7A008 Underwater sonar navigation systems using Doppler velocity or correlation velocity logs integrated with a heading source and having a positioning accuracy of equal to or less (better) than 3% of distance traveled "Circular Error Probable" ("CEP") and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: 7A008 does not control systems specially designed for installation on surface vessels or systems requiring acoustic beacons or buoys to provide positioning data. See 6A001.a for acoustic systems, and 6A001.b for correlation-velocity and Doppler-velocity sonar log equipment. See 8A002 for other marine systems.

Related Definitions: N/A

Items:

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

7A101 Accelerometers, other than those controlled by 7A001 (see List of Items Controlled), and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	*Country Chart*
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: This entry does not control accelerometers which are specially designed and developed as MWD (Measurement While Drilling) sensors for use in downhole well service operations.

Related Definitions: N/A

Items: a. Linear accelerometers designed for use in inertial navigation systems or in guidance systems of all types, usable in ''missiles'' having all of the following characteristics, and specially designed components therefore:

1. 'Scale factor' ''repeatability'' less (better) than 1250 ppm; and

2. 'Bias' ''repeatability'' less (better) than 1250 micro g.

NOTE: The measurement of 'bias' and 'scale factor' refers to one sigma standard deviation with respect to a fixed calibration over a period of one year.

b. Accelerometers of any type, designed for use in inertial navigation systems or in guidance systems of all types, specified to function at acceleration levels greater than 100 g.

NOTE TO PARAGRAPH (b): This paragraph (b) does not include accelerometers that are designed to measure vibration or shock.

7A102 Gyros, other than those controlled by 7A002 (see List of Items Controlled), and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: (1) Drift rate is defined as the time rate of output deviation from the desired output. It consists of random and systematic components and is expressed as an equivalent angular displacement per unit time with respect to inertial space. (2) Stability is defined as standard deviation (1 sigma) of the variation of a particular parameter from its calibrated value measured under stable temperature conditions. This can be expressed as a function of time.

Items:

a. All types of gyros, usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a ''range'' equal to or greater than 300 km, with a rated ''drift rate'' 'stability' of less than 0.5 degrees (1 sigma or rms) per hour in a 1 g environment.

b. Gyros of any type, designed for use in inertial navigation systems or in guidance systems of all types, specified to function at acceleration levels greater than 100 g.

TECHNICAL NOTE: In this entry, the term 'stability' is defined as a measure of the ability of a specific mechanism or performance coefficient to remain invariant when continuously exposed to a fixed operating condition. (This definition does not refer to dynamic or servo stability.) (IEEE STD 528–2001 paragraph 2.247).

7A103 Instrumentation, navigation equipment and systems, other than those controlled by 7A003, and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) For rockets, missiles, or unmanned aerial vehicles controlled under the U.S. Munitions List (22 CFR part 121), items described in 7A103.b are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (See 22 CFR part 121). (2) Inertial navigation systems and inertial equipment, and specially designed components therefor specifically designed, modified or configured for military use are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: N/A

Items: a. Inertial or other equipment using accelerometers or gyros controlled by 7A001, 7A002, 7A101 or 7A102 and systems incorporating such equipment;

NOTE 1: 7A103.a does not control equipment containing accelerometers specially designed and developed as MWD (Measurement While Drilling) sensors for use in down-hole well services operations.

NOTE 2: 7A103.a does not control inertial or other equipment using accelerometers or gyros controlled by 7A001 or 7A002 that are only NS controlled.

b. Integrated flight instrument systems, which include gyrostabilizers or automatic pilots, designed or modified for use in rockets, missiles, or unmanned aerial vehicles capable of achieving a ''range'' equal to or greater than 300 km.

c. Integrated Navigation Systems, designed or modified for use in rockets, missiles, or unmanned aerial vehicles capable of achieving a ''range'' equal to or greater than 300 km and capable of providing a navigational accuracy of 200m Circular Error Probable (CEP) or less.

TECHNICAL NOTE: An 'integrated navigation system' typically incorporates the following components:

1. An inertial measurement device (e.g., an attitude and heading reference system, inertial reference unit, or inertial navigation system);

2. One or more external sensors used to update the position and/or velocity, either periodically or continuously throughout the flight (e.g., satellite navigation receiver, radar altimeter, and/or Doppler radar); and

3. Integration hardware and software.

7A104 Gyro-astro compasses and other devices, other than those controlled by 7A004, which derive position or orientation by means of automatically tracking celestial bodies or satellites and specially designed components therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: This entry controls specially designed components for gyro-astro compasses and other devices controlled by 7A004
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

7A105 Receiving equipment for Global Navigation Satellite Systems (GNSS) (e.g. GPS, GLONASS, or Galileo) having any of the following characteristics, and specially designed components therefor. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

1. Designed or modified for use in ''missiles''; or

2. Designed or modified for airborne applications and having any of the following:

a. Capable of providing navigation information at speeds in excess of 600 m/s (1,165 nautical mph).

b. Employing decryption, designed or modified for military or governmental services, to gain access to GNSS secured signal/data; or

c. Being specially designed to employ anti-jam features (*e.g.* null steering antenna or electronically steerable antenna) to function in an environment of active or passive countermeasures.

NOTE TO 7A105: *See* also 7A005 and 7A994.

7A106 Altimeters, other than those controlled by 7A006, of radar or laser radar type, designed or modified for use in "missiles". (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

7A107 Three axis magnetic heading sensors having all of the following characteristics, and specially designed components therefor.

LICENSE REQUIREMENTS
Reason for Control: MT, AT.

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: N/A.
Related Definitions: N/A.
Items:

a. Internal tilt compensation in pitch (±90 degrees) and roll (±180 degrees) axes;

b. Capable of providing azimuthal accuracy better (less) than 0.5 degrees rms at latitudes of ±80 degrees, referenced to local magnetic field; *and*

c. Designed or modified to be integrated with flight control and navigation systems.

NOTE: Flight control and navigation systems in 7A107 include gyrostabilizers, automatic pilots and inertial navigation systems.

7A115 Passive sensors for determining bearing to specific electromagnetic source (direction finding equipment) or terrain characteristics, designed or modified for use in "missiles". (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

7A116 Flight control systems (hydraulic, mechanical, electro-optical, or electro-mechanical flight control systems (including fly-by-wire systems) and attitude control equipment) designed or modified for "missiles". (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

7A117 "Guidance sets" capable of achieving system accuracy of 3.33% or less of the range (e.g., a "CEP" of 10 km or less at a range of 300 km). (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

7A994 Other navigation direction finding equipment, airborne communication equipment, all aircraft inertial navigation systems not controlled under 7A003 or 7A103, and other avionic equipment, including parts and components, n.e.s.

LICENSE REQUIREMENTS
Reason for Control: RS, AT

Control(s)	Country chart
RS applies to QRS11–00100–100/101 and QRS11–00050–443/569 Micromachined Angular Rate Sensors. See Related Controls.	RS Column 1.
AT applies to entire entry	AT Column 1.

LICENSE REQUIREMENT NOTES: There is no *de minimis* level for foreign-made commercial primary or standby instrument systems that

integrate QRS11–00100–100/101 or commercial automatic flight control systems that integrate QRS11–00050–443/569 Micromachined Angular Rate Sensors (see §734.4(a) of the EAR).

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: QRS11 Micromachined Angular Rate Sensors are subject to the export licensing jurisdiction of the U.S. Department of State, Directorate of Defense Trade Controls, unless the QRS11–00100–100/101 is integrated into and included as an integral part of a commercial primary or standby instrument system of the type described in ECCN 7A994, or aircraft of the type described in ECCN 9A991 that incorporates such systems, or is exported solely for integration into such a system; or the QRS11–00050–443/569 is integrated into an automatic flight control system of the type described in ECCN 7A994, or aircraft of the type described in ECCN 9A991 that incorporates such systems, or are exported solely for integration into such a system. (See Commodity Jurisdiction requirements in 22 CFR Parts 121; Category VIII(e), Note(1)) In the latter case, such items are subject to the licensing jurisdiction of the Department of Commerce. Technology specific to the development and production of QRS11 sensors remains subject to the licensing jurisdiction of the Department of State.

Related Definitions: N/A

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

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

7B001 Test, calibration or alignment equipment, specially designed for equipment controlled by 7A (except 7A994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See also 7B101, 7B102 and 7B994.

(2) This entry does not control test, calibration or alignment equipment for 'Maintenance level I' or 'Maintenance Level II'.

Related Definition: (1) ''Maintenance Level I'': The failure of an inertial navigation unit is detected on the aircraft by indications from the Control and Display Unit (CDU) or by the status message from the corresponding sub-system. By following the manufacturer's manual, the cause of the failure may be localized at the level of the malfunctioning Line Replaceable Unit (LRU). The operator then removes the LRU and replaces it with a spare.

(2) ''Maintenance Level II'': The defective LRU is sent to the maintenance workshop (the manufacturer's or that of the operator responsible for level II maintenance). At the maintenance workshop, the malfunctioning LRU is tested by various appropriate means to verify and localize the defective Shop Replaceable Assembly (SRA) module responsible for the failure. This SRA is removed and replaced by an operative spare. The defective SRA (or possibly the complete LRU) is then shipped to the manufacturer. 'Maintenance Level II' does not include the disassembly or repair of controlled accelerometers or gyro sensors.

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

7B002 Equipment specially designed to characterize mirrors for ring "laser" gyros, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 7B102 and 7B994

Related Definitions: N/A

Items: a. Scatterometers having a measurement accuracy of 10 ppm or less (better);

b. Profilometers having a measurement accuracy of 0.5 nm (5 angstrom) or less (better).

7B003 Equipment specially designed for the "production" of equipment controlled by 7A (except 7A994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: (1) See also 7B103, (this entry is subject to the licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121)) and 7B994. (2) This entry includes: Inertial Measurement Unit (IMU module) tester; IMU platform tester; IMU stable element handling fixture; IMU platform balance fixture; gyro tuning test station; gyro dynamic balance station; gyro run-in/motor test station; gyro evacuation and fill station; centrifuge fixtures for gyro bearings; accelerometer axis align stations; accelerometer test station; and fiber optic gyro coil winding machines.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

7B101 "Production equipment", and other test, calibration, and alignment equipment, other than that described in 2B119 to 2B122, 7B003, and 7B102, designed or modified to be used with equipment controlled by 7A001 to 7A004 or 7A101 to 7A104.

LICENSE REQUIREMENTS
Reason for Control: MT, AT.

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: (1) *See also* 2B119 to 2B122, 7B003, 7B102, and 7B994.
(2) This entry includes: inertial measurement unit (IMU module) tester; IMU platform tester; IMU stable element handling fixture; IMU platform balance fixture; gyro tuning test station; gyro dynamic balance stations; gyro run-in/motor test stations; gyro evacuation and filling stations; centrifuge fixtures for gyro bearings; accelerometer axis align stations; and accelerometer test stations.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

7B102 Equipment, other than those controlled by 7B002, designed or modified to characterize mirrors, for laser gyro equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: N/A
Related Definitions: N/A
Items: a. Scatterometers having a threshold accuracy of 10 ppm or less (better).
b. Reflectometers having a threshold accuracy of 50 ppm or less (better).
c. Prolifometers having a threshold accuracy of 0.5nm (5 angstrom) or less (better).

7B103 Specially designed "production facilities" for equipment controlled by 7A117. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

7B994 Other equipment for the test, inspection, or "production" of navigation and avionics equipment.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

C. MATERIALS [RESERVED]

D. SOFTWARE

7D001 "Software" specially designed or modified for the "development" or "production" of equipment controlled by 7A (except 7A994) or 7B (except 7B994).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, RS, AT

Control(s)	Country chart
NS applies to "software" for equipment controlled by 7A001 to 7A004, 7A006, 7A008, 7B001, 7B002 or 7B003.	NS Column 1.
MT applies to "software" for equipment controlled for MT reasons. MT does not apply to "software" for equipment controlled by 7A008.	MT Column 1.

Control(s)	Country chart
RS applies to "software" for inertial navigation systems, inertial equipment, and specially designed components therefor, for "civil aircraft.".	RS Column 1
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) See also 7D101 and 7D994. (2) The ''software'' related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, or 7B103 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.) (3) ''Software'' for inertial navigation systems and inertial equipment, and specially designed components therefor, not for use on civil aircraft are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.)
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

7D002 "Source code" for the operation or maintenance of any inertial navigation equipment, including inertial equipment not controlled by 7A003 or 7A004, or Attitude and Heading Reference Systems ('AHRS').

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) *See also 7D102* and *7D994*. (2) This entry does not control ''source code'' for the ''use'' of gimballed 'AHRS'.
Related Definition: 'AHRS' generally differ from Inertial Navigation Systems (INS) in that an 'AHRS' provides attitude and heading information and normally does not provide the acceleration, velocity and position information associated with an INS.
Items: The list of items controlled is contained in the ECCN heading

7D003 Other "software" as follows (*see* List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to "software" for equipment controlled for MT reasons. MT does not apply to "software" for equipment controlled by 7A008.	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
STA: License Exception STA may not be used to ship or transmit software in 7D003.a, b, c, d.1 to d.4 or d.7 to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) See also 7D102 and 7D994. (2) This entry does not control ''source code'' for the operation or maintenance of gimballed 'AHRS'.
Related Definitions: 'Data-Based Referenced Navigation' ('DBRN') systems are systems which use various sources of previously measured geo-mapping data integrated to provide accurate navigation information under dynamic conditions. Data sources include bathymetric maps, stellar maps, gravity maps, magnetic maps or 3–D digital terrain maps.
Items:
a. ''Software'' specially designed or modified to improve the operational performance or reduce the navigational error of systems to the levels controlled by 7A003, 7A004 or 7A008;
b. ''Source code'' for hybrid integrated systems which improves the operational performance or reduces the navigational error of systems to the level controlled by 7A003 or 7A008 by continuously combining heading data with any of the following:
b.1. Doppler radar or sonar velocity data;
b.2. Global Navigation Satellite Systems (GNSS) reference data; or
b.3. Data from 'Data-Based Referenced Navigation' ('DBRN'') systems;
c. ''Source code'' for integrated avionics or mission systems which combine sensor data and employ ''expert systems'';
d. ''Source code'' for the ''development'' of any of the following:
d.1. Digital flight management systems for ''total control of flight'';
d.2. Integrated propulsion and flight control systems;
d.3. Fly-by-wire or fly-by-light control systems;
d.4. Fault-tolerant or self-reconfiguring ''active flight control systems'';
d.5. Airborne automatic direction finding equipment;
d.6. Air data systems based on surface static data; or
d.7. Three dimensional displays;

e. Computer-Aided-Design (CAD) ''software'' specially designed for the ''development'' of ''active flight control systems'', helicopter multi-axis fly-by-wire or fly-by-light controllers or helicopter ''circulation controlled anti-torque or circulation-controlled direction control systems'', whose ''technology'' is controlled by 7E004.b, 7E004.c.1 or 7E004.c.2.

7D101 "Software" specially designed or modified for the "use" of equipment controlled by 7A001 to 7A006, 7A101 to 7A107, 7A115, 7A116, 7B001, 7B002, 7B003, 7B101, 7B102, or 7B103.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) The ''software'' related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, or 7B103 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.) (2) ''Software'' for inertial navigation systems and inertial equipment, and specially designed components therefor, not designed for use on civil aircraft by civil aviation authorities of a country listed in Country Group A:1 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

7D102 Integration "software", as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: The ''software'' related to 7A003.b or 7A103.b are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: N/A

Items: a. Integration ''software'' for the equipment controlled by 7A103.b.

b. Integration ''software'' specially designed for the equipment controlled by 7A003 or 7A103.a.

7D103 "Software" specially designed for modelling or simulation of the "guidance sets" controlled by 7A117 or for their design integration with "missiles". (This entry is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

7D994 "Software", n.e.s., for the "development", "production", or "use" of navigation, airborne communication and other avionics.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

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

E. TECHNOLOGY

7E001 "Technology" according to the General Technology Note for the "development" of equipment or "software", controlled by 7A (except 7A994), 7B (except 7B994) or 7D (except 7D994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart
NS applies to ''technology'' for items controlled by 7A001 to 7A004, 7A006, 7A008, 7B001 to 7B003, 7D001 to 7D003.	NS Column 1.
MT applies to technology for equipment controlled for MT reasons. MT *does not* apply to ''technology'' for equipment controlled by 7A008. MT *does* apply to ''technology'' for equipment specified in 7A001, 7A002 or 7A003.d that meets or exceeds parameters of 7A101, 7A102 or 7A103.	MT Column 1.
RS applies to ''technology'' for inertial navigation systems, inertial equipment and specially designed components therefor, for civil aircraft.	RS Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) See also 7E101 and 7E994. (2) The ''technology'' related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, 7B103, software in 7D101 specified in the Related Controls paragraph of ECCN 7D101, 7D102.a, or 7D103 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

Related Definitions: Refer to the Related Definitions for 7B001 for 'Maintenance Level I' or 'Maintenance Level II'.

Items: The list of items controlled is contained in the ECCN heading

7E002 "Technology" according to the General Technology Note for the "production" of equipment controlled by 7A (except 7A994) or 7B (except 7B994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart
NS applies to ''technology'' for equipment controlled by 7A001 to 7A004, 7A006, 7A008 or 7B001 to 7B003.	NS Column 1.
MT applies to technology for equipment controlled for MT reasons. MT *does not* apply to ''technology'' for equipment controlled by 7A008. MT *does* apply to ''technology'' for equipment specified in 7A001, 7A002 or 7A003.d that meets or exceeds parameters of 7A101, 7A102 or 7A103.	MT Column 1.
RS applies to ''technology'' for inertial navigation systems, inertial equipment and specially designed components therefor, for civil aircraft.	RS Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) See also 7E102 and 7E994. (2) The ''technology'' related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, or 7B103 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121)

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

7E003 "Technology" according to the General Technology Note for the repair, refurbishing or overhaul of equipment controlled by 7A001 to 7A004.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 7E994. This entry does not control maintenance ''technology'' directly associated with calibration, removal or replacement of damaged or unserviceable LRUs and SRAs of a ''civil aircraft'' as described in ''Maintenance Level I or Maintenance Level II''.

Related Definition: Refer to the Related Definitions for 7B001 for 'Maintenance Level I' or 'Maintenance Level II'.

Items: The list of items controlled is contained in the ECCN heading

7E004 Other "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to entire entry, except 7E004.a.7.	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: See also 7E104 and 7E994

Related Definitions: ''*Primary flight control*'' means an ''aircraft'' stability or maneuvering control using force/moment generators, i.e., aerodynamic control surfaces or propulsive thrust vectoring.

Items:

a. ''Technology'' for the ''development'' or ''production'' of any of the following:

a.1. [Reserved]

a.2. Air data systems based on surface static data only, *i.e.*, which dispense with conventional air data probes;

a.3. Three dimensional displays for ''aircraft'';

a.4. [Reserved]

a.5. Electric actuators (*i.e.*, electromechanical, electrohydrostatic and integrated actuator package) specially designed for ''primary flight control'';

a.6. ''Flight control optical sensor array'' specially designed for implementing ''active flight control systems''; or

a.7. ''DBRN'' systems designed to navigate underwater, using sonar or gravity databases, that provide a positioning accuracy equal to or less (better) than 0.4 nautical miles;

b. ''Development'' ''technology'', as follows, for ''active flight control systems'' (including fly-by-wire or fly-by-light):

b.1. Configuration design for interconnecting multiple microelectronic processing elements (on-board computers) to achieve ''real time processing'' for control law implementation;

b.2. Control law compensation for sensor location or dynamic airframe loads, *i.e.*, compensation for sensor vibration environment or for variation of sensor location from the center of gravity;

b.3. Electronic management of data redundancy or systems redundancy for fault detection, fault tolerance, fault isolation or reconfiguration;

NOTE: 7E004.b.3. does not control ''technology'' for the design of physical redundancy.

b.4. Flight controls that permit inflight reconfiguration of force and moment controls for real time autonomous air vehicle control;

b.5. Integration of digital flight control, navigation and propulsion control data, into a digital flight management system for ''total control of flight'';

NOTE: 7E004.b.5 does not control:

1. ''Development'' ''technology'' for integration of digital flight control, navigation and propulsion control data, into a digital flight management system for ''flight path optimization'';

2. ''Development'' ''technology'' for ''aircraft'' flight instrument systems integrated solely for VOR, DME, ILS or MLS navigation or approaches.

b.6. Full authority digital flight control or multisensor mission management systems, employing ''expert systems'';

N.B.: For ''technology'' for ''Full Authority Digital Engine Control Systems'' (''FADEC Systems''), *see* ECCN 9E003.h.

c. ''Technology'' for the ''development'' of helicopter systems, as follows:

c.1. Multi-axis fly-by-wire or fly-by-light controllers, which combine the functions of at least two of the following into one controlling element:

c.1.a. Collective controls;

c.1.b. Cyclic controls;

c.1.c. Yaw controls;

c.2. ''Circulation-controlled anti-torque or circulation-controlled directional control systems'';

c.3. Rotor blades incorporating ''variable geometry airfoils'', for use in systems using individual blade control.

7E101 "Technology", according to the General Technology Note for the "use" of equipment controlled by 7A001 to 7A006, 7A101 to 7A107, 7A115 to 7A117, 7B001, 7B002, 7B003, 7B101, 7B102, 7B103, or 7D101 to 7D103.

LICENSE REQUIREMENTS

Reason for Control: MT, RS, AT

Control(s)	Country chart
MT applies to entire entry	MT Column 1
RS applies to "use" of inertial navigation systems, inertial equipment and specially designed components therefor, for civil aircraft.	RS Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: The ''technology'' related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, 7B103, software specified in the Related Controls paragraph of ECCN 7D101, 7D102.a, or 7D103 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

7E102 "Technology" for protection of avionics and electrical subsystems against electromagnetic pulse (EMP) and electromagnetic interference (EMI) hazards, from external sources, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: N/A

Related Definitions: N/A

Items: a. Design ''technology'' for shielding systems;

b. Design ''technology'' for the configuration of hardened electrical circuits and subsystems;

c. Design ''technology'' for the determination of hardening criteria of .a and .b of this entry.

7E104 Design "Technology" for the integration of the flight control, guidance, and propulsion data into a flight management

system, designed or modified for "missiles", for optimization of rocket system trajectory. (This entry is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

7E994 "Technology", n.e.s., for the "development", "production", or "use" of navigation, airborne communication, and other avionics equipment.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: Technology specific to the development and production of QRS11 sensors remains subject to the licensing jurisdiction of the Department of State (see ECCN 7A994, Related Controls).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

CATEGORY 8—MARINE

A. SYSTEMS, EQUIPMENT AND COMPONENTS

8A001 Submersible vehicles and surface vessels, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS: $5000; N/A for 8A001.b and .d

GBS: N/A

CIV: N/A

STA: License Exception STA may not be used to ship any commodity in 8A001.b, 8A001.c or 8A001.d to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: For the control status of equipment for submersible vehicles, see: Category 5, Part 2 ''Information Security'' for encrypted communication equipment; Category 6 for sensors; Categories 7 and 8 for navigation equipment; Category 8A for underwater equipment.

Related Definitions: N/A

Items:

a. Manned, tethered submersible vehicles designed to operate at depths exceeding 1,000 m;

b. Manned, untethered submersible vehicles having any of the following:

b.1. Designed to 'operate autonomously' and having a lifting capacity of all the following:

b.1.a. 10% or more of their weight in air; and

b.1.b. 15 kN or more;

b.2. Designed to operate at depths exceeding 1,000 m; or

b.3. Having all of the following:

b.3.a. Designed to continuously 'operate autonomously' for 10 hours or more; and

b.3.b. 'Range' of 25 nautical miles or more;

TECHNICAL NOTES: 1. For the purposes of 8A001.b, 'operate autonomously' means fully submerged, without snorkel, all systems working and cruising at minimum speed at which the submersible can safely control its depth dynamically by using its depth planes only, with no need for a support vessel or support base on the surface, sea-bed or shore, and containing a propulsion system for submerged or surface use.

2. For the purposes of 8A001.b, 'range' means half the maximum distance a submersible vehicle can 'operate autonomously'.

c. Unmanned, tethered submersible vehicles designed to operate at depths exceeding 1,000 m and having any of the following:

c.1. Designed for self-propelled maneuver using propulsion motors or thrusters controlled by 8A002.a.2; *or*

c.2. Fiber optic data link;

d. Unmanned, untethered submersible vehicles having any of the following:

d.1. Designed for deciding a course relative to any geographical reference without real-time human assistance;

d.2. Acoustic data or command link; *or*

d.3. Optical data or command link exceeding 1,000 m;

e. Ocean salvage systems with a lifting capacity exceeding 5 MN for salvaging objects from depths exceeding 250 m and having any of the following:

e.1. Dynamic positioning systems capable of position keeping within 20 m of a given point provided by the navigation system; *or*

e.2. Seafloor navigation and navigation integration systems, for depths exceeding 1,000 m and with positioning accuracies to within 10 m of a predetermined point;

f. Surface-effect vehicles (fully skirted variety) having all of the following:

f.1. Maximum design speed, fully loaded, exceeding 30 knots in a significant wave height of 1.25 m (Sea State 3) or more;

f.2. Cushion pressure exceeding 3,830 Pa; *and*

f.3. Light-ship-to-full-load displacement ratio of less than 0.70;

g. Surface-effect vehicles (rigid sidewalls) with a maximum design speed, fully loaded, exceeding 40 knots in a significant wave height of 3.25 m (Sea State 5) or more;

h. Hydrofoil vessels with active systems for automatically controlling foil systems, with a maximum design speed, fully loaded, of 40 knots or more in a significant wave height of 3.25 m (Sea State 5) or more;

i. 'Small waterplane area vessels' having any of the following:

i.1. Full load displacement exceeding 500 tonnes with a maximum design speed, fully loaded, exceeding 35 knots in a significant wave height of 3.25 m (Sea State 5) or more; *or*

i.2. Full load displacement exceeding 1,500 tonnes with a maximum design speed, fully loaded, exceeding 25 knots in a significant wave height of 4 m (Sea State 6) or more.

TECHNICAL NOTE: A 'small waterplane area vessel' is defined by the following formula: Waterplane area at an operational design draft less than 2 × (displaced volume at the operational design draft)$^{2/3}$.

8A002 Marine systems, equipment and components, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
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.

LICENSE EXCEPTIONS

LVS:$5000; N/A for 8A002.o.3.b

*GBS:*Yes for 8A002.e.2 and manipulators for civil end-uses (*e.g.*, underwater oil, gas or mining operations) controlled by 8A002.i.2 and having 5 degrees of freedom of movement; and 8A002.r.

*CIV:*Yes for 8A002.e.2 and manipulators for civil end-uses (*e.g.*, underwater oil, gas or mining operations) controlled by 8A002.i.2 and having 5 degrees of freedom of movement; and 8A002.r.

STA: License Exception STA may not be used to ship any commodity in 8A002.b, h, j, o.3, or p to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: Systems and equipment in number, components in $ value

Related Controls: (1) See also 8A992 and for underwater communications systems, see Category 5, Part I—Telecommunications). 8A002 does not control closed and semi-closed circuit (rebreathing) apparatus that is controlled under 8A018.a. (2) See also 8A992 for self-contained underwater breathing apparatus that is not controlled by 8A002 or released for control by the 8A002.q Note. (3) For electronic imaging systems specially designed or modified for underwater use incorporating image intensifier tubes specified by 6A002.a.2.a or 6A002.a.2.b, see 6A003.b.3. (4) For electronic imaging systems specially designed or modified for underwater use incorporating ''focal plane arrays'' specified by 6A002.a.3.g, see 6A003.b.4.c.

Related Definitions: N/A

Items: a. Systems, equipment and components, specially designed or modified for submersible vehicles and designed to operate at depths exceeding 1,000 m, as follows:

a.1. Pressure housings or pressure hulls with a maximum inside chamber diameter exceeding 1.5 m;

a.2. Direct current propulsion motors or thrusters;

a.3. Umbilical cables, and connectors therefor, using optical fiber and having synthetic strength members;

a.4. Components manufactured from material specified by ECCN 8C001;

TECHNICAL NOTE: The objective of 8A002.a.4 should not be defeated by the export of 'syntactic foam' controlled by 8C001 when an intermediate stage of manufacture has been performed and it is not yet in its final component form.

b. Systems specially designed or modified for the automated control of the motion of submersible vehicles controlled by 8A001, using navigation data, having closed loop servo-controls and having any of the following:

b.1. Enabling a vehicle to move within 10 m of a predetermined point in the water column;

b.2. Maintaining the position of the vehicle within 10 m of a predetermined point in the water column; *or*

b.3. Maintaining the position of the vehicle within 10 m while following a cable on or under the seabed;

c. Fiber optic pressure hull penetrators;

d. Underwater vision systems as follows:

d.1. Television systems and television cameras, as follows:

d.1.a. Television systems (comprising camera, monitoring and signal transmission equipment) having a 'limiting resolution' when measured in air of more than 800 lines and specially designed or modified for remote operation with a submersible vehicle;

d.1.b. Underwater television cameras having a 'limiting resolution' when measured in air of more than 1,100 lines;

d.1.c. Low light level television cameras specially designed or modified for underwater use and having all of the following:

d.1.c.1. Image intensifier tubes controlled by 6A002.a.2.a; and

d.1.c.2. More than 150,000 ''active pixels'' per solid state area array;

TECHNICAL NOTE: 'Limiting resolution' is a measure of horizontal resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.

d.2. Systems specially designed or modified for remote operation with an underwater vehicle, employing techniques to minimize the effects of back scatter and including range-gated illuminators or ''laser'' systems;

e. Photographic still cameras specially designed or modified for underwater use below 150 m, with a film format of 35 mm or larger and having any of the following:

e.1. Annotation of the film with data provided by a source external to the camera;

e.2. Automatic back focal distance correction; or

e.3. Automatic compensation control specially designed to permit an underwater camera housing to be usable at depths exceeding 1,000 m;[Reserved]

g. Light systems specially designed or modified for underwater use, as follows:

g.1. Stroboscopic light systems capable of a light output energy of more than 300 J per flash and a flash rate of more than 5 flashes per second;

g.2. Argon arc light systems specially designed for use below 1,000 m;

h. ''Robots'' specially designed for underwater use, controlled by using a dedicated computer and having any of the following:

h.1. Systems that control the ''robot'' using information from sensors which measure force or torque applied to an external object, distance to an external object, or tactile sense between the ''robot'' and an external object; *or*

h.2. The ability to exert a force of 250 N or more or a torque of 250 Nm or more and using titanium based alloys or ''composite'' ''fibrous or filamentary materials'' in their structural members;

i. Remotely controlled articulated manipulators specially designed or modified for use with submersible vehicles and having any of the following:

i.1. Systems which control the manipulator using information from sensors which measure any of the following:

i.1.a. Torque or force applied to an external object; *or*

i.1.b. Tactile sense between the manipulator and an external object; or

i.2. Controlled by proportional master-slave techniques or by using a dedicated computer and having 5 degrees of 'freedom of movement' or more;

TECHNICAL NOTE: Only functions having proportional control using positional feedback or by using a dedicated computer are counted when determining the number of degrees of 'freedom of movement'.

j. Air independent power systems specially designed for underwater use, as follows:

j.1. Brayton or Rankine cycle engine air independent power systems having any of the following:

j.1.a. Chemical scrubber or absorber systems, specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;

j.1.b. Systems specially designed to use a monoatomic gas;

j.1.c. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; or

j.1.d. Systems having all of the following:

j.1.d.1. Specially designed to pressurize the products of reaction or for fuel reformation;

j.1.d.2. Specially designed to store the products of the reaction; and

j.1.d.3. Specially designed to discharge the products of the reaction against a pressure of 100 kPa or more;

j.2. Diesel cycle engine air independent systems having all of the following:

j.2.a. Chemical scrubber or absorber systems, specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;

j.2.b. Systems specially designed to use a monoatomic gas;

j.2.c. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; and

j.2.d. Specially designed exhaust systems that do not exhaust continuously the products of combustion;

j.3. Fuel cell air independent power systems with an output exceeding 2 kW and having any of the following:

j.3.a. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; or

j.3.b. Systems having all of the following:

j.3.b.1. Specially designed to pressurize the products of reaction or for fuel reformation;

j.3.b.2. Specailly designed to store the products of the reaction; and

j.3.b.3. Specially designed to discharge the products of the reaction against a pressure of 100 kPa or more;

j.4. Stirling cycle engine air independent power systems having all of the following:

j.4.a. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; and

j.4.b. Specially designed exhaust systems which discharge the products of combustion against a pressure of 100 kPa or more;

k. Skirts, seals and fingers, having any of the following:

k.1. Designed for cushion pressures of 3,830 Pa or more, operating in a significant wave height of 1.25 m (Sea State 3) or more and

specially designed for surface effect vehicles (fully skirted variety) controlled by 8A001.f; *or*

k.2. Designed for cushion pressures of 6,224 Pa or more, operating in a significant wave height of 3.25 m (Sea State 5) or more and specially designed for surface effect vehicles (rigid sidewalls) controlled by 8A001.g;

l. Lift fans rated at more than 400 kW and specially designed for surface effect vehicles controlled by 8A001.f or 8A001.g;

m. Fully submerged subcavitating or supercavitating hydrofoils, specially designed for vessels controlled by 8A001.h;

n. Active systems specially designed or modified to control automatically the sea-induced motion of vehicles or vessels, controlled by 8A001.f, 8A001.g, 8A001.h or 8A001.i;

o. Propellers, power transmission systems, power generation systems and noise reduction systems, as follows:

o.1. Water-screw propeller or power transmission systems, specially designed for surface effect vehicles (fully skirted or rigid sidewall variety), hydrofoils or 'small waterplane area vessels' controlled by 8A001.f, 8A001.g, .8A001.h or 8A001.i, as follows:

o.1.a. Supercavitating, super-ventilated, partially-submerged or surface piercing propellers, rated at more than 7.5 MW;

o.1.b. Contrarotating propeller systems rated at more than 15 MW;

o.1.c. Systems employing pre-swirl or post-swirl techniques, for smoothing the flow into a propeller;

o.1.d. Light-weight, high capacity (K factor exceeding 300) reduction gearing;

o.1.e. Power transmission shaft systems incorporating ''composite'' material components and capable of transmitting more than 1 MW;

o.2. Water-screw propeller, power generation systems or transmission systems, designed for use on vessels, as follows:

o.2.a. Controllable-pitch propellers and hub assemblies, rated at more than 30 MW;

o.2.b. Internally liquid-cooled electric propulsion engines with a power output exceeding 2.5 MW;

o.2.c. ''Superconductive'' propulsion engines or permanent magnet electric propulsion engines, with a power output exceeding 0.1 MW;

o.2.d. Power transmission shaft systems incorporating ''composite'' material components and capable of transmitting more than 2 MW;

o.2.e. Ventilated or base-ventilated propeller systems, rated at more than 2.5 MW;

o.3. Noise reduction systems designed for use on vessels of 1,000 tonnes displacement or more, as follows:

o.3.a. Systems that attenuate underwater noise at frequencies below 500 Hz and consist of compound acoustic mounts for the acoustic isolation of diesel engines, diesel generator sets, gas turbines, gas turbine generator sets, propulsion motors or propulsion reduction gears, specially designed for sound or vibration isolation and having an intermediate mass exceeding 30% of the equipment to be mounted;

o.3.b. 'Active noise reduction or cancellation systems' or magnetic bearings, specially designed for power transmission systems;

TECHNICAL NOTE: 'Active noise reduction or cancellation systems' incorporate electronic control systems capable of actively reducing equipment vibration by the generation of anti-noise or anti-vibration signals directly to the source.

p. Pumpjet propulsion systems having all of the following:

p.1. Power output exceeding 2.5 MW; *and*

p.2. Using divergent nozzle and flow conditioning vane techniques to improve propulsive efficiency or reduce propulsion-generated underwater-radiated noise;

q. Underwater swimming and diving equipment as follows;

q.1. Closed circuit rebreathers;

q.2. Semi-closed circuit rebreathers;

NOTE: 8A002.q does not control individual rebreathers for personal use when accompanying their users.

r. Diver deterrent acoustic systems specially designed or modified to disrupt divers and having a sound pressure level equal to or exceeding 190 dB (reference 1 μPa at 1 m) at frequencies of 200 Hz and below.

NOTE 1: 8A002.r does not apply to diver deterrent systems based on under-water-explosive devices, air guns or combustible sources.

NOTE 2: 8A002.r includes diver deterrent acoustic systems that use spark gap sources, also known as plasma sound sources.

8A018 Items on the Wassenaar Arrangement Munitions List.

LICENSE REQUIREMENTS

Reason for Control: NS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $5000.

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 8A002 and 8A992.

Related Definitions: N/A

Items: a. Closed and semi-closed circuit (rebreathing) apparatus specially designed for military use, and specially designed components for use in the conversion of open-circuit apparatus to military use;

b. Naval equipment, as follows:

b.1. Diesel engines of 1,500 hp and over with rotary speed of 700 rpm or over specially designed for submarines, and specially designed components therefor;

b.2. Electric motors specially designed for submarines, i.e., over 1,000 hp, quick reversing type, liquid cooled, and totally enclosed, and specially designed components therefor;

b.3. Nonmagnetic diesel engines, 50 hp and over, specially designed for military purposes with nonmagnetic content in excess of 75 percent of total mass and specially designed components therefor;

b.4. Submarine and torpedo nets and specially designed components therefor.

8A918 Marine Boilers.

LICENSE REQUIREMENTS

Reason for Control: RS, AT, UN

Controls	Country chart
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry.	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $5000.

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: a. Marine boilers designed to have any of the following characteristics:

a.1. Heat release rate (at maximum rating) equal to or in excess of 190,000 BTU per hour per cubic foot of furnace volume; *or*

a.2. Ratio of steam generated in pounds per hour (at maximum rating) to the dry weight of the boiler in pounds equal to or in excess of 0.83.

b. Components, parts, accessories, and attachments for the above.

8A992 Vessels, marine systems or equipment, not controlled by 8A001, 8A002 or 8A018, and specially designed parts therefor.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 8A002 and 8A018

Related Definitions: N/A

Items: a. Underwater vision systems, as follows:

a.1. Television systems (comprising camera, lights, monitoring and signal transmission equipment) having a limiting resolution when measured in air of more than 500 lines and specially designed or modified for remote operation with a submersible vehicle; *or*

a.2. Underwater television cameras having a limiting resolution when measured in air of more than 700 lines;

TECHNICAL NOTE: Limiting resolution in television is a measure of horizontal resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.

b. Photographic still cameras specially designed or modified for underwater use, having a film format of 35 mm or larger, and having autofocusing or remote focusing specially designed for underwater use;

c. Stroboscopic light systems, specially designed or modified for underwater use, capable of a light output energy of more than 300 J per flash;

d. Other underwater camera equipment, n.e.s.;

e. Other submersible systems, n.e.s.;

f. Vessels, n.e.s., including inflatable boats, and specially designed components therefor, n.e.s.

g. Marine engines (both inboard and outboard) and submarine engines, n.e.s.; and specially designed parts therefor, n.e.s.;

h. Other self-contained underwater breathing apparatus (scuba gear) and related equipment, n.e.s.;

i. Life jackets, inflation cartridges, compasses, wetsuits, masks, fins, weight belts, and dive computers;

j. Underwater lights and propulsion equipment;

k. Air compressors and filtration systems specially designed for filling air cylinders.

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

8B001 Water tunnels having a background noise of less than 100 dB (reference 1 μPa, 1 Hz) in the frequency range from 0 to 500 Hz and designed for measuring acoustic fields generated by a hydro-flow around propulsion system models.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

C. MATERIALS

8C001 'Syntactic foam' designed for underwater use and having all of the following (*see* List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 8A002.a.4.
Related Definition: 'Syntactic foam' consists of hollow spheres of plastic or glass embedded in a resin matrix.
Items: a. Designed for marine depths exceeding 1,000 m; *and*
b. A density less than 561 kg/m^3.

D. SOFTWARE

8D001 "Software" specially designed or modified for the "development", "production" or "use" of equipment or materials, controlled by 8A (except 8A018 or 8A992), 8B or 8C.

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 REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.
LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes, except for exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''software'' specially designed for the ''development'' or ''production'' of equipment controlled by 8A001.b, 8A001.d, or 8A002.o.3.b.
STA: License Exception STA may not be used to ship or transmit ''software'' specially designed for the ''development'' or ''production'' of equipment in 8A001.b, 8A001.c, 8A001.d, 8A002.b, 8A002.h, 8A002.j, 8A002.o.3 or 8A002.p to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

8D002 Specific "software" specially designed or modified for the "development", "production", repair, overhaul or refurbishing (re-machining) of propellers specially designed for underwater noise reduction.

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 REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.
LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes
STA: License Exception STA may not be used to ship or transmit any software in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 8D992
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

8D992 "Software" specially designed or modified for the "development", "production" or "use" of equipment controlled by 8A992.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

E. TECHNOLOGY

8E001 "Technology" according to the General Technology Note for the "development" or "production" of equipment or materials, controlled by 8A (except 8A018 or 8A992), 8B or 8C.

LICENSE REQUIREMENTS
Reason for Control: NS, AT

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

Control(s)	Country chart
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.
LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes, except for exports or reexports to destinations outside of Austria, Belgium,Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of ''technology'' for items controlled by 8A001.b, 8A001.d or 8A002.o.3.b.
STA: License Exception STA may not be used to ship or transmit ''technology'' according to the General Technology Note for the ''development'' or ''production'' of equipment specified by 8A001.b, 8A001.c, 8A001.d, 8A002.b, 8A002.h, 8A002.j, 8A002.o.3 or 8A002.p to any of the eight destinations listed in §740.20(c)(2) of the EAR.
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

8E002 Other "technology" as follows (*see* 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 REQUIREMENT NOTES: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.
LICENSE EXCEPTIONS
CIV: N/A
TSR: Yes
STA: License Exception STA may not be used to ship or transmit technology in 8E002.a to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: N/A
Related Controls: See also 8E992
Related Definitions: N/A
Items: a. ''Technology'' for the ''development'', ''production'', repair, overhaul or refurbishing (re-machining) of propellers specially designed for underwater noise reduction;

b. ''Technology'' for the overhaul or refurbishing of equipment controlled by 8A001, 8A002.b, 8A002.j, 8A002.o or 8A002.p.

8E992 "Technology" for the "development", "production" or "use" of equipment controlled by 8A992.
LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
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

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

CATEGORY 9—AEROSPACE AND PROPULSION

A. SYSTEMS, EQUIPMENT AND COMPONENTS

N.B.: For propulsion systems designed or rated against neutron or transient ionizing radiation, see the U.S. Munitions List, 22 CFR part 121.

9A001 Aero gas turbine engines having any of the following (see List of Items Controlled).
LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies to only to those engines that meet the characteristics listed in 9A101.	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: See also 9A101 and 9A991
Related Definitions: N/A
Items:

a. Incorporating any of the technologies controlled by 9E003.a, 9E003.h, or 9E003.i; *or*

NOTE: 9A001.a. does not control aero gas turbine engines which meet all of the following:

a. Certified by the civil aviation authority in a country listed in Supplement No. 1 to Part 743; and

b. Intended to power non-military manned aircraft for which any of the following has been issued by a Participating State listed in Supplement No. 1 to Part 743 for the aircraft with this specific engine type:

b.1. A civil type certificate; *or*

b.2. An equivalent document recognized by the International Civil Aviation Organization (ICAO).

b. Designed to power an aircraft designed to cruise at Mach 1 or higher, for more than 30 minutes.

9A002 'Marine gas turbine engines' with an ISO standard continuous power rating of 24,245 kW or more and a specific fuel consumption not exceeding 0.219 kg/kWh in the power range from 35 to 100%, and specially designed assemblies and components therefor.

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $5000
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: N/A
Related Definition: The term 'marine gas turbine engines' includes those industrial, or aero-derivative, gas turbine engines adapted for a ship's electric power generation or propulsion.
Items: The list of items controlled is contained in the ECCN heading.

9A003 Specially designed assemblies and components, incorporating any of the "technologies" controlled by 9E003.a, 9E003.h or 9E003.i, for any of the following gas turbine engine propulsion systems (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $5000
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: N/A
Related Definition: N/A
Items:

a. Controlled by 9A001; *or*

b. Whose design or production origins are either countries in Country Group D:1 or unknown to the manufacturer.

9A004 Space launch vehicles and "spacecraft".

LICENSE REQUIREMENTS
Reason for Control: NS and AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls:

(1) See also 9A104.

(2) Space launch vehicles are under the jurisdiction of the Department of State.

(3) Effective March 15, 1999, all satellites, including commercial communications satellites, are subject to the ITAR. Effective March 15, 1999, all license applications for the export of commercial communications satellites will be processed by the State Department, Directorate of Defense Trade Controls. Retransfer of jurisdiction for commercial communications satellites and related items shall not affect the validity of any export license issued by the Department of Commerce prior to March 15, 1999, or of any export license application filed under the Export Administration Regulations on or before March 14, 1999, and subsequently issued by the Department of Commerce. Commercial communications satellites licensed by the Department of Commerce, including those already exported, remain subject to the EAR and all terms and conditions of issued export licenses until their stated expiration date. All licenses issued by the Department of Commerce for commercial communications satellites, including licenses issued after March 15, 1999, remain subject to SI controls throughout the validity of the license. Effective March 15, 1999, Department of State jurisdiction shall apply to any instance where a replacement license would normally be required from the Department of Commerce. Transferring registration or operational control to any foreign person of any item controlled by this entry must be authorized on a license issued by the Department of State, Directorate of Defense Trade Controls. This requirement applies whether the item is physically located in the United States or abroad.

(4) All other ''spacecraft'' not controlled under 9A004 and their payloads, and specifically designed or modified components, parts, accessories, attachments, and associated equipment, including ground support equipment, are subject to the export licensing authority of the Department of State unless otherwise transferred to the Department of Commerce via a commodity jurisdiction determination by the Department of State.

(5) Exporters requesting a license from the Department of Commerce for ''spacecraft''

and their associated parts and components, other than the international space station, must provide a statement from the Department of State, Directorate of Defense Trade Controls, verifying that the item intended for export is under the licensing jurisdiction of the Department of Commerce. All specially designed or modified components, parts, accessories, attachments, and associated equipment for ''spacecraft'' that have been determined by the Department of State through the commodity jurisdiction process to be under the licensing jurisdiction of the Department of Commerce and that are not controlled by any other ECCN on the Commerce Control List will be assigned a classification under this ECCN 9A004.

(6) Technical data required for the detailed design, development, manufacturing, or production of the international space station (to include specifically designed parts and components) remains under the jurisdiction of the Department of State. This control by the ITAR of detailed design, development, manufacturing or production technology for NASA's international space station does not include that level of technical data necessary and reasonable for assurance that a U.S.-built item intended to operate on NASA's international space station has been designed, manufactured, and tested in conformance with specified requirements (e.g., operational performance, reliability, lifetime, product quality, or delivery expectations). All technical data and all defense services, including all technical assistance, for launch of the international space station, including launch vehicle compatibility, integration, or processing data, are controlled and subject to the jurisdiction of the Department of State, in accordance with 22 CFR parts 120 through 130.

Items: a. The international space station being developed, launched and operated under the supervision of the U.S. National Aeronautics and Space Administration. Hardware specific to the international space station transferred to the Department of Commerce by commodity jurisdiction action is also included.

b. Specific items as may be determined to be not subject to the ITAR through the commodity jurisdiction procedure administered by the Department of State after March 15, 1999.

9A005 Liquid rocket propulsion systems containing any of the systems or components, controlled by 9A006.(These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. *See* 22 CFR part 121).

9A006 Systems and components, specially designed for liquid rocket propulsion systems. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. *See* **22 CFR part 121).**

9A007 Solid rocket propulsion systems. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A008 Components specially designed for solid rocket propulsion systems. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A009 Hybrid rocket propulsion systems. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A010 Specially designed components, systems and structures, for launch vehicles, launch vehicle propulsion systems or "spacecraft". (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121).

9A011 Ramjet, scramjet or combined cycle engines, and specially designed components therefor. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls.*See* **22 CFR part 121).**

9A012 Non-military "unmanned aerial vehicles," ("UAVs"), unmanned "airships", associated systems, equipment and components, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country Chart
NS applies to entire entry	NS Column 1
MT applies to non-military unmanned air vehicle systems (UAVs) and remotely piloted vehicles (RPVs) that are capable of a maximum range of at least 300 kilometers (km), regardless of payload.	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: See the U.S. Munitions List Category VIII (22 CFR part 121). Also see section 744.3 of the EAR.

Related Definitions: N/A

a. ''UAVs'' or unmanned ''airships'', having any of the following:

a.1. An autonomous flight control and navigation capability (*e.g.*, an autopilot with an Inertial Navigation System); *or*

a.2. Capability of controlled flight out of the direct visual range involving a human operator (*e.g.*, televisual remote control);

b. Associated systems, equipment and components, as follows:

b.1. Equipment specially designed for remotely controlling the ''UAVs'' or unmanned ''airships'', controlled by 9A012.a.;

b.2. Systems for navigation, attitude, guidance or control, other than those controlled in Category 7, specially designed to provide autonomous flight control or navigation capability to ''UAVs'' or unmanned ''airships'', controlled by 9A012.a.;

b.3. Equipment or components specially designed to convert a manned ''aircraft'' or a manned ''airship'' to a ''UAV'' or unmanned ''airship'', controlled by 9A012.a;

b.4. Air breathing reciprocating or rotary internal combustion type engines, specially designed or modified to propel ''UAVs'' or unmanned ''airships'', at altitudes above 50,000 feet (15,240 meters).

NOTE: *9A012 does not control model aircraft or model ''airships''.*

9A018 Equipment on the Wassenaar Arrangement Munitions List

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
RS applies to 9A018.a and b	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry.	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

LVS: $1500.

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: (a) Parachute systems designed for use in dropping military equipment, braking military aircraft, slowing spacecraft descent, or retarding weapons delivery; (b) Instrument flight trainers for combat simulation; and (c) military ground armed or armored vehicles and parts and components specific thereto described in 22 CFR part 121, Category VII; and all-wheel drive vehicles capable of off-road use that have been armed or armored with articles described in 22 CFR part 121, Category XIII (See §770.2(h)—Interpretation 8) are all subject to the export licensing jurisdiction of the U.S. Department of State, Directorate of Defense Trade Controls.

Related Definition: This entry controls parachute systems designed for use in dropping personnel only.

Items: a. Military trainer aircraft bearing ''T'' designations:

a.1. Using reciprocating engines; or

a.2. Turbo prop engines with less than 600 horse power (h.p.); and

a.3. Specially designed component parts.

b. Ground transport vehicles (including trailers) and parts and components therefor designed or modified for non-combat military use and unarmed all-wheel drive vehicles capable of off-road use which have been manufactured or fitted with materials to provide ballistic protection to level III (National Institute of Justice standard 0108.01, September 1985) or better. (See §770.2(h)—Interpretation 8).

c. Pressure refuelers, pressure refueling equipment, equipment specially designed to facilitate operations in confined areas; and ground equipment, developed specially for military ''aircraft'', and specially designed parts and accessories, n.e.s.;

d. Pressurized breathing equipment specially designed for use in military ''aircraft'';

e. Military parachutes and complete canopies, harnesses, and platforms and electronic release mechanisms therefor, except such types as are in normal sporting use;

f. Military instrument flight trainers, except for combat simulation; and components and accessories specially designed for such equipment.

9A101 Turbojet and Turbofan Engines, Other Than Those Controlled by 9A001, as Follows (See List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number

Related Controls: 9A101.b controls only engines for non-military unmanned air vehicles [UAVs] or remotely piloted vehicles [RPVs], and does not control other engines designed or modified for use in ''missiles'', which are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

Related Definitions: N/A

Items: a. Engines having both of the following characteristics:

a.1. Maximum thrust value greater than 400 N (achieved un-installed) excluding civil certified engines with a maximum thrust value greater than 8,890 N (achieved un-installed), *and*

a.2. Specific fuel consumption of 0.15 kg/N/hr or less (at maximum continuous power at sea level static and standard conditions); *or*

b. Engines designed or modified for use in ''missiles'', regardless of thrust or specific fuel consumption.

9A103 Liquid Propellant Tanks Specially Designed for the Propellants Controlled in ECCNs 1C011, 1C111 or Other Liquid Propellants Used in "Missiles." (These Items Are Subject to the Export Licensing Authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A104 Sounding rockets, capable of a range of at least 300 km. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A105 Liquid propellant rocket engines. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A106 Systems or components, other than those controlled by 9A006, usable in "missiles", as follows (see List of Items Controlled), and specially designed for liquid rocket propulsion systems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: Items described in 9A106.a, .b, and .c are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (See 22 CFR part 121)

Related Definitions: N/A

Items: a. Ablative liners for thrust or combustion chambers;

b. Rocket nozzles;

c. Thrust vector control sub-systems;

TECHNICAL NOTE: Examples of methods of achieving thrust vector control controlled by 9A106.c includes:

1. Flexible nozzle;
2. Fluid or secondary gas injection;
3. Movable engine or nozzle;
4. Deflection of exhaust gas steam (jet vanes or probes); or
5. Thrust tabs.

d. Liquid and slurry propellant (including oxidizers) control systems, and specially designed components therefor, designed or modified to operate in vibration environments greater than 10 g rms between 20 Hz and 2000 Hz.

NOTE: The only servo valves and pumps controlled by 9A106.d, are the following:

a. Servo valves designed for flow rates equal to or greater than 24 liters per minute, at an absolute pressure equal to or greater than 7 MPa, that have an actuator response time of less than 100 ms;

b. Pumps, for liquid propellants, with shaft speeds equal to or greater than 8,000 rpm or with discharge pressures equal to or greater than 7 MPa.

e. Flight control servo valves designed or modified for use in ''missiles'' and designed or modified to operate in a vibration environment greater than 10g rms over the entire range between 20Hz and 2 kHz.

9A107 Solid Propellant Rocket Engines, Usable in Rockets With a Range Capability of 300 Km or Greater, Other Than Those Controlled by 9A007, Having Total Impulse Capacity Equal to or Greater Than 8.41×10^5 Ns, but less than 1.1×10^6 (These Items are Subject to the Export Licensing Authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A108 Solid rocket propulsion components, other than those controlled by 9A008, usable in rockets with a range capability of 300 Km or greater. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A109 Hybrid rocket motors, usable in rockets with a range capability of 300 Km or greater, other than those controlled by 9A009, and specially designed components therefor. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A110 Composite structures, laminates and manufactures thereof, other than those controlled by entry 9A010, specially designed for use in "missiles" or the subsystems controlled by entries 9A005,

9A007, 9A105.a, 9A106 to 9A108, 9A116, or 9A119.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Kilograms

Related Controls: (1) See also 1A002. (2) ''Composite structures, laminates, and manufactures thereof, specially designed for use in missile systems are under the licensing authority of the Directorate of Defense Trade Controls, U.S. Department of State, except those specially designed for non-military unmanned air vehicles controlled in 9A012.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

9A111 Pulse jet engines, usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300km, and specially designed components therefor. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A115 Apparatus, devices and vehicles, designed or modified for the transport, handling, control, activation and launching of rockets, missiles, and unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. *See* 22 CFR part 121.)

9A116 Reentry vehicles, usable in "missiles", and equipment designed or modified therefor. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A117 Staging mechanisms, separation mechanisms, and interstages therefor, usable in "missiles". (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A118 Devices to regulate combustion usable in engines which are usable in rockets with a range capability greater than 300 Km or greater, controlled by 9A011 or 9A111. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A119 Individual rocket stages, usable in rockets with a range capability greater than 300 Km or greater, other than those controlled by 9A005, 9A007, 9A009, 9A105, 9A107 and 9A109. (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9A120 Complete unmanned aerial vehicles, not specified in 9A012, having all of the following:

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

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

Related Controls: See ECCN 9A012 or the U.S. Munitions List Category VIII (22 CFR part 121). Also see ECCN 2B352.h for controls on certain spraying or fogging systems, and components therefor, specially designed or modified for fitting to aircraft, ''lighter than air vehicles,'' or ''UAVs.''

Related Definitions: N/A

Items:

a. Having any of the following:

a.1. An autonomous flight control and navigation capability; *or*

a.2. Capability of controlled-flight out of the direct vision range involving a human operator; *and*

b. Having any of the following:

b.1. Incorporating an aerosol dispensing system/mechanism with a capacity greater than 20 liters; *or*

b.2. Designed or modified to incorporate an aerosol dispensing system/mechanism with a capacity of greater than 20 liters.

NOTE: 9A120 does not control model aircraft, specially designed for recreational or competition purposes.

TECHNICAL NOTES: 1. An aerosol consists of particulate or liquids other than fuel components, by—products or additives, as part of the ''payload'' to be dispersed in the atmosphere. Examples of aerosols include pesticides for crop dusting and dry chemicals for cloud seeding.

2. An aerosol dispensing system/mechanism contains all above devices (mechanical, electrical, hydraulic, etc.), which are necessary for storage and dispersion of an aerosol into

the atmosphere. This includes the possibility of aerosol injection into the combustion exhaust vapor and into the propeller slip stream.

9A980 Nonmilitary mobile crime science laboratories; and parts and accessories, n.e.s.

LICENSE REQUIREMENTS
Reason for Control: CC

Control(s)	Country chart
CC applies to entire entry	CC Column 1

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9A990 Diesel engines, n.e.s., and tractors and specially designed parts therefor, n.e.s.

LICENSE REQUIREMENTS
Reason for Control: AT

Control(s)	Country chart
AT applies to entire entry except 9A990.a.	AT Column 1.
AT applies to 9A990.a only	AT Column 2.

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: a. Diesel engines, n.e.s., for trucks, tractors, and automotive applications of continuous brake horsepower of 400 BHP (298 kW) or greater (performance based on SAE J1349 standard conditions of 100 Kpa and 25°)

b. Off highway wheel tractors of carriage capacity 9 mt (20,000 lbs) or more; and parts and accessories, n.e.s.

c. On-Highway tractors, with single or tandem rear axles rated for 9 mt per axel (20,000 lbs.) or greater and specially designed parts.

9A991 "Aircraft", n.e.s., and gas turbine engines not controlled by 9A001 or 9A101 and parts and components, n.e.s.

LICENSE REQUIREMENTS
Reason for Control: AT, UN

Control(s)	Country chart
AT applies to entire entry	AT Column 1.
UN applies to 9A991.a	See §746.1(b) for UN controls.

LICENSE REQUIREMENT NOTES: There is no de minimis level for foreign-made aircraft described by this entry that incorporate commercial primary or standby instrument systems that integrate QRS11–00100–100/101 or commercial automatic flight control systems that integrate QRS11–00050–443/569 Micromachined Angular Rate Sensors (see §734.4(a) of the EAR).

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: QRS11 Micromachined Angular Rate Sensors are subject to the export licensing jurisdiction of the U.S. Department of State, Directorate of Defense Trade Controls, unless the QRS11–00100–100/101 is integrated into and included as an integral part of a commercial primary or standby instrument system of the type described in ECCN 7A994, or aircraft of the type described in ECCN 9A991 that incorporates such a system, or is exported solely for integration into such a system; or the QRS11–00050–443/569 is integrated into an automatic flight control system of the type described in ECCN 7A994, or aircraft of the type described in ECCN 9A991 that incorporates such a system, or are exported solely for integration into such a system. (See Commodity Jurisdiction requirements in 22 CFR Part 121; Category VIII(e), Note(1)) In the latter case, such items are subject to the licensing jurisdiction of the Department of Commerce. Technology specific to the development and production of QRS11 sensors remains subject to the licensing jurisdiction of the Department of State.
Related Definitions: N/A
Items: a. Military aircraft, demilitarized (not specifically equipped or modified for military operation), as follows:

a.1 Cargo aircraft bearing ''C'' designations and numbered C–45 through C–118 inclusive, C–121 through C–125 inclusive, and C–131, using reciprocating engines only.

a.2 Trainer aircraft bearing ''T'' designations and using reciprocating engines or turboprop engines with less than 600 horsepower (s.h.p.).

a.3 Utility aircraft bearing ''U'' designations and using reciprocating engines only.

a.4 All liaison aircraft bearing an ''L'' designation.

a.5 All observation aircraft bearing ''O'' designations and using reciprocating engines.

b. ''Civil aircraft'';

NOTE: Specify make and model of aircraft and type of avionic equipment on aircraft.

c. Aero gas turbine engines, and specially designed parts therefor.

NOTE: 9A991.c does not control aero gas turbine engines that are destined for use in civil ''aircraft'' and that have been in use in bona fide civil ''aircraft'' for more than eight years. If they have been in use in bona fide civil ''aircraft'' for more than eight years, such engines are controlled under 9A991.d.

d. Aircraft parts and components, n.e.s.

e. Pressurized aircraft breathing equipment, n.e.s.; and specially designed parts therefor, n.e.s.

9A992 Complete canopies, harnesses, and platforms and electronic release mechanisms therefor, except such types as are in normal sporting use.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Number

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

9B001 Equipment, tooling and fixtures, specially designed for manufacturing gas turbine blades, vanes or "tip shroud" castings, as follows (*See* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies only to equipment for engines that meet the characteristics described in 9A001.	MT Column 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.

LICENSE EXCEPTIONS

LVS: $5000, except N/A for MT

GBS: Yes, except N/A for MT

CIV: Yes, except N/A for MT

STA: License Exception STA may not be used to ship commodities in 9B001.b to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: For specially designed production equipment of systems, sub-systems and components controlled by 9A005 to 9A009, 9A011, 9A101, 9A105 to 9A109, 9A111, and 9A116 to 9A119 usable in ''missiles'' see 9B115. See also 9B991.

Related Definitions: N/A

Items: a. Directional solidification or single crystal casting equipment;

b. Ceramic cores or shells.

9B002 On-line (real time) control systems, instrumentation (including sensors) or automated data acquisition and processing equipment, having all of the following (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies only to equipment for engines that meet the characteristics described in 9A001.	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $3000, except N/A for MT

GBS: Yes, except N/A for MT

CIV: Yes, except N/A for MT

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items:

a. Specially designed for the ''development'' of gas turbine engines, assemblies or components; *and*

b. Incorporating ''technologies'' controlled by 9E003.h or 9E003.i.

9B003 Equipment specially designed for the "production" or test of gas turbine brush seals designed to operate at tip speeds exceeding 335 m/s, and temperatures in excess of 773 K (500 °C), and specially designed components or accessories therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies only to equipment for engines that meet the characteristics described in 9A001.	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS

LVS: $5000, except N/A for MT

GBS: Yes, except N/A for MT

CIV: Yes, except N/A for MT

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 9B115

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

9B004 Tools, dies or fixtures, for the solid state joining of "superalloy", titanium or

intermetallic airfoil-to-disk combinations described in 9E003.a.3 or 9E003.a.6 for gas turbines.

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies only to equipment for engines that meet the characteristics described in 9A001.	MT Column 1
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $3000, except N/A for MT
GBS: Yes, except N/A for MT
CIV: Yes, except N/A for MT
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9B005 On-line (real time) control systems, instrumentation (including sensors) or automated data acquisition and processing equipment, specially designed for use with any of the following (see 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
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 9B105
Related Definitions: N/A
Items:

a. Wind tunnels designed for speeds of Mach 1.2 or more;

NOTE: 9B005.a does not control wind tunnels specially designed for educational purposes and having a 'test section size' (measured laterally) of less than 250 mm.

TECHNICAL NOTE: 'Test section size' in 9B005.a means the diameter of the circle, or the side of the square, or the longest side of the rectangle, at the largest test section location.

b. Devices for simulating flow-environments at speeds exceeding Mach 5, including hot-shot tunnels, plasma arc tunnels, shock tubes, shock tunnels, gas tunnels and light gas guns; or

c. Wind tunnels or devices, other than two-dimensional sections, capable of simulating Reynolds number flows exceeding 25×10^6.

9B006 Acoustic vibration test equipment capable of producing sound pressure levels of 160 Db or more (referenced to 20 uPa) with a rated output of 4 kW or more at a test cell temperature exceeding 1,273 K (1,000 °C), and specially designed quartz heaters therefor.

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $3000
GBS: Yes
CIV: Yes
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: See also 9B106. Note that some items in 9B006 may also be controlled under 9B106
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9B007 Equipment specially designed for inspecting the integrity of rocket motors and using Non-Destructive Test (NDT) techniques other than planar x-ray or basic physical or chemical analysis.

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9B008 Direct measurement wall skin friction transducers specially designed to operate at a test flow total (stagnation) temperature exceeding 833 K (560 °C)).

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $5000
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number

Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9B009 Tooling specially designed for producing turbine engine powder metallurgy rotor components capable of operating at stress levels of 60% of Ultimate Tensile Strength (UTS) or more and metal temperatures of 873 K (600 °C) or more.

LICENSE REQUIREMENTS
Reason for Control: NS, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

LICENSE EXCEPTIONS
LVS: $5000
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Number
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9B010 Equipment specially designed for the production of "UAVs" and associated systems, equipment and components, controlled by 9A012.

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
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Equipment in number; parts and accessories in $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

9B105 Wind tunnels for speeds of Mach 0.9 or more, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: See also 9B005
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9B106 Environmental chambers usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items:

a. Environmental chambers capable of simulating all of the following flight conditions:

a.1. Having any of the following:

a.1.a. Altitude equal to or greater than 15,000 m; or

a.1.b. Temperature range of at least −50 °C to +125 °C; and

a.2. Incorporating, or designed or modified to incorporate, a shaker unit or other vibration test equipment to produce vibration environments equal to or greater than 10 g rms, measured 'bare table', between 20 Hz and 2 kHz imparting forces equal to or greater than 5 kN;

TECHNICAL NOTES: 1. Item 9B106.a.2 describes systems that are capable of generating a vibration environment with a single wave (e.g., a sine wave) and systems capable of generating a broad band random vibration (i.e., power spectrum).

2. The term 'bare table' means a flat table, or surface, with no fixture or fittings.

3. In Item 9B106.a.2, designed or modified means the environmental chamber provides appropriate interfaces (e.g., sealing devices) to incorporate a shaker unit or other vibration test equipment as specified in this Item.

b. Environmental chambers capable of simulating all of the following flight conditions:

b.1. Acoustic environments at an overall sound pressure level of 140 dB or greater (referenced to 2×10^{-5} N/m^2) or with a total rated acoustic power output of 4kW or greater; and

b.2. Any of the following:

b.2.a. Altitude equal to or greater than 15,000 m; or

b.2.b. Temperature range of at least −50 °C to +125 °C.

9B115 Specially designed "production equipment" for the systems, sub-systems and components controlled by 9A004 to 9A009, 9A011, 9A101, 9A104 to 9A109, 9A111, 9A116 to 9A119.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number; components in $ value

Related Controls: Although items described in ECCNs 9A004 to 9A009, 9A011, 9A101, 9A104 to 9A109; 9A111, 9A116 to 9A119 are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121), the ''production equipment'' controlled in this entry that is related to these items is subject to the export licensing authority of BIS.

Related Definitions: NA.

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

9B116 Specially designed "production facilities" for the systems, sub-systems, and components controlled by 9A004 to 9A009, 9A011, 9A012, 9A101, 9A104 to 9A109, 9A111, 9A116 to 9A119.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: Equipment in number; components in $ value

Related Controls: Although items described in ECCNs 9A004 to 9A009, 9A011, 9A101, 9A104 to 9A109, 9A111, and 9A116 to 9A119 are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121), the ''production facilities'' controlled in this entry that are related to these items is subject to the export licensing authority of BIS.

Related Definitions: NA.

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

9B117 Test Benches and Test Stands for Solid or Liquid Propellant Rockets, Motors or Rocket Engines, Having Either of the Following Characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: See also 9B990

Related Definitions: N/A

Items:

a. The capacity to handle solid or liquid propellant rocket motors or rocket engines having a thrust greater than 68 kN; or

b. Capable of simultaneously measuring the three axial thrust components.

9B990 Vibration test equipment and specially designed parts and components, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

9B991 Specially designed equipment, tooling or fixtures, not controlled by 9B001, as described in the List of Items Controlled, for manufacturing or measuring gas turbine blades, vanes or tip shroud castings.

LICENSE REQUIREMENTS

Reason for Control: AT

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

LICENSE EXCEPTIONS

LVS: N/A

GBS: N/A

CIV: N/A

LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: N/A
Related Definitions: N/A
Items: a. Automated equipment using non-mechanical methods for measuring airfoil wall thickness;

b. Tooling, fixtures or measuring equipment for the ''laser'', water jet or ECM/EDM hole drilling processes controlled by 9E003.c;

c. Ceramic core leaching equipment;

d. Ceramic core manufacturing equipment or tools;

e. Ceramic shell wax pattern preparation equipment;

f. Ceramic shell burn out or firing equipment.

C. MATERIALS

9C110 Resin impregnated fiber prepregs and metal coated fiber preforms therefor, for composite structures, laminates and manufactures specified in 9A110, made either with organic matrix or metal matrix utilizing fibrous or filamentary reinforcements having a "specific tensile strength" greater than 7.62 × 10^4 m and a "specific modulus" greater than 3.18 × 10^6 m.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
LVS: N/A
GBS: N/A
CIV: N/A
LIST OF ITEMS CONTROLLED
Unit: Kilograms
Related Controls: (1) See also 1C010 and 1C210.c.

(2) The only resin impregnated fiber prepregs controlled by entry 9C110 are those using resins with a glass transition temperature (T_g), after cure, exceeding 418 K (145 °C) as determined by ASTM D4065 or national equivalents.
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

D. SOFTWARE

9D001 "Software" specially designed or modified for the "development" of equipment or "technology", controlled by 9A (except 9A018, 9A990 or 9A991), 9B (except 9B990 or 9B991) or 9E003.

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to "software" for equipment controlled by 9A001 to 9A003, 9A012, 9B001 to 9B010, and technology controlled by 9E003.	NS Column 1
MT applies to "software" for equipment controlled by 9A106.a and .b, or 9B116 for MT reasons.	MT Column 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.
LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
STA: License Exception STA may not be used to ship or transmit ''software'' specially designed or modified for the ''development'' of equipment or ''technology'', specified by ECCNs 9B001.b. or 9E003.a.1, 9E003.a.2 to a.5, 9E003.a.8, or 9E003.h to any of the eight destinations listed in §740.20(c)(2) of the EAR.
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: (1) ''Software'' ''required'' for the ''development'' of items controlled by 9A004 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (*See* 22 CFR part 121.)

(2) ''Software'' ''required'' for the ''development'' of equipment or ''technology'' subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls is also subject to the same licensing jurisdiction. (*See* 22 CFR part 121.)
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9D002 "Software" specially designed or modified for the "production" of equipment controlled by 9A (except 9A018, 9A990, or 9A991) or 9B (except 9B990 or 9B991).

LICENSE REQUIREMENTS
Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to "software" for equipment controlled by 9A001 to 9A003, 9A012, 9B001 to 9B010, and technology controlled by 9E003.	NS Column 1
MT applies to "software" for equipment controlled by 9B116 for MT reasons.	MT Column 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.
LICENSE EXCEPTIONS
CIV: N/A

TSR: N/A

STA: License Exception STA may not be used to ship or transmit ''software'' specially designed or modified for the ''production'' of equipment specified by 9B001.b to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) ''Software'' ''required'' for the ''production'' of items controlled by 9A004 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.) (2) ''Software'' ''required'' for the ''production'' of equipment or ''technology'' subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls is also subject to the same licensing jurisdiction. (See 22 CFR part 121.)

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

9D003 "Software" incorporating "technology" specified by 9E003.h and used in "FADEC Systems" for propulsion systems controlled by 9A (except 9A018, 9A990 or 9A991) or equipment controlled by 9B (except 9B990 or 9B991).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	*Country chart*
NS applies to "software" for "use" of "FADEC systems" for equipment controlled by 9A001 to 9A003.	NS Column 1.
MT applies to "software" required for the "use" of "FADEC systems" for gas turbine engines controlled by 9A101, or 9A106..	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: Yes, except N/A for MT

TSR: Yes, except N/A for MT

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: (1) See also 9D103. (2) ''Software'' ''required'' for the ''use'' of equipment or ''technology'' subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls is also subject to the same licensing jurisdiction. (See 22 CFR part 121.)

Related Definitions: N/A

Items:

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

9D004 Other "software" as follows (*see* List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
MT applies to entire entry, except 9D004.g and .f.	MT Column 1.
AT applies to entire entry	AT Column 1.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

STA: License Exception STA may not be used to ship or transmit software in 9D004.a and 9D004.c to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: $ value

Related Controls: N/A

Related Definitions: N/A

Items:

a. 2D or 3D viscous ''software'', validated with wind tunnel or flight test data required for detailed engine flow modelling;

b. ''Software'' for testing aero gas turbine engines, assemblies or components, specially designed to collect, reduce and analyze data in real time and capable of feedback control, including the dynamic adjustment of test articles or test conditions, as the test is in progress;

c. ''Software'' specially designed to control directional solidification or single crystal casting;

d. [Reserved]

e. ''Software'' specially designed or modified for the operation of ''UAVs'' and associated systems, equipment and components, controlled by 9A012;

f. ''Software'' specially designed to design the internal cooling passages of aero gas turbine engine blades, vanes and ''tip shrouds'';

g. ''Software'' having all of the following:

g.1. Specially designed to predict aero thermal, aeromechanical and combustion conditions in aero gas turbine engines; and

g.2. Theoretical modeling predictions of the aero thermal, aeromechanical and combustion conditions, which have been validated with actual turbine engine (experimental or production) performance data.

9D018 "Software" for the "use" of equipment controlled by 9A018.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
RS applies to 9A018.a and .b	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes for Australia, Japan, New Zealand, and NATO countries that are also listed in Country Group B of Supplement No. 1 to part 740 of the EAR.

LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9D101 "Software" specially designed or modified for the "use" of commodities controlled by 9B105, 9B106, 9B116, or 9B117.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9D103 "Software" specially designed for modelling, simulation or design integration of "missiles", or the subsystems controlled by 9A005, 9A007, 9A105.a, 9A106, 9A108, 9A116 or 9A119. (This entry is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9D104 "Software" specially designed and modified for the "use" of equipment controlled by 9A001, 9A005, 9A006.d, 9A006.g, 9A007.a, 9A008.d, 9A009.a, 9A010.d, 9A011, 9A012 (for MT controlled items only), 9A101, 9A105, 9A106.c and .d, 9A107, 9A108.c, 9A109, 9A111, 9A115.a, 9A116.d, 9A117, or 9A118.

LICENSE REQUIREMENTS
Reason for Control: MT, AT

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

License Exceptions
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: ''Software'' for commodities controlled by 9A005 to 9A011, 9A105, 9A106.c, 9A107 to 9A109, 9A111, 9A115, 9A116, 9A117, and 9A118 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading.

9D105 "Software" that coordinates the function of more than one subsystem, specially designed or modified for "use" in "missiles." (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

9D990 "Software", n.e.s., for the "development" or "production" of equipment controlled by 9A990 or 9B990.

LICENSE REQUIREMENTS
Reason for Control: AT

Control(s)	Country chart
AT applies to ''software'' for equipment under 9A990 except 9A990.a.	AT Column 1
AT applies to ''software'' for equipment under 9A990.a only.	AT Column 2

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9D991 "Software", for the "development" or "production" of equipment controlled by 9A991 or 9B991.

LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

E. TECHNOLOGY

NOTE: *''Development'' or ''production'' ''technology'' controlled by 9E001 to 9E003 for gas turbine engines remains controlled when used for repair or overhaul. Excluded from 9E001 to 9E003 control are: technical data, drawings or documentation for maintenance activities directly associated with calibration, removal or replacement of damaged or unserviceable line replaceable units, including replacement of whole engines or engine modules.*

9E001 "Technology" according to the General Technology Note for the "development" of equipment or "software", controlled by 9A001.b, 9A004 to 9A012, 9B (except 9B990 or 9B991), or 9D (except 9D990 or 9D991)

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to "technology" for items controlled by 9A001.b, 9A012, 9B001 to 9B010, 9D001 to 9D004 for NS reasons.	NS Column 1.
MT applies to "technology" for items controlled by 9B001, 9B002, 9B003, 9B004, 9B005, 9B007, 9B105, 9B106, 9B116, 9B117, 9D001, 9D002, 9D003, and 9D004 for MT reasons..	MT Column 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.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) See also 9E101 and 1E002.f (for controls on ''technology'' for the repair of controlled structures, laminates or materials). (2) The ''technology'' required for the ''development'' of equipment controlled by 9A004 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.) (3) ''Technology'', required for the ''development'' of equipment or ''software'' subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls, is also subject to the same licensing jurisdiction. (See 22 CFR part 121)

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

9E002 "Technology" according to the General Technology Note for the "production" of equipment controlled by 9A001.b, 9A004 to 9A011 or 9B (except 9B990 or 9B991).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart
NS applies to entire entry	NS Column 1
MT applies to "technology" for equipment controlled by 9B001, 9B002, 9B003, 9B004, 9B005, 9B007, 9B105, 9B106, 9B116, and 9B117 for MT reasons.	MT Column 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.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the eight destinations listed in §740.20(c)(2) of the EAR.

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) See also 9E102. (2) See also 1E002.f for ''technology'' for the repair of controlled structures, laminates or materials. (3) The ''technology'' required for the ''development'' of equipment controlled by 9A004 is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. (See 22 CFR part 121.) (4) ''Technology'', required for the ''development'' of equipment or ''software'' subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls, is also subject to the same licensing jurisdiction. (See 22 CFR part 121).

Related Definitions: N/A

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

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.8,.h, .i, and .j. 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.

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

STA: License Exception STA may not be used to ship or transmit any technology in 9E003.a.1, 9E003.a.2 to a.5, 9E003.a.8, or 9E003.h to any of the eight destinations listed in §740.20(c)(2) of the EAR.

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'' or ''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 and 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. Combustors having any of the following:

a.2.a. Thermally decoupled liners designed to operate at 'combustor exit temperature' exceeding 1,883K (1,610 °C);

a.2.b. Non-metallic liners;

a.2.c. Non-metallic shells; or

a.2.d. Liners designed to operate at 'combustor exit temperature' exceeding 1,883K (1,610 °C) and having holes that meet the parameters specified by 9E003.c;

NOTE: *The ''required'' ''technology'' for holes in 9E003.a.2 is limited to the derivation of the geometry and location of the holes.*

TECHNICAL NOTE: *'Combustor exit temperature' is the bulk average gas path total (stagnation) temperature between the combustor exit plane and the leading edge of the turbine inlet guide vane (i.e., measured at engine station T40 as defined in SAE ARP 755A) when the engine is running in a 'steady state mode' of operation at the certificated maximum continuous operating temperature.*

N.B.: *See 9E003.c for ''technology'' ''required'' for manufacturing cooling holes.*

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 total (stagnation) temperatures of 1,323 K (1,050 °C) or more at sea-level static take-off (ISA) in a ''steady state mode'' of engine operation;

a.5. Cooled turbine blades, vanes or ''tip shrouds'', other than those described in 9E003.a.1, exposed to gas path total (stagnation) temperatures of 1,643 K (1,370 °C) or more at sea-level static take-off (ISA) in a 'steady state mode' of engine operation;

TECHNICAL NOTE: The term 'steady state mode' defines engine operation conditions, where the engine parameters, such as thrust/power, rpm and others, have no appreciable fluctuations, when the ambient air temperature and pressure at the engine inlet are constant.

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 rotor components using powder metallurgy materials controlled by 1C002.b; *or*

TECHNICAL NOTE: ''Damage tolerant''components are designed using methodology and substantiation to predict and limit crack growth.

a.9. [Reserved]

N.B.: For ''FADEC systems'', see 9E003.h.

a.10. [Reserved]

N.B.: For adjustable flow path geometry, see 9E003.i.

a.11. Hollow fan blades;

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 manufacturing cooling holes, in gas turbine engine components incorporating any of the ''technologies'' specified by 9E003.a.1, 9E003.a.2 or 9E003.a.5, and having any of the following:

c.1. Having all of the following:

c.1.a. Minimum 'cross-sectional area' less than 0.45 mm^2;

c.1.b. 'Hole shape ratio' greater than 4.52; *and*

c.1.c. 'Incidence angle' equal to or less than 25°; *or*

c.2. Having all of the following:

c.2.a. Minimum 'cross-sectional area' less than 0.12 mm^2;

c.2.b. 'Hole shape ratio' greater than 5.65; *and*

c.2.c. 'Incidence angle' more than 25°;

NOTE: *9E003.c does not apply to ''technology'' for manufacturing constant radius cylindrical*

holes that are straight through and enter and exit on the external surfaces of the component.

TECHNICAL NOTES:

1. For the purposes of 9E003.c, the 'cross-sectional area' is the area of the hole in the plane perpendicular to the hole axis.

2. For the purposes of 9E003.c, 'hole shape ratio' is the nominal length of the axis of the hole divided by the square root of its minimum 'cross-sectional area'.

3. For the purposes of 9E003.c, 'incidence angle' is the acute angle measured between the plane tangential to the airfoil surface and the hole axis at the point where the hole axis enters the airfoil surface.

4. Techniques for manufacturing holes in 9E003.c include ''laser'', water jet, Electro-Chemical Machining (ECM) or Electrical Discharge Machining (EDM) methods.

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. '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. Power density of more than 700 kW/m^3 of 'box volume';

TECHNICAL NOTE: 'Box volume' is 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 any 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 any of the following:

a. The dimension of the crankshaft centerline 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 for high output diesel engines, as follows:

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 and having all of the following:

f.2.a. Operating at pressure ratios of 4:1 or higher;

f.2.b. 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)) and having all of the following:

f.3.a. Injection amount in excess of 230 mm^3 per injection per cylinder; and

f.3.b. Electronic control features specially designed 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 and 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;

TECHNICAL NOTE: 'High output diesel engines' are diesel engines with a specified brake mean effective pressure of 1.8 MPa or more at a speed of 2,300 r.p.m., provided the rated speed is 2,300 r.p.m. or more.

h. ''Technology'' for gas turbine engine ''FADEC systems'' as follows:

h.1. ''Development'' ''technology'' for deriving the functional requirements for the components necessary for the ''FADEC system'' to regulate engine thrust or shaft power (e.g., feedback sensor time constants and accuracies, fuel valve slew rate);

h.2. ''Development'' or ''production'' ''technology'' for control and diagnostic components unique to the ''FADEC system'' and used to regulate engine thrust or shaft power;

h.3. ''Development'' ''technology'' for the control law algorithms, including ''source code'', unique to the ''FADEC system'' and used to regulate engine thrust or shaft power.

NOTE: 9E003.h does not apply to technical data related to engine-aircraft integration required by the civil aviation certification authorities to be published for general airline use (e.g., installation manuals, operating instructions, instructions for continued airworthiness) or interface functions (e.g., input/output processing, airframe thrust or shaft power demand).

i. ''Technology'' for adjustable flow path systems designed to maintain engine stability for gas generator turbines, fan or power turbines, or propelling nozzles, as follows:

i.1. ''Development'' ''technology'' for deriving the functional requirements for the components that maintain engine stability;

i.2. ''Development'' or ''production'' ''technology'' for components unique to the adjustable flow path system and that maintain engine stability;

i.3. ''Development'' ''technology'' for the control law algorithms, including ''source code'', unique to the adjustable flow path system and that maintain engine stability;

NOTE: 9E003.i does not apply to ''development'' or ''production'' ''technology'' for any of the following:

a. Inlet guide vanes;

b. Variable pitch fans or prop-fans;

c. Variable compressor vanes;

d. Compressor bleed valves; or

e. Adjustable flow path geometry for reverse thrust.

j. ''Technology'' not otherwise controlled in 9E003.a.1 through a.8, a.10, and .h and 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.

9E018 "Technology" for the "development", "production", or "use" of equipment controlled by 9A018.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart
NS applies to entire entry	NS Column 1.
RS applies to 9A018.a and .b	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See §746.1(b) for UN controls.

LICENSE EXCEPTIONS

CIV: N/A

TSR: Yes for Australia, Japan, New Zealand, and NATO countries that are also listed in Country Group B of Supplement No. 1 to part 740 of the EAR.

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

9E101 "Technology" according to the General Technology Note for the "development", "production", or "use" of commodities or software controlled by 9A012, 9A101, 9A104 to 9A111, 9A115 to 9A119, 9C110, 9D101, 9D103, 9D104 or 9D105.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: ''Technology'' controlled by 9E101 for items in 9A012, 9A101.b, 9A104, 9A105, to 9A109, 9A110 that are specially designed for use in missile systems and subsystems, 9A111, 9A115, 9A116 to 9A119, 9D103, and 9D105 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

9E102 "Technology" according to the General Technology Note for the "use" of space launch vehicles specified in 9A004, or commodities or software controlled by 9A005 to 9A012, 9A101, 9A104 to 9A111, 9A115 to 9A119, 9B105, 9B106, 9B115, 9B116, 9B117, 9D101, 9D103, 9D104 or 9D105.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

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

LICENSE EXCEPTIONS

CIV: N/A

TSR: N/A

LIST OF ITEMS CONTROLLED

Unit: N/A

Related Controls: (1) For the purpose of this entry, ''use'' ''technology'' is limited to items controlled for MT and their subsystems.

(2) ''Technology'' controlled by 9E102 for commodities or software subject to the export licensing jurisdiction of the Department of State in 9A004 to 9A012, 9A101.b, 9A104, 9A105, 9A106.a to .c, 9A107 to 9A109, 9A110 that are specially designed for use in missile systems and subsystems, 9A111, 9A115 to 9A119, 9B115, 9B116, 9D103, specified software in 9D104, and 9D105 are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading

9E990 "Technology", n.e.s., for the "development" or "production" or "use" of equipment controlled by 9A990 or 9B990.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart
AT applies to ''technology'' for equipment under 9A990 and 9B990 except 9A990.a.	AT Column 1

Control(s)	Country chart
AT applies to "technology" for equipment under 9A990.a only.	AT Column 2

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9E991 "Technology", for the "development", "production" or "use" of equipment controlled by 9A991 or 9B991.
LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items: The list of items controlled is contained in the ECCN heading

9E993 Other "technology", not described by 9E003, as follows (see List of Items Controlled)
LICENSE REQUIREMENTS
Reason for Control: AT

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

LICENSE EXCEPTIONS
CIV: N/A
TSR: N/A
LIST OF ITEMS CONTROLLED
Unit: $ value.
Related Controls: N/A
Related Definitions: N/A
Items: a. Rotor blade tip clearance control systems employing active compensating casing ''technology'' limited to a design and development data base; *or*

b. Gas bearing for turbine engine rotor assemblies.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

[63 FR 2459, Jan. 15, 1998]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting supplement no. 1 to part 774, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at *www.fdsys.gov*.

SUPPLEMENT NO. 2 TO PART 774—GENERAL TECHNOLOGY AND SOFTWARE NOTES

1. *General Technology Note.* The export of ''technology'' that is ''required'' for the ''development'', ''production'', or ''use'' of items on the Commerce Control List is controlled according to the provisions in each Category.

''Technology'' ''required'' for the ''development'', ''production'', or ''use'' of a controlled product remains controlled even when applicable to a product controlled at a lower level.

License Exception TSU is available for ''technology'' that is the minimum necessary for the installation, operation, maintenance (checking), and repair of those products that are eligible for License Exceptions or that are exported under a license.

N.B.: This does not allow release under a License Exception of the repair ''technology'' controlled by 1E002.e, 1E002.f, 8E002.a, or 8E002.b.

N.B.: The ''minimum necessary'' excludes ''development'' or ''production'' technology and permits ''use'' technology only to the extent ''required'' to ensure safe and efficient use of the product. Individual ECCNs may further restrict export of ''minimum necessary'' information.

2. *General Software Note.* License Exception TSU (''mass market'' software) is available to all destinations, except countries in Country Group E:1 of Supplement No. 1 to part 740 of the EAR, for release of software that is generally available to the public by being:

a. Sold from stock at retail selling points, without restriction, by means of:

1. Over the counter transactions;
2. Mail order transactions;
3. Electronic transactions; *or*
4. Telephone call transactions; *and*

b. Designed for installation by the user without further substantial support by the supplier.

NOTE: The General Software Note does not apply to ''software'' controlled by Category 5—part 2 (''Information Security''). For ''software'' controlled by Category 5, part 2, see Supplement No. 1 to part 774, Category 5, part 2, Note 3—Cryptography Note.

[69 FR 46087, July 30, 2004]

SUPPLEMENT NO. 3 TO PART 774—STATEMENTS OF UNDERSTANDING

(a) Statement of Understanding—medical equipment. Commodities that are ''specially designed for medical end-use'' that ''incorporate'' commodities or software on the Commerce Control List (Supplement No. 1 to

part 774 of the EAR) that do not have a reason for control of Nuclear Nonproliferation (NP), Missile Technology (MT), or Chemical & Biological Weapons (CB) are designated by the number EAR99 (*i.e.*, are not elsewhere specified on the Commerce Control List).

NOTES TO PARAGRAPH (a): (1) ''Specially designed for medical end-use'' means designed for medical treatment or the practice of medicine (does not include medical research).

(2) Commodities or software are considered ''incorporated'' if the commodity or software is: Essential to the functioning of the medical equipment; customarily included in the sale of the medical equipment; and exported or reexported with the medical equipment.

(3) Except for such software that is made publicly available consistent with §734.3(b)(3) of the EAR, commodities and software ''specially designed for medical end-use'' remain subject to the EAR.

(4) *See also* §770.2(b) interpretation 2, for other types of equipment that incorporate items on the Commerce Control List that are subject to the EAR.

(5) For computers used with medical equipment, *see also* ECCN 4A003 note 2 regarding the ''principal element'' rule.

(6) For commodities and software specially designed for medical end-use that incorporate an encryption or other ''information security'' item subject to the EAR, *see also* Note 1 to Category 5, Part II of the Commerce Control List.

(b) *Statement of Understanding—Source Code.* For the purpose of national security controlled items, ''source code'' items are controlled either by ''software'' or by ''software'' and ''technology'' controls, except when such ''source code'' items are explicitly decontrolled.

(c) *Category 5—Part 2—Note 4 Statement of Understanding.* All items previously described by Notes (b), (c) and (h) to 5A002 are now described by Note 4 to Category 5—Part 2. Note (h) to 5A002 prior to June 25, 2010 stated that the following was not controlled by 5A002:

Equipment specially designed for the servicing of portable or mobile radiotelephones and similar client wireless devices that meet all the provisions of the Cryptography Note (Note 3 in Category 5, Part 2), where the servicing equipment meets all of the following:

(1) The cryptographic functionality of the servicing equipment cannot easily be changed by the user of the equipment;

(2) The servicing equipment is designed for installation without further substantial support by the supplier; *and*

(3) The servicing equipment cannot change the cryptographic functionality of the device being serviced.

(d) *Statement of Understanding—Used Goods.* The specifications in the Commerce Control List apply equally to new or used goods. In the case of used goods, an evaluation by the Bureau of Industry and Security may be carried out in order to assess whether the goods are capable of meeting the relevant specifications.

[75 FR 36502, June 25, 2010, as amended at 76 FR 29632, May 20, 2011]

SUPPLEMENT NO. 4 TO PART 774 [RESERVED]

SUPPLEMENT NO. 5 TO PART 774—ITEMS CLASSIFIED UNDER ECCNS 0A521, 0B521, 0C521, 0D521 AND 0E521

The following table lists items subject to the EAR that are not listed elsewhere in the CCL, but which the Department of Commerce, with the concurrence of the Departments of Defense and State, has identified warrant control for export or reexport because the items provide at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

Item descriptor. *Note:* The description must match by model number or a broader descriptor that does not necessarily need to be company specific.	Date of initial or subsequent BIS classification.	Date when the item will be designated EAR99, unless reclassified in another ECCN or the 0Y521 classification is reissued.	Item-specific license exception eligibility.
1. [Reserved]			
2. [Reserved]			

[77 FR 22200, Apr. 13, 2012]

PARTS 775–780 [RESERVED]