

Controlled items for SI – non-space

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ECCN	DESCRIPTION
<p>8A001 Submersible vehicles and surface vessels, as follows (see List of Items Controlled).</p>	<p>a. Manned, tethered submersible vehicles designed to operate at depths exceeding 1,000 m;</p> <p>b. Manned, untethered submersible vehicles having any of the following: b.1. Designed to 'operate autonomously' and having a lifting capacity of all the following: b.1.a. 10% or more of their weight in air; and b.1.b. 15 kN or more; b.2. Designed to operate at depths exceeding 1,000 m; or b.3. Having all of the following: b.3.a. Designed to continuously 'operate autonomously' for 10 hours or more; and b.3.b. 'Range' of 25 nautical miles or more;</p>
<p>8A001 Submersible vehicles and surface vessels, as follows (see List of Items Controlled).</p>	<p>c. Unmanned, tethered submersible vehicles designed to operate at depths exceeding 1,000 m and having <u>any</u> of the following: c.1. Designed for self-propelled maneuver using propulsion motors or thrusters controlled by 8A002.a.2; or c.2. Fiber optic data link;</p> <p>d. Unmanned, untethered submersible vehicles having <u>any</u> of the following: d.1. Designed for deciding a course relative to any geographical reference without real-time human assistance; d.2. Acoustic data or command link; or d.3. Optical data or command link exceeding 1,000 m;</p> <p>e. Ocean salvage systems with a lifting capacity exceeding 5 MN for salvaging objects from depths exceeding 250 m and having <u>any</u> of the following: e.1. Dynamic positioning systems capable of position keeping within 20 m of a given point provided by the navigation system; or e.2. Seafloor navigation and navigation integration systems, for depths exceeding 1,000 m and with positioning accuracies to within 10 m of a predetermined point;</p> <p>f. Surface-effect vehicles (fully skirted variety) having <u>all</u> of the following: f.1. Maximum design speed, fully loaded, exceeding 30 knots in a significant wave height of 1.25 m (Sea State 3) or more; f.2. Cushion pressure exceeding 3,830 Pa; and f.3. Light-ship-to-full-load displacement ratio of less than 0.70;</p> <p>g. Surface-effect vehicles (rigid sidewalls) with a maximum</p>

	<p>design speed, fully loaded, exceeding 40 knots in a significant wave height of 3.25 m (Sea State 5) or more;</p> <p>h. Hydrofoil vessels with active systems for automatically controlling foil systems, with a maximum design speed, fully loaded, of 40 knots or more in a significant wave height of 3.25 m (Sea State 5) or more;</p> <p>i. ‘Small waterplane area vessels’ having any of the following:</p> <ul style="list-style-type: none"> i.1. Full load displacement exceeding 500 tonnes with a maximum design speed, fully loaded, exceeding 35 knots in a significant wave height of 3.25 m (Sea State 5) or more; or i.2. Full load displacement exceeding 1,500 tonnes with a maximum design speed, fully loaded, exceeding 25 knots in a significant wave height of 4 m (Sea State 6) or more.
<p>8A002 Marine systems, equipment, “parts” and “components,” as follows (see List of Items Controlled).</p>	<p>a. “components,” “specially designed” or modified for submersible vehicles and designed to operate at depths exceeding 1,000 m, as follows:</p> <ul style="list-style-type: none"> a.1. Pressure housings or pressure hulls with a maximum inside chamber diameter exceeding 1.5 m; a.2. Direct current propulsion motors or thrusters; a.3. Umbilical cables, and connectors therefor, using optical fiber and having synthetic strength members; a.4. “Parts” and “components” manufactured from material specified by ECCN 8C001;
<p>Marine - Systems “specially designed” or modified for the automated control of the motion of submersible vehicles controlled by 8A001</p>	<p>b. Systems “specially designed” or modified for the automated control of the motion of submersible vehicles controlled by 8A001, using navigation data, having closed loop servo-controls and having any of the following:</p> <ul style="list-style-type: none"> b.1. Enabling a vehicle to move within 10 m of a predetermined point in the water column; b.2. Maintaining the position of the vehicle within 10 m of a predetermined point in the water column; <i>or</i> b.3. Maintaining the position of the vehicle within 10 m while following a cable on or under the seabed; c. Fiber optic pressure hull penetrators;
<p>Marine - Underwater vision systems</p>	<p>d. Underwater vision systems as follows:</p> <ul style="list-style-type: none"> d.1. Television systems and television cameras, as follows: <ul style="list-style-type: none"> d.1.a. Television systems (comprising camera, monitoring and signal transmission equipment) having a ‘limiting resolution’ when measured in air of more than 800 lines and “specially designed” or modified for remote operation with a submersible vehicle; d.1.b. Underwater television cameras having a ‘limiting resolution’ when measured in air of more than 1,100 lines; d.1.c. Low light level television cameras “specially designed” or modified for underwater use and having all of the following: <ul style="list-style-type: none"> d.1.c.1. Image intensifier tubes controlled by 6A002.a.2.a; <i>and</i> d.1.c.2. More than 150,000 “active pixels” per solid state area array; <p>Technical Note: ‘Limiting resolution’ is a measure of</p>

	<p><i>horizontal resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.</i></p> <p>d.2. Systems “specially designed” or modified for remote operation with an underwater vehicle, employing techniques to minimize the effects of back scatter and including range-gated illuminators or “laser” systems;</p>
Marine - Photographic still cameras	<p>e. Photographic still cameras “specially designed” or modified for underwater use below 150 m, with a film format of 35 mm or larger and having any of the following:</p> <ul style="list-style-type: none"> e.1. Annotation of the film with data provided by a source external to the camera; e.2. Automatic back focal distance correction; <i>or</i> e.3. Automatic compensation control “specially designed” to permit an underwater camera housing to be usable at depths exceeding 1,000 m;
Marine - Light systems	<p>f. [RESERVED]</p> <p>g. Light systems “specially designed” or modified for underwater use, as follows:</p> <ul style="list-style-type: none"> g.1. Stroboscopic light systems capable of a light output energy of more than 300 J per flash and a flash rate of more than 5 flashes per second; g.2. Argon arc light systems “specially designed” for use below 1,000 m;
Marine - Robots	<p>h. “Robots” “specially designed” for underwater use, controlled by using a dedicated computer and having any of the following:</p> <ul style="list-style-type: none"> h.1. Systems that control the “robot” using information from sensors which measure force or torque applied to an external object, distance. h.2. The ability to exert a force of 250 N or more or a torque of 250 Nm or more and using titanium based alloys or “composite” “fibrous or filamentary materials” in their structural members.
Remotely controlled articulated manipulators	<p>Remotely controlled articulated manipulators “specially designed” or modified for use submersible vehicles and having any of the following</p> <ul style="list-style-type: none"> i.1. Systems which control the manipulator using information from sensors which measure any of the following: <ul style="list-style-type: none"> i.1.a. Torque or force applied to an external object; <i>or</i> i.1.b. Tactile sense between the manipulator and an external object; <i>or</i> i.2. Controlled by proportional master-slave techniques or by using a dedicated computer and having 5 degrees of ‘freedom of movement’ or more; <p>Technical Note: <i>Only functions having proportional control using positional feedback or by using a dedicated computer are counted when determining the number of degrees of ‘freedom of movement’.</i></p>
Category 1	

<p>1A004 Protective and detection equipment and “components,” not “specially designed” for military use, as follows (see List of Items Controlled).</p>	<p>. Full face masks, filter canisters and decontamination equipment therefor, designed or modified for defense against any of the following, and “specially designed” “components” therefor:</p> <p>Note: 1A004.a includes Powered Air Purifying Respirators (PAPR) that are designed or modified for defense against agents or materials, listed in 1A004.a.</p> <p>Technical Note: For the purpose of 1A004.a, full face masks are also known as gas masks</p> <p>a.1. Biological agents ‘adapted for use in war’;</p> <p>a.2. Radioactive materials ‘adapted for use in war’;</p> <p>a.3. Chemical warfare (CW) agents; or</p> <p>a.4. Riot control agents’, as follows:</p> <p> a..4.a. α-Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (CAS 5798-79-8);</p> <p> a..4.b. [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenemalononitrile) (CS) (CAS 2698-41-1);</p> <p> a..4.c. 2-Chloro-1-phenylethanone, Phenylacyl chloride (ω-chloroacetophenone) (CN) (CAS 532-27-4);</p> <p> a..4.d. Dibenz-(b,f)-1,4-oxazepine, (CR) (CAS 257-07-8);</p> <p> a..4.e. 10-Chloro-5, 10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (CAS 578-94-9);</p> <p> a..4.f. N-Nonanoylmorpholine, (MPA) (CAS 5299-64-9);</p> <p>b. Protective suits, gloves and shoes, “specially designed” or modified for defense against any of the following:</p> <p>b.1. Biological agents ‘adapted for use in war’;</p> <p>b.2. Radioactive materials ‘adapted for use in war’; or</p> <p>b.3. Chemical warfare (CW) agents;</p> <p>c. Detection systems, “specially designed” or modified for detection or identification of any of the following, and “specially designed” “components” therefor:</p> <p>c.1. Biological agents ‘adapted for use in war’;</p> <p>c.2. Radioactive materials ‘adapted for use in war’; or</p> <p>c.3. Chemical warfare (CW) agents;</p> <p>d. Electronic equipment designed for automatically detecting or identifying the presence of “explosives” (as listed in the annex at the end of Category 1) residues and utilizing ‘trace detection’ techniques (e.g., surface acoustic wave, ion mobility spectrometry, differential mobility spectrometry, mass spectrometry).</p> <p>Technical Note: ‘Trace detection’ is defined as the capability to detect less than 1 ppm vapor, or 1 mg solid or liquid.</p> <p>Note 1: 1A004.d. does not apply to equipment “specially designed” for laboratory use.</p> <p>Note 2: 1A004.d. does not apply to non-contact walk-through</p>
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	<p>security portals.</p> <p>Note: 1A004 does not control: a. Personal radiation monitoring dosimeters; b. Occupational health or safety equipment limited by design or function to protect against hazards specific to residential safety or civil industries, including: 1. Mining; 2. Quarrying; 3. Agriculture; 4. Pharmaceutical; 5. Medical; 6. Veterinary; 7. Environmental; 8. Waste management; 9. Food industry.</p> <p>Technical Notes:</p> <p>1. 1A004 includes equipment, “components” that have been ‘identified,’ successfully tested to national standards or otherwise proven effective, for the detection of or defense against radioactive materials “adapted for use in war,” biological agents “adapted for use in war,” chemical warfare agent, ‘simulants’ or “riot control agents,” even if such equipment or “components” are used in civil industries such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or the food industry.</p> <p>2. ‘Simulant’: A substance or material that is used in place of toxic agent (chemical or biological) in training, research, testing or evaluation.</p>
<p>1A005 Body armor and “specially designed” “components” therefor, as follows (see List of Items Controlled).</p>	<p>a. Soft body armor not manufactured to military standards or specifications, or to their equivalents, and “specially designed” components therefor;</p> <p>b. Hard body armor plates providing ballistic protection equal to or less than level IIIA (NIJ 0101.06, July 2008) or national equivalents.</p> <p>Notes to ECCN 1A005:</p> <p>1. This entry does not control body armor when accompanying its user for the user’s own personal protection.</p> <p>2. This entry does not control body armor designed to provide frontal protection only from both fragment and blast from non-military explosive devices.</p> <p>3. This entry does not apply to body armor designed to provide protection only from knife, spike, needle or blunt trauma.</p>
<p>1A227 High-density (lead glass or other) radiation shielding windows, having all of the following characteristics (see List of Items Controlled), and “specially designed” frames therefor.</p>	<p>a. A “cold area” greater than 0.09 m²;</p> <p>b. A density greater than 3 g/cm³; and</p> <p>c. A thickness of 100 mm or greater.</p>
<p>1A985 Fingerprinting powders, dyes, and inks.</p>	<p>Same as in heading.</p>
<p>1A999 Specific processing equipment, n.e.s., as follows (see List of Items controlled).</p>	<p>a. Radiation detection, monitoring and measurement equipment, n.e.s.;</p> <p>b. Radiographic detection equipment such as x-ray converters, and storage phosphor image plates.</p>
<p>1B117 Batch mixers with</p>	<p>a. A total volumetric capacity of 110 liters (30 gallons) or</p>

<p>provision for mixing under vacuum in the range from zero to 13.326 kPa and with temperature control capability of the mixing chamber and having all of the following characteristics (see List of Items Controlled), and “specially designed” “parts” and “components” therefor.</p>	<p>more; and b. At least one mixing/kneading shaft mounted off center.</p>
<p>1C351 Human and zoonotic pathogens and “toxins”, as follows (see List of Items Controlled).</p>	<p>License Requirement Notes:</p> <p><i>1. All vaccines and “immunotoxins” are excluded from the scope of this entry. Certain medical products and diagnostic and food testing kits that contain biological toxins controlled under paragraph (d) of this entry, with the exception of toxins controlled for CW reasons under d.11 and d.12, are excluded from the scope of this entry. Vaccines, “immunotoxins”, certain medical products, and diagnostic and food testing kits excluded from the scope of this entry are controlled under ECCN 1C991.</i></p> <p><i>2. For the purposes of this entry, only saxitoxin is controlled under paragraph d.12; other members of the paralytic shellfish poison family (e.g. neosaxitoxin) are designated EAR99.</i></p> <p><i>3. Clostridium perfringens strains, other than the epsilon toxin-producing strains of Clostridium perfringens described in c.9, are excluded from the scope of this entry, since they may be used as positive control cultures for food testing and quality control.</i></p> <p><i>4. Unless specified elsewhere in this ECCN 1C351 (e.g., in License Requirement Notes 1-3), this ECCN controls all biological agents and “toxins,” regardless of quantity or attenuation, that are identified in the List of Items Controlled for this ECCN, including small quantities or attenuated strains of select biological agents or “toxins” that are excluded from the lists of select biological agents or “toxins” by the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, or the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, in accordance with their regulations in 9 CFR part 121 and 42 CFR part 73, respectively</i></p>

	<p>“List of Biological Agents for Export Control,” as follows:</p> <ul style="list-style-type: none">a.1. Andes virus;a.2. Chapare virus;a.3. Chikungunya virus;a.4. Choclo virus;a.5. Congo-Crimean haemorrhagic fever virus (a.k.a. Crimean-Congo haemorrhagic fever virus);a.6. Dengue fever virus;a.7. Dobrava-Belgrade virus;a.8. Eastern equine encephalitis virus;a.9. Ebola virus;a.10. Guanarito virus;a.11. Hantaan virus;a.12. Hendra virus (Equine morbillivirus);a.13. Japanese encephalitis virus;a.14. Junin virus;a.15. Kyasanur Forest virus;a.16. Laguna Negra virus;a.17. Lassa fever virus;a.18. Louping ill virus;a.19. Lujo virus;a.20. Lymphocytic choriomeningitis virus;a.21. Machupo virus;a.22. Marburg virus;a.23. Monkey pox virus;a.24. Murray Valley encephalitis virus;a.25. Nipah virus;a.26. Omsk haemorrhagic fever virus;a.27. Oropouche virus;a.28. Powassan virus;a.29. Rift Valley fever virus;a.30. Rocio virus;a.31. Sabia virus;a.32. Seoul virus;a.33. Sin nombre virus;a.34. St. Louis encephalitis virus;a.35. Tick-borne encephalitis virus (Far Eastern subtype, formerly known as Russian Spring-Summer encephalitis virus – see 1C351.b.3 for Siberian subtype);a.36. Variola virus;a.37. Venezuelan equine encephalitis virus;a.38. Western equine encephalitis virus; ora.39. Yellow fever virus. <p>b. . Viruses identified on the APHIS/CDC “select agents” lists (see Related Controls paragraph #2 for this ECCN), but not identified on the Australia Group (AG) “List of Biological Agents for Export Control,” as follows:</p> <ul style="list-style-type: none">b.1. Reconstructed replication competent forms of the
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	<p>1918 pandemic influenza virus containing any portion of the coding regions of all eight gene segments; b.2. SARS-associated coronavirus (SARS-CoV); or b.3. Tick-borne encephalitis virus (Siberian subtype, formerly West Siberian virus – see 1C351.a.35 for Far Eastern subtype).</p> <p>c. Bacteria identified on the Australia Group (AG) “List of Biological Agents for Export Control,” as follows: c.1. Bacillus anthracis; c.2. Brucella abortus; c.3. Brucella melitensis; c.4. Brucella suis; c.5. Burkholderia mallei (Pseudomonas mallei); c.6. Burkholderia pseudomallei (Pseudomonas pseudomallei); c.7. Chlamydophila psittaci (formerly known as Chlamydia psittaci); c.8. Clostridium argentinense (formerly known as Clostridium botulinum Type G), botulinum neurotoxin producing strains; c.9. Clostridium baratii, botulinum neurotoxin producing strains; c.10. Clostridium botulinum; c.11. Clostridium butyricum, botulinum neurotoxin producing strains; c.12. Clostridium perfringens, epsilon toxin producing types; c.13. Coxiella burnetii; c.14. Francisella tularensis; c.15. Rickettsia prowazekii; c.16. Salmonella typhi; c.17. Shiga toxin producing Escherichia coli (STEC) of serogroups O26, O45, O103, O104, O111, O121, O145, O157, and other shiga toxin producing serogroups; <i>Note: Shiga toxin producing Escherichia coli (STEC) is also known as enterohaemorrhagic E. coli (EHEC) or verocytotoxin producing E. coli (VTEC).</i> c.18. Shigella dysenteriae; c.19. Vibrio cholerae; or c.20. Yersinia pestis.</p> <p>d. “Toxins” identified on the Australia Group (AG) “List of Biological Agents for Export Control,” as follows, and “subunits” thereof: d.1. Abrin; d.2. Aflatoxins; d.3. Botulinum toxins; d.4. Cholera toxin;</p>
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	<p>d.5. Clostridium perfringens toxins; d.6. Conotoxin; d.7. Diacetoxyscirpenol toxin; d.8. HT-2 toxin; d.9. Microcystin (Cyanginosin); d.10. Modeccin toxin; d.11. Ricin; d.12. Saxitoxin; d.13. Shiga toxin; d.14. Staphylococcus aureus enterotoxins, hemolysin alpha toxin, and toxic shock syndrome toxin (formerly known as Staphylococcus enterotoxin F); d.15. T-2 toxin; d.16. Tetrodotoxin; d.17. Verotoxin and other Shiga-like ribosome inactivating proteins; d.18. Viscum Album Lectin 1 (Viscumin); or d.19. Volkensin toxin. e. "Fungi", as follows: e.1. Coccidioides immitis; or e.2. Coccidioides posadasii.</p>
<p>1C352 Animal pathogens, as follows (see List of Items Controlled).</p>	<p>a. Viruses, as follows: a.1. African swine fever virus as having high pathogenicity (HP), as follows: a.2. Avian influenza (AI) viruses identified as having high pathogenicity (HP), as follows: a.2.a. AI viruses that have an intravenous pathogenicity index (IVPI) in 6-week old chickens greater than 1.2; or a.2.b. AI viruses that cause at least 75% mortality in 4- to 8-week old chickens infected intravenously.</p> <p><i>Note: Avian influenza (AI) viruses of the H5 or H7 subtype that do not have either of the characteristics described in 1C352.a.2 (specifically, 1C352.a.2.a or a.2.b) should be sequenced to determine whether multiple basic amino acids are present at the cleavage site of the haemagglutinin molecule (HA0). If the amino acid motif is similar to that observed for other HPAI isolates, then the isolate being tested should be considered as HPAI and the virus is controlled under 1C352.a.2.</i></p> <p>a.3. Bluetongue virus; a.4. Foot and mouth disease virus; a.5. Goat pox virus; a.6. Porcine herpes virus (Aujeszky's disease); a.7. Swine fever virus (Hog cholera virus); a.8. Lyssa virus (a.k.a. Rabies);</p>

	<p>a.9. Newcastle disease virus; a.10. Peste des petits ruminants virus; a.11. Porcine enterovirus type 9 (swine vesicular disease virus); a.12. Rinderpest virus; a.13. Sheep pox virus; a.14. Teschen disease virus; a.15. Vesicular stomatitis virus; a.16. Lumpy skin disease virus; a.17. African horse sickness virus.</p> <p>b. Bacteria, as follows: b.1 Mycoplasma mycoides, as follows: b.1.a. Mycoplasma mycoides subspecies mycoides SC (small colony) (a.k.a. contagious bovine pleuropneumonia); b.1.b. Mycoplasma capricolum subspecies capripneumoniae (“strain F38”).</p>
<p>1C353 Genetic elements and genetically modified organisms, as follows (see List of Items Controlled).</p>	<p>a. Genetic elements, as follows: a.1. Genetic elements that contain nucleic acid sequences associated with the pathogenicity of microorganisms controlled by 1C351.a to .c, 1C352, or 1C354, acid sequences coding for any of the “toxins” controlled by 1C351.d or “sub-units of toxins” thereof.</p> <p>b. Genetically modified organisms, as follows: b.1. Genetically modified organisms that contain nucleic acid sequences associated with the pathogenicity of microorganisms controlled by 1C351.a to .c, 1C352, or 1C354; b.2. Genetically modified organisms that contain nucleic acid sequences coding for any of the “toxins” controlled by 1C351.d or “sub-units of toxins” thereof.</p> <p><i>Technical Notes:</i></p> <p>1. “Genetic elements” include, inter alia, chromosomes, genomes, plasmids, transposons, and vectors, whether genetically modified or unmodified, or chemically synthesized in whole or in part.</p> <p>2. This ECCN does not control nucleic acid sequences associated with the pathogenicity of enterohaemorrhagic <i>Escherichia coli</i>, serotype O157 and other verotoxin producing strains, except those nucleic acid sequences that contain coding for the verotoxin or its sub-units.</p> <p>3. “Nucleic acid sequences associated with the pathogenicity of any of the microorganisms controlled by 1C351.a to .c, 1C352, or 1C354” means any sequence specific to the relevant</p>

	<p><i>controlled microorganism that:</i></p> <p><i>a. In itself or through its transcribed or translated products represents a significant hazard to human, animal or plant health; or</i></p> <p><i>b. Is known to enhance the ability of a microorganism controlled by 1C351.a to .c, 1C352, or 1C354, or any other organism into which it may be inserted or otherwise integrated, to cause serious harm to human, animal or plant health.</i></p> <p><i>4. “Genetically modified organisms” include organisms in which the genetic material (nucleic acid sequences) has been altered in a way that does not occur naturally by mating and/or natural recombination, and encompasses those produced artificially in whole or in part.</i></p>
1C354 Plant pathogens, as follows (see List of Items Controlled).	
2A226 Valves having all of the following characteristics	<p>a. A “nominal size” of 5 mm or greater;</p> <p>b. Having a bellows seal; <i>and</i></p> <p>c. Wholly made of or lined with aluminum, aluminum alloy, nickel, or nickel alloy containing more than 60% nickel by weight.</p>
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.	<p>a. Pressure tube, pipe, and fittings of 200 mm (8 in.) or more inside diameter, and suitable for operation at pressures of 3.4 MPa (500 psi) or greater;</p> <p>b. Pipe valves having all of the following characteristics:</p> <p>b.1. A pipe size connection of 200 mm (8 in.) or more inside diameter; <i>and</i></p> <p>b.2. Rated at 10.3 MPa (1,500 psi) or more.</p>
2A994 Portable electric generators and specially designed parts.	The list of items controlled is contained in the ECCN heading.
2A999 Specific processing equipment, n.e.s., as follows (see List of Items onrolled).	a. Bellows sealed valves;
2B006 Dimensional inspection or measuring systems, equipment, and “electronic assemblies”, as follows (see List of Items Controlled).	<p>Note: <i>NP applies to measuring systems in 2B006.b.1.c that maintain, for at least 12 hours, over a temperature range of ± 1 K around a standard temperature and at a standard pressure, all of the following: a “resolution” over their full scale of 0.1 μm or less (better); and a “measurement uncertainty” equal to or less (better) than $(0.2 + L/2,000) \mu\text{m}$ (L is the measured length in mm).</i></p> <p>a. Computer controlled or “numerically controlled” Coordinate Measuring Machines (CMM), having a three dimensional length (volumetric) maximum permissible</p>

	<p>error of length measurement ($E_{0,MPE}$) at any point within the operating range of the machine (<i>i.e.</i>, within the length of axes) equal to or less (better) than $(1.7 + L/1,000) \mu\text{m}$ (L is the measured length in mm) according to ISO 10360-2 (2009);</p> <p>Technical Note: <i>The $E_{0,MPE}$ of the most accurate configuration of the CMM specified by the manufacturer (e.g., best of the following: Probe, stylus length, motion parameters, environment) and with “all compensations available” shall be compared to the $1.7 + L/1,000 \mu\text{m}$ threshold.</i></p> <p>b. Linear and angular displacement measuring instruments, as follows:</p> <p>b.1. ‘Linear displacement’ measuring instruments having any of the following:</p> <p>Note: <i>Displacement measuring “laser” interferometers are only specified by 2B006.b.1.c.</i></p> <p>Technical Note: <i>For the purpose of 2B006.b.1 ‘linear displacement’ means the change of distance between the measuring probe and the measured object.</i></p> <p>b.1.a. Non-contact type measuring systems with a “resolution” equal to or less (better) than $0.2 \mu\text{m}$ within a measuring range up to 0.2 mm;</p> <p>b.1.b. Linear voltage differential transformer systems having all of the following:</p> <p>b.1.b.1. “Linearity” equal to or less (better) than 0.1% within a measuring range up to 5 mm; <i>and</i></p> <p>b.1.b.2. Drift equal to or less (better) than 0.1% per day at a standard ambient test room temperature $\pm 1 \text{ K}$;</p> <p>b.1.c. Measuring systems having all of the following:</p> <p>b.1.c.1. Containing a “laser”; <i>and</i></p> <p>b.1.c.2. Maintaining, for at least 12 hours, at a temperature of $20 \pm 1^\circ\text{C}$, all of the following:</p> <p>b.1.c.2.a. A “resolution” over their full scale of $0.1 \mu\text{m}$ or less (better); <i>and</i></p> <p>b.1.c.2.b. Capable of achieving a “measurement uncertainty”, when compensated for the refractive index of air, equal to or less (better) than $(0.2 + L/2,000) \mu\text{m}$ (L is the measured length in mm); or</p>
<p>7A001 Accelerometers</p>	<p>a. Linear accelerometers having any of the following:</p> <p>a.1. Specified to function at linear acceleration levels less than or equal to 15 g and having any of the following:</p> <p>a.1.a. A “bias” “stability” of less (better) than 130 micro g with respect to a fixed calibration value over a period of one year; <i>or</i></p> <p>a.1.b. A “scale factor” “stability” of less (better) than 130</p>

	<p>ppm with respect to a fixed calibration value over a period of one year;</p> <p>a.2. Specified to function at linear acceleration levels exceeding 15 g but less than or equal to 100 g and having all of the following:</p> <p>a.2.a. A “bias” “repeatability” of less (better) than 1,250 micro g over a period of one year; <i>and</i></p> <p>a.2.b. A “scale factor” “repeatability” of less (better) than 1,250 ppm over a period of one year; <i>or</i></p> <p>a.3. Designed for use in inertial navigation or guidance systems and specified to function at linear acceleration levels exceeding 100 g;</p> <p>Note: 7A001.a.1 and 7A001.a.2 do not apply to accelerometers limited to measurement of only vibration or shock.</p> <p>b. Angular or rotational accelerometers, specified to function at linear acceleration</p>
<p>2B229 Centrifugal multiplane balancing machines, fixed or portable, horizontal or vertical, as follows (see List of Items Controlled).</p>	<p>a. Centrifugal balancing machines designed for balancing flexible rotors having a length of 600 mm or more and having all of the following characteristics:</p> <p>a.1. Swing or journal diameter greater than 75 mm;</p> <p>a.2. Mass capability of from 0.9 to 23 kg; <i>and</i> a.3. Capable of balancing speed of revolution greater than 5,000 r.p.m.;</p> <p>b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor components and having all of the following characteristics:</p> <p>b.1. Journal diameter greater than 75 mm; b.2. Mass capability of from 0.9 to 23 kg;</p> <p>b.3. Capable of balancing to a residual imbalance equal to or less than 0.01 kg x mm/kg per plane; <i>and</i></p> <p>b.4. Belt drive type.</p>
<p>2B352 Equipment capable of use in handling biological materials, as follows (see List of Items Controlled).</p>	<p>a. Complete containment facilities at P3 or P4 containment level.</p> <p>Technical Note: P3 or P4 (BL3, BL4, L3, L4) containment levels are as specified in the WHO Laboratory Biosafety Manual (3rd edition, Geneva, 2004).</p> <p>b. Fermenters capable of cultivation of pathogenic microorganisms, viruses, or for toxin production, without the propagation of aerosols, having a capacity equal to or greater than 20 liters.</p> <p>Technical Note: Fermenters include bioreactors, chemostats, and continuous-flow systems.</p> <p>c. Centrifugal separators capable of the continuous separation of pathogenic microorganisms, without the propagation of aerosols, and having all of the following characteristics:</p> <p>c.1. One or more sealing joints within the steam</p>

containment area;
c.2. A flow rate greater than 100 liters per hour; c.3. Components of polished stainless steel or titanium; *and*
c.4. Capable of in-situ steam sterilization in a closed state

Technical Note: *Centrifugal separators include decanters.*

d. Cross (tangential) flow filtration equipment and accessories, as follows:

d.1. Cross (tangential) flow filtration equipment capable of separation of pathogenic microorganisms, viruses, toxins or cell cultures having all of the following characteristics:

d.1.a. A total filtration area equal to or greater than 1 square meter (1 m²); *and*

d.1.b. Having any of the following characteristics:

d.1.b.1. Capable of being sterilized or disinfected in-situ; *or*

d.1.b.2. Using disposable or single-use filtration components.

N.B.: *2B352.d.1 does not control reverse osmosis equipment, as specified by the manufacturer.*

d.2. Cross (tangential) flow filtration components (e.g., modules, elements, cassettes, cartridges, units or plates) with filtration area equal to or greater than 0.2 square meters (0.2 m²) for each component and designed for use in cross (tangential) flow filtration equipment controlled by 2B352.d.1.

Technical Note: *In this ECCN, “sterilized” denotes the elimination of all viable microbes from the equipment through the use of either physical (e.g., steam) or chemical agents.*

“Disinfected” denotes the destruction of potential microbial infectivity in the equipment through the use of chemical agents with a germicidal effect. “Disinfection” and “sterilization” are distinct from “sanitization”, the latter referring to cleaning procedures designed to lower the microbial content of equipment without necessarily achieving elimination of all microbial infectivity or viability.

e. Steam sterilizable freeze-drying (lyophilization) equipment with a condenser capacity of 10 kgs of ice or greater in 24 hours (10 liters of water or greater in 24 hours), but less than 1,000 kgs of ice in 24 hours (less than 1,000 liters of water in 24 hours).

f. Protective and containment equipment, as follows:

f.1. Protective full or half suits, or hoods dependant upon a tethered external air supply and operating under positive pressure;

	<p>Technical Note: <i>This entry does not control suits designed to be worn with self-contained breathing apparatus.</i></p> <p>f.2. Class III biological safety cabinets or isolators with similar performance standards, e.g., flexible isolators, dry boxes, anaerobic chambers, glove boxes or laminar flow hoods (closed with vertical flow).</p> <p>g. Chambers designed for aerosol challenge testing with microorganisms, viruses, or toxins and having a capacity of 1 m³ or greater.</p> <p>h. Spraying or fogging systems and components therefor, as follows:</p> <p>h.1. Complete spraying or fogging systems, specially designed or modified for fitting to aircraft, “lighter than air vehicles,” or “UAVs,” capable of delivering, from a liquid suspension, an initial droplet “VMD” of less than 50 microns at a flow rate of greater than 2 liters per minute;</p> <p>h.2. Spray booms or arrays of aerosol generating units, specially designed or modified for fitting to aircraft, “lighter than air vehicles,” or “UAVs,” capable of delivering, from a liquid suspension, an initial droplet “VMD” of less than 50 microns at a flow rate of greater than 2 liters per minute; designed for fitting to the systems specified in paragraphs h.1 and h.2 of this ECCN.</p> <p>Technical Notes:</p> <p>1. <i>“Aerosol generating units” are devices specially designed or modified for fitting to aircraft and include nozzles, rotary drum atomizers and similar devices.</i></p> <p>2. <i>This ECCN does not control spraying or fogging systems and components, as specified in 2B352.h., that are demonstrated not to be capable of delivering biological agents in the form of infectious aerosols.</i></p> <p>3. <i>Droplet size for spray equipment or nozzles specially designed for use on aircraft or “UAVs” should be measured using either of the following methods (pending the adoption of internationally accepted standards):</i></p> <p>a. <i>Doppler laser method,</i></p> <p>b. <i>Forward laser diffraction method.</i></p>
<p>7A101 Accelerometers, other than those controlled by 7A001</p>	<p>a. Linear accelerometers designed for use in inertial navigation systems or in guidance missiles” having <i>all</i> of the following characteristics, and “specially designed” “parts” and “components” therefor:</p> <p>a.1. ‘Scale factor’ “repeatability” less (better) than 1250 ppm; and</p> <p>a.2. ‘Bias’ “repeatability” less (better) than 1250 micro g.</p>

	<p>Note: The measurement of 'bias' and 'scale factor' refers to one sigma standard deviation with respect to a fixed calibration over a period of one year.</p> <p>b. Accelerometers of any type, designed for use in inertial navigation systems or in guidance systems of all types, specified to function at acceleration levels greater than 100 g.</p> <p>Note to paragraph (b): This paragraph (b) does not include accelerometers that are designed to measure vibration or shock.</p>
<p>7A002 Gyros or angular rate sensors</p>	<p>a. Specified to function at linear acceleration levels less than or equal to 100 g and having any of the following:</p> <ul style="list-style-type: none"> a.1. A rate range of less than 500 degrees per second and having any of the following: <ul style="list-style-type: none"> a.1.a. A "bias" "stability" of less (better) than 0.5 degree per hour, when measured in a 1 g environment over a period of one month, and with respect to a fixed calibration value; or a.1.b. An "angle random walk" of less (better) than or equal to 0.0035 degree per square root hour; <p>or</p> <p>Note: 7A002.a.1.b does not control 'spinning mass gyros'.</p> <p>Technical Note: 'Spinning mass gyros' are gyros which use a continually rotating mass to sense angular motion.</p> <p>a.2. A rate range greater than or equal to 500 degrees per second and having any of the following:</p> <ul style="list-style-type: none"> a.2.a. A "bias" "stability" of less (better) than 40 degrees per hour, when measured in a 1 g environment over a period of three minutes, and with respect to a fixed calibration value; or a.2.b. An "angle random walk" of less (better) than or equal to 0.2 degree per square root hour; or <p>Note: 7A002.a.2.b does not apply to 'spinning mass gyros'.</p> <p>b. Specified to function at linear acceleration levels exceeding 100 g.</p>
<p>7A102 Gyros, other than those controlled by 7A002</p>	<p>a. All types of gyros, usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, with a rated "drift rate" 'stability' of less than 0.5 degrees (1 sigma or rms) per hour in a 1 g environment.</p> <p>b. Gyros of any type, designed for use in inertial navigation systems or in guidance systems of all types, specified to function at acceleration levels greater than 100 g.</p> <p>Technical Note: In this entry, the term 'stability' is defined as a measure of the ability of a specific mechanism or performance coefficient to remain invariant when continuously exposed to a fixed operating condition. (This definition does not refer to dynamic or servo stability.) (IEEE STD 528-2001 paragraph 2.247)</p>

<p>7A003 Inertial systems and “specially designed” “components”</p>	<p>a. Inertial Navigation Systems (INS) (gimbaled or strapdown) and inertial equipment, designed for “aircraft,” land vehicles, vessels (surface or underwater) or “spacecraft,” for navigation, attitude, guidance or control and having any of the following, and “specially designed” “components” therefor:</p> <ul style="list-style-type: none"> a.1. Navigation error (free inertial) subsequent to normal alignment of 0.8 nautical mile per hour (nm/hr) “Circular Error Probable” (“CEP”) or less (better); or a.2. Specified to function at linear acceleration levels exceeding 10 g; <p>b. Hybrid Inertial Navigation Systems embedded with Global Navigation Satellite System(s) (GNSS) or with “Data-Based Referenced Navigation” (“DBRN”) System(s) for navigation, attitude, guidance or control, subsequent to normal alignment and having an INS navigation position accuracy, after loss of GNSS or “DBRN” for a period of up to 4 minutes, of less (better) than 10 meters “Circular Error Probable” (“CEP”);</p> <p>c. Inertial measurement equipment for heading or True North determination and having any of the following, and “specially designed” “components” therefor:</p> <ul style="list-style-type: none"> c.1. Designed to have heading or True North determination accuracy equal to, or less (better) than 0.07 deg sec(Lat) (equivalent to 6 arc minutes (rms) at 45 degrees latitude); or c.2. Designed to have a non-operating shock level of 900 g or greater at a duration of 1 msec, or greater; <p>d. Inertial measurement equipment including Inertial Measurement Units (IMU) and Inertial Reference Systems (IRS), incorporating accelerometers or gyros controlled by 7A001 or 7A002.</p> <p>Note 1: <i>The parameters of 7A003.a and 7A003.b are applicable with any of the following environmental conditions:</i></p> <ul style="list-style-type: none"> a. <i>Input random vibration with an overall magnitude of 7.7 g (rms) in the first 0.5 hour and a total test duration of 1.5 hour per axis in each of the 3 perpendicular axes, when the random vibration meets all of the following:</i> <ul style="list-style-type: none"> 1. <i>A constant Power Spectral Density(PSD) value of 0.04 g²/Hz over a frequency interval of 15 to 1,000 Hz; and</i> 2. <i>The PSD attenuates with frequency from 0.04 g²/Hz to 0.01 g²/Hz over a frequency interval from 1,000 to 2,000 Hz;</i> b. <i>An angular rate capability about one or more axes of equal to or more than +2.62 rad/s (150 deg/s); or</i> c. <i>According to national standards equivalent to a. or b. of this note.</i> <p>Note 2: <i>7A003 does not control inertial navigation systems which are certified for use on “civil aircraft” by civil authorities of a Wassenaar Arrangement Participating State, see Supplement No. 1 to Part 743 for a list of these countries.</i></p> <p>Note 3: <i>7A003.c.1 does not control theodolite systems incorporating inertial equipment “specially designed” for civil surveying purposes.</i></p> <p>Technical Note: <i>7A003.b refers to systems in which an INS and</i></p>
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	<p><i>other independent navigation aids are built into a single unit (embedded) in order to achieve improved performance.</i></p>
<p>7A103 Instrumentation, navigation equipment and systems, other than those controlled by 7A003,</p>	<p>a. Inertial or other equipment using accelerometers or gyros controlled by 7A001, 7A002, 7A101 or 7A102 and systems incorporating such equipment, and “specially designed” “parts” and “components” therefor; Note 1: 7A103.a does not control equipment containing accelerometers “specially designed” and developed as MWD (Measurement While Drilling) sensors for use in down-hole well services operations. Note 2: 7A103.a does not control inertial or other equipment using accelerometers or gyros controlled by 7A001 or 7A002 that are only NS controlled.</p> <p>b. Integrated flight instrument systems, which include gyrostabilizers or automatic pilots, designed or modified for use in rockets, missiles, or unmanned aerial vehicles capable of achieving a “range” equal to or greater than 300 km, and “specially designed” “parts” and “components” therefor.</p> <p>c. Integrated Navigation Systems, designed or modified for use in rockets, missiles, or unmanned aerial vehicles capable of achieving a “range” equal to or greater than 300 km and capable of providing a navigational accuracy of 200m Circular Error Probable (CEP) or less.</p> <p>Technical Note: An ‘integrated navigation system’ typically incorporates the following “parts” and “components”:</p> <ol style="list-style-type: none"> 1. An inertial measurement device (e.g., an attitude and heading reference system, inertial reference unit, or inertial navigation system); 2. One or more external sensors used to update the position and/or velocity, either periodically or continuously throughout the flight (e.g., satellite navigation receiver, radar altimeter, and/or Doppler radar); and 3. Integration hardware and software.
<p>7A004 ‘Star trackers’ and “components” therefor</p>	<p>a. ‘Star trackers’ with a specified azimuth accuracy of equal to or less (better) than 20 seconds of arc throughout the specified lifetime of the equipment;</p> <p>b. “Components” “specially designed” for equipment specified in 7A004.a as follows:</p> <ol style="list-style-type: none"> b.1. Optical heads or baffles; b.2. Data processing units. <p>Technical Note: ‘Star trackers’ are also referred to as stellar attitude sensors or gyroastro compasses.</p>
<p>7A104 Gyro-astro compasses and other devices, other than those controlled by 7A004, which derive position or orientation by means of automatically tracking celestial bodies or satellites and “specially designed” “parts” and “components”</p>	<p>The list of items controlled is contained in the ECCN heading.</p>

therefor	
7A005 Global Navigation Satellite Systems (GNSS) receiving equipment having any of the following (see List of Items Controlled) and “specially designed” “components” therefor.	<p>a. Employing a decryption algorithm “specially designed” or modified for government use to access the ranging code for position and time; or</p> <p>b. Employing ‘adaptive antenna systems’.</p> <p>Note: 7A005.b does not apply to GNSS receiving equipment that only uses “components” designed to filter, switch, or combine signals from multiple omni-directional antennas that do not implement adaptive antenna techniques.</p> <p>Technical Note: For the purposes of 7A005.b ‘adaptive antenna systems’ dynamically generate one or more spatial nulls in an antenna array pattern by signal processing in the time domain or frequency domain.</p>
7A105 Receiving equipment for Global Navigation Satellite Systems (GNSS) (e.g. GPS, GLONASS, or Galileo)	<p>1. Designed or modified for use in “missiles”;</p> <p>or</p> <p>2. Designed or modified for airborne applications and having any of the following:</p> <p>2.a. Capable of providing navigation information at speeds in excess of 600 m/s (1,165 nautical mph);</p> <p>2.b. Employing decryption, designed or modified for military or governmental services, to gain access to GNSS secured signal/data; or</p> <p>2.c. Being “specially designed” to employ anti-jam features (e.g. null steering antenna or electronically steerable antenna) to function in an environment of active or passive countermeasures.</p> <p>Note to 7A105: See also 7A005 and 7A994</p>
7A006 Airborne altimeters operating at frequencies other than 4.2 to 4.4 GHz inclusive and having any of the following	<p>a. “Power management”; or</p> <p>b. Using phase shift key modulation.</p>
7A106 Altimeters, other than those controlled by 7A006, of radar or laser radar type, designed or modified for use in “missiles”.	<p>a. Internal tilt compensation in pitch (+/-90 degrees) and roll (+/-180 degrees) axes;</p> <p>b. Capable of providing azimuthal accuracy better (less) than 0.5 degrees rms at latitudes of +/- 80 degrees, referenced to local magnetic field; and</p> <p>c. Designed or modified to be integrated with flight control and navigation systems.</p> <p>Note: Flight control and navigation systems in 7A107 include gyrostabilizers, automatic pilots and inertial navigation systems.</p>
7A008 Underwater sonar navigation systems using Doppler velocity or correlation velocity logs integrated with a heading source and having a positioning accuracy of equal to or less (better) than 3% of distance	The list of items controlled is contained in the ECCN heading.

<p>traveled “Circular Error Probable” (“CEP”) and “specially designed” “components”</p>	
<p>7A115 Passive sensors for determining bearing to specific electromagnetic sources (direction finding equipment) or terrain characteristics, designed or modified for use in “missiles”.</p>	<p>(These items are “subject to the ITAR”. See 22 CFR parts 120 through 130.)</p>
<p>7A116 Flight control systems (hydraulic, mechanical, electro-optical, or electromechanical flight control systems (including fly-by-wire systems) and attitude control equipment) designed or modified for “missiles”.</p>	<p>(These items are “subject to the ITAR”. See 22 CFR parts 120 through 130.)</p>
<p>7A117 “Guidance sets” capable of achieving system accuracy of 3.33% or less of the range (e.g., a “CEP” of 10 km or less at a range of 300 km</p>	<p>(These items are “subject to the ITAR”. See 22 CFR parts 120 through 130.)</p>
<p>7A994 Other navigation direction finding equipment, airborne communication equipment</p>	<p>The list of items controlled is contained in the ECCN heading.</p> <p>Note 1) See also 7A005 and 7A105. (2) QRS11 Micromachined Angular Rate Sensors are “subject to the ITAR” (see 22 CFR parts 120 through 130), unless the QRS11-00100-100/101 is integrated into and included as an integral “component” of a commercial primary or standby instrument system of the type described in ECCN 7A994, or aircraft of the type described in ECCN 9A991 that incorporates such systems, or is exported solely for integration into such a system; or the QRS11-00050-443/569 is integrated into an automatic flight control system of the type described in ECCN 7A994, or aircraft of the type described in ECCN 9A991 that incorporates such systems, or are exported solely for integration into such a system. (See Commodity Jurisdiction requirements in 22 CFR Parts 121; Category VIII(e), Note(1).) In the latter case, such items are subject to the EAR.</p> <p>Technology specific to the development and production of QRS11 sensors remains “subject to the ITAR” (see 22 CFR parts 120 through 130).</p>

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