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Thursday  
January 15, 1998

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**Part II**

**Department of  
Commerce**

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**Bureau of Export Administration**

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**15 CFR Parts 732, 740, 742, 743, 744,  
746, 762, and 774**

**Implementation of the Wassenaar  
Arrangement List of Dual-Use Items:  
Revisions to the Commerce Control List  
and Reporting Under the Wassenaar  
Arrangement; Rule**

**DEPARTMENT OF COMMERCE****Bureau of Export Administration**

15 CFR Parts 732, 740, 742, 743, 744, 746, 762, and 774

[Docket No. 971006239-7239-01]

RIN 0694-AB35

**Implementation of the Wassenaar Arrangement List of Dual-Use Items: Revisions to the Commerce Control List and Reporting Under the Wassenaar Arrangement**

**AGENCY:** Bureau of Export Administration, Commerce.

**ACTION:** Interim rule with request for comments.

**SUMMARY:** Representatives of thirty-three countries gave final approval July 12-13, 1996 in Vienna, Austria to establish the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies. The thirty-three countries agreed to control all items in the List of Dual-Use Goods and Technologies with the objective of preventing unauthorized transfers. They further agreed on a target date of November 1, 1996, for implementation of the Wassenaar Lists.

The purpose of this interim rule is to make the changes to the Commerce Control List necessary to implement the Wassenaar List. In addition, this interim rule imposes new reporting requirements on persons that export certain items controlled under the Wassenaar Arrangement to non-member countries in order to fulfill the information exchange requirements of the Wassenaar Arrangement. The Department of Commerce, with other concerned agencies, is reviewing the Export Administration Regulations to determine whether further changes will be required to implement the information sharing provisions of the Wassenaar Arrangement and to make the necessary adjustments to existing country groups.

This rule also revises part 740 of the EAR by removing License Exception availability for certain items controlled for missile technology reasons.

Although the Export Administration Act (EAA) expired on August 20, 1994, the President invoked the International Emergency Economic Powers Act and continued in effect, to the extent permitted by law, the provisions of the EAA and the EAR in Executive Order 12924 of August 19, 1994, as extended by the President's notices of August 15, 1995, August 14, 1996 and August 15, 1997.

**DATES:** This rule is effective January 15, 1998. Comments on this rule must be received on or before February 17, 1998.

**ADDRESSES:** Written comments should be sent to Patricia Muldonian, Regulatory Policy Division, Bureau of Export Administration, Department of Commerce, P.O. Box 273, Washington, DC 20044.

**FOR FURTHER INFORMATION CONTACT:** James Lewis, Director, Office of Strategic Trade and Foreign Policy Controls, Bureau of Export Administration, Telephone: (202) 482-0092.

**SUPPLEMENTARY INFORMATION:**

**Background**

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

To fulfill U.S. commitments to the Wassenaar Arrangement with regard to dual-use items, this rule amends the Export Administration Regulations (EAR) by imposing new reporting requirements for exports of certain items controlled under the Wassenaar Arrangement. Reports are not required for reexports. These new requirements appear in newly added part 743 of the EAR. Information from exporters will be consolidated by BXA for an aggregate data submission to the participating states.

With respect to certain dual-use commodities, software, and technology, participating states have undertaken commitments to notify each other preferably within 30 days, but no later than 60 days, of an approval of a license that has been denied by another participating state for an essentially identical transaction during the preceding three years. Certain of these items are eligible for License Exceptions authorized by part 740 of the EAR.

Therefore, in order to meet Wassenaar Arrangement requirements, exporters on occasion may be informed that the export of a certain item to a specific end-user under a License Exception is not authorized or alternatively, may be requested to provide prior written notification to BXA of an export of a certain item to a specific end-user under a License Exception.

Reports are required to be submitted to BXA semiannually for specified items controlled under the Wassenaar Arrangement exported under License Exceptions LVS, GBS, CIV, CTP, TSR, and GOV. BXA must receive such reports no later than August 1 for exports during the reporting period January 1 through June 30, and no later than February 1 for exports during the reporting period July 1 through December 31. The Export Control Classification Number and paragraph reference as identified on the Commerce Control List, number of units in each shipment, and the country of ultimate destination must be included in each report for each export during the reporting period. Although the exporter must be identified on all reports to BXA, names of exporters will not be released to participating states. Certain additional information requirements apply to digital computers.

Exporters should note that the first report must be submitted to and received by BXA no later than August 1, 1998 for the partial reporting period beginning January 15, 1998 and ending June 30, 1998. Thereafter, reports are required semiannually according to the provisions of new § 743.1(f) of the EAR.

This rule also amends § 742.12 of the EAR (High Performance Computers) to clarify the reporting and recordkeeping requirements for certain computer and software exports.

This rule also amends part 740 of the EAR by adding appropriate cross-references to reporting requirements under License Exceptions LVS, GBS, CIV, TSR, CTP, and GOV. The major changes in the Commerce Control List (CCL) necessary to implement the Wassenaar Arrangement are summarized below.

In addition, based on interagency agreement, particularly consultations with the Department of State, this rule revises part 740 of the EAR by removing License Exception availability for missile technology (MT) controlled items, except that items described in ECCNs 6A008, 7A001, 7A002, 7A004, 7A101, 7A102, 7A103, 7A104, 7D001, 7D002, 7D003, 7D101, 7D102, 7E003, or 7E101, may be exported as part of a manned aircraft, satellite, land vehicle, or marine vehicle or in quantities

appropriate for replacement parts under License Exceptions TMP, RPL, TSU, or AVS. This action is based on a U.S. Government policy to restrict the proliferation of missile capability and is consistent with the Missile Technology Control Regime (MTCR) multilateral guidelines.

Also, in an effort to comply with our international commitments of the Wassenaar Arrangement, the U.S. has also committed to exercise extreme vigilance for certain items controlled for national security reasons (NS), which are considered most critical to military applications. This rule removes License Exception eligibility for License Exceptions LVS, CIV, TSR, and GOV for certain commodities, technologies, and software controlled for national security reasons for which the U.S. has agreed to license with extreme vigilance.

#### Category 1—Materials

Additional controls have been added for body armor (1A005), certain fluorocarbon electronic cooling fluids (1C006), certain "ceramic-ceramic" materials with oxide or glass matrix (1C007), certain metals and compounds (1C011), and certain material for nuclear heat sources. In addition, controls for "stress" limits for metal alloys (1C002), have been modified. Additional clarification of controls are specific for the transition temperature limits on certain "fibrous or filamentary materials" (1C010)

#### Category 2—Material Processing

A significant number of changes have been implemented for machine tools. Specifically, the machine tool entry has been modified to separate the controls on turning, milling and grinding machines. In particular, such machines will no longer be controlled under the Wassenaar Arrangement on the basis of "tilting spindles", "camming", or "run-out". Also, detailed test procedures, as specified by the International Standards Organization (ISO), will no longer be reiterated in the list. This revision will allow the regulations to remain effective while keeping the procedures under which the equipment is measured, current with industry practice. In addition, controls have been removed for "numerical control" units and "motion control boards", wire feed type electrical discharge machines (2B001), manual machines specially designed for bevel gears (2B003), systems for inspection of hemishells (2B006), and software for "flexible manufacturing units" (2D002). Two additional items have been added under 2B001. They include "specialty machines" (i.e. deep hole drilling machines) and spin-

forming/flow-forming machines. Lastly, controls on spindle assemblies and slide assemblies have been moved from 2B008 to 2B992 as specially designed components therefore.

#### Category 3—Electronics

A number of controls have been removed for components under Category 3, including microprocessors up to a composite theoretical performance (CTP) value of 260 Mtops, most storage devices (i.e. memory circuits), and on custom integrated circuits (3A001). In addition, the frequency parameter for network analyzers and microwave test receivers have been relaxed, and controls on emulators (3A002) have been removed entirely. The most significant change is in the entries under Category 3B dealing with semiconductor manufacturing equipment. Specifically, these entries have been combined and divided into two ECCNs. In addition, the limit for control of integrated circuits testers have been raised from 50 MHZ to 60 MHZ (3B002).

#### Category 4—Computers

Under category 4, the CTP value for computers has been raised from 260 Mtops to 2,000 Mtops. The limit on graphic accelerators and graphics coprocessors has been relaxed to a 3-D vector rate of 3,000,000 (4A003). The technology for "multi-data-stream processing" has been revised to the control level defined in 4A003.b. (4E002). The technology for magnetic hard disk drives (4E002) has been removed.

#### Category 5—Telecommunications, Part I

Several sections of Part I, Telecommunication have been removed creating a significant number of changes to the controls on telecommunication equipment. The majority of changes are identified in the following entries.

All controls on telecommunication transmission equipment or systems, having digital cross connect equipment and modems (5A001.b.), have been removed. In addition, controls have been removed on certain communication channel controllers, certain network access controllers, certain radio equipment operating at frequencies of 31 GHz or less, and certain digital signal processing equipment based upon "user-accessible programmability" by raising the control parameters in each instance (5A001.b.).

Also, controls have been removed on "stored program controlled" switching equipment containing any of the following characteristics, functions or features (5A001.c.):

- "Integrated Services Digital Network" (ISDN) functions;
- Multi-level priority and pre-emption for circuit switching;
- Routing or switching of "datagram" packets;
- Routing for switching of fast select packets;
- Automatic hand-off of cellular radio calls; and
- Digital cross connect equipment.

Additionally, the control parameters for the "data signaling rate" for "communications channel controllers" and the digital transfer rate for "network access controllers" have been modified to relax controls on packet switches, circuit switches and routers. Controls on all general purpose test equipment (e.g. bit error rate testers and protocol analyzers) have been removed (5B001). Controls on software for use of digital switching equipment (5D001) have been removed and controls on development technology for spread spectrum and frequency hopping techniques (5E001.b.) have been added.

#### Category 5—"Information Security", Part II

Under Part II, "Information Security", certain items have been decontrolled through an expansion of "Notes" within the entry of 5A002. These notes state that certain access control equipment (e.g. equipment to protect personal identification numbers [PIN]), data authentication equipment (e.g. equipment which calculates a Message Authentication Code [MAC]) and cryptographic equipment specially designed and limited for use in machines for banking or money transactions are not controlled. In addition, all software for virus protection (5D002) has been removed.

#### Category 6—Sensors and Lasers

Under the acoustics section, controls for certain wide-swath bathymetric survey systems and terrestrial geophones have been removed. In addition, controls for towed acoustic hydrophone arrays and processing equipment for hydrophone arrays have been modified. Controls for bottom or bay cable systems (6A001) have been added. Under optical sensors, controls for specially designed components of image intensifier tubes (6A002) have been modified. Controls for monospectral imaging sensors have been added. Under optics, controls on certain optical filters and "fluoride fiber" cable (6A004) have been removed. Under lasers, certain carbon dioxide lasers, semiconductor lasers, ruby lasers, neodymium doped lasers and free electron lasers (6A005) have

been removed. Under radar, weather balloon tracking radars (6A008) have been removed. For production equipment, equipment for test, inspection and production of lasers (6B005) have been removed. In addition, controls on materials for optical fiber preforms for the manufacture of high birefringence fibers (6C002), materials for certain low optical absorption materials, and materials for optical fiber preforms for the manufacture of fluoride fibers (6C004) have been removed. Controls on software specially designed for bottom or bay cables have been added and controls on certain primary radar target data software (6D003) have been removed. Finally, controls for certain optical fabrication technology and technology for certain optical fibers (6E003) have been removed.

#### Category 7—Navigation and Avionics

Controls on inertial navigation systems certified for use on "civil aircraft" (7A003) have been removed. Also, controls for direction finder equipment (7A007), computer aided design (CAD) software (7D003), and technology for electric actuators for primary flight control and flight control optical sensor arrays (7E004) have been added.

#### Category 8—Marine

Controls for certain underwater vision systems, certain photographic still cameras and certain light systems (8A002) have been relaxed. Controls on stirring cycle engine air independent power systems (8A002) have been clarified.

#### Category 9—Propulsion

Under the section dealing with Test, Inspection and Production Equipment, several items have been removed, including automated equipment for measuring airfoil wall thickness, tooling/fixtures, and measuring equipment for hole drilling processing, ceramic core leaching equipment and ceramic shell burn out or firing equipment (9B001). Controls on brush seals have been narrowed by adding a control for a temperature limit (9B003) and expanded by adding tools, dies or fixtures for solid state joining of intermetallic airfoil-to-disk combinations for gas turbine engines (9B004). Transducers/strain gauges/accelerometers/thermocouples for vibration equipment (9B006) have also been removed. Accordingly, under software, controls for certain software for vibration test equipment as well as certain development/production software of test facilities for engines (9D004) have been removed. Finally, a

few modifications have been made under technology for gas turbine engine components or systems and controls on helicopter power transfer systems or tilt rotor or tilt wing aircraft (9E003). Specifically, controls have been narrowed on technology for multiple domed combustors (9E003.a.2), the technology for gas bearing for gas turbine engine rotor assemblies (9E003.a.12), and the technology for helicopter, tilt rotor or tilt wing aircraft power transfer systems.

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

Numerous entries that are contained on the Wassenaar List of Dual-Use Goods and Technologies are subject to the export licensing authority of the Office of Defense Trade Controls, Department of State. This rule will list all entries that are controlled on the Wassenaar List of Dual-Use Goods and Technologies, but will specify that those entries are under the licensing authority of the Office of Defense Trade Controls, Department of State.

On March 25, 1996 (61 FR 12714), BXA revised the Commerce Control List by adopting the European Union (EU) numbering system and converted our former ECCNs to correspond accordingly. The changes adopted by this rule attempts to further harmonize the CCL with the EU List. This ensures that identical ECCNs on the CCL and the EU List will identify the same item(s). From an enforcement or customs perspective, this common numbering system simplifies export controls for all countries that harmonize to this control list. As a result of this harmonization exercise, it was discovered that certain differences exist between the EU List and the CCL and among agencies within the U.S., in terms of MTCR related controls. These differences predominately exist in the area of technology and software controls. For most of the entries, the EU text was adopted or modified to ensure that it comported to the intent of the MTCR Annex. For those technology and software entries where differences could not be resolved at the interagency level, it was agreed to maintain the control text for those entries as published in the March 25 rule, until these differences are resolved.

To ensure that no overlap in controls exists among the regimes and that the Wassenaar Arrangement list did not decontrol items that are currently controlled on the MTCR Annex, references to certain missile technology

controlled entries were included and clarification notes were added to aid the exporter.

In addition, this rule will include ECCN entries for those MTCR items that are under the licensing authority of the Department of State, Office of Defense Trade Controls. Those items are specifically listed on the CCL to inform the exporter that the corresponding EU list entry for such items are under the licensing authority of the Department of State, Office of Defense Trade Controls.

BXA is continuing a comprehensive review of the Commerce Control List (CCL) to account for items controlled by the Nuclear Suppliers Group (NSG), the Missile Technology Control Regime (MTCR), and the Australia Group (AG) and to correct errors published on March 25, 1996, and unavoidably reprinted in this version of the CCL. The review will be based in large part upon the comments received in response to the March 25 rule and upon ongoing efforts to harmonize the CCL with the EU's control list.

#### Saving Clause

This rule revises the numbering and structure of certain entries on the Commerce Control List. For items under such entries and for April 15, 1998, BXA will accept license applications for items described either by the entries in effect immediately before January 15, 1998 or the entries described in this rule. In addition, shipments of items removed from eligibility for export or reexport under a particular License Exception authorization or the designator NLR, as a result of this regulatory action, may continue to be exported or reexported under that License Exception authorization or designator until February 17, 1998.

#### Rulemaking Requirements

1. This interim rule has been determined to be significant for purposes of E.O. 12866.

2. Notwithstanding any other provision of law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with a collection of information, subject to the requirements of the Paperwork Reduction Act (PRA), unless that collection of information displays a currently valid OMB Control Number. This rule involves collections of information subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*) These collections has been approved by the Office of Management and Budget under control numbers 0694-0073, 0694-0086, and 0694-0088. This rule also contains a new collection-of-information requirement subject to

the PRA that has received emergency approval under OMB control number 0694-xxxx. The new information requirement and estimated public burden hours include: recording responses (5 minutes each); filing responses (1 minute each); and transmitting responses to BXA (10 minutes per exporter). These estimates include the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collections of information. Send comments regarding these burden estimates or any other aspect of these collections of information, including suggestions for reducing the burden, to OMB Desk Officer, New Executive Office Building, Washington, DC 20503.

3. This rule does not contain policies with Federalism implications sufficient to warrant preparation of a Federalism assessment under Executive Order 12612.

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

However, because of the importance of the issues raised by these regulations, this rule is issued in interim form and comments will be considered in the development of final regulations.

Accordingly, the Department encourages interested persons who wish to comment to do so at the earliest possible time to permit the fullest consideration of their views.

The period for submission of comments will close February 17, 1998. The Department will consider all comments received before the close of the comment period in developing final regulations. Comments received after the end of the comment period will be considered if possible, but their consideration cannot be assured. The Department will not accept public comments accompanied by a request that a part or all of the material be treated confidentially because of its

business proprietary nature or for any other reason. The Department will return such comments and materials to the person submitting the comments and will not consider them in the development of final regulations. All public comments on these regulations will be a matter of public record and will be available for public inspection and copying. In the interest of accuracy and completeness, the Department requires comments in written form.

Oral comments must be followed by written memoranda, which will also be a matter of public record and will be available for public review and copying. Communications from agencies of the United States Government or foreign governments will not be made available for public inspection.

The public record concerning these regulations will be maintained in the Bureau of Export Administration Freedom of Information Records Inspection Facility, Room 4525, Department of Commerce, 14th Street and Pennsylvania Avenue, N.W., Washington, D.C. 20230. Records in this facility, including written public comments and memoranda summarizing the substance of oral communications, may be inspected and copied in accordance with regulations published in Part 4 of Title 15 of the Code of Federal Regulations. Information about the inspection and copying of records at the facility may be obtained from Margaret Cornejo, Bureau of Export Administration Freedom of Information Officer, at the above address or by calling (202) 482-5653.

#### List of Subjects

##### 15 CFR Part 732

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

##### 15 CFR Part 740

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

##### 15 CFR Part 742

Exports, Foreign Trade.

##### 15 CFR Part 743

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

##### 15 CFR Part 744

Exports, Foreign Trade, Reporting and recordkeeping requirements.

##### 15 CFR Part 746

Embargoes, Exports, Foreign Trade, Reporting and recordkeeping requirements.

##### 15 CFR Part 762

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

##### 15 CFR Part 774

Exports, Foreign Trade.

Accordingly, parts 732, 740, 742, 744, 746, 762, and 774 of the Export Administration Regulations (15 CFR parts 730 through 799) are amended as follows:

1. The authority citation for parts 732 and 762 is revised to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; E.O. 12924, 59 FR 43437, 3 CFR, 1994 Comp., p. 917; E.O. 13026, 3 CFR, 1995 Comp., p. 228; Notice of August 15, 1995, 3 CFR, 1995 Comp., p. 501; Notice of August 14, 1996, 3 CFR, 1996 Comp., p. 298; and Notice of August 13, 1997 (62 FR 43629, August 15, 1997).

2. The authority citation for part 740 is revised to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; E.O. 12924, 59 FR 43437, 3 CFR, 1994 Comp., p. 917; Notice of August 15, 1995, 3 CFR, 1995 Comp., p. 501; Notice of August 14, 1996, 3 CFR, 1996 Comp., p. 289; and Notice of August 13, 1997 (62 FR 43629, August 15, 1997).

3. The authority citation for part 742 is revised to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 18 U.S.C. 2510 *et seq.*; 22 U.S.C. 3201 *et seq.*; 42 U.S.C. 2139a; E.O. 12058, 43 FR 20947, 3 CFR, 1978 Comp., p. 179; E.O. 12851, 58 FR 33181, 3 CFR, 1993 Comp., p. 608; E.O. 12924, 59 FR 43437, 3 CFR, 1994 Comp., p. 917; E.O. 12938, 59 FR 59099, 3 CFR, 1995 Comp., p. 950; Notice of August 15, 1995, 3 CFR, 1995 Comp., p. 501; Notice of August 14, 1996, 3 CFR, 1996 Comp., p. 289; and Notice of August 13, 1997 (62 FR 43629, August 15, 1997).

4-5. The authority citation for part 744 is revised to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 22 U.S.C. 3201 *et seq.*; 42 U.S.C. 2139a; E.O. 12058, 43 FR 20947, 3 CFR, 1978 Comp., p. 179; E.O. 12851, 58 FR 33181, 3 CFR, 1993 Comp., p. 608; E.O. 12924, 59 FR 43437, 3 CFR, 1994 Comp., p. 915; E.O. 12938, 59 FR 59099, 3 CFR, 1994 Comp., p. 950; Notice of August 14, 1996, 3 CFR, 1996 Comp., p. 298; and Notice of August 13, 1997 (62 FR 43629, August 15, 1997).

6. The authority citation for part 746 is revised to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 22 U.S.C. 287c; 22 U.S.C. 6004; E.O. 12918, 59 FR 28205, 3 CFR, 1994

Comp., p. 899; E.O. 12924, 59 FR 43437, 3 CFR, 1994 Comp., p. 917; Notice of August 14, 1996, 3 CFR, 1996 Comp., p. 298; and Notice of August 13, 1997 (62 FR 43629, August 15, 1997).

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

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 10 U.S.C. 720; 10 U.S.C. 7430(e); 18 U.S.C. 2510 *et seq.*; 22 U.S.C. 287c; 22 U.S.C. 3201 *et seq.*; 22 U.S.C. 6004; Sec. 201, Pub. L. 104-58, 109 Stat. 557 (30 U.S.C. 185(s)); 30 U.S.C. 185(u); 42 U.S.C. 2139a; 42 U.S.C. 6212; 43 U.S.C. 1354; 46 U.S.C. app. 466c; 50 U.S.C. app. 5; E.O. 12924, 59 FR 43437, 3 CFR, 1994 Comp., p. 917; Notice of August 15, 1995, 3 CFR, 1995 Comp., p. 501; Notice of August 14, 1996, 3 CFR, 1996 Comp., p. 298; and Notice of August 13, 1997 (62 FR 43629, August 15, 1997).

**PART 732—[AMENDED]**

8. Section 732.4 of the EAR is amended by adding a new paragraph (b)(3)(iv) to read as follows:

**§ 732.4 Steps regarding License Exceptions.**

\* \* \* \* \*

- (b) \* \* \*
- (3) \* \* \*

(iv) If you are exporting under License Exceptions GBS, CIV, LVS, CTP, TSR, or GOV, you should review § 743.1 of the EAR to determine the applicability of certain reporting requirements.

\* \* \* \* \*

**PART 740—[AMENDED]**

9. Section 740.2 is amended:  
 a. By adding a new paragraph (a)(5); and  
 b. By adding a new paragraph (c) to read as follows:

**§ 740.2 Restrictions on all License Exceptions.**

(a) \* \* \*  
 (5) The item is controlled for missile technology (MT) reasons, except that the items described in ECCNs 6A008, 7A001, 7A002, 7A004, 7A101, 7A102, 7A103, 7A104, 7B001, 7D001, 7D002, 7D003, 7D101, 7D102, 7E003, or 7E101, may be exported as part of a manned aircraft, satellite, land vehicle or marine vehicle or in quantities appropriate for replacement parts for such applications under § 740.9(a)(2)(ii) (License Exception TMP for kits consisting of replacement parts), § 740.10 (License Exception RPL), § 740.13 (License Exception TSU), or § 740.15(c) (License Exception AVS for equipment and spare parts for permanent use on a vessel or aircraft).

\* \* \* \* \*

(c) BXA may by informing the exporter, suspend or revoke any License

Exception in order to comply with U.S. Wassenaar obligations. In addition, BXA may inform an exporter, that before using any License Exception, a notice be submitted with BXA concerning the proposed export.

10. Section 740.3 is amended by adding a new paragraph (f) to read as follows:

**§ 740.3 Shipments of Limited Value (LVS).**

\* \* \* \* \*

(f) *Reporting requirements.* See § 743.1 of the EAR for reporting requirements for exports of certain commodities under License Exception LVS.

11. Section 740.4 is revised to read as follows:

**§ 740.4 Shipments to Country Group B countries (GBS).**

License Exception GBS authorizes exports and reexports to Country Group B (see Supplement No. 1 to part 740) of those commodities controlled to the ultimate destination for national security reasons only and identified by “GBS—Yes” on the CCL. See § 743.1 of the EAR for reporting requirements for exports of certain commodities under License Exception GBS.

12. Section 740.5 is amended by adding a new sentence at the end to read as follows:

**§ 740.5 Civil end-users (CIV).**

\* \* \* See § 743.1 of the EAR for reporting requirements for exports of certain commodities under License Exception CIV.

13. Section 740.6 is amended by adding paragraph (b) to read as follows:

**§ 740.6 Technology and software under restriction (TSR).**

\* \* \* \* \*

(b) *Reporting requirements.* See § 743.1 of the EAR for reporting requirements for exports of certain commodities under License Exception TSR.

14. Section 740.7 is amended by revising paragraph (f) to read as follows:

**§ 740.7 Computers (CTP).**

\* \* \* \* \*

(f) *Reporting requirements.* See § 743.1 of the EAR for reporting requirements for exports of certain commodities under License Exception CTP.

15. Section 740.11 is amended:

- a. By revising paragraph (a)(2);
- b. By revising paragraph (b)(2)(iii);
- c. By revising paragraph (b)(2)(iv), and
- d. By adding a new Supplement No. 1, as follows:

**§ 740.11 Governments and international organizations (GOV).**

\* \* \* \* \*

(a) \* \* \*

(2) The following items controlled for national security (NS) reasons under Export Control Classification Numbers (ECCNs) identified on the Commerce Control List may not be exported or reexported under this License Exception to destinations other than Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom: 1C001, 1C012, 5A001.b.9, 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.e.1, 6A001.a.2.e.2, 6A002.a.1.c, 6A008.l.3., 6B008, 8A001.b., 8A001.d., 8A002.o.3.b., 9A011; and

(i) “Composite” structures or laminates controlled by 1A002.a., having an organic “matrix” and made from materials listed under 1C010.c. or 1C010.d.; and

(ii) “Digital” computers controlled by 4A003.b. and having a CTP exceeding 10,000 MTOPS; and

(iii) “Electronic assemblies” controlled by 4A003.c. and capable of enhancing performance by aggregation of “computing elements” so that the CTP of the aggregation exceeds 10,000 MTOPS; and

(iv) Processing equipment controlled by 6A001.a.2.c. and specially designed for real time application with towed acoustic hydrophone arrays; and

(v) Bottom or bay cable systems controlled by 6A001.a.2.e.3 and having processing equipment specially designed for real time application with bottom or bay cable systems; and

(vi) “Software”, as follows:

(A) Controlled by 4D001, specially designed for the “development” or “production” for items controlled by 4A003.b or .c, as defined by paragraphs (a)(2)(ii) and (iii) of this section; and

(B) Controlled by 5D001.a, specially designed for items controlled by 5A001.b.9; and

(C) Controlled by 6D001 for items controlled by 6A008.l.3 or 6B008; and

(D) Controlled by 6D003.a; and

(E) Controlled by 7D003.a or 7D003.b; and

(F) Controlled by 8D001, specially designed for the “development” or “production” of equipment controlled by 8A001.b, 8A001.d, or 8A002.o.3.b; and

(G) Controlled by 9D001, specially designed for the “development” of equipment or “technology” controlled by 9A011, 9E003.a.1, or by 9E003.a.3, for items controlled by 1A002.a, as

described in paragraph (a)(2)(i) of this section; and

(H) Controlled by 9D002 for "software" specially designed for the "production" of equipment controlled by 9A011; and

(I) Controlled by 9D004.a or .c.

(b) \* \* \*

(2) \* \* \*

(iii) (A) *Items for official use within national territory by agencies of the U.S. Government.* This License Exception is available for all items consigned to and for the official use of any agency of a cooperating government within the territory of any cooperating government, except items described in paragraph (a) to Supplement No. 1 of this section:

(B) *Reporting requirements.* See § 743.1 of the EAR for reporting requirements for exports of certain items under this paragraph (b)(2)(iii).

(iv) (A) *Diplomatic and consular missions of a cooperating government.* This License Exception is available for all items consigned to and for the official use of a diplomatic or consular mission of a cooperating government located in any country in Country Group B (see Supplement No. 1 to part 740), except items described in paragraph (b) of Supplement No. 1 of this section.

(B) *Reporting requirements.* See § 743.1 of the EAR for reporting requirements for exports of certain items under this paragraph (b)(2)(iv).

\* \* \* \* \*

#### Supplement No. 1 to § 740.11—Additional Restrictions on Use of License Exception GOV

(a) Items for official use within national territory by agencies of the U.S. Government. License Exception GOV is available for all items consigned to and for the official use of any agency of a cooperating government within the territory of any cooperating government, except:

(1) Items identified on the Commerce Control List as controlled for national security (NS) reasons under Export Control Classification Numbers (ECCNs) as follows for export or reexport to destinations other than Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom: 1C001, 1C012, 5A001.b.9, 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.e.1, 6A001.a.2.e.2, 6A002.a.1.c, 6A008.1.3., 6B008, 8A001.b., 8A001.d., 8A002.o.3.b., 9A011; and

(i) "Composite" structures or laminates controlled by 1A002.a., having an organic "matrix" and made from materials listed under 1C010.c. or 1C010.d.; and

(ii) "Digital" computers controlled by 4A003.b. and having a CTP exceeding 10,000 MTOPS; and

(iii) "Electronic assemblies" controlled by 4A003.c. and capable of enhancing

performance by aggregation of "computing elements" so that the CTP of the aggregation exceeds 10,000 MTOPS; and

(iv) Processing equipment controlled by 6A001.a.2.c. and specially designed for real time application with towed acoustic hydrophone arrays; and

(v) Bottom or bay cable systems controlled by 6A001.a.2.e.3 and having processing equipment specially designed for real time application with bottom or bay cable systems;

(vi) "Software", as follows:

(A) Controlled by 4D001, specially designed for the "development" or "production" for items controlled by 4A003.b or .c, as defined by paragraphs (a)(1)(ii) and (iii) of this Supplement; and

(B) Controlled by 5D001.a, specially designed for items controlled by 5A001.b.9; and

(C) Controlled by 6D001 for items controlled by 6A008.1.3 or 6B008; and

(D) Controlled by 6D003.a; and

(E) Controlled by 7D003.a or 7D003.b; and

(F) Controlled by 8D001, specially designed for the "development" or "production" of equipment controlled by 8A001.b, 8A001.d, or 8A002.o.3.b; and

(G) Controlled by 9D001, specially designed for the "development" of equipment or "technology" controlled by 9A011, 9E003.a.1, or by 9E003.a.3, for items controlled by 1A002.a, as described in paragraph (a)(1)(i) of this Supplement; and

(H) Controlled by 9D002 for "software" specially designed for the "production" of equipment controlled by 9A011; and

(I) Controlled by 9D004.a or .c.

(vii) "Technology", as follows:

(A) Controlled by 5E001.a for items controlled by 5A001.b.9 or 5D001.a; and

(B) Controlled by 1E001 for items controlled by 1A002.a, 1C001, or 1C102 as described by paragraph (a)(1)(i) of this Supplement; and

(C) Controlled by 6E001 for the "development" of equipment or "software" in 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.c, 6A001.a.2.3, 6A002.a.1.c, 6A008.1.3, or 6B008, as described in paragraph (a)(1) of this Supplement; and

(D) Controlled by 6E002 for the "production" of equipment controlled by 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.c, 6A001.a.2.3, 6A002.a.1.c, 6A008.1.3, or 6B008, as described in paragraph (a)(1) of this Supplement; and

(E) Controlled by 8E001 for items controlled by 8A001.b, 8A002.o.3.b, or 8A001.d; and

(F) Controlled by 9E001 for items controlled by 9A011, 9D001, or 9D002; and

(G) Controlled by 9E002 for items controlled by 9A011; and

(H) Controlled by 9E003.a.1; and

(I) Controlled by 9E003.a.3 for items controlled by 1A002.a as described in paragraph (a)(1) of this Supplement.

(2) Items identified on the Commerce Control List as controlled for missile technology (MT), chemical and biological warfare (CB), or nuclear nonproliferation (NP) reasons;

(3) Regional stability items controlled under Export Control Classification Numbers (ECCNs) 6A002, 6A003, 6E001, 6E002, 7D001, 7E001, 7E002, and 7E101 as described in § 742.6(a)(1) of the EAR; or

(4) Encryption items controlled for EI reasons as described in the Commerce Control List.

(b) *Diplomatic and consular missions of a cooperating government.* License Exception GOV is available for all items consigned to and for the official use of a diplomatic or consular mission of a cooperating government located in any country in Country Group B (see Supplement No. 1 to part 740), except:

(1) Items identified on the Commerce Control List as controlled for national security (NS) reasons under Export Control Classification Numbers (ECCNs) as follows for export or reexport to destinations other than Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom: 1C001, 1C012, 5A001.b.9, 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.e.1, 6A001.a.2.e.2, 6A002.a.1.c, 6A008.1.3., 6B008, 8A001.b., 8A001.d., 8A002.o.3.b., 9A011; and

(i) "Composite" structures or laminates controlled by 1A002.a., having an organic "matrix" and made from materials listed under 1C010.c. or 1C010.d.; and

(ii) "Digital" computers controlled by 4A003.b. and having a CTP exceeding 10,000 MTOPS; and

(iii) "Electronic assemblies" controlled by 4A003.c. and capable of enhancing performance by aggregation of "computing elements" so that the CTP of the aggregation exceeds 10,000 MTOPS; and

(iv) Processing equipment controlled by 6A001.a.2.c. and specially designed for real time application with towed acoustic hydrophone arrays; and

(v) Bottom or bay cable systems controlled by 6A001.a.2.e.3 and having processing equipment specially designed for real time application with bottom or bay cable systems;

(vi) "Software", as follows:

(A) Controlled by 4D001, specially designed for the "development" or "production" for items controlled by 4A003.b or .c, as defined by paragraphs (b)(1)(ii) or (iii) of this Supplement; and

(B) Controlled by 5D001.a, specially designed for items controlled by 5A001.b.9; and

(C) Controlled by 6D001 for items controlled by 6A008.1.3 or 6B008; and

(D) Controlled by 6D003.a; and

(E) Controlled by 7D003.a or 7D003.b; and

(F) Controlled by 8D001, specially designed for the "development" or "production" of equipment controlled by 8A001.b, 8A001.d, or 8A002.o.3.b; and

(G) Controlled by 9D001, specially designed for the "development" of equipment or "technology" controlled by 9A011, 9E003.a.1, or by 9E003.a.3, for items controlled by 1A002.a, as described in paragraph (b)(1)(i) of this Supplement; and

(H) Controlled by 9D002 for "software" specially designed for the "production" of equipment controlled by 9A011; and

- (I) Controlled by 9D004 .a or .c.  
 (vii) "Technology", as follows:  
 (A) Controlled by 5E001.a for items controlled by 5A001.b.9 or 5D001.a; and  
 (B) Controlled by 1E001 for items controlled by 1A002.a, 1C001, or 1C102 as described by paragraph (b)(1) of this Supplement; and  
 (C) Controlled by 6E001 for the "development" of equipment or "software" in 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.c, 6A001.a.2.3, 6A002.a.1.c, 6A008.1.3, or 6B008, as described in paragraph (b)(1) of this Supplement; and  
 (D) Controlled by 6E002 for the "production" of equipment controlled by 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.c, 6A001.a.2.3, 6A002.a.1.c, 6A008.1.3, or 6B008, as described in paragraph (b)(1) of this Supplement; and  
 (E) Controlled by 8E001 for items controlled by 8A001.b, 8A002.o.3.b, or 8A001.d; and  
 (F) Controlled by 9E001 for items controlled by 9A011, 9D001, or 9D002; and  
 (G) Controlled by 9E002 for items controlled by 9A011; and  
 (H) Controlled by 9E003.a.1; and  
 (I) Controlled by 9E003.a.3 for items controlled by 1A002.a as described in paragraph (b)(1)(i) of this Supplement.  
 (2) Items identified on the Commerce Control List as controlled for missile technology (MT), chemical and biological warfare (CB), or nuclear nonproliferation (NP) reasons;  
 (3) Regional stability items controlled under Export Control Classification Numbers (ECCNs) 6A002, 6A003, 6E001, 6E002, 7D001, 7E001, 7E002, and 7E101 as described in § 742.6(a)(1) of the EAR; or  
 (4) Encryption items controlled for EI reasons as described in the Commerce Control List.

#### PART 742—[AMENDED]

16. Section 742.6(a)(1) is amended:  
 a. By removing the phrase "6D102 (only software for development of items in 6A002.a.1, a.2, a.3, or .c);" and  
 b. By revising the phrase "7E002 (only technology for the production of inertial navigation systems, inertial equipment, and specially designed components therefor for civil aircraft)." to read "7E002 (only technology for the production of inertial navigation systems, inertial equipment, and specially designed components therefor for civil aircraft); 7E101 (only technology for the use of inertial navigation systems, inertial equipment, and specially designed components for civil aircraft)."

17. Section 742.12 is amended by revising paragraph (a)(3) and by removing paragraph (a)(4) to read as follows:

#### § 742.12 High performance computers.

(a) \* \* \*

(3) Exporters must keep accurate records of each export to countries not included in Country Group A:1 (see Supplement No. 1 to part 740 of the EAR) of a computer with a CTP greater than 4,000 MTOPS. These records must be submitted semiannually to BXA and must contain the information as described in § 743.1 of the EAR.

\* \* \* \* \*  
 18. A new part 743 is added to read as follows:

#### PART 743—SPECIAL REPORTING

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; E.O. 12924, 59 FR 43437, 3 CFR, 1994 Comp., p. 917; Notice of August 15, 1995, 3 CFR, 1995 Comp., p. 501; Notice of August 14, 1996, 3 CFR, 1996 Comp., p. 289; and Notice of August 13, 1997 (62 FR 43629, August 15, 1997).

##### § 743.1 Wassenaar Arrangement.

(a) *Scope.* This section outlines special reporting requirements for exports of certain commodities, software and technology controlled under the Wassenaar Arrangement. Such reports must be submitted to BXA semiannually in accordance with the provisions of paragraph (f) of this section, and records of all exports subject to the reporting requirements of this section must be kept in accordance with part 762 of the EAR. This section does not require reports for reexports.

(b) *Requirements.* You must submit two (2) copies of each report required under the provisions of this section and maintain accurate supporting records (see § 762.2(b) of the EAR) for all exports of items specified in paragraph (c) of this section under any of the following License Exceptions authorized by part 740 of the EAR: License Exceptions GBS, CIV, TSR, LVS, CTP, and GOV. For purposes of this part 743, "you" has the same meaning as "U.S. exporter", as defined in part 772 of the EAR.

(c) *Items for which reports are required.* (1) You must submit reports to BXA under the provisions of this section only for exports of items controlled under the following ECCNs:

(i) *Category 1:* 1A002, 1C007.c and .d, 1C010.c and .d, 1D002, 1E001, 1E002.e, and 1E002.f;

(ii) *Category 2:* 2B001.a or .b (certain items only; see Note to this paragraph) 2B001.f, 2B003, 2D001, 2E001, and 2E002;

*Note to paragraph (c)(1)(ii):* The following are not controlled for NP reasons: turning machines controlled by 2B001.a with a capacity equal to or less than 35 mm diameter; 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 milling machines controlled by 2B001.b with x-axis travel greater than two meters and overall "positioning accuracy" on the x-axis more (worse) than 0.030 mm. Therefore, exports of such items under License Exception GOV are subject to reporting requirements.

(iii) *Category 3:* 3A002.g.2, 3B001.a.2, 3D001, and 3E001;

(iv) *Category 4:* 4A001.a.2 and .b, 4A003.b and .c (see paragraph (c)(2) of this section), 4D001, 4D003.c, and 4E001;

(v) *Category 5:* 5A001.b.8, 5B001 (items specially designed for 5A001.b.8), 5D001.a and .b, 5E001.a, 5A002, 5B002, 5D002, and 5E002;

(vi) *Category 6:* 6A001.a.1.b, .a.2.c, .a.2.d, and .a.2.e; 6A002.b, 6A004.c and d, 6A006.g and h, 6A008.d, .h, and .k; 6D001, 6D003.a, 6E001, and 6E002;

(vii) *Category 8:* 8A001.c; 8A002.b, .h, .j, .o.3.a, and .p; 8D001, 8D002, 8E001, and 8E002.a; and

(viii) *Category 9:* 9B001.b, 9D001, 9D002, 9D004.a and .c, 9E001, 9E002, 9E003.a.1, 9E003.a.2, .a.3, .a.4, .a.5, .a.8, and .a.9.

(2) Reports for "digital computers" and "electronic assemblies" controlled under ECCN 4A003.b and .c are required only for computers with a composite theoretical performance (CTP) exceeding 4,000 MTOPS or computer enhancements thereof such that the CTP exceeds 4,000 MTOPS. Records for software controlled by 4D001 are required for software specially designed for the development or production of computers having a CTP exceeding 4,000 MTOPS. For the calculation of CTP, see the Technical Note for Category 4 in the Commerce Control List (Supplement No. 2 to part 774 of the EAR).

(d) *Country Exceptions.* You must report each export subject to the provisions of this section, except for exports to countries identified in Country Group A:1 (see Supplement No. 1 to part 740 of the EAR).

(e) *Information that must be included in each report.* (1) Each report submitted to BXA for items other than those identified in paragraph (e)(2) of this section must include the following information for each export during the time periods specified in paragraph (f) of this section:

(i) Export Control Classification Number and paragraph reference as identified on the Commerce Control List;

(ii) Number of units in the shipment; and



- (iii) Country of ultimate destination.
- (2) Reports for "digital computers" and "electronic assemblies" controlled under ECCN 4A003.b and .c must include the following information:
- Date of shipment;
  - Name and address of the end-user and each intermediate consignee;
  - CTP of each computer or aggregation of computing elements in shipment;
  - Quantity shipped; and
  - End-use.

(f) *Frequency and timing of reports.*

You must submit reports subject to the provisions of this section semiannually. The reports must be labeled with the exporting company's name and address at the top of each page and must include for each such export all the information specified in paragraph (e) of this section. The reports shall cover exports made during six month time periods spanning from January 1 through June 30 and July 1 through December 31.

(1) The first report must be submitted to and received by BXA no later than August 1, 1998 for the partial reporting period beginning January 15, 1998 and ending June 30, 1998. Thereafter, reports are due according to the provisions of paragraphs (f)(2) and (f)(3) of this section.

(2) Reports for the reporting period ending June 30 must be submitted to and received by BXA no later than August 1.

(3) Reports for the reporting period ending December 31 must be submitted to and received by BXA no later than February 1.

(g) *Mailing address and facsimile number:* (1) Two (2) copies of reports required under this section shall be delivered to one of the following addresses. BXA will not accept reports sent C.O.D.

(i) For deliveries by U.S. postal service:

Bureau of Export Administration, U.S.  
Department of Commerce, P.O. Box 273,  
Attn: "Wassenaar Reports", Washington,  
D.C. 20044

(ii) For courier deliveries:

Bureau of Export Administration, U.S.  
Department of Commerce, Attn:  
"Wassenaar Reports", Room 2705, 14th  
Street and Pennsylvania Ave., N.W.,  
Washington, D.C. 20230

(2) Reports may also be sent by facsimile to: (202) 482-3345, Attn: "Wassenaar Reports".

(h) *Contacts.* General information concerning the Wassenaar Arrangement and reporting obligations thereof is available from the Office of Strategic Trade and Foreign Policy Controls, Tel. (202) 482-0092, Fax: (202) 482-4094.

**§743.2 [Reserved]**

**PART 744—[AMENDED]**

19. Section 744.8(b) is amended by revising the phrase "7A006, 7A106, 7A115, 7A994," to read "7A006, 7A994".

**PART 746—[AMENDED]**

20. Section 746.8(b)(1)(ii) is amended by revising the phrase "6E002, 9A115, 9A991.a," to read "6E002, 9A991.a,".

**PART 762—[AMENDED]**

21. Section 762.2 is amended by revising paragraphs (b)(35) and (b)(36) and by adding a new paragraph (b)(37) to read as follows:

**§762.2 Records to be retained.**

\* \* \* \* \*

(b) \* \* \*

(35) § 764.5, Voluntary self-disclosure;

(36) § 766.10, Subpoenas; and

(37) § 743.1, Wassenaar reports.

**PART 774—[AMENDED]**

22. Supplement No. 1 to part 774 is revised to read as follows:

**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, Office of Defense Trade Controls. See 22 CFR part 121.)**

**0A018 Items on the International Munitions List.**

**License Requirements**

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

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to entire entry	NS Column 1
RS applies to 0A018.c .....	RS Column 2
AT applies to entire entry	AT Column 1
UN applies to entire entry	Rwanda

**License Exceptions**

LVS: \$5000 for 0A018.a and b; \$3000 for 0A018.c; \$1500 for 0A018.d through .f; \$0 for entire entry for Rwanda

GBS: N/A

CIV: N/A

**List of Items Controlled**

*Unit:* 0A018.a, .b, and .c in \$ value; 0A018.d, .e, and .f 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. Construction equipment built to military specifications, specially designed for airborne transport; and specially designed parts and accessories therefor;

c. 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, Office of Defense Trade Controls. (See 22 CFR parts 120 through 130.)

d. Bayonets;

e. Muzzle-loading (black powder) firearms;

**Note:** Antique small arms dating prior to 1890 and their reproductions are not controlled by this ECCN 0A018.

f. Military helmets, except:

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

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

**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

**0A982 Saps; thumbcuffs, leg irons, shackles, and handcuffs; straight jackets, plastic handcuffs, machetes, conventional steel military helmets, police helmets and shields; and parts and accessories, n.e.s.**

**License Requirements**

*Reason for Control:* CC, UN

<i>Control(s)</i>	<i>Country Chart</i>
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CC applies to entire entry except machetes.	CC Column 1
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UN applies to machetes ...	Rwanda
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**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

**0A983 Specially designed implements of torture and thumbscrews; 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

**0A984 Shotguns, barrel length 18 inches (45.72 cm) inches or over; buckshot shotgun shells; 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

<i>Control(s)</i>	<i>Country Chart</i>
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CC applies to shotguns with a barrel length over 18 in. (45.72 cm) but less than 24 in. (60.96 cm) or buckshot shotgun shells controlled by this entry, regardless of end-user.	CC Column 1
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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
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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
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UN applies to entire entry	Rwanda
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**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, Office of Defense Trade Controls

*Related Definitions:* N/A

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

**0A985 Optical sighting devices for firearms (including shotguns controlled by 0A984); discharge type arms (for example, stun guns, shock batons, electric cattle prods, immobilization guns and projectiles, etc.) 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

<i>Control(s)</i>	<i>Country Chart</i>
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CC applies to entire entry	CC Column 1
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UN applies to entire entry	Rwanda
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**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

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

**License Requirements**

*Reason for Control:* UN

*Control(s):* UN applies to entire entry. A license is required for items controlled by this entry to Cuba, Libya, North Korea and Rwanda. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 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

**0A988 Conventional military steel helmets as described by 0A018.f.1; and machetes.**

**License Requirements**

*Reason for Control:* UN

*Control(s):* UN applies to entire entry. A license is required for items controlled by this entry to Cuba, Libya, North Korea and Rwanda. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information

**Note:** Exports from the U.S. and transshipments 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

**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:** N/A

**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<sub>6</sub> (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<sup>3</sup>/min or more of UF<sub>6</sub>, and discharge pressure up to 666.7 kPa, made of or protected by materials resistant to UF<sub>6</sub> (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<sup>3</sup>/min.;

- b.3. Gaseous diffusion barriers made of porous metallic, polymer or ceramic materials resistant to corrosion by UF<sub>6</sub> 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<sub>6</sub>;

- 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 x 10<sup>6</sup> m and a "specific tensile strength" greater than 76.2 x 10<sup>3</sup> m;

- c.4. Magnetic suspension bearings consisting of an annular magnet suspended within a housing made of UF<sub>6</sub> 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 x 10<sup>6</sup> m and a "specific tensile strength" greater than 76.2 x 10<sup>3</sup> 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 x 10<sup>6</sup> m and a "specific tensile strength" greater than 76.2 x 10<sup>3</sup> 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 x 10<sup>6</sup> m and a "specific tensile strength" greater than 76.2 x 10<sup>3</sup> 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<sub>6</sub> resistant materials;

- c.13. Scoops consisting of tubes of up to 12 mm internal diameter for the extraction of UF<sub>6</sub> gas from within a centrifuge rotor tube by a Pitot tube action, made of or protected by UF<sub>6</sub> 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<sub>6</sub> 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<sup>3</sup>/min, made of or protected by materials resistant to UF<sub>6</sub> (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<sub>6</sub> 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<sub>6</sub> resistant materials with a diameter of 40 to 1500 mm;

- d.7. Process systems for separating UF<sub>6</sub> from carrier gas (hydrogen or helium) to 1 ppm UF<sub>6</sub> 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<sub>6</sub> from carrier gas;

- d.7.d. UF<sub>6</sub> 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 alloy's (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.  $UF_6$  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;

f.1. Vacuum manifolds or vacuum headers having a suction capacity of 5 m<sup>3</sup>/minute or more; or

f.2. Vacuum pumps specially designed for use in UF<sub>6</sub> bearing atmospheres;

g. UF<sub>6</sub> mass spectrometers/ion sources specially designed or prepared for taking on-line samples of feed, product or tails from UF<sub>6</sub> gas streams and having all of the following characteristics:

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

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

g.3. Electron bombardment ionization sources; and

g.4. Collector system suitable for isotopic analysis.

**0B003 Plant for the production of uranium hexafluoride (UF<sub>6</sub>) and specially designed or prepared equipment and components therefor, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

**License Exceptions**

LVS: \$ value

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 UF<sub>6</sub>;

b. Equipment and components, as follows, specially designed or prepared for UF<sub>6</sub> production:

b.1. Fluorination and hydrofluorination screw and fluid bed reactors and flame towers;

b.2. Distillation equipment for the purification of UF<sub>6</sub>.

**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.3.c. 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

*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.

**0B008 Equipment for "nuclear reactors".**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

**License Exceptions**

LVS: \$ value

GBS: N/A

CIV: N/A

**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:*

**List of Items Controlled***Unit:* N/A*Related Controls:* N/A*Related Definitions:* N/A*Items:* a. Simulators specially designed for "nuclear reactors";

b. Ultrasonic or eddy current test equipment specially designed for "nuclear reactors".

**0B009 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 0B009 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<sub>3</sub>;b. Systems for the conversion of UO<sub>3</sub> to UF<sub>6</sub>;c. Systems for the conversion of UO<sub>3</sub> to UO<sub>2</sub>;d. Systems for the conversion of UO<sub>2</sub> to UF<sub>4</sub>;e. Systems for the conversion of UF<sub>4</sub> to UF<sub>6</sub>;f. Systems for the conversion of UF<sub>4</sub> to uranium metal;g. Systems for the conversion of UF<sub>6</sub> to UO<sub>2</sub>;h. Systems for the conversion of UF<sub>6</sub> to UF<sub>4</sub>.**0B986 Equipment specially designed for manufacturing shotgun shells; and ammunition hand-loading equipment for both cartridges and shotgun shells.****License Requirements***Reason for Control:* UN*Control(s):* UN applies to entire entry. A license is required for items controlled by this entry to Cuba, Libya, North Korea and Rwanda. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 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**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, nuclear-grade, having a purity level of less than 5 parts per million "boron equivalent" and with a density greater than 1.5 g/cm<sup>3</sup>.****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:* N/A*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<sub>6</sub> (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

**D. Software**

**0D001 "Software" specially designed or modified for the "development", "production" or "use" of goods controlled by this Category.**

**License Requirements**

Reason for Control: NP, AT

Control(s)	Country Chart
NP applies to "software" for items controlled by 0B003.	NP Column 1
NP applies to "software" for items controlled by 0B008.	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: (1) "Software" for items controlled by 0A001, 0A002, 0B001, 0B002, 0B004, 0B005, 0B006, 0B009, 0C001, 0C002, 0C004, 0C005, 0C006, and 0C201 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) "Software" for items controlled by 0A002 are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls (see 22 CFR part 121)

Related Definitions: N/A

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

**E. Technology**

**0E001 "Technology" according to the Nuclear Technology Note for the "development", "production" or "use" of items controlled by this Category.**

**License Requirements**

Reason for Control: NP, AT

Control(s)	Country Chart
NP applies to "technology" for items controlled by 0B003.	NP Column 1
NP applies to "technology" for items controlled by 0B008.	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: "Technology" for items controlled by 0A001, 0A002, 0B001, 0B002, 0B004, 0B005, 0B006, 0B009, 0C001, 0C002, 0C004, 0C005, 0C006, and 0C201 are subject to the export licensing

authority of the Department of Energy (see 10 CFR part 810)

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.b through 0A018.e.**

**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	Rwanda

**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

**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) but less than 24 in. (60.96 cm) and shotgun shells, regardless of end-user.	CC Column 1
CC applies to "technology" for shotguns with a barrel length over 24 in. (60.96 cm), regardless of end-user.	CC Column 2
CC applies to "technology" for shotguns with a barrel length over 24 in. (60.96 cm) if for sale or resale to police or law enforcement.	CC Column 3
UN applies to entire entry	Rwanda

**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—Materials, Chemicals, "Microorganisms" & "Toxins"

**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: 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, Office of Defense Trade Controls (see 22 CFR part 121.)

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 materials controlled by 1C009.a:  
 b.1. In sheet or film form; and  
 b.2. With a thickness exceeding 200 µm;  
 c. Seals, gaskets, valve seats, bladders or diaphragms made from fluoroelastomers containing at least one vinyl ether monomer, 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 except finished or semi-finished items specially designed for purely civilian applications as follows: sporting goods, automotive industry, machine tool industry, and medical applications.	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
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 "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

**List of Items Controlled**

*Unit:* Kilograms  
*Related Controls:* (1) See also 1A202, 9A010, and 9A110. (2) This entry does not control "composite" structures or laminates made from epoxy resin impregnated carbon "fibrous or filamentary materials" for the repair of aircraft structures of laminates, provided that the size does not exceed one square meter (1 m<sup>2</sup>)

*Related Definitions:* N/A  
*Items:* a. An organic "matrix" and made from materials controlled by 1C010.c, 1C010.d or 1C010.e; or

- b. A metal or carbon "matrix" and made from:
  - b.1. Carbon "fibrous or filamentary materials" with:
    - b.1.a. A "specific modulus" exceeding 10.15 x 10<sup>6</sup> m; and
    - b.1.b. A "specific tensile strength" exceeding 17.7 x 10<sup>4</sup> m; or
  - b.2. Materials controlled by 1C010.c.

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

**1A003 Manufactures of non-fluorinated polymeric substances controlled by 1C008.a.3 in film, sheet, tape or ribbon form with either of the following characteristics (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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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

*Related Definitions:* N/A  
*Items:* a. With 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. (These items are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls. See 22 CFR part 121.)**

**1A005 Body armor, and specially designed components therefor, not manufactured to military standards or specifications, nor to their equivalents in performance.**

**License Requirements**

*Reason for Control:* NS, UN, AT

<i>Control(s)</i>	<i>Country Chart</i>
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NS applies to entire entry NS Column 2  
 UN applies to entire entry. A license is required for items controlled by this entry to Cuba, Libya, North Korea and Rwanda. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information.

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) 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, Office of Defense Trade Controls. (See 22 CFR part 121.) (2) This entry does not control individual suits of body armor and accessories therefor, when accompanying their users for his/her own personal protection. (3) This entry does not control body armor designed to provide frontal protection only from both fragment and blast from non-military explosive devices

*Related Definitions:* N/A

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

**1A102 Resaturated pyrolyzed carbon-carbon materials designed for "missiles". (These items are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls. See 22 CFR part 121.)**

**1A202 Composite structures, other than those controlled by 1A002, in the form of tubes with an inside diameter of between 75 mm and 400 mm made with any of the "fibrous or filamentary materials" specified in 1C210.a or with carbon prepreg materials controlled by 1C210.c.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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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 also 9A010 and 9A110  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading

**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

<i>Control(s)</i>	<i>Country Chart</i>
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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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading

**1A226 Specialized packings for use in separating heavy water from ordinary water and made of phosphor bronze mesh (chemically treated to improve wettability) and designed for use in vacuum distillation towers.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading

**1A227 High-density (lead glass or other) radiation shielding windows greater than 0.09 m<sup>2</sup> on cold area and with a density greater than 3 g/cm<sup>3</sup> and a thickness of 100 mm or greater; and specially designed frames therefor.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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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:* Nuclear equipment is also 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

**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

<i>Control(s)</i>	<i>Country Chart</i>
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, Office 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; smoke bombs; non-irritant smoke flares, canisters, grenades and charges; other pyrotechnic articles having dual military and commercial use; and fingerprinting powders, dyes and inks.**

**License Requirements**

*Reason for Control:* CC

<i>Control(s)</i>	<i>Country Chart</i>
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

**B. Test, Inspection and Production Equipment**

**1B001 Equipment for the production of fibers, prepregs, preforms or "composites" controlled by 1A002 or 1C010, and specially designed components and accessories therefor.**

**License Requirements**

*Reason for Control:* NS, MT, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to entire entry	NS Column 2
MT applies to entire entry, except 1B001.d.4 and .f.	MT Column 1
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:* See also 1B101 and 1B201; and for accelerators and systems containing accelerators see 3A101

*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 axes, specially designed for the manufacture of "composite" structures or laminates from "fibrous or filamentary materials";

b. Tape-laying or tow-placement machines of which the motions for positioning and laying tape, tows or sheets are coordinated and programmed in two or more 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, for weaving, interlacing or braiding fibers to manufacture "composite" structures;

**Note:** 1B001.c does not control textile machinery not modified for the above end-uses.

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 capable of inspecting defects three dimensionally, using ultrasonic or X-ray tomography and specially designed for "composite" materials.

**1B002 Systems and components therefor, specially designed to avoid contamination and specially designed for producing metal alloys, metal alloy powder or alloyed materials controlled by 1C002.a.2, 1C002.b or 1C002.c.**

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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 or aluminum or their alloys, specially designed for the manufacture of (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* Equipment in number; components in \$ value

*Related Controls:* For specially designed production equipment of systems, subsystems 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 those structures or engines.

**1B018 Equipment on the International Munitions List.**

**License Requirements**

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

<i>Control(s)</i>	<i>Country Chart</i>
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

**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<sup>-4</sup>) Torr, and specially designed components therefor.

**1B101 Equipment, other than that controlled by 1B001, for the "production" of structural composites, and specially designed components and accessories therefor.**

**License Requirements**

*Reason for Control:* MT, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
MT applies to entire entry	MT Column 1
NP applies to 1B101.a only.	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 also 1B201

*Related Definitions:* Components and accessories controlled by this entry include molds, mandrels, dies, fixtures and tooling for the preform processing, curing, casting,

sintering or bonding of composite structures, laminates and manufactures thereof

*Items:* a. Filament winding 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 prepreps 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.

**1B115 Equipment for the "production", handling and acceptance testing of propellants or propellant constituents controlled by 1C011, 1C111 or on the U.S. Munitions List, and specially designed components therefor.**

**License Requirements**

*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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) The only batch or continuous mixers controlled by this entry are those which have provision for mixing under vacuum in the range of zero to 13.326 kPa and with a temperature control capacity of the mixing chamber: (a) Batch mixers having a total volumetric capacity of 110 liters or more and at least one mixing/kneeding shaft mounted off center; (b) Continuous mixers having two or more mixing/kneeding shafts and capability to open the mixing chamber. (2) For equipment specially designed for the production of military propellants or propellant constituents, see the U.S. Munitions List. (3) This entry does control

equipment for the "production", handling and acceptance testing of boron carbide

*Related Definitions:* N/A.

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

**1B116 Specially designed nozzles for producing 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 to 20 kPa.**

**License Requirements**

*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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

**1B201 Filament winding machines, other than those controlled by 1B001 or 1B101, in which the motions for positioning, wrapping, and winding fibers are coordinated and programmed in two or more axes, specially designed to fabricate composite structures or laminates from "fibrous or filamentary materials" and capable of winding cylindrical rotors of diameter between 75 mm and 400 mm and lengths of 600 mm or greater and coordinating and programming controls and precision mandrels therefor.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* N/A

*Related Definitions:* N/A

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

**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

<i>Control(s)</i>	<i>Country Chart</i>
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: N/A  
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: This entry includes separators capable of enriching stable isotopes and separators with the ion sources and collections both in the magnetic field and those configurations in which they are external to the field

Related Definitions: N/A

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: N/A  
Related Definition: N/A  
Items: The list of items controlled is contained in the ECCN heading.

**1B228 Hydrogen-cryogenic distillation columns having all of the 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: Heavy water production equipment is also subject to the export licensing authority of the Nuclear Regulatory Commission. (See 10 CFR part 110.)

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<sub>2</sub>-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 constructed from fine carbon steel with a diameter of 1.8 m or greater, which can operate at a nominal pressure of 2 MPa or greater, and internal contactors thereof.**

**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 0B004 for columns which are specially designed or prepared for the production of heavy water. These items are controlled on the NSG Trigger List (INFCIRC/254/part (2) See 10 CFR part 110 for heavy water production equipment subject to the export licensing authority of the Nuclear Regulatory Commission

Related Definition: (1) This entry includes internal contactors of the columns are segmented trays with an effective assembled diameter of 1.8 m (6 ft.) or greater, are designed to facilitate countercurrent contacting and constructed of materials resistant to corrosion by hydrogen sulfide/water mixtures. These may be sieve trays, valve trays, bubble cap trays or turbogrid trays. (2) Fine carbon steel in this entry is defined to be steel with the austenitic ASTM (or equivalent standard) grain size number of 5 or greater. (3) Materials resistant to corrosion by hydrogen sulfide/water mixtures in this entry are defined to be stainless steels with a carbon content of 0.03% or less

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

**1B230 Pumps circulating solutions of diluted or concentrated potassium amide catalyst in liquid ammonia (KNH<sub>2</sub>/NH<sub>3</sub>), with all of the 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: Heavy water production equipment is also subject to the export licensing authority of the Nuclear Regulatory Commission. (See 10 CFR part 110.)

Related Definitions: N/A

Items: a. Airtight (i.e., hermetically sealed);

b. For concentrated potassium amide solutions (1% or greater), operating pressure of 1.5–60 MPa (15–600 atmospheres); for dilute potassium amide solutions (less than 1%), operating pressure of 20–60 MPa (200–600 atmospheres); and

c. A capacity greater than 8.5 m<sup>3</sup>/hr.

**1B231 Tritium facilities, plant or 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: This entry does not control tritium, tritium compounds, and mixtures containing tritium, or products or devices thereof. See 10 CFR part 110 for tritium subject to the export licensing authority of the Nuclear Regulatory Commission

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 designed for operation below 35 K (-238 °C) and a throughput of hydrogen gas of 1000 kg/hr 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: N/A  
 Related Definitions: N/A  
 Items: The list of items controlled is contained in the ECCN heading

**1B233 Lithium isotope separation facilities, plant or equipment, as follows (see List of Items Controlled).**

**License Requirements**

Reason for Control:  
 Control(s): Items described in 1B233 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. Facilities or plant 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.

**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, bricks, 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

**List of Items Controlled**

Unit: Kilograms  
 Related Controls: See also 1C101  
 Related Definitions: N/A  
 Items: a. Materials for absorbing frequencies exceeding  $2 \times 10^8$  Hz but less than  $3 \times 10^{12}$  Hz.

**Notes:** 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 characteristics:  
 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  $\pm 15\%$  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  $\pm 15\%$  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  $7 \times 10^6$  N/m<sup>2</sup>; and  
 3. Compressive strength less than  $14 \times 10^6$  N/m<sup>2</sup>;  
 d. Planar absorbers made of sintered ferrite, having:  
 1. A specific gravity exceeding 4.4; and  
 2. A maximum operating temperature of 548 K (275° C).

**Note 2:** Nothing in 1C001.a releases magnetic materials to provide absorption when contained in paint.

b. Materials for absorbing frequencies exceeding  $1.5 \times 10^{14}$  Hz but less than  $3.7 \times 10^{14}$  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.a.2.c or a.2.d if they exceed the parameters stated in 1C202.	NP Column 1

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 1C202. This entry does not control metal alloys, metal alloy powder or alloyed materials for coating substrates  
 Related Definition: N/A

Items: a. Metal alloys, as follows:  
 a.1. Nickel or titanium-based alloys in the form of aluminides, as follows, in crude or semi-fabricated forms:

a.1.a. Nickel aluminides containing a minimum of 15 weight percent aluminum, a maximum of 38 weight percent aluminum and at least one additional alloying element;  
 a.1.b. Titanium aluminides containing 10 weight percent or more aluminum and at least one additional alloying element;

a. 2. Metal alloys, as follows, made from metal alloy powder or particulate material controlled by 1C002.b:

a.2.a. Nickel alloys with:  
 a.2.a.1. A stress-rupture life of 10,000 hours or longer at 923 K (650° C) at a stress of 676 MPa; or  
 a.2.a.2. A low cycle fatigue life of 10,000 cycles or more at 823 K (550° C) at a maximum stress of 1,095 MPa;  
 a.2.b. Niobium alloys with:  
 a.2.b.1. A stress-rupture life of 10,000 hours or longer at 1,073 K (800° C) at a stress of 400 MPa; or  
 a.2.b.2. A low cycle fatigue life of 10,000 cycles or more at 973 K (700° C) at a maximum stress of 700 MPa;  
 a.2.c. Titanium alloys with:

a.2.c.1. A stress-rupture life of 10,000 hours or longer at 723 K (450° C) at a stress of 200 MPa; *or*

a.2.c.2. A low cycle fatigue life of 10,000 cycles or more at 723 K (450° C) at a maximum stress of 400 MPa;

a.2.d. Aluminum alloys with a tensile strength of:

a.2.d.1. 240 MPa or more at 473 K (200° C); *or*

a.2.d.2. 415 MPa or more at 298 K (25° C);

a.2.e. Magnesium alloys with a tensile strength of 345 MPa or more and 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;

**Technical Note 1:** The metal alloys in 1C002.a 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.

b. Metal alloy powder or particulate material for materials controlled by 1C002.a, as follows:

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

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

b.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  $\mu$ m in 10<sup>9</sup> alloy particles;

b.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);

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

b.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*

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

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

b.2.a. "Vacuum atomization";

b.2.b. "Gas atomization";

b.2.c. "Rotary atomization";

b.2.d. "Splat quenching";

b.2.e. "Melt spinning" and

"comminution";

b.2.f. "Melt extraction" and

"comminution"; *or*

b.2.g. "Mechanical alloying";

c. Alloyed materials, in the form of uncomminuted flakes, ribbons or thin rods produced in a controlled environment by "splat quenching", "melt spinning" or "melt extraction", used in the manufacture of metal alloy powder or particulate material controlled by 1C002.b.

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

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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 permeability must be performed on fully annealed materials.

b. Magnetostrictive alloys, having any of the following characteristics:

b.1. A saturation magnetostriction of more than  $5 \times 10^{-4}$ ; *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 characteristics:

c.1. A composition having a minimum of 75 weight percent 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  $2 \times 10^{-4}$ ; 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 characteristics (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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. A density exceeding 17.5 g/cm<sup>3</sup>;

b. An elastic limit exceeding 1,250 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

<i>Control(s)</i>	<i>Country Chart</i>
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. Multifilamentary "superconductive" "composite" conductors containing one or more niobium-titanium filaments:

a.1. Embedded in a "matrix" other than a copper or copper-based mixed "matrix"; *or*

a.2. Having a cross-section area less than  $0.28 \times 10^{-4}$  mm<sup>2</sup> (6  $\mu$ m 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) but less than 24 K (-249.16° C);

b.2. A cross-section area less than  $0.28 \times 10^{-4}$  mm<sup>2</sup>; *and*

b.3. Remaining in the "superconductive" state at a temperature of 4.2 K (-268.96° C) when exposed to a magnetic field corresponding to a magnetic induction of 12 T.

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

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* Barrels (55 U.S. gallons/ 209 liters)

*Related Controls:* N/A

*Related Definitions:* N/A

*Items:* a. Hydraulic fluids containing, as their principal ingredients, any of the following compounds or materials:

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

**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:

**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;

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

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<sup>2</sup>/s (5,000 centistokes) measured at 298 K (25° C);

c. Damping or flotation fluids with a purity exceeding 99.8%, containing less than 25 particles of 200 μm or larger in size per 100 ml and made from at least 85% of any of the following compounds or materials:

- c.1. Dibromotetrafluoroethane;
- c.2. Polychlorotrifluoroethylene (oily and waxy modifications only); *or*
- c.3. Polybromotrifluoroethylene;
- d. Fluorocarbon electronic cooling fluids, having all of the following characteristics:

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.

**Technical Note:** For the purpose of 1C006: a. Flash point is determined using the Cleveland Open Cup Method described in ASTM D-92 or national equivalents;

b. Pour point is determined using the method described in ASTM D-97 or national equivalents;

c. Viscosity index is determined using the method described in ASTM D-2270 or national equivalents;

d. 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:

- 1. The loss in weight of each ball is less than 10 mg/mm<sup>2</sup> of ball surface;
- 2. The change in original viscosity as determined at 311 K (38° C) is less than 25%; *and*
- 3. The total acid or base number is less than 0.40;
- e. Autogenous ignition temperature is determined using the method described in ASTM E-659 or national equivalents.

**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

<i>Control(s)</i>	<i>Country Chart</i>
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NS applies to entire entry MT applies to items in 1C007.d and .f when the dielectric constant is less than 6 at frequencies from 100 Hz to 10,000 MHz for use in missile radomes.	NS Column 2. MT Column 1.
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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

**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 made from any of the following systems:

- c.1. Si-N;
- c.2. Si-C;
- c.3. Si-Al-O-N; *or*
- c.4. Si-O-N; having a “specific tensile strength” exceeding 12.7 x 10<sup>3</sup> 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<sub>2</sub>O<sub>3</sub>; *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

<i>Control(s)</i>	<i>Country Chart</i>
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NS applies to entire entry AT applies to entire entry	NS Column 2 AT Column 1
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**License Exceptions**

LVS: \$200  
GBS: N/A  
CIV: N/A

**List of Items Controlled**

*Unit:* Kilograms

*Related Controls:* N/A

*Related Definitions:* N/A

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

- a.1. Bismaleimides;
- a.2. Aromatic polyamide-imides;
- a.3. Aromatic polyimides;
- a.4. Aromatic polyetherimides having a glass transition temperature (T<sub>g</sub>) exceeding 513 K (240° C) determined using the dry method described in ASTM D 3418;

**Note:** 1C008.a does not control non-fusible compression molding powders or molded forms.

b. Thermoplastic liquid crystal copolymers having a heat distortion temperature exceeding 523 K (250° C) measured according to ASTM D-648, method A, or national equivalents, with a load of 1.82 N/mm<sup>2</sup> and composed of:

- b.1. Any of the following:
  - 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;
- b.2.b. 6-hydroxy-2 naphthoic acid; *or*
- b.2.c. 4-hydroxybenzoic acid;
- c. Polyarylene ether ketones, as follows:
  - c.1. Polyarylene ether ketone (PEEK)
  - c.2. Polyether ketone ketone (PEKK);
  - c.3. Polyether ketone (PEK);
  - c.4. Polyether ketone ether ketone ketone (PEKEKK);
  - d. Polyarylene ketones;

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

f. Polybiphenylenethersulphone.

**Technical Note:** The glass transition temperature ( $T_g$ ) for 1C008 materials is determined using the method described in ASTM D 3418 using the dry method.

**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:* N/A

*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" which may be used in organic "matrix", metallic "matrix" or carbon "matrix" "composite" structures or laminates, 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

**List of Items Controlled**

*Unit:* Kilograms

*Related Controls:* See also 1C210, 1C990, and 9A110 for material not controlled by 1C010.e, as defined by technical notes 1 or 2. Note that some items in 1C010.e are also controlled under 9A110

**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  $(296\pm 2)$  K ( $(23\pm 2)$  C) and a relative humidity of  $(50\pm 5)\%$ . (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  $(296\pm 2)$  K ( $(23\pm 2)$  C) and a relative humidity of  $(50\pm 5)\%$

*Items:* a. Organic "fibrous or filamentary materials", having all of the following:

a.1. A specific modulus exceeding  $12.7 \times 10^6$  m; and

a.2. A specific tensile strength exceeding  $23.5 \times 10^4$  m;

**Note:** 1C010.a does not control polyethylene.

b. Carbon "fibrous or filamentary materials", having all of the following:

b.1. A specific modulus exceeding  $12.7 \times 10^6$  m; and

b.2. A specific tensile strength exceeding  $23.5 \times 10^4$  m;

**Technical Note:** Properties for materials described in 1C010.b should be determined using SACMA recommended methods SRM 12 to 17, or national equivalent tow tests, such as Japanese Industrial Standard JIS-R-7601, Paragraph 6.6.2, and based on lot average.

**Note:** 1C010.b does not control fabric made from "fibrous or filamentary materials" for the repair of aircraft structures or laminates, in which the size of individual sheets does not exceed 50 cm x 90 cm.

c. Inorganic "fibrous or filamentary materials", having all of the following:

c.1. A specific modulus exceeding  $2.54 \times 10^6$  m; and

c.2. A melting, softening, decomposition or sublimation point exceeding 1,922 K (1,649 °C) in an inert environment;

**Note:** 1C010.c does not control:

1. Discontinuous, multiphase, polycrystalline alumina fibers in chopped fiber or random mat form, containing 3 weight percent or more silica, with a specific modulus of less than  $10 \times 10^6$  m;

2. Molybdenum and molybdenum alloy fibers;

3. Boron fibers;

4. 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":

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. Resin-impregnated or pitch-impregnated fibers (prepregs), metal or carbon-coated fibers (preforms) or "carbon fiber preforms", as follows:

e.1. Made from "fibrous or filamentary materials" controlled by 1C010.a, 1C010.b or 1C010.c;

e.2. Made from organic or carbon "fibrous or filamentary materials":

e.2.a. With a "specific tensile strength" exceeding  $17.7 \times 10^4$  m;

e.2.b. With a "specific modulus" exceeding  $10.15 \times 10^6$  m;

e.2.c. Not controlled by 1C010.a or 1C010.b; and

e.2.d. When impregnated with materials controlled by 1C008 or 1C009.b, having a glass transition temperature ( $T_g$ ) exceeding 383 K (110 °C) or with phenolic or epoxy resins, having a glass transition temperature ( $T_g$ ) equal to or exceeding 418 K (145 °C).

**Notes:** 1C010.e does not control:

1. Epoxy resin "matrix" impregnated carbon "fibrous or filamentary materials" (prepregs) for the repair of aircraft structures or laminates, in which the size of individual sheets of prepreg does not exceed 50 cm x 90 cm;

2. Prepregs when impregnated with phenolic or epoxy resins having a glass transition temperature ( $T_g$ ) less than 433 K (160 °C) and a cure temperature lower than the glass transition temperature.

**Technical Note:** The glass transition temperature ( $T_g$ ) for 1C010.e materials is determined using the method described in ASTM D 3418 using the dry method. The glass transition temperature for phenolic and epoxy resins is determined using the method described in ASTM D 4065 at a frequency of 1 Hz and a heating rate of 2 K per minute using the dry method.

**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 and .b.	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 1C111. (2)

Items 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, are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls (see 22 CFR part 121)

*Related Definitions:* N/A

*Items:* a. Metals in particle sizes of less than 60  $\mu$ m whether spherical, atomized, spheroidal, flaked or ground, manufactured from material consisting of 99% or more of zirconium, magnesium and alloys of these;

N.B.: The metals or alloys listed in 1C011.a are controlled whether or not the metals or alloys are encapsulated in aluminum, magnesium, zirconium or beryllium.

b. Boron or boron carbide of 85% purity or higher and a particle size of 60  $\mu$ m or less;

N.B.: The metals or alloys listed in 1C011.b are controlled whether or not the metals or alloys are encapsulated in aluminum, magnesium, zirconium or beryllium.  
 c. Guanidine nitrate.

**1C012 Materials for nuclear heat sources, 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)

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

**Note:** 1C012.a does not control:

1. Shipments with a plutonium content of 1 g or less;
2. 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 Materials on the International Munitions List.**

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

**License Exceptions**

LVS: \$3000

GBS: Yes for items listed in Advisory Note to 1C018

CIV: N/A

**List of Items Controlled**

*Unit:* Kilograms

*Related Controls:* N/A

*Related Definitions:* N/A

*Items:* a. Ethyl and Methyl centralites.

b. NN-Diphenylurea (unsymmetrical diphenylurea).

c. Methyl-NN-diphenylurea (methyl unsymmetrical diphenylurea).

d. Ethyl-NN-diphenylurea (ethyl unsymmetrical diphenylurea).

e. Ethyl phenyl urethane.

f. Diphenyl urethane.

g. Diortho tolyl-urethane.

h. 2-Nitrodiphenylamine.

i. p-Nitromethylaniline.

j. 2,2' Dinitropropanol.

k. Bis(2,2' dinitropropyl) formal and acetal.

l. 3-Nitrazo-1,5 pentane diisocyanate.

m. Guanidine nitrate.

n. Hydrogen peroxide in concentrations of 85%.

o. Charges specially designed for civilian applications, containing military explosives, except those items described in 1C992.

**Technical Note:** Military high explosives are solid, liquid or gaseous substances or mixtures of substances that, in their application as primary, booster, or main charges in warheads, demolition and other military applications, are required to detonate.

**Advisory Note:** Licenses are likely to be approved for export and reexport to satisfactory end-users in Country Group D:1 of certain explosive substances and mixtures in reasonable quantities for civilian or industrial purposes when made into cartridges or charges of an exclusively civilian or industrial nature, such as propellants for sporting purposes or shooting gallery practice; cartridges for riveting guns; and explosive charges for agricultural purposes, public works, mines, quarries or oil-well drilling. The following are the substances or mixtures to which this procedure applies:

- a. Nitrate-based (40 percent or more) and provided they do not contain more than 40 percent nitroglycol/nitroglycerin or no more than 16 percent TNT;
- b. Nitrocellulose with a nitrogen content of over 12.2 percent;
- c. Nitroglycerin;
- d. Single base nitrocellulose;
- e. Sodium azide and other inorganic azides.

**1C101 Materials and devices for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures, other than those controlled by 1C001, usable in "missiles" and their subsystems.**

**License Requirements**

*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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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:* Materials controlled by this entry include: (a) structural materials and coatings specially designed for reduced radar reflectivity; (b) coatings, including paints, specially designed for reduced or tailored reflectivity or emissivity in the microwave, infrared or ultraviolet spectra. This entry does not control coatings when specially used for the thermal control of satellites.

*Related Definitions:* N/A

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

**1C107 Graphite and ceramic materials, other than those controlled by 1C007, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* MT, AT.

<i>Control(s)</i>	<i>Country Chart</i>
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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. Fine grain recrystallized bulk graphites having a bulk density of 1.72 g/cm<sup>3</sup> or greater, measured at 288 K (15° C), and having a particle size of 100 micrometers or less, pyrolytic or fibrous reinforced graphites, usable for rocket nozzles and reentry vehicle nose tips;

b. Ceramic composite materials (dielectric constant less than 6 at frequencies from 100 Hz to 10,000 MHz), also usable for "missile" radomes, and bulk machinable silicon-carbide reinforced unfired ceramic, usable for nose tips.

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

**License Requirements**

*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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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:* The following materials, whether or not encapsulated in aluminum, beryllium, magnesium, or zirconium are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls: (See 22 CFR part 121): (a) Spherical aluminum powder with particles of uniform diameter  $60 \times 10^{-6}$  m (60 micrometers) or less and an aluminum content of 97 percent or greater; (b) Metals in particle sizes less than  $60 \times 10^{-6}$  m (60 microns), whether spherical, atomized, spheroidal, flaked or ground, manufactured from material consisting of 99 percent or more of: boron; magnesium; zirconium; alloys of boron, magnesium or zirconium; beryllium; or iron powder with average particle size of  $3 \times 10^{-6}$  m (3 microns) or less produced by hydrogen reduction of iron oxide.

*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 500 micrometer and an aluminum content of 97% by weight or greater;

a.2. Metals, other than that controlled by the U.S. Munitions List, in particle sizes of less than 500 micrometers, whether spherical, atomized, spheroidal, flaked or



ground, consisting 97% or more by weight of any of the following:

- a.2.a. Zirconium;
- a.2.b. Beryllium;
- a.2.c. Boron;
- a.2.d. Magnesium; or
- a.2.e. Alloys of the metals specified by a.2.a to a.2.d above;
- a.3. Liquid oxidizers, the following:
  - a.3.a. Dinitrogen trioxide;
  - a.3.b. Nitrogen dioxide/dinitrogen tetroxide;
  - a.3.c. Dinitrogen pentoxide;
- b. Polymeric substances:
  - b.1. Carboxy-terminated polybutadiene (CTPB);
  - b.2. Hydroxy-terminated polybutadiene (HTPB), other than that controlled by the U.S. Munitions List;
  - b.3. Polybutadiene-acrylic acid (PBAA);
  - b.4. Polybutadiene-acrylic acid-acrylonitrile (PBAN);
- 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).

**Note:** For propellants and constituent chemicals for propellants not controlled by 1C111, see the U.S. Munitions List.

**1C116 Maraging steels (steels generally characterized by high nickel, very low carbon content and the use of substitutional elements or precipitates to produce age-hardening) having an ultimate tensile strength of 1,500 MPa or greater, 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

<i>Control(s)</i>	<i>Country Chart</i>
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:* \$ value  
*Related Controls:* See also 1C216  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C117 Tungsten, molybdenum and alloys of these metals in the form of uniform, spherical or atomized particles of 500 micrometer diameter or less with a purity of 97% or greater for fabrication of rocket motor components, i.e., heat shields, nozzle substrates, nozzle throats and thrust vector control surfaces.**

**License Requirements**

*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country chart</i>
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:* The list of items controlled is contained in the ECCN heading.

**1C202 Alloys, other than those controlled by 1C002.a.2.c or .d, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* N/A  
*Related Definition:* The phrase "alloys capable of" encompasses before and after heat treatment.  
*Items:* a. Aluminum "alloys capable of" an ultimate tensile strength of 460 Mpa or more at 293 K (20° C), in the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm;  
b. Titanium "alloys capable of" an ultimate tensile strength of 900 MPa or more at 293 K (20° C) 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 preregs, other than those controlled by 1C010.a, .b or .e, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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 9A110 for fiber preregs.  
*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<sup>2</sup> divided by the specific weight in N/m<sup>3</sup>, measured at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 percent.

*Specific tensile strength* is the ultimate tensile strength in N/m<sup>2</sup> divided by specific weight in N/m<sup>3</sup>, measured at a temperature of 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 x 10<sup>6</sup> m or greater or a "specific tensile strength" of 235 x 10<sup>3</sup> m or greater except Aramid "fibrous or filamentary materials" having 0.25 percent or more by weight of an ester based fibre surface modifier;

b. Glass "fibrous or filamentary materials" having a "specific modulus" of 3.18 x 10<sup>6</sup> m or greater and a "specific tensile strength" of 76.2 x 10<sup>3</sup> 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), except forms in which no linear dimension exceeds 75 mm.**

**License Requirements**

*Reason for Control:* NP, MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* N/A  
*Related Definition:* The phrase "maraging steel capable of" encompasses maraging steel before or after heat treatment.  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C225 Boron and boron compounds, mixtures and loaded materials in which the boron-10 isotope is more than 20% by weight of the total boron content.**

**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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C226 Parts made of tungsten, tungsten carbide, or tungsten alloys (greater than 90% tungsten) having a mass greater than 20 kg and a hollow cylindrical symmetry (including cylinder segments) with an inside diameter greater than 100 mm but less than 300 mm, except parts specially designed for use as weights or gamma-ray collimators.**

**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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C227 Calcium (high purity) containing both less than 1,000 parts per million by weight of metallic impurities other than magnesium and less than 10 parts per million of boron.**

**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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C228 Magnesium (high purity) containing both less than 200 parts per million by weight of metallic impurities other than calcium and less than 10 parts per million of boron.**

**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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C229 High purity (99.99% or greater) bismuth with very low silver content (less than 10 parts per million).**

**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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C230 Beryllium metal, alloys containing more than 50% of beryllium by weight, beryllium compounds, or manufactures thereof, including waste and scrap containing beryllium metal, alloys, or compounds.**

**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) This entry includes waste and scrap containing beryllium metal, alloys, or compounds. (2) This entry does not control: (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; and, (c) Beryl (silicate of beryllium and aluminum) in the form of emeralds or aquamarines.  
*Related Definitions:* N/A.  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C231 Hafnium metal, alloys and compounds of hafnium containing more than 60% hafnium by weight and manufactures thereof.**

**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:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C232 Helium-3 or helium isotopically enriched in the helium-3 isotope, mixtures containing helium-3, or products or devices containing any of the foregoing, except a product or device containing less than 1 g of helium-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:* Liters  
*Related Controls:* N/A  
*Related Definitions:* N/A  
*Items:* The list of items controlled is contained in the ECCN heading.

**1C233 Lithium enriched in the 6 isotope (<sup>6</sup>Li) to greater than 7.5 atom percent, alloys, compounds or mixtures containing lithium enriched in the 6 isotope, or products or devices containing any of the foregoing except thermoluminescent dosimeters.**

**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:* N/A  
*Related Definitions:* The natural occurrence of the 6 isotope in lithium is 7.5 atom percent.

*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, in the form of metal, alloys containing more than 50% zirconium by weight, or compounds, or manufactures wholly thereof; except zirconium in the form of foil having a thickness not exceeding 0.10 mm.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* 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.) This entry includes waste and scrap containing zirconium. This entry does not control zirconium in the form of foil or strip having a thickness not exceeding 0.10 mm (0.004 in.).

*Related Definitions:* N/A

*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 by atoms exceeds 1 part in 1000, or products or devices containing any of the foregoing; except, a product or device containing not more than 1.48 x 10<sup>3</sup> GBq (40 Ci) of tritium in any form.**

**License Requirements**

*Reason for Control:*

*Control(s):* Items described in 1C235 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.

**1C236 Alpha-emitting radionuclides having an alpha half-life of 10 days or greater but less than 200 years, compounds or mixtures containing any of these radionuclides with a total alpha activity of 37 GBq/kg (1 Ci/kg) or greater, or products or devices containing any of the foregoing, except a product or device containing less than 3.7 GBq (100 millicuries) of alpha activity.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* Millicuries

*Related Controls:* Certain alpha emitting radionuclides are subject to the export licensing authority of the Nuclear Regulatory Commission. (See also 10 CFR part 110.)

*Related Definition:* N/A

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

**1C237 Radium-226, radium-226 compounds, mixtures containing radium-226, or products or devices containing any of the foregoing, except medical applicators, or products or devices containing not more than 0.37 GBq (10 millicuries) of radium-226 in any form.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* N/A

*Related Definition:* N/A

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

**1C238 Chlorine trifluoride (ClF<sub>3</sub>).**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* N/A

*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% thereof, with a crystal density greater than 1.8 gm per cm<sup>3</sup> and having a detonation velocity greater than 8,000 m/s.**

**License Requirements**

*Reason for Control:*

<i>Control(s)</i>	<i>Country Chart</i>
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 also 22 CFR part 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 controlled by 0C006, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:*

<i>Control(s)</i>	<i>Country Chart</i>
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:* N/A

*Related Definitions:* N/A

*Items:* a. Powder with a nickel purity content of 99.0% by weight or greater and a mean particle size of less than 10 micrometers measured by American Society for Testing and Materials (ASTM) B330 standard, except filamentary nickel powders;

b. Porous nickel powder produced from materials controlled by 1C240.a, except single porous nickel sheets not exceeding 1,000 cm<sup>2</sup> per sheet.

**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.

**1C350 Chemicals that may be used as precursors for toxic chemical agents, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* CB, AT

<i>Control(s)</i>	<i>Country Chart</i>
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

**License Requirement Notes**

1. **SAMPLE SHIPMENTS:** Certain sample shipments of chemicals controlled under ECCN 1C350 may be made without a license, as provided by the following:

a. **Chemicals Not Eligible:** The following chemicals are *not* eligible for sample shipments: 0-Ethyl-2-diisopropylaminoethyl methylphosphonite (QL) (C.A.S. #57856-11-8), Ethylphosphonyl difluoride (C.A.S. #753-98-0), and Methylphosphonyl difluoride (C.A.S. #676-99-3).

b. **Countries Not Eligible:** The following countries are *not* eligible to receive sample shipments: Cuba, Iran, Iraq, Libya, North Korea, Sudan, Syria.

c. **Sample Shipments:** 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 each chemical to any one consignee per calendar year. Multiple sample shipments, in any quantity, not exceeding the totals indicated in this paragraph may be exported without a license, in accordance with the provisions of this Note 1. 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 the chemical weapons. However, a sample shipment received under this exclusion remains subject to all General Prohibitions including the end-use restriction described in § 744.4 of the EAR.

d. 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 to the U.S. Department of Commerce, Bureau of Export Administration, P.O. Box 273, Washington, DC 20044, Attn: "Report of Sample Shipments of Chemical Precursors".

2. **MIXTURES:** Mixtures controlled by this entry that contain certain concentrations of precursor and intermediate chemicals are subject to the following licensing requirements:

a. A license is required, regardless of the concentrations in the mixture, for the following chemicals: 0-Ethyl-2-diisopropylaminoethyl methylphosphonite (QL) (C.A.S.#57856-11-8), Ethylphosphonyl difluoride (C.A.S.#753-98-0) and Methylphosphonyl difluoride (C.A.S.#676-99-3);

b. A license is required when at least one of the following chemicals constitutes more than 10 percent of the weight of the mixture on a solvent free basis: Arsenic trichloride (C.A.S.#7784-34-1), Benzilic acid (C.A.S.#76-93-7), Diethyl ethylphosphonate (C.A.S.#78-38-6), Diethyl methylphosphonite (C.A.S.#15715-41-0), Diethyl-N,N-dimethylphosphoroamidate (C.A.S. #2404-03-7), N,N-Diisopropyl-beta-aminoethane thiol (C.A.S.#5842-07-9), N,N-Diisopropyl-2-aminoethyl chloride hydrochloride (C.A.S.#4261-68-1), N,N-

Diisopropyl-beta-aminoethanol (C.A.S.#96-80-0), N,N-Diisopropyl-beta-aminoethyl chloride (C.A.S.#96-79-7), Dimethyl ethylphosphonate (C.A.S.#6163-75-3), Dimethyl methylphosphonate (C.A.S.#756-79-6), Ethylphosphonous dichloride [Ethylphosphinyl dichloride] (C.A.S.#1498-40-4), Ethylphosphonous difluoride [Ethylphosphinyl difluoride] (C.A.S.#430-78-4), Ethylphosphonyl dichloride (C.A.S.#1066-50-8), Methylphosphonous dichloride [Methylphosphinyl dichloride] (C.A.S.#676-83-5), Methylphosphonous difluoride [Methylphosphinyl difluoride] (C.A.S.#753-59-3), Methylphosphonyl dichloride (C.A.S.#676-97-1), Pinacolyl alcohol (C.A.S.#464-07-3), 3-Quinuclidinol (C.A.S.#1619-34-7), and Thiodiglycol (C.A.S.#111-48-8); (Related ECCN: 1C995)

c. A license is required when at least one of all other chemicals in the List of Items Controlled constitutes more than 25 percent of the weight of the mixture on a solvent free basis (related ECCN: 1C995); and

d. A license is not required under this entry for mixtures when the controlled chemical is a normal ingredient in consumer goods packaged for retail sale for personal use. Such consumer goods are controlled by ECCN EAR99.

e. Calculation of concentrations of AG-controlled chemicals.

1. **Usual Commercial Purposes.** In calculating the percentage of an AG controlled chemical in a mixture (solution), any other chemical must be excluded if it was not added for usual commercial purposes, but was added for the sole purpose of circumventing the Export Administration Regulations.

2. **"Solvent Free Basis Requirement."** When calculating the percentage, by weight, of components in a chemical mixture, you must exclude from the calculation any component of the mixture that acts as a solvent.

3. **Solvent—**For purposes of this ECCN "A substance capable of dissolving another mixture to form a uniformly dispersed mixture (solution)".

- Solvents are liquids at standard temperature and pressure (STP).
- In no instance is an AG controlled chemical considered a "solvent".
- All ingredients of mixtures are expressed in terms of weight.
- The solvent component of the mixture converts it into a solution.

3. **TRACE QUANTITIES:** a. A license is required for mixtures containing any amount (including trace quantities) for the following 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).

b. Except as noted in paragraph (3)(a) of the License Requirements Note, a license is not required under this entry for mixtures that contain a cumulative total concentration of no more than 10,000 parts by weight (pbw) per million of all precursor or intermediate chemicals listed in this entry. The calculation for this paragraph (3)(b) should not be done on a solvent-free basis (related ECCN: 1C995).

c. **Countries Not Eligible:** The following countries are not eligible for exports under this Trace Quantities Note: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

4. **COMPOUNDS:** A license is not required under this entry for chemical compounds created with any chemicals identified in this ECCN 1C350, unless those compounds are also identified in this entry.

**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 (Item 25 in List of Items Controlled) includes its liquid, gaseous, and aqueous phases, and hydrates.

3. All *de minimis* exclusions of this entry extend to all mixtures including those that contain no solvents.

4. A Solvent is defined as a substance capable of dissolving another substance to form a uniformly dispersed mixture (solution). For examples and clarification of the term "solvent free" basis, see § 770.4 of the EAR.

**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 1C995

*Related Definition:* See § 770.2(k) of the EAR for synonyms for the chemicals listed in this entry.

*Items:* a. Precursor Chemicals, as follows:

- a.1. (C.A.S. #1341-49-7) Ammonium hydrogen fluoride;
- a.2. (C.A.S. #7784-34-1) Arsenic trichloride;
- a.3. (C.A.S. #76-93-7) Benzilic acid;
- a.4. (C.A.S. #107-07-3) 2-Chloroethanol;
- a.5. (C.A.S. #78-38-6) Diethyl ethylphosphonate;
- a.6. (C.A.S. #15715-41-0) Diethyl methylphosphonite;
- a.7. (C.A.S. S.#2404-03-7) Diethyl-N,N-dimethylphosphoroamidate;
- a.8. (C.A.S. #762-04-9) Diethyl phosphite;
- a.9. (C.A.S. #100-37-8) N,N-Diethylaminoethanol;
- a.10. (C.A.S. #5842-07-9) N,N-Diisopropyl-beta-aminoethane thiol;
- a.11. (C.A.S. #4261-68-1) N,N-Diisopropyl-beta-aminoethyl chloride hydrochloride;
- a.12. (C.A.S. #96-80-0) N,N-Diisopropyl-beta-aminoethanol;
- a.13. (C.A.S. #96-79-7), N,N-Diisopropyl-beta-aminoethyl chloride;
- a.14. (C.A.S. #108-18-9) Diisopropylamine;
- a.15. (C.A.S. #6163-75-3) Dimethyl ethylphosphonate;
- a.16. (C.A.S. #756-79-6) Dimethyl methylphosphonate;
- a.17. (C.A.S. #868-85-9) Dimethyl phosphite (dimethyl hydrogen phosphite);
- a.18. (C.A.S. #124-40-3) Dimethylamine;
- a.19. (C.A.S. #506-59-2) Dimethylamine hydrochloride;
- a.20. (C.A.S. #57856-11-8) 0-Ethyl-2-diisopropylaminoethyl methyl phosphonite (QL);

- a.21. (C.A.S. #1498-40-4) Ethyl phosphonous dichloride [Ethyl phosphinyl dichloride];
- a.22. (C.A.S. #430-78-4) Ethyl phosphonous difluoride [Ethyl phosphinyl difluoride];
- a.23. (C.A.S. #1066-50-8) Ethyl phosphonyl dichloride;
- a.24. (C.A.S. #753-98-0) Ethyl phosphonyl difluoride;
- a.25. (C.A.S. #7664-39-3) Hydrogen fluoride;
- a.26. (C.A.S. #3554-74-3) 3-Hydroxyl-1-methylpiperidine;
- a.27. (C.A.S. #76-89-1) Methyl benzilate;
- a.28. (C.A.S. #676-83-5) Methyl phosphonous dichloride [Methyl phosphinyl dichloride];
- a.29. (C.A.S. #753-59-3) Methyl phosphonous difluoride [Methyl phosphinyl difluoride];
- a.30. (C.A.S. #676-97-1) Methyl phosphonyl dichloride;
- a.31. (C.A.S. #676-99-3) Methyl phosphonyl difluoride;
- a.32. (C.A.S. #10025-87-3) Phosphorus oxychloride;
- a.33. (C.A.S. #10026-13-8) Phosphorus pentachloride;
- a.34. (C.A.S. #1314-80-3) Phosphorus pentasulfide;
- a.35. (C.A.S. #7719-12-2) Phosphorus trichloride;
- a.36. (C.A.S. #75-97-8) Pinacolone;
- a.37. (C.A.S. #464-07-3) Pinacolyl alcohol;
- a.38. (C.A.S. #151-50-8) Potassium cyanide;
- a.39. (C.A.S. #7789-23-3) Potassium fluoride;
- a.40. (C.A.S. #7789-29-9) Potassium bifluoride;
- a.41. (C.A.S. #1619-34-7) 3-Quinuclidinol;
- a.42. (C.A.S. #3731-38-2) 3-Quinuclidone;
- a.43. (C.A.S. #1333-83-1) Sodium bifluoride;
- a.44. (C.A.S. #143-33-9) Sodium cyanide;
- a.45. (C.A.S. #7681-49-4) Sodium fluoride;
- a.46. (C.A.S. #1313-82-2) Sodium sulfide;
- a.47. (C.A.S. #10025-67-9) Sulfur monochloride;
- a.48. (C.A.S. #10545-99-0) Sulfur dichloride;
- a.49. (C.A.S. #111-48-8) Thiodiglycol;
- a.50. (C.A.S. #7719-09-7) Thionyl chloride;
- a.51. (C.A.S. #102-71-6) Triethanolamine;
- a.52. (C.A.S. #637-39-8) Triethanolamine hydrochloride;
- a.53. (C.A.S. #122-52-1) Triethyl phosphite; and
- a.54. (C.A.S. #121-45-9) Trimethyl phosphite.
- b. Reserved.

**1C351 Human pathogens, zoonoses, and "toxins", 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 Exceptions**

LVS: N/A

GBS: N/A

CIV: N/A

**List of Items Controlled**

Unit: \$ value

*Related Controls:* All vaccines and "immunotoxins" are excluded from the scope of this entry. See also 1C991.

*Related Definition:* (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. Chikungunya virus;
  - a.2. Congo-Crimean haemorrhagic fever virus;
  - a.3. Dengue fever virus;
  - a.4. Eastern equine encephalitis virus;
  - a.5. Ebola virus;
  - a.6. Hantaan virus;
  - a.7. Japanese encephalitis virus;
  - a.8. Junin virus;
  - a.9. Lassa fever virus
  - a.10. Lymphocytic choriomeningitis virus;
  - a.11. Machupo virus;
  - a.12. Marburg virus;
  - a.13. Monkey pox virus;
  - a.14. Rift Valley fever virus;
  - a.15. Tick-borne encephalitis virus (Russian Spring-Summer encephalitis virus);
  - a.16. Variola virus;
  - a.17. Venezuelan equine encephalitis virus;
  - a.18. Western equine encephalitis virus;
  - a.19. White pox; or
  - a.20. Yellow fever virus.
- b. Rickettsiae, as follows:
- b.1. Bartonella quintana (Rochalimea quintana, Rickettsia quintana);
  - b.2. Coxiella burnetii;
  - b.3. Rickettsia prowasecki; or
  - b.4. Rickettsia rickettsii.
- 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. Chlamydia psittaci;
  - c.8. Clostridium botulinum;
  - c.9. Francisella tularensis;
  - c.10. Salmonella typhi;
  - c.11. Shigella dysenteriae;
  - c.12. Vibrio cholerae;
  - c.13. Yersinia pestis.

d. "Toxins", as follows: and subunits thereof:

- d.1. Botulinum toxins;
- d.2. Clostridium perfringens toxins;
- d.3. Conotoxin;
- d.4. Microcystin (cyanoginisin);
- d.5. Ricin;
- d.6. Saxitoxin;
- d.7. Shiga toxin;
- d.8. Staphylococcus aureus toxins;
- d.9. Tetrodotoxin;
- d.10. Verotoxin; or
- d.11. Aflatoxins.

**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 Exceptions**

LVS: N/A

GBS: N/A

CIV: N/A

**List of Items Controlled**

Unit: \$ value

*Related Controls:* All vaccines are excluded from the scope of this entry. See also 1C991.

*Related Definition:* N/A

*Items:* a. Viruses, as follows:

- a.1. African swine fever virus;
- a.2. Avian influenza virus that are:
  - a.2.a. Defined in EC Directive 92/40/EC (O.J. L.16 23.1.92 p.19) as having high pathogenicity, as follows:
    - a.2.a.1. Type A viruses with an IVPI (intravenous pathogenicity index) in 6 week old chickens of greater than 1.2; or
    - a.2.a.2. Type A viruses H5 or H7 subtype for which nucleotide sequencing has demonstrated multiple basic amino acids at the cleavage site of haemagglutinin;
  - 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.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;
- b. Bacteria, as follows:
  - b.1. Mycoplasma mycoides.
  - b.2. Reserved.

**1C353 Genetically-modified "microorganisms", 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 Exceptions**

LVS: N/A

GBS: N/A

CIV: N/A

**List of Items Controlled**

Unit: \$ value

*Related Controls:* All vaccines are excluded from the scope of this entry. See also 1C991

*Related Definition:* N/A

*Items:* a. Genetically modified "microorganisms" or genetic elements that

contain nucleic acid sequences associated with pathogenicity of organisms controlled by 1C351.a to .c or 1C352 or 1C354;  
 b. Genetically modified "microorganisms" or genetic elements that contain nucleic acid sequences coding for any of the "toxins" controlled by 1C351.d or "sub-units of toxins" thereof.

**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 Exceptions**

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

**List of Items Controlled**

*Unit:* \$ value  
*Related Controls:* All vaccines are excluded from the scope of this entry. See also 1C991

*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*;

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*).

**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  $3.18 \times 10^6$  m or greater and a specific tensile strength of  $7.62 \times 10^4$  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 containing items controlled by ECCNs 1C351, 1C352, 1C353, and 1C354; and immunotoxins.**

**License Requirements**

**Reason for Control:** AT

AT applies to entire entry. A license is required for items controlled by this entry to Cuba, Iran, Libya 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

**License Exceptions**

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

**List of Items Controlled**

Unit: \$ value

Related Controls: N/A

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

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

**1C992 Oil well perforators.****License Requirements**

Reason for Control: AT

Control(s)	Country Chart
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AT applies to entire entry	AT Column 1
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**License Exceptions**

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

**List of Items Controlled**

Unit: Materials in number

Related Controls: N/A

Related Definitions: N/A

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 RDX, PYX, PETN, HNS, or HMX; and
- a.2. Have only a uniformly shaped conical liner with an included angle of 90 degrees or less; and
- a.3. Have a total explosive mass of no more than 90 grams; and
- a.4. Have a diameter not exceeding three inches.
- b. Reserved.

**1C995 Mixtures containing precursor and intermediate chemicals used in the "production" of chemical warfare agents that are not controlled by ECCN 1C350.****License Requirements**

Reason for Control: AT

AT applies to entire entry. A license is required for items controlled by this entry to Cuba, Iran, Libya 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

**License Exceptions**

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

**List of Items Controlled**

Unit: Kilograms

Related Controls: N/A

Related Definition: For calculation of *de minimis* quantities of controlled chemicals in mixtures, see the License Requirements Notes 2 and 3 under ECCN 1C350 and § 770.4 of the EAR

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

**D. Software****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
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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
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AT applies to entire entry	AT Column 1
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**License Exceptions**

CIV: Yes, except N/A for MT  
TSR: Yes, except N/A for MT

**List of Items Controlled**

Unit: \$ value

Related Controls: See also 1D101 and 1D102

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, MT, AT

Control(s)	Country Chart
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NS applies to entire entry	NS Column 1
MT applies to "software" specially designed or modified for the "development" of "composites" controlled by 1A, 1B or 1C entries for MT reasons.	MT Column 1

AT applies to entire entry	AT Column 1
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**License Requirement Notes:** See § 743.1 of the EAR for reporting requirements for exports under Exceptions.

**License Exceptions**

CIV: Yes, except N/A for MT  
TSR: Yes, except N/A for MT

**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, Office 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

**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

Control(s)	Country Chart
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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
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**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 for the "use" of goods controlled by 1B101.****License Requirements**

Reason for Control: MT, AT

Control(s)	Country Chart
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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

**1D102 Other "software" not controlled by 1D001, 1D002, and 1D103, specially designed for the "development", "production" or "use" of items controlled by 1A, 1B, and 1C for MT reasons.****License Requirements**

Reason for Control: MT, AT

Control(s)	Country Chart
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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

**1D103 "Software" specially designed for analysis of reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures.**

**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

**1D201 "Software" specially designed for the "use" of goods 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: N/A  
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	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: N/A  
Related Definitions: N/A  
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, 1C990, or 1C994.**

**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**

**1E001 "Technology" according to the "development" or "production" of items controlled by 1A001.b, 1A001.c, 1A002, 1A003, 1A004, 1A005, 1A102, 1B or 1C (except 1C980 to 1C984, 1C988, 1C990, 1C991, 1C992, 1C994 and 1C995).**

**License Requirements**  
Reason for Control: NS, MT, NP, CB, AT

Control(s)	Country Chart
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NS applies to "technology" for items controlled by 1A001.b and .c, 1A002, 1A003, 1B001 to 1B003, 1B018, 1B225, 1C001 to 1C010, 1C018, 1C230, 1C231, 1C233, or 1C234.

MT applies to "technology" 1 for items controlled by 1B001, 1B101, 1B115, 1B116, 1C001, 1C007, 1C101, 1C107, 1C011, 1C111, 1C116, or 1C117 for MT reasons.

NP applies to "technology" for items controlled by 1A002, 1B001, 1B101, 1B201, 1B225 to 1B232, 1C001, 1C010, 1C202, 1C210, 1C216, 1C225 to 1C234, 1C236 to 1C238 for NP reasons.

CB applies to "technology" for items controlled by 1C351, 1C352, 1C353, or 1C354.

CB applies to "technology" for materials controlled by 1C350.

AT applies to entire entry

**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 MT and for exports and reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "technology" for items controlled by 1C001 or 1C012; or 1A002.a, having an organic "matrix" and made from materials listed under 1C010.c or 1C010.d.

**List of Items Controlled**  
Unit: N/A  
Related Controls: (1) See also 1E101 and 1E210. (2) "Technology" for items

controlled by 1C235 are subject to the export licensing authority of the Department of Energy (see 10 CFR part 810). (3) "Technology" for items described in 1C012 are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (4) "Technology" for items controlled by 1A102 are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls (see 22 CFR part 121).

Related Definitions: 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, AT

Control(s)	Country Chart
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NS applies to entire entry NS Column 1  
MT applies to 1E002.e ..... 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: Yes, except for 1E002.e

**List of Items Controlled**  
Unit: N/A  
Related Controls: See also 1E102, 1E202, and 1E101 for "technology" related to 1E002.e  
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 vinyl ether 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 characteristics:  
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. Total metallic impurities, excluding intentional additions, of less than:  
c.1.b.1. 1,000 ppm for single oxides or carbides; or  
c.1.b.2. 5,000 ppm for complex compounds or single nitrides; and  
c.1.c. Having any of the following:  
c.1.c.1. Average particle size equal to or less than 5 µm and no more than 10% of the particles larger than 10 µm; or  
**Note:** For zirconia, these limits are 1 µm and 5 µm respectively.  
c.1.c.2. Having all of the following:  
c.1.c.2.a. Platelets with a length to thickness ratio exceeding 5;



c.1.c.2.b. Whiskers with a length to diameter ratio exceeding 10 for diameters less than 2 µm; and  
 c.1.c.2.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.

**1E101 “Technology” according to the General Technology Note for the “use” of goods controlled by 1A102, 1B001, 1B101, 1B115, 1B116, 1C001, 1C007, 1C011, 1C101, 1C107, 1C111, 1C116, 1C117, 1D101 or 1D103.**

**License Requirements**  
*Reason for Control:* MT, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
MT applies to entire entry	MT Column 1
NP applies to 1B001.a and 1B101.	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, Office 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, AT

<i>Control(s)</i>	<i>Country Chart</i>
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.

**1E103 “Technical data” (including processing conditions) for the regulation of temperature, pressure or atmosphere in autoclaves or hydroclaves, when used for the “production” of “composites” or partially processed “composites”.**

**License Requirements**  
*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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” relating to 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 to 20 kPa.**

**License Requirements**  
*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* This entry includes “technology” for the composition of precursor gases, flow-rates and process control schedules and parameters.  
*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 goods controlled by 1A002, 1A202, 1A225 to 1A227, 1B201, 1B225 to 1B233, 1C002.a.2.c or .d, 1C010.b, 1C202, 1C210, 1C216, 1C225 to 1C240 or 1D201.**

**License Requirements**  
*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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.

**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

<i>Control(s)</i>	<i>Country Chart</i>
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” of “software” controlled by 1D201.**

**License Requirements**  
*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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

<i>Control(s)</i>	<i>Country Chart</i>
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, or 1C354.**

**License Requirements**

*Reason for Control:* CB, AT

<i>Control(s)</i>	<i>Country Chart</i>
CB applies to "technology" for the disposal of items controlled by 1C351, 1C352, 1C353, or 1C354.	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.

**1E994 "Technology" for the "development", "production", or "use" of fibrous and filamentary materials controlled by 1C990 or fluorocarbon electronic cooling fluids controlled by 1C994.**

**License Requirements**

*Reason for Control:* AT

<i>Control(s)</i>	<i>Country Chart</i>
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 controlled by this CCL Category or in any other category in the CCL are designated by the number EAR99.**

*Category 2—Materials Processing*

**Note:** For quiet running bearings, see the U.S. Munitions List.

**A. Equipment, Assemblies 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, AT

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

**License Exceptions**

LVS: \$3000  
GBS: Yes, for 2A001.a and 2A001.b  
CIV: Yes, for 2A001.a and 2A001.b

**List of Items Controlled**

*Unit:* \$ value  
*Related Controls:* (1) See also 2A991. (2) This entry does not control balls with tolerance specified by the manufacturer in accordance with ISO 3290 as grade 5 or worse. (3) Quiet running bearings are subject to the export licensing authority of the Department of State, Office of Defense Trade Controls. (See 22 CFR part 121.)

*Related Definitions:* Annular Bearing Engineers Committee (ABEC).

*Items:* a. Ball bearings and solid roller bearings having tolerances specified by the manufacturer in accordance with ABEC 7, ABEC 7P, ABEC 7T or ISO Standard Class 4 or better (or national equivalents), and having rings, balls or rollers made from monel or beryllium;

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

b. Other ball bearings and solid roller bearings having tolerances specified by the manufacturer in accordance with ABEC 9, ABEC 9P or ISO Standard Class 2 or better (or national equivalents);

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

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

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

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

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

**2A225 Crucibles made of materials resistant to liquid actinide metals, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* N/A  
*Related Definitions:* N/A  
*Items:* a. Crucibles with a volume of between 150 ml and 8 liters and made of or coated with any of the following materials having a purity of 98% or greater:

a.1. Calcium fluoride (CaF<sub>2</sub>);  
a.2. Calcium zirconate (metazirconate) (Ca<sub>2</sub>ZrO<sub>3</sub>);

a.3. Cerium sulphide (Ce<sub>2</sub>S<sub>3</sub>);

a.4. Erbium oxide (erbia) (Er<sub>2</sub>O<sub>3</sub>);

a.5. Hafnium oxide (hafnia) (HfO<sub>2</sub>);

a.6. Magnesium oxide (MgO);

a.7. Nitrided niobium-titanium-tungsten alloy (approximately 50% Nb, 30% Ti, 20% W);

a.8. Yttrium oxide (yttria) (Y<sub>2</sub>O<sub>3</sub>); or

a.9. Zirconium oxide (zirconia) (ZrO<sub>2</sub>);  
b. Crucibles with a volume of between 50 ml and 2 liters and made of or lined with tantalum, having a purity of 99.9% or greater;  
c. Crucibles with a volume of between 50 ml and 2 liters and made of or lined with tantalum (having a purity of 98% or greater) coated with tantalum carbide, nitride or boride (or any combination of these).

**2A226 Valves 5 mm or greater in "nominal size", with a bellows seal, wholly made of or lined with aluminum, aluminum alloy, nickel, or alloy containing 60% or more nickel, either manually or automatically operated.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* Valves are also subject to the export licensing authority of the Nuclear Regulatory Commission. (See 10 CFR part 110.)

*Related Definition:* For valves with different inlet and outlet diameter, the "nominal size" parameter described in the entry refers to the smallest diameter.

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

**2A290 Generators and other equipment specially designed, prepared, or intended for use with nuclear plants.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* Nuclear equipment is also 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 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:* Nuclear equipment is also subject to the export licensing authority of the Nuclear Regulatory Commission. (See 10 CFR part 110.)*Related Definitions:* N/A*Items:* a. Process control systems, except those controlled by 2A290.b, intended for use with nuclear reactors.

b. Casks that are specially designed for transportation of high-level radioactive material and that weigh more than 1,000 kg.

c. Commodities, parts and accessories specially designed or prepared for use with nuclear plants (e.g., snubbers, airlocks, reactor and fuel inspection equipment) except items licensed by the Nuclear Regulatory Commission, pursuant to 10 CFR part 110.

**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, 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:* Pressure tubes, pipes, and fittings in kilograms; valves in number; parts and accessories in \$ value*Related Controls:* Piping, fittings, and valves are also 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 inches) 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 8 inches or more inside diameter;
- b.2. Rated at 1,500 psi or more;
- c. Parts, n.e.s.

**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:* N/A*Related Definitions:* N/A*Items:* The list of items controlled is contained in the ECCN heading**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, Office 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).

**2A993 Explosive detection systems, consisting of an automated device, or combination of devices, with the ability to detect the presence of different types of explosives, in passenger checked baggage, without need for human skill, vigilance, or judgment.****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:* The list of items controlled is contained in the ECCN heading**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, Libya, 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**Note:** Exports from the U.S. and transshipments to Iran must be licensed by the Department of Treasury, Office of Foreign Assets Control. (See § 742.8 and § 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**B. Test, Inspection and Production Equipment****Notes for Category 2B:** 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.

N.B. 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. Axis nomenclature shall be in accordance with International Standard ISO 841, "Numerical Control Machines—Axis and Motion Nomenclature".

3. For the purposes of 2B001 to 2B009 a "tilting spindle" is counted as a rotary axis.

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

5. The positioning accuracy of "numerically controlled" machine tools is to be determined and presented in accordance with ISO 230/2.

**2B001 Machine tools and any combination thereof, for removing (or cutting) metals, ceramics or "composites", which, according to the manufacturer's technical specification, can be equipped with electronic devices for "numerical control".**

**License Requirements**

Reason for Control: NS, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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 equal to or less 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" on the x-axis more (worse) than 0.030 mm.	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: N/A  
GBS: N/A  
CIV: N/A

**List of Items Controlled**

*Unit:* Equipment in number; parts and accessories in \$ value  
*Related Controls:* See also 2B290 and 2B991  
*Related Definitions:* N/A  
*Items:* a. Machine tools for turning, having all of the following characteristics:

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

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

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

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

b.1.a. Positioning accuracy with all compensations available of less (better) than 6 µm along any linear axis (overall positioning); *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"; *or*

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

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

c.1.a. Positioning accuracy with all compensations available of less (better) than 4 µm along any linear axis (overall positioning); *and*

c.1.b. Three or more axes which can be coordinated simultaneously for "contouring control"; *or*

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

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

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

a. Limited to cylindrical grinding; *and*

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

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

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

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

3. Tool or cutter grinding machines shipped as complete systems with "software" specially designed for the production of tools or cutters.

4. Crank shaft or cam shaft grinding machines.

5. Surface grinders.

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

e. Machine tools for removing metals, ceramics or "composites":

e.1. By means of:

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

e.1.b. Electron beam; *or*

e.1.c. "Laser" beam; *and*

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

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

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

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

**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<sub>c</sub> = 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

<i>Control(s)</i>	<i>Country Chart</i>
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:* Equipment in number; parts 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 following characteristics described in the List of Items Controlled, and specially designed dies, molds, components, accessories and controls therefor.**

**License Requirements**

Reason for Control: NS, MT, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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 temperatures exceeding 1,733K, and pressure 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:* Equipment in number; parts and accessories in \$ value

*Related Controls:* See also 2B104 and 2B204

*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. 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 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

<i>Control(s)</i>	<i>Country Chart</i>
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:* 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.

*Related Definitions:* N/A

*Items:* a. "Stored program controlled" chemical vapor deposition (CVD) production equipment having all of the following:

- a.1. Process modified for one of the following:
  - a.1.a. Pulsating CVD;
  - a.1.b. Controlled nucleation thermal decomposition (CNTD); or
  - a.1.c. Plasma enhanced or plasma assisted CVD; and
- a.2. 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. "Stored program controlled" ion implantation production equipment having beam currents of 5 mA or more;
- c. "Stored program controlled" electron beam physical vapor (EB-PVD) production equipment incorporating all of the following:
  - c.1. Power systems rated for over 80 kW;
  - c.2. A liquid pool level "laser" control system which regulates precisely the ingots feed rate; and
  - c.3. A computer controlled rate monitor operating on the principle of photoluminescence of the ionized atoms in the

evaporant stream to control the deposition rate of a coating containing two or more elements;

d. "Stored program controlled" plasma spraying production equipment having any of the following characteristics:

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. "Stored program controlled" sputter deposition production equipment capable of current densities of 0.1 mA/mm<sup>2</sup> or higher at a deposition rate 15 μm/h or more;

f. "Stored program controlled" cathodic arc deposition equipment incorporating a grid of electromagnets for steering control of the arc spot on the cathode;

g. "Stored program controlled" ion plating production equipment allowing for the *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 and equipment, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NS, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to entire entry	NS Column 2
NP applies to 2B006.a and .b.	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:* See also 2B206 and 2B996.

*Related Definition:* (1) Machine tools which can be used as measuring machines are controlled if they meet or exceed the criteria specified for the machine tool function or the measuring machine function. (2) A machine described by this entry is controlled if it exceeds the control threshold anywhere within its operating range.

*Items:* a. Computer controlled, "numerically controlled" or "stored program controlled" dimensional inspection machines, having a three dimensional length (volumetric) "measurement uncertainty" equal to or less (better) than (1.7 + L/1,000) μm (L is the measured length in mm) tested according to ISO 10360-2;

b. Linear and angular displacement measuring instruments, as follows:

- b.1. Linear measuring instruments having any of the following:
  - 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 characteristics:

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; or

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, over a temperature range of ± 1 K around a standard temperature and at a standard pressure, 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. A "measurement uncertainty" equal to or less (better) than (0.2 + L/2,000) μm (L is the measured length in mm);

**Note:** 2B006.b.1 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.

b.2. Angular 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 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).

**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

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to entire entry	NS Column 2
NP applies to 2B007.c if specially designed or rated as radiation hardened to withstand greater than 5 X 10 <sup>4</sup> grays(Si) without operational degradation; to 2B007.b; and to specially designed controllers and "end-effectors" therefor.	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:* See also 2B207 and 2B997

*Related Definitions:* N/A

*Items:* a. Capable in real time of full three-dimensional image processing or three-dimensional scene analysis to generate or modify "programs" or to generate or modify numerical program data;

**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 explosive munitions environments;
- c. Specially designed or rated as radiation-hardened to withstand greater than  $5 \times 10^3$  Gy (Si) without operational degradation; or
- d. Specially designed to operate at altitudes exceeding 30,000 m.

**2B008 Assemblies, units or inserts specially designed for machine tools, or for equipment controlled by 2B006 or 2B007, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NS, AT

<i>Control(s)</i>	<i>Country Chart</i>
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. Linear position feedback units (e.g., inductive type devices, graduated scales, infrared systems or "laser" systems) having an overall "accuracy" less (better) than  $(800 + (600 \times L \times 10^{-3}))$  nm (L equals the effective length in mm);

**Note:** For "laser" systems see also Note to 2B006.b.1.

b. Rotary position feedback units (e.g., inductive type devices, scales, infrared systems or "laser" systems) having an "accuracy" less (better) than 0.00025°;

**Note:** For "laser" systems see also Note to 2B006.b.1.

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 the characteristics (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* NS, MT, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to entire entry	NS Column 2
MT applies to spin-forming machines the machines combining the functions of spin-forming and flow-forming; and flow-forming machines.	MT Column 1

<i>Control(s)</i>	<i>Country Chart</i>
NP applies to flow-forming machines; and spin-forming machines capable of flow-forming functions.	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 also 2B109 for additional flow-forming machines for MT and NP reasons. See also 2B209 for additional flow-forming machines controlled for NP reasons.

*Related Definitions:* Machines combining the function of spin-forming and flow-forming are for the purpose of 2B009 regarded as flow-forming machines.

*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.

**2B018 Equipment on the International Munitions List.**

**License Requirements**

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

<i>Control(s)</i>	<i>Country Chart</i>
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  
 AT applies to entire entry

**License Exceptions**

LVS: \$3000  
 GBS: Yes for Advisory Note in this entry to 2B018

**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.

**Advisory Note:** Licenses are likely to be approved, as administrative exceptions, for export and reexport to Country Group D:1 of 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.

**2B104 Equipment and process controls designed or modified for densification and pyrolysis of structural composite rocket nozzles and reentry vehicle nose tips.**

**License Requirements**

*Reason for Control:* MT, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
MT applies to entire entry	MT Column 1
NP applies to 2B104.a	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:* The only "isostatic presses" and furnaces controlled by 2B104 are: (a) "Isostatic presses", other than those controlled by 2B004, having all the following characteristics: (1) Maximum working pressure of 69 MPa or greater; (2) Designed to achieve and maintain a thermal environment of 873 K (600° C) or greater; and (3) Possessing a chamber cavity with an diameter of 254 mm or greater; (b) CVD Furnaces designed or modified for the densification of carbon-carbon composites.

*Related Definitions:* N/A

*Items:* The list of items controlled is 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

<i>Control(s)</i>	<i>Country Chart</i>
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; parts and accessories in \$ value.

*Related Controls:* See also 2B009 and 2B209.  
*Related Definition:* This entry controls only spin-forming machines combining the functions of spin-forming and flow-forming and flow forming machines.

*Items:* a. 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; and  
 b. With more than two axes which can be coordinated simultaneously for "contouring control."

**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.

**2B116 Vibration test systems, equipment and components therefor, as follows (see List of Items Controlled).**

**License Requirements**

*Reason for Control:* MT, NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
MT applies to entire entry	MT Column 1

<i>Control(s)</i>	<i>Country Chart</i>
NP applies to electro-dynamic vibration test systems, employing feedback or closed loop control techniques and incorporating a digital controller, capable of vibrating at 10 g RMS or more between 20 Hz and 2000 Hz and imparting forces of 50 kN (11,250 lbs.) measured "bare table", or greater.	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 also 9B990

*Related Definitions:* (1) The term "digital control" refers to equipment, the functions of which are, partly or entirely, automatically controlled by stored and digitally coded electrical signals. (2) The term "bare table" means a flat table, or surface, with no fixture or fitting.

*Items:* a. Vibration test systems employing feedback or closed loop techniques and incorporating a digital controller, capable of vibrating a system at 10 g RMS or more over the entire range 20 Hz to 2,000 Hz and imparting forces of 50 kN (11,250 lbs.), measured "bare table", or greater;  
 b. Digital controllers, combined with specially designed vibration test "software", with a real-time 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 of 50 kN (11,250 lbs.), measured "bare table", or greater, 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 of 50 kN, measured "bare table", or greater, and usable in vibration test systems described in 2B116.a.

**2B201 Machine tools, other than those controlled by 2B001 for removing or cutting metals, ceramics or "composites", which, according to manufacturer's technical specification, can be equipped with electronic for simultaneous "contouring control" in two or more axes.**

**License Requirements**

*Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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 also 2B290, 2B991, and 2D002 "Numerical control" units are controlled by their associated "software".

*Related Definition:* N/A

*Items:* a. Machine tools for milling, having any of the following characteristics:  
 a.1. "Positioning accuracies" with all compensations available less (better) than 0.006 mm along any linear axis (positioning); or

a.2. Two or more contouring rotary axes.  
**Note:** 2B201.a. does not control milling having the following characteristics:  
 a. X-axis travel greater than 2 m;  
 b. Overall "positioning accuracy" on the x-axis more (worse) than 0.030 mm.

b. Machine tools for grinding, having any of the following characteristics:  
 b.1. "Positioning accuracies" with all compensations available less (better) than 0.004 mm along any linear axis (positioning); or  
 b.2. Two or more contouring rotary axes.

**Note:** 2B201.b 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 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.

c. Machines for turning, that have "positioning accuracies" with all compensations available less (better) than 0.006 mm along any linear axis (overall positioning) for machines capable of machining diameters greater than 35 mm.

**Note:** Bar machines (Swissturn), limited to machining only bar feed thru, are excluded 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.

**2B204 "Isostatic presses," not controlled by 2B004 or 2B104, capable of achieving a maximum working pressure of 69 Mpa (10,000 psi) or greater and having a chamber cavity with an inside diameter in excess of 152 mm (6 inches) and specially designed dies, molds, and controls 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:* Equipment in number  
*Related Controls:* N/A

*Related Definition:* 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 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:* The list of items controlled is contained in the ECCN heading.

**2B206 Dimensional inspection machines, devices or systems, other than those controlled by 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:* See also 2B992.

*Related Definition:* (1) Machine tools that can be used as measuring machines are controlled if they meet or exceed the criteria specified for the machine function or the measuring machine function. (2) A machine controlled by 2B206 is controlled if it exceeds the control threshold anywhere within its operating range. (3) 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.

*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  $(1.25 + L/1000) \mu\text{m}$  tested with a probe of "accuracy" of less (better) than 0.2  $\mu\text{m}$  (L is the measured length 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 less (better) than 3.5  $\mu\text{m}$  per 5 mm; and
- b.2. "Angular position deviation" equal to or less than 0.02°.

**2B207 "Robots" or "end-effectors", other than those controlled by 2B007, specially designed to comply with national safety standards applicable to handling high explosives (for example, meeting code ratings for high explosives) and specially designed controllers 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:* N/A  
*Related Definitions:* N/A

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

**2B209 Flow forming machines, or spin forming machines capable of flow forming functions, other than those controlled by 2B009 or 2B109, or 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:* N/A.

*Related Definition:* This entry includes machines which have only a single roller designed to deform metal plus two auxiliary rollers which support the mandrel, but do not participate directly in the deformation process.

*Items:* a. Machines having any of the following:

- a.1. Having three or more rollers (active or guiding); and
- a.2. According to the manufacturer's technical specification can be equipped with "numerical control" units or a computer control.
- b. Rotor-forming mandrels designed to form cylindrical rotors of inside diameter between 75 mm (3 in.) and 400 mm (16 in.).

**2B225 Remote manipulators that can be used to provide remote actions in radiochemical separation operations and hot cells, 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:* N/A.

*Related Definition:* Remote manipulators provide translation of human operator actions to a remote operating arm and terminal fixture. They may be of a "master/slave" type or operated by joystick or keypad.

- Items:* a. Having a capability of penetrating 0.6 m or more of hot cell wall (operation); or
- b. Having 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).

**2B226 Vacuum or controlled environment (inert gas) induction furnaces capable of operation above 1,123 K (850° C) and having induction coils 600 mm or less in diameter, and designed for power inputs of 5 kW or more, and power supplies specially designed therefor with a specified power output of 5 kW or more.**

**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 also Category 3B. This entry does not control furnaces designed for the processing of semiconductor wafers.

*Related Definition:* N/A

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

**2B227 Vacuum and controlled atmosphere metallurgical melting and casting furnaces and specially configured computer control and monitoring systems 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:* N/A

*Related Definition:* N/A

*Items:* a. Arc remelt and casting furnaces with consumable electrode capacities



between 1000 cm<sup>3</sup> and 20,000 cm<sup>3</sup>, capable of operating with melting temperatures above 1,973 K (1,700° C);

b. Electron beam melting and plasma atomization and furnaces, with a power of 50 kW or greater, capable of operating melting temperatures above 1,473 K (1,200° C).

**2B228 Rotor fabrication and assembly equipment and 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: N/A

Related Definitions: N/A

Items: a. Rotor assembly equipment for assembly of gas centrifuge rotor sections, baffles and end caps, including associated precision mandrels, clamps and shrink fit machines;

b. Rotor straightening equipment for alignment of gas centrifuge rotor sections to a common axis;

**Technical Note:** Normally such equipment will consist 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 (bellows made of high-strength aluminum alloys, maraging steel or high strength filamentary materials). The bellows have all of the following dimensions:

- c.1. 75 mm to 400 mm inside diameter;
- c.2. 12.7 mm or more in length; and
- c.3. Single convolution depth more than 2 mm.

**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: N/A

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. A swing or journal diameter of 75 mm or more;

a.2. Mass capability of from 0.9 to 23 kg; and

a.3. Capable of balancing speed of revolution more than 5000 r.p.m.;

b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor components and having all of the following characteristics:

b.1. A journal diameter of 75 mm or more;

b.2. Mass capability of from 0.9 to 23 kg;

b.3. Capable of balancing to a residual imbalance of 0.01 kg mm/kg per plane or better; and

b.4. Belt drive type.

**2B230 "Pressure transducers" which are capable of measuring absolute pressure at any point in the range 0 to 13 kPa, with pressure sensing elements made of or protected by nickel, nickel alloys with more than 60% nickel by weight, aluminum or aluminum alloys, having any of the 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: N/A

Related Definitions: (1) Pressure transducers are devices that convert pressure measurements into an electrical signal. (2) For the purposes of this entry, "accuracy" includes non-linearity, hysteresis and repeatability at ambient temperature.

Items: a. A full scale of less than 13 kPa and an "accuracy" of better than +/- 1% (full-scale); or

b. A full scale of 13 kPa or greater and an "accuracy" of better than +/- 130 Pa.

**2B231 Vacuum pumps with an input throat size of 380 mm or greater with a pumping speed of 15,000 liters/s or greater and capable of producing an ultimate vacuum better than 10<sup>-4</sup> Torr (1.33 x 10<sup>-4</sup> mbar).**

**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: Vacuum pumps for gaseous diffusion separation process are subject to

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

Related Definition: (1) The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off. (2) The pumping speed is determined at the measurement point with nitrogen gas or air.

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

**2B232 Multistage light gas guns or other high-velocity gun systems (coil, electromagnetic, electrothermal, or 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: N/A.

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.**

**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: N/A

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, 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 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:* Equipment in number.

*Related Controls:* The controls in this entry do not apply to equipment that is: (a) specially designed for use in civil applications (e.g., food processing, pulp and paper processing, or water purification); and (b) inappropriate, by the nature of its design, for use in storing, processing, producing or conducting and controlling the flow of chemical weapons precursors controlled by 1C350.

*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, Office 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<sup>3</sup> (100 liters) and less than 20 m<sup>3</sup> (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. Fluoropolymers;  
a.3. Glass (including vitrified or enamelled coating or glass lining);  
a.4. Nickel or alloys with more than 40% nickel by weight;

a.5. Tantalum or tantalum alloys;  
a.6. Titanium or titanium alloys; or  
a.7. Zirconium or zirconium alloys;  
b. Agitators for use in reaction vessels or reactors where all surfaces of the agitator 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. Fluoropolymers;  
b.3. Glass (including vitrified or enamelled coatings or glass lining);  
b.4. Nickel or alloys with more than 40% nickel by weight;

b.5. Tantalum or tantalum alloys;  
b.6. Titanium or titanium alloys; or  
b.7. Zirconium or zirconium alloys;

c. Storage tanks, containers or receivers with a total internal (geometric) volume greater than 0.1 m<sup>3</sup> (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. Fluoropolymers;  
c.3. Glass (including vitrified or enamelled coatings or glass lining);  
c.4. Nickel or alloys with more than 40% nickel by weight;

c.5. Tantalum or tantalum alloys;  
c.6. Titanium or titanium alloys; or  
c.7. Zirconium or zirconium alloys;  
d. Heat exchangers or condensers with a heat transfer surface area of less than 20 m<sup>2</sup>, 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. Fluoropolymers;  
d.3. Glass (including vitrified or enamelled coatings or glass lining);

d.4. Graphite;  
d.5. Nickel or alloys with more than 40% nickel by weight;

d.6. Tantalum or tantalum alloys;  
d.7. Titanium or titanium alloys; or  
d.8. Zirconium or zirconium alloys;  
e. Distillation or absorption columns of internal diameter greater than 0.1 m, 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. Fluoropolymers;  
e.3. Glass (including vitrified or enamelled coatings or glass lining);

e.4. Graphite;  
e.5. Nickel or alloys with more than 40% nickel by weight;

e.6. Tantalum or tantalum alloys;  
e.7. Titanium or titanium alloys; or  
e.8. Zirconium or zirconium alloys;  
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. Multiple seal valves incorporating a leak detection port, bellows-seal valves, non-return (check) valves or diaphragm valves, in which all surfaces that come in to direct contact with the chemical(s) being 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. Fluoropolymers;  
g.3. Glass (including vitrified or enamelled coatings or glass lining);  
g.4. Nickel or alloys with more than 40% nickel by weight;

g.5. Tantalum or tantalum alloys;  
g.6. Titanium or titanium alloys; or  
g.7. Zirconium or zirconium alloys;  
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. Fluoropolymers;  
h.3. Glass (including vitrified or enamelled coatings or glass lining);

h.4. Graphite;  
h.5. Nickel or alloys with more than 40% nickel by weight;

h.6. Tantalum or tantalum alloys;  
h.7. Titanium or titanium alloys; or  
h.8. Zirconium or zirconium alloys;

i. Multiple-seal, canned drive, magnetic drive, bellows or diaphragm pumps, with manufacturer's specified maximum flow-rate greater than 0.6 m<sup>3</sup>/hour, or vacuum pumps with manufacturer's specified maximum flow-rate greater than 5 m<sup>3</sup>/hour (under standard temperature (273 K (0°C)) and pressure (101.3 kPa) conditions), 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. Ceramics;  
i.3. Ferrosilicon;  
i.4. Fluoropolymers;  
i.5. Glass (including vitrified or enamelled coatings or glass lining);

i.6. Graphite;  
i.7. Nickel or alloys with more than 40% nickel by weight;

i.8. Tantalum or tantalum alloys;  
i.9. Titanium or titanium alloys, or  
i.10. Zirconium or zirconium alloys;  
j. Incinerators designed to destroy chemical warfare agents, or chemical weapons precursors controlled by 1C350, 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. Ceramics; or  
j.3. Nickel or alloys with more than 40% nickel by weight.

**2B351 Toxic gas monitoring systems and dedicated detectors therefor.**

**License Requirements**  
Reason for Control: CB, AT.

Control(s)	Country Chart
CB applies to entire entry	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:* Equipment in number

*Related Controls:* N/A

*Related Definitions:* N/A

*Items:* a. Designed for continuous operation and usable for the detection of chemical warfare agents, chemicals controlled by 1C350 or organic compounds containing phosphorus, sulphur, fluorine or chlorine, at concentrations of less than 0.3 mg/m<sup>3</sup>; 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 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:* Equipment in number

*Related Controls:* N/A

*Related Definitions:* For purposes of this entry, isolators include flexible isolators,

dry boxes, anaerobic chambers and glove boxes.

*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 (Geneva, 1983).

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 100 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. A flow rate greater than 100 liters per hour;
- c.2. Components of polished stainless steel or titanium;
- c.3. Double or multiple sealing joints within the steam containment area; *and*
- c.4. Capable of *in situ* steam sterilization in a closed state.

**Technical Note:** Centrifugal separators include decanters.

d. Cross-flow filtration equipment capable of continuous separation of pathogenic microorganisms, viruses, toxins, and cell cultures without the propagation of aerosols, having all of the following characteristics:

- d.1. Equal to or greater than 5 square meters;
- d.2. Capable of *in situ* sterilization.
- e. Steam sterilizable freeze-drying equipment with a condenser capacity greater than 50 kgs of ice in 24 hours but less than 1,000 kgs;
- f. Equipment that incorporates or is contained in P3 or P4 containment housing, as follows:
  - f.1. Independently ventilated protective full or half suits;
  - f.2. Class III biological safety cabinets or isolators with similar performance standards;
  - g. Chambers designed for aerosol challenge testing with microorganisms, viruses, or toxins and having a capacity of 1 m<sup>3</sup> or greater.

**2B991 Numerical control units for machine tools and "numerically controlled" machine tools, n.e.s.**

**License Requirements**

*Reason for Control:* AT

<i>Control(s)</i>	<i>Country Chart</i>
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. "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", with all compensations available:

c.2.a. Better than 0.020 mm along any linear axis (overall positioning) for grinding machines;

c.2.b. Better than 0.020 mm along any linear axis (overall positioning) for milling machines; *or*

c.2.c. Better than 0.020 mm 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. "Cammings" (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

<i>Control(s)</i>	<i>Country Chart</i>
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 "cammings" 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 "cammings" 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

<i>Control(s)</i>	<i>Country Chart</i>
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);  
     b. Systems for simultaneous 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 micrometer per 5 mm; and  
         b.2. "Angular position deviation" equal to or less (better) than 0.02°;

**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.

**C. Materials [Reserved]**

**D. Software**

**2D001 "Software" 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

**List of Items Controlled**

Unit: \$ value  
 Related Controls: See also 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 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 1
NP applies to entire entry, except 2D002.b.	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 also 2D202. (2) This entry does not control "software" specially designed or modified for the operation of machine tools not controlled by Category 2.  
 Related Definitions: N/A

- Items: a. Coordinating simultaneously more than 4 axes for "contouring control"; or
- b. "Real time processing" of data to modify tool path, feed rate and spindle data, during the machining operation, by any of the following:
  - b.1. 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. "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.

**2D018 "Software" for the "development", "production" or "use" of equipment controlled by 2B018.**

**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 by 2B018 for MT reasons.	MT 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.

**2D101 "Software" specially designed for the "use" of equipment controlled by 2B104, 2B109 or 2B116.****License Requirements***Reason for Control:* NS, MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
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:* See also 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

<i>Control(s)</i>	<i>Country Chart</i>
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.**2D202 "Software" specially designed or modified for the "development", "production" or "use" of equipment controlled by 2B201.****License Requirements***Reason for Control:* NP, AT

<i>Control(s)</i>	<i>Country Chart</i>
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  
AT applies to entire entryNP Column 2  
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.**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, Libya, 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.

**Note:** Exports from the U.S. and transshipments to *Iran* must be licensed by the Department of Treasury, Office of Foreign Assets Control. (See § 742.8 and § 746.7 for additional information on this requirement.)**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 2A991, 2A993, or 2A994), 2B (except 2B991, 2B993, 2B996, 2B997, or 2B998), or 2D (except 2D991, 2D992, or 2D994).****License Requirements***Reason for Control:* NS, MT, NP, CB, AT**Control(s) Country Chart**

NS applies to "tech-

nology" for items controlled by 2A001, 2B001 to 2B009, 2D001 or 2D002

NS Column 1

MT applies to "tech-

nology" for items controlled by 2B004, 2B009, 2B018, 2B104, 2B109, 2B116, 2D001 or 2D101 for MT reasons

MT Column 1

NP applies to "tech-

nology" for items controlled by 2B001, 2B004, 2B006, 2B007 2B009, 2B104, 2B109, 2B204 2B206, 2B207, 2B209, 2B225, 2B226, 2B228, 2B229, 2B231, 2D001, 2D002, or 2D201 for NP reasons

NP Column 1

NP applies to "tech-

nology" for equipment controlled by 2A290

NP Column 2

<p><i>Control(s)</i>                      <i>Country Chart</i></p> <p>CB applies to "tech- nology" for equipment controlled by 2B350 to 2B352</p> <p>AT applies to entire entry    AT Column 1</p> <p><b>License Requirement Notes:</b> See § 743.1 of the EAR for reporting requirements for exports under License Exceptions.</p> <p><b>License Exceptions</b> CIV: N/A TSR: Yes, except N/A for MT</p> <p><b>List of Items Controlled</b> <i>Unit:</i> N/A <i>Related Controls:</i> See also 2E101, 2E201, and 2E301 <i>Related Definitions:</i> N/A <i>Items:</i> The list of items controlled is contained in the ECCN heading.</p> <p><b>2E002 "Technology" according to the General Technology Note for the "production" of equipment controlled by 2A (except 2A991, 2A993, or 2A994), or 2B (except 2B991, 2B993, 2B996, 2B997, or 2B998).</b></p> <p><b>License Requirements</b> <i>Reason for Control:</i> NS, MT, NP, CB, AT</p> <p><i>Control(s)</i>                      <i>Country Chart</i></p> <p>NS applies to "tech- nology" for equipment controlled by 2A001, 2B001 to 2B009</p> <p>MT applies to "tech- nology" for equipment controlled by 2B004, 2B009, 2B018, 2B104, 2B109, and 2B116 for MT reasons</p> <p>NP applies to "tech- nology" for equipment controlled by 2B001, 2B004, 2B006, 2B007, 2B009, 2B104, 2B109, 2B204, 2B206, 2B207, 2B209, 2B225, 2B226, 2B228, 2B229, or 2B231 for NP reasons</p>	<p><i>Control(s)</i>                      <i>Country Chart</i></p> <p>NP applies to "tech- nology" for equipment controlled by 2A290</p> <p>CB applies to "tech- nology" for equipment controlled by 2B350 to 2B352</p> <p>AT applies to entire entry    AT Column 1</p> <p><b>License Requirement Notes:</b> See § 743.1 of the EAR for reporting requirements for exports under License Exceptions.</p> <p><b>License Exceptions</b> CIV: N/A TSR: Yes, except N/A for MT</p> <p><b>List of Items Controlled</b> <i>Unit:</i> N/A <i>Related Controls:</i> N/A <i>Related Definitions:</i> N/A <i>Items:</i> The list of items controlled is contained in the ECCN heading.</p> <p><b>2E003 Other "technology", as follows (see List of Items Controlled).</b></p> <p><b>License Requirements</b> <i>Reason for Control:</i> NS, AT</p> <p><i>Control(s)</i>                      <i>Country Chart</i></p> <p>NS applies to entire entry    NS Column 1 AT applies to entire entry    AT Column 1</p> <p><b>License Exceptions</b> CIV: N/A TSR: Yes, except 2E003.a, .b, .e and .f</p> <p><b>List of Items Controlled</b> <i>Unit:</i> N/A <i>Related Controls:</i> N/A <i>Related Definitions:</i> N/A <i>Items:</i> 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";</p>	<p>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.</p>
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CATEGORY 2E—MATERIALS PROCESSING TABLE; DEPOSITION TECHNIQUES

[The numbers in parentheses refer to the Notes following this Table]

1. Coating Process (1)	2. Substrate	3. Resultant Coating
A. Chemical Vapor Deposition (CVD) .....	<p>"Superalloys" .....</p> <p>Ceramics and Low-expansion glasses (14) .....</p> <p>Carbon-carbon, Ceramic, and Metal "matrix" "composites".</p> <p>Cemented tungsten carbide (16), Silicon car- bide.</p> <p>Molybdenum and Molybdenum alloys .....</p> <p>Beryllium and Beryllium alloys .....</p>	<p>Aluminides for internal passages</p> <p>Silicides</p> <p>Carbides</p> <p>Dielectric layers (15)</p> <p>Silicides</p> <p>Carbides</p> <p>Refractory metals</p> <p>Mixtures thereof (4)</p> <p>Dielectric layers (15)</p> <p>Aluminides</p> <p>Alloyed aluminides (2)</p> <p>Carbides</p> <p>Tungsten</p> <p>Mixtures thereof (4)</p> <p>Dielectric layers (15)</p> <p>Dielectric layers (15)</p> <p>Dielectric layers (15)</p>

CATEGORY 2E—MATERIALS PROCESSING TABLE; DEPOSITION TECHNIQUES—Continued

[The numbers in parentheses refer to the Notes following this Table]

1. Coating Process (1)	2. Substrate	3. Resultant Coating
B. Thermal-Evaporation Physical Vapor Deposition (TE-PVD)	Sensor window materials (9) .....	Dielectric layers (15)
1. Physical Vapor Deposition (PVD): Electron-Beam (EB-PVD).	"Superalloys" .....	Alloyed silicides Alloyed aluminides (2) MCrAlX (5) Modified zirconia (12) Silicides Aluminides Mixtures thereof (4)
	Ceramics 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)
	Cemented tungsten carbide (16), Silicon carbide.	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys .....	Dielectric layers (15)
	Beryllium and Beryllium alloys .....	Dielectric layers (15)
	Sensor window materials (9) .....	Dielectric layers (15)
	Titanium alloys (13) .....	Borides Nitrides
2. Ion assisted resistive heating Physical Vapor Deposition (Ion Plating).	Ceramics and Low-expansion glasses (14) .....	Dielectric layers (15)
	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)
3. Physical Vapor Deposition: "laser" evaporation.	Ceramics and Low-expansion glasses (14) .....	Silicides
	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)
4. Physical Vapor Deposition: cathodic arc discharge.	"Superalloys" .....	Alloyed silicides Alloyed Aluminides (2) MCrAlX (5)
	Polymers (11) and Organic "matrix" "composites".	Borides Carbides Nitrides
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)	Silicides
	Refractory metals and alloys (8) .....	Oxides

CATEGORY 2E—MATERIALS PROCESSING TABLE; DEPOSITION TECHNIQUES—Continued  
 [The numbers in parentheses refer to the Notes following this Table]

1. Coating Process (1)	2. Substrate	3. Resultant Coating
D. Plasma spraying .....	"Superalloys" .....  Aluminum alloys (6) .....  Refractory metals and alloys (8) .....  Corrosion resistant steel (7) .....  Titanium alloys (13) .....	MCrAlX (5) Modified zirconia (12) Mixtures Thereof (4) Abradable Nickel-Graphite Abradable Ni-Cr-Al- Bentonite Abradable Al-Si-Polyester Alloyed aluminides (2) MCrAlX (5) Modified zirconia (12) Silicides Mixtures thereof (4) Aluminides Silicides Carbides Modified zirconia (12) Mixtures thereof (4) Carbides Aluminides Silicides Alloyed aluminides (2) Abradable Nickel-Graphite Abradable Ni-Cr-Al- Bentonite Abradable Al-Si-Polyester
E. Slurry Deposition .....	Refractory metals alloys (8) .....  Carbon-carbon, Ceramic and Metal "matrix" "composites".	Fused silicides Fused aluminides except for resistance heat- ing elements Silicides Carbides Mixtures thereof (4)
F. Sputter Deposition .....	"Superalloys" .....  Ceramics and Low-expansion glasses (14) .....  Titanium alloys (13) .....  Carbon-carbon, Ceramic and Metal "matrix" "Composites".  Cemented tungsten carbide (16), Silicon car- bide.  Molybdenum and Molybdenum alloys ..... Beryllium and Beryllium alloys ..... Sensor window materials (9) .....	Alloyed silicides Alloyed aluminides (2) Noble metal modified aluminides (3) MCrAlX (5) Modified zirconia (12) Platinum Mixtures thereof (4) Silicides Platinum Mixtures thereof (4) Dielectric layers (15) Borides Nitrides Oxides Silicides Aluminides Alloyed aluminides (2) Carbides Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Carbides Tungsten Mixtures thereof (4) Dielectric layers (15) Dielectric layers (15) Borides Dielectric layers (15) Dielectric layers (15)



CATEGORY 2E—MATERIALS PROCESSING TABLE; DEPOSITION TECHNIQUES—Continued

[The numbers in parentheses refer to the Notes following this Table]

1. Coating Process (1)	2. Substrate	3. Resultant Coating
G. Ion Implantation .....	Refractory metals and alloys (8) .....	Aluminides Silicides Oxides Carbides
	High temperature bearing steels .....	Additions of Chromium, Tantalum, or Niobium (Columbium)
	Titanium alloys (13) .....	Borides Nitrides
	Beryllium and Beryllium alloys ..... Cemented tungsten carbide (16) .....	Borides Carbides Nitrides

**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. Mixtures consist of infiltrated material, graded compositions, co-deposits 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 weight percent in various proportions and combinations, except:

a. CoCrAlY coatings which contain less than 22 weight percent of chromium, less than 7 weight percent of aluminum and less than 2 weight percent of yttrium;

b. CoCrAlY coatings which contain 22 to 24 weight percent of chromium, 10 to 12 weight percent of aluminum and 0.5 to 0.7 weight percent of yttrium; or

c. NiCrAlY coatings which contain 21 to 23 weight percent of chromium, 10 to 12 weight percent of aluminum and 0.9 to 1.1 weight percent 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 consist of 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 and the

following metal halides: potassium iodide, potassium fluoride, or sensor window materials of more than 40 mm diameter for thallium bromide and thallium chlorobromide.

10. "Technology" for single-step pack cementation of solid airfoils is not controlled by this Category.

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 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  $1 \times 10^{-7} \text{ K}^{-1}$  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.

**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. Resistive Heating PVD employs electrically resistive heating sources capable of producing a controlled and uniform flux of evaporated coating species;

3. "Laser" Evaporation uses either pulsed or continuous wave "laser" beams to heat 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.

c. 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 to be deposited 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.

d. 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. 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.

e. 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 carried out underwater.

**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.

f. 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.

g. 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.

h. 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 coating 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;

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;

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:

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:

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:

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;

f. Substrate orientation;

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 distribution;

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;