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**No. S 536**

STRATEGIC GOODS (CONTROL) ACT  
(CHAPTER 300)

STRATEGIC GOODS (CONTROL)  
ORDER 2018

ARRANGEMENT OF PARAGRAPHS

Paragraph

1. Citation and commencement
  2. Strategic goods and strategic goods technology
  3. Revocation
- The Schedule
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In exercise of the powers conferred by section 4A(1) of the Strategic Goods (Control) Act, the Minister for Trade and Industry makes the following Order:

**Citation and commencement**

1. This Order is the Strategic Goods (Control) Order 2018 and comes into operation on 1 November 2018.

**Strategic goods and strategic goods technology**

2. The goods and technology specified in the Schedule are strategic goods and strategic goods technology, respectively, for the purposes of the Act.

**Revocation**

3. The Strategic Goods (Control) Order 2017 (G.N. No. S 366/2017) is revoked.

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**THE SCHEDULE**

Paragraph 2

**PART 1****MILITARY GOODS THE EXPORT, TRANSHIPMENT OR BRINGING  
IN TRANSIT OF WHICH, AND TECHNOLOGY THE EXPORT OR  
TRANSMISSION OF WHICH, REQUIRE A PERMIT***Division 1 — Preliminary Provisions**Subdivision 1 — General Notes*

1. Non-controlled goods (including plant) containing one or more controlled components set out in Division 2 are to be considered controlled goods within Division 2, if the controlled components are the principal element of the non-controlled goods and can feasibly be removed or used for other purposes.
2. In determining whether goods are to be considered the principal element of other goods for the purposes of paragraph 1, factors such as the quantity, value and technological know-how involved, and other special circumstances which might establish the goods as the principal element of those other goods, must be weighed.
3. Goods specified in Division 2 include both new and used goods.
4. Chemicals in Division 2 are listed by name and CAS number. Chemicals of the same structural formula (including hydrates) as chemicals listed in Division 2 are to be considered as coming within the descriptions of the second-mentioned chemicals regardless of name or CAS number. CAS numbers are shown in order to assist in identifying whether a particular chemical or mixture is a chemical within Division 2, irrespective of nomenclature. CAS numbers are not intended to be used as unique identifiers, because some forms of the listed chemical have different CAS numbers, and mixtures containing a listed chemical may also have different CAS numbers.
5. Specially formulated pharmaceutical products that contain any item under Category Code ML8 in Division 2 are not treated as coming under that Division.
6. An aircraft is not treated as coming under Category Code ML10 in Division 2, if it has no item listed in that Division and it is not configured for military use.

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*Subdivision 2 — Definitions of Words and  
Expressions in this Part*

7. In this Part, a word or expression in quotation marks (“ ”) takes the definition set out against it in this paragraph:

“additives” (ML8) means substances used in explosive formulations to improve their properties;

“aircraft” (ML8, ML10, ML14) means a fixed wing, swivel wing, rotary wing (helicopter), tilt rotor or tilt-wing airborne vehicle;

“automated command and control systems” (ML11) means electronic systems, through which information essential to the effective operation of the grouping, major formation, tactical formation, unit, ship, subunit or weapons under command is entered, processed and transmitted. This is achieved by the use of computer and other specialised hardware designed to support the functions of a military command and control organisation. The main functions of an automated command and control system are the efficient automated collection, accumulation, storage and processing of information; the display of the situation and the circumstances affecting the preparation and conduct of combat operations; operational and tactical calculations for the allocation of resources among force groupings or elements of the operational order of battle or battle deployment according to the mission or stage of the operation; the preparation of data for appreciation of the situation and decision-making at any point during operation or battle; and computer simulation of operations;

“biocatalysts” (ML7, ML22) means enzymes for specific chemical or biochemical reactions or other biological compounds which bind to and accelerate the degradation of CW agents;

“biological agents” (ML7) means pathogens or toxins, selected or modified (such as by altering the purity, shelf life, virulence, dissemination characteristics, or resistance to UV radiation) to produce casualties in humans or animals, degrade equipment or damage crops or the environment;

“biopolymers” (ML7) means any of the following biological macromolecules:

- a. Enzymes for specific chemical or biochemical reactions;
- b. ‘Anti-idiotypic antibodies’, ‘monoclonal antibodies’ or ‘polyclonal antibodies’; or

- c. Specially designed or specially processed ‘receptors’;

*Technical Notes*

1. *‘Anti-idiotypic antibodies’ means antibodies which bind to the specific antigen binding sites of other antibodies.*
2. *‘Monoclonal antibodies’ means proteins which bind to one antigenic site and are produced by a single clone of cells.*
3. *‘Polyclonal antibodies’ means a mixture of proteins which bind to the specific antigen and are produced by more than one clone of cells.*
4. *‘Receptors’ means biological macromolecular structures capable of binding ligands, the binding of which affects physiological functions.*

“civil aircraft” (ML4, ML10) means an “aircraft” listed by designation in published airworthiness certification lists by civil aviation authorities of one or more “participating states” to fly commercial civil internal and external routes or for legitimate civil, private or business use;

“deactivated firearm” (ML1) means a firearm that has been made incapable of firing any projectile by processes. These processes permanently modify the essential elements of the firearm. Deactivation of the firearm may be attested by a certificate delivered by a competent authority of the country in which the firearm is deactivated and may be marked on the firearm by a stamp on an essential part;

“development” (All Categories) has the same meaning as in the Act;

“end-effectors” (ML17) means grippers, ‘active tooling units’ and any other tooling that is attached to the baseplate on the end of a “robot” manipulator arm;

*Technical Note*

*‘Active tooling units’ means devices for applying motive power, process energy or sensing to a workpiece.*

“energetic materials” (ML8) means substances or mixtures that react chemically to release energy required for their intended application. “Explosives”, “pyrotechnics” and “propellants” are subclasses of energetic materials;

“explosives” (ML8, ML18) means solid, liquid or gaseous substances or mixtures of substances which, in their application as primary, booster, or main charges in warheads, demolition and other applications, are required to detonate;

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“expression vectors” (ML7) means carriers (e.g. plasmid and virus) used to introduce genetic material into host cells;

“fibrous or filamentary materials” (ML13) includes the following:

- a. Continuous monofilaments;
- b. Continuous yarns and rovings;
- c. Tapes, fabrics, random mats and braids;
- d. Chopped fibres, staple fibres and coherent fibre blankets;
- e. Whiskers, either monocrystalline or polycrystalline, of any length;
- f. Aromatic polyamide pulp;

“first generation image intensifier tubes” (ML15) means electrostatically focused tubes, employing input and output fibre optic or glass face plates, or multi-alkali photocathodes (S-20 or S-25), but not microchannel plate amplifiers;

“fuel cell” (ML17) means an electrochemical device that converts chemical energy directly into Direct Current (DC) electricity by consuming fuel from an external source;

“laser” (ML9, ML17, ML19) means an item that produces spatially and temporally coherent light through amplification by stimulated emission of radiation;

“library” (parametric technical database) (ML17) means a collection of technical information, reference to which may enhance the performance of relevant systems, equipment or components;

“lighter-than-air vehicles” (ML10) means balloons and ‘airships’ that rely on hot air or on lighter-than-air gases such as helium or hydrogen for their lift;

*Technical Note*

*‘Airship’ means a power-driven airborne vehicle that is kept buoyant by a body of gas (usually helium, formerly hydrogen) which is lighter than air.*

“nuclear reactor” (ML17) includes the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain or come into direct contact with or control the primary coolant of the reactor core;

“participating state” (ML4, ML10) means a state participating in the Wassenaar Arrangement (details of which are set out in <https://www.wassenaar.org>);

“precursors” (ML8) means speciality chemicals used in the manufacture of “explosives”;

“production” (All Categories) has the same meaning as in the Act;

“propellants” (ML8, ML18) means substances or mixtures that react chemically to produce large volumes of hot gases at controlled rates to perform mechanical work;

“pyrotechnic(s)” (ML4, ML8) means mixtures of solid or liquid fuels and oxidisers which, when ignited, undergo an energetic chemical reaction at a controlled rate intended to produce specific time delays, or quantities of heat, noise, smoke, visible light or infrared radiation. Pyrophorics are a subclass of “pyrotechnics”, which contain no oxidisers but ignite spontaneously on contact with air;

“required” (ML22), in relation to “technology”, means only that portion of “technology” which is peculiarly responsible for achieving or exceeding the controlled performance levels, characteristics or functions. Such “required” “technology” may be shared by different products;

“riot control agents” (ML7) means substances which, under the expected conditions of use for riot control purposes, produce rapidly in human sensory irritation or disabling physical effects which disappear within a short time following termination of exposure;

*Technical Note*

*Tear gases are a subset of “riot control agents”.*

“robot” (ML17) means a manipulation mechanism, which may be of the continuous path or the point-to-point variety, may use sensors, and has all the following characteristics:

- a. It is multifunctional;
- b. It is capable of positioning or orienting material, parts, tools or special devices through variable movements in three dimensional space;
- c. It incorporates three or more closed or open loop servo-devices which may include stepping motors; and

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- d. It has ‘user-accessible programmability’ by means of the teach/playback method or by means of an electronic computer which may be a programmable logic controller, i.e. without mechanical intervention;

Technical Note

*‘User-accessible programmability’ means the facility allowing a user to insert, modify or replace ‘programs’ by means other than:*

- a. *A physical change in wiring or interconnections; or*
- b. *The setting of function controls including entry of parameters;*

Technical Note

*‘Program’ means a sequence of instructions to carry out a process in, or convertible into, a form executable by an electronic computer.*

Note

*“Robot” does not include the following devices:*

- a. *Manipulation mechanisms which are only manually or teleoperator controllable;*
- b. *Fixed sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The program is mechanically limited by fixed stops, such as pins or cams. The sequence of motions and the selection of paths or angles are not variable or changeable by mechanical, electronic or electrical means;*
- c. *Mechanically controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The program is mechanically limited by fixed, but adjustable stops such as pins or cams. The sequence of motions and the selection of paths or angles are variable within the fixed program pattern. Variations or modifications of the program pattern (e.g. changes of pins or exchanges of cams) in one or more motion axes are accomplished only through mechanical operations;*

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- d. *Non-servo-controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The program is variable but the sequence proceeds only by the binary signal from mechanically fixed electrical binary devices or adjustable stops;*
  - e. *Stacker cranes defined as Cartesian coordinate manipulator systems manufactured as an integral part of a vertical array of storage bins and designed to access the contents of those bins for storage or retrieval.*

“software” (All Categories) means a collection of one or more ‘programs’ or ‘microprograms’ recorded, stored or embodied in any device;

Technical Notes

1. *‘Program’ means a sequence of instructions to carry out a process in, or convertible into, a form executable by an electronic computer.*
2. *‘Microprogram’ means a sequence of elementary instructions maintained in a special storage, the execution of which is initiated by the introduction of its reference instruction into an instruction register.*

“spacecraft” (ML11) means active and passive satellites and space probes;

“space-qualified” (ML19) means designed, manufactured, or qualified through successful testing, for operation at altitudes greater than 100 km above the surface of the Earth;

Note

*A determination that a specific item is “space-qualified” by virtue of testing does not mean that other items in the same production run or model series are “space-qualified” if not individually tested.*

“superconductive” (ML20), in relation to any equipment, means the equipment is made of any material (such as a metal, alloy or compound) which can lose all electrical resistance (i.e. it can attain infinite electrical conductivity and carry very large electrical currents without Joule heating);

Technical Note

*The “superconductive” state of a material is individually characterised by a ‘critical temperature’, a critical magnetic field, which is a function of temperature, and a critical current density, which is a function of both magnetic field and temperature.*



Technical Note

*‘Critical temperature’ (sometimes referred to as the transition temperature) of a specific “superconductive” material is the temperature at which the material loses all resistance to the flow of direct electrical current.*

“technology” (All Categories) means information (including information comprised in such documents as specifications, blueprints, plans, manuals, models, diagrams, formulae, tables and designs) that is necessary for the “development”, “production” or ‘use’ of any goods;

Technical Note

*‘Use’ has the same meaning as in the Act.*

“unmanned aerial vehicle” (“UAV”) (ML10) means any “aircraft” capable of initiating flight and sustaining controlled flight and navigation without any human presence on board.

8. In paragraph 7, a reference to a Category Code (prefixed with the abbreviation “ML”) in brackets is a reference to that Category Code in Division 2 in which the defined word or expression appears.
9. In this Part, a word or expression enclosed with single quotation marks (‘ ’) takes the definition set out against it in the Technical Note that follows immediately after the definition in which the word or expression appears.

*Subdivision 3 — Acronyms and Abbreviations used in this Part*

The acronyms and abbreviations used in this Part and set out in the first column have the meanings set out against them in the second column.

<i>First Column</i>	<i>Second Column</i>
<i>Acronym or Abbreviation</i>	<i>Meaning</i>
CAS	Chemical Abstracts Service
CW	Chemical Warfare
UV	UltraViolet

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*Division 2 — List of Military Goods*


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<i>Category Code</i>	<i>Item Description</i>
ML1	<p>Smooth-bore weapons with a calibre of less than 20 mm, other arms and automatic weapons with a calibre of 12.7 mm (calibre 0.5 inches) or less and accessories, as follows, and specially designed components therefor:</p> <p><i>Note</i>  <i>Category Code ML1 does not apply to the following:</i></p> <ul style="list-style-type: none"> <li><i>a. Firearms specially designed for dummy ammunition and which are incapable of discharging a projectile;</i></li> <li><i>b. Firearms specially designed to launch tethered projectiles having no high explosive charge or communications link, to a range of less than or equal to 500 m;</i></li> <li><i>c. Weapons using non-centre fire cased ammunition and which are not of the fully automatic firing type;</i></li> <li><i>d. “Deactivated firearms”.</i></li> </ul> <ul style="list-style-type: none"> <li>a. Rifles and combination guns, handguns, machine, sub-machine and volley guns;</li> </ul> <p><i>Note</i>  <i>Category Code ML1.a. does not apply to the following:</i></p> <ul style="list-style-type: none"> <li><i>a. Rifles and combination guns, manufactured earlier than 1938;</i></li> <li><i>b. Reproductions of rifles and combination guns, the originals of which were manufactured earlier than 1890;</i></li> <li><i>c. Handguns, volley guns and machine guns, manufactured earlier than 1890, and their reproductions;</i></li> <li><i>d. Rifles or handguns, specially designed to discharge an inert projectile by compressed air or CO<sub>2</sub>.</i></li> </ul> <ul style="list-style-type: none"> <li>b. Smooth-bore weapons as follows: <ul style="list-style-type: none"> <li>1. Smooth-bore weapons specially designed for military use;</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Other smooth-bore weapons as follows:</p> <ol style="list-style-type: none"> <li>a. Fully automatic type weapons;</li> <li>b. Semi-automatic or pump-action type weapons;</li> </ol> <p><i>Note</i>  <i>Category Code ML1.b.2. does not apply to weapons specially designed to discharge an inert projectile by compressed air or CO<sub>2</sub>.</i></p> <p><i>Note</i>  <i>Category Code ML1.b. does not apply to the following:</i></p> <ol style="list-style-type: none"> <li>a. <i>Smooth-bore weapons manufactured earlier than 1938;</i></li> <li>b. <i>Reproductions of smooth-bore weapons, the originals of which were manufactured earlier than 1890;</i></li> <li>c. <i>Smooth-bore weapons used for hunting or sporting purposes. These weapons must not be specially designed for military use or of the fully automatic firing type;</i></li> <li>d. <i>Smooth-bore weapons specially designed for any of the following:</i> <ol style="list-style-type: none"> <li>1. <i>Slaughtering of domestic animals;</i></li> <li>2. <i>Tranquilising of animals;</i></li> <li>3. <i>Seismic testing;</i></li> <li>4. <i>Firing of industrial projectiles; <u>or</u></i></li> <li>5. <i>Disrupting Improvised Explosive Devices (IEDs).</i></li> </ol> <p><i><u>N.B.</u></i>  <i>For disruptors, see Category Code ML4 and Category Code IA006 in Division 2 of Part 2 of this Schedule.</i></p> </li> </ol> <p>c. Weapons using caseless ammunition;</p> <p>d. Accessories designed for arms specified by Category Code ML1.a., ML1.b. or ML1.c., as follows:</p> <ol style="list-style-type: none"> <li>1. Detachable cartridge magazines;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
ML2	<p>2 Sound suppressors or moderators;</p> <p>3. Special gun-mountings;</p> <p>4. Flash suppressors;</p> <p>5. Optical weapon-sights with electronic image processing;</p> <p>6. Optical weapon-sights specially designed for military use.</p> <p>Smooth-bore weapons with a calibre of 20 mm or more, other weapons or armament with a calibre greater than 12.7 mm (calibre 0.5 inches), projectors and accessories, as follows, and specially designed components therefor:</p> <p>a. Guns, howitzers, cannon, mortars, anti-tank weapons, projectile launchers, military flame throwers, rifles, recoilless rifles, smooth-bore weapons and signature reduction devices therefor;</p> <p><i>Note 1</i>  <i>Category Code ML2.a. includes injectors, metering devices, storage tanks and other specially designed components for use with liquid propelling charges for any of the equipment specified in Category Code ML2.a.</i></p> <p><i>Note 2</i>  <i>Category Code ML2.a. does not apply to weapons as follows:</i></p> <p>a. <i>Rifles, smooth-bore weapons and combination guns, manufactured earlier than 1938;</i></p> <p>b. <i>Reproductions of rifles, smooth-bore weapons and combination guns, the originals of which were manufactured earlier than 1890;</i></p> <p>c. <i>Guns, howitzers, cannons and mortars, manufactured earlier than 1890;</i></p> <p>d. <i>Smooth-bore weapons used for hunting or sporting purposes. These weapons must not be specially designed for military use or of the fully automatic firing type;</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>e. <i>Smooth-bore weapons specially designed for any of the following:</i></p> <ol style="list-style-type: none"> <li>1. <i>Slaughtering of domestic animals;</i></li> <li>2. <i>Tranquilising of animals;</i></li> <li>3. <i>Seismic testing;</i></li> <li>4. <i>Firing of industrial projectiles; <u>or</u></i></li> <li>5. <i>Disrupting Improvised Explosive Devices (IEDs);</i></li> </ol> <p><u>N.B.</u> <i>For disruptors, see Category Code ML4 and Category Code 1A006 in Division 2 of Part 2 of this Schedule.</i></p> <p>f. <i>Hand-held projectile launchers specially designed to launch tethered projectiles having no high explosive charge or communications link, to a range of less than or equal to 500 m.</i></p> <p>b. <i>Smoke, gas and pyrotechnic projectors or generators, specially designed or modified for military use;</i></p> <p><u>Note</u> <i>Category Code ML2.b. does not apply to signal pistols.</i></p> <p>c. <i>Weapon-sights and weapon-sight mounts, having both of the following characteristics:</i></p> <ol style="list-style-type: none"> <li>1. <i>Specially designed for military use; <u>and</u></i></li> <li>2. <i>Specially designed for weapons specified in Category Code ML2.a.;</i></li> </ol> <p>d. <i>Mountings and detachable cartridge magazines, specially designed for the weapons specified in Category Code ML2.a.</i></p>
ML3	<p><i>Ammunition and fuse setting devices, as follows, and specially designed components therefor:</i></p> <p>a. <i>Ammunition for weapons specified in Category Code ML1, ML2 or ML12;</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Fuse setting devices specially designed for ammunition specified in Category Code ML3.a.</p> <p><u>Note 1</u> Specially designed components specified in Category Code ML3 include:</p> <p>a. Metal or plastic fabrications such as primer anvils, bullet cups, cartridge links, rotating bands and munitions metal parts;</p> <p>b. Safing and arming devices, fuses, sensors and initiation devices;</p> <p>c. Power supplies with high one-time operational output;</p> <p>d. Combustible cases for charges;</p> <p>e. Submunitions including bomblets, minelets and terminally guided projectiles.</p> <p><u>Note 2</u> Category Code ML3.a. does not apply to any of the following:</p> <p>a. Ammunition crimped without a projectile (blank star);</p> <p>b. Dummy ammunition with a pierced powder chamber;</p> <p>c. Other blank and dummy ammunition, not incorporating components designed for live ammunition; <u>or</u></p> <p>d. Components specially designed for blank or dummy ammunition, specified in this Note 2.a., b., or c.</p> <p><u>Note 3</u> Category Code ML3.a. does not apply to cartridges specially designed for any of the following purposes:</p> <p>a. Signalling;</p> <p>b. Bird scaring; <u>or</u></p> <p>c. Lighting of gas flares at oil wells.</p>

<i>Category Code</i>	<i>Item Description</i>
ML4	<p>Bombs, torpedoes, rockets, missiles, other explosive devices and charges and related equipment and accessories, as follows, and specially designed components therefor:</p> <p><u><i>N.B. 1</i></u>  <i>For guidance and navigation equipment, see Category Code ML11.</i></p> <p><u><i>N.B. 2</i></u>  <i>For Aircraft Missile Protection Systems (AMPS), see Category Code ML4.c.</i></p> <p>a. Bombs, torpedoes, grenades, smoke canisters, rockets, mines, missiles, depth charges, demolition-charges, demolition-devices, demolition-kits, “pyrotechnic” devices, cartridges and simulators (i.e. equipment simulating the characteristics of any of these items), specially designed for military use;</p> <p><u><i>Note</i></u>  <i>Category Code ML4.a. includes:</i></p> <p>a. <i>Smoke grenades, fire bombs, incendiary bombs and explosive devices;</i></p> <p>b. <i>Missile rocket nozzles and re-entry vehicle nosetips.</i></p> <p>b. Equipment having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Specially designed for military use; <u>and</u></li> <li>2. Specially designed for ‘activities’ relating to either of the following: <ol style="list-style-type: none"> <li>a. Items specified in Category Code ML4.a.; <u>or</u></li> <li>b. Improvised Explosive Devices (IEDs);</li> </ol> </li> </ol> <p><u><i>Technical Note</i></u>  <i>For the purpose of Category Code ML4.b.2., ‘activities’ applies to handling, launching, laying, controlling, discharging, detonating, activating, powering with one-time operational output, decoying, jamming, sweeping, detecting, disrupting or disposing.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p><u>Note 1</u>  Category Code ML4.b. includes:</p> <ol style="list-style-type: none"> <li>a. Mobile gas liquefying equipment capable of producing 1,000 kg or more per day of gas in liquid form;</li> <li>b. Buoyant electric conducting cable suitable for sweeping magnetic mines.</li> </ol> <p><u>Note 2</u>  Category Code ML4.b. does not apply to hand-held devices limited by design solely to the detection of metal objects and incapable of distinguishing between mines and other metal objects.</p> <p>c. Aircraft Missile Protection Systems (AMPS).</p> <p><u>Note</u>  Category Code ML4.c. does not apply to AMPS having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Have either of the following missile warning sensors: <ol style="list-style-type: none"> <li>1. Passive sensors having peak response between 100 nm – 400 nm; <u>or</u></li> <li>2. Active pulsed Doppler missile warning sensors;</li> </ol> </li> <li>b. Have countermeasures dispensing systems;</li> <li>c. Have flares, which exhibit both a visible signature and an infrared signature, for acting as decoys for surface-to-air missiles; <u>and</u></li> <li>d. Installed on “civil aircraft” and having all of the following characteristics: <ol style="list-style-type: none"> <li>1. The AMPS is only operable in a specific “civil aircraft” in which the specific AMPS is installed and for which either of the following has been issued: <ol style="list-style-type: none"> <li>a. A civil Type Certificate issued by civil aviation authorities of one or more “participating states”; <u>or</u></li> </ol> </li> </ol> </li> </ol>



<i>Category Code</i>	<i>Item Description</i>
ML5	<p data-bbox="715 454 1272 548"><i>b. An equivalent document recognised by the International Civil Aviation Organisation (ICAO);</i></p> <p data-bbox="651 568 1272 633"><i>2. The AMPS employs protection to prevent unauthorised access to “software”; and</i></p> <p data-bbox="651 654 1272 784"><i>3. The AMPS incorporates an active mechanism that forces the system not to function when it is removed from the “civil aircraft” in which it was installed.</i></p> <p data-bbox="501 853 1272 983">Fire control, and related alerting and warning equipment, and related systems, test and alignment and countermeasure equipment, as follows, specially designed for military use, and specially designed components and accessories therefor:</p> <p data-bbox="501 1003 1272 1068"><i>a. Weapon-sights, bombing computers, gun laying equipment and weapon control systems;</i></p> <p data-bbox="501 1088 1272 1218"><i>b. Target acquisition, designation, range-finding, surveillance or tracking systems; detection, data fusion, recognition or identification equipment; and sensor integration equipment;</i></p> <p data-bbox="501 1238 1272 1303"><i>c. Countermeasure equipment for items specified in Category Code ML5.a. or ML5.b.;</i></p> <p data-bbox="564 1323 628 1350"><i>Note</i></p> <p data-bbox="564 1361 1272 1426"><i>For the purpose of Category Code ML5.c., countermeasure equipment includes detection equipment.</i></p> <p data-bbox="501 1447 1272 1543"><i>d. Field test or alignment equipment, specially designed for items specified in Category Code ML5.a., ML5.b. or ML5.c.</i></p>
ML6	<p data-bbox="501 1615 1043 1641">Ground vehicles and components, as follows:</p> <p data-bbox="501 1662 564 1688"><i>N.B.</i></p> <p data-bbox="501 1709 1272 1769"><i>For guidance and navigation equipment, see Category Code ML11.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. Ground vehicles and components therefor, specially designed or modified for military use;</p> <p><u>Technical Note</u>  <i>For the purpose of Category Code ML6.a., the term ground vehicles includes trailers.</i></p> <p>b. Other ground vehicles and components, as follows:</p> <p>1. Vehicles having all of the following characteristics:</p> <p>a. Manufactured or fitted with materials or components to provide ballistic protection to level III (NIJ 0108.01, September 1985, or comparable national standard) or better;</p> <p>b. Have a transmission to provide drive to both front and rear wheels simultaneously, including those vehicles having additional wheels for load bearing purposes whether driven or not;</p> <p>c. Gross Vehicle Weight Rating (GVWR) greater than 4,500 kg; <u>and</u></p> <p>d. Designed or modified for off-road use;</p> <p>2. Components having both of the following characteristics:</p> <p>a. Specially designed for vehicles specified in Category Code ML6.b.1.; <u>and</u></p> <p>b. Providing ballistic protection to level III (NIJ 0108.01, September 1985, or comparable national standard) or better.</p> <p><u>N.B.</u>  <i>See also Category Code ML13.a.</i></p> <p><u>Note 1</u>  <i>Category Code ML6.a. includes:</i></p> <p>a. <i>Tanks and other military armed vehicles and military vehicles fitted with mountings for arms or equipment for mine laying or the launching of munitions specified in Category Code ML4;</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="502 448 798 481"><i>b. Armoured vehicles;</i></p> <p data-bbox="502 504 1101 537"><i>c. Amphibious and deep water fording vehicles;</i></p> <p data-bbox="502 548 1260 649"><i>d. Recovery vehicles and vehicles for towing or transporting ammunition or weapon systems and associated load handling equipment.</i></p> <p data-bbox="502 660 582 694"><u><i>Note 2</i></u></p> <p data-bbox="502 705 1260 840"><i>Under Category Code ML6.a., modification of a ground vehicle for military use entails a structural, electrical or mechanical change involving one or more components that are specially designed for military use. Such components include:</i></p> <p data-bbox="502 851 1260 929"><i>a. Pneumatic tyre casings of a kind specially designed to be bullet-proof;</i></p> <p data-bbox="502 940 1260 1008"><i>b. Armoured protection of vital parts (e.g. fuel tanks or vehicle cabs);</i></p> <p data-bbox="502 1019 1165 1052"><i>c. Special reinforcements or mountings for weapons;</i></p> <p data-bbox="502 1064 790 1097"><i>d. Black-out lighting.</i></p> <p data-bbox="502 1120 582 1153"><u><i>Note 3</i></u></p> <p data-bbox="502 1164 1260 1232"><i>Category Code ML6 does not apply to civil vehicles designed or modified for transporting money or valuables.</i></p> <p data-bbox="502 1243 582 1276"><u><i>Note 4</i></u></p> <p data-bbox="502 1288 1260 1355"><i>Category Code ML6 does not apply to vehicles that meet all of the following:</i></p> <p data-bbox="502 1366 957 1400"><i>a. Were manufactured before 1946;</i></p> <p data-bbox="502 1422 1260 1523"><i>b. Do not have items specified in any part of this Division and manufactured after 1945, except for reproductions of original components or accessories for the vehicle; <u>and</u></i></p> <p data-bbox="502 1534 1260 1635"><i>c. Do not incorporate weapons specified in Category Code ML1, ML2 or ML4 unless they are inoperable and incapable of discharging a projectile.</i></p>

<i>Category Code</i>	<i>Item Description</i>
ML7	<p>Chemical agents, “biological agents”, “riot control agents”, radioactive materials, related equipment, components and materials, as follows:</p> <ol style="list-style-type: none"> <li>a. “Biological agents” or radioactive materials selected or modified to increase their effectiveness in producing casualties in humans or animals, degrading equipment or damaging crops or the environment;</li> <li>b. Chemical Warfare (CW) agents, including: <ol style="list-style-type: none"> <li>1. CW nerve agents: <ol style="list-style-type: none"> <li>a. O-Alkyl (equal to or less than C<sub>10</sub>, including cycloalkyl) alkyl (Methyl, Ethyl, n-Propyl or Isopropyl)-phosphonofluoridates, such as: <ol style="list-style-type: none"> <li>1. Sarin (GB):O-Isopropyl methylphosphonofluoridate (107-44-8);</li> <li>2. Soman (GD):O-Pinacolyl methylphosphonofluoridate (96-64-0);</li> </ol> </li> <li>b. O-Alkyl (equal to or less than C<sub>10</sub>, including cycloalkyl) N,N-dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphoramidocyanidates, such as: <ol style="list-style-type: none"> <li>1. Tabun (GA):O-Ethyl N,N-dimethylphosphoramidocyanidate (77-81-6);</li> </ol> </li> <li>c. O-Alkyl (H or equal to or less than C<sub>10</sub>, including cycloalkyl) S-2-dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl)-aminoethyl alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphonothiolates and corresponding alkylated and protonated salts, such as: <ol style="list-style-type: none"> <li>1. VX: O-Ethyl S-2-diisopropylaminoethyl methyl phosphonothiolate (50782-69-9);</li> </ol> </li> </ol> </li> <li>2. CW vesicant agents: <ol style="list-style-type: none"> <li>a. Sulphur mustards, such as: <ol style="list-style-type: none"> <li>1. 2-Chloroethylchloromethylsulphide (2625-76-5);</li> </ol> </li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	2. Bis(2-chloroethyl) sulphide (505-60-2);
	3. Bis(2-chloroethylthio) methane (63869-13-6);
	4. 1,2-bis (2-chloroethylthio) ethane (3563-36-8);
	5. 1,3-bis (2-chloroethylthio) -n-propane (63905-10-2);
	6. 1,4-bis (2-chloroethylthio) -n-butane (142868-93-7);
	7. 1,5-bis (2-chloroethylthio) -n-pentane (142868-94-8);
	8. Bis (2-chloroethylthiomethyl) ether (63918-90-1);
	9. Bis (2-chloroethylthioethyl) ether (63918-89-8);
	b. Lewisites, such as:
	1. 2-chlorovinylchloroarsine (541-25-3);
	2. Tris (2-chlorovinyl) arsine (40334-70-1);
	3. Bis (2-chlorovinyl) chloroarsine (40334-69-8);
	c. Nitrogen mustards, such as:
	1. HN1: bis (2-chloroethyl) ethylamine (538-07-8);
	2. HN2: bis (2-chloroethyl) methylamine (51-75-2);
	3. HN3: tris (2-chloroethyl) amine (555-77-1);
	3. CW incapacitating agents, such as:
	a. 3-Quinuclidinyl benzilate (BZ) (6581-06-2);
	4. CW defoliants, such as
	a. Butyl 2-chloro-4-fluorophenoxyacetate (LNF);

<i>Category Code</i>	<i>Item Description</i>
	<p>b. 2,4,5-trichlorophenoxyacetic acid (93-76-5) mixed with 2,4-dichlorophenoxyacetic acid (94-75-7) (Agent Orange (39277-47-9));</p> <p>c. CW binary precursors and key precursors, as follows:</p> <ol style="list-style-type: none"> <li>1. Alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) Phosphonyl Difluorides, such as:           <ol style="list-style-type: none"> <li>a. DF: Methyl Phosphonyldifluoride (676-99-3);</li> </ol> </li> <li>2. O-Alkyl (H or equal to or less than C<sub>10</sub>, including cycloalkyl) O-2-dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl)-aminoethyl alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphonites and corresponding alkylated and protonated salts, such as:           <ol style="list-style-type: none"> <li>a. QL: O-Ethyl O-2-di-isopropylaminoethyl methylphosphonite (57856-11-8);</li> </ol> </li> <li>3. Chlorosarin: O-Isopropyl methylphosphonochloridate (1445-76-7);</li> <li>4. Chlorosoman: O-Pinacolyl methylphosphonochloridate (7040-57-5);</li> </ol> <p>d. “Riot control agents”, active constituent chemicals and combinations thereof, including:</p> <ol style="list-style-type: none"> <li>1. α-Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (5798-79-8);</li> <li>2. [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenemalononitrile) (CS) (2698-41-1);</li> <li>3. 2-Chloro-1-phenylethanone, Phenylacyl chloride (ω-chloroacetophenone) (CN) (532-27-4);</li> <li>4. Dibenz-(b,f)-1,4-oxazepine, (CR) (257-07-8);</li> <li>5. 10-Chloro-5,10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (578-94-9);</li> <li>6. N-Nonanoylmorpholine, (MPA) (5299-64-9);</li> </ol> <p><i>Note 1</i>  <i>Category Code ML7.d. does not apply to “riot control agents” individually packaged for personal self-defence purposes.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="564 454 647 483"><u>Note 2</u></p> <p data-bbox="564 495 1262 591"><i>Category Code ML7.d. does not apply to active constituent chemicals, and combinations thereof, identified and packaged for food production or medical purposes.</i></p> <p data-bbox="501 613 1262 710">e. <i>Equipment, specially designed or modified for military use, designed or modified for the dissemination of either of the following, and specially designed components therefor:</i></p> <ol data-bbox="564 725 1262 875" style="list-style-type: none"> <li data-bbox="564 725 1262 792">1. <i>Materials or agents specified in Category Code ML7.a., ML7.b. or ML7.d.; or</i></li> <li data-bbox="564 808 1262 875">2. <i>CW agents made up of precursors specified in Category Code ML7.c.;</i></li> </ol> <p data-bbox="501 898 1262 994">f. <i>Protective and decontamination equipment, specially designed or modified for military use, components and chemical mixtures, as follows:</i></p> <ol data-bbox="564 1010 1262 1442" style="list-style-type: none"> <li data-bbox="564 1010 1262 1144">1. <i>Equipment designed or modified for defence against materials specified in Category Code ML7.a., ML7.b. or ML7.d., and specially designed components therefor;</i></li> <li data-bbox="564 1160 1262 1294">2. <i>Equipment designed or modified for decontamination of objects contaminated with materials specified in Category Code ML7.a. or ML7.b., and specially designed components therefor;</i></li> <li data-bbox="564 1310 1262 1442">3. <i>Chemical mixtures specially developed or formulated for the decontamination of objects contaminated with materials specified in Category Code ML7.a. or ML7.b.;</i></li> </ol> <p data-bbox="564 1464 628 1494"><u>Note</u></p> <p data-bbox="564 1505 970 1534"><i>Category Code ML7.f.1. includes:</i></p> <ol data-bbox="564 1556 1262 1675" style="list-style-type: none"> <li data-bbox="564 1556 1262 1624">a. <i>Air conditioning units specially designed or modified for nuclear, biological or chemical filtration;</i></li> <li data-bbox="564 1639 863 1668">b. <i>Protective clothing.</i></li> </ol> <p data-bbox="564 1691 624 1720"><u>N.B.</u></p> <p data-bbox="564 1731 1262 1827"><i>For civil gas masks, protective and decontamination equipment, see also Category Code 1A004 in Division 2 of Part 2 of this Schedule.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="502 448 1260 582">g. Equipment, specially designed or modified for military use, designed or modified for the detection or identification of materials specified in Category Code ML7.a., ML7.b. or ML7.d., and specially designed components therefor;</p> <p data-bbox="566 604 630 638"><i>Note</i></p> <p data-bbox="566 638 1260 705"><i>Category Code ML7.g. does not apply to personal radiation monitoring dosimeters.</i></p> <p data-bbox="566 728 630 761"><i>N.B.</i></p> <p data-bbox="566 761 1260 828"><i>See also Category Code IA004 in Division 2 of Part 2 of this Schedule.</i></p> <p data-bbox="502 851 1260 974">h. “Biopolymers” specially designed or processed for the detection or identification of CW agents specified in Category Code ML7.b., and the cultures of specific cells used to produce them;</p> <p data-bbox="502 996 1260 1064">i. “Biocatalysts” for the decontamination or degradation of CW agents, and biological systems therefor, as follows:</p> <ol data-bbox="566 1086 1260 1512" style="list-style-type: none"> <li data-bbox="566 1086 1260 1243">1. “Biocatalysts” specially designed for the decontamination or degradation of CW agents specified in Category Code ML7.b., and resulting from directed laboratory selection or genetic manipulation of biological systems;</li> <li data-bbox="566 1265 1260 1512">2. Biological systems containing the genetic information specific to the production of “biocatalysts” specified in Category Code ML7.i.1., as follows: <ol data-bbox="646 1388 981 1512" style="list-style-type: none"> <li data-bbox="646 1388 981 1422">a. “Expression vectors”;</li> <li data-bbox="646 1433 981 1467">b. Viruses;</li> <li data-bbox="646 1478 981 1512">c. Cultures of cells.</li> </ol> </li> </ol> <p data-bbox="502 1534 582 1568"><i>Note 1</i></p> <p data-bbox="502 1579 1260 1646"><i>Category Codes ML7.b. and ML7.d. do not apply to the following:</i></p> <ol data-bbox="502 1657 1053 1836" style="list-style-type: none"> <li data-bbox="502 1657 1053 1691">a. Cyanogen chloride (506-77-4);</li> <li data-bbox="502 1702 1053 1736">b. Hydrocyanic acid (74-90-8);</li> <li data-bbox="502 1747 1053 1780">c. Chlorine (7782-50-5);</li> <li data-bbox="502 1792 1053 1836">d. Carbonyl chloride (phosgene) (75-44-5);</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>e. <i>Diphosgene (trichloromethyl-chloroformate) (503-38-8);</i></p> <p>f. <i>Not used;</i></p> <p>g. <i>Xylyl bromide, ortho: (89-92-9), meta: (620-13-3), para: (104-81-4);</i></p> <p>h. <i>Benzyl bromide (100-39-0);</i></p> <p>i. <i>Benzyl iodide (620-05-3);</i></p> <p>j. <i>Bromo acetone (598-31-2);</i></p> <p>k. <i>Cyanogen bromide (506-68-3);</i></p> <p>l. <i>Bromo methylethylketone (816-40-0);</i></p> <p>m. <i>Chloro acetone (78-95-5);</i></p> <p>n. <i>Ethyl iodoacetate (623-48-3);</i></p> <p>o. <i>Iodo acetone (3019-04-3);</i></p> <p>p. <i>Chloropicrin (76-06-2).</i></p> <p><u>Note 2</u></p> <p><i>The cultures of cells and biological systems specified in Category Codes ML7.h. and ML7.i.2. are exclusive and these sub-items do not apply to cells or biological systems for civil purposes, such as:</i></p> <p>a. <i>agricultural, pharmaceutical, medical, veterinary, environmental or waste management purposes; <u>or</u></i></p> <p>b. <i>in the food industry.</i></p>
ML8	<p>“Energetic materials” and related substances, as follows:</p> <p><u>N.B. 1</u></p> <p><i>See also Category Code 1C011 in Division 2 of Part 2 of this Schedule.</i></p> <p><u>N.B. 2</u></p> <p><i>For charges and devices, see Category Code ML4 and Category Code 1A008 in Division 2 of Part 2 of this Schedule.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. For the purpose of Category Code ML8, excluding Category Code ML8.c.11. or ML8.c.12., 'mixture' refers to a composition of two or more substances with at least one substance being listed in the sub-items under this Category Code.</li> <li>2. Any substance listed in the sub-items under Category Code ML8 is treated as coming within the description of that substance even when utilised in an application other than that indicated. (e.g. TAGN is predominantly used as an explosive but can also be used either as a fuel or an oxidiser.)</li> <li>3. For the purpose of Category Code ML8, particle size is the mean particle diameter on a weight or volume basis. International or equivalent national standards will be used in sampling and determining particle size. <ol style="list-style-type: none"> <li>a. "Explosives" as follows, and 'mixtures' thereof: <ol style="list-style-type: none"> <li>1. ADNBF (aminodinitrobenzofuroxan or 7-amino-4,6-dinitrobenzofurazane-1-oxide) (97096-78-1);</li> <li>2. BNCP (cis-bis (5-nitrotetrazolato) tetra amine-cobalt (III) perchlorate) (117412-28-9);</li> <li>3. CL-14 (diamino dinitrobenzofuroxan or 5,7-diamino-4,6-dinitrobenzofurazane-1-oxide) (117907-74-1);</li> <li>4. CL-20 (HNIW or Hexanitrohexaazaisowurtzitane) (135285-90-4); chlathrates of CL-20 (see also Category Codes ML8.g.3. and g.4. for its "precursors");</li> <li>5. CP (2-(5-cyanotetrazolato) penta amine-cobalt (III) perchlorate) (70247-32-4);</li> <li>6. DADE (1,1-diamino-2,2-dinitroethylene, FOX7) (145250-81-3);</li> <li>7. DATB (diaminotrinitrobenzene) (1630-08-6);</li> <li>8. DDFP (1,4-dinitrodifurazanopiperazine);</li> <li>9. DDPO (2,6-diamino-3,5-dinitropyrazine-1-oxide, PZO) (194486-77-6);</li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>10. DIPAM (3,3'-diamino-2,2',4,4',6,6'-hexanitrobiphenyl or dipicramide) (17215-44-0);</p> <p>11. DNGU (DINGU or dinitroglycoluril) (55510-04-8);</p> <p>12. Furazans as follows:</p> <ul style="list-style-type: none"> <li>a. DAAOF (DAAF, DAAFox, or diaminoazoxyfuran);</li> <li>b. DAAzF (diaminoazofuran) (78644-90-3);</li> </ul> <p>13. HMX and derivatives (see also Category Code ML8.g.5. for its "precursors"), as follows:</p> <ul style="list-style-type: none"> <li>a. HMX (Cyclotetramethylenetetranitramine, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazine, 1,3,5,7-tetranitro-1,3,5,7-tetraza-cyclooctane, octogen or octogene) (2691-41-0);</li> <li>b. Difluoroaminated analogs of HMX;</li> <li>c. K-55 (2,4,6,8-tetranitro-2,4,6,8-tetraazabicyclo [3,3,0]-octanone-3, tetranitrosemiglycouril or keto-bicyclic HMX) (130256-72-3);</li> </ul> <p>14. HNAD (hexanitroadamantane) (143850-71-9);</p> <p>15. HNS (hexanitrostilbene) (20062-22-0);</p> <p>16. Imidazoles as follows:</p> <ul style="list-style-type: none"> <li>a. BNNII (Octahydro-2,5-bis(nitroimino)imidazo [4,5-d]imidazole);</li> <li>b. DNI (2,4-dinitroimidazole) (5213-49-0);</li> <li>c. FDIA (1-fluoro-2,4-dinitroimidazole);</li> <li>d. NTDNIA (N-(2-nitrotriazolo)-2,4-dinitroimidazole);</li> <li>e. PTIA (1-picryl-2,4,5-trinitroimidazole);</li> </ul> <p>17. NTNMH (1-(2-nitrotriazolo)-2-dinitromethylene hydrazine);</p> <p>18. NTO (ONTA or 3-nitro-1,2,4-triazol-5-one) (932-64-9);</p> <p>19. Polynitrocubanes with more than four nitro groups;</p>

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	<p>20. PYX (2,6-Bis(picrylamino)-3,5-dinitropyridine) (38082-89-2);</p> <p>21. RDX and derivatives, as follows:</p> <ul style="list-style-type: none"> <li>a. RDX (cyclotrimethylenetrinitramine, cyclonite, T4, hexahydro-1,3,5-trinitro-1,3,5-triazine, 1,3,5-trinitro-1,3,5-triazacyclohexane, hexogen or hexogene) (121-82-4);</li> <li>b. Keto-RDX (K-6 or 2,4,6-trinitro-2,4,6-triazacyclohexanone) (115029-35-1);</li> </ul> <p>22. TAGN (triaminoguanidinenitrate) (4000-16-2);</p> <p>23. TATB (triaminotrinitrobenzene) (3058-38-6) (see also Category Code ML8.g.7. for its “precursors”);</p> <p>24. TEDDZ (3,3,7,7-tetrabis(difluoroamine) octahydro-1,5-dinitro-1,5-diazocine);</p> <p>25. Tetrazoles as follows:</p> <ul style="list-style-type: none"> <li>a. NTAT (nitrotriazol aminotetrazole);</li> <li>b. NTNT (1-N-(2-nitrotriazolo)-4-nitrotetrazole);</li> </ul> <p>26. Tetryl (trinitrophenylmethylnitramine) (479-45-8);</p> <p>27. TNAD (1,4,5,8-tetranitro-1,4,5,8-tetraazadecalin) (135877-16-6) (see also Category Code ML8.g.6. for its “precursors”);</p> <p>28. TNAZ (1,3,3-trinitroazetidine) (97645-24-4) (see also Category Code ML8.g.2. for its “precursors”);</p> <p>29. TNGU (SORGUYL or tetranitroglycoluril) (55510-03-7);</p> <p>30. TNP (1,4,5,8-tetranitro-pyridazino[4,5-d]pyridazine) (229176-04-9);</p> <p>31. Triazines as follows:</p> <ul style="list-style-type: none"> <li>a. DNAM (2-oxy-4,6-dinitroamino-s-triazine) (19899-80-0);</li> <li>b. NNHT (2-nitroimino-5-nitro-hexahydro-1,3,5-triazine) (130400-13-4);</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>32. Triazoles as follows:</p> <ul style="list-style-type: none"> <li>a. 5-azido-2-nitrotriazole;</li> <li>b. ADHTDN (4-amino-3,5-dihydrazino-1,2,4-triazole dinitramide) (1614-08-0);</li> <li>c. ADNT (1-amino-3,5-dinitro-1,2,4-triazole);</li> <li>d. BDNTA ((bis-dinitrotriazole)amine);</li> <li>e. DBT (3,3'-dinitro-5,5-bi-1,2,4-triazole) (30003-46-4);</li> <li>f. DNBT (dinitrobistriazole) (70890-46-9);</li> <li>g. Not used;</li> <li>h. NTDNT (1-N-(2-nitrotriazolo) 3,5-dinitrotriazole);</li> <li>i. PDNT (1-picryl-3,5-dinitrotriazole);</li> <li>j. TACOT (tetranitrobenzotriazolobenzotriazole) (25243-36-1);</li> </ul> <p>33. Explosives not listed elsewhere in Category Code ML8.a. and having either of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Detonation velocity exceeding 8,700 m/s, at maximum density; <u>or</u></li> <li>b. Detonation pressure exceeding 34 GPa (340 kbar);</li> </ul> <p>34. Not used;</p> <p>35. DNAN (2,4-dinitroanisole) (119-27-7);</p> <p>36. TEX (4,10-Dinitro-2,6,8,12-tetraoxa-4,10-diazaisowurtzitane);</p> <p>37. GUDN (Guanylurea dinitramide) FOX-12 (217464-38-5);</p> <p>38. Tetrazines as follows:</p> <ul style="list-style-type: none"> <li>a. BTAT (Bis(2,2,2-trinitroethyl)-3,6-diaminotetrazine);</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="651 454 1267 521">b. LAX-112 (3,6-diamino-1,2,4,5-tetrazine-1,4-dioxide);</p> <p data-bbox="564 539 1267 674">39. Energetic ionic materials melting between 343 K (70°C) and 373 K (100°C) and with detonation velocity exceeding 6,800 m/s or detonation pressure exceeding 18 GPa (180 kbar);</p> <p data-bbox="564 689 1150 757">40. BTNEN (Bis(2,2,2-trinitroethyl)-nitramine) (19836-28-3);</p> <p data-bbox="564 772 1267 840">41. FTDO (5,6-(3',4'-furazano)-1,2,3,4-tetrazine-1,3-dioxide);</p> <p data-bbox="564 855 1126 889">42. EDNA (Ethylenedinitramine) (505-71-5);</p> <p data-bbox="564 904 628 938"><u>Note</u></p> <p data-bbox="564 947 1225 981"><i>Category Code ML8.a. includes 'explosive co-crystals'.</i></p> <p data-bbox="628 996 815 1030"><u>Technical Note</u></p> <p data-bbox="628 1039 1267 1205"><i>An 'explosive co-crystal' is a solid material consisting of an ordered three dimensional arrangement of two or more explosive molecules, where at least one is specified in Category Code ML8.a.</i></p> <p data-bbox="501 1220 863 1254">b. "Propellants" as follows:</p> <ol data-bbox="564 1272 1267 1868" style="list-style-type: none"> <li data-bbox="564 1272 1267 1429">1. Any solid "propellant" with a theoretical specific impulse (under standard conditions) of more than: <ol data-bbox="651 1357 1267 1554" style="list-style-type: none"> <li data-bbox="651 1357 1267 1424">a. 240 seconds for non-metallised, non-halogenised "propellant";</li> <li data-bbox="651 1440 1267 1507">b. 250 seconds for non-metallised, halogenised "propellant"; <u>or</u></li> <li data-bbox="651 1523 1267 1554">c. 260 seconds for metallised "propellant";</li> </ol> </li> <li data-bbox="564 1570 746 1603">2. Not used;</li> <li data-bbox="564 1619 1267 1686">3. "Propellants" having a force constant of more than 1,200 kJ/kg;</li> <li data-bbox="564 1702 1267 1868">4. "Propellants" that can sustain a steady-state linear burning rate of more than 38 mm/s under standard conditions (as measured in the form of an inhibited single strand) of 6.89 MPa (68.9 bar) pressure and 294 K (21°C);</li> </ol>

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	<p>5. Elastomer Modified Cast Double Base (EMCDB) “propellants” with extensibility at maximum stress of more than 5% at 233 K (-40°C);</p> <p>6. Any “propellant” containing substances specified in Category Code ML8.a.;</p> <p>7. “Propellants”, not specified elsewhere in any part of this Division, specially designed for military use;</p> <p>c. “Pyrotechnics”, fuels and related substances, as follows, and ‘mixtures’ thereof:</p> <p>1. “Aircraft” fuels specially formulated for military purposes;</p> <p><i>Note 1</i>  <i>Category Code ML8.c.1. does not apply to the following “aircraft” fuels: JP-4, JP-5, and JP-8.</i></p> <p><i>Note 2</i>  <i>“Aircraft” fuels specified in Category Code ML8.c.1. are finished products, not their constituents.</i></p> <p>2. Alane (aluminium hydride) (7784-21-6);</p> <p>3. Boranes, as follows, and their derivatives:</p> <p>a. Carbones;</p> <p>b. Borane homologues, as follows:</p> <p>1. Decaborane (14) (17702-41-9);</p> <p>2. Pentaborane (9) (19624-22-7);</p> <p>3. Pentaborane (11) (18433-84-6);</p> <p>4. Hydrazine and derivatives, as follows (see also Category Codes ML8.d.8. and d.9. for oxidising hydrazine derivatives):</p> <p>a. Hydrazine (302-01-2) in concentrations of 70% or more;</p> <p>b. Monomethyl hydrazine (60-34-4);</p>

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	<p>c. Symmetrical dimethyl hydrazine (540-73-8);</p> <p>d. Unsymmetrical dimethyl hydrazine (57-14-7);</p> <p><u>Note</u>  <i>Category Code ML8.c.4.a. does not apply to hydrazine ‘mixtures’ specially formulated for corrosion control.</i></p> <p>5. Metal fuels, fuel ‘mixtures’ or “pyrotechnic” ‘mixtures’, in particle form whether spherical, atomised, spheroidal, flaked or ground, manufactured from material consisting of 99% or more of either of the following:</p> <p>a. Metals as follows and ‘mixtures’ thereof:</p> <ol style="list-style-type: none"> <li>1. Beryllium (7440-41-7) in particle sizes of less than 60 µm;</li> <li>2. Iron powder (7439-89-6) with particle size of 3 µm or less produced by reduction of iron oxide with hydrogen; <u>or</u></li> </ol> <p>b. ‘Mixtures’ containing either of the following:</p> <ol style="list-style-type: none"> <li>1. Zirconium (7440-67-7), magnesium (7439-95-4) or alloys of these in particle sizes of less than 60 µm; <u>or</u></li> <li>2. Boron (7440-42-8) or boron carbide (12069-32-8) fuels of 85% purity or higher and particle sizes of less than 60 µm;</li> </ol> <p><u>Note 1</u>  <i>Category Code ML8.c.5. applies to “explosives” and fuels, whether or not the metals or alloys are encapsulated in aluminium, magnesium, zirconium, or beryllium.</i></p> <p><u>Note 2</u>  <i>Category Code ML8.c.5.b. only applies to metal fuels in particle form when they are mixed with other substances to form a ‘mixture’ formulated for military purposes such as liquid “propellant” slurries, solid “propellants”, or “pyrotechnic” ‘mixtures’.</i></p>



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	<p data-bbox="630 448 710 481"><u>Note 3</u></p> <p data-bbox="630 492 1260 593"><i>Category Code ML8.c.5.b.2. does not apply to boron and boron carbide enriched with boron-10 (20% or more of total boron-10 content).</i></p> <ol style="list-style-type: none"> <li data-bbox="566 604 1260 750">6. Military materials, containing thickeners for hydrocarbon fuels, specially formulated for use in flame throwers or incendiary munitions, such as metal stearates (e.g. octal (637-12-7)) or palmitates;</li> <li data-bbox="566 761 1260 862">7. Perchlorates, chlorates and chromates, composited with powdered metal or other high energy fuel components;</li> <li data-bbox="566 873 1260 1019">8. Spherical or spheroidal aluminium powder (7429-90-5) with a particle size of 60 µm or less and manufactured from material with an aluminium content of 99% or more;</li> <li data-bbox="566 1030 1260 1108">9. Titanium subhydride (TiH<sub>n</sub>) of stoichiometry equivalent to n = 0.65-1.68;</li> <li data-bbox="566 1120 1260 1556">10. Liquid high energy density fuels not specified in Category Code ML8.c.1., as follows: <ol style="list-style-type: none"> <li data-bbox="646 1198 1260 1332">a. Mixed fuels, that incorporate both solid and liquid fuels (e.g. boron slurry), having a mass-based energy density of 40 MJ/kg or greater;</li> <li data-bbox="646 1344 1260 1556">b. Other high energy density fuels and fuel additives (e.g. cubane, ionic solutions, JP-7, JP-10), having a volume-based energy density of 37.5 GJ per cubic metre or greater, measured at 293 K (20°C) and one atmosphere (101.325 kPa) pressure;</li> </ol> </li> </ol> <p data-bbox="710 1568 774 1601"><u>Note</u></p> <p data-bbox="710 1612 1260 1713"><i>Category Code ML8.c.10.b. does not apply to fossil refined fuels or biofuels, or fuels for engines certified for use in civil aviation.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>11. “Pyrotechnic” and pyrophoric materials, as follows: <ul style="list-style-type: none"> <li>a. “Pyrotechnic” and pyrophoric materials specifically formulated to enhance or control the production of radiated energy in any part of the IR spectrum;</li> <li>b. Mixtures of magnesium, polytetrafluoroethylene (PTFE) and a vinylidene difluoride-hexafluoropropylene copolymer (e.g. MTV);</li> </ul> </li> <li>12. Fuel mixtures, “pyrotechnic” mixtures or “energetic materials”, not specified elsewhere in Category Code ML8, having all of the following characteristics: <ul style="list-style-type: none"> <li>a. Containing greater than 0.5% of particles of any of the following: <ul style="list-style-type: none"> <li>1. Aluminium;</li> <li>2. Beryllium;</li> <li>3. Boron;</li> <li>4. Zirconium;</li> <li>5. Magnesium; <u>or</u></li> <li>6. Titanium;</li> </ul> </li> <li>b. Particles specified in Category Code ML8.c.12.a. with a size less than 200 nm in any direction; <u>and</u></li> <li>c. Particles specified in Category Code ML8.c.12.a. with a metal content of 60% or greater;</li> </ul> </li> <li>d. Oxidisers as follows, and ‘mixtures’ thereof: <ul style="list-style-type: none"> <li>1. ADN (ammonium dinitramide or SR 12) (140456-78-6);</li> <li>2. AP (ammonium perchlorate) (7790-98-9);</li> <li>3. Compounds composed of fluorine and any of the following: <ul style="list-style-type: none"> <li>a. Other halogens;</li> </ul> </li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Oxygen; <u>or</u></p> <p>c. Nitrogen;</p> <p><i>Note 1</i>  <i>Category Code ML8.d.3. does not apply to chlorine trifluoride (7790-91-2).</i></p> <p><i>Note 2</i>  <i>Category Code ML8.d.3. does not apply to nitrogen trifluoride (7783-54-2) in its gaseous state.</i></p> <p>4. DNAD (1,3-dinitro-1,3-diazetidine) (78246-06-7);</p> <p>5. HAN (hydroxylammonium nitrate) (13465-08-2);</p> <p>6. HAP (hydroxylammonium perchlorate) (15588-62-2);</p> <p>7. HNF (hydrazinium nitroformate) (20773-28-8);</p> <p>8. Hydrazine nitrate (37836-27-4);</p> <p>9. Hydrazine perchlorate (27978-54-7);</p> <p>10. Liquid oxidisers comprised of or containing inhibited red fuming nitric acid (IRFNA) (8007-58-7);</p> <p><i>Note</i>  <i>Category Code ML8.d.10. does not apply to non-inhibited fuming nitric acid.</i></p> <p>e. Binders, plasticisers, monomers and polymers, as follows:</p> <p>1. AMMO (azidomethylmethyloxetane and its polymers) (90683-29-7) (see also Category Code ML8.g.1. for its “precursors”);</p> <p>2. BAMO (3,3-bis(azidomethyl)oxetane and its polymers) (17607-20-4) (see also Category Code ML8.g.1. for its “precursors”);</p> <p>3. BDNPA (bis (2,2-dinitropropyl)acetal) (5108-69-0);</p> <p>4. BDNPF (bis (2,2-dinitropropyl)formal) (5917-61-3);</p> <p>5. BTTN (butanetrioltrinitrate) (6659-60-5) (see also Category Code ML8.g.8. for its “precursors”);</p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>6. Energetic monomers, plasticisers or polymers, specially formulated for military use and containing any of the following:               <ol style="list-style-type: none"> <li>a. Nitro groups;</li> <li>b. Azido groups;</li> <li>c. Nitrate groups;</li> <li>d. Nitraza groups; <u>or</u></li> <li>e. Difluoroamino groups;</li> </ol> </li> <li>7. FAMA0 (3-difluoroaminomethyl-3-azidomethyl oxetane) and its polymers;</li> <li>8. FEFO (bis-(2-fluoro-2,2-dinitroethyl) formal) (17003-79-1);</li> <li>9. FPF-1 (poly-2,2,3,3,4,4-hexafluoropentane-1,5-diol formal) (376-90-9);</li> <li>10. FPF-3 (poly-2,4,4,5,5,6,6-heptafluoro-2-trifluoromethyl-3-oxaheptane-1,7-diol formal);</li> <li>11. GAP (glycidylazide polymer) (143178-24-9) and its derivatives;</li> <li>12. HTPB (hydroxyl terminated polybutadiene) with a hydroxyl functionality equal to or greater than 2.2 and less or equal to 2.4, a hydroxyl value of less than 0.77 meq/g, and a viscosity at 30°C of less than 47 poise (69102-90-5);</li> <li>13. Alcohol functionalised poly(epichlorohydrin) with a molecular weight of less than 10,000, as follows:               <ol style="list-style-type: none"> <li>a. Poly(epichlorohydrindiol);</li> <li>b. Poly(epichlorohydrintriol);</li> </ol> </li> <li>14. NENAs (nitrateethylnitramine compounds) (17096-47-8, 85068-73-1, 82486-83-7, 82486-82-6 and 85954-06-9);</li> <li>15. PGN (poly-GLYN, polyglycidylnitrate or poly(nitratomethyl oxirane)) (27814-48-8);</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>16. Poly-NIMMO (poly (nitratomethylmethyloxetane), poly-NMMO or (poly(3-Nitratomethyl-3-methyloxetane)) (84051-81-0);</p> <p>17. Polynitroorthocarbonates;</p> <p>18. TVOPA (1,2,3-tris[1,2-bis(difluoroamino)ethoxy] propane or tris vinoxyl propane adduct) (53159-39-0);</p> <p>19. 4,5 diazidomethyl-2-methyl-1,2,3-triazole (iso-DAMTR);</p> <p>20. PNO (Poly(3-nitrato oxetane));</p> <p>21. TMETN (Trimethylolethane trinitrate) (3032-55-1);</p> <p>f. "Additives" as follows:</p> <ol style="list-style-type: none"> <li>1. Basic copper salicylate (62320-94-9);</li> <li>2. BHEGA (bis-(2-hydroxyethyl) glycolamide) (17409-41-5);</li> <li>3. BNO (butadienenitrileoxide);</li> <li>4. Ferrocene derivatives, as follows: <ol style="list-style-type: none"> <li>a. Butacene (125856-62-4);</li> <li>b. Catocene (2,2-bis-ethylferrocenyl propane) (37206-42-1);</li> <li>c. Ferrocene carboxylic acids and ferrocene carboxylic acid esters;</li> <li>d. n-butyl-ferrocene (31904-29-7);</li> <li>e. Other adducted polymer ferrocene derivatives not specified elsewhere in Category Code ML8.f.4.;</li> <li>f. Ethyl ferrocene (1273-89-8);</li> <li>g. Propyl ferrocene;</li> <li>h. Pentyl ferrocene (1274-00-6);</li> <li>i. Dicyclopentyl ferrocene;</li> <li>j. Dicyclohexyl ferrocene;</li> <li>k. Diethyl ferrocene (1273-97-8);</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>l. Dipropyl ferrocene;</li> <li>m. Dibutyl ferrocene (1274-08-4);</li> <li>n. Dihexyl ferrocene (93894-59-8);</li> <li>o. Acetyl ferrocene (1271-55-2)/1,1'-diacetyl ferrocene (1273-94-5);</li> </ul> <ul style="list-style-type: none"> <li>5. Lead beta-resorcyate (20936-32-7) or copper beta-resorcyate (70983-44-7);</li> <li>6. Lead citrate (14450-60-3);</li> <li>7. Lead-copper chelates of beta-resorcyate or salicylates (68411-07-4);</li> <li>8. Lead maleate (19136-34-6);</li> <li>9. Lead salicylate (15748-73-9);</li> <li>10. Lead stannate (12036-31-6);</li> <li>11. MAPO (tris-1-(2-methyl)aziridinyl phosphine oxide) (57-39-6); BOBBA 8 (bis(2-methyl aziridinyl) 2-(2-hydroxypropanoxy) propylamino phosphine oxide); and other MAPO derivatives;</li> <li>12. Methyl BAPO (bis(2-methyl aziridinyl) methylamino phosphine oxide) (85068-72-0);</li> <li>13. N-methyl-p-nitroaniline (100-15-2);</li> <li>14. 3-Nitroazirane-1,5-pentane diisocyanate (7406-61-9);</li> <li>15. Organo-metallic coupling agents as follows: <ul style="list-style-type: none"> <li>a. Neopentyl[diallyl]oxy, tri[diethyl]phosphato-titanate (103850-22-2); also known as titanium IV, 2,2[bis 2-propenolato-methyl, butanolato, tris (diethyl) phosphato] (110438-25-0); or LICA 12 (103850-22-2);</li> <li>b. Titanium IV, [(2-propenolato-1) methyl, n-propanolatomethyl] butanolato-1, tris[diethyl] pyrophosphate or KR3538;</li> <li>c. Titanium IV, [(2-propenolato-1)methyl, n-propanolatomethyl] butanolato-1, tris(diethyl)phosphate;</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>16. Polycyanodifluoroaminoethyleneoxide;</p> <p>17. Bonding agents as follows:</p> <ol style="list-style-type: none"> <li>a. 1,1R,1S-trimesoyl-tris(2-ethylaziridine) (HX-868, BITA) (7722-73-8);</li> <li>b. Polyfunctional aziridine amides with isophthalic, trimesic, isocyanuric or trimethyladipic backbone also having a 2-methyl or 2-ethyl aziridine group;</li> </ol> <p><i>Note</i> Category Code ML8.f.17.b. includes:</p> <ol style="list-style-type: none"> <li>a. 1,1 H-Isophthaloyl-bis(2-methylaziridine) (HX-752) (7652-64-4);</li> <li>b. 2,4,6-tris(2-ethyl-1-aziridinyl)-1,3,5-triazine (HX-874) (18924-91-9);</li> <li>c. 1,1'-trimethyladipoyl-bis(2-ethylaziridine) (HX-877) (71463-62-2).</li> </ol> <p>18. Propyleneimine (2-methylaziridine) (75-55-8);</p> <p>19. Superfine iron oxide (Fe<sub>2</sub>O<sub>3</sub>) (1317-60-8) with a specific surface area more than 250 m<sup>2</sup>/g and an average particle size of 3 nm or less;</p> <p>20. TEPAN (tetraethylenepentaamineacrylonitrile) (68412-45-3); cyanoethylated polyamines and their salts;</p> <p>21. TEPANOL (tetraethylenepentaamineacrylonitrileglycidol) (68412-46-4); cyanoethylated polyamines adducted with glycidol and their salts;</p> <p>22. TPB (triphenyl bismuth) (603-33-8);</p> <p>23. TEPB (Tris (ethoxyphenyl) bismuth) (90591-48-3);</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>g. “Precursors” as follows:</p> <p><u><i>N.B.</i></u>  <i>The references in Category Code ML8.g. are specified “energetic materials” manufactured from these substances.</i></p> <ol style="list-style-type: none"> <li>1. BCMO (3,3-bis(chloromethyl)oxetane) (78-71-7) (see also Category Codes ML8.e.1. and e.2.);</li> <li>2. Dinitroazetidine-t-butyl salt (125735-38-8) (see also Category Code ML8.a.28.);</li> <li>3. Hexaazaisowurtzitane derivatives including HBIW (hexabenzylhexaazaisowurtzitane) (124782-15-6) (see also Category Code ML8.a.4.) and TAIW (tetraacetyldibenzylhexaazaisowurtzitane) (182763-60-6) (see also Category Code ML8.a.4.);</li> <li>4. Not used;</li> <li>5. TAT (1,3,5,7 tetraacetyl-1,3,5,7,-tetraaza cyclooctane) (41378-98-7) (see also Category Code ML8.a.13.);</li> <li>6. 1,4,5,8-tetraazadecalin (5409-42-7) (see also Category Code ML8.a.27.);</li> <li>7. 1,3,5-trichlorobenzene (108-70-3) (see also Category Code ML8.a.23.);</li> <li>8. 1,2,4-trihydroxybutane (1,2,4-butanetriol) (3068-00-6) (see also Category Code ML8.e.5.);</li> <li>9. DADN (1,5-diacetyl-3,7-dinitro-1, 3, 5, 7-tetraaza-cyclooctane) (see also Category Code ML8.a.13.);</li> </ol> <p>h. ‘Reactive material’ powders and shapes, as follows:</p> <ol style="list-style-type: none"> <li>1. Powders of any of the following materials, with a particle size less than 250 µm in any direction and not specified elsewhere in Category Code ML8: <ol style="list-style-type: none"> <li>a. Aluminium;</li> <li>b. Niobium;</li> <li>c. Boron;</li> <li>d. Zirconium;</li> </ol> </li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>e. Magnesium;</p> <p>f. Titanium;</p> <p>g. Tantalum;</p> <p>h. Tungsten;</p> <p>i. Molybdenum; <u>or</u></p> <p>j. Hafnium;</p> <p>2. Shapes, not specified in Category Code ML3, ML4, ML12 or ML16, fabricated from powders specified in Category Code ML8.h.1.</p> <p><u>Technical Notes</u></p> <p>1. 'Reactive materials' are designed to produce an exothermic reaction only at high shear rates, and are designed for use as liners or casings in warheads.</p> <p>2. 'Reactive material' powders are produced by, for example, a high energy ball milling process.</p> <p>3. 'Reactive material' shapes are produced by, for example, selective laser sintering.</p> <p><u>Note 1</u></p> <p>Category Code ML8 does not apply to the following substances unless they are compounded or mixed with the "energetic material" specified in Category Code ML8.a. or powdered metals specified in Category Code ML8.c.:</p> <p>a. Ammonium picrate (131-74-8);</p> <p>b. Black powder;</p> <p>c. Hexanitrodiphenylamine (131-73-7);</p> <p>d. Difluoroamine (10405-27-3);</p> <p>e. Nitrostarch (9056-38-6);</p> <p>f. Potassium nitrate (7757-79-1);</p> <p>g. Tetranitronaphthalene;</p> <p>h. Trinitroanisol;</p> <p>i. Trinitronaphthalene;</p>

<i>Category Code</i>	<i>Item Description</i>
j.	<i>Trinitroxylene;</i>
k.	<i>N-pyrrolidinone; 1-methyl-2-pyrrolidinone (872-50-4);</i>
l.	<i>Dioctylmaleate (142-16-5);</i>
m.	<i>Ethylhexylacrylate (103-11-7);</i>
n.	<i>Triethylaluminium (TEA) (97-93-8), trimethylaluminium (TMA) (75-24-1), and other pyrophoric metal alkyls and aryls of lithium, sodium, magnesium, zinc or boron;</i>
o.	<i>Nitrocellulose (9004-70-0);</i>
p.	<i>Nitroglycerin (or glyceroltrinitrate, trinitroglycerine) (NG) (55-63-0);</i>
q.	<i>2,4,6-trinitrotoluene (TNT) (118-96-7);</i>
r.	<i>Ethylenediaminedinitrate (EDDN) (20829-66-7);</i>
s.	<i>Pentaerythritoltetranitrate (PETN) (78-11-5);</i>
t.	<i>Lead azide (13424-46-9), normal lead styphnate (15245-44-0) and basic lead styphnate (12403-82-6), and primary explosives or priming compositions containing azides or azide complexes;</i>
u.	<i>Triethyleneglycoldinitrate (TEGDN) (111-22-8);</i>
v.	<i>2,4,6-trinitroresorcinol (styphnic acid) (82-71-3);</i>
w.	<i>Diethyldiphenylurea (85-98-3); dimethyldiphenylurea (611-92-7); methylethyldiphenylurea; [Centralites];</i>
x.	<i>N,N-diphenylurea (unsymmetrical diphenylurea) (603-54-3);</i>
y.	<i>Methyl-N,N-diphenylurea (methyl unsymmetrical diphenylurea) (13114-72-2);</i>
z.	<i>Ethyl-N,N-diphenylurea (ethyl unsymmetrical diphenylurea) (64544-71-4);</i>
aa.	<i>2-Nitrodiphenylamine (2-NDPA) (119-75-5);</i>
bb.	<i>4-Nitrodiphenylamine (4-NDPA) (836-30-6);</i>
cc.	<i>2,2-dinitropropanol (918-52-5);</i>

<i>Category Code</i>	<i>Item Description</i>
	<p>dd. Nitroguanidine (556-88-7) (see Category Code 1C011.d. in Division 2 of Part 2 of this Schedule).</p> <p><u>Note 2</u>  Category Code ML8 does not apply to ammonium perchlorate (Category Code ML8.d.2.), NTO (Category Code ML8.a.18.) or catocene (Category Code ML8.f.4.b.), and meeting all of the following:</p> <ol style="list-style-type: none"> <li>a. Specially shaped and formulated for civil-use gas generation devices;</li> <li>b. Compounded or mixed, with non-active thermoset binders or plasticisers, and having a mass of less than 250 g;</li> <li>c. Having a maximum of 80% ammonium perchlorate (Category Code ML8.d.2.) in mass of active material;</li> <li>d. Having less than or equal to 4 g of NTO (Category Code ML8.a.18.); <u>and</u></li> <li>e. Having less than or equal to 1 g of catocene (Category Code ML8.f.4.b.).</li> </ol>
ML9	<p>Vessels of war (surface or underwater), special naval equipment, accessories, components and other surface vessels, as follows:</p> <p><u>N.B.</u>  For guidance and navigation equipment, see Category Code ML11.</p> <ol style="list-style-type: none"> <li>a. Vessels and components, as follows: <ol style="list-style-type: none"> <li>1. Vessels (surface or underwater) specially designed or modified for military use, regardless of current state of repair or operating condition, and whether or not they contain weapon delivery systems or armour, and hulls or parts of hulls for such vessels, and components therefor specially designed for military use;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Surface vessels, other than those specified in Category Code ML9.a.1., having any of the following, fixed or integrated into the vessel:</p> <p>a. Automatic weapons specified in Category Code ML1, or weapons specified in Category Code ML2, ML4, ML12 or ML19, or 'mountings' or hard points for weapons having a calibre of 12.7 mm or greater;</p> <p><i>Technical Note</i> <i>'Mountings' refers to weapon mounts or structural strengthening for the purpose of installing weapons.</i></p> <p>b. Fire control systems specified in Category Code ML5;</p> <p>c. Having both of the following:</p> <ol style="list-style-type: none"> <li>1. 'Chemical, Biological, Radiological and Nuclear (CBRN) protection'; <u>and</u></li> <li>2. 'Pre-wet or wash down system' designed for decontamination purposes; <u>or</u></li> </ol> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. 'CBRN protection' is a self-contained interior space containing features such as over-pressurisation, isolation of ventilation systems, limited ventilation openings with CBRN filters and limited personnel access points incorporating air-locks.</li> <li>2. 'Pre-wet or wash down system' is a seawater spray system capable of simultaneously wetting the exterior superstructure and decks of a vessel.</li> </ol> <p>d. Active weapon countermeasure systems specified in Category Code ML4.b., ML5.c. or ML11.a. and having any of the following:</p> <ol style="list-style-type: none"> <li>1. 'CBRN protection';</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="710 448 1268 548">2. Hull and superstructure, specially designed to reduce the radar cross section;</li> <li data-bbox="710 560 1268 739">3. Thermal signature reduction devices, (e.g. an exhaust gas cooling system), excluding those specially designed to increase overall power plant efficiency or to reduce the environmental impact; <u>or</u></li> <li data-bbox="710 750 1268 851">4. A degaussing system designed to reduce the magnetic signature of the whole vessel;</li> </ol> <p data-bbox="774 862 965 907"><i><u>Technical Note</u></i></p> <p data-bbox="774 907 1268 1142"><i>'CBRN protection' is a self-contained interior space containing features such as over-pressurisation, isolation of ventilation systems, limited ventilation openings with CBRN filters and limited personnel access points incorporating air-locks.</i></p> <ol style="list-style-type: none"> <li data-bbox="494 1153 1268 1265">b. Engines and propulsion systems, as follows, specially designed for military use, and components therefor specially designed for military use: <ol style="list-style-type: none"> <li data-bbox="558 1276 1268 1310">1. Diesel engines specially designed for submarines;</li> <li data-bbox="558 1321 1268 1624">2. Electric motors specially designed for submarines and having all of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="646 1411 1268 1478">a. Power output of more than 0.75 MW (1,000 hp);</li> <li data-bbox="646 1489 1268 1523">b. Quick reversing;</li> <li data-bbox="646 1534 1268 1579">c. Liquid cooled; <u>and</u></li> <li data-bbox="646 1590 1268 1624">d. Totally enclosed;</li> </ol> </li> <li data-bbox="558 1635 1268 1713">3. Non-magnetic diesel engines having both of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="646 1724 1268 1758">a. Power output of 37.3 kW (50 hp) or more; <u>and</u></li> <li data-bbox="646 1769 1268 1836">b. Non-magnetic content in excess of 75% of total mass;</li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>4. 'Air Independent Propulsion' (AIP) systems specially designed for submarines;</p> <p><u>Technical Note</u>  <i>'Air Independent Propulsion' (AIP) allows a submerged submarine to operate its propulsion system, without access to atmospheric oxygen, for a longer time than the batteries would have otherwise allowed. For the purpose of Category Code ML9.b.4., AIP does not include nuclear power.</i></p> <p>c. Underwater detection devices, specially designed for military use, controls therefor and components therefor specially designed for military use;</p> <p>d. Anti-submarine nets and anti-torpedo nets, specially designed for military use;</p> <p>e. Not used;</p> <p>f. Hull penetrators and connectors, specially designed for military use, that enable interaction with equipment external to a vessel, and components therefor specially designed for military use;</p> <p><u>Note</u>  <i>Category Code ML9.f. includes connectors for vessels which are of the single-conductor, multi-conductor, coaxial or waveguide type, and hull penetrators for vessels, both of which are capable of remaining impervious to leakage from without and of retaining required characteristics at marine depths exceeding 100 m; and fibre-optic connectors and optical hull penetrators, specially designed for "laser" beam transmission, regardless of depth. Category Code ML9.f. does not apply to ordinary propulsive shaft and hydrodynamic control-rod hull penetrators.</i></p> <p>g. Silent bearings having any of the following, components therefor and equipment containing those bearings, specially designed for military use:</p> <ol style="list-style-type: none"> <li>1. Gas or magnetic suspension;</li> <li>2. Active signature controls; <u>or</u></li> <li>3. Vibration suppression controls.</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
ML10	<p>“Aircraft”, “lighter-than-air vehicles”, “unmanned aerial vehicles” (“UAVs”), aero-engines and “aircraft” equipment, related equipment and components, as follows, specially designed or modified for military use:</p> <p><u><i>N.B.</i></u></p> <p><i>For guidance and navigation equipment, see Category Code ML11.</i></p> <ol style="list-style-type: none"> <li>a. Manned “aircraft” and “lighter-than-air vehicles”, and specially designed components therefor;</li> <li>b. Not used;</li> <li>c. Unmanned “aircraft” and “lighter-than-air vehicles”, and related equipment, as follows, and specially designed components therefor: <ol style="list-style-type: none"> <li>1. “UAVs”, Remotely Piloted Air Vehicles (RPVs), autonomous programmable vehicles and unmanned “lighter-than-air vehicles”;</li> <li>2. Launchers, recovery equipment and ground support equipment;</li> <li>3. Equipment designed for command or control;</li> </ol> </li> <li>d. Propulsion aero-engines and specially designed components therefor;</li> <li>e. Airborne refuelling equipment specially designed or modified for either of the following, and specially designed components therefor: <ol style="list-style-type: none"> <li>1. “Aircraft” specified in Category Code ML10.a.; <u>or</u></li> <li>2. Unmanned “aircraft” specified in Category Code ML10.c.;</li> </ol> </li> <li>f. ‘Ground equipment’ specially designed for “aircraft” specified in Category Code ML10.a. or aero-engines specified in Category Code ML10.d.;</li> </ol> <p><u><i>Technical Note</i></u></p> <p><i>‘Ground equipment’ includes pressure refuelling equipment and equipment designed to facilitate operations in confined areas.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="502 459 1268 582">g. Aircrew life support equipment, aircrew safety equipment and other devices for emergency escape, not specified in Category Code ML10.a., designed for “aircraft” specified in Category Code ML10.a.;</p> <p data-bbox="566 604 1268 750"><i>Note</i> Category Code ML10.g. does not include aircrew helmets that do not incorporate, or have mountings or fittings for, equipment specified in any part of this Division.</p> <p data-bbox="566 772 1268 840"><i>N.B.</i> For helmets, see also Category Code ML13.c.</p> <p data-bbox="502 862 1268 918">h. Parachutes, paragliders and related equipment, as follows, and specially designed components therefor:</p> <ol data-bbox="566 940 1268 1176" style="list-style-type: none"> <li>1. Parachutes not specified elsewhere in any part of this Division;</li> <li>2. Paragliders;</li> <li>3. Equipment specially designed for high altitude parachutists (e.g. suits, special helmets, breathing systems, navigation equipment);</li> </ol> <p data-bbox="502 1198 1268 1254">i. Controlled opening equipment or automatic piloting systems, designed for parachuted loads.</p> <p data-bbox="502 1276 1268 1444"><i>Note 1</i> Category Code ML10.a. does not apply to “aircraft” and “lighter-than-air vehicles” or variants of those “aircraft”, specially designed for military use and which are all of the following:</p> <ol data-bbox="502 1467 1268 1691" style="list-style-type: none"> <li>a. Not a combat “aircraft”;</li> <li>b. Not configured for military use and not fitted with equipment or attachments specially designed or modified for military use; <u>and</u></li> <li>c. Certified for civil use by civil aviation authorities of one or more “participating states”.</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p><u>Note 2</u>  <i>Category Code ML10.d. does not apply to:</i></p> <ul style="list-style-type: none"> <li data-bbox="502 544 1268 678"><i>a. Aero-engines designed or modified for military use which have been certified by civil aviation authorities of one or more “participating states” for use in “civil aircraft”, or specially designed components therefor;</i></li> <li data-bbox="502 696 1268 763"><i>b. Reciprocating engines or specially designed components therefor, except those specially designed for “UAVs”.</i></li> </ul> <p><u>Note 3</u>  <i>For the purposes of Category Codes ML10.a. and ML10.d., specially designed components and related equipment for non-military “aircraft” or aero-engines modified for military use applies only to those military components and to military related equipment required for the modification to military use.</i></p> <p><u>Note 4</u>  <i>For the purpose of Category Code ML10.a., military use includes: combat, military reconnaissance, assault, military training, logistics support, and transporting and airdropping troops or military equipment.</i></p> <p><u>Note 5</u>  <i>Category Code ML10.a. does not apply to “aircraft” that meet all of the following:</i></p> <ul style="list-style-type: none"> <li data-bbox="502 1323 1018 1357"><i>a. Were first manufactured before 1946;</i></li> <li data-bbox="502 1375 1268 1509"><i>b. Do not incorporate items specified in any part of this Division, unless the items are required to meet safety or airworthiness standards of civil aviation authorities of one or more “participating states”; <u>and</u></i></li> <li data-bbox="502 1527 1268 1621"><i>c. Do not incorporate weapons specified in any part of this Division, unless inoperable and incapable of being returned to operation.</i></li> </ul>

<i>Category Code</i>	<i>Item Description</i>
ML11	<p>Electronic equipment, “spacecraft” and components, not specified elsewhere in any part of this Division, as follows:</p> <p>a. Electronic equipment specially designed for military use and specially designed components therefor;</p> <p><i>Note</i>  <i>Category Code ML11.a. includes:</i></p> <p>a. <i>Electronic countermeasure and electronic counter-countermeasure equipment (i.e. equipment designed to introduce extraneous or erroneous signals into radar or radio communication receivers or otherwise hinder the reception, operation or effectiveness of adversary electronic receivers including their countermeasure equipment), including jamming and counter-jamming equipment;</i></p> <p>b. <i>Frequency agile tubes;</i></p> <p>c. <i>Electronic systems or equipment, designed either for surveillance and monitoring of the electromagnetic spectrum for military intelligence or security purposes or for counteracting such surveillance and monitoring;</i></p> <p>d. <i>Underwater countermeasures, including acoustic and magnetic jamming and decoy, equipment designed to introduce extraneous or erroneous signals into sonar receivers;</i></p> <p>e. <i>Data processing security equipment, data security equipment and transmission and signalling line security equipment, using ciphering processes;</i></p> <p>f. <i>Identification, authentication and keyloader equipment and key management, manufacturing and distribution equipment;</i></p> <p>g. <i>Guidance and navigation equipment;</i></p> <p>h. <i>Digital troposcatter-radio communications transmission equipment;</i></p> <p>i. <i>Digital demodulators specially designed for signals intelligence;</i></p> <p>j. <i>“Automated Command and Control Systems”.</i></p>

<i>Category Code</i>	<i>Item Description</i>
ML12	<p><u><i>N.B.</i></u>  <i>For “software” associated with military “Software” Defined Radio (SDR), see Category Code ML21.</i></p> <p>b. Global Navigation Satellite Systems (GNSS) jamming equipment and specially designed components therefor;</p> <p>c. “Spacecraft” specially designed or modified for military use, and “spacecraft” components specially designed for military use.</p> <p>High velocity kinetic energy weapon systems and related equipment, as follows, and specially designed components therefor:</p> <p>a. Kinetic energy weapon systems specially designed for destruction or effecting mission-abort of a target;</p> <p>b. Specially designed test and evaluation facilities and test models, including diagnostic instrumentation and targets, for dynamic testing of kinetic energy projectiles and systems.</p> <p><u><i>N.B.</i></u>  <i>For weapon systems using sub-calibre ammunition or employing solely chemical propulsion, and ammunition therefor, see Category Codes ML1 to ML4.</i></p> <p><u><i>Note 1</i></u>  <i>Category Code ML12 includes the following when specially designed for kinetic energy weapon systems:</i></p> <p>a. <i>Launch propulsion systems capable of accelerating masses larger than 0.1 g to velocities in excess of 1.6 km/s, in single or rapid fire modes;</i></p> <p>b. <i>Prime power generation, electric armour, energy storage (e.g. high energy storage capacitors), thermal management, conditioning, switching or fuel-handling equipment; and electrical interfaces between power supply, gun and other turret electric drive functions;</i></p> <p><u><i>N.B.</i></u>  <i>See also Category Code 3A001.e.2. in Division 2 of Part 2 of this Schedule for high energy storage capacitors.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. <i>Target acquisition, tracking, fire control or damage assessment systems;</i></p> <p>d. <i>Homing seeker, guidance or divert propulsion (lateral acceleration) systems for projectiles.</i></p> <p><u>Note 2</u>  <i>Category Code ML12 applies to weapon systems using any of the following methods of propulsion:</i></p> <p>a. <i>Electromagnetic;</i></p> <p>b. <i>Electrothermal;</i></p> <p>c. <i>Plasma;</i></p> <p>d. <i>Light gas; <u>or</u></i></p> <p>e. <i>Chemical (when used in combination with any of the above).</i></p>
ML13	<p>Armoured or protective equipment, constructions and components, as follows:</p> <p>a. Metallic or non-metallic armoured plate, having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Manufactured to comply with a military standard or specification; <u>or</u></li> <li>2. Suitable for military use;</li> </ol> <p><u>N.B.</u>  <i>For body armour plates, see Category Code ML13.d.2.</i></p> <p>b. Constructions of metallic or non-metallic materials, or combinations thereof, specially designed to provide ballistic protection for military systems, and specially designed components therefor;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. Helmets manufactured according to military standards or specifications, or comparable national standards, and specially designed helmet shells, liners, or comfort pads, therefor;</p> <p><u><i>N.B.</i></u>  <i>For other military helmet components or accessories, see the relevant Category Code in this Division.</i></p> <p>d. Body armour or protective garments, and components therefor, as follows:</p> <p>1. Soft body armour or protective garments, manufactured to military standards or specifications, or to their equivalents, and specially designed components therefor;</p> <p><u><i>Note</i></u>  <i>For the purpose of Category Code ML13.d.1., military standards or specifications include, at a minimum, specifications for fragmentation protection.</i></p> <p>2. Hard body armour plates providing ballistic protection equal to or greater than level III (NIJ 0101.06, July 2008) or national equivalents.</p> <p><u><i>Note 1</i></u>  <i>Category Code ML13.b. includes materials specially designed to form explosive reactive armour or to construct military shelters.</i></p> <p><u><i>Note 2</i></u>  <i>Category Code ML13.c. does not apply to conventional steel helmets, neither modified or designed to accept, nor equipped with any type of accessory device.</i></p> <p><u><i>Note 3</i></u>  <i>Category Codes ML13.c. and ML13.d. do not apply to helmets, body armour or protective garments, when accompanying their user for the user's own personal protection.</i></p> <p><u><i>Note 4</i></u>  <i>The only helmets specially designed for bomb disposal personnel that are specified in Category Code ML13 are those specially designed for military use.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p><u><i>N.B. 1</i></u>  <i>See also Category Code 1A005 in Division 2 of Part 2 of this Schedule.</i></p> <p><u><i>N.B. 2</i></u>  <i>For “fibrous or filamentary materials” used in the manufacture of body armour and helmets, see Category Code 1C010 in Division 2 of Part 2 of this Schedule.</i></p>
ML14	<p>‘Specialised equipment for military training’ or for simulating military scenarios, simulators specially designed for training in the use of any firearm or weapon specified in Category Code ML1 or ML2, and specially designed components and accessories therefor.</p> <p><u><i>Technical Note</i></u>  <i>The term ‘specialised equipment for military training’ includes military types of attack trainers, operational flight trainers, radar target trainers, radar target generators, gunnery training devices, anti-submarine warfare trainers, flight simulators (including human-rated centrifuges for pilot/astronaut training), radar trainers, instrument flight trainers, navigation trainers, missile launch trainers, target equipment, drone “aircraft”, armament trainers, pilotless “aircraft” trainers, mobile training units and training equipment for ground military operations.</i></p> <p><u><i>Note 1</i></u>  <i>Category Code ML14 includes image generating and interactive environment systems for simulators, when specially designed or modified for military use.</i></p> <p><u><i>Note 2</i></u>  <i>Category Code ML14 does not apply to equipment specially designed for training in the use of hunting or sporting weapons.</i></p>
ML15	<p>Imaging or countermeasure equipment, as follows, specially designed for military use, and specially designed components and accessories therefor:</p> <p>a. Recorders and image processing equipment;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Cameras, photographic equipment and film processing equipment;</p> <p>c. Image intensifier equipment;</p> <p>d. Infrared or thermal imaging equipment;</p> <p>e. Imaging radar sensor equipment;</p> <p>f. Countermeasure or counter-countermeasure equipment, for the equipment specified in Category Codes ML15.a. to ML15.e.</p> <p><i>Note</i> Category Code ML15.f. includes equipment designed to degrade the operation or effectiveness of military imaging systems or to minimise such degrading effects.</p> <p><i>Note</i> Category Code ML15 does not apply to “first generation image intensifier tubes” or equipment specially designed to incorporate “first generation image intensifier tubes”.</p> <p><i>N.B.</i> For the classification of weapon-sights incorporating “first generation image intensifier tubes”, see Category Codes ML1, ML2 and ML5.a.</p> <p><i>N.B.</i> See also Category Codes 6A002.a.2. and 6A002.b. in Division 2 of Part 2 of this Schedule.</p>
ML16	<p>Forgings, castings and other unfinished products, specially designed for items specified in Category Code ML1 to ML4, ML6, ML9, ML10, ML12 or ML19.</p> <p><i>Note</i> Category Code ML16 applies to unfinished products when they are identifiable by material composition, geometry or function.</p>

<i>Category Code</i>	<i>Item Description</i>
ML17	<p>Miscellaneous equipment, materials and “libraries”, as follows, and specially designed components therefor:</p> <ol style="list-style-type: none"> <li>a. Diving and underwater swimming apparatus, specially designed or modified for military use, as follows: <ol style="list-style-type: none"> <li>1. Self-contained diving rebreathers, closed or semi-closed circuit;</li> <li>2. Underwater swimming apparatus specially designed for use with the diving apparatus specified in Category Code ML17.a.1.;</li> </ol> <p><i>N.B.</i> <i>See also Category Code 8A002.q. in Division 2 of Part 2 of this Schedule.</i></p> </li> <li>b. Construction equipment specially designed for military use;</li> <li>c. Fittings, coatings and treatments, for signature suppression, specially designed for military use;</li> <li>d. Field engineer equipment specially designed for use in a combat zone;</li> <li>e. “Robots”, “robot” controllers and “robot” “end-effectors”, having any of the following characteristics: <ol style="list-style-type: none"> <li>1. Specially designed for military use;</li> <li>2. Incorporating means of protecting hydraulic lines against externally induced punctures caused by ballistic fragments (e.g. incorporating self-sealing lines) and designed to use hydraulic fluids with flash points higher than 839 K (566°C); <u>or</u></li> <li>3. Specially designed or rated for operating in an electromagnetic pulse (EMP) environment;</li> </ol> <p><i>Technical Note</i> <i>Electromagnetic pulse does not refer to unintentional interference caused by electromagnetic radiation from nearby equipment (e.g. machinery, appliances or electronics) or lightning.</i></p> </li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>f. “Libraries” specially designed or modified for military use with systems, equipment or components, specified in this Division;</p> <p>g. Nuclear power generating equipment or propulsion equipment, including “nuclear reactors”, specially designed for military use and components therefor specially designed or ‘modified’ for military use;</p> <p>h. Equipment and material, coated or treated for signature suppression, specially designed for military use, other than those specified elsewhere in this Division;</p> <p>i. Simulators specially designed for military “nuclear reactors”;</p> <p>j. Mobile repair shops specially designed or ‘modified’ to service military equipment;</p> <p>k. Field generators specially designed or ‘modified’ for military use;</p> <p>l. ISO intermodal containers or demountable vehicle bodies (i.e. swap bodies), specially designed or ‘modified’ for military use;</p> <p>m. Ferries, other than those specified elsewhere in this Division, bridges and pontoons, specially designed for military use;</p> <p>n. Test models specially designed for the “development” of items specified in Category Code ML4, ML6, ML9 or ML10;</p> <p>o. “Laser” protection equipment (e.g. eye or sensor protection) specially designed for military use;</p> <p>p. “Fuel cells”, other than those specified elsewhere in this Division, specially designed or ‘modified’ for military use.</p>
	<p><u><i>Technical Notes</i></u></p> <p>1. <i>Not used.</i></p> <p>2. <i>For the purpose of Category Code ML17, ‘modified’ means any structural, electrical, mechanical, or other change that provides a non-military item with military capabilities equivalent to an item which is specially designed for military use.</i></p>

<i>Category Code</i>	<i>Item Description</i>
ML18	<p data-bbox="502 448 1125 481">‘Production’ equipment and components, as follows:</p> <ul style="list-style-type: none"> <li data-bbox="502 504 1260 593">a. Specially designed or modified ‘production’ equipment for the ‘production’ of products specified in this Division, and specially designed components therefor;</li> <li data-bbox="502 616 1260 750">b. Specially designed environmental test facilities and specially designed equipment therefor, for the certification, qualification or testing of products specified in this Division.</li> </ul> <p data-bbox="502 772 686 795"><u>Technical Note</u></p> <p data-bbox="502 806 1260 907"><i>For the purpose of Category Code ML18, the term ‘production’ includes design, examination, manufacture, testing and checking.</i></p> <p data-bbox="502 929 566 952"><u>Note</u></p> <p data-bbox="502 963 1260 1030"><i>Category Codes ML18.a. and ML18.b. include the following equipment:</i></p> <ul style="list-style-type: none"> <li data-bbox="502 1052 821 1075">a. <i>Continuous nitrators;</i></li> <li data-bbox="502 1097 1260 1164">b. <i>Centrifugal testing apparatus or equipment, having any of the following characteristics:</i> <ul style="list-style-type: none"> <li data-bbox="566 1187 1260 1254">1. <i>Driven by a motor or motors having a total rated horsepower of more than 298 kW (400 hp);</i></li> <li data-bbox="566 1276 1260 1299">2. <i>Capable of carrying a payload of 113 kg or more; or</i></li> <li data-bbox="566 1321 1260 1388">3. <i>Capable of exerting a centrifugal acceleration of 8 g or more on a payload of 91 kg or more;</i></li> </ul> </li> <li data-bbox="502 1411 821 1433">c. <i>Dehydration presses;</i></li> <li data-bbox="502 1456 1260 1523">d. <i>Screw extruders specially designed or modified for military “explosive” extrusion;</i></li> <li data-bbox="502 1545 1260 1568">e. <i>Cutting machines for the sizing of extruded “propellants”;</i></li> <li data-bbox="502 1590 1260 1657">f. <i>Sweetie barrels (tumblers) 1.85 m or more in diameter and having over 227 kg product capacity;</i></li> <li data-bbox="502 1680 1077 1702">g. <i>Continuous mixers for solid “propellants”;</i></li> <li data-bbox="502 1724 1260 1792">h. <i>Fluid energy mills for grinding or milling the ingredients of military “explosives”;</i></li> </ul>

<i>Category Code</i>	<i>Item Description</i>
ML19	<p data-bbox="502 454 1268 521"><i>i. Equipment to achieve both sphericity and uniform particle size in metal powder listed in Category Code ML8.c.8.;</i></p> <p data-bbox="502 533 1268 600"><i>j. Convection current converters for the conversion of materials listed in Category Code ML8.c.3.</i></p> <p data-bbox="502 667 1268 768">Directed Energy Weapon (DEW) systems, related or countermeasure equipment and test models, as follows, and specially designed components therefor:</p> <p data-bbox="502 790 1268 857"><i>a. “Laser” systems specially designed for destruction or effecting mission-abort of a target;</i></p> <p data-bbox="502 869 1268 936"><i>b. Particle beam systems capable of destruction or effecting mission-abort of a target;</i></p> <p data-bbox="502 947 1268 1014"><i>c. High power Radio Frequency (RF) systems capable of destruction or effecting mission-abort of a target;</i></p> <p data-bbox="502 1025 1268 1126"><i>d. Equipment specially designed for the detection or identification of, or defence against, systems specified in Category Codes ML19.a. to ML19.c.;</i></p> <p data-bbox="502 1137 1268 1205"><i>e. Physical test models for the systems, equipment and components, specified in Category Code ML19;</i></p> <p data-bbox="502 1216 1268 1328"><i>f. “Laser” systems specially designed to cause permanent blindness to unenhanced vision, i.e. to the naked eye or to the eye with corrective eyesight devices.</i></p> <p data-bbox="502 1350 582 1384"><u><i>Note 1</i></u></p> <p data-bbox="502 1395 1268 1462"><i>DEW systems specified in Category Code ML19 include systems whose capability is derived from the controlled application of:</i></p> <p data-bbox="502 1473 1268 1541"><i>a. “Lasers” of sufficient power to effect destruction similar to the manner of conventional ammunition;</i></p> <p data-bbox="502 1552 1268 1619"><i>b. Particle accelerators which project a charged or neutral particle beam with destructive power;</i></p> <p data-bbox="502 1630 1268 1776"><i>c. High pulsed power or high average power Radio Frequency (RF) beam transmitters, which produce fields sufficiently intense to disable electronic circuitry at a distant target.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p><u>Note 2</u>  <i>Category Code ML19 includes the following when specially designed for DEW systems:</i></p> <ul style="list-style-type: none"> <li><i>a. Prime power generation, energy storage, switching, power conditioning or fuel-handling equipment;</i></li> <li><i>b. Target acquisition or tracking systems;</i></li> <li><i>c. Systems capable of assessing target damage, destruction or mission-abort;</i></li> <li><i>d. Beam-handling, propagation or pointing equipment;</i></li> <li><i>e. Equipment with rapid beam slew capability for rapid multiple target operations;</i></li> <li><i>f. Adaptive optics and phase conjugators;</i></li> <li><i>g. Current injectors for negative hydrogen ion beams;</i></li> <li><i>h. “Space-qualified” accelerator components;</i></li> <li><i>i. Negative ion beam funnelling equipment;</i></li> <li><i>j. Equipment for controlling and slewing a high energy ion beam;</i></li> <li><i>k. “Space-qualified” foils for neutralising negative hydrogen isotope beams.</i></li> </ul>
ML20	<p>Cryogenic and “superconductive” equipment, as follows, and specially designed components and accessories therefor:</p> <ul style="list-style-type: none"> <li><i>a. Equipment specially designed or configured to be installed in a vehicle for military ground, marine, airborne or space applications, capable of operating while in motion and of producing or maintaining temperatures below 103 K (-170°C);</i></li> </ul> <p><u>Note</u>  <i>Category Code ML20.a. includes mobile systems incorporating or employing accessories or components manufactured from non-metallic or non-electrical conductive materials, such as plastics or epoxy-impregnated materials.</i></p>

<i>Category Code</i>	<i>Item Description</i>
ML21	<p>b. “Superconductive” electrical equipment (rotating machinery or transformers) specially designed or configured to be installed in a vehicle for military ground, marine, airborne or space applications and capable of operating while in motion.</p> <p><i>Note</i>  <i>Category Code ML20.b. does not apply to direct-current hybrid homopolar generators that have single-pole normal metal armatures which rotate in a magnetic field produced by superconducting windings, provided those windings are the only superconducting components in the generator.</i></p> <p>“Software” as follows:</p> <p>a. “Software” specially designed or modified for any of the following:</p> <ol style="list-style-type: none"> <li>1. “Development”, “production”, operation or maintenance of equipment specified in this Division;</li> <li>2. “Development” or “production” of materials specified in this Division; <u>or</u></li> <li>3. “Development”, “production”, operation or maintenance of “software” specified in this Division;</li> </ol> <p>b. Specific “software”, other than that specified in Category Code ML21.a., as follows:</p> <ol style="list-style-type: none"> <li>1. “Software” specially designed for military use and specially designed for modelling, simulating or evaluating military weapon systems;</li> <li>2. “Software” specially designed for military use and specially designed for modelling or simulating military operational scenarios;</li> <li>3. “Software” for determining the effects of conventional, nuclear, chemical or biological weapons;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
ML22	<p>4. “Software” specially designed for military use and specially designed for Command, Communications, Control and Intelligence (C<sup>3</sup>I) or Command, Communications, Control, Computer and Intelligence (C<sup>4</sup>I) applications;</p> <p>c. “Software”, not specified in Category Code ML21.a. or ML21.b., specially designed or modified to enable equipment not specified in this Division to perform the military functions of equipment specified in this Division.</p> <p>“Technology” as follows:</p> <p>a. “Technology”, other than specified in Category Code ML22.b., which is “required” for the “development”, “production”, operation, installation, maintenance (checking), repair, overhaul or refurbishing of items specified in this Division;</p> <p>b. “Technology” as follows:</p> <ol style="list-style-type: none"> <li>1. “Technology” “required” for the design of, the assembly of components into, and the operation, maintenance and repair of, complete production installations for items specified in this Division, even if the components of such production installations are not specified;</li> <li>2. “Technology” “required” for the “development” and “production” of small arms, even if used to produce reproductions of antique small arms;</li> <li>3. Not used; <u>N.B.</u> <i>See Category Code ML22.a. for “technology” previously specified by Category Code ML22.b.3.</i></li> <li>4. Not used; <u>N.B.</u> <i>See Category Code ML22.a. for “technology” previously specified by Category Code ML22.b.4.</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="566 448 1268 582">5. “Technology” “required” exclusively for the incorporation of “biocatalysts”, specified in Category Code ML7.i.1., into military carrier substances or military material.</p> <p data-bbox="502 593 582 627"><i>Note 1</i></p> <p data-bbox="502 638 1268 840"><i>“Technology” “required” for the “development”, “production”, operation, installation, maintenance (checking), repair, overhaul or refurbishing of items specified in this Division is considered to fall within Category Code ML22 even when applicable to any goods which are not specified in this Division.</i></p> <p data-bbox="502 851 582 884"><i>Note 2</i></p> <p data-bbox="502 896 1268 996"><i>Category Code ML22 does not include “technology” for magnetic induction for continuous propulsion of civil transport devices.</i></p>

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PART 2

DUAL-USE GOODS THE EXPORT, TRANSHIPMENT OR  
BRINGING IN TRANSIT OF WHICH, AND TECHNOLOGY  
THE EXPORT OR TRANSMISSION OF WHICH, REQUIRE A PERMIT

*Division 1 — Preliminary Provisions*

*Subdivision 1 — General Notes*

1. Non-controlled goods (including plant) containing one or more controlled components set out in Division 2 are considered to be controlled goods within Division 2, if the controlled components are the principal element of the non-controlled goods and can feasibly be removed or used for other purposes.
2. In determining whether goods are to be considered the principal element of other goods for the purposes of paragraph 1, factors such as the quantity, value and technological know-how involved, and other special circumstances which might establish the goods as the principal element of the other goods, must be weighed.
3. Goods specified in Division 2 include both new and used goods.
4. Chemicals in Division 2 are listed by name and CAS number. Chemicals of the same structural formula (including hydrates) as chemicals listed in Division 2 are to be considered as coming within the descriptions of the second-mentioned chemicals regardless of name or CAS number. CAS numbers are shown in order to assist in identifying whether a particular chemical or mixture is a chemical within Division 2, irrespective of nomenclature. CAS numbers are not intended to be used as unique identifiers, because some forms of the listed chemical have different CAS numbers, and mixtures containing a listed chemical may also have different CAS numbers.

*Subdivision 2 — Nuclear Technology Note (NTN)*

*(To be read in conjunction with section E of Category 0.)*

5. “Technology” for the “development”, “production” or “use” of goods specified in Category 0 are considered to be “technology” under section E of that Category even when applicable to goods not so specified.



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*Subdivision 3 — General Technology Note (GTN)*

*(To be read in conjunction with section E of Categories 1 to 9.)*

6. “Technology” under section E of Categories 1 to 9 is “technology” which is “required” for the “development”, “production” or “use” of goods specified in those Categories.

“Technology” for the “development”, “production” or “use” of goods specified in Categories 1 to 9 is considered to be “technology” under section E of those Categories even when applicable to goods not so specified.

*Subdivision 4 — General Software Note (GSN)*

7. Categories 0 to 9 of Division 2 do not include “software” which is either of the following:

- a. Software generally available to the public by being:
1. Sold from stock at retail selling points, without restriction, by means of:
    - a. Over-the-counter transactions;
    - b. Mail order transactions;
    - c. Electronic transactions; or
    - d. Telephone order transactions; and
  2. Designed for installation by the user without further substantial support by the supplier; or
- b. The minimum necessary “object code” for the installation, operation, maintenance (checking) or repair of those items whose export has been authorised.

*Note*

*Paragraph 7 does not extend to “software” specified in Category 5 — Part 2 (“Information Security”).*

*Subdivision 5 — General “Information Security” Note (GISN)*

8. “Information security” items or functions, even if they are components, “software” or functions of other items, are treated as coming within Category 5 — Part 2.

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*Subdivision 6 — Definitions of Words and Expressions in this Part*

9. In this Part, a word or expression in quotation marks (“ ”) takes the definition set out against it in this paragraph:

“accuracy” (Categories 2, 3, 6, 7, 8), usually measured in terms of inaccuracy, means the maximum deviation, positive or negative, of an indicated value from an accepted standard or true value;

“active flight control systems” (Category 7) means systems that function to prevent undesirable “aircraft” and missile motions or structural loads by autonomously processing outputs from multiple sensors and then providing the necessary preventive commands to effect automatic control;

“active pixel” (Category 6) means a minimum (single) element of the solid state array which has a photoelectric transfer function when exposed to light (electromagnetic) radiation;

“Adjusted Peak Performance” (“APP”) (Category 4) means an adjusted peak rate at which “digital computers” perform 64-bit or larger floating-point additions and multiplications, and is expressed in Weighted TeraFLOPS (WT) with units of  $10^{12}$  adjusted Floating-Point Operations (FPO) per second;

*N.B.*

*See Category 4, Technical Note.*

“aircraft” (Categories 1, 6, 7, 9) means a fixed wing, swivel wing, rotary wing (helicopter), tilt rotor or tilt-wing airborne vehicle;

*N.B.*

*See also “civil aircraft”.*

“airship” (Category 9) means a power-driven airborne vehicle that is kept buoyant by a body of gas (usually helium, formerly hydrogen) which is lighter than air;

“all compensations available” (Category 2) means after all feasible measures available to the manufacturer to minimise all systematic positioning errors for the particular machine-tool model or measuring errors for the particular Coordinate Measuring Machine (CMM) are considered;

“allocated by the ITU” (Categories 3, 5) means the allocation of frequency bands according to the current edition of the ITU Radio Regulations for primary, permitted and secondary services;

*Note*

*Additional and alternative allocations are not included.*

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“angle random walk” (Category 7) means the angular error build-up with time that is due to white noise in angular rate (Ref. IEEE Std 528-2001);

“angular position deviation” (Category 2) means the maximum difference between angular position and the actual, very accurately measured angular position after the workpiece mount of the table has been turned out of its initial position;

“APP” (Category 4) is equivalent to “Adjusted Peak Performance”;

“asymmetric algorithm” (Category 5) means a cryptographic algorithm using different, mathematically-related keys for encryption and decryption;

*Note*

*A common use of “asymmetric algorithms” is key management.*

“authentication” (Category 5) means verifying the identity of a user, process or device, often as a prerequisite to allowing access to resources in an information system. This includes verifying the origin or content of a message or other information, and all aspects of access control where there is no encryption of files or text except as directly related to the protection of passwords, Personal Identification Numbers (PINs) or similar data to prevent unauthorised access;

“automatic target tracking” (Category 6) means a processing technique that automatically determines and provides as output an extrapolated value of the most probable position of the target in real time;

“average output power” (Category 6) means the total “laser” output energy, in joules, divided by the period over which a series of consecutive pulses is emitted, in seconds. For a series of uniformly spaced pulses it is equal to the total “laser” output energy in a single pulse, in joules, multiplied by the pulse frequency of the “laser”, in Hertz;

“basic gate propagation delay time” (Category 3) means the propagation delay time value corresponding to the basic gate used in a “monolithic integrated circuit”. For a ‘family’ of “monolithic integrated circuits”, this may be specified either as the propagation delay time per typical gate within the given ‘family’ or as the typical propagation delay time per gate within the given ‘family’;

*Note 1*

*“Basic gate propagation delay time” is not to be confused with the input or output delay time of a complex “monolithic integrated circuit”.*

Note 2

'Family' consists of all integrated circuits to which all of the following are applied as their manufacturing methodology and specifications except their respective functions:

- a. The common hardware and software architecture;
- b. The common design and process technology; and
- c. The common basic characteristics.

"bias" (accelerometer) (Category 7) means the average over a specified time of accelerometer output, measured at specified operating conditions, that has no correlation with input acceleration or rotation. "Bias" (accelerometer) is expressed in g or in metres per second squared ( $\text{g}$  or  $\text{m/s}^2$ ). (Ref. IEEE Std 528-2001) (Micro g equals  $1 \times 10^{-6}$  g);

"bias" (gyro) (Category 7) means the average over a specified time of gyro output, measured at specified operating conditions, that has no correlation with input rotation or acceleration. "Bias" (gyro) is typically expressed in degrees per hour (deg/hr). (Ref. IEEE Std 528-2001);

"biological agents" (Category 1) means pathogens or toxins, selected or modified (such as altering the purity, shelf life, virulence, dissemination characteristics, or resistance to UV radiation) to produce casualties in humans or animals, degrade equipment or damage crops or the environment;

"camming" (Category 2) means axial displacement in one revolution of the main spindle measured in a plane perpendicular to the spindle faceplate, at a point next to the circumference of the spindle faceplate (Ref. ISO 230-1:1986, paragraph 5.63);

"carbon fibre preforms" (Category 1) means an ordered arrangement of uncoated or coated fibres intended to constitute a framework of a part before the "matrix" is introduced to form a "composite";

"chemical laser" (Category 6) means a "laser" in which the excited species is produced by the output energy from a chemical reaction;

"chemical mixture" (Category 1) means a solid, liquid or gaseous product made up of two or more components which do not react together under the conditions under which the mixture is stored;

"Circular Error Probable" ("CEP") (Category 7) means in a circular normal distribution, the radius of the circle containing 50% of the individual measurements being made, or the radius of the circle within which there is a 50% probability of being located;

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“circulation-controlled anti-torque or circulation-controlled direction control systems” (Category 7) means systems that use air blown over aerodynamic surfaces to increase or control the forces generated by the surfaces;

“civil aircraft” (Categories 1, 3, 4, 7) means an “aircraft” listed by designation in published airworthiness certification lists by the civil aviation authorities of a “participating state” to fly commercial civil internal and external routes or for legitimate civil, private or business use;

*N.B.*

*See also “aircraft”.*

“commingled” (Category 1) means filament to filament blending of thermoplastic fibres and reinforcement fibres in order to produce a fibre reinforcement “matrix” mix in total fibre form;

“comminution” (Category 1) means a process to reduce a material to particles by crushing or grinding;

“communications channel controller” (Category 4) means the physical interface which controls the flow of synchronous or asynchronous digital information. It is an assembly that can be integrated into computer or telecommunications equipment to provide communications access;

“compensation systems” (Category 6) means systems which consist of the primary scalar sensor, one or more reference sensors (e.g. vector magnetometers) together with software that permit reduction of rigid body rotation noise of the platform;

“composite” (Categories 1, 2, 6, 8, 9) means a “matrix” and an additional phase or additional phases consisting of particles, whiskers, fibres or any combination thereof, present for a specific purpose or purposes;

“compound rotary table” (Category 2) means a table allowing the workpiece to rotate and tilt about two non-parallel axes, which can be coordinated simultaneously for “contouring control”;

“III/V compounds” (Categories 3, 6) means polycrystalline or binary or complex monocrystalline products consisting of elements of groups IIIA and VA of Mendeleev’s periodic classification table (e.g. gallium arsenide, gallium-aluminium arsenide, indium phosphide);

“contouring control” (Category 2) means two or more “numerically controlled” motions operating in accordance with instructions that specify the next required position and the required feed rates to that position. These feed rates are varied in relation to each other so that a desired contour is generated (Ref. ISO/DIS 2806-1980);

“critical temperature” (Categories 1, 3, 5) (sometimes referred to as the transition temperature) of a specific “superconductive” material means the temperature at which the material loses all resistance to the flow of direct electrical current;

“cryptographic activation” (Category 5) means any technique that activates or enables cryptographic capability of an item, by means of a secure mechanism implemented by the manufacturer of the item, where this mechanism is uniquely bound to either of the following:

- a. A single instance of the item; or
- b. One customer, for multiple instances of the item;

Technical Notes

1. “Cryptographic activation” techniques and mechanisms may be implemented as hardware, “software” or “technology”.
2. Mechanisms for “cryptographic activation” can, for example, be serial number-based licence keys or authentication instruments such as digitally signed certificates.

“cryptography” (Category 5) means the discipline which embodies principles, means and methods for the transformation of data in order to hide its information content, prevent its undetected modification or prevent its unauthorised use. “Cryptography” is limited to the transformation of information using one or more ‘secret parameters’ (e.g. crypto variables) or associated key management;

Note

“Cryptography” does not include ‘fixed’ data compression or coding techniques.

Technical Note

‘Fixed’ means the coding or compression algorithm cannot accept externally supplied parameters (e.g. cryptographic or key variables) and cannot be modified by the user.

Technical Note

‘Secret parameter’ means a constant or key kept from the knowledge of others or shared only within a group.

“CW laser” (Category 6) means a “laser” that produces a nominally constant output energy for greater than 0.25 seconds;

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“Data-Based Referenced Navigation” (“DBRN”) (Category 7) Systems means systems which use various sources of previously measured geo-mapping data integrated to provide accurate navigation information under dynamic conditions. Data sources include bathymetric maps, stellar maps, gravity maps, magnetic maps or 3-D digital terrain maps;

“deformable mirrors” (Category 6) (also known as adaptive optic mirrors) means mirrors having:

- a. A single continuous optical reflecting surface which is dynamically deformed by the application of individual torques or forces to compensate for distortions in the optical waveform incident upon the mirror; or
- b. Multiple optical reflecting elements that can be individually and dynamically repositioned by the application of torques or forces to compensate for distortions in the optical waveform incident upon the mirror;

“depleted uranium” (Category 0) means uranium depleted in the isotope 235 below that occurring in nature;

“development” (GTN, NTN, All Categories) has the same meaning as in the Act;

“diffusion bonding” (Categories 1, 2, 9) means a solid state joining of at least two separate pieces of metals into a single piece with a joint strength equivalent to that of the weakest material, wherein the principal mechanism is interdiffusion of atoms across the interface;

“digital computer” (Categories 4, 5) means equipment which can, in the form of one or more discrete variables, perform all of the following:

- a. Accept data;
- b. Store data or instructions in fixed or alterable (writable) storage devices;
- c. Process data by means of a stored sequence of instructions which is modifiable; and
- d. Provide output of data;

*Note*

*Modifications of a stored sequence of instructions include replacement of fixed storage devices, but not a physical change in wiring or interconnections.*

“digital transfer rate” (Category 5) means the total bit rate of the information that is directly transferred on any type of medium;

N.B.

*See also “total digital transfer rate”.*

“direct-acting hydraulic pressing” (Category 2) means a deformation process which uses a fluid-filled flexible bladder in direct contact with the workpiece;

“drift rate” (gyro) (Category 7) means the component of gyro output that is functionally independent of input rotation. It is expressed as an angular rate. (Ref. IEEE Std 528-2001);

“effective gramme” (Categories 0, 1) of “special fissile material” means:

- a. For plutonium isotopes and uranium-233, the isotope weight in grammes;
- b. For uranium enriched 1 per cent or greater in the isotope uranium-235, the element weight in grammes multiplied by the square of its enrichment expressed as a decimal weight fraction;
- c. For uranium enriched below 1 per cent in the isotope uranium-235, the element weight in grammes multiplied by 0.0001;

“electronic assembly” (Categories 2, 3, 4) means a number of electronic components (i.e. ‘circuit elements’, ‘discrete components’, integrated circuits, etc.) connected together to perform one or more specific functions, replaceable as an entity and normally capable of being disassembled;

Technical Note 1

*‘Circuit element’ means a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.*

Technical Note 2

*‘Discrete component’ means a separately packaged ‘circuit element’ with its own external connections.*

“electronically steerable phased array antenna” (Categories 5, 6) means an antenna which forms a beam by means of phase coupling, i.e. the beam direction is controlled by the complex excitation coefficients of the radiating elements and the direction of that beam can be varied in azimuth or in elevation, or both, by application, both in transmission and reception, of an electrical signal;



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“energetic materials” (Category 1) means substances or mixtures that react chemically to release energy required for their intended application. “Explosives”, ‘pyrotechnics’ and ‘propellants’ are subclasses of energetic materials;

*Technical Note 1*

*‘Pyrotechnics’ means mixtures of solid or liquid fuels and oxidisers which, when ignited, undergo an energetic chemical reaction at a controlled rate intended to produce specific time delays, or quantities of heat, noise, smoke, visible light or infrared radiation. Pyrophorics are a subclass of ‘pyrotechnics’, which contain no oxidisers but ignite spontaneously on contact with air.*

*Technical Note 2*

*‘Propellants’ means substances or mixtures that react chemically to produce large volumes of hot gases at controlled rates to perform mechanical work.*

“end-effectors” (Category 2) means grippers, ‘active tooling units’ and any other tooling that is attached to the baseplate on the end of a “robot” manipulator arm;

*Technical Note*

*‘Active tooling unit’ means a device for applying motive power, process energy or sensing to the workpiece.*

“equivalent density” (Category 6) means the mass of an optic per unit optical area projected onto the optical surface;

“explosives” (Category 1) means solid, liquid or gaseous substances or mixtures of substances which, in their application as primary, booster, or main charges in warheads, demolition and other applications, are required to detonate;

“fibrous or filamentary materials” (Categories 0, 1, 2, 8, 9) includes the following:

- a. Continuous “monofilaments”;
- b. Continuous “yarns” and “rovings”;
- c. “Tapes”, fabrics, random mats and braids;
- d. Chopped fibres, staple fibres and coherent fibre blankets;
- e. Whiskers, either monocrystalline or polycrystalline, of any length;
- f. Aromatic polyamide pulp;

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“film type integrated circuit” (Category 3) means an array of ‘circuit elements’ and metallic interconnections formed by deposition of a thick or thin film on an insulating “substrate”;

*Technical Note*

*‘Circuit element’ means a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.*

“flight control optical sensor array” (Category 7) means a network of distributed optical sensors, using “laser” beams, to provide real-time flight control data for on-board processing;

“flight path optimisation” (Category 7) means a procedure that minimises deviations from a four-dimensional (space and time) desired trajectory based on maximising performance or effectiveness for mission tasks;

“fly-by-light system” (Category 7) means a primary digital flight control system employing feedback to control the “aircraft” during flight, where the commands to the effectors or actuators are optical signals;

“fly-by-wire system” (Category 7) means a primary digital flight control system employing feedback to control the “aircraft” during flight, where the commands to the effectors or actuators are electrical signals;

“focal plane array” (Category 6) means a linear or two-dimensional planar layer, or combination of planar layers, of individual detector elements, with or without readout electronics, which work in the focal plane;

*Note*

*“Focal plane array” does not include a stack of single detector elements or any two, three or four element detectors provided time delay and integration is not performed within the element.*

“fractional bandwidth” (Categories 3, 5) means the “instantaneous bandwidth” divided by the centre frequency, expressed as a percentage;

“frequency hopping” (Categories 5, 6) means a form of “spread spectrum” in which the transmission frequency of a single communication channel is made to change by a random or pseudo-random sequence of discrete steps;

“frequency mask trigger” (Category 3) for “signal analysers” means a mechanism where the trigger function is able to select a frequency range to be triggered on as a subset of the acquisition bandwidth while ignoring other signals that may also be present within the same acquisition bandwidth. A “frequency mask trigger” may contain more than one independent set of limits;

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“frequency switching time” (Category 3) means the time (i.e. delay) taken by a signal when switched from an initial specified output frequency, to arrive at or within either of the following:

- a.  $\pm 100$  Hz of a final specified output frequency of less than 1 GHz; or
- b.  $\pm 0.1$  part per million of a final specified output frequency of equal to or greater than 1 GHz;

“frequency synthesiser” (Category 3) means any kind of frequency source, regardless of the actual technique used, providing a multiplicity of simultaneous or alternative output frequencies, from one or more outputs, controlled by, derived from or disciplined by a lesser number of standard (or master) frequencies;

“fuel cell” (Category 8) means an electrochemical device that converts chemical energy directly into Direct Current (DC) electricity by consuming fuel from an external source;

“Full Authority Digital Engine Control System” or “FADEC System” (Category 9) means a digital electronic control system for a gas turbine engine that is able to autonomously control the engine throughout its whole operating range from demanded engine start until demanded engine shut-down, in both normal and fault conditions;

“fusible” (Category 1) means capable of being cross-linked or polymerised further (cured) by the use of heat, radiation, catalysts, etc., or that can be melted without pyrolysis (charring);

“gas atomisation” (Category 1) means a process to reduce a molten stream of metal alloy to droplets of 500 micrometre diameter or less by a high pressure gas stream;

“geographically dispersed” (Category 6) means a state where each location is distant from any other location by more than 1,500 m in any direction. Mobile sensors are always considered “geographically dispersed”;

“guidance set” (Category 7) means systems that integrate the process of measuring and computing a vehicle’s position and velocity (i.e. navigation) with that of computing and sending commands to the vehicle’s flight control systems to correct the trajectory;

“hot isostatic densification” (Category 2) means the process of pressurising a casting at temperatures exceeding 375 K (102°C) in a closed cavity through various media (gas, liquid, solid particles, etc.) to create equal force in all directions to reduce or eliminate internal voids in the casting;

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“hybrid integrated circuit” (Category 3) means any combination of integrated circuit or circuits, or integrated circuit with ‘circuit elements’ or ‘discrete components’ connected together to perform one or more specific functions, and having all of the following characteristics:

- a. Containing at least one unencapsulated device;
- b. Connected together using typical IC production methods;
- c. Replaceable as an entity; and
- d. Not normally capable of being disassembled;

Technical Note 1

*‘Circuit element’ means a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.*

Technical Note 2

*‘Discrete component’ means a separately packaged ‘circuit element’ with its own external connections.*

“image enhancement” (Category 4) means the processing of externally derived information-bearing images by algorithms such as time compression, filtering, extraction, selection, correlation, convolution or transformations between domains (e.g. Fast Fourier Transform (FFT) or Walsh transform). This does not include algorithms using only linear or rotational transformation of a single image, such as translation, feature extraction, registration or false colouration;

“immunotoxin” (Category 1) means a conjugate of one cell specific monoclonal antibody and a “toxin” or “sub-unit of toxin”, that selectively affects diseased cells;

“information security” (GSN, GISN, Category 5) means all the means and functions ensuring the accessibility, confidentiality or integrity of information or communications, excluding the means and functions intended to safeguard against malfunctions. “Information security” includes “cryptography”, “cryptographic activation”, ‘cryptanalysis’, protection against compromising emanations and computer security;

Technical Note

*‘Cryptanalysis’ means analysis of a cryptographic system or its inputs and outputs to derive confidential variables or sensitive data, including clear text.*

“instantaneous bandwidth” (Categories 3, 5) means the bandwidth over which output power remains constant within 3 dB without adjustment of other operating parameters;

“instrumented range” (Category 6) means the specified unambiguous display range of a radar;

“insulation” (Category 9) means insulation that is applied to the components of a rocket motor, i.e. the case, nozzle, inlets, case closures, and includes cured or semi-cured compounded rubber sheet stock containing an insulating or refractory material. It may also be incorporated as stress relief boots or flaps;

“interior lining” (Category 9) means interior lining that is suited for the bond interface between the solid propellant and the case or insulating liner, and is usually a liquid polymer based dispersion of refractory or insulating materials, e.g. carbon filled hydroxyl terminated polybutadiene (HTPB) or other polymer with added curing agents sprayed or screeded over a case interior;

“intrinsic magnetic gradiometer” (Category 6) means a single magnetic field gradient sensing element and associated electronics the output of which is a measure of magnetic field gradient;

N.B.

*See also “magnetic gradiometer”.*

“intrusion software” (Category 4) means “software” specially designed or modified to avoid detection by ‘monitoring tools’, or to defeat ‘protective countermeasures’, of a computer or network-capable device, and performing either of the following:

- a. The extraction of data or information, from a computer or network-capable device, or the modification of system or user data;  
or
- b. The modification of the standard execution path of a program or process in order to allow the execution of externally provided instructions;

Note 1

*“Intrusion software” does not include any of the following:*

- a. *Hypervisors, debuggers or Software Reverse Engineering (SRE) tools;*
- b. *Digital Rights Management (DRM) “software”; or*
- c. *“Software” designed to be installed by manufacturers, administrators or users, for the purposes of asset tracking or recovery.*

Note 2

*Network-capable devices include mobile devices and smart meters.*

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Technical Notes

1. *'Monitoring tools'* means "software" or hardware devices, that monitor system behaviours or processes running on a device. This includes antivirus (AV) products, end point security products, Personal Security Products (PSP), Intrusion Detection Systems (IDS), Intrusion Prevention Systems (IPS) or firewalls.
2. *'Protective countermeasures'* means techniques designed to ensure the safe execution of code, such as Data Execution Prevention (DEP), Address Space Layout Randomisation (ASLR) or sandboxing.

"isolated live cultures" (Category 1) includes live cultures in dormant form and in dried preparations;

"isostatic presses" (Category 2) means equipment capable of pressurising a closed cavity through various media (e.g. gas, liquid, solid particles, etc.) to create equal pressure in all directions within the cavity upon a workpiece or material;

"laser" (Categories 0, 1, 2, 3, 5, 6, 7, 8, 9) means an item that produces spatially and temporally coherent light through amplification by stimulated emission of radiation;

N.B.

See also:

- "Chemical laser";
- "CW laser";
- "Pulsed laser";
- "Super High Power Laser";
- "Transfer laser".

"library" (Category 1) (parametric technical database) means a collection of technical information, reference to which may enhance the performance of relevant systems, equipment or components;

"lighter-than-air vehicles" (Category 9) means balloons and "airships" that rely on hot air or other lighter-than-air gases such as helium or hydrogen for their lift;

"linearity" (Category 2) (usually measured in terms of non-linearity) means the maximum deviation of the actual characteristic (average of upscale and downscale readings), positive or negative, from a straight line so positioned as to equalise and minimise the maximum deviations;

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“local area network” (Categories 4, 5) means a data communication system having both of the following characteristics:

- a. Allows an arbitrary number of independent ‘data devices’ to communicate directly with each other; and
- b. Is confined to a geographical area of moderate size (e.g. office building, plant, campus, warehouse);

*Technical Note*

*‘Data device’ means equipment capable of transmitting or receiving sequences of digital information.*

“magnetic gradiometers” (Category 6) means instruments designed to detect the spatial variation of magnetic fields from sources external to the instrument. They consist of multiple “magnetometers” and associated electronics the output of which is a measure of magnetic field gradient;

*N.B.*

*See also “intrinsic magnetic gradiometer”.*

“magnetometers” (Category 6) means instruments designed to detect magnetic fields from sources external to the instrument. They consist of a single magnetic field sensing element and associated electronics the output of which is a measure of the magnetic field;

“main storage” (Category 4) means the primary storage for data or instructions for rapid access by a Central Processing Unit (CPU). It consists of the internal storage of a “digital computer” and any hierarchical extension thereto, such as cache storage or non-sequentially accessed extended storage;

“materials resistant to corrosion by UF<sub>6</sub>” (Category 0) means copper, copper alloys, stainless steel, aluminium, aluminium oxide, aluminium alloys, nickel or alloys containing 60% or more nickel by weight and fluorinated hydrocarbon polymers;

“matrix” (Categories 1, 2, 8, 9) means a substantially continuous phase that fills the space between particles, whiskers or fibres;

“measurement uncertainty” (Category 2) means the characteristic parameter which specifies in what range around the output value the correct value of the measurable variable lies with a confidence level of 95%. It includes the uncorrected systematic deviations, the uncorrected backlash and the random deviations (Ref. ISO 10360-2);

“mechanical alloying” (Category 1) means an alloying process resulting from the bonding, fracturing and rebonding of elemental and master alloy powders by mechanical impact. Non-metallic particles may be incorporated in the alloy by addition of the appropriate powders;

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“melt extraction” (Category 1) means a process to ‘solidify rapidly’ and extract a ribbon-like alloy product by the insertion of a short segment of a rotating chilled block into a bath of a molten metal alloy;

*Technical Note*

*‘Solidify rapidly’ means solidification of molten material at cooling rates exceeding 1,000 K/s.*

“melt spinning” (Category 1) means a process to ‘solidify rapidly’ a molten metal stream impinging upon a rotating chilled block, forming a flake, ribbon or rod-like product;

*Technical Note*

*‘Solidify rapidly’ means solidification of molten material at cooling rates exceeding 1,000 K/s.*

“microcomputer microcircuit” (Category 3) means a “monolithic integrated circuit” or “multichip integrated circuit” containing an Arithmetic Logic Unit (ALU) capable of executing general purpose instructions from an internal storage, on data contained in the internal storage;

*Note*

*The internal storage may be augmented by an external storage.*

“microprocessor microcircuit” (Category 3) means a “monolithic integrated circuit” or “multichip integrated circuit” containing an Arithmetic Logic Unit (ALU) capable of executing a series of general purpose instructions from an external storage;

*Note 1*

*“Microprocessor microcircuit” normally does not contain integral user-accessible storage, although storage present on-the-chip may be used in performing its logic function.*

*Note 2*

*“Microprocessor microcircuit” includes chip sets which are designed to operate together to provide the function of a “microprocessor microcircuit”.*

“microorganisms” (Categories 1, 2) means bacteria, viruses, mycoplasmas, rickettsiae, chlamydiae or fungi, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures;



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“missiles” (Categories 1, 3, 6, 7, 9) means complete rocket systems and unmanned aerial vehicle systems, capable of delivering at least 500 kg payload to a range of at least 300 km;

“monofilament” (Category 1) or filament means the smallest increment of fibre, usually several micrometres in diameter;

“monolithic integrated circuit” (Category 3) means a combination of passive or active ‘circuit elements’ or both which:

- a. Are formed by means of diffusion processes, implantation processes or deposition processes in or on a single semiconducting piece of material, a so-called chip;
- b. Can be considered as indivisibly associated; and
- c. Perform the function or functions of a circuit;

*Technical Note*

*‘Circuit element’ means a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor or one capacitor, etc.*

“Monolithic Microwave Integrated Circuit” (“MMIC”) (Categories 3, 5) means a “monolithic integrated circuit” that operates at microwave or millimeter wave frequencies;

“monospectral imaging sensors” (Category 6) means sensors capable of acquisition of imaging data from one discrete spectral band;

“multichip integrated circuit” (Category 3) means two or more “monolithic integrated circuits” bonded to a common “substrate”;

“multispectral imaging sensors” (Category 6) means sensors capable of simultaneous or serial acquisition of imaging data from two or more discrete spectral bands. Sensors having more than twenty discrete spectral bands are sometimes referred to as hyperspectral imaging sensors;

“natural uranium” (Category 0) means uranium containing the mixtures of isotopes occurring in nature;

“network access controller” (Category 4) means a physical interface to a distributed switching network. It uses a common medium which operates throughout at the same “digital transfer rate” using arbitration (e.g. token or carrier sense) for transmission. Independently from any other, it selects data packets or data groups (e.g. Ref. IEEE 802) addressed to it. It is an assembly that can be integrated into computer or telecommunications equipment to provide communications access;

“neural computer” (Category 4) means a computational device designed or modified to mimic the behaviour of a neuron or a collection of neurons, i.e. a computational device which is distinguished by its hardware capability to modulate the weights and numbers of the interconnections of a multiplicity of computational components based on previous data;

“nuclear reactor” (Category 0) means a complete reactor capable of operation so as to maintain a controlled self-sustaining fission chain reaction. A “nuclear reactor” includes all the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain, come into direct contact with or control the primary coolant of the reactor core;

“numerical control” (Category 2) means the automatic control of a process performed by a device that makes use of numeric data usually introduced as the operation is in progress (Ref. ISO 2382);

“object code” (GSN) means an equipment executable form of a convenient expression of one or more processes (“source code” or source language) which has been compiled by programming system;

“Operations, Administration or Maintenance” (“OAM”) (Category 5) means performing one or more of the following tasks:

- a. Establishing or managing any of the following:
  1. Accounts or privileges of users or administrators;
  2. Settings of an item; or
  3. Authentication data in support of the tasks described in paragraph a.1. or a.2.;
- b. Monitoring or managing the operating condition or performance of an item; or
- c. Managing logs or audit data in support of any of the tasks described in paragraph a. or b.;

Note

“OAM” does not include either of the following tasks or their associated key management functions:

- a. Provisioning or upgrading any cryptographic functionality that is not directly related to establishing or managing authentication data in support of the tasks described in paragraph a.1. or a.2. above; or
- b. Performing any cryptographic functionality on the forwarding or data plane of an item.

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“optical computer” (Category 4) means a computer designed or modified to use light to represent data, and the computational logic elements of which are based on directly coupled optical devices;

“optical integrated circuit” (Category 3) means a “monolithic integrated circuit” or a “hybrid integrated circuit”, containing one or more parts designed to function as a photosensor or photoemitter or to perform an optical or an electro-optical function or functions;

“optical switching” (Category 5) means the routing of or switching of signals in optical form without conversion to electrical signals;

“overall current density” (Category 3) means the total number of ampere-turns in the coil (i.e. the sum of the number of turns multiplied by the maximum current carried by each turn) divided by the total cross-section of the coil (comprising the superconducting filaments, the metallic matrix in which the superconducting filaments are embedded, the encapsulating material, any cooling channels, etc.);

“participating state” (Categories 7, 9) means a state participating in the Wassenaar Arrangement (details of which are set out in <https://www.wassenaar.org>);

“peak power” (Category 6) means the highest power attained in the “pulse duration”;

“personal area network” (Category 5) means a data communication system having both of the following characteristics:

- a. Allows an arbitrary number of independent or interconnected ‘data devices’ to communicate directly with each other; and
- b. Is confined to the communication between devices within the immediate vicinity of an individual person or device controller (e.g. single room, office, or automobile and their nearby surrounding spaces);

*Technical Note*

*‘Data device’ means equipment capable of transmitting or receiving sequences of digital information.*

“plasma atomisation” (Category 1) means a process to reduce a molten stream or solid metal to droplets of 500 µm diameter or less, using plasma torches in an inert gas environment;

“power management” (Category 7) means changing the transmitted power of the altimeter signal so that received power at the “aircraft” altitude is always at the minimum necessary to determine the altitude;

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“previously separated” (Category 1) means the application of any process intended to increase the concentration of the controlled isotope;

“primary flight control” (Category 7) means an “aircraft” stability or manoeuvring control using force or moment generators, i.e. aerodynamic control surfaces or propulsive thrust vectoring;

“principal element” (Category 4), as it applies in Category 4, is an element the replacement value of which is more than 35% of the total value of the system of which it is an element. Element value is the price paid for the element by the manufacturer of the system, or by the system integrator. Total value is the normal international selling price to unrelated parties at the point of manufacture or consolidation of shipment;

“production” (GTN, NTN, All Categories) has the same meaning as in the Act;

“production equipment” (Categories 1, 7, 9) means tooling, templates, jigs, mandrels, moulds, dies, fixtures, alignment mechanisms, test equipment, other machinery and components therefor, limited to those specially designed or modified for “development” or for one or more phases of “production”;

“production facilities” (Categories 7, 9) means “production equipment” and specially designed software therefor integrated into installations for “development” or for one or more phases of “production”;

“program” (Categories 2, 6) means a sequence of instructions to carry out a process in, or convertible into, a form executable by an electronic computer;

“pulse compression” (Category 6) means the coding and processing of a radar signal pulse of long time duration to one of short time duration, while maintaining the benefits of high pulse energy;

“pulse duration” (Category 6) means the duration of a “laser” pulse, or the time between the half-power points on the leading edge and trailing edge of an individual pulse;

“pulsed laser” (Category 6) means a “laser” having a “pulse duration” that is less than or equal to 0.25 seconds;

“quantum cryptography” (Category 5) means a family of techniques for the establishment of shared key for “cryptography” by measuring the quantum-mechanical properties of a physical system (including those physical properties explicitly governed by quantum optics, quantum field theory or quantum electrodynamics);

“radar frequency agility” (Category 6) means any technique which changes, in a pseudo-random sequence, the carrier frequency of a pulsed radar transmitter between pulses or between groups of pulses by an amount equal to or larger than the pulse bandwidth;

“radar spread spectrum” (Category 6) means any modulation technique for spreading energy originating from a signal with a relatively narrow frequency band, over a much wider band of frequencies, by using random or pseudo-random coding;

“radiant sensitivity” (Category 6) means Radiant sensitivity ( $\text{mA/W}$ ) =  $0.807 \times (\text{wavelength in nm} \times \text{Quantum Efficiency (QE)})$ ;

*Technical Note*

*QE is usually expressed as a percentage; however, for the purposes of this formula, QE is expressed as a decimal number less than one, e.g. 78% is 0.78.*

“real-time bandwidth” (Category 3) for “signal analysers” means the widest frequency range for which the analyser can continuously transform time-domain data entirely into frequency-domain results using a Fourier or other discrete time transformation that processes every incoming time point, without a reduction of measured amplitude of more than 3 dB below the actual signal amplitude caused by gaps or windowing effects, while outputting or displaying the transformed data;

“real time processing” (Category 6) means the processing of data by a computer system providing a required level of service, as a function of available resources, within a guaranteed response time, regardless of the load of the system, when stimulated by an external event;

“repeatability” (Category 7) means the closeness of agreement among repeated measurements of the same variable under the same operating conditions when changes in conditions or non-operating periods occur between measurements (Ref. IEEE Std 528-2001 (one sigma standard deviation));

“required” (GTN, Categories 5, 6, 7, 9), in relation to “technology”, refers to only that portion of “technology” which is peculiarly responsible for achieving or extending the controlled performance levels, characteristics or functions. Such “required” “technology” may be shared by different goods;

“resolution” (Category 2) means the least increment of a measuring device; or, on digital instruments, the least significant bit (Ref. ANSI B-89.1.12);

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“riot control agents” (Category 1) means substances which, under the expected conditions of use for riot control purposes, produce rapidly in human sensory irritation or disabling physical effects which disappear within a short time following termination of exposure;

*Technical Note*

*Tear gases are a subset of “riot control agents”.*

“robot” (Categories 2, 8) means a manipulation mechanism, which may be of the continuous path or the point-to-point variety, may use sensors, and has all the following characteristics:

- a. It is multifunctional;
- b. It is capable of positioning or orienting material, parts, tools or special devices through variable movements in three dimensional space;
- c. It incorporates three or more closed or open loop servo-devices which may include stepping motors; and
- d. It has a “user-accessible programmability” by means of the teach/playback method or by means of an electronic computer which may be a programmable logic controller, i.e. without mechanical intervention;

*Note*

*“Robot” does not include the following devices:*

- a. *Manipulation mechanisms which are only manually or teleoperator controllable;*
- b. *Fixed sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The program is mechanically limited by fixed stops, such as pins or cams. The sequence of motions and the selection of paths or angles are not variable or changeable by mechanical, electronic or electrical means;*

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- c. *Mechanically controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The program is mechanically limited by fixed, but adjustable stops, such as pins or cams. The sequence of motions and the selection of paths or angles are variable within the fixed program pattern. Variations or modifications of the program pattern (e.g. changes of pins or exchanges of cams) in one or more motion axes are accomplished only through mechanical operations;*
  - d. *Non-servo-controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The program is variable but the sequence proceeds only by the binary signal from mechanically fixed electrical binary devices or adjustable stops;*
  - e. *Stacker cranes defined as Cartesian coordinate manipulator systems manufactured as an integral part of a vertical array of storage bins and designed to access the contents of those bins for storage or retrieval.*

“rotary atomisation” (Category 1) means a process to reduce a stream or pool of molten metal to droplets to a diameter of 500 micrometre or less by centrifugal force;

“roving” (Category 1) means a bundle (typically 12-120) of approximately parallel ‘strands’;

*Technical Note*

*‘Strand’ means a bundle of “monofilaments” (typically over 200) arranged approximately parallel to each other.*

“run-out” (Category 2) (out-of-true running) means radial displacement in one revolution of the main spindle measured in a plane perpendicular to the spindle axis at a point on the external or internal revolving surface to be tested (Ref. ISO 230-1:1986, paragraph 5.61);

“scale factor” (gyro or accelerometer) (Category 7) means the ratio of change in output to a change in the input intended to be measured. “Scale factor” is generally evaluated as the slope of the straight line that can be fitted by the method of least squares to input-output data obtained by varying the input cyclically over the input range;

“settling time” (Category 3) means the time required for the output to come within one-half bit of the final value when switching between any two levels of the converter;

“signal analysers” (Category 3) means apparatus capable of measuring and displaying basic properties of the single-frequency components of multi-frequency signals;

“signal processing” (Categories 3, 4, 5, 6) means the processing of externally derived information-bearing signals by algorithms such as time compression, filtering, extraction, selection, correlation, convolution or transformations between domains (e.g. Fast Fourier Transform (FFT) or Walsh transform);

“software” (GSN, All Categories) means a collection of one or more “programs” or ‘microprograms’ recorded, stored or embodied in any device;

*Technical Note*

*‘Microprogram’ means a sequence of elementary instructions maintained in a special storage, the execution of which is initiated by the introduction of its reference instruction into an instruction register.*

“source code” (or source language) (Categories 6, 7, 9) means a convenient expression of one or more processes which may be turned by a programming system into equipment executable form (“object code” (or object language));

“spacecraft” (Category 9) means active and passive satellites and space probes;

“spacecraft bus” (Category 9) means equipment that provides the support infrastructure of the “spacecraft” and location for the “spacecraft payload”;

“spacecraft payload” (Category 9) means equipment, attached to the “spacecraft bus”, designed to perform a mission in space (e.g. communications, observation, science);

“space-qualified” (Categories 3, 6, 7) means designed, manufactured or qualified through successful testing, for operation at altitudes greater than 100 km above the surface of the Earth;

*Note*

*A determination that a specific item is “space-qualified” by virtue of testing does not mean that other items in the same production run or model series are “space-qualified” if not individually tested.*



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“special fissile material” (Category 0) means plutonium-239, uranium-233, ‘uranium enriched in the isotopes 235 or 233’, and any material containing the foregoing;

*Technical Note*

*‘uranium enriched in the isotopes 235 or 233’ means uranium containing the isotopes 235 or 233, or both, in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is more than the ratio of the isotope 235 to the isotope 238 occurring in nature (isotopic ratio 0.71 per cent).*

“specific modulus” (Categories 0, 1, 9) means 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 ( $(23 \pm 2)^\circ C$ ) and a relative humidity of  $(50 \pm 5)\%$ ;

“specific tensile strength” (Categories 0, 1, 9) means Ultimate Tensile Strength (UTS) in pascals, equivalent to  $N/m^2$  divided by specific weight in  $N/m^3$ , measured at a temperature of  $(296 \pm 2)$  K ( $(23 \pm 2)^\circ C$ ) and a relative humidity of  $(50 \pm 5)\%$ ;

“spinning mass gyros” (Category 7) means gyros which use a continually rotating mass to sense angular motion;

“splat quenching” (Category 1) means a process to ‘solidify rapidly’ a molten metal stream impinging upon a chilled block, forming a flake-like product;

*Technical Note*

*‘Solidify rapidly’ means solidification of molten material at cooling rates exceeding 1,000 K/s.*

“spread spectrum” (Category 5) means the technique whereby energy in a relatively narrow-band communication channel is spread over a much wider energy spectrum;

“spread spectrum” radar (Category 6) – see “radar spread spectrum”;

“stability” (Category 7) means the standard deviation (1 sigma) of the variation of a particular parameter from its calibrated value measured under stable temperature conditions. It can be expressed as a function of time;

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“substrate” (Category 3) means a sheet of base material with or without an interconnection pattern and on which or within which ‘discrete components’ or integrated circuits or both can be located;

*Technical Note*

*‘Discrete component’ means a separately packaged ‘circuit element’ with its own external connections.*

*Technical Note*

*‘Circuit element’ means a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor or one capacitor, etc.*

“substrate blanks” (Categories 3, 6) means monolithic compounds with dimensions suitable for the production of optical elements such as mirrors or optical windows;

“sub-unit of toxin” (Category 1) means a structurally and functionally discrete component of a whole “toxin”;

“superalloys” (Categories 2, 9) means nickel-, cobalt- or iron-base alloys having strengths superior to any alloys in the AISI 300 series at temperatures over 922 K (649°C) under severe environmental and operating conditions;

“superconductive” (Categories 1, 3, 5, 6, 8) means materials, i.e. metals, alloys or compounds, which can lose all electrical resistance, i.e. which can attain infinite electrical conductivity and carry very large electrical currents without Joule heating;

*Note*

*The “superconductive” state of a material is individually characterised by a “critical temperature”, a critical magnetic field, which is a function of temperature, and a critical current density which is, however, a function of both magnetic field and temperature.*

“Super High Power Laser” (“SHPL”) (Category 6) means a “laser” capable of delivering (the total or any portion of) the output energy exceeding 1 kJ within 50 ms or having an average or CW power exceeding 20 kW;

“superplastic forming” (Categories 1, 2) means a deformation process using heat for metals that are normally characterised by low values of elongation (less than 20%) at the breaking point as determined at room temperature by conventional tensile strength testing, in order to achieve elongations during processing which are at least 2 times those values;

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“symmetric algorithm” (Category 5) means a cryptographic algorithm using an identical key for both encryption and decryption;

*Note*

*A common use of “symmetric algorithms” is to safeguard confidentiality of data.*

“systolic array computer” (Category 4) means a computer where the flow and modification of the data is dynamically controllable at the logic gate level by the user;

“tape” (Category 1) means a material constructed of interlaced or unidirectional “monofilaments”, ‘strands’, “rovings”, “tows”, “yarns”, etc., usually pre-impregnated with resin;

*Technical Note*

*‘Strand’ is a bundle of “monofilaments” (typically over 200) arranged approximately parallel to each other.*

“technology” (GTN, NTN, All Categories) means information (including information comprised in such documents as specifications, blueprints, plans, manuals, models, diagrams, formulae, tables and designs) that is necessary for the “development”, “production” or “use” of any goods;

“three dimensional integrated circuit” (Category 3) means a collection of semiconductor dies or active device layers, integrated together, and having through semiconductor via connections passing completely through an ‘interposer’, substrate, die or layer to establish interconnections between the device layers;

*Technical Note*

*‘Interposer’ is an interface that enables electrical connections.*

“tilting spindle” (Category 2) means a tool-holding spindle which alters, during the machining process, the angular position of its centre line with respect to any other axis;

“time constant” (Category 6) means the time taken from the application of a light stimulus for the current increment to reach a value of  $1-1/e$  times the final value (i.e. 63% of the final value);

“tip shroud” (Category 9) means a stationary ring component (solid or segmented) attached to the inner surface of the engine turbine casing or a feature at the outer tip of the turbine blade, which primarily provides a gas seal between the stationary and rotating components;

“total control of flight” (Category 7) means an automated control of “aircraft” state variables and flight path to meet mission objectives responding to real-time changes in data regarding objectives, hazards or other “aircraft”;

“total digital transfer rate” (Category 5) means the number of bits, including line coding, overhead and so forth per unit time passing between corresponding equipment in a digital transmission system;

*N.B.*

*See also “digital transfer rate”.*

“tow” (Category 1) means a bundle of “monofilaments”, usually approximately parallel to each other;

“toxins” (Categories 1, 2) means toxins in the form of deliberately isolated preparations or mixtures, no matter how produced, other than toxins present as contaminants of other materials such as pathological specimens, crops, foodstuffs or seed stocks of “microorganisms”;

“transfer laser” (Category 6) means a “laser” in which the lasing species is excited through the transfer of energy by collision of a non-lasing atom or molecule with a lasing atom or molecule species;

“tunable” (Category 6) means the ability of a “laser” to produce a continuous output at all wavelengths over a range of several “laser” transitions. A line selectable “laser” produces discrete wavelengths within one “laser” transition and is not considered “tunable”;

“Unidirectional Positioning Repeatability” (“UPR”) (Category 2) means the smaller of values  $R_{\uparrow}$  and  $R_{\downarrow}$  (forward and backward), as defined by 3.21 of Ref. ISO 230-2:2014 or national equivalents, of an individual machine tool axis;

“unmanned aerial vehicle” (“UAV”) (Category 9) means any aircraft capable of initiating flight and sustaining controlled flight and navigation without any human presence on board;

“use” (GTN, NTN, All Categories) has the same meaning as in the Act;

“user-accessible programmability” (Category 6) means the facility allowing a user to insert, modify or replace “programs” by means other than:

- a. A physical change in wiring or interconnections; or
- b. The setting of function controls including entry of parameters;

“vaccine” (Category 1) means a medicinal product in a pharmaceutical formulation licensed by, or having marketing or clinical trial authorisation from, the regulatory authorities of either the country of manufacture or of use, which is intended to stimulate a protective immunological response in humans or animals in order to prevent disease in those to whom or to which it is administered;

“vacuum atomisation” (Category 1) means a process to reduce a molten stream of metal to droplets of a diameter of 500 micrometre or less by the rapid evolution of a dissolved gas upon exposure to a vacuum;

“variable geometry airfoils” (Category 7) means the use of trailing edge flaps or tabs, or leading edge slats or pivoted nose droop, the position of which can be controlled in flight;

“yarn” (Category 1) means a bundle of twisted ‘strands’.

*Technical Note*

*‘Strand’ means a bundle of “monofilaments” (typically over 200) arranged approximately parallel to each other.*

10. In this Part, a word or expression enclosed with single quotation marks (‘’) takes the definition set out against it in the Technical Note that follows immediately after the provision in which the word or expression appears.

*Subdivision 7 — Acronyms and Abbreviations used in this Part*

The acronyms and abbreviations used in this Part and set out in the first column have the meanings set out against them in the second column.

<i>First column</i>	<i>Second column</i>
<i>Acronym or Abbreviation</i>	<i>Meaning</i>
ABEC	Annular Bearing Engineers Committee
ABMA	American Bearing Manufacturers Association
ADC	Analogue-to-Digital Converter
AGMA	American Gear Manufacturers Association
AHRS	Attitude and Heading Reference Systems
AISI	American Iron and Steel Institute
ALE	Atomic Layer Epitaxy
ALU	Arithmetic Logic Unit

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ANSI	American National Standards Institute
APP	Adjusted Peak Performance
APU	Auxiliary Power Unit
ASTM	American Society for Testing and Materials
ATC	Air Traffic Control
BJT	Bipolar Junction Transistors
BPP	Beam Parameter Product
BSC	Base Station Controller
CAD	Computer-Aided-Design
CAS	Chemical Abstracts Service
CCD	Charge Coupled Device
CDU	Control and Display Unit
CEP	Circular Error Probable
CMM	Coordinate Measuring Machine
CMOS	Complementary Metal Oxide Semiconductor
CNTD	Controlled Nucleation Thermal Deposition
CPLD	Complex Programmable Logic Device
CPU	Central Processing Unit
CVD	Chemical Vapour Deposition
CW	Chemical Warfare
CW (for lasers)	Continuous Wave
DAC	Digital-to-Analogue Converter
DANL	Displayed Average Noise Level
DBRN	Data-Based Referenced Navigation
DDS	Direct Digital Synthesiser
DMA	Dynamic Mechanical Analysis
DME	Distance Measuring Equipment
DMOSFET	Diffused Metal Oxide Semiconductor Field Effect Transistor
DS	Directionally Solidified
EB	Exploding Bridge

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EB-PVD	Electron Beam Physical Vapour Deposition
EBW	Exploding Bridge Wire
ECM	Electro-Chemical Machining
EDM	Electrical Discharge Machines
EEPROMs	Electrically Erasable Programmable Read-Only Memories
EFI	Exploding Foil Initiators
EIRP	Effective Isotropic Radiated Power
ERF	Electrorheological Finishing
ERP	Effective Radiated Power
ETO	Emitter Turn-Off Thyristor
ETT	Electrical Triggering Thyristor
FADEC	Full Authority Digital Engine Control
FFT	Fast Fourier Transform
FPGA	Field Programmable Gate Array
FPIC	Field Programmable Interconnect
FPLA	Field Programmable Logic Array
FPO	Floating-Point Operation
FWHM	Full-Width Half-Maximum
GSM	Global System for Mobile Communications
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
GTO	Gate Turn-off Thyristor
HBT	Hetero-Bipolar Transistors
HEMT	High Electron Mobility Transistors
ICAO	International Civil Aviation Organisation
IEC	International Electro-technical Commission
IED	Improvised Explosive Device
IEEE	Institute of Electrical and Electronic Engineers
IFOV	Instantaneous-Field-Of-View
IGBT	Insulated Gate Bipolar Transistor

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IGCT	Integrated Gate Commutated Thyristor
IHO	International Hydrographic Organisation
ILS	Instrument Landing System
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
IP	Internet Protocol
IRS	Inertial Reference System
IRU	Inertial Reference Unit
ISA	International Standard Atmosphere
ISAR	Inverse Synthetic Aperture Radar
ISO	International Organisation for Standardisation
ITU	International Telecommunication Union
JT	Joule-Thomson
LIDAR	Light Detection and Ranging
LIDT	Laser Induced Damage Threshold
LOA	Length Overall
LRU	Line Replaceable Unit
MLS	Microwave Landing Systems
MMIC	Monolithic Microwave Integrated Circuit
MOCVD	Metal Organic Chemical Vapour Deposition
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MPM	Microwave Power Module
MRAM	Magnetic Random Access Memory
MRF	Magnetorheological Finishing
MRF	Minimum Resolvable Feature size
MRI	Magnetic Resonance Imaging
MTBF	Mean-Time-Between-Failures
MTTF	Mean-Time-To-Failure
NA	Numerical Aperture
NDT	Non-Destructive Test



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NEQ	Net Explosive Quantity
OAM	Operations, Administration or Maintenance
OSI	Open Systems Interconnection
PAI	Polyamide-imides
PAR	Precision Approach Radar
PCL	Passive Coherent Location
PIN	Personal Identification Number
PMR	Private Mobile Radio
PVD	Physical Vapour Deposition
ppm	parts per million
QAM	Quadrature-Amplitude-Modulation
RAP	Reactive Atom Plasmas
RF	Radio Frequency
RNC	Radio Network Controller
S-FIL	Step and Flash Imprint Lithography
SAR	Synthetic Aperture Radar
SAS	Synthetic Aperture Sonar
SC	Single Crystal
SCR	Silicon Controlled Rectifier
SFDR	Spurious Free Dynamic Range
SHPL	Super High Power Laser
SLAR	Sidelooking Airborne Radar
SOI	Silicon-On-Insulator
SPLD	Simple Programmable Logic Device
SQUID	Superconducting Quantum Interference Device
SRA	Shop Replaceable Assembly
SRAM	Static Random Access Memory
SSB	Single Sideband
SSR	Secondary Surveillance Radar
SSS	Side Scan Sonar

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TIR	Total Indicated Reading
TVR	Transmitting Voltage Response
UPR	Unidirectional Positioning Repeatability
UV	UltraViolet
UTS	Ultimate Tensile Strength
VJFET	Vertical Junction Field Effect Transistor
VOR	Very High Frequency Omni-directional Range
WLAN	Wireless Local Area Network

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*Division 2 — List of Dual-Use Goods*


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<i>Category Code</i>	<i>Item Description</i>
<b>CATEGORY 0 — NUCLEAR MATERIALS, FACILITIES, AND EQUIPMENT</b>	
<b>0A</b>	<b>Systems, Equipment and Components</b>
0A001	<p>“Nuclear reactors” and specially designed or prepared equipment and components therefor, as follows:</p> <ul style="list-style-type: none"> <li>a. “Nuclear reactors”;</li> <li>b. Metal vessels, or major shop-fabricated parts therefor, including the reactor vessel head for a reactor pressure vessel, specially designed or prepared to contain the core of a “nuclear reactor”;</li> <li>c. Manipulative equipment specially designed or prepared for inserting or removing fuel in a “nuclear reactor”;</li> <li>d. Control rods specially designed or prepared for the control of the fission process in a “nuclear reactor”, support or suspension structures therefor, rod drive mechanisms and rod guide tubes;</li> <li>e. Pressure tubes specially designed or prepared to contain both fuel elements and the primary coolant in a “nuclear reactor”;</li> <li>f. Zirconium metal tubes or zirconium alloy tubes (or assemblies of tubes) specially designed or prepared for use as fuel cladding in a “nuclear reactor”, and in quantities exceeding 10 kg;</li> </ul> <p><u><i>N.B.</i></u>  <i>For zirconium pressure tubes, see Category Code 0A001.e. and for calandria tubes, see Category Code 0A001.h.</i></p> <ul style="list-style-type: none"> <li>g. Coolant pumps or circulators specially designed or prepared for circulating the primary coolant of “nuclear reactors”;</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>h. ‘Nuclear reactor internals’ specially designed or prepared for use in a “nuclear reactor”, including support columns for the core, fuel channels, calandria tubes, thermal shields, baffles, core grid plates, and diffuser plates;</p> <p><i>Technical Note</i>  <i>In Category Code 0A001.h., ‘nuclear reactor internals’ means any major structure within a reactor vessel which has one or more functions such as supporting the core, maintaining fuel alignment, directing primary coolant flow, providing radiation shields for the reactor vessel, and guiding in-core instrumentation.</i></p> <p>i. Heat exchangers as follows:</p> <ol style="list-style-type: none"> <li>1. Steam generators specially designed or prepared for the primary, or intermediate, coolant circuit of a “nuclear reactor”;</li> <li>2. Other heat exchangers specially designed or prepared for use in the primary coolant circuit of a “nuclear reactor”;</li> </ol> <p><i>Note</i>  <i>Category Code 0A001.i. does not include heat exchangers for the supporting systems of the reactor, e.g. the emergency cooling system or the decay heat cooling system.</i></p> <p>j. Neutron detectors specially designed or prepared for determining neutron flux levels within the core of a “nuclear reactor”;</p> <p>k. ‘External thermal shields’ specially designed or prepared for use in a “nuclear reactor” for the reduction of heat loss and also for the containment vessel protection.</p> <p><i>Technical Note</i>  <i>In Category Code 0A001.k., ‘external thermal shields’ means major structures placed over the reactor vessel which reduce heat loss from the reactor and reduce temperature within the containment vessel.</i></p>

<i>Category Code</i>	<i>Item Description</i>
<b>0B</b>	<b>Test, Inspection and Production Equipment</b>
0B001	<p>Plant for the separation of isotopes of “natural uranium”, “depleted uranium” or “special fissile materials”, and specially designed or prepared equipment and components therefor, as follows:</p> <p>a. Plant specially designed for separating isotopes of “natural uranium”, “depleted uranium”, or “special fissile materials”, as follows:</p> <ol style="list-style-type: none"> <li>1. Gas centrifuge separation plant;</li> <li>2. Gaseous diffusion separation plant;</li> <li>3. Aerodynamic separation plant;</li> <li>4. Chemical exchange separation plant;</li> <li>5. Ion-exchange separation plant;</li> <li>6. Atomic vapour “laser” isotope separation plant;</li> <li>7. Molecular “laser” isotope separation plant;</li> <li>8. Plasma separation plant;</li> <li>9. Electromagnetic separation plant;</li> </ol> <p>b. Gas centrifuges and assemblies and components, specially designed or prepared for gas centrifuge separation process, as follows:</p> <p><u>Technical Note</u>  <i>In Category Code 0B001.b., ‘high strength-to-density ratio material’ means any of the following:</i></p> <ol style="list-style-type: none"> <li>a. <i>Maraging steel capable of an Ultimate Tensile Strength (UTS) of 1.95 GPa or more;</i></li> <li>b. <i>Aluminium alloys capable of an Ultimate Tensile Strength (UTS) of 0.46 GPa or more; or</i></li> <li>c. <i>“Fibrous or filamentary materials” with a “specific modulus” of more than <math>3.18 \times 10^6</math> m and a “specific tensile strength” greater than <math>7.62 \times 10^4</math> m.</i></li> </ol> <ol style="list-style-type: none"> <li>1. Gas centrifuges;</li> <li>2. Complete rotor assemblies;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>3. Rotor tube cylinders with a wall thickness of 12 mm or less, a diameter of between 75 mm and 650 mm, made from 'high strength-to-density ratio materials';</li> <li>4. Rings or bellows with a wall thickness of 3 mm or less and a diameter of between 75 mm and 650 mm and designed to give local support to a rotor tube or to join a number together, made from 'high strength-to-density ratio materials';</li> <li>5. Baffles of between 75 mm and 650 mm diameter for mounting inside a rotor tube, made from 'high strength-to-density ratio materials';</li> <li>6. Top or bottom caps of between 75 mm and 650 mm diameter to fit the ends of a rotor tube, made from 'high strength-to-density ratio materials';</li> <li>7. Magnetic suspension bearings as follows: <ol style="list-style-type: none"> <li>a. Bearing assemblies consisting of an annular magnet suspended within a housing made of or protected by "materials resistant to corrosion by UF<sub>6</sub>" containing a damping medium and having the magnet coupling with a pole piece or second magnet fitted to the top cap of the rotor;</li> <li>b. Active magnetic bearings specially designed or prepared for use with gas centrifuges;</li> </ol> </li> <li>8. Specially prepared bearings comprising a pivot-cup assembly mounted on a damper;</li> <li>9. Molecular pumps comprised of cylinders having internally machined or extruded helical grooves and internally machined bores;</li> <li>10. Ring-shaped motor stators for multiphase AC hysteresis (or reluctance) motors for synchronous operation within a vacuum at a frequency of 600 Hz or more and a power of 40 VA or more;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>11. 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 that are parallel to each other and perpendicular to the cylinder's longitudinal axis to within 0.05 degrees or less;</li> <li>12. Scoops consisting of specially designed or prepared tubes for the extraction of UF<sub>6</sub> gas from within the rotor tube by a Pitot tube action and capable of being fixed to the central gas extraction system;</li> <li>13. Frequency changers (converters or inverters) specially designed or prepared to supply motor stators for gas centrifuge enrichment, having both of the following characteristics, and specially designed components therefor: <ol style="list-style-type: none"> <li>a. A multiphase frequency output of 600 Hz or greater; <u>and</u></li> <li>b. High stability (with frequency control better than 0.2%);</li> </ol> </li> <li>14. Shut-off and control valves, as follows: <ol style="list-style-type: none"> <li>a. Shut-off valves specially designed or prepared to act on the feed, product or tails UF<sub>6</sub> gaseous streams of an individual gas centrifuge;</li> <li>b. Bellows-sealed valves, shut-off or control, made of or protected by "materials resistant to corrosion by UF<sub>6</sub>", with an inside diameter of 10 mm to 160 mm, specially designed or prepared for use in main or auxiliary systems of gas centrifuge enrichment plants;</li> </ol> </li> <li>c. Equipment and components, specially designed or prepared for gaseous diffusion separation process, as follows: <ol style="list-style-type: none"> <li>1. 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 nm to 100 nm, a thickness of 5 mm or less, and, for tubular forms, a diameter of 25 mm or less;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="526 448 1268 526">2. Gaseous diffuser housings made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”;</li> <li data-bbox="526 537 1268 705">3. Compressors or gas blowers with a suction volume capacity of 1 m<sup>3</sup>/min or more of UF<sub>6</sub>, discharge pressure up to 500 kPa and having a pressure ratio of 10:1 or less, and made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”;</li> <li data-bbox="526 716 1268 817">4. Rotary shaft seals for compressors or blowers specified in Category Code 0B001.c.3. and designed for a buffer gas in-leakage rate of less than 1,000 cm<sup>3</sup>/min;</li> <li data-bbox="526 828 1268 974">5. Heat exchangers made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”, and designed for a leakage pressure rate of less than 10 Pa per hour under a pressure differential of 100 kPa;</li> <li data-bbox="526 985 1268 1086">6. Bellows-sealed valves, manual or automated, shut-off or control, made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”;</li> </ol> <p data-bbox="470 1097 1268 1176">d. Equipment and components, specially designed or prepared for aerodynamic separation process, as follows:</p> <ol style="list-style-type: none"> <li data-bbox="526 1187 1268 1355">1. Separation nozzles consisting of slit-shaped, curved channels having a radius of curvature less than 1 mm, resistant to corrosion by UF<sub>6</sub>, and having a knife-edge contained within the nozzle which separates the gas flowing through the nozzle into two streams;</li> <li data-bbox="526 1366 1268 1467">2. Cylindrical or conical tubes, (vortex tubes), made of or protected by “materials resistant to corrosion by UF<sub>6</sub>” and with one or more tangential inlets;</li> <li data-bbox="526 1478 1268 1579">3. Compressors or gas blowers made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”, and rotary shaft seals therefor;</li> <li data-bbox="526 1590 1268 1668">4. Heat exchangers made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”;</li> <li data-bbox="526 1680 1268 1780">5. Separation element housings, made of or protected by “materials resistant to corrosion by UF<sub>6</sub>” to contain vortex tubes or separation nozzles;</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>6. Bellows-sealed valves, manual or automated, shut-off or control, made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”, with a diameter of 40 mm or more;</li> <li>7. Process systems for separating UF<sub>6</sub> from carrier gas (hydrogen or helium) to 1 parts per million (ppm) UF<sub>6</sub> content or less, including: <ul style="list-style-type: none"> <li>a. Cryogenic heat exchangers and cryoseparators capable of temperatures of 153 K (-120°C) or less;</li> <li>b. Cryogenic refrigeration units capable of temperatures of 153 K (-120°C) or less;</li> <li>c. Separation nozzle or vortex tube units for the separation of UF<sub>6</sub> from carrier gas;</li> <li>d. UF<sub>6</sub> cold traps capable of freezing out UF<sub>6</sub>;</li> </ul> </li> <li>e. Equipment and components, specially designed or prepared for chemical exchange separation process, as follows: <ul style="list-style-type: none"> <li>1. 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 protected by suitable plastic materials such as fluorinated hydrocarbon polymers or glass);</li> <li>2. 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 protected by suitable plastic materials such as fluorinated hydrocarbon polymers or glass);</li> <li>3. Electrochemical reduction cells resistant to concentrated hydrochloric acid solutions, for reduction of uranium from one valence state to another;</li> <li>4. Electrochemical reduction cells feed equipment to take U<sup>+4</sup> 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);</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>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 <math>U^{+6}</math> or <math>U^{+4}</math> to <math>U^{+3}</math>;</p> <p>6. Uranium oxidation systems for oxidation of <math>U^{+3}</math> to <math>U^{+4}</math>;</p> <p>f. Equipment and components, specially designed or prepared for ion-exchange separation process, as follows:</p> <ol style="list-style-type: none"> <li>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 fibres, 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 373 K (100°C) to 473 K (200°C);</li> <li>2. Ion exchange columns (cylindrical) with a diameter greater than 1,000 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 373 K (100°C) to 473 K (200°C) and pressures above 0.7 MPa;</li> <li>3. Ion exchange reflux systems (chemical or electrochemical oxidation or reduction systems) for regeneration of the chemical reducing or oxidising agents used in ion exchange enrichment cascades;</li> </ol> <p>g. Equipment and components, specially designed or prepared for laser-based separation processes using atomic vapour laser isotope separation, as follows:</p> <ol style="list-style-type: none"> <li>1. Uranium metal vaporisation systems designed to achieve a delivered power of 1 kW or more on the target for use in laser enrichment;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Liquid or vapour uranium metal handling systems specially designed or prepared for handling molten uranium, molten uranium alloys or uranium metal vapour for use in laser enrichment, and specially designed components therefor;</p> <p><u><i>N.B.</i></u> <i>See also Category Code 2A225.</i></p> <p>3. Product and tails collector assemblies for uranium metal in liquid or solid form, made of or protected by materials resistant to the heat and corrosion of uranium metal vapour or liquid, such as yttria-coated graphite or tantalum;</p> <p>4. Separator module housings (cylindrical or rectangular vessels) for containing the uranium metal vapour source, the electron beam gun and the product and tails collectors;</p> <p>5. “Lasers” or “laser” systems specially designed or prepared for the separation of uranium isotopes with a spectrum frequency stabilisation for operation over extended periods of time;</p> <p><u><i>N.B.</i></u> <i>See also Category Codes 6A005 and 6A205.</i></p> <p>h. Equipment and components, specially designed or prepared for laser-based separation processes using molecular laser isotope separation, as follows:</p> <ol style="list-style-type: none"> <li>1. Supersonic expansion nozzles for cooling mixtures of UF<sub>6</sub> and carrier gas to 150 K (-123°C) or less and made from “materials resistant to corrosion by UF<sub>6</sub>”;</li> <li>2. Product or tails collector components or devices specially designed or prepared for collecting uranium material or uranium tails material following illumination with laser light, made of “materials resistant to corrosion by UF<sub>6</sub>”;</li> <li>3. Compressors made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”, and rotary shaft seals therefor;</li> <li>4. Equipment for fluorinating UF<sub>5</sub> (solid) to UF<sub>6</sub> (gas);</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>5. Process systems for separating UF<sub>6</sub> from carrier gas (e.g. nitrogen, argon or other gas) including:</p> <ol style="list-style-type: none"> <li>a. Cryogenic heat exchangers and cryoseparators capable of temperatures of 153 K (-120°C) or less;</li> <li>b. Cryogenic refrigeration units capable of temperatures of 153 K (-120°C) or less;</li> <li>c. UF<sub>6</sub> cold traps capable of freezing out UF<sub>6</sub>;</li> </ol> <p>6. “Lasers” or “laser” systems specially designed or prepared for the separation of uranium isotopes with a spectrum frequency stabilisation for operation over extended periods of time;</p> <p><u><i>N.B.</i></u>  <i>See also Category Codes 6A005 and 6A205.</i></p> <p>i. Equipment and components, specially designed or prepared for plasma separation process, as follows:</p> <ol style="list-style-type: none"> <li>1. 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;</li> <li>2. Radio Frequency (RF) ion excitation coils for frequencies of more than 100 kHz and capable of handling more than 40 kW mean power;</li> <li>3. Uranium plasma generation systems;</li> <li>4. Not used;</li> <li>5. Product and tails collector assemblies for uranium metal in solid form, made of or protected by materials resistant to the heat and corrosion of uranium vapour such as yttria-coated graphite or tantalum;</li> <li>6. Separator module housings (cylindrical) for containing the uranium plasma source, Radio Frequency (RF) drive coil and the product and tails collectors and made of a suitable non-magnetic material (e.g. stainless steel);</li> </ol> <p>j. Equipment and components, specially designed or prepared for electromagnetic separation process, as follows:</p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>1. Ion sources, single or multiple, consisting of a vapour source, ioniser, and beam accelerator made of suitable non-magnetic materials (e.g. graphite, stainless steel, or copper) and capable of providing a total ion beam current of 50 mA or greater;</li> <li>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);</li> <li>3. Vacuum housings for uranium electromagnetic separators made of non-magnetic materials (e.g. stainless steel) and designed to operate at pressures of 0.1 Pa or lower;</li> <li>4. Magnet pole pieces with a diameter greater than 2 m;</li> <li>5. High voltage power supplies for ion sources, having all of the following characteristics: <ol style="list-style-type: none"> <li>a. Capable of continuous operation;</li> <li>b. Output voltage of 20,000 V or greater;</li> <li>c. Output current of 1 A or greater; <u>and</u></li> <li>d. Voltage regulation of better than 0.01% over a period of 8 hours;</li> </ol> <p><u>N.B.</u> See also Category Code 3A227.</p> </li> <li>6. Magnet power supplies (high power, direct current) having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Capable of continuous operation with a current output of 500 A or greater at a voltage of 100 V or greater; <u>and</u></li> <li>b. Current or voltage regulation better than 0.01% over a period of 8 hours.</li> </ol> <p><u>N.B.</u> See also Category Code 3A226.</p> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
0B002	<p data-bbox="475 450 1268 584">Specially designed or prepared auxiliary systems, equipment and components, as follows, for isotope separation plant specified in Category Code 0B001, made of or protected by “materials resistant to corrosion by UF<sub>6</sub>”:</p> <ol style="list-style-type: none"> <li data-bbox="475 600 1268 667">a. Feed autoclaves, ovens or systems used for passing UF<sub>6</sub> to the enrichment process;</li> <li data-bbox="475 683 1268 750">b. Desublimers or cold traps, used to remove UF<sub>6</sub> from the enrichment process for subsequent transfer upon heating;</li> <li data-bbox="475 766 1268 799">c. Product and tails stations for transferring UF<sub>6</sub> into containers;</li> <li data-bbox="475 815 1268 920">d. Liquefaction or solidification stations used to remove UF<sub>6</sub> from the enrichment process by compressing, cooling and converting UF<sub>6</sub> to a liquid or solid form;</li> <li data-bbox="475 936 1268 1041">e. Piping systems and header systems specially designed or prepared for handling UF<sub>6</sub> within gaseous diffusion, centrifuge or aerodynamic cascades;</li> <li data-bbox="475 1057 1268 1406">f. Vacuum systems and pumps, as follows: <ol style="list-style-type: none"> <li data-bbox="539 1102 1268 1169">1. Vacuum manifolds, vacuum headers or vacuum pumps having a suction capacity of 5 m<sup>3</sup>/minute or more;</li> <li data-bbox="539 1184 1268 1290">2. Vacuum pumps specially designed for use in UF<sub>6</sub>-bearing atmospheres made of, or protected by “materials resistant to corrosion by UF<sub>6</sub>”;</li> <li data-bbox="539 1305 1268 1406">3. Vacuum systems consisting of vacuum manifolds, vacuum headers and vacuum pumps, and designed for service in UF<sub>6</sub>-bearing atmospheres;</li> </ol> </li> <li data-bbox="475 1422 1268 1852">g. UF<sub>6</sub> mass spectrometers/ion sources capable of taking on-line samples from UF<sub>6</sub> gas streams and having all of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="539 1534 1268 1639">1. Capable of measuring ions of 320 atomic mass units or greater and having a resolution of better than 1 part in 320;</li> <li data-bbox="539 1655 1268 1760">2. Have ion sources constructed of or protected by nickel, nickel-copper alloys with a nickel content of 60% or more by weight, or nickel-chrome alloys;</li> <li data-bbox="539 1776 1268 1809">3. Have electron bombardment ionisation sources; <u>and</u></li> <li data-bbox="539 1825 1268 1852">4. Have a collector system suitable for isotopic analysis.</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
0B003	<p>Plant for the conversion of uranium and equipment specially designed or prepared therefor, as follows:</p> <ol style="list-style-type: none"> <li>a. Systems for the conversion of uranium ore concentrates to <math>UO_3</math>;</li> <li>b. Systems for the conversion of <math>UO_3</math> to <math>UF_6</math>;</li> <li>c. Systems for the conversion of <math>UO_3</math> to <math>UO_2</math>;</li> <li>d. Systems for the conversion of <math>UO_2</math> to <math>UF_4</math>;</li> <li>e. Systems for the conversion of <math>UF_4</math> to <math>UF_6</math>;</li> <li>f. Systems for the conversion of <math>UF_4</math> to uranium metal;</li> <li>g. Systems for the conversion of <math>UF_6</math> to <math>UO_2</math>;</li> <li>h. Systems for the conversion of <math>UF_6</math> to <math>UF_4</math>;</li> <li>i. Systems for the conversion of <math>UO_2</math> to <math>UCl_4</math>.</li> </ol>
0B004	<p>Plant for the production or concentration of heavy water, deuterium and deuterium compounds and specially designed or prepared equipment and components therefor, as follows:</p> <ol style="list-style-type: none"> <li>a. Plant for the production of heavy water, deuterium or deuterium compounds, as follows: <ol style="list-style-type: none"> <li>1. Water-hydrogen sulphide exchange plants;</li> <li>2. Ammonia-hydrogen exchange plants;</li> </ol> </li> <li>b. Equipment and components, as follows: <ol style="list-style-type: none"> <li>1. Water-hydrogen sulphide exchange towers with diameters of 1.5 m or more, capable of operating at pressures greater than or equal to 2 MPa;</li> <li>2. Single stage, low head (i.e. 0.2 MPa) centrifugal blowers or compressors for hydrogen sulphide gas circulation (i.e. gas containing more than 70% <math>H_2S</math>) with a throughput capacity greater than or equal to <math>56 \text{ m}^3/\text{second}</math> when operating at pressures greater than or equal to 1.8 MPa suction and having seals designed for wet <math>H_2S</math> service;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>3. Ammonia-hydrogen exchange towers greater than or equal to 35 m in height with diameters of 1.5 m to 2.5 m capable of operating at pressures greater than 15 MPa;</li> <li>4. Tower internals, including stage contactors, and stage pumps, including those which are submersible, for heavy water production utilising the ammonia-hydrogen exchange process;</li> <li>5. Ammonia crackers with operating pressures greater than or equal to 3 MPa for heavy water production utilising the ammonia-hydrogen exchange process;</li> <li>6. Infrared absorption analysers capable of on-line hydrogen/deuterium ratio analysis where deuterium concentrations are equal to or greater than 90%;</li> <li>7. Catalytic burners for the conversion of enriched deuterium gas into heavy water utilising the ammonia-hydrogen exchange process;</li> <li>8. Complete heavy water upgrade systems, or columns therefor, for the upgrade of heavy water to reactor-grade deuterium concentration;</li> <li>9. Ammonia synthesis converters or synthesis units specially designed or prepared for heavy water production utilising the ammonia-hydrogen exchange process.</li> </ol>
0B005	<p>Plant specially designed for the fabrication of “nuclear reactor” fuel elements and specially designed or prepared equipment therefor.</p> <p><u>Technical Note</u></p> <p><i>Specially designed or prepared equipment for the fabrication of “nuclear reactor” fuel elements includes equipment which:</i></p> <ol style="list-style-type: none"> <li>a. <i>Normally comes into direct contact with or directly processes or controls the production flow of nuclear materials;</i></li> <li>b. <i>Seals the nuclear materials within the cladding;</i></li> </ol>



Category Code	Item Description
0B006	<p>c. Checks the integrity of the cladding or the seal;</p> <p>d. Checks the finish treatment of the sealed fuel; <u>or</u></p> <p>e. Is used for assembling reactor elements.</p> <p>Plant for the reprocessing of irradiated “nuclear reactor” fuel elements, and specially designed or prepared equipment and components therefor.</p> <p><u>Note</u> Category Code 0B006 includes:</p> <p>a. Plant for the reprocessing of irradiated “nuclear reactor” fuel elements including 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;</p> <p>b. Fuel element chopping or shredding machines, i.e. remotely operated equipment to cut, chop or shear irradiated “nuclear reactor” fuel assemblies, bundles or rods;</p> <p>c. 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;</p> <p>d. Solvent extractors, such as packed or pulsed columns, mixer settlers or centrifugal contactors, resistant to the corrosive effects of nitric acid and specially designed or prepared for use in a plant for the reprocessing of irradiated “natural uranium”, “depleted uranium” or “special fissile materials”;</p> <p>e. Holding or storage vessels specially designed to be critically safe and resistant to the corrosive effects of nitric acid;</p> <p><u>Technical Note</u> Holding or storage vessels may have the following features:</p> <p>1. Walls or internal structures with a boron equivalent (calculated for all constituent elements as defined in the note to Category Code 0C004) of at least two per cent;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. A maximum diameter of 175 mm for cylindrical vessels; <i>or</i></p> <p>3. A maximum width of 75 mm for either a slab or annular vessel.</p> <p>f. Neutron measurement systems specially designed or prepared for integration and use with automated process control systems in a plant for the reprocessing of irradiated “natural uranium”, “depleted uranium” or “special fissile materials”.</p>
0B007	<p>Plant for the conversion of plutonium and equipment specially designed or prepared therefor, as follows:</p> <p>a. Systems for the conversion of plutonium nitrate to oxide;</p> <p>b. Systems for plutonium metal production.</p>
<b>0C</b>	<b>Materials</b>
0C001	<p>“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.</p> <p><u>Note</u></p> <p>Category Code 0C001 does not include the following:</p> <p>a. Four grammes or less of “natural uranium” or “depleted uranium” when contained in a sensing component in instruments;</p> <p>b. “Depleted uranium” specially fabricated for the following civil non-nuclear applications:</p> <ol style="list-style-type: none"> <li>1. Shielding;</li> <li>2. Packaging;</li> <li>3. Ballasts having a mass not greater than 100 kg;</li> <li>4. Counter-weights having a mass not greater than 100 kg;</li> </ol> <p>c. Alloys containing less than 5% thorium;</p> <p>d. Ceramic products containing thorium, which have been manufactured for non-nuclear use.</p>

Category Code	Item Description
0C002	<p>“Special fissile materials”.</p> <p><u>Note</u> Category Code 0C002 does not include four “effective grammes” or less when contained in a sensing component in instruments.</p>
0C003	<p>Deuterium, heavy water (deuterium oxide) and other compounds of deuterium, and mixtures and solutions containing deuterium, in which the isotopic ratio of deuterium to hydrogen exceeds 1:5,000.</p>
0C004	<p>Graphite having a purity level of better than 5 parts per million (ppm) ‘boron equivalent’ and with a density greater than 1.5 g/cm<sup>3</sup> for use in a “nuclear reactor”, in quantities exceeding 1 kg.</p> <p><u>N.B.</u> See also Category Code 1C107.</p> <p><u>Note 1</u> For the purpose of Category Code 0C004, whether or not the exports of graphite meeting the above specifications are for “nuclear reactor” use is determined, at or before the time of export, by the competent authorities of the country in which the exporter is established.</p> <p><u>Note 2</u> In Category Code 0C004, ‘boron equivalent’ (BE) means the sum of BE<sub>Z</sub> for impurities (excluding BE<sub>carbon</sub> since carbon is not considered an impurity) including boron, where:</p> <p><math>BE_z \text{ (ppm)} = CF \times \text{concentration of element Z in ppm};</math></p> <p>where <math>CF</math> is the conversion factor = <math>\frac{\sigma_z \times A_B}{\sigma_B \times A_z}</math></p> <p>and <math>\sigma_B</math> and <math>\sigma_z</math> are the thermal neutron capture cross sections (in barns) for naturally occurring boron and element Z respectively; and <math>A_B</math> and <math>A_z</math> are the atomic masses of naturally occurring boron and element Z respectively.</p>

<i>Category Code</i>	<i>Item Description</i>
0C005	Specially prepared compounds or powders for the manufacture of gaseous diffusion barriers, resistant to corrosion by UF <sub>6</sub> (e.g. nickel or alloy containing 60% or more nickel by weight, aluminium oxide and fully fluorinated hydrocarbon polymers), having a purity of 99.9% by weight or more and a particle size less than 10 µm measured by American Society for Testing and Materials (ASTM) B330 standard and a high degree of particle size uniformity.
<b>0D</b>	<b>Software</b>
0D001	“Software” specially designed or modified for the “development”, “production” or “use” of goods specified in this Category.
<b>0E</b>	<b>Technology</b>
0E001	“Technology” (according to the Nuclear Technology Note) for the “development”, “production” or “use” of goods specified in this Category.

<i>Category Code</i>	<i>Item Description</i>
<b>CATEGORY 1 — SPECIAL MATERIALS AND RELATED EQUIPMENT</b>	
<b>1A</b>	<b>Systems, Equipment and Components</b>
1A001	<p>Components made from fluorinated compounds, as follows:</p> <ol style="list-style-type: none"> <li>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 specified in Category Code 1C009.b. or 1C009.c.;</li> <li>b. Not used;</li> <li>c. Not used.</li> </ol>
1A002	<p>“Composite” structures or laminates, having either of the following characteristics:</p> <p><u><i>N.B.</i></u></p> <p><i>See also Category Codes 1A202, 9A010 and 9A110.</i></p> <ol style="list-style-type: none"> <li>a. Consisting of an organic “matrix” and materials specified in Category Code 1C010.c., 1C010.d. or 1C010.e.; <u>or</u></li> <li>b. Consisting of a metal or carbon “matrix”, and either of the following: <ol style="list-style-type: none"> <li>1. Carbon “fibrous or filamentary materials” having both of the following characteristics: <ol style="list-style-type: none"> <li>a. A “specific modulus” exceeding <math>10.15 \times 10^6</math> m; <u>and</u></li> <li>b. A “specific tensile strength” exceeding <math>17.7 \times 10^4</math> m; <u>or</u></li> </ol> </li> <li>2. Materials specified in Category Code 1C010.c.</li> </ol> </li> </ol> <p><u><i>Note 1</i></u></p> <p><i>Category Code 1A002 does not include “composite” structures or laminates made from epoxy resin impregnated carbon “fibrous or filamentary materials” for the repair of “civil aircraft” structures or laminates, having all of the following characteristics:</i></p> <ol style="list-style-type: none"> <li>a. <i>An area not exceeding 1 m<sup>2</sup>;</i></li> <li>b. <i>A length not exceeding 2.5 m; <u>and</u></i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. A width exceeding 15 mm.</p> <p><u>Note 2</u>  Category Code 1A002 does not include semi-finished items, specially designed for purely civilian applications, as follows:</p> <p>a. Sporting goods;  b. Automotive industry;  c. Machine tool industry;  d. Medical applications.</p> <p><u>Note 3</u>  Category Code 1A002.b.1. does not include semi-finished items containing a maximum of two dimensions of interwoven filaments and specially designed for applications, as follows:</p> <p>a. Metal heat-treatment furnaces for tempering metals;  b. Silicon boule production equipment.</p> <p><u>Note 4</u>  Category Code 1A002 does not include finished items specially designed for a specific application.</p>
1A003	<p>Manufactures of non-“fusible” aromatic polyimides in film, sheet, tape or ribbon form having either of the following characteristics:</p> <p>a. A thickness exceeding 0.254 mm; <u>or</u>  b. Coated or laminated with carbon, graphite, metals or magnetic substances.</p> <p><u>Note</u>  Category Code 1A003 does not include manufactures when coated or laminated with copper and designed for the production of electronic printed circuit boards.</p> <p><u>N.B.</u>  For “fusible” aromatic polyimides in any form, see Category Code 1C008.a.3.</p>

<i>Category Code</i>	<i>Item Description</i>
1A004	<p>Protective and detection equipment and components not specially designed for military use, as follows:</p> <p><u>N.B.</u></p> <p><i>See also Division 2 of Part 1 of this Schedule, and Category Codes 2B351 and 2B352.</i></p> <p>a. Full face masks, filter canisters and decontamination equipment therefor, designed or modified for defence against any of the following, and specially designed components therefor:</p> <p><u>Note</u></p> <p><i>Category Code 1A004.a. includes Powered Air Purifying Respirators (PAPR) that are designed or modified for defence against agents or materials, listed in Category Code 1A004.a.</i></p> <p><u>Technical Note</u></p> <p><i>For the purpose of Category Code 1A004.a.:</i></p> <ol style="list-style-type: none"> <li>1. Full face masks are also known as gas masks.</li> <li>2. Filter canisters include filter cartridges. <ol style="list-style-type: none"> <li>1. “Biological agents”;</li> <li>2. ‘Radioactive materials’;</li> <li>3. Chemical Warfare (CW) agents; <u>or</u></li> <li>4. “Riot control agents”, including: <ol style="list-style-type: none"> <li>a. <math>\alpha</math>-Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (5798-79-8);</li> <li>b. [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenemalononitrile) (CS) (2698-41-1);</li> <li>c. 2-Chloro-1-phenylethanone, Phenylacetyl chloride (<math>\omega</math>-chloroacetophenone) (CN) (532-27-4);</li> <li>d. Dibenz-(b,f)-1,4-oxazepine (CR) (257-07-8);</li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>e. 10-Chloro-5,10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (578-94-9);</p> <p>f. N-Nonanoylmorpholine, (MPA) (5299-64-9);</p> <p>b. Protective suits, gloves and shoes, specially designed or modified for defence against any of the following:</p> <ol style="list-style-type: none"> <li>1. “Biological agents”;</li> <li>2. ‘Radioactive materials’; <u>or</u></li> <li>3. Chemical Warfare (CW) agents;</li> </ol> <p>c. Detection systems, specially designed or modified for detection or identification of any of the following, and specially designed components therefor:</p> <ol style="list-style-type: none"> <li>1. “Biological agents”;</li> <li>2. ‘Radioactive materials’; <u>or</u></li> <li>3. Chemical Warfare (CW) agents;</li> </ol> <p>d. Electronic equipment designed for automatically detecting or identifying the presence of “explosives” residues and utilising ‘trace detection’ techniques (e.g. surface acoustic wave, ion mobility spectrometry, differential mobility spectrometry, mass spectrometry).</p> <p><u>Technical Note</u>  ‘Trace detection’ is defined as the capability to detect less than 1 parts per million (ppm) vapour, or 1 mg solid or liquid.</p> <p><u>Note 1</u>  Category Code 1A004.d. does not include equipment specially designed for laboratory use.</p> <p><u>Note 2</u>  Category Code 1A004.d. does not include non-contact walk-through security portals.</p>



Category Code	Item Description
	<p><u>Note</u></p> <p>Category Code 1A004 does not include:</p> <ol style="list-style-type: none"> <li>a. Personal radiation monitoring dosimeters;</li> <li>b. Occupational health or safety equipment limited by design or function to protect against hazards specific to residential safety or civil industries, including: <ol style="list-style-type: none"> <li>1. Mining;</li> <li>2. Quarrying;</li> <li>3. Agriculture;</li> <li>4. Pharmaceutical;</li> <li>5. Medical;</li> <li>6. Veterinary;</li> <li>7. Environmental;</li> <li>8. Waste management;</li> <li>9. Food industry.</li> </ol> </li> </ol> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. Category Code 1A004 includes equipment and components that have been identified, successfully tested to national standards or otherwise proven effective, for the detection of or defence against 'radioactive materials', "biological agents", Chemical Warfare (CW) agents, 'simulants' or "riot control agents", even if such equipment or components are used in civil industries such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or the food industry.</li> <li>2. 'Simulant' is a substance or material that is used in place of toxic agent (chemical or biological) in training, research, testing or evaluation.</li> <li>3. For the purposes of Category Code 1A004, 'radioactive materials' are those selected or modified to increase their effectiveness in producing casualties in humans or animals, degrading equipment or damaging crops or the environment.</li> </ol>

Category Code	Item Description
1A005	<p>Body armour and components therefor, as follows:</p> <p><u>N.B.</u> See also Division 2 of Part 1 of this Schedule.</p> <p>a. Soft body armour not manufactured to military standards or specifications, or to their equivalents, and specially designed components therefor;</p> <p>b. Hard body armour plates providing ballistic protection equal to or less than level IIIA (NIJ 0101.06, July 2008) or national equivalents.</p> <p><u>N.B.</u> For “fibrous or filamentary materials” used in the manufacture of body armour, see Category Code 1C010.</p> <p><u>Note 1</u> Category Code 1A005 does not include body armour when accompanying its user for the user’s own personal protection.</p> <p><u>Note 2</u> Category Code 1A005 does not include body armour designed to provide frontal protection only from both fragment and blast from non-military explosive devices.</p> <p><u>Note 3</u> Category Code 1A005 does not include body armour designed to provide protection only from knife, spike, needle or blunt trauma.</p>
1A006	<p>Equipment, specially designed or modified for the disposal of Improvised Explosive Devices (IEDs), as follows, and specially designed components and accessories therefor:</p> <p><u>N.B.</u> See also Division 2 of Part 1 of this Schedule.</p> <p>a. Remotely operated vehicles;</p>

<i>Category Code</i>	<i>Item Description</i>
1A007	<p>b. 'Disruptors'.</p> <p><i>Technical Note</i></p> <p><i>'Disruptors' are devices specially designed for the purpose of preventing the operation of an explosive device by projecting a liquid, solid or frangible projectile.</i></p> <p><i>Note</i></p> <p><i>Category Code 1A006 does not include equipment when accompanying its operator.</i></p> <p>Equipment and devices, specially designed to initiate charges and devices containing "energetic materials", by electrical means, as follows:</p> <p><i>N.B.</i></p> <p><i>See also Division 2 of Part 1 of this Schedule, and Category Codes 3A229 and 3A232.</i></p> <p>a. Explosive detonator firing sets designed to drive explosive detonators specified in Category Code 1A007.b.;</p> <p>b. Electrically driven explosive detonators as follows:</p> <ol style="list-style-type: none"> <li>1. Exploding Bridge (EB);</li> <li>2. Exploding Bridge Wire (EBW);</li> <li>3. Slapper;</li> <li>4. Exploding Foil Initiators (EFI).</li> </ol> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. <i>The word initiator or igniter is sometimes used in place of the word detonator.</i></li> <li>2. <i>For the purpose of Category Code 1A007.b., the detonators of concern all utilise a small electrical conductor (bridge, bridge wire, or foil) that explosively vaporises when a fast,</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
1A008	<p data-bbox="539 454 1264 786"><i>high-current electrical pulse is passed through it. In non-slapper types, the exploding conductor starts a chemical detonation in a contacting high explosive material such as PETN (pentaerythritoltetranitrate). In slapper detonators, the explosive vaporisation of the electrical conductor drives a flyer or slapper across a gap, and the impact of the slapper on an explosive starts a chemical detonation. The slapper in some designs is driven by magnetic force. The term exploding foil detonator may refer to either an EB or a slapper-type detonator.</i></p> <p data-bbox="475 857 1023 887">Charges, devices and components, as follows:</p> <ul style="list-style-type: none"> <li data-bbox="475 909 1264 969">a. ‘Shaped charges’ having both of the following characteristics: <ul style="list-style-type: none"> <li data-bbox="539 992 1238 1021">1. Net Explosive Quantity (NEQ) greater than 90 g; <u>and</u></li> <li data-bbox="539 1043 1246 1072">2. Outer casing diameter equal to or greater than 75 mm;</li> </ul> </li> <li data-bbox="475 1095 1264 1155">b. Linear shaped cutting charges having both of the following characteristics, and specially designed components therefor: <ul style="list-style-type: none"> <li data-bbox="539 1178 1118 1207">1. An explosive load greater than 40 g/m; <u>and</u></li> <li data-bbox="539 1229 932 1258">2. A width of 10 mm or more;</li> </ul> </li> <li data-bbox="475 1281 1264 1310">c. Detonating cord with explosive core load greater than 64 g/m;</li> <li data-bbox="475 1332 1264 1420">d. Cutters, other than those specified in Category Code 1A008.b., and severing tools, having a Net Explosive Quantity (NEQ) greater than 3.5 kg.</li> </ul> <p data-bbox="475 1442 660 1471"><u>Technical Note</u></p> <p data-bbox="475 1494 1264 1554"><i>‘Shaped charges’ are explosive charges shaped to focus the effects of the explosive blast.</i></p>
1A102	<p data-bbox="475 1619 1264 1711">Resaturated pyrolised carbon-carbon components designed for space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.</p>

Category Code	Item Description
1A202	<p>Composite structures, other than those specified in Category Code 1A002, in the form of tubes and having both of the following characteristics:</p> <p><u>N.B.</u> See also Category Codes 9A010 and 9A110.</p> <ul style="list-style-type: none"> <li>a. An inside diameter of between 75 mm and 400 mm; <u>and</u></li> <li>b. Made with any of the “fibrous or filamentary materials” specified in Category Code 1C010.a. or 1C010.b. or 1C210.a. or with carbon prepreg materials specified in Category Code 1C210.c.</li> </ul>
1A225	<p>Platinised 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.</p>
1A226	<p>Specialised packings which may be used in separating heavy water from ordinary water, having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Made of phosphor bronze mesh chemically treated to improve wettability; <u>and</u></li> <li>b. Designed to be used in vacuum distillation towers.</li> </ul>
1A227	<p>High-density (lead glass or other) radiation shielding windows, having all of the following characteristics, and specially designed frames therefor:</p> <ul style="list-style-type: none"> <li>a. A ‘cold area’ greater than 0.09 m<sup>2</sup>;</li> <li>b. A density greater than 3 g/cm<sup>3</sup>; <u>and</u></li> <li>c. A thickness of 100 mm or greater.</li> </ul> <p><u>Technical Note</u> In Category Code 1A227, ‘cold area’ means the viewing area of the window exposed to the lowest level of radiation in the design application.</p>

<i>Category Code</i>	<i>Item Description</i>
<b>1B</b>	<b>Test, Inspection and Production Equipment</b>
1B001	<p>Equipment for the production or inspection of “composite” structures or laminates specified in Category Code 1A002 or “fibrous or filamentary materials” specified in Category Code 1C010, as follows, and specially designed components and accessories therefor:</p> <p><u><i>N.B.</i></u>  <i>See also Category Codes 1B101 and 1B201.</i></p> <p>a. Filament winding machines, of which the motions for positioning, wrapping and winding fibres are coordinated and programmed in three or more ‘primary servo positioning’ axes, specially designed for the manufacture of “composite” structures or laminates, from “fibrous or filamentary materials”;</p> <p>b. ‘Tape-laying machines’, of which the motions for positioning and laying tape are coordinated and programmed in five or more ‘primary servo positioning’ axes, specially designed for the manufacture of “composite” airframe or ‘missile’ structures;</p> <p><u><i>Note</i></u>  <i>In Category Code 1B001.b., ‘missile’ means complete rocket systems and unmanned aerial vehicle systems.</i></p> <p><u><i>Technical Note</i></u>  <i>For the purpose of Category Code 1B001.b., ‘tape-laying machines’ have the ability to lay one or more ‘filament bands’ limited to widths greater than 25.4 mm and less than or equal to 304.8 mm, and to cut and restart individual ‘filament band’ courses during the laying process.</i></p> <p>c. Multidirectional, multidimensional weaving machines or interlacing machines, including adapters and modification kits, specially designed or modified for weaving, interlacing or braiding fibres, for “composite” structures;</p> <p><u><i>Technical Note</i></u>  <i>For the purpose of Category Code 1B001.c., the technique of interlacing includes knitting.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. Equipment specially designed or adapted for the production of reinforcement fibres, as follows:</p> <ol style="list-style-type: none"> <li>1. Equipment for converting polymeric fibres (e.g. polyacrylonitrile, rayon, pitch or polycarbosilane) into carbon fibres or silicon carbide fibres, including special equipment to strain the fibre during heating;</li> <li>2. Equipment for the Chemical Vapour Deposition (CVD) of elements or compounds, on heated filamentary substrates, to manufacture silicon carbide fibres;</li> <li>3. Equipment for the wet-spinning of refractory ceramics (e.g. aluminium oxide);</li> <li>4. Equipment for converting aluminium containing precursor fibres into alumina fibres by heat treatment;</li> </ol> <p>e. Equipment for producing prepregs specified in Category Code 1C010.e. by the hot melt method;</p> <p>f. Non-destructive inspection equipment specially designed for “composite” materials, as follows:</p> <ol style="list-style-type: none"> <li>1. X-ray tomography systems for three dimensional defect inspection;</li> <li>2. Numerically controlled ultrasonic testing machines of which the motions for positioning transmitters or receivers are simultaneously coordinated and programmed in four or more axes to follow the three dimensional contours of the component under inspection;</li> </ol> <p>g. ‘Tow-placement machines’, of which the motions for positioning and laying tows are coordinated and programmed in two or more ‘primary servo positioning’ axes, specially designed for the manufacture of “composite” airframe or ‘missile’ structures.</p> <p><u>Technical Note</u>  <i>For the purpose of Category Code 1B001.g., ‘tow-placement machines’ have the ability to place one or more ‘filament bands’ having widths less than or equal to 25.4 mm, and to cut and restart individual ‘filament band’ courses during the placement process.</i></p>

Category Code	Item Description
	<p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. For the purpose of Category Code 1B001, 'primary servo positioning' axes control, under computer program direction, the position of the end-effector (i.e. head) in space relative to the workpiece at the correct orientation and direction to achieve the desired process.</li> <li>2. For the purpose of Category Code 1B001, a 'filament band' is a single continuous width of fully or partially resin-impregnated tape, tow or fibre. Fully or partially resin-impregnated 'filament bands' include those coated with dry powder that tacks upon heating.</li> </ol>
1B002	<p>Equipment for producing metal alloys, metal alloy powder or alloyed materials, specially designed to avoid contamination and specially designed for use in one of the processes specified in Category Code 1C002.c.2.</p> <p><u>N.B.</u> See also Category Code 1B102.</p>
1B003	<p>Tools, dies, moulds or fixtures, for "superplastic forming" or "diffusion bonding" titanium, aluminium or their alloys, specially designed for the manufacture of any of the following:</p> <ol style="list-style-type: none"> <li>a. Airframe or aerospace structures;</li> <li>b. "Aircraft" or aerospace engines; <u>or</u></li> <li>c. Specially designed components for structures specified in Category Code 1B003.a. or for engines specified in Category Code 1B003.b.</li> </ol>
1B101	<p>Equipment, other than that specified in Category Code 1B001, for the "production" of structural composites as follows; and specially designed components and accessories therefor:</p> <p><u>N.B.</u> See also Category Code 1B201.</p>



<i>Category Code</i>	<i>Item Description</i>
	<p><u>Note</u>  <i>Components and accessories specified in Category Code 1B101 include moulds, mandrels, dies, fixtures and tooling for the preform pressing, curing, casting, sintering or bonding of composite structures, laminates and manufactures thereof.</i></p> <p>a. Filament winding machines or fibre placement machines, of which the motions for positioning, wrapping and winding fibres 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;</p> <p>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;</p> <p>c. Equipment designed or modified for the “production” of “fibrous or filamentary materials” as follows:</p> <ol style="list-style-type: none"> <li>1. Equipment for converting polymeric fibres (e.g. polyacrylonitrile, rayon or polycarbosilane) including special provision to strain the fibre during heating;</li> <li>2. Equipment for the vapour deposition of elements or compounds on heated filament substrates;</li> <li>3. Equipment for the wet-spinning of refractory ceramics (e.g. aluminium oxide);</li> </ol> <p>d. Equipment designed or modified for special fibre surface treatment or for producing prepregs and preforms specified in Category Code 9C110.</p> <p><u>Note</u>  <i>Category Code 1B101.d. includes rollers, tension stretchers, coating equipment, cutting equipment and clicker dies.</i></p>
1B102	<p>Metal powder “production equipment”, other than that specified in Category Code 1B002, and components, as follows:</p> <p><u>N.B.</u>  <i>See also Category Code 1B115.b.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. Metal powder “production equipment” usable for the “production”, in a controlled environment, of spherical, spheroidal or atomised materials specified in Category Code 1C011.a., 1C011.b., 1C111.a.1., 1C111.a.2. or in Division 2 of Part 1 of this Schedule;</p> <p>b. Specially designed components for “production equipment” specified in Category Code 1B002 or 1B102.a.</p> <p><u>Note</u> Category Code 1B102 includes:</p> <p>a. Plasma generators (high frequency arc-jet) usable for obtaining sputtered or spherical metallic powders with organisation of the process in an argon-water environment;</p> <p>b. Electrobust equipment usable for obtaining sputtered or spherical metallic powders with organisation of the process in an argon-water environment;</p> <p>c. Equipment usable for the “production” of spherical aluminium powders by powdering a melt in an inert medium (e.g. nitrogen).</p>
1B115	<p>Equipment, other than that specified in Category Code 1B002 or 1B102, for the production of propellant and propellant constituents, as follows, and specially designed components therefor:</p> <p>a. “Production equipment” for the “production”, handling or acceptance testing of liquid propellants or propellant constituents specified in Category Code 1C011.a., 1C011.b., 1C111 or in Division 2 of Part 1 of this Schedule;</p> <p>b. “Production equipment” for the “production”, handling, mixing, curing, casting, pressing, machining, extruding or acceptance testing of solid propellants or propellant constituents specified in Category Code 1C011.a., 1C011.b., 1C111 or in Division 2 of Part 1 of this Schedule.</p> <p><u>Note</u> Category Code 1B115.b. does not include batch mixers, continuous mixers or fluid energy mills. For batch mixers, continuous mixers and fluid energy mills, see Category Codes 1B117, 1B118 and 1B119.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p><u>Note 1</u> For equipment specially designed for the production of military goods, see Division 2 of Part 1 of this Schedule.</p> <p><u>Note 2</u> Category Code 1B115 does not include equipment for the “production”, handling and acceptance testing of boron carbide.</p>
1B116	Specially designed nozzles for producing pyrolytically derived materials formed on a mould, 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.
1B117	<p>Batch mixers with provision for mixing under vacuum in the range of zero to 13.326 kPa and with temperature control capability of the mixing chamber and having both of the following characteristics, and specially designed components therefor:</p> <p>a. A total volumetric capacity of 110 litres or more; <u>and</u></p> <p>b. At least one ‘mixing/kneading shaft’ mounted off centre.</p> <p><u>Note</u> In Category Code 1B117.b., ‘mixing/kneading shaft’ does not refer to deagglomerators or knife-spindles.</p>
1B118	<p>Continuous mixers with provision for mixing under vacuum in the range of zero to 13.326 kPa and with a temperature control capability of the mixing chamber and having either of the following, and specially designed components therefor:</p> <p>a. Two or more mixing/kneading shafts; <u>or</u></p> <p>b. A single rotating shaft which oscillates and having kneading teeth/pins on the shaft as well as inside the casing of the mixing chamber.</p>

<i>Category Code</i>	<i>Item Description</i>
1B119	Fluid energy mills usable for grinding or milling substances specified in Category Code 1C011.a., 1C011.b., 1C111 or in Division 2 of Part 1 of this Schedule, and specially designed components therefor.
1B201	<p>Filament winding machines, other than those specified in Category Code 1B001 or 1B101, and related equipment, as follows:</p> <p>a. Filament winding machines having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Having motions for positioning, wrapping, and winding fibres coordinated and programmed in two or more axes;</li> <li>2. Specially designed to fabricate composite structures or laminates from “fibrous or filamentary materials”; <u>and</u></li> <li>3. Capable of winding cylindrical tubes with an internal diameter between 75 mm and 650 mm and lengths of 300 mm or greater;</li> </ol> <p>b. Coordinating and programming controls for the filament winding machines specified in Category Code 1B201.a.;</p> <p>c. Precision mandrels for the filament winding machines specified in Category Code 1B201.a.</p>
1B225	Electrolytic cells for fluorine production with an output capacity greater than 250 g of fluorine per hour.
1B226	<p>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.</p> <p><u>Note</u>  <i>Category Code 1B226 includes separators:</i></p> <ol style="list-style-type: none"> <li>a. <i>Capable of enriching stable isotopes;</i></li> <li>b. <i>With the ion sources and collectors both in the magnetic field and those configurations in which they are external to the field.</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
1B228	<p>Hydrogen-cryogenic distillation columns having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Designed for operation with internal temperatures of 35 K (-238°C) or less;</li> <li>b. Designed for operation at an internal pressure of 0.5 MPa to 5 MPa;</li> <li>c. Constructed of either:               <ol style="list-style-type: none"> <li>1. Stainless steel of the 300 series with low sulphur content and with an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; <u>or</u></li> <li>2. Equivalent materials which are both cryogenic and H<sub>2</sub>-compatible; <u>and</u></li> </ol> </li> <li>d. With internal diameters of 30 cm or greater and ‘effective lengths’ of 4 m or greater.</li> </ol> <p><i>Technical Note</i>  <i>In Category Code 1B228, ‘effective length’ means the active height of packing material in a packed-type column, or the active height of internal contactor plates in a plate-type column.</i></p>
1B229	<p>Water-hydrogen sulphide exchange tray columns and ‘internal contactors’, as follows:</p> <p><i>N.B.</i>  <i>For columns which are specially designed or prepared for the production of heavy water, see Category Code 0B004.</i></p> <ol style="list-style-type: none"> <li>a. Water-hydrogen sulphide exchange tray columns, having all of the following characteristics:               <ol style="list-style-type: none"> <li>1. Can operate at pressures of 2 MPa or greater;</li> <li>2. Constructed of carbon steel having an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; <u>and</u></li> <li>3. With a diameter of 1.8 m or greater;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. 'Internal contactors' for the water-hydrogen sulphide exchange tray columns specified in Category Code 1B229.a.</p> <p><i>Technical Note</i></p> <p><i>'Internal contactors' of the columns are segmented trays which have an effective assembled diameter of 1.8 m or greater, are designed to facilitate countercurrent contacting and are constructed of stainless steels with a carbon content of 0.03% or less. These may be sieve trays, valve trays, bubble cap trays, or turbogrid trays.</i></p>
1B230	<p>Pumps capable of circulating solutions of concentrated or dilute potassium amide catalyst in liquid ammonia (<math>\text{KNH}_2/\text{NH}_3</math>), having all of the following characteristics:</p> <p>a. Airtight (i.e. hermetically sealed);</p> <p>b. A capacity greater than <math>8.5 \text{ m}^3/\text{h}</math>; <u>and</u></p> <p>c. Either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. For concentrated potassium amide solutions (1% or greater), an operating pressure of 1.5 MPa to 60 MPa; <u>or</u></li> <li>2. For dilute potassium amide solutions (less than 1%), an operating pressure of 20 MPa to 60 MPa.</li> </ol>
1B231	<p>Tritium facilities or plants, and equipment therefor, as follows:</p> <p>a. Facilities or plants for the production, recovery, extraction, concentration, or handling of tritium;</p> <p>b. Equipment for tritium facilities or plants, as follows:</p> <ol style="list-style-type: none"> <li>1. Hydrogen or helium refrigeration units capable of cooling to 23 K (-250°C) or less, with heat removal capacity greater than 150 W;</li> <li>2. Hydrogen isotope storage or purification systems using metal hydrides as the storage or purification medium.</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
1B232	<p>Turboexpanders or turboexpander-compressor sets having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Designed for operation with an outlet temperature of 35 K (-238°C) or less; <u>and</u></li> <li>b. Designed for a throughput of hydrogen gas of 1,000 kg/h or greater.</li> </ul>
1B233	<p>Lithium isotope separation facilities or plants, and systems and equipment therefor, as follows:</p> <ul style="list-style-type: none"> <li>a. Facilities or plants for the separation of lithium isotopes;</li> <li>b. Equipment for the separation of lithium isotopes based on the lithium-mercury amalgam process, as follows: <ul style="list-style-type: none"> <li>1. Packed liquid-liquid exchange columns specially designed for lithium amalgams;</li> <li>2. Mercury or lithium amalgam pumps;</li> <li>3. Lithium amalgam electrolysis cells;</li> <li>4. Evaporators for concentrated lithium hydroxide solution;</li> </ul> </li> <li>c. Ion exchange systems specially designed for lithium isotope separation, and specially designed components therefor;</li> <li>d. Chemical exchange systems (employing crown ethers, cryptands, or lariat ethers), specially designed for lithium isotope separation, and specially designed components therefor.</li> </ul>
1B234	<p>High explosive containment vessels, chambers, containers and other similar containment devices designed for the testing of high explosives or explosive devices and having both of the following characteristics:</p> <p><u>N.B.</u>  <i>See also Division 2 of Part 1 of this Schedule.</i></p>

<i>Category Code</i>	<i>Item Description</i>
1C	<p>a. Designed to fully contain an explosion equivalent to 2 kg of TNT or greater; <u>and</u></p> <p>b. Having design elements or features enabling real time or delayed transfer of diagnostic or measurement information.</p> <p><b>Materials</b></p> <p><u>Technical Note</u></p> <p><i>Unless provision to the contrary is made, the words ‘metals’ and ‘alloys’ in Category Codes 1C001 to 1C012 cover crude and semi-fabricated forms, as follows:</i></p> <p><i>Crude forms, in relation to materials, means anodes, balls, bars (including notched bars and wire bars), billets, blocks, blooms, brickets, cakes, cathodes, crystals, cubes, dice, grains, granules, ingots, lumps, pellets, pigs, powder, rondelles, shot, slabs, slugs, sponge, sticks;</i></p> <p><i>Semi-fabricated forms, in relation to materials, means either of the following:</i></p> <p>a. <i>Wrought or worked materials fabricated by rolling, drawing, extruding, forging, impact extruding, pressing, graining, atomising, 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; <u>or</u></i></p> <p>b. <i>Cast material produced by casting in sand, die, metal, plaster or other types of moulds, including high pressure castings, sintered forms, and forms made by powder metallurgy;</i></p> <p><i>whether or not coated, plated, drilled or punched.</i></p> <p><i>Category 1C includes non-listed forms of those materials which are purportedly finished products but are in reality crude forms or semi-fabricated forms.</i></p>



<i>Category Code</i>	<i>Item Description</i>
1C001	<p>Materials specially designed for use as absorbers of electromagnetic waves, or intrinsically conductive polymers, as follows:</p> <p><u>N.B.</u></p> <p><i>See also Category Code 1C101.</i></p> <p>a. Materials for absorbing frequencies exceeding <math>2 \times 10^8</math> Hz but less than <math>3 \times 10^{12}</math> Hz;</p> <p><u>Note 1</u></p> <p><i>Category Code 1C001.a. does not include:</i></p> <p>a. <i>Hair type absorbers, constructed of natural or synthetic fibres, with non-magnetic loading to provide absorption;</i></p> <p>b. <i>Absorbers having no magnetic loss and whose incident surface is non-planar in shape, including pyramids, cones, wedges and convoluted surfaces;</i></p> <p>c. <i>Planar absorbers, having all of the following characteristics:</i></p> <ol style="list-style-type: none"> <li>1. <i>Made from either of the following:</i> <ol style="list-style-type: none"> <li>a. <i>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 <math>\pm 15\%</math> of the centre frequency of the incident energy, and not capable of withstanding temperatures exceeding 450 K (177°C); <u>or</u></i></li> <li>b. <i>Ceramic materials providing more than 20% echo compared with metal over a bandwidth exceeding <math>\pm 15\%</math> of the centre frequency of the incident energy, and not capable of withstanding temperatures exceeding 800 K (527°C);</i></li> </ol> </li> </ol>

Category Code	Item Description
	<p style="text-align: center;"><u>Technical Note</u></p> <p style="text-align: center;"><i>Absorption test samples for Category Code 1C001.a. Note 1.c.1. should be a square at least 5 wavelengths of the centre frequency on a side and positioned in the far field of the radiating element.</i></p> <p style="text-align: center;">2. <i>Tensile strength less than <math>7 \times 10^6</math> N/m<sup>2</sup>; <u>and</u></i></p> <p style="text-align: center;">3. <i>Compressive strength less than <math>14 \times 10^6</math> N/m<sup>2</sup>;</i></p> <p>d. <i>Planar absorbers made of sintered ferrite, having both of the following characteristics:</i></p> <p style="text-align: center;">1. <i>A specific gravity exceeding 4.4; <u>and</u></i></p> <p style="text-align: center;">2. <i>A maximum operating temperature of 548 K (275°C).</i></p> <p style="text-align: center;"><u>Note 2</u></p> <p style="text-align: center;"><i>Nothing in Note 1 to Category Code 1C001.a. releases magnetic materials to provide absorption when contained in paint.</i></p> <p>b. <i>Materials for absorbing frequencies exceeding <math>1.5 \times 10^{14}</math> Hz but less than <math>3.7 \times 10^{14}</math> Hz and not transparent to visible light;</i></p> <p style="text-align: center;"><u>Note</u></p> <p style="text-align: center;"><i>Category Code 1C001.b. does not include materials, specially designed or formulated for either of the following applications:</i></p> <p style="text-align: center;">a. <i>“Laser” marking of polymers; <u>or</u></i></p> <p style="text-align: center;">b. <i>“Laser” welding of polymers.</i></p> <p>c. <i>Intrinsically conductive polymeric materials with a ‘bulk electrical conductivity’ exceeding 10,000 S/m (Siemens per metre) or a ‘sheet (surface) resistivity’ of less than 100 ohms/square, based on any of the following polymers:</i></p> <p style="text-align: center;">1. <i>Polyaniline;</i></p> <p style="text-align: center;">2. <i>Polypyrrole;</i></p> <p style="text-align: center;">3. <i>Polythiophene;</i></p> <p style="text-align: center;">4. <i>Poly phenylene-vinylene; <u>or</u></i></p>

Category Code	Item Description
	<p>5. Poly thienylene-vinylene.</p> <p><u>Note</u> Category Code 1C001.c. does not include materials in a liquid form.</p> <p><u>Technical Note</u> 'Bulk electrical conductivity' and 'sheet (surface) resistivity' should be determined using ASTM D-257 or national equivalents.</p>
1C002	<p>Metal alloys, metal alloy powder and alloyed materials, as follows:</p> <p><u>N.B.</u> See also Category Code 1C202.</p> <p><u>Note</u> Category Code 1C002 does not include metal alloys, metal alloy powder and alloyed materials, specially formulated for coating purposes.</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. The metal alloys in Category Code 1C002 are those containing a higher percentage by weight of the stated metal than of any other element.</li> <li>2. 'Stress-rupture life' is measured in accordance with ASTM standard E-139 or national equivalents.</li> <li>3. 'Low cycle fatigue life' is 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 (<math>K_t</math>) equal to 1. The average stress is defined as maximum stress minus minimum stress divided by maximum stress.</li> </ol> <p>a. Aluminides, as follows:</p> <ol style="list-style-type: none"> <li>1. Nickel aluminides containing a minimum of 15% by weight aluminium, a maximum of 38% by weight aluminium and at least one additional alloying element;</li> <li>2. Titanium aluminides containing 10% by weight or more aluminium and at least one additional alloying element;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Metal alloys, as follows, made from the powder or particulate material specified in Category Code 1C002.c.:</p> <ol style="list-style-type: none"> <li>1. Nickel alloys having either of the following characteristics:           <ol style="list-style-type: none"> <li>a. A 'stress-rupture life' of 10,000 hours or longer at 923 K (650°C) at a stress of 676 MPa; <u>or</u></li> <li>b. A 'low cycle fatigue life' of 10,000 cycles or more at 823 K (550°C) at a maximum stress of 1,095 MPa;</li> </ol> </li> <li>2. Niobium alloys having either of the following characteristics:           <ol style="list-style-type: none"> <li>a. A 'stress-rupture life' of 10,000 hours or longer at 1,073 K (800°C) at a stress of 400 MPa; <u>or</u></li> <li>b. A 'low cycle fatigue life' of 10,000 cycles or more at 973 K (700°C) at a maximum stress of 700 MPa;</li> </ol> </li> <li>3. Titanium alloys having either of the following characteristics:           <ol style="list-style-type: none"> <li>a. A 'stress-rupture life' of 10,000 hours or longer at 723 K (450°C) at a stress of 200 MPa; <u>or</u></li> <li>b. A 'low cycle fatigue life' of 10,000 cycles or more at 723 K (450°C) at a maximum stress of 400 MPa;</li> </ol> </li> <li>4. Aluminium alloys having either of the following characteristics:           <ol style="list-style-type: none"> <li>a. A tensile strength of 240 MPa or more at 473 K (200°C); <u>or</u></li> <li>b. A tensile strength of 415 MPa or more at 298 K (25°C);</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>5. Magnesium alloys having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. A tensile strength of 345 MPa or more; <u>and</u></li> <li>b. A corrosion rate of less than 1 mm/year in 3% sodium chloride aqueous solution measured in accordance with ASTM standard G-31 or national equivalents;</li> </ol> <p>c. Metal alloy powder or particulate material, having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Made from any of the following composition systems:  <i>Technical Note</i>  <i>X in the following equals one or more alloying elements.</i> <ol style="list-style-type: none"> <li>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 <math>\mu\text{m}</math> in <math>10^9</math> alloy particles;</li> <li>b. Niobium alloys (Nb-Al-X or Nb-X-Al, Nb-Si-X or Nb-X-Si, Nb-Ti-X or Nb-X-Ti);</li> <li>c. Titanium alloys (Ti-Al-X or Ti-X-Al);</li> <li>d. Aluminium alloys (Al-Mg-X or Al-X-Mg, Al-Zn-X or Al-X-Zn, Al-Fe-X or Al-X-Fe); <u>or</u></li> <li>e. Magnesium alloys (Mg-Al-X or Mg-X-Al);</li> </ol> </li> <li>2. Made in a controlled environment by any of the following processes: <ol style="list-style-type: none"> <li>a. "Vacuum atomisation";</li> <li>b. "Gas atomisation";</li> <li>c. "Rotary atomisation";</li> <li>d. "Splat quenching";</li> <li>e. "Melt spinning" and "comminution";</li> <li>f. "Melt extraction" and "comminution";</li> <li>g. "Mechanical alloying"; <u>or</u></li> <li>h. "Plasma atomisation"; <u>and</u></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. Capable of forming materials specified in Category Code 1C002.a. or 1C002.b.;</p> <p>d. Alloyed materials having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Made from any of the composition systems specified in Category Code 1C002.c.1.;</li> <li>2. In the form of uncomminuted flakes, ribbons or thin rods; <u>and</u></li> <li>3. Produced in a controlled environment by any of the following:               <ol style="list-style-type: none"> <li>a. “Splat quenching”;</li> <li>b. “Melt spinning”; <u>or</u></li> <li>c. “Melt extraction”.</li> </ol> </li> </ol>
1C003	<p>Magnetic metals, of all types and of whatever form, having any of the following characteristics:</p> <p>a. Initial relative permeability of 120,000 or more and a thickness of 0.05 mm or less;</p> <p><i>Technical Note</i>  <i>Measurement of initial relative permeability is that performed on fully annealed materials.</i></p> <p>b. Magnetostrictive alloys having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A saturation magnetostriction of more than <math>5 \times 10^{-4}</math>; <u>or</u></li> <li>2. A magnetomechanical coupling factor (k) of more than 0.8; <u>or</u></li> </ol> <p>c. Amorphous or ‘nanocrystalline’ alloy strips, having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A composition having a minimum of 75% by weight of iron, cobalt or nickel;</li> <li>2. A saturation magnetic induction (<math>B_s</math>) of 1.6 T or more; <u>and</u></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. Either of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. A strip thickness of 0.02 mm or less; <u>or</u></li> <li>b. An electrical resistivity of <math>2 \times 10^{-4}</math> ohm cm or more.</li> </ul> <p><i>Technical Note</i>  <i>'Nanocrystalline' materials in Category Code 1C003.c. are those materials having a crystal grain size of 50 nm or less, as determined by X-ray diffraction.</i></p>
1C004	<p>Uranium titanium alloys or tungsten alloys with a “matrix” based on iron, nickel or copper, having all of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. A density exceeding 17.5 g/cm<sup>3</sup>;</li> <li>b. An elastic limit exceeding 880 MPa;</li> <li>c. An Ultimate Tensile Strength (UTS) exceeding 1,270 MPa; <u>and</u></li> <li>d. An elongation exceeding 8%.</li> </ul>
1C005	<p>“Superconductive” “composite” conductors in lengths exceeding 100 m or with a mass exceeding 100 g, as follows:</p> <ul style="list-style-type: none"> <li>a. “Superconductive” “composite” conductors containing one or more niobium-titanium ‘filaments’, having both of the following characteristics: <ul style="list-style-type: none"> <li>1. Embedded in a “matrix” other than a copper or copper-based mixed “matrix”; <u>and</u></li> <li>2. Having a cross-section area less than <math>0.28 \times 10^{-4}</math> mm<sup>2</sup> (6 μm in diameter for circular ‘filaments’);</li> </ul> </li> <li>b. “Superconductive” “composite” conductors consisting of one or more “superconductive” ‘filaments’ other than niobium-titanium, having both of the following characteristics: <ul style="list-style-type: none"> <li>1. A “critical temperature” at zero magnetic induction exceeding 9.85 K (-263.31°C); <u>and</u></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Remaining in the “superconductive” state at a temperature of 4.2 K (-268.96°C) when exposed to a magnetic field oriented in any direction perpendicular to the longitudinal axis of conductor and corresponding to a magnetic induction of 12 T with critical current density exceeding 1,750 A/mm<sup>2</sup> on overall cross-section of the conductor;</p> <p>c. “Superconductive” “composite” conductors consisting of one or more “superconductive” ‘filaments’ which remain “superconductive” above 115 K (-158.16°C).</p> <p><i>Technical Note</i>  <i>For the purpose of Category Code 1C005, ‘filaments’ may be in wire, cylinder, film, tape or ribbon form.</i></p>
1C006	<p>Fluids and lubricating materials, as follows:</p> <p>a. Not used;</p> <p>b. Lubricating materials containing, as their principal ingredients, either of the following:</p> <ol style="list-style-type: none"> <li>1. Phenylene or alkylphenylene ethers or thio-ethers, or their mixtures, containing more than two ether or thio-ether functions or mixtures thereof; <u>or</u></li> <li>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);</li> </ol> <p>c. Damping or flotation fluids having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Purity exceeding 99.8%;</li> <li>2. Containing less than 25 particles of 200 µm or larger in size per 100 ml; <u>and</u></li> <li>3. Made from at least 85% of any of the following: <ol style="list-style-type: none"> <li>a. Dibromotetrafluoroethane (25497-30-7, 124-73-2, 27336-23-8);</li> <li>b. Polychlorotrifluoroethylene (oily and waxy modifications only); <u>or</u></li> </ol> </li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>c. Polybromotrifluoroethylene;</p> <p>d. Fluorocarbon electronic cooling fluids having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Containing 85% by weight or more of any of the following, or mixtures thereof: <ol style="list-style-type: none"> <li>a. Monomeric forms of perfluoropolyalkylether-triazines or perfluoroaliphatic-ethers;</li> <li>b. Perfluoroalkylamines;</li> <li>c. Perfluorocycloalkanes; <u>or</u></li> <li>d. Perfluoroalkanes;</li> </ol> </li> <li>2. Density at 298 K (25°C) of 1.5 g/ml or more;</li> <li>3. In a liquid state at 273 K (0°C); <u>and</u></li> <li>4. Containing 60% or more by weight of fluorine.</li> </ol> <p><i>Note</i>  <i>Category Code 1C006.d. does not apply to materials specified and packaged as medical products.</i></p>
1C007	<p>Ceramic powders, ceramic-“matrix” “composite” materials and ‘precursor materials’, as follows:</p> <p><i>N.B.</i>  <i>See also Category Code 1C107.</i></p> <ol style="list-style-type: none"> <li>a. Ceramic powders of titanium diboride (TiB<sub>2</sub>) (12045-63-5) having total metallic impurities, excluding intentional additions, of less than 5,000 parts per million (ppm), an average particle size equal to or less than 5 µm and no more than 10% of the particles larger than 10 µm;</li> <li>b. Not used;</li> </ol>

Category Code	Item Description
	<p>c. Ceramic-“matrix” “composite” materials as follows:</p> <ol style="list-style-type: none"> <li>1. Ceramic-ceramic “composite” materials with a glass or oxide-“matrix” and reinforced with either of the following:           <ol style="list-style-type: none"> <li>a. Continuous fibres made from either of the following materials:               <ol style="list-style-type: none"> <li>1. <math>\text{Al}_2\text{O}_3</math> (1344-28-1); <u>or</u></li> <li>2. Si-C-N; <u>or</u></li> </ol> <p><i>Note</i>  <i>Category Code 1C007.c.1.a. does not apply to “composites” containing fibres with a tensile strength of less than 700 MPa at 1,273 K (1,000°C) or tensile creep resistance of more than 1% creep strain at 100 MPa load and 1,273 K (1,000°C) for 100 hours.</i></p> </li> <li>b. Fibres having both of the following characteristics:               <ol style="list-style-type: none"> <li>1. Made from any of the following materials:                   <ol style="list-style-type: none"> <li>a. Si-N;</li> <li>b. Si-C;</li> <li>c. Si-Al-O-N; <u>or</u></li> <li>d. Si-O-N; <u>and</u></li> </ol> </li> <li>2. Having a “specific tensile strength” exceeding <math>12.7 \times 10^3</math> m;</li> </ol> </li> </ol> </li> <li>2. Ceramic “matrix” “composite” materials, with a “matrix” formed of carbides or nitrides of silicon, zirconium or boron;</li> </ol> <p>d. Not used;</p> <p>e. ‘Precursor materials’ specially designed for the “production” of materials specified in Category Code 1C007.c., as follows:</p> <ol style="list-style-type: none"> <li>1. Polydiorganosilanes;</li> <li>2. Polysilazanes;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
1C008	<p>3. Polycarbosilazanes;</p> <p><u>Technical Note</u>  <i>For the purpose of Category Code 1C007, ‘precursor materials’ are special purpose polymeric or metallo-organic materials used for the “production” of silicon carbide, silicon nitride, or ceramics with silicon, carbon and nitrogen.</i></p> <p>f. Not used.</p> <p>Non-fluorinated polymeric substances as follows:</p> <p>a. Imides, as follows:</p> <ol style="list-style-type: none"> <li>1. Bismaleimides;</li> <li>2. Aromatic Polyamide-imides (PAI) having a ‘glass transition temperature (T<sub>g</sub>)’ exceeding 563 K (290°C);</li> <li>3. Aromatic polyimides having a ‘glass transition temperature (T<sub>g</sub>)’ exceeding 505 K (232°C);</li> <li>4. Aromatic polyetherimides having a ‘glass transition temperature (T<sub>g</sub>)’ exceeding 563 K (290°C);</li> </ol> <p><u>Note</u>  <i>Category Code 1C008.a. includes substances in liquid or solid “fusible” form, including resin, powder, pellet, film, sheet, tape or ribbon.</i></p> <p><u>N.B.</u>  <i>For non-“fusible” aromatic polyimides in film, sheet, tape or ribbon form, see Category Code 1A003.</i></p> <p>b. Not used;</p> <p>c. Not used;</p> <p>d. Polyarylene ketones;</p> <p>e. Polyarylene sulphides, where the arylene group is biphenylene, triphenylene or combinations thereof;</p>

Category Code	Item Description
	<p>f. Polybiphenylenethersulphone having a ‘glass transition temperature (<math>T_g</math>)’ exceeding 563 K (290°C).</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. The ‘glass transition temperature (<math>T_g</math>)’ for Category Code 1C008.a.2. thermoplastic materials, Category Code 1C008.a.4. materials and Category Code 1C008.f. materials is determined using the method described in Ref. ISO 11357-2 (1999) or national equivalents.</li> <li>2. The ‘glass transition temperature (<math>T_g</math>)’ for Category Code 1C008.a.2. thermosetting materials and Category Code 1C008.a.3. materials is determined using the 3-point bend method described in ASTM D 7028-07 or equivalent national standard. The test is to be performed using a dry test specimen which has attained a minimum of 90% degree of cure as specified by ASTM E 2160-04 or equivalent national standard, and was cured using the combination of standard and post-cure processes that yield the highest <math>T_g</math>.</li> </ol>
1C009	<p>Unprocessed fluorinated compounds as follows:</p> <ol style="list-style-type: none"> <li>a. Not used;</li> <li>b. Fluorinated polyimides containing 10% by weight or more of combined fluorine;</li> <li>c. Fluorinated phosphazene elastomers containing 30% by weight or more of combined fluorine.</li> </ol>
1C010	<p>“Fibrous or filamentary materials”, as follows:</p> <p><u>N.B.</u></p> <p>See also Category Codes 1C210 and 9C110.</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. For the purpose of calculating “specific tensile strength”, “specific modulus” or specific weight of “fibrous or filamentary materials” in Category Code 1C010.a., 1C010.b., 1C010.c. or 1C010.e.1.b., the tensile strength and modulus should be determined by using Method A described in Ref. ISO 10618 (2004) or national equivalents.</li> </ol>

Category Code	Item Description
	<p>2. The assessment of the “specific tensile strength”, “specific modulus” or specific weight of non-unidirectional “fibrous or filamentary materials” (e.g. fabrics, random mats or braids) in Category Code 1C010 is to be based on the mechanical properties of the constituent unidirectional monofilaments (e.g. monofilaments, yarns, rovings or tows) prior to processing into the non-unidirectional “fibrous or filamentary materials”.</p> <p>a. Organic “fibrous or filamentary materials”, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. “Specific modulus” exceeding <math>12.7 \times 10^6</math> m; <u>and</u></li> <li>2. “Specific tensile strength” exceeding <math>23.5 \times 10^4</math> m;</li> </ol> <p><u>Note</u> Category Code 1C010.a. does not include polyethylene.</p> <p>b. Carbon “fibrous or filamentary materials”, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. “Specific modulus” exceeding <math>14.65 \times 10^6</math> m; <u>and</u></li> <li>2. “Specific tensile strength” exceeding <math>26.82 \times 10^4</math> m;</li> </ol> <p><u>Note</u> Category Code 1C010.b. does not include:</p> <ol style="list-style-type: none"> <li>a. “Fibrous or filamentary materials”, for the repair of “civil aircraft” structures or laminates, having all of the following characteristics: <ol style="list-style-type: none"> <li>1. An area not exceeding <math>1 \text{ m}^2</math>;</li> <li>2. A length not exceeding 2.5 m; <u>and</u></li> <li>3. A width exceeding 15 mm;</li> </ol> </li> <li>b. Mechanically chopped, milled or cut carbon “fibrous or filamentary materials” 25 mm or less in length.</li> </ol> <p>c. Inorganic “fibrous or filamentary materials”, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. “Specific modulus” exceeding <math>2.54 \times 10^6</math> m; <u>and</u></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Melting, softening, decomposition or sublimation point exceeding 1,922 K (1,649°C) in an inert environment;</p> <p><i>Note</i>  <i>Category Code 1C010.c. does not include:</i></p> <p>a. <i>Discontinuous, multiphase, polycrystalline alumina fibres in chopped fibre or random mat form, containing 3% by weight or more silica, with a “specific modulus” of less than <math>10 \times 10^6</math> m;</i></p> <p>b. <i>Molybdenum and molybdenum alloy fibres;</i></p> <p>c. <i>Boron fibres;</i></p> <p>d. <i>Discontinuous ceramic fibres with a melting, softening, decomposition or sublimation point lower than 2,043 K (1,770°C) in an inert environment.</i></p> <p>d. “Fibrous or filamentary materials”, having either of the following characteristics:</p> <p>1. Composed of either of the following:</p> <p>a. Polyetherimides specified in Category Code 1C008.a.; <u>or</u></p> <p>b. Materials specified in Category Codes 1C008.d. to 1C008.f.; <u>or</u></p> <p>2. Composed of materials specified in Category Code 1C010.d.1.a. or 1C010.d.1.b. and “commingled” with other fibres specified in Category Code 1C010.a., 1C010.b. or 1C010.c.;</p> <p>e. Fully or partially resin-impregnated or pitch-impregnated “fibrous or filamentary materials” (prepregs), metal or carbon-coated “fibrous or filamentary materials” (preforms) or “carbon fibre preforms”, having both of the following characteristics:</p> <p>1. Having either of the following:</p> <p>a. Inorganic “fibrous or filamentary materials” specified in Category Code 1C010.c.; <u>or</u></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="624 454 1267 551">b. Organic or carbon “fibrous or filamentary materials”, having both of the following characteristics:</p> <ol data-bbox="687 568 1267 719" style="list-style-type: none"> <li data-bbox="687 568 1267 640">1. “Specific modulus” exceeding <math>10.15 \times 10^6</math> m; <u>and</u></li> <li data-bbox="687 651 1267 719">2. “Specific tensile strength” exceeding <math>17.7 \times 10^4</math> m; <u>and</u></li> </ol> <p data-bbox="539 734 1126 768">2. Having any of the following characteristics:</p> <ol data-bbox="624 786 1267 1151" style="list-style-type: none"> <li data-bbox="624 786 1267 853">a. Resin or pitch specified in Category Code 1C008 or 1C009.b.;</li> <li data-bbox="624 869 1267 972">b. ‘Dynamic Mechanical Analysis glass transition temperature (DMA <math>T_g</math>)’ equal to or exceeding 453 K (180°C) and having a phenolic resin; <u>or</u></li> <li data-bbox="624 987 1267 1151">c. ‘Dynamic Mechanical Analysis glass transition temperature (DMA <math>T_g</math>)’ equal to or exceeding 505 K (232°C) and having a resin or pitch, not specified in Category Code 1C008 or 1C009.b., and not being a phenolic resin.</li> </ol> <p data-bbox="539 1171 624 1205"><u>Note 1</u></p> <p data-bbox="539 1211 1267 1346"><i>Metal or carbon-coated “fibrous or filamentary materials” (preforms) or “carbon fibre preforms”, not impregnated with resin or pitch, are specified by “fibrous or filamentary materials” in Category Code 1C010.a., 1C010.b. or 1C010.c.</i></p> <p data-bbox="539 1361 624 1395"><u>Note 2</u></p> <p data-bbox="539 1402 1046 1435"><i>Category Code 1C010.e. does not include:</i></p> <ol data-bbox="539 1451 1267 1736" style="list-style-type: none"> <li data-bbox="539 1451 1267 1585">a. Epoxy resin “matrix” impregnated carbon “fibrous or filamentary materials” (prepregs) for the repair of “civil aircraft” structures or laminates, having all of the following characteristics: <ol data-bbox="624 1603 1098 1736" style="list-style-type: none"> <li data-bbox="624 1603 1023 1637">1. An area not exceeding 1 m<sup>2</sup>;</li> <li data-bbox="624 1653 1098 1686">2. A length not exceeding 2.5 m; <u>and</u></li> <li data-bbox="624 1702 1002 1736">3. A width exceeding 15 mm;</li> </ol> </li> </ol>

Category Code	Item Description
	<p>b. Fully or partially resin-impregnated or pitch-impregnated mechanically chopped, milled or cut carbon “fibrous or filamentary materials” 25 mm or less in length when using a resin or pitch other than those specified by Category Code 1C008 or 1C009.b.</p> <p><u>Technical Note</u> The ‘Dynamic Mechanical Analysis glass transition temperature (DMA <math>T_g</math>)’ for materials specified by Category Code 1C010.e. is determined using the method described in ASTM D 7028-07, or equivalent national standard, on a dry test specimen. In the case of thermoset materials, degree of cure of a dry test specimen is a minimum of 90% as defined by ASTM E 2160-04 or equivalent national standard.</p>
1C011	<p>Metals and compounds, as follows:</p> <p><u>N.B.</u> See also Division 2 of Part 1 of this Schedule and Category Code 1C111.</p> <p>a. Metals in particle sizes of less than 60 <math>\mu\text{m}</math> whether spherical, atomised, spheroidal, flaked or ground, manufactured from material consisting of 99% or more of zirconium, magnesium and alloys thereof;</p> <p><u>Technical Note</u> The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.</p> <p><u>Note</u> Category Code 1C011.a. includes metals or alloys listed therein whether or not they are encapsulated in aluminium, magnesium, zirconium or beryllium.</p> <p>b. Boron or boron alloys, with a particle size of 60 <math>\mu\text{m}</math> or less, as follows;</p> <ol style="list-style-type: none"> <li>1. Boron with a purity of 85% by weight or more;</li> </ol>



Category Code	Item Description
	<p>2. Boron alloys with a boron content of 85% by weight or more;</p> <p><u>Note</u>  <i>Category Code 1C011.b. includes metals or alloys listed therein whether or not they are encapsulated in aluminium, magnesium, zirconium or beryllium.</i></p> <p>c. Guanidine nitrate (506-93-4);</p> <p>d. Nitroguanidine (NQ) (556-88-7).</p> <p><u>N.B.</u>  <i>See also Division 2 of Part 1 of this Schedule for metal powders mixed with other substances to form a mixture formulated for military purposes.</i></p>
1C012	<p>Materials as follows:</p> <p><u>Technical Note</u>  <i>These materials are typically used for nuclear heat sources.</i></p> <p>a. Plutonium in any form with a plutonium isotopic assay of plutonium-238 of more than 50% by weight;</p> <p><u>Note</u>  <i>Category Code 1C012.a. does not include:</i></p> <p><i>a. Shipments with a plutonium content of 1 g or less;</i></p> <p><i>b. Shipments of 3 “effective grammes” or less when contained in a sensing component in instruments.</i></p> <p>b. “Previously separated” neptunium-237 in any form.</p> <p><u>Note</u>  <i>Category Code 1C012.b. does not include shipments with a neptunium-237 content of 1 g or less.</i></p>

<i>Category Code</i>	<i>Item Description</i>
1C101	<p>Materials and devices for reduced observables such as radar reflectivity, UltraViolet (UV)/infrared signatures and acoustic signatures, other than those specified in Category Code 1C001, usable in ‘missiles’, “missile” sub-systems or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a.</p> <p><u>Note 1</u>  <i>Category Code 1C101 includes:</i></p> <ul style="list-style-type: none"> <li>a. <i>Structural materials and coatings specially designed for reduced radar reflectivity;</i></li> <li>b. <i>Coatings, including paints, specially designed for reduced or tailored reflectivity or emissivity in the microwave, infrared or UltraViolet (UV) regions of the electromagnetic spectrum.</i></li> </ul> <p><u>Note 2</u>  <i>Category Code 1C101 does not include coatings when specially used for the thermal control of satellites.</i></p> <p><u>Technical Note</u>  <i>In Category Code 1C101, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
1C102	<p>Resaturated pyrolised carbon-carbon materials designed for space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.</p>
1C107	<p>Graphite and ceramic materials, other than those specified in Category Code 1C007, as follows:</p> <ul style="list-style-type: none"> <li>a. Fine grain graphites with a bulk density of 1.72 g/cm<sup>3</sup> or greater, measured at 288 K (15°C), and having a grain size of 100 µm or less, usable for rocket nozzles and re-entry vehicle nose tips, which can be machined to any of the following products: <ul style="list-style-type: none"> <li>1. Cylinders having a diameter of 120 mm or greater and a length of 50 mm or greater;</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Tubes having an inner diameter of 65 mm or greater and a wall thickness of 25 mm or greater and a length of 50 mm or greater; <u>or</u></p> <p>3. Blocks having a size of 120 mm × 120 mm × 50 mm or greater;</p> <p><u>N.B.</u> See also Category Code 0C004.</p> <p>b. Pyrolytic or fibrous reinforced graphites, usable for rocket nozzles and re-entry vehicle nose tips usable in “missiles”, space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104;</p> <p><u>N.B.</u> See also Category Code 0C004.</p> <p>c. Ceramic composite materials (dielectric constant less than 6 at any frequency from 100 MHz to 100 GHz) for use in radomes usable in “missiles”, space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104;</p> <p>d. Bulk machinable silicon-carbide reinforced unfired ceramic, usable for nose tips usable in “missiles”, space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104;</p> <p>e. Reinforced silicon-carbide ceramic composites, usable for nose tips, re-entry vehicles and nozzle flaps usable in “missiles”, space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104;</p> <p>f. Bulk machinable ceramic composite materials consisting of an ‘Ultra High Temperature Ceramic (UHTC)’ matrix with a melting point equal to or greater than 3,000°C and reinforced with fibres or filaments, usable for missile components (such as nose tips, re-entry vehicles, leading edges, jet vanes, control surfaces or rocket motor throat inserts) in “missiles”, space launch vehicles specified in Category Code 9A004, sounding rockets specified in Category Code 9A104 or ‘missiles’.</p>

Category Code	Item Description
	<p><u>Note</u> Category Code 1C107.f. does not include 'Ultra High Temperature Ceramic (UHTC)' materials in non-composite form.</p> <p><u>Technical Note 1</u> In Category Code 1C107.f. 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p> <p><u>Technical Note 2</u> 'Ultra High Temperature Ceramics (UHTC)' includes:</p> <ol style="list-style-type: none"> <li>1. Titanium diboride (<math>TiB_2</math>);</li> <li>2. Zirconium diboride (<math>ZrB_2</math>);</li> <li>3. Niobium diboride (<math>NbB_2</math>);</li> <li>4. Hafnium diboride (<math>HfB_2</math>);</li> <li>5. Tantalum diboride (<math>TaB_2</math>);</li> <li>6. Titanium carbide (<math>TiC</math>);</li> <li>7. Zirconium carbide (<math>ZrC</math>);</li> <li>8. Niobium carbide (<math>NbC</math>);</li> <li>9. Hafnium carbide (<math>HfC</math>);</li> <li>10. Tantalum carbide (<math>TaC</math>).</li> </ol>
1C111	<p>Propellants and constituent chemicals for propellants, other than those specified in Category Code 1C011, as follows:</p> <p>a. Propulsive substances:</p> <ol style="list-style-type: none"> <li>1. Spherical or spheroidal aluminium powder, other than that specified in Division 2 of Part 1 of this Schedule, in particle size of less than 200 <math>\mu m</math> and an aluminium content of 97% by weight or more, if at least 10% of the total weight is made up of particles of less than 63 <math>\mu m</math>, according to Ref. ISO 2591-1:1988 or national equivalents;</li> </ol> <p><u>Technical Note</u> A particle size of 63 <math>\mu m</math> (Ref. ISO R-565) corresponds to 250 mesh (Tyler) or 230 mesh (ASTM standard E-11).</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Metal powders, other than that specified in Division 2 of Part 1 of this Schedule, as follows:</p> <p>a. Metal powders of zirconium, beryllium or magnesium, or alloys of these metals, if at least 90% of the total particles by particle volume or weight are made up of particles of less than 60 µm (determined by measurement techniques such as using a sieve, laser diffraction or optical scanning), whether spherical, atomised, spheroidal, flaked or ground, consisting 97% by weight or more of any of the following:</p> <ol style="list-style-type: none"> <li>1. Zirconium;</li> <li>2. Beryllium; <u>or</u></li> <li>3. Magnesium;</li> </ol> <p><i>Technical Note</i>  <i>The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.</i></p> <p>b. Metal powders of either boron or boron alloys with a boron content of 85% or more by weight, if at least 90% of the total particles by particle volume or weight are made up of particles of less than 60 µm (determined by measurement techniques such as using a sieve, laser diffraction or optical scanning), whether spherical, atomised, spheroidal, flaked or ground;</p> <p><i>Note</i>  <i>Category Codes 1C111a.2.a. and 1C111a.2.b. include any powder mixture with a multimodal particle distribution (e.g. a mixture of different grain sizes) if one or more modes in the powder mixture are specified in Division 2 of Part 2 of this Schedule.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. Oxidiser substances usable in liquid propellant rocket engines as follows:</p> <ol style="list-style-type: none"> <li>a. Dinitrogen trioxide (10544-73-7);</li> <li>b. Nitrogen dioxide (10102-44-0)/dinitrogen tetroxide (10544-72-6);</li> <li>c. Dinitrogen pentoxide (10102-03-1);</li> <li>d. Mixed Oxides of Nitrogen (MON);</li> </ol> <p><i>Technical Note</i></p> <p><i>Mixed Oxides of Nitrogen (MON) are solutions of Nitric Oxide (NO) in Dinitrogen Tetroxide/ Nitrogen Dioxide (N<sub>2</sub>O<sub>4</sub>/NO<sub>2</sub>) that can be used in missile systems. There are a range of compositions that can be denoted as MON<sub>i</sub> or MON<sub>ij</sub>, where i and j are integers representing the percentage of Nitric Oxide in the mixture (e.g. MON<sub>3</sub> contains 3% Nitric Oxide, MON<sub>25</sub> 25% Nitric Oxide. An upper limit is MON<sub>40</sub>, 40% by weight).</i></p> <ol style="list-style-type: none"> <li>e. See Inhibited Red Fuming Nitric Acid (IRFNA) in Division 2 of Part 1 of this Schedule;</li> <li>f. See compounds composed of fluorine and one or more of other halogens, oxygen or nitrogen in Division 2 of Part 1 of this Schedule and Category Code 1C238;</li> </ol> <p>4. Hydrazine derivatives as follows:</p> <p><u>N.B.</u></p> <p><i>See also Division 2 of Part 1 of this Schedule.</i></p> <ol style="list-style-type: none"> <li>a. Trimethylhydrazine (1741-01-1);</li> <li>b. Tetramethylhydrazine (6415-12-9);</li> <li>c. N,N diallylhydrazine (5164-11-4);</li> <li>d. Allylhydrazine (7422-78-8);</li> <li>e. Ethylene dihydrazine (6068-98-0);</li> <li>f. Monomethylhydrazine dinitrate;</li> <li>g. Unsymmetrical dimethylhydrazine nitrate;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>h. Hydrazinium azide (14546-44-2);</p> <p>i. 1,1-Dimethylhydrazinium azide (227955-52-4) / 1,2-Dimethylhydrazinium azide (299177-50-7);</p> <p>j. Hydrazinium dinitrate (13464-98-7);</p> <p>k. Diimido oxalic acid dihydrazine (3457-37-2);</p> <p>l. 2-hydroxyethylhydrazine nitrate (HEHN);</p> <p>m. See Hydrazinium perchlorate in Division 2 of Part 1 of this Schedule;</p> <p>n. Hydrazinium diperchlorate (13812-39-0);</p> <p>o. Methylhydrazine nitrate (MHN) (29674-96-2);</p> <p>p. 1,1-Diethylhydrazine nitrate (DEHN) / 1,2-Diethylhydrazine nitrate (DEHN) (363453-17-2);</p> <p>q. 3,6-dihydrazino tetrazine nitrate (1,4-dihydrazine nitrate) (DHTN);</p> <p>5. High energy density materials, other than that specified in Division 2 of Part 1 of this Schedule, usable in 'missiles' or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a., as follows:</p> <p>a. Mixed fuel that incorporate both solid and liquid fuels, such as boron slurry, having a mass-based energy density of <math>40 \times 10^6</math> J/kg or greater;</p> <p>b. Other high energy density fuels and fuel additives (e.g. cubane, ionic solutions, JP-10) having a volume-based energy density of <math>37.5 \times 10^9</math> J/m<sup>3</sup> or greater, measured at 20°C and one atmosphere (101.325 kPa) pressure;</p> <p><u>Note</u>  <i>Category Code 1C111.a.5.b. does not include fossil refined fuels and biofuels produced from vegetables, including fuels for engines certified for use in civil aviation, unless specially formulated for 'missiles' or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a.</i></p>

Category Code	Item Description
	<p data-bbox="603 454 786 488"><u>Technical Note</u></p> <p data-bbox="603 495 1262 595"><i>In Category Code IC111.a.5., 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p> <ol style="list-style-type: none"> <li data-bbox="539 611 1078 645">6. Hydrazine replacement fuels as follows:           <ol style="list-style-type: none"> <li data-bbox="624 660 1134 725">a. 2-Dimethylaminoethylazide (DMAZ) (86147-04-8);</li> </ol> </li> <li data-bbox="475 741 804 775">b. Polymeric substances:           <ol style="list-style-type: none"> <li data-bbox="539 790 1262 855">1. Carboxy-terminated polybutadiene (including carboxyl-terminated polybutadiene) (CTPB);</li> <li data-bbox="539 875 1262 1008">2. Hydroxy-terminated polybutadiene (including hydroxyl-terminated polybutadiene) (HTPB) (69102-90-5), other than that specified in Division 2 of Part 1 of this Schedule;</li> <li data-bbox="539 1025 1034 1059">3. Polybutadiene-acrylic acid (PBAA);</li> <li data-bbox="539 1077 1262 1142">4. Polybutadiene-acrylic acid-acrylonitrile (PBAN) (25265-19-4 / 68891-50-9);</li> <li data-bbox="539 1160 1193 1193">5. Polytetrahydrofuran polyethylene glycol (TPEG);</li> </ol> <p data-bbox="603 1209 786 1243"><u>Technical Note</u></p> <p data-bbox="603 1249 1262 1350"><i>Polytetrahydrofuran polyethylene glycol (TPEG) is a block co-polymer of poly 1,4-Butanediol (110-63-4) and polyethylene glycol (PEG) (25322-68-3).</i></p> <ol style="list-style-type: none"> <li data-bbox="539 1366 1262 1431">6. Polyglycidyl nitrate (PGN or poly-GLYN) (27814-48-8);</li> </ol> </li> <li data-bbox="475 1451 991 1485">c. Other propellant additives and agents:           <ol style="list-style-type: none"> <li data-bbox="539 1500 1262 1601">1. See carboranes, decaboranes, pentaboranes and derivatives thereof in Division 2 of Part 1 of this Schedule;</li> <li data-bbox="539 1619 1198 1653">2. Triethylene glycol dinitrate (TEGDN) (111-22-8);</li> <li data-bbox="539 1671 1011 1704">3. 2-Nitrodiphenylamine (119-75-5);</li> <li data-bbox="539 1722 1219 1756">4. Trimethylolethane trinitrate (TMETN) (3032-55-1);</li> </ol> </li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"><li>5. Diethylene glycol dinitrate (DEGDN) (693-21-0);</li><li>6. Ferrocene derivatives as follows:<ul style="list-style-type: none"><li>a. See catocene in Division 2 of Part 1 of this Schedule;</li><li>b. See ethyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>c. See propyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>d. See n-butyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>e. See pentyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>f. See dicyclopentyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>g. See dicyclohexyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>h. See diethyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>i. See dipropyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>j. See dibutyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>k. See dihexyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>l. See acetyl ferrocene/1,1'-diacetyl ferrocene in Division 2 of Part 1 of this Schedule;</li><li>m. See ferrocene carboxylic acids in Division 2 of Part 1 of this Schedule;</li></ul></li></ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>n. See butacene in Division 2 of Part 1 of this Schedule;</p> <p>o. Other ferrocene derivatives usable as rocket propellant burning rate modifiers, other than those specified in Division 2 of Part 1 of this Schedule;</p> <p><u>Note</u> Category Code 1C111.c.6.o. does not include ferrocene derivatives that contain a six carbon aromatic functional group attached to the ferrocene molecule.</p> <p>7. 4,5 diazidomethyl-2-methyl-1,2,3-triazole (iso-DAMTR), other than that specified in Division 2 of Part 1 of this Schedule;</p> <p>d. 'Gel propellants', other than that specified in Division 2 of Part 1 of this Schedule, specifically formulated for use in 'missiles'.</p> <p><u>Technical Notes</u></p> <p>1. In Category Code 1C111.d. a 'gel propellant' is a fuel or oxidiser formulation using a gellant such as silicates, kaolin (clay), carbon or any polymeric gellant.</p> <p>2. In Category Code 1C111.d. a 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p> <p><u>Note</u> For propellants and constituent chemicals for propellants not specified in Category Code 1C111, see Division 2 of Part 1 of this Schedule.</p>
1C116	<p>Maraging steels, usable in 'missiles', having both of the following characteristics:</p> <p><u>N.B.</u> See also Category Code 1C216.</p> <p>a. An Ultimate Tensile Strength (UTS), measured at 293 K (20°C), equal to or greater than:</p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>1. 0.9 GPa in the solution annealed stage; <u>or</u></li> <li>2. 1.5 GPa in the precipitation hardened stage; <u>and</u></li> </ol> <p>b. Either of the following forms:</p> <ol style="list-style-type: none"> <li>1. Sheet, plate or tubing with a wall or plate thickness equal to or less than 5 mm; <u>or</u></li> <li>2. Tubular forms with a wall thickness equal to or less than 50 mm and having an inner diameter equal to or greater than 270 mm.</li> </ol> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. <i>Maraging steels are iron alloys:</i> <ol style="list-style-type: none"> <li>a. <i>Generally characterised by high nickel, very low carbon content and the use of substitutional elements or precipitates to produce strengthening and age-hardening of the alloy; <u>and</u></i></li> <li>b. <i>Subjected to heat treatment cycles to facilitate the martensitic transformation process (solution annealed stage) and subsequently age hardened (precipitation hardened stage).</i></li> </ol> </li> <li>2. <i>In Category Code 1C116, 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></li> </ol>
1C117	<p>Materials for the fabrication of 'missiles' components as follows:</p> <ol style="list-style-type: none"> <li>a. Tungsten and alloys in particulate form with a tungsten content of 97% by weight or more and a particle size of <math>50 \times 10^{-6}</math> m (50 <math>\mu</math>m) or less;</li> <li>b. Molybdenum and alloys in particulate form with a molybdenum content of 97% by weight or more and a particle size of <math>50 \times 10^{-6}</math> m (50 <math>\mu</math>m) or less;</li> <li>c. Tungsten materials in solid form having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Any of the following material compositions: <ol style="list-style-type: none"> <li>a. Tungsten and alloys containing 97% by weight or more of tungsten;</li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>b. Copper infiltrated tungsten containing 80% by weight or more of tungsten; <u>or</u></li> <li>c. Silver infiltrated tungsten containing 80% by weight or more of tungsten; <u>and</u></li> </ul> <p>2. Able to be machined to any of the following products:</p> <ul style="list-style-type: none"> <li>a. Cylinders having a diameter of 120 mm or greater and a length of 50 mm or greater;</li> <li>b. Tubes having an inner diameter of 65 mm or greater and a wall thickness of 25 mm or greater and a length of 50 mm or greater; <u>or</u></li> <li>c. Blocks having a size of 120 mm by 120 mm by 50 mm or greater.</li> </ul> <p><i><u>Technical Note</u></i>  <i>In Category Code 1C117, 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
1C118	<p>Titanium-stabilised duplex stainless steel (Ti-DSS) having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Having all of the following characteristics: <ul style="list-style-type: none"> <li>1. Containing 17-23% by weight chromium and 4.5-7% by weight nickel;</li> <li>2. Having a titanium content of greater than 0.10% by weight; <u>and</u></li> <li>3. A ferritic-austenitic microstructure (also referred to as a two-phase microstructure) of which at least 10% is austenite by volume (according to ASTM E-1181-87 or national equivalents); <u>and</u></li> </ul> </li> <li>b. Having any of the following forms: <ul style="list-style-type: none"> <li>1. Ingots or bars having a size of 100 mm or more in each dimension;</li> <li>2. Sheets having a width of 600 mm or more and a thickness of 3 mm or less; <u>or</u></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
1C202	<p data-bbox="539 454 1272 517">3. Tubes having an outer diameter of 600 mm or more and a wall thickness of 3 mm or less.</p> <p data-bbox="475 584 1272 651">Alloys, other than those specified in Category Code 1C002.b.3. or .b.4., as follows:</p> <p data-bbox="475 667 1272 734">a. Aluminium alloys having both of the following characteristics:</p> <ol data-bbox="539 750 1272 902" style="list-style-type: none"> <li data-bbox="539 750 1272 817">1. ‘Capable of’ an Ultimate Tensile Strength (UTS) of 460 MPa or more at 293 K (20°C); <u>and</u></li> <li data-bbox="539 833 1272 902">2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm;</li> </ol> <p data-bbox="475 918 1272 952">b. Titanium alloys having both of the following characteristics:</p> <ol data-bbox="539 967 1272 1120" style="list-style-type: none"> <li data-bbox="539 967 1272 1034">1. ‘Capable of’ an Ultimate Tensile Strength (UTS) of 900 MPa or more at 293 K (20°C); <u>and</u></li> <li data-bbox="539 1050 1272 1120">2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm.</li> </ol> <p data-bbox="475 1135 660 1169"><i>Technical Note</i></p> <p data-bbox="475 1176 1272 1243"><i>The phrase alloys ‘capable of’ encompasses alloys before or after heat treatment.</i></p>
1C210	<p data-bbox="475 1310 1272 1377">‘Fibrous or filamentary materials’ or prepregs, other than those specified in Category Code 1C010.a., b. or e., as follows:</p> <p data-bbox="475 1393 1272 1460">a. Carbon or aramid ‘fibrous or filamentary materials’ having either of the following characteristics:</p> <ol data-bbox="539 1476 1272 1565" style="list-style-type: none"> <li data-bbox="539 1476 1272 1509">1. A “specific modulus” of <math>12.7 \times 10^6</math> m or greater; <u>or</u></li> <li data-bbox="539 1525 1272 1565">2. A “specific tensile strength” of <math>23.5 \times 10^4</math> m or greater;</li> </ol> <p data-bbox="475 1581 600 1615"><i>Note</i></p> <p data-bbox="475 1621 1272 1711"><i>Category Code 1C210.a. does not include aramid ‘fibrous or filamentary materials’ having 0.25% by weight or more of an ester based fibre surface modifier;</i></p> <p data-bbox="475 1727 1272 1794">b. Glass ‘fibrous or filamentary materials’ having both of the following characteristics:</p> <ol data-bbox="539 1809 1272 1850" style="list-style-type: none"> <li data-bbox="539 1809 1272 1850">1. A “specific modulus” of <math>3.18 \times 10^6</math> m or greater; <u>and</u></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. A “specific tensile strength” of <math>7.62 \times 10^4</math> m or greater;</p> <p>c. Thermoset resin impregnated continuous “yarns”, “rovings”, “tows” or “tapes” with a width of 15 mm or less (prepregs), made from carbon or glass ‘fibrous or filamentary materials’ specified in Category Code 1C210.a. or b.</p> <p><i>Technical Note</i> The resin forms the matrix of the composite.</p> <p><i>Note</i> In Category Code 1C210, ‘fibrous or filamentary materials’ is restricted to continuous “monofilaments”, “yarns”, “rovings”, “tows” or “tapes”.</p>
1C216	<p>Maraging steel, other than that specified in Category Code 1C116, ‘capable of’ an Ultimate Tensile Strength (UTS) of 1,950 MPa or more, at 293 K (20°C).</p> <p><i>Note</i> Category Code 1C216 does not include forms in which all linear dimensions are 75 mm or less.</p> <p><i>Technical Note</i> The phrase maraging steel ‘capable of’ encompasses maraging steel before or after heat treatment.</p>
1C225	<p>Boron enriched in the boron-10 (<math>^{10}\text{B}</math>) isotope to greater than its natural isotopic abundance, as follows: elemental boron, compounds, mixtures containing boron, manufactures thereof, waste or scrap of any of the foregoing.</p> <p><i>Note</i> In Category Code 1C225, mixtures containing boron include boron loaded materials.</p> <p><i>Technical Note</i> The natural isotopic abundance of boron-10 is approximately 18.5 weight per cent (20 atom per cent).</p>

<i>Category Code</i>	<i>Item Description</i>
1C226	<p>Tungsten, tungsten carbide, and alloys containing more than 90% tungsten by weight, other than that specified by Category Code 1C117, having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. In forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100 mm and 300 mm; <u>and</u></li> <li>b. A mass greater than 20 kg.</li> </ul> <p><u>Note</u>  <i>Category Code 1C226 does not include manufactures specially designed as weights or gamma-ray collimators.</i></p>
1C227	<p>Calcium having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Containing less than 1,000 parts per million (ppm) by weight of metallic impurities other than magnesium; <u>and</u></li> <li>b. Containing less than 10 parts per million (ppm) by weight of boron.</li> </ul>
1C228	<p>Magnesium having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Containing less than 200 parts per million (ppm) by weight of metallic impurities other than calcium; <u>and</u></li> <li>b. Containing less than 10 parts per million (ppm) by weight of boron.</li> </ul>
1C229	<p>Bismuth having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. A purity of 99.99% or greater by weight; <u>and</u></li> <li>b. Containing less than 10 parts per million (ppm) by weight of silver.</li> </ul>
1C230	<p>Beryllium metal, alloys containing more than 50% beryllium by weight, beryllium compounds, manufactures thereof, and waste or scrap of any of the foregoing, other than that specified in Division 2 of Part 1 of this Schedule.</p>

Category Code	Item Description
	<p><u>N.B.</u> See also Division 2 of Part 1 of this Schedule.</p> <p><u>Note</u> Category Code 1C230 does not include the following:</p> <ol style="list-style-type: none"> <li>a. Metal windows for X-ray machines, or for bore-hole logging devices;</li> <li>b. Oxide shapes in fabricated or semi-fabricated forms specially designed for electronic component parts or as substrates for electronic circuits;</li> <li>c. Beryl (silicate of beryllium and aluminium) in the form of emeralds or aquamarines.</li> </ol>
1C231	Hafnium metal, alloys containing more than 60% hafnium by weight, hafnium compounds containing more than 60% hafnium by weight, manufactures thereof, and waste or scrap of any of the foregoing.
1C232	Helium-3 ( <sup>3</sup> He), mixtures containing helium-3, and products or devices containing any of the foregoing.
1C233	<p>Lithium enriched in the lithium-6 (<sup>6</sup>Li) isotope to greater than its natural isotopic abundance, and products or devices containing enriched lithium, as follows: elemental lithium, alloys, compounds, mixtures containing lithium, manufactures thereof, waste or scrap of any of the foregoing.</p> <p><u>Note</u> Category Code 1C233 does not include thermoluminescent dosimeters.</p> <p><u>Technical Note</u> The natural isotopic abundance of lithium-6 is approximately 6.5 weight per cent (7.5 atom per cent).</p>



<i>Category Code</i>	<i>Item Description</i>
1C234	<p>Zirconium with a hafnium content of less than 1 part hafnium to 500 parts zirconium by weight, as follows: metal, alloys containing more than 50% zirconium by weight, compounds, manufactures thereof, waste or scrap of any of the foregoing, other than those specified in Category Code 0A001.f.</p> <p><u>Note</u> Category Code 1C234 does not include zirconium in the form of foil having a thickness of 0.1 mm or less.</p>
1C235	<p>Tritium, tritium compounds, mixtures containing tritium in which the ratio of tritium to hydrogen atoms exceeds 1 part in 1,000, and products or devices containing any of the foregoing.</p> <p><u>Note</u> Category Code 1C235 does not include a product or device containing less than <math>1.48 \times 10^3</math> GBq (40 Ci) of tritium.</p>
1C236	<p>‘Radionuclides’ appropriate for making neutron sources based on alpha-n reaction, other than those specified in Category Codes 0C001 and 1C012.a., in the following forms:</p> <ol style="list-style-type: none"> <li>a. Elemental;</li> <li>b. Compounds having a total activity of 37 GBq/kg (1 Ci/kg) or greater;</li> <li>c. Mixtures having a total activity of 37 GBq/kg (1 Ci/kg) or greater;</li> <li>d. Products or devices containing any of the foregoing.</li> </ol> <p><u>Note</u> Category Code 1C236 does not include a product or device containing less than 3.7 GBq (100 millicuries) of activity.</p> <p><u>Technical Note</u> In Category Code 1C236, ‘radionuclides’ are any of the following:</p> <ul style="list-style-type: none"> <li>– Actinium-225 (Ac-225)</li> <li>– Actinium-227 (Ac-227)</li> <li>– Californium-253 (Cf-253)</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	– <i>Curium-240 (Cm-240)</i>
	– <i>Curium-241 (Cm-241)</i>
	– <i>Curium-242 (Cm-242)</i>
	– <i>Curium-243 (Cm-243)</i>
	– <i>Curium-244 (Cm-244)</i>
	– <i>Einsteinium-253 (Es-253)</i>
	– <i>Einsteinium-254 (Es-254)</i>
	– <i>Gadolinium-148 (Gd-148)</i>
	– <i>Plutonium-236 (Pu-236)</i>
	– <i>Plutonium-238 (Pu-238)</i>
	– <i>Polonium-208 (Po-208)</i>
	– <i>Polonium-209 (Po-209)</i>
	– <i>Polonium-210 (Po-210)</i>
	– <i>Radium-223 (Ra-223)</i>
	– <i>Thorium-227 (Th-227)</i>
	– <i>Thorium-228 (Th-228)</i>
	– <i>Uranium-230 (U-230)</i>
	– <i>Uranium-232 (U-232)</i>
1C237	Radium-226 ( <sup>226</sup> Ra), radium-226 alloys, radium-226 compounds, mixtures containing radium-226, manufactures thereof, and products or devices containing any of the foregoing.
	<u>Note</u>
	<i>Category Code 1C237 does not include the following:</i>
	a. <i>Medical applicators;</i>
	b. <i>A product or device containing less than 0.37 GBq (10 millicuries) of radium-226.</i>
1C238	Chlorine trifluoride (ClF <sub>3</sub> ).

<i>Category Code</i>	<i>Item Description</i>
1C239	High explosives, other than those specified in Division 2 of Part 1 of this Schedule, or substances or mixtures containing more than 2% by weight thereof, with a crystal density greater than 1.8 g/cm <sup>3</sup> and having a detonation velocity greater than 8,000 m/s.
1C240	<p>Nickel powder and porous nickel metal, other than those specified in Category Code 0C005, as follows:</p> <p>a. Nickel powder having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A nickel purity content of 99% or greater by weight; <u>and</u></li> <li>2. A mean particle size of less than 10 µm measured by American Society for Testing and Materials (ASTM) B330 standard;</li> </ol> <p>b. Porous nickel metal produced from materials specified in Category Code 1C240.a.</p>
	<p><u>Note</u></p> <p><i>Category Code 1C240 does not include the following:</i></p> <p>a. <i>Filamentary nickel powders;</i></p> <p>b. <i>Single porous nickel sheets with an area of 1,000 cm<sup>2</sup> per sheet or less.</i></p>
	<p><u>Technical Note</u></p> <p><i>Category Code 1C240.b. refers to porous metal formed by compacting and sintering the materials in Category Code 1C240.a. to form a metal material with fine pores interconnected throughout the structure.</i></p>
1C241	<p>Rhenium, and alloys containing 90% by weight or more rhenium; and alloys of rhenium and tungsten containing 90% by weight or more of any combination of rhenium and tungsten, other than those specified in Category Code 1C226, having both of the following characteristics:</p> <p>a. In forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100 mm and 300 mm; <u>and</u></p> <p>b. A mass greater than 20 kg.</p>

Category Code	Item Description
1C350	<p>Chemicals, which may be used as precursors for toxic chemical agents, as follows, and “chemical mixtures” containing one or more thereof:</p> <p><u>N.B.</u></p> <p>See also Division 2 of Part 1 of this Schedule and Category Code 1C450.</p> <ol style="list-style-type: none"> <li>1. Thiodiglycol (111-48-8);</li> <li>2. Phosphorus oxychloride (10025-87-3);</li> <li>3. Dimethyl methylphosphonate (756-79-6);</li> <li>4. See Methyl phosphonyl difluoride (676-99-3) in Division 2 of Part 1 of this Schedule;</li> <li>5. Methyl phosphonyl dichloride (676-97-1);</li> <li>6. Dimethyl phosphite (DMP) (868-85-9);</li> <li>7. Phosphorus trichloride (7719-12-2);</li> <li>8. Trimethyl phosphite (TMP) (121-45-9);</li> <li>9. Thionyl chloride (7719-09-7);</li> <li>10. 3-Hydroxy-1-methylpiperidine (3554-74-3);</li> <li>11. N,N-Diisopropyl-(beta)-aminoethyl chloride (96-79-7);</li> <li>12. N,N-Diisopropyl-(beta)-aminoethane thiol (5842-07-9);</li> <li>13. 3-Quinuclidinol (1619-34-7);</li> <li>14. Potassium fluoride (7789-23-3);</li> <li>15. 2-Chloroethanol (107-07-3);</li> <li>16. Dimethylamine (124-40-3);</li> <li>17. Diethyl ethylphosphonate (78-38-6);</li> <li>18. Diethyl N,N-dimethylphosphoramidate (2404-03-7);</li> <li>19. Diethyl phosphite (762-04-9);</li> <li>20. Dimethylamine hydrochloride (506-59-2);</li> <li>21. Ethyl phosphinyl dichloride (1498-40-4);</li> <li>22. Ethyl phosphonyl dichloride (1066-50-8);</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	23. See Ethyl phosphonyl difluoride (753-98-0) in Division 2 of Part 1 of this Schedule;
	24. Hydrogen fluoride (7664-39-3);
	25. Methyl benzilate (76-89-1);
	26. Methyl phosphinyl dichloride (676-83-5);
	27. N,N-Diisopropyl-(beta)-amino ethanol (96-80-0);
	28. Pinacolyl alcohol (464-07-3);
	29. See O-Ethyl O-2-diisopropylaminoethyl methylphosphonite (QL) (57856-11-8) in Division 2 of Part 1 of this Schedule;
	30. Triethyl phosphite (122-52-1);
	31. Arsenic trichloride (7784-34-1);
	32. Benzilic acid (76-93-7);
	33. Diethyl methylphosphonite (15715-41-0);
	34. Dimethyl ethylphosphonate (6163-75-3);
	35. Ethyl phosphinyl difluoride (430-78-4);
	36. Methyl phosphinyl difluoride (753-59-3);
	37. 3-Quinuclidone (3731-38-2);
	38. Phosphorus pentachloride (10026-13-8);
	39. Pinacolone (75-97-8);
	40. Potassium cyanide (151-50-8);
	41. Potassium bifluoride (7789-29-9);
	42. Ammonium hydrogen fluoride or ammonium bifluoride (1341-49-7);
	43. Sodium fluoride (7681-49-4);
	44. Sodium bifluoride (1333-83-1);
	45. Sodium cyanide (143-33-9);
	46. Triethanolamine (102-71-6);
	47. Phosphorus pentasulphide (1314-80-3);
	48. Di-isopropylamine (108-18-9);

<i>Category Code</i>	<i>Item Description</i>
	49. Diethylaminoethanol (100-37-8);
	50. Sodium sulphide (1313-82-2);
	51. Sulphur monochloride (10025-67-9);
	52. Sulphur dichloride (10545-99-0);
	53. Triethanolamine hydrochloride (637-39-8);
	54. N,N-Diisopropyl-(beta)-aminoethyl chloride hydrochloride (4261-68-1);
	55. Methylphosphonic acid (993-13-5);
	56. Diethyl methylphosphonate (683-08-9);
	57. N,N-Dimethylaminophosphoryl dichloride (677-43-0);
	58. Triisopropyl phosphite (116-17-6);
	59. Ethyldiethanolamine (139-87-7);
	60. O,O-Diethyl phosphorothioate (2465-65-8);
	61. O,O-Diethyl phosphorodithioate (298-06-6);
	62. Sodium hexafluorosilicate (16893-85-9);
	63. Methylphosphonothioic dichloride (676-98-2);
	64. Diethylamine (109-89-7).
	<u>Note 1</u>
	<i>Category Code 1C350 does not include “chemical mixtures” containing one or more of the chemicals specified in Category Codes 1C350.2., .6., .7., .8., .9., .10., .14., .15., .16., .19., .20., .24., .25., .30., .37., .38., .39., .40., .41., .42., .43., .44., .45., .46., .47., .48., .49., .50., .51., .52., .53., .58., .59., .60., .61., 62. and .64. in which no individually specified chemical constitutes more than 30% by the weight of the mixture.</i>
	<u>Note 2</u>
	<i>Category Code 1C350 does not include products identified as consumer goods and packaged for retail sale for personal use or packaged for individual use.</i>

<i>Category Code</i>	<i>Item Description</i>
1C351	<p>Human and animal pathogens and “toxins”, as follows:</p> <ol style="list-style-type: none"> <li>a. Viruses, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows: <ol style="list-style-type: none"> <li>1. African horse sickness virus;</li> <li>2. African swine fever virus;</li> <li>3. Andes virus;</li> <li>4. Avian influenza virus, which are <ol style="list-style-type: none"> <li>a. Uncharacterised; <u>or</u></li> <li>b. Defined in Annex I(2) EC Directive 2005/94/EC (O.J. L.10 14.1.2006 p. 16) as having high pathogenicity, as follows: <ol style="list-style-type: none"> <li>1. Type A viruses with an IVPI (intravenous pathogenicity index) in 6 week old chickens of greater than 1.2; <u>or</u></li> <li>2. Type A viruses of the subtypes H5 or H7 with genome sequences codified for multiple basic amino acids at the cleavage site of the haemagglutinin molecule similar to that observed for other HPAI viruses, indicating that the haemagglutinin molecule can be cleaved by a host ubiquitous protease;</li> </ol> </li> </ol> </li> <li>5. Bluetongue virus;</li> <li>6. Chapare virus;</li> <li>7. Chikungunya virus;</li> <li>8. Choclo virus;</li> <li>9. Crimean-Congo hemorrhagic fever virus;</li> <li>10. Not used;</li> <li>11. Dobrava-Belgrade virus;</li> <li>12. Eastern equine encephalitis virus;</li> <li>13. Ebolavirus: all members of the Ebolavirus genus;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	14. Foot-and-mouth disease virus;
	15. Goatpox virus;
	16. Guanarito virus;
	17. Hantaan virus;
	18. Hendra virus (Equine morbillivirus);
	19. Suid herpesvirus 1 (Pseudorabies virus) (Aujeszky's disease);
	20. Classical swine fever virus (Hog cholera virus);
	21. Japanese encephalitis virus;
	22. Junin virus;
	23. Kyasanur Forest disease virus;
	24. Laguna Negra virus;
	25. Lassa virus;
	26. Louping ill virus;
	27. Lujo virus;
	28. Lumpy skin disease virus;
	29. Lymphocytic choriomeningitis virus;
	30. Machupo virus;
	31. Marburgvirus: all members of the Marburgvirus genus;
	32. Monkeypox virus;
	33. Murray Valley encephalitis virus;
	34. Newcastle disease virus;
	35. Nipah virus;
	36. Omsk haemorrhagic fever virus;
	37. Oropouche virus;
	38. Peste-des-petits-ruminants virus;
	39. Swine vesicular disease virus;
	40. Powassan virus;



<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>41. Rabies virus and all other members of the Lyssavirus genus;</li> <li>42. Rift Valley fever virus;</li> <li>43. Rinderpest virus;</li> <li>44. Rocio virus;</li> <li>45. Sabia virus;</li> <li>46. Seoul virus;</li> <li>47. Sheeppox virus;</li> <li>48. Sin Nombre virus;</li> <li>49. St. Louis encephalitis virus;</li> <li>50. Porcine Teschovirus;</li> <li>51. Tick-borne encephalitis virus (Far Eastern subtype);</li> <li>52. Variola virus;</li> <li>53. Venezuelan equine encephalitis virus;</li> <li>54. Vesicular stomatitis virus;</li> <li>55. Western equine encephalitis virus;</li> <li>56. Yellow fever virus;</li> <li>57. Severe acute respiratory syndrome-related coronavirus (SARS-related coronavirus);</li> <li>58. Reconstructed 1918 influenza virus;</li> </ul>
	<ul style="list-style-type: none"> <li>b. Not used;</li> </ul>
	<ul style="list-style-type: none"> <li>c. Bacteria, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows: <ul style="list-style-type: none"> <li>1. Bacillus anthracis;</li> <li>2. Brucella abortus;</li> <li>3. Brucella melitensis;</li> <li>4. Brucella suis;</li> <li>5. Burkholderia mallei (Pseudomonas mallei);</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>6. Burkholderia pseudomallei (Pseudomonas pseudomallei);</p> <p>7. Chlamydia psittaci (Chlamydophila psittaci);</p> <p>8. Clostridium argentinense (formerly known as Clostridium botulinum Type G), botulinum neurotoxin producing strains;</p> <p>9. Clostridium baratii, botulinum neurotoxin producing strains;</p> <p>10. Clostridium botulinum;</p> <p>11. Clostridium butyricum, botulinum neurotoxin producing strains;</p> <p>12. Clostridium perfringens epsilon toxin producing types;</p> <p>13. Coxiella burnetii;</p> <p>14. Francisella tularensis;</p> <p>15. Mycoplasma capricolum subspecies capripneumoniae (strain F38);</p> <p>16. Mycoplasma mycoides subspecies mycoides SC (small colony);</p> <p>17. Rickettsia prowasecki;</p> <p>18. Salmonella enterica subspecies enterica serovar Typhi (Salmonella typhi);</p> <p>19. Shiga toxin producing Escherichia coli (STEC) of serogroups O26, O45, O103, O104, O111, O121, O145, O157, and other shiga toxin producing serogroups;</p> <p><i>Note</i>  <i>Shiga toxin producing Escherichia coli (STEC) includes inter alia enterohaemorrhagic E. coli (EHEC), verotoxin producing E. coli (VTEC) or verocytotoxin producing E. coli (VTEC).</i></p> <p>20. Shigella dysenteriae;</p> <p>21. Vibrio cholerae;</p> <p>22. Yersinia pestis;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. “Toxins”, as follows, and “sub-unit of toxins” thereof:</p> <ol style="list-style-type: none"> <li>1. Botulinum toxins;</li> <li>2. Clostridium perfringens alpha, beta 1, beta 2, epsilon and iota toxins;</li> <li>3. Conotoxin;</li> <li>4. Ricin;</li> <li>5. Saxitoxin;</li> <li>6. Shiga toxins (shiga-like toxins, verotoxins and verocytotoxins);</li> <li>7. Staphylococcus aureus enterotoxins, hemolysin alpha toxin, and toxic shock syndrome toxin (formerly known as Staphylococcus enterotoxin F);</li> <li>8. Tetrodotoxin;</li> <li>9. Not used;</li> <li>10. Microcystins (Cyanginosins);</li> <li>11. Aflatoxins;</li> <li>12. Abrin;</li> <li>13. Cholera toxin;</li> <li>14. Diacetoxyscirpenol;</li> <li>15. T-2 toxin;</li> <li>16. HT-2 toxin;</li> <li>17. Modeccin;</li> <li>18. Volkensin;</li> <li>19. Viscumin (Viscum Album Lectin 1);</li> </ol> <p><u>Note</u></p> <p><i>Category Code 1C351.d. does not include botulinum toxins or conotoxins in product form meeting all of the following criteria:</i></p> <ol style="list-style-type: none"> <li>1. <i>Are pharmaceutical formulations designed for human administration in the treatment of medical conditions;</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="539 454 1275 521">2. <i>Are pre-packaged for distribution as medical products; <u>and</u></i></li> <li data-bbox="539 539 1275 607">3. <i>Are authorised by a state authority to be marketed as medical products.</i></li> </ol> <p data-bbox="475 622 1275 757">e. <i>Fungi, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</i></p> <ol style="list-style-type: none"> <li data-bbox="539 772 863 801">1. <i>Coccidioides immitis;</i></li> <li data-bbox="539 819 884 848">2. <i>Coccidioides posadasii.</i></li> </ol> <p data-bbox="475 869 1275 981"><i>Note</i> <i>Category Code 1C351 does not include “vaccines” or “immunotoxins”.</i></p>
1C353	<p data-bbox="475 1048 1275 1077"><i>Genetic elements and genetically modified organisms, as follows:</i></p> <ol style="list-style-type: none"> <li data-bbox="475 1099 1275 1223">a. <i>Genetically modified organisms or genetic elements that contain nucleic acid sequences associated with pathogenicity of organisms specified in Category Code 1C351.a., 1C351.c., 1C351.e. or 1C354;</i></li> <li data-bbox="475 1245 1275 1368">b. <i>Genetically modified organisms or genetic elements that contain nucleic acid sequences coding for any of the “toxins” specified in Category Code 1C351.d. or “sub-units of toxins” thereof.</i></li> </ol> <p data-bbox="475 1391 1275 1753"><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li data-bbox="475 1435 1275 1603">1. <i>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></li> <li data-bbox="475 1626 1275 1753">2. <i>Genetic elements include inter alia chromosomes, genomes, plasmids, transposons, and vectors whether genetically modified or unmodified, or chemically synthesised in whole or in part.</i></li> </ol>

Category Code	Item Description
	<p>3. <i>Nucleic acid sequences associated with the pathogenicity of any of the “microorganisms” specified in Category Code 1C351.a., 1C351.c., 1C351.e. or 1C354 means any sequence specific to the specified “microorganism” that:</i></p> <p>a. <i>In itself or through its transcribed or translated products represents a significant hazard to human, animal or plant health; <u>or</u></i></p> <p>b. <i>Is known to enhance the ability of a specified “microorganism”, or any other organism into which it may be inserted or otherwise integrated, to cause serious harm to humans, animals or plant health.</i></p> <p><u>Note</u>  <i>Category Code 1C353 does not extend to nucleic acid sequences associated with the pathogenicity of enterohaemorrhagic Escherichia coli, serotype O157 and other verotoxin producing strains, other than those coding for the verotoxin, or for its sub-units.</i></p>
1C354	<p>Plant pathogens, as follows:</p> <p>a. Viruses, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <ol style="list-style-type: none"> <li>1. Andean potato latent virus (Potato Andean latent tymovirus);</li> <li>2. Potato spindle tuber viroid;</li> </ol> <p>b. Bacteria, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <ol style="list-style-type: none"> <li>1. Xanthomonas albilineans;</li> <li>2. Xanthomonas axonopodis pv. citri (Xanthomonas campestris pv. citri A) [Xanthomonas campestris pv. citri];</li> <li>3. Xanthomonas oryzae pv. oryzae (Pseudomonas campestris pv. oryzae);</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>4. <i>Clavibacter michiganensis</i> subsp. <i>sepedonicus</i> (<i>Corynebacterium michiganensis</i> subsp. <i>sepedonicum</i> or <i>Corynebacterium sepedonicum</i>);</li> <li>5. <i>Ralstonia solanacearum</i>, race 3, biovar 2;</li> </ol> <p>c. Fungi, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <ol style="list-style-type: none"> <li>1. <i>Colletotrichum kahawae</i> (<i>Colletotrichum coffeanum</i> var. <i>virulans</i>);</li> <li>2. <i>Cochliobolus miyabeanus</i> (<i>Helminthosporium oryzae</i>);</li> <li>3. <i>Microcyclus ulei</i> (syn. <i>Dothidella ulei</i>);</li> <li>4. <i>Puccinia graminis</i> ssp. <i>graminis</i> var. <i>graminis</i>/<i>Puccinia graminis</i> ssp. <i>graminis</i> var. <i>stakmanii</i> (<i>Puccinia graminis</i> [syn. <i>Puccinia graminis</i> f. sp. <i>tritici</i>]);</li> <li>5. <i>Puccinia striiformis</i> (syn. <i>Puccinia glumarum</i>);</li> <li>6. <i>Magnaporthe oryzae</i> (<i>Pyricularia oryzae</i>);</li> <li>7. <i>Peronosclerospora philippinensis</i> (<i>Peronosclerospora sacchari</i>);</li> <li>8. <i>Sclerophthora rayssiae</i> var. <i>zeae</i>;</li> <li>9. <i>Synchytrium endobioticum</i>;</li> <li>10. <i>Tilletia indica</i>;</li> <li>11. <i>Thecaphora solani</i>.</li> </ol>
1C450	<p>Toxic chemicals and toxic chemical precursors, as follows, and “chemical mixtures” containing one or more thereof:</p> <p><u><i>N.B.</i></u></p> <p><i>See also Category Codes 1C350, 1C351.d. and Division 2 of Part 1 of this Schedule.</i></p> <p>a. Toxic chemicals, as follows:</p> <ol style="list-style-type: none"> <li>1. Amiton: O,O-Diethyl S-[2-(diethylamino)ethyl] phosphorothiolate (78-53-5) and corresponding alkylated or protonated salts;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>2. PFIB: 1,1,3,3,3-Pentafluoro-2-(trifluoromethyl)-1-propene (382-21-8);</li> <li>3. See BZ: 3-Quinuclidinyl benzilate (6581-06-2) in Division 2 of Part 1 of this Schedule;</li> <li>4. Phosgene: Carbonyl dichloride (75-44-5);</li> <li>5. Cyanogen chloride (506-77-4);</li> <li>6. Hydrogen cyanide (74-90-8);</li> <li>7. Chloropicrin: Trichloronitromethane (76-06-2);</li> </ol> <p>b. Toxic chemical precursors, as follows:</p> <ol style="list-style-type: none"> <li>1. Chemicals, other than those specified in Division 2 of Part 1 of this Schedule or in Category Code 1C350, containing a phosphorus atom to which is bonded one methyl, ethyl or propyl (normal or iso) group but not further carbon atoms;</li> </ol> <p><i>Note</i>  <i>Category Code 1C450.b.1. does not include Fonofos: O-Ethyl S-phenyl ethylphosphonothiolothionate (944-22-9).</i></p> <ol style="list-style-type: none"> <li>2. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] phosphoramidic dihalides, other than N,N-Dimethylaminophosphoryl dichloride;</li> </ol> <p><i>N.B.</i>  <i>See Category Code 1C350.57. for N,N-Dimethylaminophosphoryl dichloride.</i></p> <ol style="list-style-type: none"> <li>3. Dialkyl [methyl, ethyl or propyl (normal or iso)] N,N-dialkyl [methyl, ethyl or propyl (normal or iso)]-phosphoramidates, other than Diethyl-N,N-dimethylphosphoramidate which is specified in Category Code 1C350;</li> <li>4. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] aminoethyl-2-chlorides and corresponding protonated salts, other than N,N-Diisopropyl-(beta)-aminoethyl chloride or N,N-Diisopropyl-(beta)-aminoethyl chloride hydrochloride which are specified in Category Code 1C350;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>5. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] aminoethane-2-ols and corresponding protonated salts, other than N,N-Diisopropyl-(beta)-aminoethanol (96-80-0) and N,N-Diethylaminoethanol (100-37-8) which are specified in Category Code 1C350;</p> <p><u>Note</u>  <i>Category Code 1C450.b.5. does not include the following:</i></p> <p>a. <i>N,N-Dimethylaminoethanol (108-01-0) and corresponding protonated salts;</i></p> <p>b. <i>Protonated salts of N,N-Diethylaminoethanol (100-37-8).</i></p> <p>6. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] aminoethane-2-thiols and corresponding protonated salts, other than N,N-Diisopropyl-(beta)-aminoethane thiol which is specified in Category Code 1C350;</p> <p>7. See Category Code 1C350 for ethyldiethanolamine (139-87-7);</p> <p>8. Methyldiethanolamine (105-59-9).</p> <p><u>Note 1</u>  <i>Category Code 1C450 does not include “chemical mixtures” containing one or more of the chemicals specified in Category Codes 1C450.a.4., .a.5., .a.6., .a.7. and .b.8. in which no individually specified chemical constitutes more than 30% by weight of the mixture.</i></p> <p><u>Note 2</u>  <i>Category Code 1C450 does not include products identified as consumer goods packaged for retail sale for personal use or packaged for individual use.</i></p>
<p><b>1D</b> 1D001</p>	<p><b>Software</b>  “Software” specially designed or modified for the “development”, “production” or “use” of equipment specified in Category Codes 1B001 to 1B003.</p>



<i>Category Code</i>	<i>Item Description</i>
1D002	“Software” for the “development” of organic “matrix”, metal “matrix” or carbon “matrix” laminates or “composites”.
1D003	“Software” specially designed or modified to enable equipment to perform the functions of equipment specified in Category Code 1A004.c. or 1A004.d.
1D101	“Software” specially designed or modified for the operation or maintenance of goods specified in Category Code 1B101, 1B102, 1B115, 1B117, 1B118 or 1B119.
1D103	“Software” specially designed for analysis of reduced observables such as radar reflectivity, UltraViolet (UV)/infrared signatures and acoustic signatures.
1D201	“Software” specially designed for the “use” of goods specified in Category Code 1B201.
<b>1E</b>	<b>Technology</b>
1E001	“Technology” (according to the General Technology Note) for the “development” or “production” of equipment or materials specified in Category Code 1A002 to 1A005, 1A006.b., 1A007 or Category 1B or 1C.
1E002	Other “technology”, as follows: <ul style="list-style-type: none"> <li>a. “Technology” for the “development” or “production” of polybenzothiazoles or polybenzoxazoles;</li> <li>b. “Technology” for the “development” or “production” of fluoroelastomer compounds containing at least one vinyl ether monomer;</li> <li>c. “Technology” for the design or “production” of the following ceramic powders or non-“composite” ceramic materials: <ol style="list-style-type: none"> <li>1. Ceramic powders having all of the following characteristics:</li> </ol> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. Are of any of the following compositions:</p> <ol style="list-style-type: none"> <li>1. Single or complex oxides of zirconium and complex oxides of silicon or aluminium;</li> <li>2. Single nitrides of boron (cubic crystalline forms);</li> <li>3. Single or complex carbides of silicon or boron; <u>or</u></li> <li>4. Single or complex nitrides of silicon;</li> </ol> <p>b. Have either of the following total metallic impurities (excluding intentional additions):</p> <ol style="list-style-type: none"> <li>1. Less than 1,000 parts per million (ppm) for single oxides or carbides; <u>or</u></li> <li>2. Less than 5,000 parts per million (ppm) for complex compounds or single nitrides; <u>and</u></li> </ol> <p>c. Being either of the following:</p> <ol style="list-style-type: none"> <li>1. Zirconia (1314-23-4) with an average particle size equal to or less than 1 µm and no more than 10% of the particles larger than 5 µm; <u>or</u></li> <li>2. Other ceramic powders with an average particle size equal to or less than 5 µm and no more than 10% of the particles larger than 10 µm;</li> </ol> <p>2. Non-“composite” ceramic materials composed of the materials specified in Category Code 1E002.c.1.;</p> <p><i>Note</i>  <i>Category Code 1E002.c.2. does not include “technology” for abrasives.</i></p> <p>d. Not used;</p> <p>e. “Technology” for the installation, maintenance or repair of materials specified in Category Code 1C001;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>f. “Technology” for the repair of “composite” structures, laminates or materials specified in Category Code 1A002 or 1C007.c.;</p> <p><i>Note</i>  <i>Category Code 1E002.f. does not include “technology” for the repair of “civil aircraft” structures using carbon “fibrous or filamentary materials” and epoxy resins, contained in “aircraft” manufacturers’ manuals.</i></p> <p>g. “Libraries” specially designed or modified to enable equipment to perform the functions of equipment specified in Category Code 1A004.c. or 1A004.d.</p>
1E101	<p>“Technology” (according to the General Technology Note) for the “use” of goods specified in Category Code 1A102, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C101, 1C107, 1C111, 1C116, 1C117, 1C118, 1D101 or 1D103.</p>
1E102	<p>“Technology” (according to the General Technology Note) for the “development” of “software” specified in Category Code 1D001, 1D101 or 1D103.</p>
1E103	<p>“Technology” for the regulation of temperature, pressure or atmosphere in autoclaves or hydroclaves, when used for the “production” of “composites” or partially processed “composites”.</p>
1E104	<p>“Technology” relating to the “production” of pyrolytically derived materials formed on a mould, 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.</p> <p><i>Note</i>  <i>Category Code 1E104 includes “technology” for the composition of precursor gases, flow rates and process control schedules and parameters.</i></p>

<i>Category Code</i>	<i>Item Description</i>
1E201	“Technology” (according to the General Technology Note) for the “use” of goods specified in Category Code 1A002, 1A007, 1A202, 1A225 to 1A227, 1B201, 1B225 to 1B234, 1C002.b.3. or .b.4., 1C010.b., 1C202, 1C210, 1C216, 1C225 to 1C241 or 1D201.
1E202	“Technology” (according to the General Technology Note) for the “development” or “production” of goods specified in Category Code 1A007, 1A202 or 1A225 to 1A227.
1E203	“Technology” (according to the General Technology Note) for the “development” of “software” specified in Category Code 1D201.

Category Code	Item Description
<b>CATEGORY 2 — MATERIALS PROCESSING</b>	
<b>2A</b>	<b>Systems, Equipment and Components</b>
	<u>N.B.</u>
	<i>For quiet running bearings, see Division 2 of Part 1 of this Schedule.</i>
2A001	Anti-friction bearings and bearing systems, as follows, and components therefor:
	<u>N.B.</u>
	<i>See also Category Code 2A101.</i>
	<u>Note</u>
	<i>Category Code 2A001 does not include balls with tolerances specified by the manufacturer in accordance with Ref. ISO 3290 as grade 5 or worse.</i>
	<p>a. Ball bearings and solid roller bearings, having all tolerances specified by the manufacturer in accordance with Ref. ISO 492 Tolerance Class 4 (or national equivalents), or better, and having both ‘rings’ and ‘rolling elements’, made from monel or beryllium;</p>
	<u>Note</u>
	<i>Category Code 2A001.a. does not include tapered roller bearings.</i>
	<u>Technical Notes</u>
	<p>1. ‘Ring’ - annular part of a radial rolling bearing incorporating one or more raceways (Ref. ISO 5593:1997).</p>
	<p>2. ‘Rolling element’ - ball or roller which rolls between raceways (Ref. ISO 5593:1997).</p>
	b. Not used;
	c. Active magnetic bearing systems using any of the following:
	<p>1. Materials with flux densities of 2 T or greater and yield strengths greater than 414 MPa;</p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>2. All-electromagnetic 3D homopolar bias designs for actuators; <u>or</u></li> <li>3. High temperature (450 K (177°C) and above) position sensors.</li> </ol>
2A101	<p>Radial ball bearings, other than those specified in Category Code 2A001, having all tolerances specified in accordance with Ref. ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC-9 or other national equivalents), or better and having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. An inner ring bore diameter between 12 mm and 50 mm;</li> <li>b. An outer ring outside diameter between 25 mm and 100 mm; <u>and</u></li> <li>c. A width between 10 mm and 20 mm.</li> </ol>
2A225	<p>Crucibles made of materials resistant to liquid actinide metals, as follows:</p> <ol style="list-style-type: none"> <li>a. Crucibles having both of the following characteristics: <ol style="list-style-type: none"> <li>1. A volume of between 150 cm<sup>3</sup> and 8,000 cm<sup>3</sup>; <u>and</u></li> <li>2. Made of or coated with any of the following materials, or combination of the following materials, having an overall impurity level of 2% or less by weight: <ol style="list-style-type: none"> <li>a. Calcium fluoride (CaF<sub>2</sub>);</li> <li>b. Calcium zirconate (metazirconate) (CaZrO<sub>3</sub>);</li> <li>c. Cerium sulphide (Ce<sub>2</sub>S<sub>3</sub>);</li> <li>d. Erbium oxide (erbia) (Er<sub>2</sub>O<sub>3</sub>);</li> <li>e. Hafnium oxide (hafnia) (HfO<sub>2</sub>);</li> <li>f. Magnesium oxide (MgO);</li> <li>g. Nitrided niobium-titanium-tungsten alloy (approximately 50% Nb, 30% Ti, 20% W);</li> <li>h. Yttrium oxide (yttria) (Y<sub>2</sub>O<sub>3</sub>); <u>or</u></li> <li>i. Zirconium oxide (zirconia) (ZrO<sub>2</sub>);</li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>b. Crucibles having both of the following characteristics:               <ul style="list-style-type: none"> <li>1. A volume of between 50 cm<sup>3</sup> and 2,000 cm<sup>3</sup>; <u>and</u></li> <li>2. Made of or lined with tantalum, having a purity of 99.9% or greater by weight;</li> </ul> </li> <li>c. Crucibles having all of the following characteristics:               <ul style="list-style-type: none"> <li>1. A volume of between 50 cm<sup>3</sup> and 2,000 cm<sup>3</sup>;</li> <li>2. Made of or lined with tantalum, having a purity of 98% or greater by weight; <u>and</u></li> <li>3. Coated with tantalum carbide, nitride, boride, or any combination thereof.</li> </ul> </li> </ul>
2A226	<p>Valves having all of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. A 'nominal size' of 5 mm or greater;</li> <li>b. Having a bellows seal; <u>and</u></li> <li>c. Wholly made of or lined with aluminium, aluminium alloy, nickel, or nickel alloy containing more than 60% nickel by weight.</li> </ul> <p><u>Technical Note</u>  <i>For valves with different inlet and outlet diameters, the 'nominal size' in Category Code 2A226 refers to the smallest diameter.</i></p>
<b>2B</b>	<p><b>Test, Inspection and Production Equipment</b></p> <p><u>Technical Notes</u></p> <ul style="list-style-type: none"> <li>1. <i>Secondary parallel contouring axes, (e.g. the w-axis on horizontal boring mills or a secondary rotary axis the centre line of which is parallel to the primary rotary axis) are not counted in the total number of contouring axes. Rotary axes need not rotate over 360°. A rotary axis can be driven by a linear device (e.g. a screw or a rack-and-pinion).</i></li> </ul>

Category Code	Item Description
	<p>2. For the purpose of Category 2B, the number of axes which can be coordinated simultaneously for “contouring control” is the number of axes along or around which, during processing of the workpiece, simultaneous and interrelated motions are performed between the workpiece and a tool. This does not include any additional axes along or around which other relative movement within the machine are performed such as:</p> <ol style="list-style-type: none"> <li>a. Wheel-dressing systems in grinding machines;</li> <li>b. Parallel rotary axes designed for mounting of separate workpieces;</li> <li>c. Co-linear rotary axes designed for manipulating the same workpiece by holding it in a chuck from different ends.</li> </ol> <p>3. Axis nomenclature must be in accordance with International Standard ISO 841:2001, Industrial automation systems and integration - Numerical control of machines - Coordinate system and Motion nomenclature.</p> <p>4. For the purposes of Category Codes 2B001 to 2B009, a “tilting spindle” is counted as a rotary axis.</p> <p>5. Stated “Unidirectional Positioning Repeatability” (“UPR”) may be used for each machine tool model as an alternative to individual machine tests and is determined as follows:</p> <ol style="list-style-type: none"> <li>a. Select five machines of a model to be evaluated;</li> <li>b. Measure the linear axis repeatability (<math>R_{\uparrow}</math>, <math>R_{\downarrow}</math>) according to Ref. ISO 230-2:2014 and evaluate “Unidirectional Positioning Repeatability” (“UPR”) for each axis of each of the five machines;</li> <li>c. Determine the arithmetic mean value of the “Unidirectional Positioning Repeatability” (<math>\overline{UPR}</math>) – values for each axis of all five machines together. These arithmetic mean values of “Unidirectional Positioning Repeatability” (<math>\overline{UPR}</math>) become the stated value of each axis for the model (<math>\overline{UPR}_x, \overline{UPR}_y, \dots</math>);</li> </ol>



Category Code	Item Description
2B001	<p>d. Since the Category 2 list refers to each linear axis there will be as many stated “Unidirectional Positioning Repeatability” (“UPR”) values as there are linear axes;</p> <p>e. If any axis of a machine model not included under Category Codes 2B001.a. to 2B001.c. has a stated “Unidirectional Positioning Repeatability” (“UPR”) equal to or less than the specified “Unidirectional Positioning Repeatability” (“UPR”) of each machine tool model plus 0.7 <math>\mu\text{m}</math>, the builder should be required to reaffirm the accuracy level once every eighteen months.</p> <p>6. For the purposes of Category Codes 2B001.a. to 2B001.c., measurement uncertainty for the “Unidirectional Positioning Repeatability” (“UPR”) of machine tools, as defined in the International Standard ISO 230-2:2014 or national equivalents, must not be considered.</p> <p>7. For the purposes of Category Codes 2B001.a. to 2B001.c., the measurement of axes must be made according to test procedures in 5.3.2. of Ref. ISO 230-2:2014. Tests for axes longer than 2 m must be made over 2 m segments. Axes longer than 4 m require multiple tests (e.g. two tests for axes longer than 4 m and up to 8 m, three tests for axes longer than 8 m and up to 12 m), each over 2 m segments and distributed in equal intervals over the axis length. Test segments are equally spaced along the full axis length, with any excess length equally divided at the beginning, in between, and at the end of the test segments. The smallest “Unidirectional Positioning Repeatability” (“UPR”) value of all test segments is to be reported.</p> <p>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”, as follows:</p> <p><u>N.B.</u></p> <p>See also Category Code 2B201.</p>

Category Code	Item Description
	<p><u>Note 1</u>  <i>Category Code 2B001 does not include special purpose machine tools limited to the manufacture of gears. For such machines, see Category Code 2B003.</i></p> <p><u>Note 2</u>  <i>Category Code 2B001 does not include special purpose machine tools limited to the manufacture of any of the following:</i></p> <ul style="list-style-type: none"> <li>a. <i>Crankshafts or camshafts;</i></li> <li>b. <i>Tools or cutters;</i></li> <li>c. <i>Extruder worms;</i></li> <li>d. <i>Engraved or faceted jewellery parts; <u>or</u></i></li> <li>e. <i>Dental prostheses.</i></li> </ul> <p><u>Note 3</u>  <i>A machine tool having at least two of the three turning, milling or grinding capabilities (e.g. a turning machine with milling capability), is treated as coming within those entries in Category Codes 2B001.a., .b. and .c. that are applicable to its capabilities.</i></p> <p><u>N.B.</u>  <i>For optical finishing machines, see Category Code 2B002.</i></p> <ul style="list-style-type: none"> <li>a. <i>Machine tools for turning having two or more axes which can be coordinated simultaneously for “contouring control” having either of the following characteristics:</i> <ul style="list-style-type: none"> <li>1. <i>“Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 0.9 µm along one or more linear axes with a travel length less than 1 m; <u>or</u></i></li> <li>2. <i>“Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 1.1 µm along one or more linear axes with a travel length equal to or greater than 1 m;</i></li> </ul> </li> </ul> <p><u>Note 1</u>  <i>Category Code 2B001.a. does not include turning machines specially designed for producing contact lenses, having both of the following characteristics:</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. Machine controller limited to using ophthalmic based “software” for part programming data input; <u>and</u></p> <p>b. No vacuum chucking.</p> <p><u>Note 2</u></p> <p><i>Category Code 2B001.a. does not include 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.</i></p> <p>b. Machine tools for milling having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Three linear axes plus one rotary axis which can be coordinated simultaneously for “contouring control” having either of the following characteristics: <ol style="list-style-type: none"> <li>a. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 0.9 µm along one or more linear axes with a travel length less than 1 m; <u>or</u></li> <li>b. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 1.1 µm along one or more linear axes with a travel length equal to or greater than 1 m;</li> </ol> </li> <li>2. Five or more axes which can be coordinated simultaneously for “contouring control” having any of the following characteristics: <ol style="list-style-type: none"> <li>a. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 0.9 µm along one or more linear axes with a travel length less than 1 m;</li> <li>b. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 1.4 µm along one or more linear axes with a travel length equal to or greater than 1 m and less than 4 m; <u>or</u></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>c. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 6 <math>\mu\text{m}</math> along one or more linear axes with a travel length equal to or greater than 4 m;</li> <li>d. Not used;</li> </ul> <p>3. A “Unidirectional Positioning Repeatability” (“UPR”) for jig boring machines, equal to or less (better) than 1.1 <math>\mu\text{m}</math> along one or more linear axes; <u>or</u></p> <p>4. Fly cutting machines having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Spindle “run-out” and “camming” less (better) than 0.0004 mm TIR; <u>and</u></li> <li>b. Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR over 300 mm of travel;</li> </ul> <p>c. Machine tools for grinding having either of the following characteristics:</p> <ul style="list-style-type: none"> <li>1. Having both of the following characteristics: <ul style="list-style-type: none"> <li>a. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 1.1 <math>\mu\text{m}</math> along one or more linear axes; <u>and</u></li> <li>b. Three or more axes which can be coordinated simultaneously for “contouring control”; <u>or</u></li> </ul> </li> <li>2. Five or more axes which can be coordinated simultaneously for “contouring control” having any of the following characteristics: <ul style="list-style-type: none"> <li>a. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 1.1 <math>\mu\text{m}</math> along one or more linear axes with a travel length less than 1 m;</li> <li>b. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 1.4 <math>\mu\text{m}</math> along one or more linear axes with a travel length equal to or greater than 1 m and less than 4 m; <u>or</u></li> </ul> </li> </ul>

Category Code	Item Description
	<p data-bbox="624 454 1264 584">c. “Unidirectional Positioning Repeatability” (“UPR”) equal to or less (better) than 6 <math>\mu\text{m}</math> along one or more linear axes with a travel length equal to or greater than 4 m;</p> <p data-bbox="539 607 600 633"><i>Note</i></p> <p data-bbox="539 645 1264 707">Category Code 2B001.c. does not include grinding machines as follows:</p> <p data-bbox="539 730 1264 824">a. Cylindrical external, internal, and external-internal grinding machines, having both of the following characteristics:</p> <ol data-bbox="624 846 1264 958" style="list-style-type: none"> <li>1. Limited to cylindrical grinding; <u>and</u></li> <li>2. Limited to a maximum workpiece capacity of 150 mm outside diameter or length;</li> </ol> <p data-bbox="539 981 1264 1111">b. Machines designed specifically as jig grinders that do not have a z-axis or a w-axis, with a “Unidirectional Positioning Repeatability” (“UPR”) less (better) than 1.1 <math>\mu\text{m}</math>;</p> <p data-bbox="539 1133 810 1160">c. Surface grinders.</p> <p data-bbox="475 1182 1264 1272">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”;</p> <p data-bbox="475 1294 1264 1357">e. Machine tools for removing metals, ceramics or “composites”, having both of the following characteristics:</p> <ol data-bbox="539 1379 1264 1843" style="list-style-type: none"> <li>1. Removing material by means of any of the following: <ol data-bbox="624 1424 1264 1592" style="list-style-type: none"> <li>a. Water or other liquid jets, including those employing abrasive additives;</li> <li>b. Electron beam; <u>or</u></li> <li>c. “Laser” beam; <u>and</u></li> </ol> </li> <li>2. At least two rotary axes having both of the following characteristics: <ol data-bbox="624 1693 1264 1843" style="list-style-type: none"> <li>a. Can be coordinated simultaneously for “contouring control”; <u>and</u></li> <li>b. A positioning “accuracy” of less (better) than 0.003°;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
2B002	<p>f. Deep-hole-drilling machines and turning machines modified for deep-hole-drilling, having a maximum depth-of-bore capability exceeding 5 m.</p> <p>“Numerically controlled” optical finishing machine tools equipped for selective material removal to produce non-spherical optical surfaces having all of the following characteristics:</p> <p>a. Finishing the form to less (better) than 1 µm;</p> <p>b. Finishing to a roughness less (better) than 100 nm rms;</p> <p>c. Four or more axes which can be coordinated simultaneously for “contouring control”; <u>and</u></p> <p>d. Using any of the following processes:</p> <ol style="list-style-type: none"> <li>1. Magnetorheological Finishing (‘MRF’);</li> <li>2. Electrorheological Finishing (‘ERF’);</li> <li>3. ‘Energetic particle beam finishing’;</li> <li>4. ‘Inflatable membrane tool finishing’; <u>or</u></li> <li>5. ‘Fluid jet finishing’.</li> </ol> <p><i>Technical Note</i></p> <p><i>For the purpose of Category Code 2B002:</i></p> <p>a. ‘MRF’ is a material removal process using an abrasive magnetic fluid whose viscosity is controlled by a magnetic field.</p> <p>b. ‘ERF’ is a removal process using an abrasive fluid whose viscosity is controlled by an electric field.</p> <p>c. ‘Energetic particle beam finishing’ uses Reactive Atom Plasmas (RAP) or ion-beams to selectively remove material.</p> <p>d. ‘Inflatable membrane tool finishing’ is a process that uses a pressurised membrane that deforms to contact the workpiece over a small area.</p> <p>e. ‘Fluid jet finishing’ makes use of a fluid stream for material removal.</p>

<i>Category Code</i>	<i>Item Description</i>
2B003	<p>“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 (<math>R_c = 40</math> 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 Ref. ISO 1328 class 3).</p>
2B004	<p>Hot “isostatic presses” having both of the following characteristics, and specially designed components and accessories therefor:</p> <p><u>N.B.</u>  <i>See also Category Codes 2B104 and 2B204.</i></p> <p>a. A controlled thermal environment within the closed cavity and a chamber cavity with an inside diameter of 406 mm or more; <u>and</u></p> <p>b. Having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A maximum working pressure exceeding 207 MPa;</li> <li>2. A controlled thermal environment exceeding 1,773 K (1,500°C); <u>or</u></li> <li>3. A facility for hydrocarbon impregnation and removal of resultant gaseous degradation products.</li> </ol> <p><u>Technical Note</u>  <i>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.</i></p> <p><u>N.B.</u>  <i>For specially designed dies, moulds and tooling, see Category Codes 1B003, 9B009 and Division 2 of Part 1 of this Schedule.</i></p>

<i>Category Code</i>	<i>Item Description</i>
2B005	<p>Equipment specially designed for the deposition, processing and in-process control of inorganic overlays, coatings and surface modifications, as follows, for substrates specified in column 2, by processes shown in column 1 in the Table following Category Code 2E003.f., and specially designed automated handling, positioning, manipulation and control components therefor:</p> <ol style="list-style-type: none"> <li>a. Chemical Vapour Deposition (CVD) production equipment having both of the following characteristics: <ul style="list-style-type: none"> <li><u><i>N.B.</i></u></li> <li><i>See also Category Code 2B105.</i></li> <ol style="list-style-type: none"> <li>1. A process modified for one of the following: <ol style="list-style-type: none"> <li>a. Pulsating CVD;</li> <li>b. Controlled Nucleation Thermal Deposition (CNTD); <u>or</u></li> <li>c. Plasma enhanced or plasma assisted CVD; <u>and</u></li> </ol> </li> <li>2. Having either of the following characteristics: <ol style="list-style-type: none"> <li>a. Incorporating high vacuum (equal to or less than 0.01 Pa) rotating seals; <u>or</u></li> <li>b. Incorporating <i>in situ</i> coating thickness control;</li> </ol> </li> </ol> </ul></li> <li>b. Ion implantation production equipment having beam currents of 5 mA or more;</li> <li>c. Electron Beam Physical Vapour Deposition (EB-PVD) production equipment incorporating power systems rated for over 80 kW and having either of the following: <ol style="list-style-type: none"> <li>1. A liquid pool level “laser” control system which regulates precisely the ingots feed rate; <u>or</u></li> <li>2. A computer controlled rate monitor operating on the principle of photo-luminescence of the ionised atoms in the evaporant stream to control the deposition rate of a coating containing two or more elements;</li> </ol> </li> </ol>



Category Code	Item Description
	<p>d. Plasma spraying production equipment having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Operating at reduced pressure controlled atmosphere (equal to 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; <u>or</u></li> <li>2. Incorporating <i>in situ</i> coating thickness control;</li> </ol> <p>e. Sputter deposition production equipment capable of current densities of 0.1 mA/mm<sup>2</sup> or higher at a deposition rate of 15 µm/h or more;</p> <p>f. Cathodic arc deposition production equipment incorporating a grid of electromagnets for steering control of the arc spot on the cathode;</p> <p>g. Ion plating production equipment capable of the <i>in situ</i> measurement of either of the following:</p> <ol style="list-style-type: none"> <li>1. Coating thickness on the substrate and rate control; <u>or</u></li> <li>2. Optical characteristics.</li> </ol> <p><u>Note</u>  <i>Category Code 2B005 does not include Chemical Vapour Deposition (CVD), cathodic arc, sputter deposition, ion plating or ion implantation equipment, specially designed for cutting or machining tools.</i></p>
2B006	<p>Dimensional inspection or measuring systems, equipment and “electronic assemblies”, as follows:</p> <p>a. Computer controlled or “numerically controlled” Coordinate Measuring Machines (CMM), having a three dimensional (volumetric) maximum permissible error of length measurement (<math>E_{0,MPE}</math>) at any point within the operating range of the machine (i.e. within the length of axes) equal to or less (better) than <math>(1.7 + L/1,000)</math> µm (L is the measured length in mm), according to Ref. ISO 10360-2 (2009);</p>

Category Code	Item Description
	<p data-bbox="539 454 722 488"><u>Technical Note</u></p> <p data-bbox="539 499 1265 663"><i>The <math>E_{0,MPE}</math> 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” must be compared to the <math>1.7 + L/1,000 \mu\text{m}</math> threshold.</i></p> <p data-bbox="539 678 595 712"><u>N.B.</u></p> <p data-bbox="539 723 919 757"><i>See also Category Code 2B206.</i></p> <p data-bbox="475 768 1265 835">b. Linear and angular displacement measuring instruments, as follows:</p> <p data-bbox="539 857 1265 925">1. ‘Linear displacement’ measuring instruments having any of the following:</p> <p data-bbox="603 947 659 981"><u>Note</u></p> <p data-bbox="603 992 1265 1081"><i>Interferometer and optical-encoder displacement measuring systems containing a “laser” are only included in Category Codes 2B006.b.1.c. and 2B206.c.</i></p> <p data-bbox="603 1104 786 1137"><u>Technical Note</u></p> <p data-bbox="603 1149 1265 1238"><i>For the purpose of Category Code 2B006.b.1., ‘linear displacement’ means the change of distance between the measuring probe and the measured object.</i></p> <p data-bbox="627 1261 1265 1350">a. Non-contact type measuring systems with a “resolution” equal to or less (better) than <math>0.2 \mu\text{m}</math> within a measuring range up to <math>0.2 \text{ mm}</math>;</p> <p data-bbox="627 1373 1265 1462">b. Linear Variable Differential Transformer (LVDT) systems having both of the following characteristics:</p> <p data-bbox="691 1485 1265 1552">1. Having either of the following characteristics:</p> <p data-bbox="754 1574 1265 1731">a. “Linearity” equal to or less (better) than <math>0.1\%</math> measured from 0 to the ‘full operating range’, for LVDTs with a ‘full operating range’ up to and including <math>\pm 5 \text{ mm}</math>; <u>or</u></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="746 454 1268 589">b. “Linearity” equal to or less (better) than 0.1% measured from 0 to 5 mm for LVDTs with a ‘full operating range’ greater than <math>\pm 5</math> mm; <u>and</u></p> <p data-bbox="687 607 1268 701">2. Drift equal to or less (better) than 0.1% per day at a standard ambient test room temperature <math>\pm 1</math> K;</p> <p data-bbox="687 719 874 752"><i>Technical Note</i></p> <p data-bbox="687 763 1268 965"><i>For the purpose of Category Code 2B006.b.1.b., ‘full operating range’ is half of the total possible linear displacement of the LVDT. For example, LVDTs with a ‘full operating range’ up to and including <math>\pm 5</math> mm can measure a total possible linear displacement of 10 mm.</i></p> <p data-bbox="624 981 1268 1048">c. Measuring systems having all of the following characteristics:</p> <ol data-bbox="687 1066 1268 1462" style="list-style-type: none"> <li data-bbox="687 1066 1007 1099">1. Containing a “laser”;</li> <li data-bbox="687 1115 1268 1182">2. A “resolution” over their full scale of 0.2 nm or less (better); <u>and</u></li> <li data-bbox="687 1198 1268 1462">3. Capable of achieving a “measurement uncertainty” equal to or less (better) than <math>(1.6 + L/2,000)</math> nm (L is the measured length in mm) at any point within a measuring range, when compensated for the refractive index of air and measured over a period of 30 seconds at a temperature of <math>20 \pm 0.01^\circ\text{C}</math>; <u>or</u></li> </ol> <p data-bbox="624 1480 1268 1574">d. “Electronic assemblies” specially designed to provide feedback capability in systems specified in Category Code 2B006.b.1.c.;</p> <p data-bbox="603 1597 667 1630"><i>Note</i></p> <p data-bbox="603 1641 1268 1841"><i>Category Code 2B006.b.1. does not include measuring interferometer systems, with an automatic control system that is designed to use no feedback techniques, containing a “laser” to measure slide movement errors of machine-tools, dimensional inspection machines or similar equipment.</i></p>

Category Code	Item Description
	<p>2. Angular displacement measuring instruments having an angular position “accuracy” equal to or less (better) than 0.00025°;</p> <p><i>Note</i> Category Code 2B006.b.2. does not include optical instruments, such as autocollimators, using collimated light (e.g. “laser light”) to detect angular displacement of a mirror.</p> <p>c. Equipment for measuring surface roughness (including surface defects), by measuring optical scatter with a sensitivity of 0.5 nm or less (better).</p> <p><i>Note</i> Category Code 2B006 includes machine tools, other than those specified by Category Code 2B001, that can be used as measuring machines if they meet or exceed the criteria specified for the measuring machine function.</p>
2B007	<p>“Robots” having any of the following characteristics and specially designed controllers and “end-effectors” therefor:</p> <p><i>N.B.</i> See also Category Code 2B207.</p> <p>a. Capable in real-time of full three-dimensional image processing or full three-dimensional ‘scene analysis’ to generate or modify “programs” or to generate or modify numerical program data;</p> <p><i>Technical Note</i> 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).</p> <p>b. Specially designed to comply with national safety standards applicable to potentially explosive munitions environments;</p> <p><i>Note</i> Category Code 2B007.b. does not include “robots” specially designed for paint-spraying booths.</p>

<i>Category Code</i>	<i>Item Description</i>
2B008	<p>c. Specially designed or rated as radiation-hardened to withstand a total radiation dose greater than <math>5 \times 10^3</math> Gy (silicon) without operational degradation; <u>or</u></p> <p><i>Technical Note</i>  <i>The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionising radiation.</i></p> <p>d. Specially designed to operate at altitudes exceeding 30,000 m.</p> <p>Assemblies or units, specially designed for machine tools, or dimensional inspection or measuring systems and equipment, as follows:</p> <p>a. Linear position feedback units having an overall “accuracy” less (better) than <math>(800 + (600 \times L/1,000))</math> nm (L equals the effective length in mm);</p> <p><i>N.B.</i>  <i>For “laser” systems, see also Category Codes 2B006.b.1.c., 2B006.b.1.d. and 2B206.c.</i></p> <p>b. Rotary position feedback units having an “accuracy” less (better) than 0.00025°;</p> <p><i>N.B.</i>  <i>For “laser” systems, see also Note to Category Code 2B006.b.2.</i></p> <p><i>Note</i>  <i>Category Codes 2B008.a. and 2B008.b. include units, which are designed to determine the positioning information for feedback control, such as inductive type devices, graduated scales, infrared systems or “laser” systems.</i></p> <p>c. “Compound rotary tables” and “tilting spindles”, capable of upgrading, according to the manufacturer’s specifications, machine tools to or above the levels specified in Category 2B.</p>

Category Code	Item Description
2B009	<p>Spin-forming machines and flow-forming machines, which, according to the manufacturer's technical specification, can be equipped with "numerical control" units or a computer control and having both of the following characteristics:</p> <p><u>N.B.</u></p> <p>See also Category Codes 2B109 and 2B209.</p> <ol style="list-style-type: none"> <li>a. Three or more axes which can be coordinated simultaneously for "contouring control"; <u>and</u></li> <li>b. A roller force more than 60 kN.</li> </ol> <p><u>Technical Note</u></p> <p>For the purpose of Category Code 2B009, machines combining the function of spin-forming and flow-forming are regarded as flow-forming machines.</p>
2B104	<p>"Isostatic presses", other than those specified in Category Code 2B004, having all of the following characteristics:</p> <p><u>N.B.</u></p> <p>See also Category Code 2B204.</p> <ol style="list-style-type: none"> <li>a. Maximum working pressure of 69 MPa or greater;</li> <li>b. Designed to achieve and maintain a controlled thermal environment of 873 K (600°C) or greater; <u>and</u></li> <li>c. Possessing a chamber cavity with an inside diameter of 254 mm or greater.</li> </ol>
2B105	<p>Chemical Vapour Deposition (CVD) furnaces, other than those specified in Category Code 2B005.a., designed or modified for the densification of carbon-carbon composites.</p>
2B109	<p>Flow-forming machines, other than those specified in Category Code 2B009, and specially designed components as follows:</p> <p><u>N.B.</u></p> <p>See also Category Code 2B209.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. Flow-forming machines having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. According to the manufacturer's technical specification, can be equipped with "numerical control" units or a computer control, even when not equipped with such units; <u>and</u></li> <li>2. With more than two axes which can be coordinated simultaneously for "contouring control";</li> </ol> <p>b. Specially designed components for flow-forming machines specified in Category Code 2B009 or 2B109.a.</p> <p><u>Note</u>  <i>Category Code 2B109 does not include machines that are not usable in the production of propulsion components and equipment (e.g. motor cases and interstages) for systems specified in Category Code 9A005, 9A007.a. or 9A105.a.</i></p> <p><u>Technical Note</u>  <i>Machines combining the function of spin-forming and flow-forming are for the purpose of Category Code 2B109 regarded as flow-forming machines.</i></p>
2B116	<p>Vibration test systems, equipment and components therefor, as follows:</p> <ol style="list-style-type: none"> <li>a. Vibration test systems employing feedback or closed loop techniques and incorporating a digital controller, capable of vibrating a system at an acceleration equal to or greater than 10 g rms between 20 Hz and 2 kHz while imparting forces equal to or greater than 50 kN, measured 'bare table';</li> <li>b. Digital controllers, combined with specially designed vibration test software, with a 'real-time control bandwidth' greater than 5 kHz designed for use with vibration test systems specified in Category Code 2B116.a.;</li> </ol> <p><u>Technical Note</u>  <i>In Category Code 2B116.b., 'real-time control bandwidth' means the maximum rate at which a controller can execute complete cycles of sampling, processing data and transmitting control signals.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. Vibration thrusters (shaker units), with or without associated amplifiers, capable of imparting a force equal to or greater than 50 kN, measured 'bare table', and usable in vibration test systems specified in Category Code 2B116.a.;</p> <p>d. Test piece support structures and electronic units designed to combine multiple shaker units in a system capable of providing an effective combined force equal to or greater than 50 kN, measured 'bare table', and usable in vibration systems specified in Category Code 2B116.a.</p> <p><u>Technical Note</u>  <i>In Category Code 2B116, 'bare table' means a flat table, or surface, with no fixture or fittings.</i></p>
2B117	<p>Equipment and process controls, other than those specified in Category Code 2B004, 2B005.a., 2B104 or 2B105, designed or modified for densification and pyrolysis of structural composite rocket nozzles and re-entry vehicle nose tips.</p>
2B119	<p>Balancing machines and related equipment, as follows:</p> <p><u>N.B.</u>  <i>See also Category Code 2B219.</i></p> <p>a. Balancing machines having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Not capable of balancing rotors/assemblies having a mass greater than 3 kg;</li> <li>2. Capable of balancing rotors/assemblies at speeds greater than 12,500 rpm;</li> <li>3. Capable of correcting unbalance in two planes or more; <u>and</u></li> <li>4. Capable of balancing to a residual specific unbalance of 0.2 g mm per kg of rotor mass;</li> </ol> <p><u>Note</u>  <i>Category Code 2B119.a. does not include balancing machines designed or modified for dental or other medical equipment.</i></p>



<i>Category Code</i>	<i>Item Description</i>
2B120	<p>b. Indicator heads designed or modified for use with machines specified in Category Code 2B119.a.</p> <p><i>Technical Note</i>  <i>Indicator heads are sometimes known as balancing instrumentation.</i></p> <p>Motion simulators or rate tables having all of the following characteristics:</p> <p>a. Two axes or more;</p> <p>b. Designed or modified to incorporate slip rings or integrated non-contact devices capable of transferring electrical power, signal information, or both; <u>and</u></p> <p>c. Having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. For any single axis having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Capable of rates of 400 degrees/s or more, or 30 degrees/s or less; <u>and</u></li> <li>b. A rate resolution equal to or less than 6 degrees/s and an accuracy equal to or less than 0.6 degrees/s;</li> </ol> </li> <li>2. Having a worst-case rate stability equal to or better (less) than plus or minus 0.05% averaged over 10 degrees or more; <u>or</u></li> <li>3. A positioning “accuracy” equal to or less (better) than 5 arc second.</li> </ol> <p><i>Note 1</i>  <i>Category Code 2B120 does not include rotary tables designed or modified for machine tools or for medical equipment. For machine tool rotary tables, see Category Code 2B008.</i></p> <p><i>Note 2</i>  <i>Motion simulators or rate tables that satisfy all the characteristics under Category Code 2B120 remain within that Code whether or not slip rings or integrated non-contact devices are fitted on them at time of export.</i></p>

<i>Category Code</i>	<i>Item Description</i>
2B121	<p>Positioning tables (equipment capable of precise rotary positioning in any axes), other than those specified in Category Code 2B120, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Two axes or more; <u>and</u></li> <li>b. A positioning “accuracy” equal to or less (better) than 5 arc second.</li> </ol> <p><u>Note</u>  <i>Category Code 2B121 does not include rotary tables designed or modified for machine tools or for medical equipment. For machine tool rotary tables, see Category Code 2B008.</i></p>
2B122	<p>Centrifuges capable of imparting accelerations above 100 g and designed or modified to incorporate slip rings or integrated non-contact devices capable of transferring electrical power, signal information, or both.</p> <p><u>Note</u>  <i>Centrifuges that come within the description in Category Code 2B122 remain within that Code whether or not slip rings or integrated non-contact devices are fitted on them at time of export.</i></p>
2B201	<p>Machine tools and any combination thereof, other than those specified in Category Code 2B001, as follows, for removing or cutting metals, ceramics or “composites”, which, according to the manufacturer’s technical specification, can be equipped with electronic devices for simultaneous “contouring control” in two or more axes:</p> <p><u>Technical Note</u>  <i>Stated positioning accuracy levels derived under the following procedures from measurements made according to Ref. ISO 230-2:1988 or national equivalents may be used for each machine tool model if provided to, and accepted by, national authorities instead of individual machine tests. Determination of stated positioning accuracy:</i></p> <ol style="list-style-type: none"> <li>a. <i>Select five machines of a model to be evaluated;</i></li> <li>b. <i>Measure the linear axis accuracies according to Ref. ISO 230-2:1988;</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. Determine the accuracy values (A) for each axis of each machine. The method of calculating the accuracy value is described in the Ref. ISO 230-2:1988 standard;</p> <p>d. Determine the average accuracy value of each axis. This average value becomes the stated positioning accuracy of each axis for the model (<math>\hat{A}_x \hat{A}_y \dots</math>);</p> <p>e. Since Category Code 2B201 refers to each linear axis, there will be as many stated positioning accuracy values as there are linear axes;</p> <p>f. If any axis of a machine tool not included in Category Code 2B201.a., 2B201.b. or 2B201.c. has a stated positioning accuracy of 6 <math>\mu\text{m}</math> or better (less) for grinding machines, and 8 <math>\mu\text{m}</math> or better (less) for milling and turning machines, both according to Ref. ISO 230-2:1988, then the builder should be required to reaffirm the accuracy level once every eighteen months.</p> <p>a. Machine tools for milling having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Positioning accuracies with “all compensations available” equal to or less (better) than 6 <math>\mu\text{m}</math> according to Ref. ISO 230-2:1988 or national equivalents along any linear axis;</li> <li>2. Two or more contouring rotary axes; <u>or</u></li> <li>3. Five or more axes which can be coordinated simultaneously for “contouring control”;</li> </ol> <p><u>Note</u>  Category Code 2B201.a. does not include milling machines having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. X-axis travel greater than 2 m; <u>and</u></li> <li>b. Overall positioning accuracy on the x-axis more (worse) than 30 <math>\mu\text{m}</math>.</li> </ol>

Category Code	Item Description
	<p>b. Machine tools for grinding having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Positioning accuracies with “all compensations available” equal to or less (better) than 4 <math>\mu\text{m}</math> according to Ref. ISO 230-2:1988 or national equivalents along any linear axis;</li> <li>2. Two or more contouring rotary axes; <u>or</u></li> <li>3. Five or more axes which can be coordinated simultaneously for “contouring control”;</li> </ol> <p><i>Note</i>  Category Code 2B201.b. does not include grinding machines as follows:</p> <ol style="list-style-type: none"> <li>a. Cylindrical external, internal, and external-internal grinding machines having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Limited to a maximum workpiece capacity of 150 mm outside diameter or length; <u>and</u></li> <li>2. Axes limited to x, z and c;</li> </ol> </li> <li>b. Jig grinders that do not have a z-axis or a w-axis with an overall ‘positioning accuracy’ less (better) than 4 <math>\mu\text{m}</math> according to Ref. ISO 230-2:1988 or national equivalents.</li> </ol> <p>c. Machine tools for turning, that have positioning accuracies with “all compensations available” better (less) than 6 <math>\mu\text{m}</math> according to Ref. ISO 230-2:1988 along any linear axis (overall positioning) for machines capable of machining diameters greater than 35 mm;</p> <p><i>Note</i>  Category Code 2B201.c. does not include 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 or milling capabilities, or both for machining parts with diameters less than 42 mm.</p>

Category Code	Item Description
2B204	<p><u>Note 1</u>  Category Code 2B201 does not include special purpose machine tools limited to the manufacture of any of the following parts:</p> <ol style="list-style-type: none"> <li>a. Gears;</li> <li>b. Crankshafts or camshafts;</li> <li>c. Tools or cutters; <u>or</u></li> <li>d. Extruder worms.</li> </ol> <p><u>Note 2</u>  A machine tool having at least two of the three turning, milling or grinding capabilities (e.g. a turning machine with milling capability) is treated as coming within those entries in Category Code 2B201.a., .b. or .c. that are applicable to its capabilities.</p> <p><u>Note 3</u>  Category Codes 2B201.a.3. and 2B201.b.3. include machines based on a parallel linear kinematic design (e.g. hexapods) that have 5 or more axes none of which are rotary axes.</p> <p>“Isostatic presses”, other than those specified in Category Code 2B004 or 2B104, and related equipment, as follows:</p> <ol style="list-style-type: none"> <li>a. “Isostatic presses” having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Capable of achieving a maximum working pressure of 69 MPa or greater; <u>and</u></li> <li>2. A chamber cavity with an inside diameter in excess of 152 mm;</li> </ol> </li> <li>b. Dies, moulds and controls, specially designed for “isostatic presses” specified in Category Code 2B204.a.</li> </ol> <p><u>Technical Note</u>  In Category Code 2B204, 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.</p>

Category Code	Item Description
2B206	<p>Dimensional inspection machines, instruments or systems, other than those specified in Category Code 2B006, as follows:</p> <p>a. Computer controlled or numerically controlled Coordinate Measuring Machines (CMM) having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Having only two axes and having a maximum permissible error of length measurement along any axis (one dimensional), identified as any combination of <math>E_{0x,MPE}</math>, <math>E_{0y,MPE}</math>, or <math>E_{0z,MPE}</math>, equal to or less (better) than <math>(1.25 + L/1,000) \mu\text{m}</math> (where L is the measured length in mm) at any point within the operating range of the machine (i.e. within the length of the axis), according to Ref. ISO 10360-2 (2009); <u>or</u></li> <li>2. Three or more axes and having a three dimensional (volumetric) maximum permissible error of length measurement (<math>E_{0,MPE}</math>) equal to or less (better) than <math>(1.7 + L/800) \mu\text{m}</math> (where L is the measured length in mm) at any point within the operating range of the machine (i.e. within the length of the axis), according to Ref. ISO 10360-2 (2009);</li> </ol> <p><i>Technical Note</i></p> <p><i>The <math>E_{0,MPE}</math> of the most accurate configuration of the CMM specified according to Ref. ISO 10360-2 (2009) by the manufacturer (e.g. best of the following: probe, stylus, length, motion parameters, environments) and with all compensations available must be compared to the <math>(1.7 + L/800) \mu\text{m}</math> threshold.</i></p> <p>b. Systems for simultaneous linear-angular inspection of hemishells, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. “Measurement uncertainty” along any linear axis equal to or less (better) than <math>3.5 \mu\text{m}</math> per 5 mm; <u>and</u></li> <li>2. “Angular position deviation” equal to or less than <math>0.02^\circ</math>;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. 'Linear displacement' measuring systems having both of the following characteristics:</p> <p><u>Technical Note</u>  <i>For the purpose of Category Code 2B206.c., 'linear displacement' means the change of distance between the measuring probe and the measured object.</i></p> <ol style="list-style-type: none"> <li>1. Containing a "laser"; <u>and</u></li> <li>2. Maintaining, for at least 12 hours, at a temperature of <math>\pm 1</math> K around a standard temperature and standard pressure, both of the following: <ol style="list-style-type: none"> <li>a. A "resolution" over their full scale of <math>0.1 \mu\text{m}</math> or better; <u>and</u></li> <li>b. With a "measurement uncertainty" equal to or better (less) than <math>(0.2 + L/2,000) \mu\text{m}</math> (L is the measured length in mm).</li> </ol> </li> </ol> <p><u>Note</u>  <i>Category Code 2B206.c. does not include 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.</i></p> <p><u>Note 1</u>  <i>Machine tools that can be used as measuring machines are included if they meet or exceed the criteria specified for the machine tool function or the measuring machine function.</i></p> <p><u>Note 2</u>  <i>A machine specified in Category Code 2B206 is included in that Category Code if it exceeds the specifications stated therein anywhere within its operating range.</i></p> <p><u>Technical Note</u>  <i>All parameters of measurement values in Category Code 2B206 represent plus/minus i.e. not total band.</i></p>

<i>Category Code</i>	<i>Item Description</i>
2B207	<p>“Robots”, “end-effectors” and control units, other than those specified in Category Code 2B007, as follows:</p> <ol style="list-style-type: none"> <li>a. “Robots” or “end-effectors” specially designed to comply with national safety standards applicable to handling high explosives (e.g. meeting electrical code ratings for high explosives);</li> <li>b. Control units specially designed for any of the “robots” or “end-effectors” specified in Category Code 2B207.a.</li> </ol>
2B209	<p>Flow forming machines, spin forming machines capable of flow forming functions, other than those specified in Category Code 2B009 or 2B109, and mandrels, as follows:</p> <ol style="list-style-type: none"> <li>a. Machines having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Three or more rollers (active or guiding); <u>and</u></li> <li>2. Which, according to the manufacturer’s technical specification, can be equipped with “numerical control” units or a computer control;</li> </ol> <p><i>Note</i>  <i>Category Code 2B209.a. 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.</i></p> </li> <li>b. Rotor-forming mandrels designed to form cylindrical rotors of inside diameter between 75 mm and 400 mm.</li> </ol>
2B219	<p>Centrifugal multiplane balancing machines, fixed or portable, horizontal or vertical, as follows:</p> <ol style="list-style-type: none"> <li>a. Centrifugal balancing machines designed for balancing flexible rotors having a length of 600 mm or more and having all of the following characteristics: <ol style="list-style-type: none"> <li>1. Swing or journal diameter greater than 75 mm;</li> <li>2. Mass capability of from 0.9 kg to 23 kg; <u>and</u></li> <li>3. Capable of balancing speed of revolution greater than 5,000 rpm;</li> </ol> </li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor components and having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Journal diameter greater than 75 mm;</li> <li>2. Mass capability of from 0.9 kg to 23 kg;</li> <li>3. A minimum achievable residual specific unbalance equal to or less than 10 g mm/kg per plane; <u>and</u></li> <li>4. Belt drive type.</li> </ol>
2B225	<p>Remote manipulators that can be used to provide remote actions in radiochemical separation operations or hot cells, having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. A capability of penetrating 0.6 m or more of hot cell wall (through-the-wall operation); <u>or</u></li> <li>b. A capability of bridging over the top of a hot cell wall with a thickness of 0.6 m or more (over-the-wall operation).</li> </ol> <p><i><u>Technical Note</u></i>  <i>Remote manipulators provide translation of human operator actions to a remote operating arm and terminal fixture. They may be of 'master/slave' type or operated by joystick or keypad.</i></p>
2B226	<p>Controlled atmosphere (vacuum or inert gas) induction furnaces, other than those specified in Category Codes 3B001 and 9B001 and power supplies therefor, as follows:</p> <p><i><u>N.B.</u></i>  <i>See also Category Codes 3B001 and 9B001.</i></p> <ol style="list-style-type: none"> <li>a. Furnaces having all of the following characteristics: <ol style="list-style-type: none"> <li>1. Capable of operation above 1,123 K (850°C);</li> <li>2. Induction coils 600 mm or less in diameter; <u>and</u></li> <li>3. Designed for power inputs of 5 kW or more;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
2B227	<p>b. Power supplies, with a specified power output of 5 kW or more, specially designed for furnaces specified in Category Code 2B226.a.</p> <p><i>Note</i>  <i>Category Code 2B226.a. does not include furnaces designed for the processing of semiconductor wafers.</i></p> <p>Vacuum or other controlled atmosphere metallurgical melting and casting furnaces and related equipment as follows:</p> <p>a. Arc remelt and casting furnaces having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Consumable electrode capacities between 1,000 cm<sup>3</sup> and 20,000 cm<sup>3</sup>; <u>and</u></li> <li>2. Capable of operating with melting temperatures above 1,973 K (1,700°C);</li> </ol> <p>b. Electron beam melting furnaces and plasma atomisation and melting furnaces, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A power of 50 kW or greater; <u>and</u></li> <li>2. Capable of operating with melting temperatures above 1,473 K (1,200°C);</li> </ol> <p>c. Computer control and monitoring systems specially configured for any of the furnaces specified in Category Code 2B227.a. or 2B227.b.;</p> <p>d. Plasma torches specially designed for furnaces specified in Category Code 2B227.b. having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Operating at a power greater than 50 kW; <u>and</u></li> <li>2. Capable of operating above 1,473 K (1,200°C);</li> </ol> <p>e. Electron beam guns specially designed for the furnaces specified in Category Code 2B227.b. operating at a power greater than 50 kW.</p>

<i>Category Code</i>	<i>Item Description</i>
2B228	<p>Rotor fabrication or assembly equipment, rotor straightening equipment, bellows-forming mandrels and dies, as follows:</p> <p>a. Rotor assembly equipment for assembly of gas centrifuge rotor tube sections, baffles, and end caps;</p> <p><i>Note</i> <i>Category Code 2B228.a. includes precision mandrels, clamps, and shrink fit machines.</i></p> <p>b. Rotor straightening equipment for alignment of gas centrifuge rotor tube sections to a common axis;</p> <p><i>Technical Note</i> <i>Equipment specified in Category Code 2B228.b. normally consists of precision measuring probes linked to a computer that subsequently controls the action of, e.g. pneumatic rams used for aligning the rotor tube sections.</i></p> <p>c. Bellows-forming mandrels and dies for producing single-convolution bellows.</p> <p><i>Technical Note</i> <i>In Category Code 2B228.c., the bellows have all of the following characteristics:</i></p> <p>a. <i>Inside diameter between 75 mm and 400 mm;</i></p> <p>b. <i>Length equal to or greater than 12.7 mm;</i></p> <p>c. <i>Single convolution depth greater than 2 mm; and</i></p> <p>d. <i>Made of high-strength aluminium alloys, maraging steel or high strength “fibrous or filamentary materials”.</i></p>
2B230	<p>All types of ‘pressure transducers’ capable of measuring absolute pressures and having all of the following:</p> <p>a. Pressure sensing elements made of or protected by aluminium, aluminium alloy, aluminium oxide (alumina or sapphire), nickel, nickel alloy with more than 60% nickel by weight, or fully fluorinated hydrocarbon polymers;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Seals, if any, essential for sealing the pressure sensing element, and in direct contact with the process medium, made of or protected by aluminium, aluminium alloy, aluminum oxide (alumina or sapphire), nickel, nickel alloy with more than 60% nickel by weight, or fully fluorinated hydrocarbon polymers; <u>and</u></p> <p>c. Having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A full scale of less than 13 kPa and an ‘accuracy’ of better than 1% of full-scale; <u>or</u></li> <li>2. A full scale of 13 kPa or greater and an ‘accuracy’ of better than 130 Pa when measured at 13 kPa.</li> </ol> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>In Category Code 2B230, ‘pressure transducer’ means a device that converts a pressure measurement into a signal.</i></li> <li>2. <i>For the purpose of Category Code 2B230, ‘accuracy’ includes non-linearity, hysteresis and repeatability at ambient temperature.</i></li> </ol>
2B231	<p>Vacuum pumps having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Input throat size equal to or greater than 380 mm;</li> <li>b. Pumping speed equal to or greater than 15 m<sup>3</sup>/s; <u>and</u></li> <li>c. Capable of producing an ultimate vacuum better than 13 mPa.</li> </ol> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>The pumping speed is determined at the measurement point with nitrogen gas or air.</i></li> <li>2. <i>The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off.</i></li> </ol>
2B232	<p>High-velocity gun systems (propellant, gas, coil, electromagnetic, and electrothermal types, and other advanced systems) capable of accelerating projectiles to 1.5 km/s or greater.</p> <p><u>N.B.</u></p> <p><i>See also Division 2 of Part 1 of this Schedule.</i></p>

<i>Category Code</i>	<i>Item Description</i>
2B233	<p>Bellows-sealed scroll-type compressors and bellows-sealed scroll-type vacuum pumps having all of the following characteristics:</p> <p><u>N.B.</u> See also Category Code 2B350.i.</p> <ol style="list-style-type: none"> <li>a. Capable of an inlet volume flow rate of 50 m<sup>3</sup>/h or greater;</li> <li>b. Capable of a pressure ratio of 2:1 or greater; <u>and</u></li> <li>c. Having all surfaces that come in contact with the process gas made from any of the following materials:               <ol style="list-style-type: none"> <li>1. Aluminium or aluminium alloy;</li> <li>2. Aluminium oxide;</li> <li>3. Stainless steel;</li> <li>4. Nickel or nickel alloy;</li> <li>5. Phosphor bronze; <u>or</u></li> <li>6. Fluoropolymers.</li> </ol> </li> </ol>
2B350	<p>Chemical manufacturing facilities, equipment and components, as follows:</p> <ol style="list-style-type: none"> <li>a. Reaction vessels or reactors, with or without agitators, with total internal (geometric) volume greater than 0.1 m<sup>3</sup> (100 litres) and less than 20 m<sup>3</sup> (20,000 litres), where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:               <ol style="list-style-type: none"> <li>1. 'Alloys' with more than 25% nickel and 20% chromium by weight;</li> <li>2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>3. Glass (including vitrified or enamelled coating or glass lining);</li> <li>4. Nickel or 'alloys' with more than 40% nickel by weight;</li> <li>5. Tantalum or tantalum 'alloys';</li> <li>6. Titanium or titanium 'alloys';</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>7. Zirconium or zirconium ‘alloys’; <u>or</u></p> <p>8. Niobium (columbium) or niobium ‘alloys’;</p> <p>b. Agitators designed for use in reaction vessels or reactors specified in Category Code 2B350.a.; and impellers, blades or shafts designed for such agitators, 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:</p> <ol style="list-style-type: none"> <li>1. ‘Alloys’ with more than 25% nickel and 20% chromium by weight;</li> <li>2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>3. Glass (including vitrified or enamelled coatings or glass lining);</li> <li>4. Nickel or ‘alloys’ with more than 40% nickel by weight;</li> <li>5. Tantalum or tantalum ‘alloys’;</li> <li>6. Titanium or titanium ‘alloys’;</li> <li>7. Zirconium or zirconium ‘alloys’; <u>or</u></li> <li>8. Niobium (columbium) or niobium ‘alloys’;</li> </ol> <p>c. Storage tanks, containers or receivers with a total internal (geometric) volume greater than 0.1 m<sup>3</sup> (100 litres) where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:</p> <ol style="list-style-type: none"> <li>1. ‘Alloys’ with more than 25% nickel and 20% chromium by weight;</li> <li>2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>3. Glass (including vitrified or enamelled coatings or glass lining);</li> <li>4. Nickel or ‘alloys’ with more than 40% nickel by weight;</li> <li>5. Tantalum or tantalum ‘alloys’;</li> <li>6. Titanium or titanium ‘alloys’;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>7. Zirconium or zirconium ‘alloys’; <u>or</u></p> <p>8. Niobium (columbium) or niobium ‘alloys’;</p> <p>d. Heat exchangers or condensers with a heat transfer surface area greater than 0.15 m<sup>2</sup>, and less than 20 m<sup>2</sup>; and tubes, plates, coils or blocks (cores) designed for such heat exchangers or condensers, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:</p> <ol style="list-style-type: none"> <li>1. ‘Alloys’ with more than 25% nickel and 20% chromium by weight;</li> <li>2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>3. Glass (including vitrified or enamelled coatings or glass lining);</li> <li>4. Graphite or ‘carbon graphite’;</li> <li>5. Nickel or ‘alloys’ with more than 40% nickel by weight;</li> <li>6. Tantalum or tantalum ‘alloys’;</li> <li>7. Titanium or titanium ‘alloys’;</li> <li>8. Zirconium or zirconium ‘alloys’;</li> <li>9. Silicon carbide;</li> <li>10. Titanium carbide; <u>or</u></li> <li>11. Niobium (columbium) or niobium ‘alloys’;</li> </ol> <p>e. Distillation or absorption columns of internal diameter greater than 0.1 m; and liquid distributors, vapour distributors or liquid collectors designed for such distillation or absorption columns, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:</p> <ol style="list-style-type: none"> <li>1. ‘Alloys’ with more than 25% nickel and 20% chromium by weight;</li> <li>2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>3. Glass (including vitrified or enamelled coatings or glass lining);</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>4. Graphite or 'carbon graphite';</li> <li>5. Nickel or 'alloys' with more than 40% nickel by weight;</li> <li>6. Tantalum or tantalum 'alloys';</li> <li>7. Titanium or titanium 'alloys';</li> <li>8. Zirconium or zirconium 'alloys'; <u>or</u></li> <li>9. Niobium (columbium) or niobium 'alloys';</li> </ol> <p>f. Remotely operated filling equipment in which all surfaces that come in direct contact with the chemical(s) being processed are made from either of the following materials:</p> <ol style="list-style-type: none"> <li>1. 'Alloys' with more than 25% nickel and 20% chromium by weight; <u>or</u></li> <li>2. Nickel or 'alloys' with more than 40% nickel by weight;</li> </ol> <p>g. Valves and components, as follows:</p> <ol style="list-style-type: none"> <li>1. Valves, having both of the following characteristics: <ol style="list-style-type: none"> <li>a. A 'nominal size' greater than 10 mm (3/8"); <u>and</u></li> <li>b. All surfaces that come in direct contact with the chemical(s) being produced, processed, or contained are made from 'corrosion resistant materials';</li> </ol> </li> <li>2. Valves, other than those specified in Category Code 2B350.g.1., having all of the following characteristics: <ol style="list-style-type: none"> <li>a. A 'nominal size' equal to or greater than 25.4 mm (1") and equal to or less than 101.6 mm (4");</li> <li>b. Casings (valve bodies) or preformed casing liners;</li> <li>c. A closure element designed to be interchangeable; <u>and</u></li> <li>d. All surfaces of the casing (valve body) or preformed case liner that come in direct contact with the chemical(s) being produced, processed, or contained are made from 'corrosion resistant materials';</li> </ol> </li> </ol>



Category Code	Item Description
	<p>3. Components, designed for valves specified in Category Code 2B350.g.1. or 2B350.g.2., in which all surfaces that come in direct contact with the chemical(s) being produced, processed, or contained are made from 'corrosion resistant materials', as follows:</p> <ol style="list-style-type: none"> <li>a. Casings (valve bodies);</li> <li>b. Preformed casing liners;</li> </ol> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. For the purpose of Category Code 2B350.g., 'corrosion resistant materials' means any of the following materials: <ol style="list-style-type: none"> <li>a. Nickel or alloys with more than 40% nickel by weight;</li> <li>b. Alloys with more than 25% nickel and 20% chromium by weight;</li> <li>c. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>d. Glass or glass-lined (including vitrified or enamelled coatings);</li> <li>e. Tantalum or tantalum alloys;</li> <li>f. Titanium or titanium alloys;</li> <li>g. Zirconium or zirconium alloys;</li> <li>h. Niobium (columbium) or niobium alloys; <u>or</u></li> <li>i. Ceramic materials as follows: <ol style="list-style-type: none"> <li>1. Silicon carbide with a purity of 80% or more by weight;</li> <li>2. Aluminium oxide (alumina) with a purity of 99.9% or more by weight;</li> <li>3. Zirconium oxide (zirconia).</li> </ol> </li> </ol> </li> <li>2. The 'nominal size' is defined as the smaller of the inlet and outlet diameters.</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>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:</p> <ol style="list-style-type: none"> <li>1. 'Alloys' with more than 25% nickel and 20% chromium by weight;</li> <li>2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>3. Glass (including vitrified or enamelled coatings or glass lining);</li> <li>4. Graphite or 'carbon graphite';</li> <li>5. Nickel or 'alloys' with more than 40% nickel by weight;</li> <li>6. Tantalum or tantalum 'alloys';</li> <li>7. Titanium or titanium 'alloys';</li> <li>8. Zirconium or zirconium 'alloys'; <u>or</u></li> <li>9. Niobium (columbium) or niobium 'alloys';</li> </ol> <p>i. Multiple-seal and seal-less 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), other than those specified in Category Code 2B233; and casings (pump bodies), preformed casing liners, impellers, rotors or jet pump nozzles designed for such pumps, in which all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:</p> <ol style="list-style-type: none"> <li>1. 'Alloys' with more than 25% nickel and 20% chromium by weight;</li> <li>2. Ceramics;</li> <li>3. Ferrosilicon (high silicon iron alloys);</li> <li>4. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</li> <li>5. Glass (including vitrified or enamelled coatings or glass lining);</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>6. Graphite or ‘carbon graphite’;</p> <p>7. Nickel or ‘alloys’ with more than 40% nickel by weight;</p> <p>8. Tantalum or tantalum ‘alloys’;</p> <p>9. Titanium or titanium ‘alloys’;</p> <p>10. Zirconium or zirconium ‘alloys’; <u>or</u></p> <p>11. Niobium (columbium) or niobium ‘alloys’;</p> <p><u>Technical Note</u></p> <p><i>In Category Code 2B350.i., the term seal refers to only those seals that come into direct contact with the chemical(s) being processed (or are designed to), and provide a sealing function where a rotary or reciprocating drive shaft passes through a pump body.</i></p> <p>j. Incinerators designed to destroy chemicals specified in Category Code 1C350, having specially designed waste supply systems, special handling facilities and an average combustion chamber temperature greater than 1,273 K (1,000°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:</p> <p>1. ‘Alloys’ with more than 25% nickel and 20% chromium by weight;</p> <p>2. Ceramics; <u>or</u></p> <p>3. Nickel or ‘alloys’ with more than 40% nickel by weight.</p> <p><u>Note</u></p> <p><i>For the purpose of Category Code 2B350, the materials used for gaskets, packing, seals, screws, washers or other materials performing a sealing function do not determine the control status, provided that such components are designed to be interchangeable.</i></p> <p><u>Technical Notes</u></p> <p>1. ‘Carbon graphite’ is a composition consisting of amorphous carbon and graphite, in which the graphite content is 8% or more by weight.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. <i>For the listed materials in the above entries, the term ‘alloy’ when not accompanied by a specific elemental concentration is understood as identifying those alloys where the identified metal is present in a higher percentage by weight than any other element.</i></p>
2B351	<p>Toxic gas monitoring systems and their dedicated detecting components, other than those specified in Category Code 1A004, as follows; and detectors; sensor devices; and replaceable sensor cartridges therefor:</p> <p>a. Designed for continuous operation and usable for the detection of Chemical Warfare (CW) agents or chemicals specified in Category Code 1C350, at concentrations of less than 0.3 mg/m<sup>3</sup>; <u>or</u></p> <p>b. Designed for the detection of cholinesterase-inhibiting activity.</p>
2B352	<p>Equipment capable of use in handling biological materials as follows:</p> <p>a. Containment facilities and related equipment, as follows:</p> <ol style="list-style-type: none"> <li>1. Complete containment facilities that meet the criteria for P3 or P4 (BL3, BL4, L3, L4) containment as specified in the WHO Laboratory Biosafety Manual (3<sup>rd</sup> edition Geneva, 2004);</li> <li>2. Equipment designed for fixed installation in containment facilities included in Category Code 2B352.a., as follows: <ol style="list-style-type: none"> <li>a. Double-door pass-through decontamination autoclaves;</li> <li>b. Breathing air suit decontamination showers;</li> <li>c. Mechanical-seal or inflatable-seal walkthrough doors;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Fermenters and components as follows:</p> <ol style="list-style-type: none"> <li>1. Fermenters capable of cultivation of “microorganisms” or of live cells for the production of viruses or toxins, without the propagation of aerosols, having a total capacity of 20 litres or more;</li> <li>2. Components designed for fermenters in Category Code 2B352.b.1. as follows: <ol style="list-style-type: none"> <li>a. Cultivation chambers designed to be sterilised or disinfected <i>in situ</i>;</li> <li>b. Cultivation chamber holding devices;</li> <li>c. Process control units capable of simultaneously monitoring and controlling two or more fermentation system parameters (e.g. temperature, pH, nutrients, agitation, dissolved oxygen, air flow, foam control);</li> </ol> <p><u>Technical Note</u>  <i>For the purpose of Category Code 2B352.b., fermenters include bioreactors, single-use (disposable) bioreactors, chemostats and continuous-flow systems.</i></p> </li> </ol> <p>c. Centrifugal separators, capable of continuous separation without the propagation of aerosols, having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Flow rate exceeding 100 litres per hour;</li> <li>2. Components of polished stainless steel or titanium;</li> <li>3. One or more sealing joints within the steam containment area; <u>and</u></li> <li>4. Capable of <i>in situ</i> steam sterilisation in a closed state;</li> </ol> <p><u>Technical Note</u>  <i>Centrifugal separators include decanters.</i></p>

Category Code	Item Description
	<p>d. Cross (tangential) flow filtration equipment and components as follows:</p> <ol style="list-style-type: none"> <li>1. Cross (tangential) flow filtration equipment capable of separation of “microorganisms”, viruses, toxins or cell cultures having both of the following characteristics:           <ol style="list-style-type: none"> <li>a. A total filtration area equal to or greater than 1 m<sup>2</sup>; <u>and</u></li> <li>b. Having either of the following characteristics:               <ol style="list-style-type: none"> <li>1. Capable of being sterilised or disinfected <i>in situ</i>; <u>or</u></li> <li>2. Using disposable or single-use filtration components;</li> </ol> </li> </ol> </li> </ol> <p><i><u>Technical Note</u></i></p> <p><i>In Category Code 2B352.d.1.b., sterilised 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 sterilisation are distinct from sanitisation, the latter referring to cleaning procedures designed to lower the microbial content of equipment without necessarily achieving elimination of all microbial infectivity or viability.</i></p> <p><i><u>Note</u></i></p> <p><i>Category Code 2B352.d. does not include reverse osmosis and hemodialysis equipment, as specified by the manufacturer.</i></p> <ol style="list-style-type: none"> <li>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 m<sup>2</sup> for each component and designed for use in cross (tangential) flow filtration equipment specified in Category Code 2B352.d.;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>e. Steam, gas or vapour sterilisable freeze drying equipment with a condenser capacity of 10 kg of ice or more in 24 hours and less than 1,000 kg of ice in 24 hours;</p> <p>f. Protective and containment equipment, as follows:</p> <ol style="list-style-type: none"> <li>1. Protective full or half suits, or hoods dependent upon a tethered external air supply and operating under positive pressure;           <p><u>Note</u>  <i>Category Code 2B352.f.1. does not include suits designed to be worn with self-contained breathing apparatus.</i></p> </li> <li>2. Biocontainment chambers, isolators, or biological safety cabinets having all of the following characteristics, for normal operation:           <ol style="list-style-type: none"> <li>a. Fully enclosed workspace where the operator is separated from the work by a physical barrier;</li> <li>b. Able to operate at negative pressure;</li> <li>c. Means to safely manipulate items in the workspace; <u>and</u></li> <li>d. Supply and exhaust air to and from the workspace is HEPA filtered;</li> </ol> <p><u>Note 1</u>  <i>Category Code 2B352.f.2. includes Class III biosafety cabinets, as described in the latest edition of the WHO Laboratory Biosafety Manual or constructed in accordance with national standards, regulations or guidance.</i></p> <p><u>Note 2</u>  <i>Category Code 2B352.f.2. does not include isolators specially designed for barrier nursing or transportation of infected patients.</i></p> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>g. Aerosol inhalation equipment designed for aerosol challenge testing with “microorganisms”, viruses or “toxins” as follows:</p> <ol style="list-style-type: none"> <li>1. Whole-body exposure chambers having a capacity of 1 m<sup>3</sup> or more;</li> <li>2. Nose-only exposure apparatus utilising directed aerosol flow and having capacity for exposure of either of the following: <ol style="list-style-type: none"> <li>a. 12 or more rodents; <u>or</u></li> <li>b. 2 or more animals other than rodents;</li> </ol> </li> <li>3. Closed animal restraint tubes designed for use with nose-only exposure apparatus utilising directed aerosol flow;</li> </ol> <p>h. Spray drying equipment capable of drying toxins or pathogenic microorganisms having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A water evaporation capacity of <math>\geq 0.4</math> kg/h and <math>\leq 400</math> kg/h;</li> <li>2. The ability to generate a typical mean product particle size of <math>\leq 10</math> <math>\mu\text{m}</math> with existing fittings or by minimal modification of the spray-dryer with atomisation nozzles enabling generation of the required particle size; <u>and</u></li> <li>3. Capable of being sterilised or disinfected <i>in situ</i>.</li> </ol>
<b>2C</b>	<p><b>Materials</b></p> <p>None.</p>
<b>2D</b> 2D001	<p><b>Software</b></p> <p>“Software”, other than that specified in Category Code 2D002, as follows:</p> <ol style="list-style-type: none"> <li>a. “Software” specially designed or modified for the “development” or “production” of equipment specified in Category Code 2A001 or 2B001;</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>b. “Software” specially designed or modified for the “use” of equipment specified in Category Code 2A001.c., 2B001 or 2B003 to 2B009.</p> <p><u>Note</u>  <i>Category Code 2D001 does not include part programming “software” that generates “numerical control” codes for machining various parts.</i></p>
2D002	<p>“Software” for electronic devices, even when residing in an electronic device or system, enabling such devices or systems to function as a “numerical control” unit, capable of coordinating simultaneously more than four axes for “contouring control”.</p> <p><u>Note 1</u>  <i>Category Code 2D002 does not include “software” specially designed or modified for the operation of items not specified in Category 2.</i></p> <p><u>Note 2</u>  <i>Category Code 2D002 does not include “software” for items specified in Category Code 2B002. See Category Codes 2D001 and 2D003 for “software” for items specified in Category Code 2B002.</i></p> <p><u>Note 3</u>  <i>Category Code 2D002 does not include “software” that is exported with, and the minimum necessary for the operation of, items not specified in Category 2.</i></p>
2D003	<p>“Software”, designed or modified for the operation of equipment specified in Category Code 2B002, that converts optical design, workpiece measurements and material removal functions into “numerical control” commands to achieve the desired workpiece form.</p>

<i>Category Code</i>	<i>Item Description</i>
2D101	<p>“Software” specially designed or modified for the “use” of equipment specified in Category Code 2B104, 2B105, 2B109, 2B116, 2B117 or 2B119 to 2B122.</p> <p><u><i>N.B.</i></u>  <i>See also Category Code 9D004.</i></p>
2D201	<p>“Software” specially designed for the “use” of equipment specified in Category Code 2B204, 2B206, 2B207, 2B209, 2B219 or 2B227.</p>
2D202	<p>“Software” specially designed or modified for the “development”, “production” or “use” of equipment specified in Category Code 2B201.</p> <p><u><i>Note</i></u>  <i>Category Code 2D202 does not include part programming “software” that generates “numerical control” command codes but does not allow direct use of equipment for machining various parts.</i></p>
2D351	<p>“Software”, other than that specified in Category Code 1D003, specially designed for the “use” of equipment specified in Category Code 2B351.</p>
<b>2E</b>	<b>Technology</b>
2E001	<p>“Technology” (according to the General Technology Note) for the “development” of equipment or “software” specified in Category 2A, 2B or 2D.</p> <p><u><i>Note</i></u>  <i>Category Code 2E001 includes “technology” for the integration of probe systems into coordinate measurement machines specified in Category Code 2B006.a.</i></p>
2E002	<p>“Technology” (according to the General Technology Note) for the “production” of equipment specified in Category 2A or 2B.</p>

<i>Category Code</i>	<i>Item Description</i>
2E003	<p>Other “technology” as follows:</p> <ol style="list-style-type: none"> <li>a. “Technology” for the “development” of interactive graphics as an integrated part in “numerical control” units for preparation or modification of part programs;</li> <li>b. “Technology” for metal-working manufacturing processes, as follows: <ol style="list-style-type: none"> <li>1. “Technology” for the design of tools, dies or fixtures specially designed for any of the following processes: <ol style="list-style-type: none"> <li>a. “Superplastic forming”;</li> <li>b. “Diffusion bonding”; <u>or</u></li> <li>c. “Direct-acting hydraulic pressing”;</li> </ol> </li> <li>2. Technical data consisting of process methods or parameters as listed below used to control: <ol style="list-style-type: none"> <li>a. “Superplastic forming” of aluminium alloys, titanium alloys or “superalloys”: <ol style="list-style-type: none"> <li>1. Surface preparation;</li> <li>2. Strain rate;</li> <li>3. Temperature;</li> <li>4. Pressure;</li> </ol> </li> <li>b. “Diffusion bonding” of “superalloys” or titanium alloys: <ol style="list-style-type: none"> <li>1. Surface preparation;</li> <li>2. Temperature;</li> <li>3. Pressure;</li> </ol> </li> <li>c. “Direct-acting hydraulic pressing” of aluminium alloys or titanium alloys: <ol style="list-style-type: none"> <li>1. Pressure;</li> <li>2. Cycle time;</li> </ol> </li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. “Hot isostatic densification” of titanium alloys, aluminium alloys or “superalloys”:</p> <ol style="list-style-type: none"> <li>1. Temperature;</li> <li>2. Pressure;</li> <li>3. Cycle time;</li> </ol> <p>c. “Technology” for the “development” or “production” of hydraulic stretch-forming machines and dies therefor, for the manufacture of airframe structures;</p> <p>d. “Technology” for the “development” of generators of machine tool instructions (e.g. part programs) from design data residing inside “numerical control” units;</p> <p>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;</p> <p>f. “Technology” for the application of inorganic overlay coatings or inorganic surface modification coatings (specified in column 3 of the Table entitled Deposition Techniques) to non-electronic substrates (specified in column 2 of that Table), by processes specified in column 1 of that Table and defined in the Technical Note.</p> <p><u>Note</u>  <i>The Table entitled Deposition Techniques and Technical Note appear after Category Code 2E301.</i></p> <p><u>N.B.</u>  <i>This table should be read to specify the “technology” for a particular Coating Process only when the Resultant Coating in column 3 is in a paragraph directly across from the relevant Substrate under column 2. For example, Chemical Vapour Deposition (CVD) coating process technical data are included for the application</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<i>of silicides to carbon-carbon, ceramic and metal “matrix” “composites” substrates, but are not included for the application of silicides to ‘cemented tungsten carbide’ (16), ‘silicon carbide’ (18) substrates. In the second case, the resultant coating is not listed in the paragraph under column 3 directly across from the paragraph under column 2 listing ‘cemented tungsten carbide’ (16), ‘silicon carbide’ (18).</i>
2E101	“Technology” (according to the General Technology Note) for the “use” of equipment or “software” specified in Category Code 2B004, 2B009, 2B104, 2B109, 2B116, 2B119 to 2B122 or 2D101.
2E201	“Technology” (according to the General Technology Note) for the “use” of equipment or “software” specified in Category Code 2A225, 2A226, 2B001, 2B006, 2B007.b., 2B007.c., 2B008, 2B009, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B233, 2D201 or 2D202.
2E301	“Technology” (according to the General Technology Note) for the “use” of goods specified in Category Codes 2B350 to 2B352.

TABLE – DEPOSITION TECHNIQUES

*Notes*

1. Bracketed numbers are explained in the Notes that appear after the table.
2. The coating processes under column 1 are further explained in the Technical Notes below.

1. Coating Process (1)	2. Substrate	3. Resultant Coating
A. Chemical Vapour Deposition (CVD)	“Superalloys”	Aluminides for internal passages
	Ceramics (19) and Low-expansion glasses (14)	Silicides Carbides Dielectric layers (15) Diamond Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal “matrix” “composites”	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Aluminides Alloyed aluminides (2) Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)

1. Coating Process (1)	2. Substrate	3. Resultant Coating
	Beryllium and Beryllium alloys  Sensor window materials (9)	Dielectric layers (15) Diamond Diamond-like carbon (17)  Dielectric layers (15) Diamond Diamond-like carbon (17)
B. Thermal-Evaporation Physical Vapour Deposition (TE-PVD)  B.1 Physical Vapour Deposition (PVD): Electron-Beam (EB-PVD)	“Superalloys”  Ceramics (19) and Low-expansion glasses (14)  Corrosion resistant steel (7)  Carbon-carbon, Ceramic and Metal “matrix” “composites”	Alloyed silicides Alloyed aluminides (2) MCrAlX (5) Modified zirconia (12) Silicides Aluminides Mixtures thereof (4)  Dielectric layers (15)  MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)  Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride

1. Coating Process (1)	2. Substrate	3. Resultant Coating
B.2 Ion assisted resistive heating Physical Vapour Deposition (PVD) (Ion Plating)	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15) Borides Beryllium
	Sensor window materials (9)	Dielectric layers (15)
	Titanium alloys (13)	Borides Nitrides
	Ceramics (19) and Low-expansion glasses (14)	Dielectric layers (15) Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Dielectric layers (15)
	Cemented tungsten carbide (16), Silicon carbide	Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
B.3 Physical Vapour Deposition (PVD): "Laser" Vaporisation	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
	Ceramics (19) and Low-expansion glasses (14)	Silicides Dielectric layers (15) Diamond-like carbon (17)



1. Coating Process (1)	2. Substrate	3. Resultant Coating
B.4 Physical Vapour Deposition (PVD): Cathodic Arc Discharge	Carbon-carbon, Ceramic and Metal “matrix” “composites”	Dielectric layers (15)
	Cemented tungsten carbide (16), Silicon carbide	Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
C. Pack cementation (See A above for out-of-pack cementation) (10)	Carbon-carbon, Ceramic and Metal “matrix” “composites”	Silicides Carbides Mixtures thereof (4)
	Titanium alloys (13)	Silicides Aluminides Alloyed aluminides (2)
	Refractory metals and alloys (8)	Silicides Oxides

1. Coating Process (1)	2. Substrate	3. Resultant Coating
D. Plasma spraying	“Superalloys”	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4) Abradable Nickel-Graphite Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester Alloyed aluminides (2)
	Aluminium alloys (6)	MCrAlX (5) Modified zirconia (12) Silicides Mixtures thereof (4)
	Refractory metals and alloys (8)	Aluminides Silicides Carbides
	Corrosion resistant steel (7)	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)
	Titanium alloys (13)	Carbides Aluminides Silicides Alloyed aluminides (2) Abradable Nickel-Graphite Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester

1. Coating Process (1)	2. Substrate	3. Resultant Coating
E. Slurry Deposition	Refractory metals and alloys (8)  Carbon-carbon, Ceramic and Metal “matrix” “composites”	Fused silicides Fused aluminides except for resistance heating elements  Silicides Carbides Mixtures thereof (4)
F. Sputter Deposition	“Superalloys”  Ceramics and Low-expansion glasses (14)  Titanium alloys (13)	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) Diamond-like carbon (17)  Borides Nitrides Oxides Silicides Aluminides Alloyed aluminides (2) Carbides

1. Coating Process (1)	2. Substrate	3. Resultant Coating
	Carbon-carbon, Ceramic and Metal “matrix” “composites”  Cemented tungsten carbide (16), Silicon carbide (18)  Molybdenum and Molybdenum alloys  Beryllium and Beryllium alloys  Sensor window materials (9)  Refractory metals and alloys (8)	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride  Carbides Tungsten Mixtures thereof (4) Dielectric layers (15) Boron nitride  Dielectric layers (15)  Borides Dielectric layers (15) Beryllium  Dielectric layers (15) Diamond-like carbon (17)  Aluminides Silicides Oxides Carbides
G. Ion Implantation	High temperature bearing steels  Titanium alloys (13)  Beryllium and Beryllium alloys  Cemented tungsten carbide (16)	Additions of Chromium Tantalum or Niobium (Columbium)  Borides Nitrides  Borides  Carbides Nitrides

TABLE — DEPOSITION TECHNIQUES — NOTES

1. The term ‘coating process’ includes coating repair and refurbishing as well as original coating.
2. The term ‘alloyed aluminide coating’ includes single or multiple-step coatings in which an element or elements are deposited prior to or during application of the aluminide coating, even if these elements are deposited by another coating process. It does not, however, include the multiple use of single-step pack cementation processes to achieve alloyed aluminides.
3. The term ‘noble metal modified aluminide’ coating includes multiple-step coatings in which the noble metal or noble metals are laid down by some other coating process prior to application of the aluminide coating.
4. The term ‘mixtures thereof’ includes infiltrated material, graded compositions, 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% by weight in various proportions and combinations, except:
  - a. CoCrAlY coatings which contain less than 22% by weight of chromium, less than 7% by weight of aluminium and less than 2% by weight of yttrium;
  - b. CoCrAlY coatings which contain 22% to 24% by weight of chromium, 10% to 12% by weight of aluminium and 0.5% to 0.7% by weight of yttrium; or
  - c. NiCrAlY coatings which contain 21% to 23% by weight of chromium, 10% to 12% by weight of aluminium and 0.9% to 1.1% by weight of yttrium.
6. The term ‘aluminium alloys’ refers to alloys having an Ultimate Tensile Strength (UTS) of 190 MPa or more measured at 293 K (20°C).
7. The term ‘corrosion resistant steel’ refers to AISI (American Iron and Steel Institute) 300 series or equivalent national standard steels.
8. ‘Refractory metals and alloys’ include the following metals and their alloys: niobium (columbium), molybdenum, tungsten and tantalum.
9. ‘Sensor window materials’ as follows: alumina, silicon, germanium, zinc sulphide, zinc selenide, gallium arsenide, diamond, gallium phosphide, sapphire and the following metal halides: sensor window materials of more than 40 mm diameter for zirconium fluoride and hafnium fluoride.

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10. Category 2 does not include “technology” for single-step pack cementation of solid airfoils.
  11. ‘Polymers’, as follows: polyimide, polyester, polysulphide, 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 stabilise certain crystallographic phases and phase compositions. Thermal barrier coatings made of zirconia, modified with calcia or magnesia by mixing or fusion, are not included.
  13. ‘Titanium alloys’ refers only to aerospace alloys having an Ultimate Tensile Strength (UTS) 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 refer to more than four dielectric layers or dielectric/metal “composite” layers.
  16. ‘Cemented tungsten carbide’ does not include cutting and forming tool materials consisting of tungsten carbide/(cobalt, nickel), titanium carbide/(cobalt, nickel), chromium carbide/nickel-chromium and chromium carbide/nickel.
  17. “Technology” for depositing diamond-like carbon on any of the following is not included in Category 2:  

magnetic disk drives and heads, equipment for the manufacture of disposables, valves for faucets, acoustic diaphragms for speakers, engine parts for automobiles, cutting tools, punching-pressing dies, office automation equipment, microphones or medical devices or moulds, for casting or moulding of plastics, manufactured from alloys containing less than 5% beryllium.
  18. ‘Silicon carbide’ does not include cutting and forming tool materials.
  19. Ceramic substrates, as used in this Table, does not include ceramic materials containing 5% by weight, or greater, clay or cement content, either as separate constituents or in combination.

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 TABLE — DEPOSITION TECHNIQUES — TECHNICAL NOTE

Processes specified in Column 1 of the Table are defined as follows:

- a. Chemical Vapour 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 Deposition (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 Vapour 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 vaporise 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 synthesise 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;

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2. Ion Assisted Resistive Heating PVD employs electrically resistive heating sources in combination with impinging ion beam(s) to produce a controlled and uniform flux of evaporated coating species;
  3. “Laser” Vaporisation uses either pulsed or Continuous Wave (CW) “laser” beams to vaporise 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 ionised plasma. The anode can be either a cone attached to the periphery of the cathode, through an insulator, or the chamber. Substrate biasing is used for non-line-of-sight deposition.

*Note*

*This definition does not include random cathodic arc deposition with non-biased substrates.*

5. Ion Plating is a special modification of a general TE-PVD process in which a plasma or an ion source is used to ionise the species to be deposited, and a negative bias is applied to the substrate in order to facilitate the extraction of the species from the plasma. The introduction of reactive species, evaporation of solids within the process chamber, and the use of monitors to provide in-process measurement of optical characteristics and thicknesses of coatings are ordinary modifications of the process.
- c. Pack Cementation is a surface modification coating or overlay coating process wherein a substrate is immersed in a powder mixture (a pack), that consists of:
1. The metallic powders that are to be deposited (usually aluminium, 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) and 1,375 K (1,102°C) for sufficient time to deposit the coating.



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- d. Plasma Spraying is an overlay coating process wherein a gun (spray torch) which produces and controls a plasma accepts powder or wire coating materials, melts them and propels them towards a substrate, whereon an integrally bonded coating is formed. Plasma spraying constitutes either low pressure plasma spraying or high velocity plasma spraying.

Note 1

*Low pressure means less than ambient atmospheric pressure.*

Note 2

*High velocity refers to nozzle-exit gas velocity exceeding 750 m/s calculated at 293 K (20°C) at 0.1 MPa.*

- e. Slurry Deposition is a surface modification coating or overlay coating process wherein a metallic or ceramic powder with an organic binder is suspended in a liquid and is applied to a substrate by either spraying, dipping or painting, subsequent air or oven drying, and heat treatment to obtain the desired coating.
- f. Sputter Deposition is an overlay coating process based on a momentum transfer phenomenon, wherein positive ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on an appropriately positioned substrate.

Note 1

*The Table refers only to triode, magnetron or reactive sputter deposition which is used to increase adhesion of the coating and rate of deposition and to Radio Frequency (RF) augmented sputter deposition used to permit vaporisation of non-metallic coating materials.*

Note 2

*Low-energy ion beams (less than 5 keV) can be used to activate the deposition.*

- g. Ion Implantation is a surface modification coating process in which the element to be alloyed is ionised, 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 Vapour Deposition (EB-PVD) or sputter deposition.

Category Code	Item Description
<b>CATEGORY 3 — ELECTRONICS</b>	
3A	<p><b>Systems, Equipment and Components</b></p> <p><u>Note 1</u>  <i>Equipment and components described in Category Code 3A001 or 3A002, other than those described in Category Code 3A001.a.3. to 3A001.a.10., 3A001.a.12. or 3A001.a.14., which are specially designed for or which have the same functional characteristics as other equipment are treated as coming within that description only if that other equipment is included in Division 2 of this Part.</i></p> <p><u>Note 2</u>  <i>Integrated circuits described in Category Code 3A001.a.3. to 3A001.a.9., 3A001.a.12. or 3A001.a.14., which are unalterably programmed or designed for a specific function for another equipment are treated as coming within that description only if that other equipment is included in Division 2 of this Part.</i></p> <p><u>N.B.</u>  <i>Where it is unclear if the other equipment is included in Division 2 of this Part, then the integrated circuit is treated as falling within Category Codes 3A001.a.3. to 3A001.a.9., 3A001.a.12. and 3A001.a.14. if it comes within the relevant description therein.</i></p>
3A001	<p>Electronic items as follows:</p> <p>a. General purpose integrated circuits, as follows:</p> <p><u>Note 1</u>  <i>Category Code 3A001.a. includes wafers (finished or unfinished), in which the function has been determined, if it comes within the parameters set out therein.</i></p> <p><u>Note 2</u>  <i>Integrated circuits include the following types:</i></p> <ul style="list-style-type: none"> <li>– “Monolithic integrated circuits”;</li> <li>– “Hybrid integrated circuits”;</li> <li>– “Multichip integrated circuits”;</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>– “Film type integrated circuits”, including silicon-on-sapphire integrated circuits;</li> <li>– “Optical integrated circuits”;</li> <li>– “Three dimensional integrated circuits”;</li> <li>– “Monolithic Microwave Integrated Circuits” (“MMICs”).</li> </ul> <p>1. Integrated circuits designed or rated as radiation hardened to withstand any of the following:</p> <ul style="list-style-type: none"> <li>a. A total dose of <math>5 \times 10^3</math> Gy (silicon) or higher;</li> <li>b. A dose rate upset of <math>5 \times 10^6</math> Gy (silicon)/s or higher; <u>or</u></li> <li>c. A fluence (integrated flux) of neutrons (1 MeV equivalent) of <math>5 \times 10^{13}</math> n/cm<sup>2</sup> or higher on silicon, or its equivalent for other materials;</li> </ul> <p><i>Note</i> Category Code 3A001.a.1.c. does not include Metal Insulator Semiconductors (MIS).</p> <p>2. “Microprocessor microcircuits”, “microcomputer microcircuits”, microcontroller microcircuits, storage integrated circuits manufactured from a compound semiconductor, analogue-to-digital converters, integrated circuits that contain Analogue-to-Digital Converters (ADCs) and store or process the digitised data, Digital-to-Analogue Converters (DACs), electro-optical or “optical integrated circuits” designed for “signal processing”, field programmable logic devices, custom integrated circuits for which either the function is unknown or the control status of the equipment in which the integrated circuit will be used is unknown, Fast Fourier Transform (FFT) processors, Electrical Erasable Programmable Read-Only Memories (EEPROMs), flash memories, Static Random Access Memories (SRAMs), or Magnetic Random Access Memories (MRAMs), having any of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Rated for operation at an ambient temperature above 398 K (125°C);</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Rated for operation at an ambient temperature below 218 K (-55°C); <u>or</u></p> <p>c. Rated for operation over the entire ambient temperature range from 218 K (-55°C) to 398 K (125°C);</p> <p><i>Note</i>  <i>Category Code 3A001.a.2. does not include integrated circuits for civil automobiles or railway train applications.</i></p> <p>3. “Microprocessor microcircuits”, “microcomputer microcircuits” and microcontroller microcircuits, manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz;</p> <p><i>Note</i>  <i>Category Code 3A001.a.3. includes digital signal processors, digital array processors and digital coprocessors.</i></p> <p>4. Not used;</p> <p>5. Analogue-to-Digital Converter (ADC) and Digital-to-Analogue Converter (DAC) integrated circuits, as follows:</p> <p>a. ADCs having any of the following characteristics:</p> <p><i>N.B.</i>  <i>See also Category Code 3A101.</i></p> <ol style="list-style-type: none"> <li>1. A resolution of 8 bit or more, but less than 10 bit, with an output rate greater than 1.3 giga samples per second (GSPS);</li> <li>2. A resolution of 10 bit or more, but less than 12 bit, with an output rate greater than 600 mega samples per second (MSPS);</li> <li>3. A resolution of 12 bit or more, but less than 14 bit, with an output rate greater than 400 mega samples per second (MSPS);</li> </ol>

Category Code	Item Description
	<p data-bbox="691 454 1259 555">4. A resolution of 14 bit or more, but less than 16 bit, with an output rate greater than 250 mega samples per second (MSPS); <u>or</u></p> <p data-bbox="691 568 1259 672">5. A resolution of 16 bit or more with an output rate greater than 65 mega samples per second (MSPS);</p> <p data-bbox="691 685 746 719"><u>N.B.</u></p> <p data-bbox="691 725 1259 860"><i>For integrated circuits that contain Analogue-to-Digital Converters (ADCs) and store or process the digitised data, see Category Code 3A001.a.14.</i></p> <p data-bbox="691 875 884 909"><u>Technical Notes</u></p> <p data-bbox="691 920 1259 987">1. A resolution of <math>n</math> bit corresponds to a quantisation of <math>2^n</math> levels.</p> <p data-bbox="691 1003 1259 1070">2. The number of bits in the output word is equal to the resolution of the ADC.</p> <p data-bbox="691 1086 1259 1189">3. The output rate is the maximum output rate of the converter, regardless of the architecture or oversampling.</p> <p data-bbox="691 1205 1259 1339">4. For ‘multiple channel ADCs’, the outputs are not aggregated and the output rate is the maximum output rate of any single channel.</p> <p data-bbox="691 1355 1259 1556">5. For ‘interleaved ADCs’ or for ‘multiple channel ADCs’ that are specified to have an interleaved mode of operation, the outputs are aggregated and the output rate is the maximum combined total output rate of all of the outputs.</p> <p data-bbox="691 1572 1259 1742">6. Vendors may also refer to the output rate as sampling rate, conversion rate or throughput rate. It is often specified in megahertz (MHz), mega words per second or mega samples per second (MSPS).</p> <p data-bbox="691 1758 1259 1856">7. For the purpose of measuring output rate, one sample per second is equivalent to one Hertz or one output word per second.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="692 454 1267 584">8. <i>'Multiple channel ADCs' are defined as devices which integrate more than one ADC, designed so that each ADC has a separate analogue input.</i></p> <p data-bbox="692 607 1267 835">9. <i>'Interleaved ADCs' are defined as devices which have multiple ADC units that sample the same analogue input at different times such that when the outputs are aggregated, the analogue input has been effectively sampled and converted at a higher sampling rate.</i></p> <p data-bbox="628 857 1267 920">b. Digital-to-Analogue Converters (DAC) having either of the following characteristics:</p> <p data-bbox="692 943 1267 1037">1. A resolution of 10 bit or more with an 'adjusted update rate' of greater than 3,500 MSPS; <u>or</u></p> <p data-bbox="692 1059 1267 1189">2. A resolution of 12 bit or more with an 'adjusted update rate' of greater than 1,250 MSPS and having either of the following characteristics:</p> <p data-bbox="756 1211 1267 1305">a. A "settling time" less than 9 ns to 0.024% of full scale from a full scale step; <u>or</u></p> <p data-bbox="756 1328 1267 1525">b. A 'Spurious Free Dynamic Range' (SFDR) greater than 68 dBc (carrier) when synthesising a full scale analogue signal of 100 MHz or the highest full scale analogue signal frequency specified below 100 MHz;</p> <p data-bbox="692 1547 884 1574"><u>Technical Notes</u></p> <p data-bbox="692 1597 1267 1816">1. <i>'Spurious Free Dynamic Range' (SFDR) is defined as the ratio of the RMS value of the carrier frequency (maximum signal component) at the input of the DAC to the RMS value of the next largest noise or harmonic distortion component at its output.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="691 454 1267 584">2. <i>SFDR is determined directly from the specification table or from the characterisation plots of SFDR versus frequency.</i></p> <p data-bbox="691 607 1267 701">3. <i>A signal is defined to be full scale when its amplitude is greater than -3 dBfs (full scale).</i></p> <p data-bbox="691 723 1267 1704">4. <i>‘Adjusted update rate’ for DACs:</i></p> <p data-bbox="751 775 1267 1133">a. <i>For conventional (non-interpolating) DACs, the ‘adjusted update rate’ is the rate at which the digital signal is converted to an analogue signal and the output analogue values are changed by the DAC. For DACs where the interpolation mode may be bypassed (interpolation factor of one), the DAC should be considered as a conventional (non-interpolating) DAC.</i></p> <p data-bbox="751 1155 1267 1704">b. <i>For interpolating DACs (oversampling DACs), the ‘adjusted update rate’ is defined as the DAC update rate divided by the smallest interpolating factor. For interpolating DACs, the ‘adjusted update rate’ may be referred to by different terms including:</i></p> <ul style="list-style-type: none"> <li data-bbox="815 1447 1054 1473">– <i>input data rate</i></li> <li data-bbox="815 1496 1054 1523">– <i>input word rate</i></li> <li data-bbox="815 1545 1054 1572">– <i>input sample rate</i></li> <li data-bbox="815 1594 1230 1621">– <i>maximum total input bus rate</i></li> <li data-bbox="815 1644 1267 1704">– <i>maximum DAC clock rate for DAC clock input.</i></li> </ul> <p data-bbox="544 1727 1267 1821">6. <i>Electro-optical and “optical integrated circuits”, designed for “signal processing” and having all of the following characteristics:</i></p> <p data-bbox="627 1843 1214 1870">a. <i>One or more than one internal “laser” diode;</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="628 454 1259 517">b. One or more than one internal light detecting element; <u>and</u></p> <p data-bbox="628 535 935 566">c. Optical waveguides;</p> <p data-bbox="544 584 1259 651">7. Field programmable logic devices having either of the following characteristics:</p> <p data-bbox="628 669 1259 736">a. A maximum number of single-ended digital inputs/outputs of greater than 700; <u>or</u></p> <p data-bbox="628 754 1259 822">b. An ‘aggregate one-way peak serial transceiver data rate’ of 500 Gb/s or greater;</p> <p data-bbox="604 840 663 871"><u>Note</u></p> <p data-bbox="604 880 1038 911"><i>Category Code 3A001.a.7. includes:</i></p> <ul data-bbox="628 929 1259 1193" style="list-style-type: none"> <li data-bbox="628 929 1259 965">– <i>Simple Programmable Logic Devices (SPLDs)</i></li> <li data-bbox="628 978 1259 1046">– <i>Complex Programmable Logic Devices (CPLDs)</i></li> <li data-bbox="628 1059 1259 1095">– <i>Field Programmable Gate Arrays (FPGAs)</i></li> <li data-bbox="628 1108 1259 1144">– <i>Field Programmable Logic Arrays (FPLAs)</i></li> <li data-bbox="628 1158 1259 1193">– <i>Field Programmable Interconnects (FPICs)</i></li> </ul> <p data-bbox="604 1211 663 1243"><u>N.B.</u></p> <p data-bbox="604 1252 1259 1386"><i>For integrated circuits having field programmable logic devices that are combined with an Analogue-to-Digital Converter (ADC), see Category Code 3A001.a.14.</i></p> <p data-bbox="604 1404 799 1435"><u>Technical Notes</u></p> <ol data-bbox="628 1444 1259 1762" style="list-style-type: none"> <li data-bbox="628 1444 1259 1615">1. <i>Maximum number of digital inputs/outputs in Category Code 3A001.a.7.a. is also referred to as the maximum user inputs/outputs or maximum available inputs/outputs, whether the integrated circuit is packaged or bare die.</i></li> <li data-bbox="628 1628 1259 1762">2. <i>‘Aggregate one-way peak serial transceiver data rate’ is the product of the peak serial one-way transceiver data rate times the number of transceivers on the FPGA.</i></li> </ol> <p data-bbox="544 1780 722 1812">8. Not used;</p> <p data-bbox="544 1825 1019 1856">9. Neural network integrated circuits;</p>



<i>Category Code</i>	<i>Item Description</i>
	<p>10. Custom integrated circuits for which the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Have more than 1,500 terminals;</li> <li>b. A typical “basic gate propagation delay time” of less than 0.02 ns; <u>or</u></li> <li>c. An operating frequency exceeding 3 GHz;</li> </ul> <p>11. Digital integrated circuits, other than those described in Category Codes 3A001.a.3. to 3A001.a.10. and 3A001.a.12., based upon any compound semiconductor and having either of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. An equivalent gate count of more than 3,000 (2 input gates); <u>or</u></li> <li>b. A toggle frequency exceeding 1.2 GHz;</li> </ul> <p>12. Fast Fourier Transform (FFT) processors having a rated execution time for an N-point complex FFT of less than <math>(N \log_2 N)/20,480</math> ms, where N is the number of points;</p> <p><i>Technical Note</i>  <i>When N is equal to 1,024 points, the formula in Category Code 3A001.a.12. gives an execution time of 500 <math>\mu</math>s.</i></p> <p>13. Direct Digital Synthesiser (DDS) integrated circuits having either of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. A ‘Digital-to-Analogue Converter (DAC) clock frequency’ of 3.5 GHz or more and a DAC resolution of 10 bit or more, but less than 12 bit; <u>or</u></li> <li>b. A ‘DAC clock frequency’ of 1.25 GHz or more and a DAC resolution of 12 bit or more;</li> </ul> <p><i>Technical Note</i>  <i>The ‘DAC clock frequency’ may be specified as the master clock frequency or the input clock frequency.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>14. Integrated circuits that perform both of the following:</p> <p>a. Analogue-to-digital conversions meeting any of the following:</p> <ol style="list-style-type: none"> <li>1. A resolution of 8 bit or more, but less than 10 bit, with an input sample rate greater than 1.3 giga samples per second (GSPS);</li> <li>2. A resolution of 10 bit or more, but less than 12 bit, with an input sample rate greater than 1 giga samples per second (GSPS);</li> <li>3. A resolution of 12 bit or more, but less than 14 bit, with an input sample rate greater than 1 giga samples per second (GSPS);</li> <li>4. A resolution of 14 bit or more, but less than 16 bit, with an input sample rate greater than 400 mega samples per second (MSPS); <u>or</u></li> <li>5. A resolution of 16 bit or more with an input sample rate greater than 180 mega samples per second (MSPS); <u>and</u></li> </ol> <p>b. Either of the following:</p> <ol style="list-style-type: none"> <li>1. Storage of digitised data; <u>or</u></li> <li>2. Processing of digitised data;</li> </ol> <p><u>N.B. 1</u>  <i>For Analogue-to-Digital Converter (ADC) integrated circuits, see Category Code 3A001.a.5.a.</i></p> <p><u>N.B. 2</u>  <i>For field programmable logic devices, see Category Code 3A001.a.7.</i></p>

Category Code	Item Description
	<p>b. Microwave or millimetre wave items, as follows:</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. For purpose of Category Code 3A001.b., the parameter peak saturated power output may also be referred to on product data sheets as output power, saturated power output, maximum power output, peak power output, or peak envelope power output.</li> <li>2. For purpose of Category Code 3A001.b.1., ‘vacuum electronic devices’ are electronic devices based on the interaction of an electron beam with an electromagnetic wave propagating in a vacuum circuit or interacting with Radio Frequency (RF) vacuum cavity resonators. ‘Vacuum electronic devices’ include klystrons, travelling-wave tubes, and their derivatives.</li> </ol> <ol style="list-style-type: none"> <li>1. ‘Vacuum electronic devices’ and cathodes, as follows: <p><u>Note 1</u></p> <p>Category Code 3A001.b.1. does not include ‘vacuum electronic devices’ designed or rated for operation in any frequency band and having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Does not exceed 31.8 GHz; <u>and</u></li> <li>b. Is “allocated by the ITU” for radio-communications services, but not for radio-determination.</li> </ol> <p><u>Note 2</u></p> <p>Category Code 3A001.b.1. does not include non-“space-qualified” ‘vacuum electronic devices’ having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. An average output power equal to or less than 50 W; <u>and</u></li> <li>b. Designed or rated for operation in any frequency band and having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Exceeds 31.8 GHz but does not exceed 43.5 GHz; <u>and</u></li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="691 454 1268 555">2. <i>Is “allocated by the ITU” for radio-communications services, but not for radio-determination.</i></p> <p data-bbox="628 573 1268 640">a. Travelling-wave ‘vacuum electronic devices’, pulsed or continuous wave, as follows:</p> <ol data-bbox="691 658 1268 1854" style="list-style-type: none"> <li data-bbox="691 658 1268 725">1. Devices operating at frequencies exceeding 31.8 GHz;</li> <li data-bbox="691 743 1268 833">2. Devices having a cathode heater with a turn on time to rated RF power of less than 3 seconds;</li> <li data-bbox="691 851 1268 990">3. Coupled cavity devices, or derivatives thereof, with a “fractional bandwidth” of more than 7% or a peak power exceeding 2.5 kW;</li> <li data-bbox="691 1008 1268 1608">4. Devices based on helix, folded waveguide, or serpentine waveguide circuits, or derivatives thereof, having any of the following characteristics: <ol data-bbox="767 1160 1268 1608" style="list-style-type: none"> <li data-bbox="767 1160 1268 1326">a. An “instantaneous bandwidth” of more than one octave, and average power (expressed in kW) times frequency (expressed in GHz) of more than 0.5;</li> <li data-bbox="767 1344 1268 1509">b. An “instantaneous bandwidth” of one octave or less, and average power (expressed in kW) times frequency (expressed in GHz) of more than 1;</li> <li data-bbox="767 1527 1268 1563">c. Being “space-qualified”; <u>or</u></li> <li data-bbox="767 1581 1268 1608">d. Having a gridded electron gun;</li> </ol> </li> <li data-bbox="691 1626 1268 1854">5. Devices with a “fractional bandwidth” greater than or equal to 10%, with any of the following: <ol data-bbox="767 1742 1268 1854" style="list-style-type: none"> <li data-bbox="767 1742 1268 1778">a. An annular electron beam;</li> <li data-bbox="767 1796 1268 1854">b. A non-axisymmetric electron beam; <u>or</u></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="767 454 1129 488">c. Multiple electron beams;</p> <p data-bbox="628 506 1259 568">b. Crossed-field amplifier ‘vacuum electronic devices’ with a gain of more than 17 dB;</p> <p data-bbox="628 586 1259 786">c. Thermionic cathodes designed for ‘vacuum electronic devices’ producing an emission current density at rated operating conditions exceeding 5 A/cm<sup>2</sup> or a pulsed (non-continuous) current density at rated operating conditions exceeding 10 A/cm<sup>2</sup>;</p> <p data-bbox="628 804 1259 866">d. ‘Vacuum electronic devices’ with the capability to operate in a ‘dual mode’.</p> <p data-bbox="692 884 874 918"><u>Technical Note</u></p> <p data-bbox="692 929 1259 1128"><i>‘Dual mode’ means the ‘vacuum electronic device’ beam current can be intentionally changed between continuous-wave and pulsed mode operation by use of a grid and produces a peak pulse output power greater than the continuous-wave output power.</i></p> <p data-bbox="544 1146 1259 1209">2. “Monolithic Microwave Integrated Circuits” (“MMIC”) amplifiers that are any of the following:</p> <p data-bbox="608 1227 660 1261"><u>N.B.</u></p> <p data-bbox="608 1272 1259 1335"><i>For “MMIC” amplifiers that have an integrated phase shifter, see Category Code 3A001.b.12.</i></p> <p data-bbox="628 1352 1259 1485">a. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz with a “fractional bandwidth” greater than 15%, and having any of the following characteristics:</p> <ol data-bbox="692 1503 1259 1783" style="list-style-type: none"> <li data-bbox="692 1503 1259 1635">1. A peak saturated power output greater than 75 W (48.75 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;</li> <li data-bbox="692 1653 1259 1783">2. A peak saturated power output greater than 55 W (47.4 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li data-bbox="691 454 1268 584">3. A peak saturated power output greater than 40 W (46 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; <u>or</u></li> <li data-bbox="691 607 1268 736">4. A peak saturated power output greater than 20 W (43 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;</li> <li data-bbox="627 759 1268 896">b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 16 GHz with a “fractional bandwidth” greater than 10%, and having either of the following characteristics: <ul style="list-style-type: none"> <li data-bbox="691 907 1268 1037">1. A peak saturated power output greater than 10 W (40 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz; <u>or</u></li> <li data-bbox="691 1059 1268 1153">2. A peak saturated power output greater than 5 W (37 dBm) at any frequency exceeding 8.5 GHz up to and including 16 GHz;</li> </ul> </li> <li data-bbox="627 1176 1268 1339">c. Rated for operation with a peak saturated power output greater than 3 W (34.77 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz, and with a “fractional bandwidth” of greater than 10%;</li> <li data-bbox="627 1361 1268 1491">d. Rated for operation with a peak saturated power output greater than 0.1 nW (-70 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;</li> <li data-bbox="627 1514 1268 1677">e. Rated for operation with a peak saturated power output greater than 1 W (30 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz, and with a “fractional bandwidth” of greater than 10%;</li> <li data-bbox="627 1700 1268 1859">f. Rated for operation with a peak saturated power output greater than 31.62 mW (15 dBm) at any frequency exceeding 43.5 GHz up to and including 75 GHz, and with a “fractional bandwidth” of greater than 10%;</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="628 454 1267 618">g. Rated for operation with a peak saturated power output greater than 10 mW (10 dBm) at any frequency exceeding 75 GHz up to and including 90 GHz, and with a “fractional bandwidth” of greater than 5%; <u>or</u></p> <p data-bbox="628 636 1267 734">h. Rated for operation with a peak saturated power output greater than 0.1 nW (-70 dBm) at any frequency exceeding 90 GHz;</p> <p data-bbox="604 754 687 786"><u>Note 1</u></p> <p data-bbox="604 795 719 826"><i>Not used.</i></p> <p data-bbox="604 846 687 878"><u>Note 2</u></p> <p data-bbox="604 887 1267 1052"><i>Whether any MMIC whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by Category Codes 3A001.b.2.a. to 3A001.b.2.h., is included in that Category is determined by the lowest peak saturated power output threshold.</i></p> <p data-bbox="604 1072 687 1104"><u>Note 3</u></p> <p data-bbox="604 1113 1267 1245"><i>Notes 1 and 2 in Category 3A mean that Category Code 3A001.b.2. does not include MMICs if they are specially designed for other applications, e.g. telecommunications, radar, automobiles.</i></p> <p data-bbox="544 1265 1267 1328">3. Discrete microwave transistors having any of the following characteristics:</p> <p data-bbox="628 1348 1267 1447">a. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz and having any of the following characteristics:</p> <ol data-bbox="692 1464 1267 1742" style="list-style-type: none"> <li data-bbox="692 1464 1267 1597">1. A peak saturated power output greater than 400 W (56 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;</li> <li data-bbox="692 1615 1267 1742">2. A peak saturated power output greater than 205 W (53.12 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>3. A peak saturated power output greater than 115 W (50.61 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; <u>or</u></li> <li>4. A peak saturated power output greater than 60 W (47.78 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;</li> </ul> <p>b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz and having any of the following characteristics:</p> <ul style="list-style-type: none"> <li>1. A peak saturated power output greater than 50 W (47 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz;</li> <li>2. A peak saturated power output greater than 15 W (41.76 dBm) at any frequency exceeding 8.5 GHz up to and including 12 GHz;</li> <li>3. A peak saturated power output greater than 40 W (46 dBm) at any frequency exceeding 12 GHz up to and including 16 GHz; <u>or</u></li> <li>4. A peak saturated power output greater than 7 W (38.45 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz;</li> </ul> <p>c. Rated for operation with a peak saturated power output greater than 0.5 W (27 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;</p> <p>d. Rated for operation with a peak saturated power output greater than 1 W (30 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz; <u>or</u></p>



Category Code	Item Description
	<p>e. Rated for operation with a peak saturated power output greater than 0.1 nW (-70 dBm) at any frequency exceeding 43.5 GHz;</p> <p><u>Note 1</u>  <i>Whether a transistor whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by Category Codes 3A001.b.3.a. to 3A001.b.3.e., is included under that Category is determined by the lowest peak saturated power output threshold.</i></p> <p><u>Note 2</u>  <i>Category Code 3A001.b.3. includes bare dice, dice mounted on carriers, or dice mounted in packages. Some discrete transistors may also be referred to as power amplifiers, but the status of these discrete transistors is determined by Category Code 3A001.b.3.</i></p> <p>4. Microwave solid state amplifiers and microwave assemblies/modules containing microwave solid state amplifiers, having any of the following characteristics:</p> <p>a. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz with a “fractional bandwidth” greater than 15%, and having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A peak saturated power output greater than 500 W (57 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;</li> <li>2. A peak saturated power output greater than 270 W (54.3 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;</li> <li>3. A peak saturated power output greater than 200 W (53 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; <u>or</u></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="691 454 1267 584">4. A peak saturated power output greater than 90 W (49.54 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;</p> <p data-bbox="627 607 1267 736">b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz with a “fractional bandwidth” greater than 10%, and having any of the following characteristics:</p> <ol data-bbox="691 759 1267 1337" style="list-style-type: none"> <li data-bbox="691 759 1267 889">1. A peak saturated power output greater than 70 W (48.54 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz;</li> <li data-bbox="691 911 1267 1041">2. A peak saturated power output greater than 50 W (47 dBm) at any frequency exceeding 8.5 GHz up to and including 12 GHz;</li> <li data-bbox="691 1064 1267 1193">3. A peak saturated power output greater than 30 W (44.77 dBm) at any frequency exceeding 12 GHz up to and including 16 GHz; <u>or</u></li> <li data-bbox="691 1216 1267 1346">4. A peak saturated power output greater than 20 W (43 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz;</li> </ol> <p data-bbox="627 1368 1267 1498">c. Rated for operation with a peak saturated power output greater than 0.5 W (27 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;</p> <p data-bbox="627 1520 1267 1675">d. Rated for operation with a peak saturated power output greater than 2 W (33 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz, and with a “fractional bandwidth” of greater than 10%;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>e. Rated for operation at frequencies exceeding 43.5 GHz and having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A peak saturated power output greater than 0.2 W (23 dBm) at any frequency exceeding 43.5 GHz up to and including 75 GHz, and with a “fractional bandwidth” of greater than 10%;</li> <li>2. A peak saturated power output greater than 20 mW (13 dBm) at any frequency exceeding 75 GHz up to and including 90 GHz, and with a “fractional bandwidth” of greater than 5%; <u>or</u></li> <li>3. A peak saturated power output greater than 0.1 nW (-70 dBm) at any frequency exceeding 90 GHz; <u>or</u></li> </ol> <p>f. Not used.</p> <p><u><i>N.B. 1</i></u>  <i>For “MMIC” amplifiers, see Category Code 3A001.b.2.</i></p> <p><u><i>N.B. 2</i></u>  <i>For ‘transmit/receive modules’ and ‘transmit modules’, see Category Code 3A001.b.12.</i></p> <p><u><i>Note 1</i></u>  <i>Not used.</i></p> <p><u><i>Note 2</i></u>  <i>Whether an item whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by Category Codes 3A001.b.4.a. to 3A001.b.4.e., is included in that Category is determined by the lowest peak saturated power output threshold.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="544 454 1264 786">5. Electronically or magnetically tunable band-pass or band-stop filters, having more than 5 tunable resonators capable of tuning across 1.5:1 frequency band (<math>f_{\max}/f_{\min}</math>) in less than 10 <math>\mu</math>s and having either of the following characteristics:               <ol style="list-style-type: none"> <li data-bbox="628 640 1264 703">a. A band-pass bandwidth of more than 0.5% of centre frequency; <u>or</u></li> <li data-bbox="628 723 1264 786">b. A band-stop bandwidth of less than 0.5% of centre frequency;</li> </ol> </li> <li data-bbox="544 804 719 835">6. Not used;</li> <li data-bbox="544 853 1264 1720">7. Converters and harmonic mixers having any of the following characteristics:               <ol style="list-style-type: none"> <li data-bbox="628 943 1264 1005">a. Designed to extend the frequency range of “signal analysers” beyond 90 GHz;</li> <li data-bbox="628 1025 1264 1285">b. Designed to extend the operating range of signal generators as follows:                   <ol style="list-style-type: none"> <li data-bbox="692 1106 959 1137">1. Beyond 90 GHz;</li> <li data-bbox="692 1158 1264 1285">2. To an output power greater than 100 mW (20 dBm) anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;</li> </ol> </li> <li data-bbox="628 1305 1264 1720">c. Designed to extend the operating range of network analysers as follows:                   <ol style="list-style-type: none"> <li data-bbox="692 1395 975 1426">1. Beyond 110 GHz;</li> <li data-bbox="692 1447 1264 1574">2. To an output power greater than 31.62 mW (15 dBm) anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;</li> <li data-bbox="692 1594 1264 1720">3. To an output power greater than 1 mW (0 dBm) anywhere within the frequency range exceeding 90 GHz but not exceeding 110 GHz; <u>or</u></li> </ol> </li> <li data-bbox="628 1740 1264 1803">d. Designed to extend the frequency range of microwave test receivers beyond 110 GHz;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>8. Microwave power amplifiers containing ‘vacuum electronic devices’ specified in Category Code 3A001.b.1. and having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Operating frequencies above 3 GHz;</li> <li>b. An average output power to mass ratio exceeding 80 W/kg; <u>and</u></li> <li>c. A volume of less than 400 cm<sup>3</sup>;</li> </ol> <p><i>Note</i>  <i>Category Code 3A001.b.8. does not include equipment designed or rated for operation in any frequency band which is “allocated by the ITU” for radio-communications services, but not for radio-determination.</i></p> <p>9. Microwave Power Modules (MPM), consisting of, at least, a travelling-wave ‘vacuum electronic device’, a “Monolithic Microwave Integrated Circuit” (“MMIC”) and an integrated electronic power conditioner and having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. A ‘turn-on time’ from off to fully operational in less than 10 seconds;</li> <li>b. A volume less than the maximum rated power in watts multiplied by 10 cm<sup>3</sup>/W; <u>and</u></li> <li>c. An “instantaneous bandwidth” greater than 1 octave (<math>f_{\max} &gt; 2f_{\min}</math>) and having either of the following characteristics: <ol style="list-style-type: none"> <li>1. For frequencies equal to or less than 18 GHz, an RF output power greater than 100 W; <u>or</u></li> <li>2. A frequency greater than 18 GHz;</li> </ol> </li> </ol> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. <i>To calculate the volume in Category Code 3A001.b.9.b., the following example is provided: for a maximum rated power of 20 W, the volume would be: <math>20\text{ W} \times 10\text{ cm}^3/\text{W} = 200\text{ cm}^3</math>.</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="628 454 1267 584">2. The ‘turn-on time’ in Category Code 3A001.b.9.a. refers to the time from fully-off to fully operational, i.e. it includes the warm-up time of the MPM.</p> <p data-bbox="544 607 1267 736">10. Oscillators or oscillator assemblies, specified to operate with a Single Sideband (SSB) phase noise, in dBc/Hz, less (better) than <math>-(126 + 20\log_{10}F - 20\log_{10}f)</math> anywhere within the range of <math>10 \text{ Hz} \leq F \leq 10 \text{ kHz}</math>;</p> <p data-bbox="603 759 788 786"><i>Technical Note</i></p> <p data-bbox="603 797 1267 898"><i>In Category Code 3A001.b.10., F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.</i></p> <p data-bbox="544 920 1267 1010">11. “Frequency synthesiser” “electronic assemblies” having a “frequency switching time” as specified by any of the following:</p> <ul style="list-style-type: none"> <li data-bbox="628 1032 900 1059">a. Less than 143 ps;</li> <li data-bbox="628 1081 1267 1211">b. Less than 100 <math>\mu\text{s}</math> for any frequency change exceeding 2.2 GHz within the synthesised frequency range exceeding 4.8 GHz but not exceeding 31.8 GHz;</li> <li data-bbox="628 1234 804 1261">c. Not used;</li> <li data-bbox="628 1283 1267 1413">d. Less than 500 <math>\mu\text{s}</math> for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 31.8 GHz but not exceeding 37 GHz;</li> <li data-bbox="628 1435 1267 1565">e. Less than 100 <math>\mu\text{s}</math> for any frequency change exceeding 2.2 GHz within the synthesised frequency range exceeding 37 GHz but not exceeding 90 GHz;</li> <li data-bbox="628 1588 836 1615">f. Not used; <u>or</u></li> </ul>

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	<p data-bbox="628 454 1259 517">g. Less than 1 ms within the synthesised frequency range exceeding 90 GHz;</p> <p data-bbox="604 537 660 566"><u>N.B.</u></p> <p data-bbox="604 577 1259 707"><i>For general purpose “signal analysers”, signal generators, network analysers and microwave test receivers, see Category Codes 3A002.c., 3A002.d., 3A002.e. and 3A002.f., respectively.</i></p> <p data-bbox="544 728 1259 857">12. ‘Transmit/receive modules’, ‘transmit/receive MMICs’, ‘transmit modules’, and ‘transmit MMICs’, rated for operation at frequencies above 2.7 GHz and having all of the following characteristics:</p> <p data-bbox="628 880 1259 1010">a. A peak saturated power output (in watts), <math>P_{\text{sat}}</math>, greater than 505.62 divided by the maximum operating frequency (in GHz) squared [<math>P_{\text{sat}} &gt; 505.62 \text{ W} \cdot \text{GHz}^2 / f_{\text{GHz}}^2</math>] for any channel;</p> <p data-bbox="628 1030 1259 1093">b. A “fractional bandwidth” of 5% or greater for any channel;</p> <p data-bbox="628 1113 1259 1274">c. Any planar side with length <math>d</math> (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [<math>d \leq 15 \text{ cm} \cdot \text{GHz} \cdot N / f_{\text{GHz}}</math>] where <math>N</math> is the number of transmit or transmit/receive channels; <u>and</u></p> <p data-bbox="628 1294 1259 1357">d. An electronically variable phase shifter per channel.</p> <p data-bbox="604 1377 799 1406"><u>Technical Notes</u></p> <p data-bbox="628 1417 1259 1547">1. A ‘transmit/receive module’ is a multifunction “electronic assembly” that provides bi-directional amplitude and phase control for transmission and reception of signals.</p> <p data-bbox="628 1568 1259 1666">2. A ‘transmit module’ is an “electronic assembly” that provides amplitude and phase control for transmission of signals.</p> <p data-bbox="628 1686 1259 1816">3. A ‘transmit/receive MMIC’ is a multifunction “MMIC” that provides bi-directional amplitude and phase control for transmission and reception of signals.</p>

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	<p data-bbox="628 454 1268 555">4. A 'transmit MMIC' is a "MMIC" that provides amplitude and phase control for transmission of signals.</p> <p data-bbox="628 568 1268 770">5. 2.7 GHz should be used as the lowest operating frequency (<math>f_{\text{GHz}}</math>) in the formula in Category Code 3A001.b.12.c. for transmit/receive or transmit modules that have a rated operation range extending downward to 2.7 GHz and below <math>[d \leq 15 \text{ cm} * \text{GHz} * N / 2.7 \text{ GHz}]</math>.</p> <p data-bbox="628 784 1268 1019">6. Category Code 3A001.b.12. applies to 'transmit/receive modules' or 'transmit modules' with or without a heat sink. The value of <math>d</math> in Category Code 3A001.b.12.c. does not include any portion of the 'transmit/receive module' or 'transmit module' that functions as a heat sink.</p> <p data-bbox="628 1032 1268 1234">7. 'Transmit/receive modules', or 'transmit modules', or 'transmit/receive MMICs' or 'transmit MMICs' may or may not have <math>N</math> integrated radiating antenna elements where <math>N</math> is the number of transmit or transmit/receive channels.</p> <p data-bbox="480 1256 1268 1323">c. Acoustic wave devices as follows and specially designed components therefor:</p> <p data-bbox="544 1346 1268 1435">1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices, having any of the following characteristics:</p> <p data-bbox="628 1458 1268 1491">a. A carrier frequency exceeding 6 GHz;</p> <p data-bbox="628 1514 1268 1603">b. A carrier frequency exceeding 1 GHz, but not exceeding 6 GHz, and having any of the following characteristics:</p> <p data-bbox="692 1626 1268 1693">1. A 'frequency side-lobe rejection' exceeding 65 dB;</p> <p data-bbox="692 1715 1268 1805">2. A product of the maximum delay time and the bandwidth (time in <math>\mu\text{s}</math> and bandwidth in MHz) of more than 100;</p> <p data-bbox="692 1827 1268 1856">3. A bandwidth greater than 250 MHz; <u>or</u></p>



<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="691 454 1251 488">4. A dispersive delay of more than 10 <math>\mu\text{s}</math>; <u>or</u></p> <p data-bbox="628 506 1251 568">c. A carrier frequency of 1 GHz or less and having any of the following characteristics:</p> <ol style="list-style-type: none"> <li data-bbox="691 586 1251 685">1. A product of the maximum delay time and the bandwidth (time in <math>\mu\text{s}</math> and bandwidth in MHz) of more than 100;</li> <li data-bbox="691 703 1251 736">2. A dispersive delay of more than 10 <math>\mu\text{s}</math>; <u>or</u></li> <li data-bbox="691 754 1251 853">3. A ‘frequency side-lobe rejection’ exceeding 65 dB and a bandwidth greater than 100 MHz;</li> </ol> <p data-bbox="608 871 788 904"><i>Technical Note</i></p> <p data-bbox="608 913 1251 976"><i>‘Frequency side-lobe rejection’ is the maximum rejection value specified in data sheet.</i></p> <ol style="list-style-type: none"> <li data-bbox="544 994 1251 1093">2. Bulk (volume) acoustic wave devices which permit the direct processing of signals at frequencies exceeding 6 GHz;</li> <li data-bbox="544 1111 1251 1281">3. Acoustic-optic “signal processing” devices employing interaction between acoustic waves (bulk wave or surface wave) and light waves which permit the direct processing of signals or images, including spectral analysis, correlation or convolution;</li> </ol> <p data-bbox="544 1299 603 1332"><i>Note</i></p> <p data-bbox="544 1341 1251 1440"><i>Category Code 3A001.c. does not include acoustic wave devices that are limited to a single band pass, low pass, high pass or notch filtering, or resonating function.</i></p> <p data-bbox="480 1458 1251 1650">d. Electronic devices and circuits containing components, manufactured from “superconductive” materials, specially designed for operation at temperatures below the “critical temperature” of at least one of the “superconductive” constituents and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li data-bbox="544 1668 1251 1805">1. Current switching for digital circuits using “superconductive” gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than <math>10^{-14}</math> J; <u>or</u></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000;</p> <p>e. High energy devices, as follows:</p> <p>1. 'Cells', as follows:</p> <p>a. 'Primary cells' having an 'energy density' exceeding 550 Wh/kg at 20°C;</p> <p>b. 'Secondary cells' having an 'energy density' exceeding 350 Wh/kg at 20°C;</p> <p><u>Technical Notes</u></p> <p>1. For the purpose of Category Code 3A001.e.1., 'energy density' (Wh/kg) is calculated from the nominal voltage multiplied by the nominal capacity in ampere-hours (Ah) divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in ohms and the mass in kilograms.</p> <p>2. For the purpose of Category Code 3A001.e.1., a 'cell' is defined as an electrochemical device, which has positive and negative electrodes, an electrolyte, and is a source of electrical energy. It is the basic building block of a battery.</p> <p>3. For the purpose of Category Code 3A001.e.1.a., a 'primary cell' is a 'cell' that is not designed to be charged by any other source.</p> <p>4. For the purpose of Category Code 3A001.e.1.b., a 'secondary cell' is a 'cell' that is designed to be charged by an external electrical source.</p> <p><u>Note</u></p> <p>Category Code 3A001.e.1. does not include batteries, including single-cell batteries.</p> <p>2. High energy storage capacitors, as follows:</p>

Category Code	Item Description
	<p data-bbox="603 454 660 488"><u>N.B.</u></p> <p data-bbox="603 495 1267 562">See also Category Code 3A201.a. and Division 2 of Part 1 of this Schedule.</p> <p data-bbox="627 577 1267 1346">           a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) and having all of the following characteristics:           <ol data-bbox="691 696 1267 898" style="list-style-type: none"> <li data-bbox="691 696 1267 763">1. A voltage rating equal to or more than 5 kV;</li> <li data-bbox="691 779 1267 846">2. An energy density equal to or more than 250 J/kg; <u>and</u></li> <li data-bbox="691 862 1267 898">3. A total energy equal to or more than 25 kJ;</li> </ol>           b. Capacitors with a repetition rate of 10 Hz or more (repetition rated capacitors) and having all of the following characteristics:           <ol data-bbox="691 1025 1267 1346" style="list-style-type: none"> <li data-bbox="691 1025 1267 1093">1. A voltage rating equal to or more than 5 kV;</li> <li data-bbox="691 1108 1267 1176">2. An energy density equal to or more than 50 J/kg;</li> <li data-bbox="691 1191 1267 1258">3. A total energy equal to or more than 100 J; <u>and</u></li> <li data-bbox="691 1274 1267 1346">4. A charge/discharge cycle life equal to or more than 10,000;</li> </ol> </p> <p data-bbox="539 1361 1267 1496">3. “Superconductive” electromagnets and solenoids, specially designed to be fully charged or discharged in less than one second and having all of the following characteristics:</p> <p data-bbox="603 1512 660 1545"><u>N.B.</u></p> <p data-bbox="603 1552 1007 1585">See also Category Code 3A201.b.</p> <p data-bbox="603 1601 660 1635"><u>Note</u></p> <p data-bbox="603 1641 1267 1776">Category Code 3A001.e.3. does not include “superconductive” electromagnets or solenoids specially designed for Magnetic Resonance Imaging (MRI) medical equipment.</p> <p data-bbox="627 1792 1267 1861">           a. Energy delivered during the discharge exceeding 10 kJ in the first second;         </p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Inner diameter of the current carrying windings of more than 250 mm; <u>and</u></p> <p>c. Rated for a magnetic induction of more than 8 T or “overall current density” in the winding of more than 300 A/mm<sup>2</sup>;</p> <p>4. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are “space-qualified”, having a minimum average efficiency exceeding 20% at an operating temperature of 301 K (28°C) under simulated ‘AM0’ illumination with an irradiance of 1,367 watts per square metre (W/m<sup>2</sup>);</p> <p><i>Technical Note</i>  ‘AM0’, or ‘Air Mass Zero’, refers to the spectral irradiance of sun light in the earth's outer atmosphere when the distance between the earth and sun is one astronomical unit (AU).</p> <p>f. Rotary input type absolute position encoders having an “accuracy” equal to or less (better) than 1 second of arc, and specially designed encoder rings, discs or scales therefor;</p> <p>g. Solid-state pulsed power switching thyristor devices and ‘thyristor modules’, using either electrically, optically, or electron radiation controlled switch methods and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A maximum turn-on current rate of rise (di/dt) greater than 30,000 A/μs and off-state voltage greater than 1,100 V; <u>or</u></li> <li>2. A maximum turn-on current rate of rise (di/dt) greater than 2,000 A/μs and having both of the following characteristics: <ol style="list-style-type: none"> <li>a. An off-state peak voltage equal to or greater than 3,000 V; <u>and</u></li> <li>b. A peak (surge) current equal to or greater than 3,000 A;</li> </ol> </li> </ol> <p><i>Note 1</i>  Category Code 3A001.g. includes:</p>

Category Code	Item Description
	<ul style="list-style-type: none"> <li>– Silicon Controlled Rectifiers (SCRs)</li> <li>– Electrical Triggering Thyristors (ETTs)</li> <li>– Light Triggering Thyristors (LTTs)</li> <li>– Integrated Gate Commutated Thyristors (IGCTs)</li> <li>– Gate Turn-off Thyristors (GTOs)</li> <li>– MOS Controlled Thyristors (MCTs)</li> <li>– Solidtrons</li> </ul> <p><u>Note 2</u> Category Code 3A001.g. does not include thyristor devices and ‘thyristor modules’ incorporated into equipment designed for civil railway or “civil aircraft” applications.</p> <p><u>Technical Note</u> For the purpose of Category Code 3A001.g., a ‘thyristor module’ contains one or more thyristor devices.</p> <p>h. Solid-state power semiconductor switches, diodes, or ‘modules’, having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Rated for a maximum operating junction temperature greater than 488 K (215°C);</li> <li>2. Repetitive peak off-state voltage (blocking voltage) exceeding 300 V; <u>and</u></li> <li>3. Continuous current greater than 1 A.</li> </ol> <p><u>Note 1</u> Repetitive peak off-state voltage in Category Code 3A001.h. includes drain to source voltage, collector to emitter voltage, repetitive peak reverse voltage and peak repetitive off-state blocking voltage.</p> <p><u>Note 2</u> Category Code 3A001.h. includes:</p> <ul style="list-style-type: none"> <li>– Junction Field Effect Transistors (JFETs)</li> <li>– Vertical Junction Field Effect Transistors (VJFETs)</li> <li>– Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)</li> </ul>

Category Code	Item Description
	<ul style="list-style-type: none"> <li>– Double Diffused Metal Oxide Semiconductor Field Effect Transistor (DMOSFET)</li> <li>– Insulated Gate Bipolar Transistor (IGBT)</li> <li>– High Electron Mobility Transistors (HEMTs)</li> <li>– Bipolar Junction Transistors (BJTs)</li> <li>– Thyristors and Silicon Controlled Rectifiers (SCRs)</li> <li>– Gate Turn-Off Thyristors (GTOs)</li> <li>– Emitter Turn-Off Thyristors (ETOs)</li> <li>– PiN Diodes</li> <li>– Schottky Diodes</li> </ul> <p><u>Note 3</u> Category Code 3A001.h. does not include switches, diodes, or ‘modules’, incorporated into equipment designed for civil automobile, civil railway or “civil aircraft” applications.</p> <p><u>Technical Note</u> For the purpose of Category Code 3A001.h., ‘modules’ contain one or more solid-state power semiconductor switches or diodes.</p>
3A002	<p>General purpose “electronic assemblies”, modules and equipment, as follows:</p> <p>a. Recording equipment and oscilloscopes, as follows:</p> <ol style="list-style-type: none"> <li>1. Not used;</li> <li>2. Not used;</li> <li>3. Not used;</li> <li>4. Not used;</li> <li>5. Not used;</li> <li>6. Digital data recorders having both of the following characteristics: <ol style="list-style-type: none"> <li>a. A sustained ‘continuous throughput’ of more than 6.4 Gbit/s to disk or solid-state drive memory; <u>and</u></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. A processor that performs analysis of Radio Frequency (RF) signal data while it is being recorded;</p> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. For recorders with a parallel bus architecture, the 'continuous throughput' rate is the highest word rate multiplied by the number of bits in a word.</li> <li>2. 'Continuous throughput' is the fastest data rate the instrument can record to disk or solid-state drive memory without the loss of any information while sustaining the input digital data rate or digitiser conversion rate.</li> </ol> <p>7. Real-time oscilloscopes having a vertical root-mean-square (rms) noise voltage of less than 2% of full-scale at the vertical scale setting that provides the lowest noise value for any input 3 dB bandwidth of 60 GHz or greater per channel;</p> <p><i>Note</i> Category Code 3A002.a.7. does not include equivalent-time sampling oscilloscopes.</p> <p>b. Not used;</p> <p>c. "Signal analysers", as follows:</p> <ol style="list-style-type: none"> <li>1. "Signal analysers" having a 3 dB resolution bandwidth (RBW) exceeding 10 MHz anywhere within the frequency range exceeding 31.8 GHz but not exceeding 37 GHz;</li> <li>2. "Signal analysers" having Displayed Average Noise Level (DANL) less (better) than -150 dBm/Hz anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;</li> <li>3. "Signal analysers" having a frequency exceeding 90 GHz;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>4. “Signal analysers” having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. “Real-time bandwidth” exceeding 170 MHz; <u>and</u></li> <li>b. Having either of the following characteristics: <ol style="list-style-type: none"> <li>1. 100% probability of discovery with less than a 3 dB reduction from full amplitude due to gaps or windowing effects of signals having a duration of 15 µs or less; <u>or</u></li> <li>2. A “frequency mask trigger” function with 100% probability of trigger (capture) for signals having a duration of 15 µs or less;</li> </ol> </li> </ol> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. <i>Probability of discovery in Category Code 3A002.c.4.b.1. is also referred to as probability of intercept or probability of capture.</i></li> <li>2. <i>For the purpose of Category Code 3A002.c.4.b.1., the duration for 100% probability of discovery is equivalent to the minimum signal duration necessary for the specified level measurement uncertainty.</i></li> </ol> <p><i>Note</i></p> <p><i>Category Code 3A002.c.4. does not include those “signal analysers” using only constant percentage bandwidth filters (also known as octave or fractional octave filters).</i></p> <p>5. Not used;</p> <p>d. Signal generators having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Specified to generate pulse-modulated signals having both of the following characteristics, anywhere within the frequency range exceeding 31.8 GHz but not exceeding 37 GHz: <ol style="list-style-type: none"> <li>a. ‘Pulse duration’ of less than 25 ns; <u>and</u></li> </ol> </li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>b. On/off ratio equal to or exceeding 65 dB;</p> <p>2. An output power exceeding 100 mW (20 dBm) anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;</p> <p>3. A “frequency switching time” as specified by any of the following:</p> <p>a. Not used;</p> <p>b. Less than 100 <math>\mu</math>s for any frequency change exceeding 2.2 GHz within the frequency range exceeding 4.8 GHz but not exceeding 31.8 GHz;</p> <p>c. Not used;</p> <p>d. Less than 500 <math>\mu</math>s for any frequency change exceeding 550 MHz within the frequency range exceeding 31.8 GHz but not exceeding 37 GHz; <u>or</u></p> <p>e. Less than 100 <math>\mu</math>s for any frequency change exceeding 2.2 GHz within the frequency range exceeding 37 GHz but not exceeding 90 GHz;</p> <p>f. Not used;</p> <p>4. Single Sideband (SSB) phase noise, in dBc/Hz, specified as being either of the following:</p> <p>a. Less (better) than <math>-(126 + 20\log_{10}F - 20\log_{10}f)</math> anywhere within the range of <math>10 \text{ Hz} \leq F \leq 10 \text{ kHz}</math> anywhere within the frequency range exceeding 3.2 GHz but not exceeding 90 GHz; <u>or</u></p> <p>b. Less (better) than <math>-(206 - 20\log_{10}f)</math> anywhere within the range of <math>10 \text{ kHz} &lt; F \leq 100 \text{ kHz}</math> anywhere within the frequency range exceeding 3.2 GHz but not exceeding 90 GHz; <u>or</u></p> <p><i>Technical Note</i> <i>In Category Code 3A002.d.4., F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.</i></p> <p>5. A maximum frequency exceeding 90 GHz;</p>

Category Code	Item Description
	<p><u>Note 1</u> For the purpose of Category Code 3A002.d., the term signal generators includes arbitrary waveform and function generators.</p> <p><u>Note 2</u> Category Code 3A002.d. does not include equipment in which the output frequency is either produced by the addition or subtraction of two or more crystal oscillator frequencies, or by an addition or subtraction followed by a multiplication of the result.</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. The maximum frequency of an arbitrary waveform or function generator is calculated by dividing the sample rate, in samples/second, by a factor of 2.5.</li> <li>2. For the purpose of Category Code 3A002.d.1.a., 'pulse duration' is defined as the time interval from the point on the leading edge that is 50% of the pulse amplitude to the point on the trailing edge that is 50% of the pulse amplitude.</li> </ol> <p>e. Network analysers having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. An output power exceeding 31.62 mW (15 dBm) anywhere within the operating frequency range exceeding 43.5 GHz but not exceeding 90 GHz;</li> <li>2. An output power exceeding 1 mW (0 dBm) anywhere within the operating frequency range exceeding 90 GHz but not exceeding 110 GHz;</li> <li>3. 'Non-linear vector measurement functionality' at frequencies exceeding 50 GHz but not exceeding 110 GHz; <u>or</u></li> </ol> <p><u>Technical Note</u> 'Non-linear vector measurement functionality' is an instrument's ability to analyse the test results of devices driven into the large-signal domain or the non-linear distortion range.</p> <ol style="list-style-type: none"> <li>4. A maximum operating frequency exceeding 110 GHz;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>f. Microwave test receivers having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A maximum operating frequency exceeding 110 GHz; <u>and</u></li> <li>2. Being capable of measuring amplitude and phase simultaneously;</li> </ol> <p>g. Atomic frequency standards being any of the following:</p> <ol style="list-style-type: none"> <li>1. “Space-qualified”;</li> <li>2. Non-rubidium and having a long-term stability less (better) than <math>1 \times 10^{-11}</math>/month; <u>or</u></li> <li>3. Non-“space-qualified” and having all of the following characteristics: <ol style="list-style-type: none"> <li>a. Being a rubidium standard;</li> <li>b. Long-term stability less (better) than <math>1 \times 10^{-11}</math>/month; <u>and</u></li> <li>c. Total power consumption of less than 1 W;</li> </ol> </li> </ol> <p>h. “Electronic assemblies”, modules, or equipment, specified to perform both of the following:</p> <ol style="list-style-type: none"> <li>1. Analogue-to-digital conversions meeting any of the following: <ol style="list-style-type: none"> <li>a. A resolution of 8 bit or more, but less than 10 bit, with an input sample rate greater than 1,300 million samples per second;</li> <li>b. A resolution of 10 bit or more, but less than 12 bit, with an input sample rate greater than 1,000 million samples per second;</li> <li>c. A resolution of 12 bit or more, but less than 14 bit, with an input sample rate greater than 1,000 million samples per second;</li> <li>d. A resolution of 14 bit or more but less than 16 bit, with an input sample rate greater than 400 million samples per second; <u>or</u></li> </ol> </li> </ol>

Category Code	Item Description
	<p>e. A resolution of 16 bit or more with an input sample rate greater than 180 million samples per second; <u>and</u></p> <p>2. Any of the following:</p> <p>a. Output of digitised data;</p> <p>b. Storage of digitised data; <u>or</u></p> <p>c. Processing of digitised data.</p> <p><u>N.B.</u>  <i>Digital data recorders, oscilloscopes, “signal analysers”, signal generators, network analysers and microwave test receivers, are specified in Category Codes 3A002.a.6., 3A002.a.7., 3A002.c., 3A002.d., 3A002.e. and 3A002.f., respectively.</i></p> <p><u>Technical Note</u>  <i>For multiple-channel “electronic assemblies” or modules, control status is determined by the highest single-channel specified performance of such multiple-channel “electronic assemblies” or modules.</i></p> <p><u>Note</u>  <i>Category Code 3A002.h. includes ADC cards, waveform digitisers, data acquisition cards, signal acquisition boards and transient recorders.</i></p>
3A003	<p>Spray cooling thermal management systems employing closed loop fluid handling and reconditioning equipment in a sealed enclosure where a dielectric fluid is sprayed onto electronic components using specially designed spray nozzles that are designed to maintain electronic components within their operating temperature range, and specially designed components therefor.</p>
3A101	<p>Electronic equipment, devices and components, other than those specified in Category Code 3A001, as follows:</p> <p>a. Analogue-to-Digital Converters (ADCs), usable in “missiles”, designed to meet military specifications for ruggedised equipment;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Accelerators capable of delivering electromagnetic radiation produced by bremsstrahlung from accelerated electrons of 2 MeV or greater, and systems containing those accelerators.</p> <p><i>Note</i>  <i>Category Code 3A101.b. does not include equipment specially designed for medical purposes.</i></p>
3A102	<p>‘Thermal batteries’ designed or modified for ‘missiles’.</p> <p><i>Technical Notes</i></p> <p>1. <i>In Category Code 3A102, ‘thermal batteries’ are single use batteries that contain a solid non-conducting inorganic salt as the electrolyte. These batteries incorporate a pyrolytic material that, when ignited, melts the electrolyte and activates the battery.</i></p> <p>2. <i>In Category Code 3A102, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
3A201	<p>Electronic components, other than those specified in Category Code 3A001, as follows:</p> <p>a. Capacitors having either of the following sets of characteristics:</p> <ol style="list-style-type: none"> <li>1. a. Voltage rating greater than 1.4 kV;</li> <li>b. Energy storage greater than 10 J;</li> <li>c. Capacitance greater than 0.5 <math>\mu\text{F}</math>; <u>and</u></li> <li>d. Series inductance less than 50 nH; <u>or</u></li> <li>2. a. Voltage rating greater than 750 V;</li> <li>b. Capacitance greater than 0.25 <math>\mu\text{F}</math>; <u>and</u></li> <li>c. Series inductance less than 10 nH;</li> </ol> <p>b. Superconducting solenoidal electromagnets having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Capable of creating magnetic fields greater than 2 T;</li> <li>2. A ratio of length to inner diameter greater than 2;</li> </ol>

Category Code	Item Description
	<p>3. Inner diameter greater than 300 mm; <u>and</u></p> <p>4. Magnetic field uniform to better than 1% over the central 50% of the inner volume;</p> <p><i>Note</i>  <i>Category Code 3A201.b. does not include magnets specially designed for and exported 'as parts of' medical nuclear magnetic resonance (NMR) imaging systems. For this purpose, the magnets and NMR imaging systems may be part of the same shipment or in separate shipments from different sources, provided the related export documents clearly specify that the separate shipments are dispatched 'as part of' the imaging systems.</i></p> <p>c. Flash X-ray generators or pulsed electron accelerators having either of the following sets of characteristics:</p> <ol style="list-style-type: none"> <li>1. a. An accelerator peak electron energy of 500 keV or greater but less than 25 MeV; <u>and</u></li> <li style="padding-left: 2em;">b. With a 'figure of merit' (K) of 0.25 or greater; <u>or</u></li> <li>2. a. An accelerator peak electron energy of 25 MeV or greater; <u>and</u></li> <li style="padding-left: 2em;">b. A 'peak power' greater than 50 MW.</li> </ol> <p><i>Note</i>  <i>Category Code 3A201.c. does not include accelerators that are component parts of devices designed for purposes other than electron beam or X-ray radiation (e.g. electron microscopy) nor those designed for medical purposes.</i></p>

Category Code	Item Description
	<p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. The 'figure of merit' <math>K</math> is defined as:  <math display="block">K = 1.7 \times 10^3 V^{2.65} Q</math> <p><math>V</math> is the peak electron energy in million electron volts.            If the accelerator beam pulse duration is less than or equal to <math>1 \mu\text{s}</math>, then <math>Q</math> is the total accelerated charge in Coulombs. If the accelerator beam pulse duration is greater than <math>1 \mu\text{s}</math>, then <math>Q</math> is the maximum accelerated charge in <math>1 \mu\text{s}</math>.  <math>Q</math> equals the integral of <math>i</math> with respect to <math>t</math>, over the lesser of <math>1 \mu\text{s}</math> or the time duration of the beam pulse (<math>Q = \int idt</math>), where <math>i</math> is beam current in amperes and <math>t</math> is time in seconds.</p> </li> <li>2. 'Peak power' = (peak potential in volts) <math>\times</math> (peak beam current in amperes).</li> <li>3. In machines based on microwave accelerating cavities, the time duration of the beam pulse is the lesser of <math>1 \mu\text{s}</math> or the duration of the bunched beam packet resulting from one microwave modulator pulse.</li> <li>4. In machines based on microwave accelerating cavities, the peak beam current is the average current in the time duration of a bunched beam packet.</li> </ol>
3A225	<p>Frequency changers or generators, other than those specified in Category Code 0B001.b.13., usable as a variable or fixed frequency motor drive, having all of the following characteristics:</p> <p><u>N.B.</u></p> <ol style="list-style-type: none"> <li>1. "Software" specially designed to enhance or release the performance of a frequency changer or generator to meet the characteristics of Category Code 3A225 is specified in Category Code 3D225.</li> <li>2. "Technology" in the form of codes or keys to enhance or release the performance of a frequency changer or generator to meet the characteristics of Category Code 3A225 is specified in Category Code 3E225.</li> </ol> <p>a. Multiphase output providing a power of 40 VA or greater;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Operating at a frequency of 600 Hz or more; <u>and</u></p> <p>c. Frequency control better (less) than 0.2%.</p> <p><u>Note</u></p> <p><i>Category Code 3A225 does not include frequency changers or generators if they have hardware, “software” or “technology” constraints that limit the performance to less than that specified above, provided they meet any of the following:</i></p> <ol style="list-style-type: none"> <li>1. <i>They need to be returned to the original manufacturer to make the enhancements or release the constraints;</i></li> <li>2. <i>They require “software” as specified in Category Code 3D225 to enhance or release the performance to meet the characteristics of Category Code 3A225; <u>or</u></i></li> <li>3. <i>They require “technology” in the form of keys or codes as specified in Category Code 3E225 to enhance or release the performance to meet the characteristics of Category Code 3A225.</i></li> </ol> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>Frequency changers in Category Code 3A225 are also known as converters or inverters.</i></li> <li>2. <i>Frequency changers in Category Code 3A225 may be marketed as Generators, Electronic Test Equipment, AC Power Supplies, Variable Speed Motors Drives, Variable Speed Drives (VSDs), Variable Frequency Drives (VFDs), Adjustable Frequency Drives (AFDs), or Adjustable Speed Drives (ASDs).</i></li> </ol>
3A226	<p>High-power direct current power supplies, other than those specified in Category Code 0B001.j.6., having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Capable of continuously producing, over a time period of 8 hours, 100 V or greater with current output of 500 A or greater; <u>and</u></li> <li>b. Current or voltage stability better than 0.1% over a time period of 8 hours.</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
3A227	<p>High-voltage direct current power supplies, other than those specified in Category Code 0B001.j.5., having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Capable of continuously producing, over a time period of 8 hours, 20 kV or greater with current output of 1 A or greater; <u>and</u></li> <li>b. Current or voltage stability better than 0.1% over a time period of 8 hours.</li> </ol>
3A228	<p>Switching devices, as follows:</p> <ol style="list-style-type: none"> <li>a. Cold-cathode tubes, whether gas filled or not, operating similarly to a spark gap, having all of the following characteristics: <ol style="list-style-type: none"> <li>1. Containing three or more electrodes;</li> <li>2. Anode peak voltage rating of 2.5 kV or more;</li> <li>3. Anode peak current rating of 100 A or more; <u>and</u></li> <li>4. Anode delay time of 10 <math>\mu</math>s or less;</li> </ol> <p><i>Note</i>  <i>Category Code 3A228 includes gas krytron tubes and vacuum sphytron tubes.</i></p> </li> <li>b. Triggered spark gaps having both of the following characteristics: <ol style="list-style-type: none"> <li>1. An anode delay time of 15 <math>\mu</math>s or less; <u>and</u></li> <li>2. Rated for a peak current of 500 A or more;</li> </ol> </li> <li>c. Modules or assemblies with a fast switching function, other than those specified in Category Code 3A001.g. or 3A001.h., having all of the following characteristics: <ol style="list-style-type: none"> <li>1. Anode peak voltage rating greater than 2 kV;</li> <li>2. Anode peak current rating of 500 A or more; <u>and</u></li> <li>3. Turn-on time of 1 <math>\mu</math>s or less.</li> </ol> </li> </ol>

Category Code	Item Description
3A229	<p>High-current pulse generators as follows:</p> <p><u>N.B.</u> See also Division 2 of Part 1 of this Schedule.</p> <p>a. Detonator firing sets (initiator systems, firesets), including electronically-charged, explosively-driven and optically-driven firing sets, other than those specified in Category Code 1A007.a., designed to drive multiple controlled detonators specified in Category Code 1A007.b.;</p> <p>b. Modular electrical pulse generators (pulsers) having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Designed for portable, mobile, or ruggedized-use;</li> <li>2. Capable of delivering their energy in less than 15 <math>\mu</math>s into loads of less than 40 ohms;</li> <li>3. Having an output greater than 100 A;</li> <li>4. No dimension greater than 30 cm;</li> <li>5. Weight less than 30 kg; <u>and</u></li> <li>6. Specified for use over an extended temperature range 223 K (-50°C) to 373 K (100°C) or specified as suitable for aerospace applications;</li> </ol> <p><u>Note</u> Category Code 3A229.b. includes xenon flash-lamp drivers.</p> <p>c. Micro-firing units having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. No dimension greater than 35 mm;</li> <li>2. Voltage rating of equal to or greater than 1 kV; <u>and</u></li> <li>3. Capacitance of equal to or greater than 100 nF.</li> </ol>
3A230	<p>High-speed pulse generators, and 'pulse heads' therefor, having both of the following characteristics:</p> <p>a. Output voltage greater than 6 V into a resistive load of less than 55 ohms; <u>and</u></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. 'Pulse transition time' less than 500 ps.</p> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. In Category Code 3A230, 'pulse transition time' is defined as the time interval between 10% and 90% voltage amplitude.</li> <li>2. 'Pulse heads' are impulse forming networks designed to accept a voltage step function and shape it into a variety of pulse forms that can include rectangular, triangular, step, impulse, exponential, or monocycle types. 'Pulse heads' can be an integral part of the pulse generator, they can be a plug-in module to the device or they can be an externally connected device.</li> </ol>
3A231	<p>Neutron generator systems, including tubes, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Designed for operation without an external vacuum system; <u>and</u></li> <li>b. Utilising either of the following: <ol style="list-style-type: none"> <li>1. Electrostatic acceleration to induce a tritium-deuterium nuclear reaction; <u>or</u></li> <li>2. Electrostatic acceleration to induce a deuterium-deuterium nuclear reaction and capable of an output of <math>3 \times 10^9</math> neutrons/s or greater.</li> </ol> </li> </ol>
3A232	<p>Multipoint initiation systems, other than those specified in Category Code 1A007, as follows:</p> <p><u>N.B.</u></p> <p><i>See also Division 2 of Part 1 of this Schedule.</i></p> <p><i>See Category Code 1A007.b. for detonators.</i></p> <ol style="list-style-type: none"> <li>a. Not used;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface over an area greater than 5,000 mm<sup>2</sup> from a single firing signal with an initiation timing spread over the surface of less than 2.5 µs.</p> <p><i>Note</i> Category Code 3A232 does not include detonators using only primary explosives, such as lead azide.</p>
3A233	<p>Mass spectrometers, other than those specified in Category Code 0B002.g., capable of measuring ions of 230 atomic mass units or greater and having a resolution of better than 2 parts in 230, as follows, and ion sources therefor:</p> <p>a. Inductively coupled plasma mass spectrometers (ICP/MS);</p> <p>b. Glow discharge mass spectrometers (GDMS);</p> <p>c. Thermal ionisation mass spectrometers (TIMS);</p> <p>d. Electron bombardment mass spectrometers having both of the following features:</p> <ol style="list-style-type: none"> <li>1. A molecular beam inlet system that injects a collimated beam of analyte molecules into a region of the ion source where the molecules are ionised by an electron beam; <u>and</u></li> <li>2. One or more 'cold traps' that can be cooled to a temperature of 193 K (-80°C);</li> </ol> <p>e. Not used;</p> <p>f. Mass spectrometers equipped with a microfluorination ion source designed for actinides or actinide fluorides.</p> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. <i>Electron bombardment mass spectrometers in Category Code 3A233.d. are also known as electron impact mass spectrometers or electron ionisation mass spectrometers.</i></li> </ol>

Category Code	Item Description
	<p>2. In Category Code 3A233.d.2., a 'cold trap' is a device that traps gas molecules by condensing or freezing them on cold surfaces. For the purpose of Category Code 3A233.d.2., a closed-loop gaseous helium cryogenic vacuum pump is not a 'cold trap'.</p>
3A234	<p>Striplines to provide low inductance path to detonators with the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Voltage rating greater than 2 kV; <u>and</u></li> <li>b. Inductance of less than 20 nH.</li> </ol>
<b>3B</b>	<b>Test, Inspection and Production Equipment</b>
3B001	<p>Equipment for the manufacturing of semiconductor devices or materials, as follows and specially designed components and accessories therefor:</p> <p><u>N.B.</u> See also Category Code 2B226.</p> <ol style="list-style-type: none"> <li>a. Equipment designed for epitaxial growth, as follows: <ol style="list-style-type: none"> <li>1. Equipment designed or modified to produce a layer of any material other than silicon with a thickness uniform to less than <math>\pm 2.5\%</math> across a distance of 75 mm or more;</li> </ol> <p><u>Note</u> Category Code 3B001.a.1. includes Atomic Layer Epitaxy (ALE) equipment.</p> <ol style="list-style-type: none"> <li>2. Metal Organic Chemical Vapour Deposition (MOCVD) reactors designed for compound semiconductor epitaxial growth of material having two or more of the following elements: aluminium, gallium, indium, arsenic, phosphorus, antimony, or nitrogen;</li> <li>3. Molecular beam epitaxial growth equipment using gas or solid sources;</li> </ol> </li> <li>b. Equipment designed for ion implantation and having any of the following characteristics: <ol style="list-style-type: none"> <li>1. Not used;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>2. Being designed and optimised to operate at a beam energy of 20 keV or more and a beam current of 10 mA or more for hydrogen, deuterium or helium implant;</li> <li>3. Direct write capability;</li> <li>4. A beam energy of 65 keV or more and a beam current of 45 mA or more for high energy oxygen implant into a heated semiconductor material “substrate”; <u>or</u></li> <li>5. Being designed and optimised to operate at a beam energy of 20 keV or more and a beam current of 10 mA or more for silicon implant into a semiconductor material “substrate” heated to 600°C or greater;</li> </ol> <p>c. Not used;</p> <p>d. Not used;</p> <p>e. Automatic loading multi-chamber central wafer handling systems, having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Interfaces for wafer input and output, to which more than two functionally different ‘semiconductor process tools’ specified in Category Code 3B001.a.1., 3B001.a.2., 3B001.a.3. or 3B001.b. are designed to be connected; <u>and</u></li> <li>2. Designed to form an integrated system in a vacuum environment for ‘sequential multiple wafer processing’;</li> </ol> <p><u>Note</u></p> <p><i>Category Code 3B001.e. does not include automatic robotic wafer handling systems specially designed for parallel wafer processing.</i></p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>For the purpose of Category Code 3B001.e., ‘semiconductor process tools’ refers to modular tools that provide physical processes for semiconductor production that are functionally different, such as deposition, implant or thermal processing.</i></li> </ol>

Category Code	Item Description
	<p>2. For the purpose of Category Code 3B001.e., 'sequential multiple wafer processing' means the capability to process each wafer in different 'semiconductor process tools', such as by transferring each wafer from one tool to a second tool and on to a third tool with the automatic loading multi-chamber central wafer handling systems.</p> <p>f. Lithography equipment as follows:</p> <p>1. Align and expose step and repeat (direct step on wafer) or step and scan (scanner) equipment for wafer processing using photo-optical or X-ray methods and having either of the following characteristics:</p> <p>a. A light source wavelength shorter than 193 nm; <u>or</u></p> <p>b. Capable of producing a pattern with a 'Minimum Resolvable Feature size' (MRF) of 45 nm or less;</p> <p><u>Technical Note</u> The 'Minimum Resolvable Feature size' (MRF) is calculated by the following formula:</p> $MRF = \frac{\left[ \begin{array}{c} \text{an exposure light source} \\ \text{wavelength in nm} \end{array} \right] \times [K \text{ factor}]}{\text{numerical aperture}}$ <p>where the K factor = 0.35</p> <p>2. Imprint lithography equipment capable of producing features of 45 nm or less;</p> <p><u>Note</u> Category Code 3B001.f.2. includes:</p> <ul style="list-style-type: none"> <li>– Micro contact printing tools</li> <li>– Hot embossing tools</li> <li>– Nano-imprint lithography tools</li> <li>– Step and Flash Imprint Lithography (S-FIL) tools</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. Equipment specially designed for mask making having both of the following:</p> <ol style="list-style-type: none"> <li>a. A deflected focused electron beam, ion beam or “laser” beam; <u>and</u></li> <li>b. Having any of the following characteristics: <ol style="list-style-type: none"> <li>1. A Full-Width Half-Maximum (FWHM) spot size smaller than 65 nm and an image placement less than 17 nm (mean + 3 sigma); <u>or</u></li> <li>2. Not used;</li> <li>3. A second-layer overlay error of less than 23 nm (mean + 3 sigma) on the mask;</li> </ol> </li> </ol> <p>4. Equipment designed for device processing using direct writing methods, having both of the following:</p> <ol style="list-style-type: none"> <li>a. A deflected focused electron beam; <u>and</u></li> <li>b. Having either of the following characteristics: <ol style="list-style-type: none"> <li>1. A minimum beam size equal to or smaller than 15 nm; <u>or</u></li> <li>2. An overlay error less than 27 nm (mean + 3 sigma);</li> </ol> </li> </ol> <p>g. Masks and reticles, designed for integrated circuits specified in Category Code 3A001;</p> <p>h. Multi-layer masks with a phase shift layer not specified in Category Code 3B001.g. and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Made on a mask “substrate blank” from glass specified as having less than 7 nm/cm birefringence; <u>or</u></li> <li>2. Designed to be used by lithography equipment having a light source wavelength less than 245 nm;</li> </ol> <p><u>Note</u>  <i>Category Code 3B001.h. does not include multi-layer masks with a phase shift layer designed for the fabrication of memory devices not specified in Category Code 3A001.</i></p>



<i>Category Code</i>	<i>Item Description</i>
3B002	<p>i. Imprint lithography templates designed for integrated circuits specified in Category Code 3A001.</p> <p>Test equipment specially designed for testing finished or unfinished semiconductor devices as follows and specially designed components and accessories therefor:</p> <p>a. For testing S-parameters of transistor devices at frequencies exceeding 31.8 GHz;</p> <p>b. Not used;</p> <p>c. For testing microwave integrated circuits specified in Category Code 3A001.b.2.</p>
<b>3C</b>	<b>Materials</b>
3C001	<p>Hetero-epitaxial materials consisting of a “substrate” having stacked epitaxially grown multiple layers of any of the following:</p> <p>a. Silicon (Si);</p> <p>b. Germanium (Ge);</p> <p>c. Silicon carbide (SiC); <u>or</u></p> <p>d. “III/V compounds” of gallium or indium.</p> <p><i>Note</i>  <i>Category Code 3C001.d. does not apply to a “substrate” having one or more P-type epitaxial layers of GaN, InGaN, AlGaN, InAlN, InAlGaN, GaP, GaAs, AlGaAs, InP, InGaP, AlInP or InGaAlP, independent of the sequence of the elements, except if the P-type epitaxial layer is between N-type layers.</i></p>
3C002	<p>Resist materials as follows and “substrates” coated with the following resists:</p> <p>a. Resists designed for semiconductor lithography as follows:</p> <p>1. Positive resists adjusted (optimised) for use at wavelengths less than 245 nm but equal to or greater than 15 nm;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Resists adjusted (optimised) for use at wavelengths less than 15 nm but greater than 1 nm;</p> <p>b. All resists designed for use with electron beams or ion beams, with a sensitivity of 0.01 <math>\mu\text{coulomb}/\text{mm}^2</math> or better;</p> <p>c. Not used;</p> <p>d. All resists optimised for surface imaging technologies;</p> <p>e. All resists designed or optimised for use with imprint lithography equipment specified in Category Code 3B001.f.2. that use either a thermal or photo-curable process.</p>
3C003	<p>Organo-inorganic compounds as follows:</p> <p>a. Organo-metallic compounds of aluminium, gallium or indium, having a purity (metal basis) better than 99.999%;</p> <p>b. Organo-arsenic, organo-antimony and organo-phosphorus compounds, having a purity (inorganic element basis) better than 99.999%.</p> <p><i>Note</i>  <i>Category Code 3C003 only includes compounds whose metallic, partly metallic or non-metallic element is directly linked to carbon in the organic part of the molecule.</i></p>
3C004	<p>Hydrides of phosphorus, arsenic or antimony, having a purity better than 99.999%, even diluted in inert gases or hydrogen.</p> <p><i>Note</i>  <i>Category Code 3C004 does not include hydrides containing 20% molar or more of inert gases or hydrogen.</i></p>
3C005	<p>Silicon carbide (SiC), gallium nitride (GaN), aluminium nitride (AlN) or aluminium gallium nitride (AlGaN) semiconductor “substrates”, or ingots, boules, or other preforms of those materials, having resistivities greater than 10,000 ohm-cm at 20°C.</p>

<i>Category Code</i>	<i>Item Description</i>
3C006	“Substrates” specified in Category Code 3C005 with at least one epitaxial layer of silicon carbide, gallium nitride, aluminium nitride or aluminium gallium nitride.
<b>3D</b>	<b>Software</b>
3D001	“Software” specially designed for the “development” or “production” of equipment specified in Category Codes 3A001.b. to 3A002.h. or Category 3B.
3D002	“Software” specially designed for the “use” of equipment specified in Category Code 3B001.a. to f., 3B002 or 3A225.
3D003	<p>‘Physics-based’ simulation “software” specially designed for the “development” of lithographic, etching or deposition processes for translating masking patterns into specific topographical patterns in conductors, dielectrics or semiconductor materials.</p> <p><i>Technical Note</i></p> <p><i>‘Physics-based’ in Category Code 3D003 means using computations to determine a sequence of physical cause and effect events based on physical properties (e.g. temperature, pressure, diffusion constants and semiconductor materials properties).</i></p> <p><i>Note</i></p> <p><i>Libraries, design attributes or associated data for the design of semiconductor devices or integrated circuits are considered as “technology”.</i></p>
3D004	“Software” specially designed for the “development” of equipment specified in Category Code 3A003.
3D101	“Software” specially designed or modified for the “use” of equipment specified in Category Code 3A101.b.

<i>Category Code</i>	<i>Item Description</i>
3D225	“Software” specially designed to enhance or release the performance of frequency changers or generators to meet the characteristics of Category Code 3A225.
<p data-bbox="373 618 414 651"><b>3E</b></p> <p data-bbox="352 667 435 701">3E001</p>	<p data-bbox="475 618 628 651"><b>Technology</b></p> <p data-bbox="475 667 1267 768">“Technology” (according to the General Technology Note) for the “development” or “production” of equipment or materials specified in Category 3A, 3B or 3C.</p> <p data-bbox="475 786 560 819"><u>Note 1</u></p> <p data-bbox="475 824 1267 898"><i>Category Code 3E001 does not include “technology” for equipment or components specified in Category Code 3A003.</i></p> <p data-bbox="475 909 560 943"><u>Note 2</u></p> <p data-bbox="475 947 1267 1055"><i>Category Code 3E001 does not include “technology” for integrated circuits specified in Category Codes 3A001.a.3. to 3A001.a.12., having both of the following characteristics:</i></p> <ul style="list-style-type: none"> <li data-bbox="475 1066 1094 1099">a. <i>Using “technology” at or above 0.13 μm; <u>and</u></i></li> <li data-bbox="475 1115 1267 1189">b. <i>Incorporating multi-layer structures with three or fewer metal layers.</i></li> </ul>
3E002	<p data-bbox="475 1249 1267 1480">“Technology” (according to the General Technology Note) other than that specified in Category Code 3E001, for the “development” or “production” of a “microprocessor microcircuit”, “microcomputer microcircuit” or microcontroller microcircuit core, having an Arithmetic Logic Unit (ALU) with an access width of 32 bits or more and any of the following features or characteristics:</p> <ul style="list-style-type: none"> <li data-bbox="475 1503 1267 1603">a. <i>A ‘vector processor unit’ designed to perform more than two calculations on floating-point vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously;</i></li> </ul> <p data-bbox="539 1619 727 1653"><u>Technical Note</u></p> <p data-bbox="539 1659 1267 1861"><i>A ‘vector processing unit’ is a processor element with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously, having at least one vector Arithmetic Logic Unit (ALU) and vector registers of at least 32 elements each.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Designed to perform more than four 64-bit or larger Floating-Point Operation (FPO) results per cycle; <u>or</u></p> <p>c. Designed to perform more than eight 16-bit fixed-point multiply-accumulate results per cycle (e.g. digital manipulation of analogue information that has been previously converted into digital form, also known as digital “signal processing”).</p> <p><u>Note 1</u> Category Code 3E002 does not include “technology” for multimedia extensions.</p> <p><u>Note 2</u> Category Code 3E002 does not include “technology” for micro-processor cores, having both of the following characteristics:</p> <p>a. Using “technology” at or above 0.13 <math>\mu\text{m}</math>; <u>and</u></p> <p>b. Incorporating multi-layer structures with five or fewer metal layers.</p> <p><u>Note 3</u> Category Code 3E002 includes “technology” for the “development” or “production” of digital signal processors and digital array processors.</p>
3E003	<p>Other “technology” for the “development” or “production” of the following:</p> <p>a. Vacuum microelectronic devices;</p> <p>b. Hetero-structure semiconductor electronic devices such as High Electron Mobility Transistors (HEMT), Hetero-Bipolar Transistors (HBT), quantum well and super lattice devices;</p> <p><u>Note</u> Category Code 3E003.b. does not include “technology” for High Electron Mobility Transistors (HEMT) operating at frequencies lower than 31.8 GHz and hetero-junction bipolar transistors (HBT) operating at frequencies lower than 31.8 GHz.</p> <p>c. “Superconductive” electronic devices;</p>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>d. Substrates of films of diamond for electronic components;</li> <li>e. Substrates of Silicon-On-Insulator (SOI) for integrated circuits in which the insulator is silicon dioxide;</li> <li>f. Substrates of silicon carbide for electronic components;</li> <li>g. ‘Vacuum electronic devices’ operating at frequencies of 31.8 GHz or higher.</li> </ul>
3E101	“Technology” (according to the General Technology Note) for the “use” of equipment or “software” specified in Category Code 3A001.a.1. or 2., 3A101, 3A102 or 3D101.
3E102	“Technology” (according to the General Technology Note) for the “development” of “software” specified in Category Code 3D101.
3E201	“Technology” (according to the General Technology Note) for the “use” of equipment specified in Category Codes 3A001.e.2., 3A001.e.3., 3A001.g., 3A201, 3A225 to 3A234.
3E225	“Technology”, in the form of codes or keys, to enhance or release the performance of frequency changers or generators to meet the characteristics of Category Code 3A225.

Category Code	Item Description
<b>CATEGORY 4 — COMPUTERS</b>	
<i>Note 1</i>	
Computers, related equipment and “software” performing telecommunications or “local area network” functions with the performance characteristics in Category 5 – Part 1 (Telecommunications) are also treated as coming within that Category.	
<i>Note 2</i>	
Control units which directly interconnect the buses or channels of Central Processing Units (CPUs), “main storage” or disk controllers are not regarded as telecommunications equipment described in Category 5 – Part 1 (Telecommunications).	
<u>N.B.</u>	
For “software” specially designed for packet switching, see Category Code 5D001.	
<b>4A</b>	<b>Systems, Equipment and Components</b>
4A001	<p>Electronic computers and related equipment, having the following characteristic, and “electronic assemblies” and specially designed components therefor:</p> <p><u>N.B.</u></p> <p>See also Category Code 4A101.</p> <p>a. Specially designed to have either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Rated for operation at an ambient temperature below 228 K (-45°C) or above 358 K (85°C); <u>or</u></li> </ol> <p><u>Note</u></p> <p>Category Code 4A001.a.1. does not apply to computers specially designed for civil automobile, railway train or “civil aircraft” applications.</p> <ol style="list-style-type: none"> <li>2. Radiation hardened to exceed any of the following specifications: <ol style="list-style-type: none"> <li>a. Total Dose                    <math>5 \times 10^3</math> Gy (silicon);</li> <li>b. Dose Rate Upset            <math>5 \times 10^6</math> Gy (silicon)/s; <u>or</u></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
4A003	<p data-bbox="619 454 1209 521">c. Single Event Upset <math>1 \times 10^{-8}</math> Error/bit/day;</p> <p data-bbox="598 539 1262 645"><u>Note</u> Category Code 4A001.a.2. does not include computers specially designed for “civil aircraft” applications.</p> <p data-bbox="472 663 651 689">b. Not used.</p> <p data-bbox="472 763 1262 857">“Digital computers”, “electronic assemblies”, and related equipment therefor, as follows, and specially designed components therefor:</p> <p data-bbox="472 880 1015 954"><u>Note 1</u> Category Code 4A003 includes the following:</p> <ul data-bbox="472 969 1102 1200" style="list-style-type: none"> <li>– ‘Vector processors’;</li> <li>– Array processors;</li> <li>– Digital signal processors;</li> <li>– Logic processors;</li> <li>– Equipment designed for “image enhancement”;</li> </ul> <p data-bbox="536 1216 1262 1458"><u>Technical Note</u> A ‘vector processor’ is defined as a processor with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 64-bit or larger numbers) simultaneously, having at least 2 vector functional units and at least 8 vector registers of at least 64 elements each.</p> <p data-bbox="472 1480 1262 1619"><u>Note 2</u> The control status of the “digital computers” and related equipment described in Category Code 4A003 is determined by the control status of other equipment or systems provided:</p> <ul data-bbox="472 1637 1262 1785" style="list-style-type: none"> <li>a. The “digital computers” or related equipment are essential for the operation of the other equipment or systems;</li> <li>b. The “digital computers” or related equipment are not a “principal element” of the other equipment or systems; <u>and</u></li> </ul>



Category Code	Item Description
	<p><u>N.B. 1</u>  <i>The control status of “signal processing” or “image enhancement” equipment specially designed for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the “principal element” criterion.</i></p> <p><u>N.B. 2</u>  <i>For the control status of “digital computers” or related equipment for telecommunications equipment, see Category 5 – Part 1 (Telecommunications).</i></p> <p>c. <i>The “technology” for the “digital computers” and related equipment is determined by Category 4E.</i></p> <p>a. Not used;</p> <p>b. “Digital computers” having an “Adjusted Peak Performance” (“APP”) exceeding 16 Weighted TeraFLOPS (WT);</p> <p>c. “Electronic assemblies” specially designed or modified for enhancing performance by aggregation of processors so that the “APP” of the aggregation exceeds the limit specified in Category Code 4A003.b.;</p> <p><u>Note 1</u>  <i>Category Code 4A003.c. includes only “electronic assemblies” and programmable interconnections not exceeding the limit specified in Category Code 4A003.b. when shipped as unintegrated “electronic assemblies”.</i></p> <p><u>Note 2</u>  <i>Category Code 4A003.c. does not include “electronic assemblies” specially designed for a product or family of products whose maximum configuration does not exceed the limit specified in Category Code 4A003.b.</i></p> <p>d. Not used;</p> <p>e. Not used;</p> <p>f. Not used;</p>

<i>Category Code</i>	<i>Item Description</i>
g.	Equipment specially designed for aggregating the performance of “digital computers” by providing external interconnections which allows communications at unidirectional data rates exceeding 2 Gbyte/s per link.  <i>Note</i> <i>Category Code 4A003.g. does not include internal interconnection equipment (e.g. backplanes and buses), passive interconnection equipment, “network access controllers” or “communications channel controllers”.</i>
4A004	Computers as follows and specially designed related equipment, “electronic assemblies” and components therefor:  a. “Systolic array computers”; b. “Neural computers”; c. “Optical computers”.
4A005	Systems, equipment, and components therefor, specially designed or modified for the generation, command and control, or delivery of “intrusion software”.
4A101	Analogue computers, “digital computers” or digital differential analysers, other than those specified in Category Code 4A001.a.1., which are ruggedised and designed or modified for use in space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.
4A102	“Hybrid computers” specially designed for modelling, simulation or design integration of space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.  <i>Note</i> <i>Category Code 4A102 only extends to equipment supplied with “software” specified in Category Code 7D103 or 9D103.</i>

<i>Category Code</i>	<i>Item Description</i>
<b>4B</b>	<p><b>Test, Inspection and Production Equipment</b></p> <p>None.</p>
<b>4C</b>	<p><b>Materials</b></p> <p>None.</p>
<b>4D</b>	<p><b>Software</b></p> <p><u>Note</u> For “software” for equipment described in other Categories, please see the appropriate Category.</p>
4D001	<p>“Software” as follows:</p> <ol style="list-style-type: none"> <li>a. “Software” specially designed or modified for the “development” or “production” of equipment or “software” specified in Category Codes 4A001 to 4A004, or Category 4D;</li> <li>b. “Software”, other than that specified in Category Code 4D001.a., specially designed or modified for the “development” or “production” of equipment, as follows: <ol style="list-style-type: none"> <li>1. “Digital computers” having an “Adjusted Peak Performance” (“APP”) exceeding 8 Weighted TeraFLOPS (WT);</li> <li>2. “Electronic assemblies” specially designed or modified for enhancing performance by aggregation of processors so that the “APP” of the aggregation exceeds the limit in Category Code 4D001.b.1.</li> </ol> </li> </ol> <p><u>Note</u> Please see Technical Note on calculation of “APP” immediately after Category Code 4E001.</p>
4D004	<p>“Software” specially designed or modified for the generation, command and control, or delivery of “intrusion software”.</p>

<i>Category Code</i>	<i>Item Description</i>
<b>4E</b>	<b>Technology</b>
4E001	<p>a. “Technology” (according to the General Technology Note) for the “development”, “production” or “use” of equipment or “software” specified in Category 4A or 4D;</p> <p>b. “Technology” (according to the General Technology Note), other than that specified in Category Code 4E001.a., for the “development” or “production” of equipment as follows:</p> <ol style="list-style-type: none"> <li>1. “Digital computers” having an “Adjusted Peak Performance” (“APP”) exceeding 8 Weighted TeraFLOPS (WT);</li> <li>2. “Electronic assemblies” specially designed or modified for enhancing performance by aggregation of processors so that the “APP” of the aggregation exceeds the limit in Category Code 4E001.b.1.;</li> </ol> <p>c. “Technology” for the “development” of “intrusion software”.</p> <p><u>Note</u> Please see Technical Note on calculation of “APP” immediately after Category Code 4E001.</p>

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TECHNICAL NOTE ON “ADJUSTED PEAK PERFORMANCE” (“APP”)

“APP” is an adjusted peak rate at which “digital computers” perform 64-bit or larger floating-point additions and multiplications.

“APP” is expressed in Weighted TeraFLOPS (WT), in units of  $10^{12}$  adjusted Floating-Point Operations (FPO) per second.

Abbreviations used in this Technical Note

n	number of processors in the “digital computer”
i	processor number (i,...n)
$t_i$	processor cycle time ( $t_i = 1/F_i$ )
$F_i$	processor frequency
$R_i$	peak floating-point calculating rate
$W_i$	architecture adjustment factor

Outline of “APP” calculation method

1. For each processor i, determine the peak number of 64-bit or larger Floating-Point Operations (FPO),  $FPO_i$ , performed per cycle for each processor in the “digital computer”.

Note

*In determining FPO, include only 64-bit or larger floating-point additions and/or multiplications. All Floating-Point Operations (FPO) must be expressed in operations per processor cycle; operations requiring multiple cycles may be expressed in fractional results per cycle. For processors not capable of performing calculations on floating-point operands of 64-bit or more, the effective calculating rate R is zero.*

2. Calculate the floating-point rate R for each processor  $R_i = FPO_i/t_i$ .
3. Calculate “APP” as “APP” =  $W_1 \times R_1 + W_2 \times R_2 + \dots + W_n \times R_n$ .
4. For ‘vector processors’,  $W_i = 0.9$ . For non-‘vector processors’,  $W_i = 0.3$ .

Note 1

*For processors that perform compound operations in a cycle, such as addition and multiplication, each operation is counted.*

Note 2

*For a pipelined processor the effective calculating rate R is the faster of the pipelined rate, once the pipeline is full, or the non-pipelined rate.*

Note 3

The calculating rate *R* of each contributing processor is to be calculated at its maximum value theoretically possible before the “APP” of the combination is derived. Simultaneous operations are assumed to exist when the computer manufacturer claims concurrent, parallel, or simultaneous operation or execution in a manual or brochure for the computer.

Note 4

Do not include processors that are limited to input/output and peripheral functions (e.g. disk drive, communication and video display) when calculating “APP”.

Note 5

“APP” values are not to be calculated for processor combinations (inter)connected by “Local Area Networks”, Wide Area Networks, I/O shared connections/devices, I/O controllers and any communication interconnection implemented by “software”.

Note 6

“APP” values must be calculated for processor combinations containing processors specially designed to enhance performance by aggregation, operating simultaneously and sharing memory.

Technical Notes

1. Aggregate all processors and accelerators operating simultaneously and located on the same die.
2. Processor combinations share memory when any processor is capable of accessing any memory location in the system through the hardware transmission of cache lines or memory words, without the involvement of any software mechanism, which may be achieved using “electronic assemblies” specified in Category Code 4A003.c.

Note 7

A ‘vector processor’ is defined as a processor with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 64-bit or larger numbers) simultaneously, having at least 2 vector functional units and at least 8 vector registers of at least 64 elements each.

Category Code	Item Description
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**CATEGORY 5 — TELECOMMUNICATIONS AND “INFORMATION SECURITY”**

**Part 1 — TELECOMMUNICATIONS**

Note 1

*Category 5 – Part 1 concerns components, test and “production” equipment and “software”, therefor which are specially designed for telecommunications equipment or systems.*

N.B.

*For “lasers” specially designed for telecommunications equipment or systems, see Category Code 6A005.*

Note 2

*“Digital computers”, related equipment or “software”, when essential for the operation and support of telecommunications equipment described in this Category, are regarded as specially designed components for the purposes of this Category, provided they are the standard models customarily supplied by the manufacturer. This includes operation, administration, maintenance, engineering or billing computer systems.*

<b>5A1</b>	<b>Systems, Equipment and Components</b>
5A001	<p>Telecommunications systems, equipment, components and accessories, as follows:</p> <p>a. Any type of telecommunications equipment having any of the following characteristics, functions or features:</p> <ol style="list-style-type: none"> <li>1. Specially designed to withstand transitory electronic effects or electromagnetic pulse effects, both arising from a nuclear explosion;</li> <li>2. Specially hardened to withstand gamma, neutron or ion radiation; <u>or</u></li> <li>3. Specially designed to operate outside the temperature range from 218 K (-55°C) to 397 K (124°C);</li> </ol> <p><u>Note</u> <i>Category Code 5A001.a.3. applies only to electronic equipment.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="542 459 598 481"><u>Note</u></p> <p data-bbox="542 492 1260 560"><i>Category Codes 5A001.a.2. and 5A001.a.3. do not include equipment designed or modified for use on board satellites.</i></p> <p data-bbox="478 571 1260 672">b. Telecommunications systems and equipment, and specially designed components and accessories therefor, having any of the following characteristics, functions or features:</p> <ol data-bbox="542 694 1260 1814" style="list-style-type: none"> <li data-bbox="542 694 1260 761">1. Being underwater untethered communications systems having any of the following characteristics:           <ol data-bbox="622 772 1260 1086" style="list-style-type: none"> <li data-bbox="622 772 1260 840">a. An acoustic carrier frequency outside the range from 20 kHz to 60 kHz;</li> <li data-bbox="622 851 1260 918">b. Using an electromagnetic carrier frequency below 30 kHz;</li> <li data-bbox="622 929 1260 974">c. Using electronic beam steering techniques; <u>or</u></li> <li data-bbox="622 985 1260 1086">d. Using “lasers” or light-emitting diodes (LEDs) with an output wavelength greater than 400 nm and less than 700 nm, in a “local area network”;</li> </ol> </li> <li data-bbox="542 1108 1260 1198">2. Being radio equipment operating in the 1.5 MHz to 87.5 MHz band and having both of the following characteristics:           <ol data-bbox="622 1220 1260 1668" style="list-style-type: none"> <li data-bbox="622 1220 1260 1321">a. Automatically predicting and selecting frequencies and “total digital transfer rates” per channel to optimise the transmission; <u>and</u></li> <li data-bbox="622 1332 1260 1668">b. Incorporating a linear power amplifier configuration having a capability to support multiple signals simultaneously at an output power of 1 kW or more in the frequency range of 1.5 MHz or more but less than 30 MHz, or 250 W or more in the frequency range of 30 MHz or more but not exceeding 87.5 MHz, over an “instantaneous bandwidth” of one octave or more and with an output harmonic and distortion content of better than -80 dB;</li> </ol> </li> <li data-bbox="542 1691 1260 1814">3. Being radio equipment employing “spread spectrum” techniques, including “frequency hopping” techniques, other than those specified in Category Code 5A001.b.4. and having either of the following characteristics:</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>a. User programmable spreading codes; <u>or</u></p> <p>b. A total transmitted bandwidth which is 100 or more times the bandwidth of any one information channel and in excess of 50 kHz;</p> <p><i>Note</i>  <i>Category Code 5A001.b.3.b. does not apply to radio equipment specially designed for use with any of the following:</i></p> <p>a. <i>Civil cellular radio-communications systems; <u>or</u></i></p> <p>b. <i>Fixed or mobile satellite earth stations for commercial civil telecommunications.</i></p> <p><i>Note</i>  <i>Category Code 5A001.b.3. does not include equipment designed to operate at an output power of 1 W or less.</i></p> <p>4. Being radio equipment employing ultra-wideband modulation techniques, having user programmable channelising codes, scrambling codes or network identification codes and having either of the following characteristics:</p> <p>a. A bandwidth exceeding 500 MHz; <u>or</u></p> <p>b. A “fractional bandwidth” of 20% or more;</p> <p>5. Being digitally controlled radio receivers having all of the following characteristics:</p> <p>a. Have more than 1,000 channels;</p> <p>b. A ‘channel switching time’ of less than 1 ms;</p> <p>c. Automatic searching or scanning of a part of the electromagnetic spectrum; <u>and</u></p> <p>d. Identification of the received signals or the type of transmitter; <u>or</u></p> <p><i>Note</i>  <i>Category Code 5A001.b.5. does not include radio equipment specially designed for use with civil cellular radio-communications systems.</i></p>

Category Code	Item Description
	<p data-bbox="603 452 790 483"><u>Technical Note</u></p> <p data-bbox="603 495 1268 728">'Channel switching time' means the time (i.e. delay) to change from one receiving frequency to another, to arrive at or within <math>\pm 0.05\%</math> of the final specified receiving frequency. Items having a specified frequency range of less than <math>\pm 0.05\%</math> around their centre frequency are defined to be incapable of channel frequency switching.</p> <p data-bbox="544 745 1268 842">6. Employing functions of digital "signal processing" to provide 'voice coding' output at rates of less than 700 bit/s;</p> <p data-bbox="603 862 799 893"><u>Technical Notes</u></p> <ol data-bbox="628 904 1268 1189" style="list-style-type: none"> <li data-bbox="628 904 1268 1001">1. For variable rate 'voice coding', Category Code 5A001.b.6. applies to the 'voice coding' output of continuous speech.</li> <li data-bbox="628 1021 1268 1189">2. For the purpose of Category Code 5A001.b.6., 'voice coding' is defined as the technique to take samples of human voice and then convert these samples into a digital signal, taking into account specific characteristics of human speech.</li> </ol> <p data-bbox="478 1207 1268 1303">c. Optical fibres of more than 500 m in length and specified by the manufacturer as being capable of withstanding a 'proof test' tensile stress of <math>2 \times 10^9</math> N/m<sup>2</sup> or more;</p> <p data-bbox="544 1323 598 1355"><u>N.B.</u></p> <p data-bbox="544 1364 1268 1426">For underwater umbilical cables, see Category Code 8A002.a.3.</p> <p data-bbox="544 1447 724 1478"><u>Technical Note</u></p> <p data-bbox="544 1489 1268 1722">'Proof Test': on-line or off-line production screen testing that dynamically applies a prescribed tensile stress over a 0.5 m to 3 m length of fibre at a running rate of 2 m/s to 5 m/s while passing between capstans approximately 150 mm in diameter. The ambient temperature is a nominal 293 K (20°C) and relative humidity 40%. Equivalent national standards may be used for executing the proof test.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. “Electronically steerable phased array antennae” having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Rated for operation above 31.8 GHz, but not exceeding 57 GHz, and having an Effective Radiated Power (ERP) equal to or greater than +20 dBm (22.15 dBm Effective Isotropic Radiated Power (EIRP));</li> <li>2. Rated for operation above 57 GHz, but not exceeding 66 GHz, and having an ERP equal to or greater than +24 dBm (26.15 dBm EIRP);</li> <li>3. Rated for operation above 66 GHz, but not exceeding 90 GHz, and having an ERP equal to or greater than +20 dBm (22.15 dBm EIRP); <u>or</u></li> <li>4. Rated for operation above 90 GHz;</li> </ol> <p><i>Note</i>  <i>Category Code 5A001.d. does not include “electronically steerable phased array antennae” for landing systems with instruments meeting ICAO standards covering Microwave Landing Systems (MLS).</i></p> <p>e. Radio direction finding equipment operating at frequencies above 30 MHz and having both of the following characteristics, and specially designed components therefor:</p> <ol style="list-style-type: none"> <li>1. “Instantaneous bandwidth” of 10 MHz or more; <u>and</u></li> <li>2. Capable of finding a Line Of Bearing (LOB) to non-cooperating radio transmitters with a signal duration of less than 1 ms;</li> </ol> <p>f. Mobile telecommunications interception or jamming equipment, and monitoring equipment therefor, as follows, and specially designed components therefor:</p> <ol style="list-style-type: none"> <li>1. Interception equipment designed for the extraction of voice or data, transmitted over the air interface;</li> <li>2. Interception equipment not specified in Category Code 5A001.f.1., designed for the extraction of client device or subscriber identifiers (e.g. IMSI, TIMSI or IMEI), signalling, or other metadata transmitted over the air interface;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. Jamming equipment specially designed or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunication services and performing any of the following:</p> <ul style="list-style-type: none"> <li>a. Simulate the functions of Radio Access Network (RAN) equipment;</li> <li>b. Detect and exploit specific characteristics of the mobile telecommunications protocol employed (e.g. GSM); <u>or</u></li> <li>c. Exploit specific characteristics of the mobile telecommunications protocol employed (e.g. GSM);</li> </ul> <p>4. RF monitoring equipment designed or modified to identify the operation of items specified in Category Code 5A001.f.1., 5A001.f.2. or 5A001.f.3.;</p> <p><u>Note</u>  <i>Category Codes 5A001.f.1. and 5A001.f.2. do not include any of the following:</i></p> <ul style="list-style-type: none"> <li>a. <i>Equipment specially designed for the interception of analogue Private Mobile Radio (PMR), IEEE 802.11 WLAN;</i></li> <li>b. <i>Equipment designed for mobile telecommunications network operators; <u>or</u></i></li> <li>c. <i>Equipment designed for the “development” or “production” of mobile telecommunications equipment or systems.</i></li> </ul> <p><u>N.B. 1</u>  <i>See also Division 2 of Part 1 of this Schedule.</i></p> <p><u>N.B. 2</u>  <i>For radio receivers, see Category Code 5A001.b.5.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="480 454 1262 584">g. Passive Coherent Location (PCL) systems or equipment, specially designed for detecting and tracking moving objects by measuring reflections of ambient Radio Frequency (RF) emissions, supplied by non-radar transmitters;</p> <p data-bbox="544 607 727 633"><i>Technical Note</i></p> <p data-bbox="544 647 1262 707"><i>Non-radar transmitters may include commercial radio, television or cellular telecommunications base stations.</i></p> <p data-bbox="544 730 603 757"><i>Note</i></p> <p data-bbox="544 770 1262 831"><i>Category Code 5A001.g. does not include either of the following:</i></p> <p data-bbox="544 853 1018 880"><i>a. Radio-astronomical equipment; or</i></p> <p data-bbox="544 902 1262 963"><i>b. Systems or equipment, that require any radio transmission from the target.</i></p> <p data-bbox="480 985 1262 1046">h. Counter Improvised Explosive Device (IED) equipment and related equipment, as follows:</p> <p data-bbox="544 1068 1262 1198">1. Radio Frequency (RF) transmitting equipment, not specified in Category Code 5A001.f., designed or modified for prematurely activating or preventing the initiation of Improvised Explosive Devices (IEDs);</p> <p data-bbox="544 1220 1262 1350">2. Equipment using techniques designed to enable radio communications in the same frequency channels on which co-located equipment specified in Category Code 5A001.h.1. is transmitting;</p> <p data-bbox="544 1373 603 1400"><i>N.B.</i></p> <p data-bbox="544 1413 1082 1440"><i>See also Division 2 of Part 1 of this Schedule.</i></p> <p data-bbox="480 1462 659 1489">i. Not used;</p> <p data-bbox="480 1512 1262 1610">j. Internet Protocol (IP) network communications surveillance systems or equipment, and specially designed components therefor, having both of the following characteristics:</p> <p data-bbox="544 1632 1262 1731">1. Performing all of the following on a carrier class Internet Protocol (IP) network (e.g. national grade IP backbone):</p> <p data-bbox="624 1753 1262 1845">a. Analysis at the application layer (e.g. Layer 7 of Open Systems Interconnection (OSI) model (Ref. ISO/IEC 7498-1));</p>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>b. Extraction of selected metadata and application content (e.g. voice, video, messages, attachments); <u>and</u></li> <li>c. Indexing of extracted data; <u>and</u></li> </ul> <p>2. Being specially designed to carry out both of the following:</p> <ul style="list-style-type: none"> <li>a. Execution of searches on the basis of ‘hard selectors’; <u>and</u></li> </ul> <p><i>Technical Note</i>  ‘Hard selectors’ means data or set of data, related to an individual (e.g. family name, given name, e-mail, street address, phone number or group affiliations).</p> <ul style="list-style-type: none"> <li>b. Mapping of the relational network of an individual or of a group of people.</li> </ul> <p><i>Note</i>  Category Code 5A001.j. does not include systems or equipment, specially designed for any of the following:</p> <ul style="list-style-type: none"> <li>a. Marketing purposes;</li> <li>b. Network Quality of Service (QoS); <u>or</u></li> <li>c. Quality of Experience (QoE).</li> </ul>
5A101	<p>Telemetry and telecontrol equipment, including ground equipment, designed or modified for ‘missiles’.</p> <p><i>Technical Note</i>  In Category Code 5A101, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p> <p><i>Note</i>  Category Code 5A101 does not include:</p> <ul style="list-style-type: none"> <li>a. Equipment designed or modified for manned aircraft or satellites;</li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. <i>Ground based equipment designed or modified for terrestrial or marine applications;</i></p> <p>c. <i>Equipment designed for commercial, civil or ‘Safety of Life’ (e.g. data integrity, flight safety) GNSS services.</i></p>
<b>5B1</b>	<b>Test, Inspection and Production Equipment</b>
5B001	<p>Telecommunications test, inspection and production equipment, components and accessories, as follows:</p> <p>a. Equipment and specially designed components or accessories therefor, specially designed for the “development” or “production” of equipment, functions or features, specified in Category Code 5A001;</p> <p><i>Note</i> <i>Category Code 5B001.a. does not include optical fibre characterisation equipment.</i></p> <p>b. Equipment and specially designed components or accessories therefor, specially designed for the “development” of any of the following telecommunication transmission or switching equipment:</p> <ol style="list-style-type: none"> <li>1. Not used;</li> <li>2. Equipment employing a “laser” and having any of the following characteristics: <ol style="list-style-type: none"> <li>a. A transmission wavelength exceeding 1,750 nm;</li> <li>b. Not used;</li> <li>c. Not used;</li> <li>d. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz; <u>or</u></li> </ol> </li> </ol> <p><i>Note</i> <i>Category Code 5B001.b.2.d. does not include equipment specially designed for the “development” of commercial TV systems.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	3. Not used; 4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 1,024; 5. Not used.
<b>5C1</b>	<b>Materials</b> None.
<b>5D1</b>	<b>Software</b>
5D001	“Software” as follows: a. “Software” specially designed or modified for the “development”, “production” or “use” of equipment, functions or features, specified in Category Code 5A001; b. Not used; c. Specific “software” specially designed or modified to provide characteristics, functions or features of equipment, specified in Category Code 5A001 or 5B001; d. “Software” specially designed or modified for the “development” of any of the following telecommunication transmission or switching equipment: 1. Not used; 2. Equipment employing a “laser” and having either of the following characteristics: a. A transmission wavelength exceeding 1,750 nm; <u>or</u> b. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz; <u>or</u> <u>Note</u> Category Code 5D001.d.2.b. does not include “software” specially designed or modified for the “development” of commercial TV systems.



<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>3. Not used;</li> <li>4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 1,024.</li> </ol>
5D101	“Software” specially designed or modified for the “use” of equipment specified in Category Code 5A101.
<b>5E1</b>	<b>Technology</b>
5E001	<p>“Technology”, as follows:</p> <ol style="list-style-type: none"> <li>a. “Technology” (according to the General Technology Note) for the “development”, “production” or “use” (excluding operation) of equipment, functions or features specified in Category Code 5A001 or “software” specified in Category Code 5D001.a.;</li> <li>b. Specific “technology” as follows: <ol style="list-style-type: none"> <li>1. “Technology” “required” for the “development” or “production” of telecommunications equipment specially designed to be used on board satellites;</li> <li>2. “Technology” for the “development” or “use” of “laser” communication techniques with the capability of automatically acquiring and tracking signals and maintaining communications through exoatmosphere or sub-surface (water) media;</li> <li>3. “Technology” for the “development” of digital cellular radio base station receiving equipment whose reception capabilities that allow multi-band, multi-channel, multi-mode, multi-coding algorithm or multi-protocol operation can be modified by changes in “software”;</li> <li>4. “Technology” for the “development” of “spread spectrum” techniques, including “frequency hopping” techniques;</li> </ol> </li> </ol> <p><i>Note</i>  Category Code 5E001.b.4. does not apply to “technology” for the “development” of either of the following:</p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="628 454 1272 488">a. <i>Civil cellular radio-communications systems; or</i></p> <p data-bbox="628 501 1272 566">b. <i>Fixed or mobile satellite earth stations for commercial civil telecommunications.</i></p> <p data-bbox="480 584 1272 685">c. “Technology” (according to the General Technology Note) for the “development” or “production” of any of the following:</p> <ol style="list-style-type: none"> <li data-bbox="544 701 724 734">1. Not used;</li> <li data-bbox="544 750 1272 815">2. Equipment employing a “laser” and having any of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="628 831 1272 864">a. A transmission wavelength exceeding 1,750 nm;</li> <li data-bbox="628 880 807 913">b. Not used;</li> <li data-bbox="628 929 807 963">c. Not used;</li> <li data-bbox="628 978 1272 1079">d. Employing wavelength division multiplexing techniques of optical carriers at less than 100 GHz spacing; <u>or</u></li> <li data-bbox="628 1095 1272 1160">e. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz;</li> </ol> </li> </ol> <p data-bbox="692 1176 751 1209"><u>Note</u></p> <p data-bbox="692 1225 1272 1290"><i>Category Code 5E001.c.2.e. does not include “technology” for commercial TV systems.</i></p> <p data-bbox="608 1305 667 1339"><u>N.B.</u></p> <p data-bbox="608 1355 1272 1442"><i>For “technology” for the “development” or “production” of non-telecommunications equipment employing a laser, see Category 6E.</i></p> <ol style="list-style-type: none"> <li data-bbox="544 1458 1272 1523">3. Equipment employing “optical switching” and having a switching time less than 1 ms;</li> <li data-bbox="544 1538 1272 1603">4. Radio equipment having any of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="628 1619 1272 1684">a. Quadrature-Amplitude-Modulation (QAM) techniques above level 1,024;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Operating at input or output frequencies exceeding 31.8 GHz; <u>or</u></p> <p><i>Note</i>  <i>Category Code 5E001.c.4.b. does not include “technology” for equipment designed or modified for operation in any frequency band which is “allocated by the ITU” for radio-communications services, but not for radio-determination.</i></p> <p>c. Operating in the 1.5 MHz to 87.5 MHz band and incorporating adaptive techniques providing more than 15 dB suppression of an interfering signal; <u>or</u></p> <p>5. Not used;</p> <p>6. Mobile equipment having both of the following characteristics:</p> <p>a. Operating at an optical wavelength greater than or equal to 200 nm and less or equal to 400 nm; <u>and</u></p> <p>b. Operating as a “local area network”;</p> <p>d. “Technology” (according to the General Technology Note) for the “development” or “production” of “Monolithic Microwave Integrated Circuit” (“MMIC”) amplifiers specially designed for telecommunications and having any of the following characteristics:</p> <p><i>Technical Note</i>  <i>For the purpose of Category Code 5E001.d., the parameter peak saturated power output may also be referred to on product data sheets as output power, saturated power output, maximum power output, peak power output, or peak envelope power output.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="542 448 1268 1052">1. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz with a “fractional bandwidth” greater than 15%, and having any of the following characteristics:               <ol style="list-style-type: none"> <li data-bbox="622 604 1268 705">a. A peak saturated power output greater than 75 W (48.75 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;</li> <li data-bbox="622 716 1268 817">b. A peak saturated power output greater than 55 W (47.4 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;</li> <li data-bbox="622 828 1268 929">c. A peak saturated power output greater than 40 W (46 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; <u>or</u></li> <li data-bbox="622 940 1268 1052">d. A peak saturated power output greater than 20 W (43 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;</li> </ol> </li> <li data-bbox="542 1064 1268 1433">2. Rated for operation at frequencies exceeding 6.8 GHz up to and including 16 GHz with a “fractional bandwidth” greater than 10%, and having either of the following characteristics:               <ol style="list-style-type: none"> <li data-bbox="622 1220 1268 1321">a. A peak saturated power output greater than 10 W (40 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz; <u>or</u></li> <li data-bbox="622 1332 1268 1433">b. A peak saturated power output greater than 5 W (37 dBm) at any frequency exceeding 8.5 GHz up to and including 16 GHz;</li> </ol> </li> <li data-bbox="542 1444 1268 1579">3. Rated for operation with a peak saturated power output greater than 3 W (34.77 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz, and with a “fractional bandwidth” of greater than 10%;</li> <li data-bbox="542 1590 1268 1702">4. Rated for operation with a peak saturated power output greater than 0.1 nW (-70 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;</li> <li data-bbox="542 1713 1268 1848">5. Rated for operation with a peak saturated power output greater than 1 W (30 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz, and with a “fractional bandwidth” of greater than 10%;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>6. Rated for operation with a peak saturated power output greater than 31.62 mW (15 dBm) at any frequency exceeding 43.5 GHz up to and including 75 GHz, and with a “fractional bandwidth” of greater than 10%;</li> <li>7. Rated for operation with a peak saturated power output greater than 10 mW (10 dBm) at any frequency exceeding 75 GHz up to and including 90 GHz, and with a “fractional bandwidth” of greater than 5%; <u>or</u></li> <li>8. Rated for operation with a peak saturated power output greater than 0.1 nW (-70 dBm) at any frequency exceeding 90 GHz;</li> </ol> <p>e. “Technology” (according to the General Technology Note) for the “development” or “production” of electronic devices and circuits, specially designed for telecommunications and containing components manufactured from “superconductive” materials, specially designed for operation at temperatures below the “critical temperature” of at least one of the “superconductive” constituents and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Current switching for digital circuits using “superconductive” gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than <math>10^{-14}</math> J; <u>or</u></li> <li>2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000.</li> </ol>
5E101	“Technology” (according to the General Technology Note) for the “development”, “production” or “use” of equipment specified in Category Code 5A101.

Category Code	Item Description
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**Part 2 — “INFORMATION SECURITY”**

Note 1

Not used.

Note 2

Category 5 – Part 2 does not include products when accompanying their user for the user’s personal use.

Note 3

*Cryptography Note*

Category Codes 5A002, 5D002.a.1., 5D002.b. and 5D002.c.1. do not include goods as follows:

- a. Goods that meet all of the following:
  1. Generally available to the public by being sold, without restriction, from stock at retail selling points by means of any of the following:
    - a. Over-the-counter transactions;
    - b. Mail order transactions;
    - c. Electronic transactions; or
    - d. Telephone call transactions;
  2. The cryptographic functionality cannot easily be changed by the user; and
  3. Designed for installation by the user without further substantial support by the supplier;
- b. Hardware components or ‘executable software’, of existing goods described in paragraph a. of this Note, that have been designed for these existing items, meeting all of the following:
  1. “Information security” is not the primary function or set of functions of the component or ‘executable software’;
  2. The component or ‘executable software’ does not change any cryptographic functionality of the existing items, or add new cryptographic functionality to the existing items; and
  3. The feature set of the component or ‘executable software’ is fixed and is not designed or modified to customer specification.

Category Code	Item Description
	<p><u>Technical Note</u></p> <p><i>For the purpose of the Cryptography Note, ‘executable software’ means “software” in executable form, from an existing hardware component excluded from Category Code 5A002 by the Cryptography Note.</i></p> <p><u>Note</u></p> <p><i>‘Executable software’ does not include complete binary images of the “software” running on an end-item.</i></p> <p><u>Note to the Cryptography Note</u></p> <ol style="list-style-type: none"> <li>1. <i>To meet paragraph a. of Note 3, both of the following must apply:</i> <ol style="list-style-type: none"> <li>a. <i>The item is of potential interest to a wide range of individuals and businesses; <u>and</u></i></li> <li>b. <i>The price and information about the main functionality of the item are available before purchase without the need to consult the vendor or supplier. A simple price enquiry is not considered to be a consultation.</i></li> </ol> </li> <li>2. <i>In determining eligibility of paragraph a. of Note 3, factors such as quantity, price, required technical skill, existing sales channels, typical customers, typical use or any exclusionary practices of the supplier may be taken into account.</i></li> </ol>
<p><b>5A2</b></p> <p>5A002</p>	<p><b>Systems, Equipment and Components</b></p> <p>“Information security” systems, equipment and components, as follows:</p> <p><u>N.B.</u></p> <p><i>For Global Navigation Satellite Systems (GNSS) receiving equipment containing or employing decryption, see Category Code 7A005 and for related decryption “software” and “technology”, see Category Codes 7D005 and 7E001.</i></p> <ol style="list-style-type: none"> <li>a. <i>Designed or modified to use ‘cryptography for data confidentiality’ having ‘in excess of 56 bits of symmetric key length, or equivalent’, where that cryptographic capability is usable without “cryptographic activation” or has been activated, as follows:</i> <ol style="list-style-type: none"> <li>1. <i>Items having “information security” as a primary function;</i></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="544 454 1272 555">2. Digital communication or networking systems, equipment or components, not specified in Category Code 5A002.a.1.;</p> <p data-bbox="544 568 1272 703">3. Computers, other items having information storage or processing as a primary function, and components therefor, not specified in Category Code 5A002.a.1. or 5A002.a.2.;</p> <p data-bbox="604 719 663 752"><u><i>N.B.</i></u></p> <p data-bbox="604 763 1272 826"><i>For operating systems, see also Category Codes 5D002.a.1. and 5D002.c.1.</i></p> <p data-bbox="544 844 1272 1010">4. Items, not specified in Category Codes 5A002.a.1. to 5A002.a.3., where the ‘cryptography for data confidentiality’ having ‘in excess of 56 bits of symmetric key length, or equivalent’ has both of the following characteristics:</p> <p data-bbox="628 1028 1272 1090">a. It supports a non-primary function of the item; <u>and</u></p> <p data-bbox="628 1111 1272 1211">b. It is performed by incorporated equipment or “software” that would, as a standalone item, be specified by Category 5 – Part 2;</p> <p data-bbox="541 1229 735 1263"><u><i>Technical Notes</i></u></p> <p data-bbox="544 1270 1272 1435">1. <i>For the purpose of Category Code 5A002.a., ‘cryptography for data confidentiality’ means “cryptography” that employs digital techniques and performs any cryptographic function other than any of the following:</i></p> <p data-bbox="628 1453 911 1487">a. <i>“Authentication”;</i></p> <p data-bbox="628 1505 906 1538">b. <i>Digital signature;</i></p> <p data-bbox="628 1556 871 1590">c. <i>Data integrity;</i></p> <p data-bbox="628 1608 900 1641">d. <i>Non-repudiation;</i></p> <p data-bbox="628 1659 1272 1722">e. <i>Digital rights management, including the execution of copy-protected “software”;</i></p> <p data-bbox="628 1740 1272 1836">f. <i>Encryption or decryption in support of entertainment, mass commercial broadcasts or medical records management; <u>or</u></i></p>



Category Code	Item Description
	<p data-bbox="628 454 1268 517">g. Key management in support of any function described in paragraphs a. to f. above.</p> <p data-bbox="544 539 1268 636">2. For the purpose of Category Code 5A002.a., ‘in excess of 56 bits of symmetric key length, or equivalent’ means either of the following:</p> <p data-bbox="628 658 1268 754">a. A “symmetric algorithm” employing a key length in excess of 56 bits, not including parity bits; <u>or</u></p> <p data-bbox="628 777 1268 840">b. An “asymmetric algorithm” where the security of the algorithm is based on any of the following:</p> <ol data-bbox="692 862 1268 1218" style="list-style-type: none"> <li>1. Factorisation of integers in excess of 512 bits (e.g. RSA);</li> <li>2. Computation of discrete logarithms in a multiplicative group of a finite field of size greater than 512 bits (e.g. Diffie-Hellman over <math>Z/pZ</math>); <u>or</u></li> <li>3. Discrete logarithms in a group other than those mentioned in paragraph b.2. in excess of 112 bits (e.g. Diffie-Hellman over an elliptic curve).</li> </ol> <p data-bbox="544 1240 1268 1413"><u>Note 1</u> When necessary as determined by the appropriate authority in the exporter's country, details of items must be accessible and provided to the authority upon request, in order to establish either of the following:</p> <p data-bbox="544 1435 1268 1498">a. Whether the item meets the criteria of Category Codes 5A002.a.1. to 5A002.a.4.; <u>or</u></p> <p data-bbox="544 1520 1268 1615">b. Whether the cryptographic capability for data confidentiality specified by Category Code 5A002.a. is usable without “cryptographic activation”.</p>

Category Code	Item Description
	<p><u>Note 2</u></p> <p>Category Code 5A002.a. does not include any of the following items, or specially designed “information security” components therefor:</p> <p>a. Smart cards and smart card ‘readers/writers’, as follows:</p> <ol style="list-style-type: none"> <li>1. A smart card or an electronically readable personal document (e.g. token coin, e-passport) that meets either of the following:           <ol style="list-style-type: none"> <li>a. The cryptographic capability meets both of the following:               <ol style="list-style-type: none"> <li>1. It is restricted for use in any of the following:                   <ol style="list-style-type: none"> <li>a. Equipment or systems not described in Category Codes 5A002.a.1. to 5A002.a.4.;</li> <li>b. Equipment or systems not using ‘cryptography for data confidentiality’ having ‘in excess of 56 bits of symmetric key length, or equivalent’; <u>or</u></li> <li>c. Equipment or systems, excluded from Category Code 5A002.a., by paragraphs b. to f. of this Note; <u>and</u></li> </ol> </li> <li>2. It cannot be reprogrammed for any other use; <u>or</u></li> </ol> </li> <li>b. Having all of the following characteristics:               <ol style="list-style-type: none"> <li>1. It is specially designed and limited to allow protection of ‘personal data’ stored within;</li> <li>2. Has been, or can only be, personalised for public or commercial transactions or individual identification; <u>and</u></li> </ol> </li> </ol> </li> </ol>

Category Code	Item Description
	<p data-bbox="756 454 1257 517">3. Where the cryptographic capability is not user-accessible;</p> <p data-bbox="756 539 938 566"><u>Technical Note</u></p> <p data-bbox="756 580 1257 712">'Personal data' includes any data specific to a particular person or entity, such as the amount of money stored and data necessary for "authentication".</p> <p data-bbox="628 730 1257 826">2. 'Readers/writers' specially designed or modified, and limited, for items specified in paragraph a.1. of this Note;</p> <p data-bbox="691 848 873 875"><u>Technical Note</u></p> <p data-bbox="691 889 1257 983">'Readers/writers' include equipment that communicates with smart cards or electronically readable documents through a network.</p> <p data-bbox="544 1005 1257 1068">b. Cryptographic equipment specially designed and limited for banking use or 'money transactions';</p> <p data-bbox="606 1090 788 1117"><u>Technical Note</u></p> <p data-bbox="606 1131 1257 1225">'Money transactions' in Category Code 5A002.a. Note 2.b. includes the collection and settlement of fares or credit functions.</p> <p data-bbox="544 1247 1257 1509">c. Portable or mobile radiotelephones for civil use (e.g. for use with commercial civil cellular radio communication systems) that are not capable of transmitting encrypted data directly to another radiotelephone or equipment (other than Radio Access Network (RAN) equipment), nor of passing encrypted data through RAN equipment (e.g. Radio Network Controller (RNC) or Base Station Controller (BSC));</p> <p data-bbox="544 1532 1257 1731">d. Cordless telephone equipment not capable of end-to-end encryption where the maximum effective range of unboosted cordless operation (i.e. a single, unrelayed hop between terminal and home base station) is less than 400 metres according to the manufacturer's specifications;</p>

Category Code	Item Description
	<p>e. <i>Portable or mobile radiotelephones and similar client wireless devices for civil use, that implement only published or commercial cryptographic standards (except for anti-piracy functions, which may be non-published) and also meet the provisions of paragraphs a.2. and a.3. of the Cryptography Note (Note 3 in Category 5 – Part 2), that have been customised for a specific civil industry application with features that do not affect the cryptographic functionality of these original non-customised devices;</i></p> <p>f. <i>Items, where the “information security” functionality is limited to wireless “personal area network” functionality that have both of the following characteristics:</i></p> <ol style="list-style-type: none"> <li>1. <i>Implement only published or commercial cryptographic standards; <u>and</u></i></li> <li>2. <i>The cryptographic capability is limited to a nominal operating range not exceeding 30 m according to the manufacturer’s specifications, or not exceeding 100 m according to the manufacturer’s specifications for equipment that cannot interconnect with more than seven devices;</i></li> </ol> <p>g. <i>Mobile telecommunications Radio Access Network (RAN) equipment designed for civil use, which also meet the provisions of paragraphs a.2. and a.3. of the Cryptography Note (Note 3 to Category 5 – Part 2), having an RF output power limited to 0.1 W (20 dBm) or less, and supporting 16 or fewer concurrent users;</i></p> <p>h. <i>Routers, switches or relays, where the “information security” functionality is limited to the tasks of “Operations, Administration or Maintenance” (“OAM”) implementing only published or commercial cryptographic standards; <u>or</u></i></p> <p>i. <i>General purpose computing equipment or servers, where the “information security” functionality meets both of the following:</i></p>

Category Code	Item Description
	<ol style="list-style-type: none"> <li>1. <i>Uses only published or commercial cryptographic standards; <u>and</u></i></li> <li>2. <i>Is any of the following:</i> <ol style="list-style-type: none"> <li>a. <i>Integral to a CPU that meets the provisions of Note 3 to Category 5 – Part 2;</i></li> <li>b. <i>Integral to an operating system that is not specified by Category Code 5D002; <u>or</u></i></li> <li>c. <i>Limited to “OAM” of the equipment.</i></li> </ol> </li> <li>b. <i>Designed or modified to enable, by means of “cryptographic activation” an item to achieve or exceed the controlled performance levels for functionality specified in Category Code 5A002.a. that would not otherwise be enabled;</i></li> <li>c. <i>Designed or modified to use or perform “quantum cryptography”;</i>  <i><u>Technical Note</u></i>  <i>“Quantum cryptography” is also known as Quantum Key Distribution (QKD).</i></li> <li>d. <i>Designed or modified to use cryptographic techniques to generate channelising codes, scrambling codes or network identification codes, for systems using ultra-wideband modulation techniques and having either of the following characteristics:</i> <ol style="list-style-type: none"> <li>1. <i>A bandwidth exceeding 500 MHz; <u>or</u></i></li> <li>2. <i>A “fractional bandwidth” of 20% or more;</i></li> </ol> </li> <li>e. <i>Designed or modified to use cryptographic techniques to generate the spreading code for “spread spectrum” systems, other than those specified in Category Code 5A002.d., including the hopping code for “frequency hopping” systems.</i></li> </ol>
5A003	<p>Systems, equipment and components, for non-cryptographic “information security”, as follows:</p> <ol style="list-style-type: none"> <li>a. <i>Communications cable systems designed or modified using mechanical, electrical or electronic means to detect surreptitious intrusion;</i></li> </ol>

Category Code	Item Description
	<p><u>Note</u>  <i>Category Code 5A003.a. only includes physical layer security. For the purpose of Category Code 5A003.a., the physical layer includes Layer 1 of the Reference Model of Open Systems Interconnection (OSI) (Ref. ISO/IEC 7498-1).</i></p> <p>b. Specially designed or modified to reduce the compromising emanations of information-bearing signals beyond what is necessary for health, safety or electromagnetic interference standards.</p>
5A004	<p>Systems, equipment and components for defeating, weakening or bypassing “information security”, as follows:</p>
	<p>a. Designed or modified to perform ‘cryptanalytic functions’.</p>
	<p><u>Note</u>  <i>Category Code 5A004.a. includes systems or equipment, designed or modified to perform ‘cryptanalytic functions’ by means of reverse engineering.</i></p>
	<p><u>Technical Note</u>  <i>‘Cryptanalytic functions’ are functions designed to defeat cryptographic mechanisms in order to derive confidential variables or sensitive data, including clear text, passwords or cryptographic keys.</i></p>
<b>5B2</b>	<b>Test, Inspection and Production Equipment</b>
5B002	<p>“Information security” test, inspection and “production” equipment, as follows:</p> <p>a. Equipment specially designed for the “development” or “production” of equipment specified in Category Code 5A002, 5A003, 5A004 or 5B002.b.;</p> <p>b. Measuring equipment specially designed to evaluate and validate the “information security” functions of the equipment specified in Category Code 5A002, 5A003 or 5A004, or of “software” specified in Category Code 5D002.a. or 5D002.c.</p>

<i>Category Code</i>	<i>Item Description</i>
<b>5C2</b>	<p><b>Materials</b></p> <p>None.</p>
<b>5D2</b> 5D002	<p><b>Software</b></p> <p>“Software” as follows:</p> <ol style="list-style-type: none"> <li>a. “Software” specially designed or modified for the “development”, “production” or “use” of any of the following: <ol style="list-style-type: none"> <li>1. Equipment specified in Category Code 5A002 or “software” specified in Category Code 5D002.c.1.;</li> <li>2. Equipment specified in Category Code 5A003 or “software” specified in Category Code 5D002.c.2.; <u>or</u></li> <li>3. Equipment specified in Category Code 5A004 or “software” specified in Category Code 5D002.c.3.;</li> </ol> </li> <li>b. “Software” designed or modified to enable, by means of “cryptographic activation”, an item to meet the criteria for functionality specified by Category Code 5A002.a., that would not otherwise be met;</li> <li>c. “Software” having the characteristics of, or performing or simulating the functions of, any of the following: <ol style="list-style-type: none"> <li>1. Equipment specified in Category Code 5A002.a., 5A002.c., 5A002.d. or 5A002.e.;</li> </ol> <p><i>Note</i></p> <p><i>Category Code 5D002.c.1. does not apply to “software” limited to the tasks of “OAM” implementing only published or commercial cryptographic standards.</i></p> <ol style="list-style-type: none"> <li>2. Equipment specified in Category Code 5A003; <u>or</u></li> <li>3. Equipment specified in Category Code 5A004;</li> </ol> </li> <li>d. Not used.</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
<b>5E2</b>	<b>Technology</b>
5E002	<p>“Technology” as follows:</p> <ol style="list-style-type: none"> <li>a. “Technology” (according to the General Technology Note) for the “development”, “production” or “use” of equipment specified in Category Code 5A002, 5A003, 5A004 or 5B002, or of “software” specified in Category Code 5D002.a. or 5D002.c.;</li> <li>b. “Technology” to enable, by means of “cryptographic activation”, an item to meet the criteria for functionality specified by Category Code 5A002.a., that would not otherwise be met.</li> </ol> <p><u>Note</u>  <i>Category Code 5E002 includes “information security” technical data resulting from procedures carried out to evaluate or determine the implementation of functions, features or techniques specified in Category 5 – Part 2.</i></p>



<i>Category Code</i>	<i>Item Description</i>
<b>CATEGORY 6 — SENSORS AND LASERS</b>	
<b>6A</b>	<b>Systems, Equipment and Components</b>
6A001	<p>Acoustic systems, equipment and components, as follows:</p> <p>a. Marine acoustic systems, equipment and specially designed components therefor, as follows:</p> <p>1. Active (transmitting or transmitting-and-receiving) systems, equipment and specially designed components therefor, as follows:</p> <p><i>Note</i>  <i>Category Code 6A001.a.1. does not include equipment as follows:</i></p> <p>a. <i>Depth sounders operating vertically below the apparatus, not including a scanning function exceeding <math>\pm 20^\circ</math>, and limited to measuring the depth of water, the distance of submerged or buried objects or fish finding;</i></p> <p>b. <i>Acoustic beacons, as follows:</i></p> <p>1. <i>Acoustic emergency beacons;</i></p> <p>2. <i>Pingers specially designed for relocating or returning to an underwater position.</i></p> <p>a. Acoustic seabed survey equipment, as follows:</p> <p>1. Surface vessel survey equipment designed for seabed topographic mapping and having all of the following characteristics:</p> <p>a. Designed to take measurements at an angle exceeding <math>20^\circ</math> from the vertical;</p> <p>b. Designed to measure seabed topography at seabed depths exceeding 600 m;</p> <p>c. ‘Sounding resolution’ less than 2;  <u>and</u></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. 'Enhancement' of the depth "accuracy" through compensation for all of the following:</p> <ol style="list-style-type: none"> <li>1. Motion of the acoustic sensor;</li> <li>2. In-water propagation from sensor to the seabed and back; <u>and</u></li> <li>3. Sound speed at the sensor;</li> </ol> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. 'Sounding resolution' is the swath width (degrees) divided by the maximum number of soundings per swath.</li> <li>2. 'Enhancement' includes the ability to compensate by external means.</li> </ol> <p>2. Underwater survey equipment designed for seabed topographic mapping and having either of the following:</p> <p><i>Technical Note</i></p> <p><i>The acoustic sensor pressure rating determines the depth rating of the equipment specified in Category Code 6A001.a.1.a.2.</i></p> <ol style="list-style-type: none"> <li>a. Having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Designed or modified to operate at depths exceeding 300 m; <u>and</u></li> </ol> </li> </ol>

Category Code	Item Description
	<p data-bbox="820 454 1267 521">2. 'Sounding rate' greater than 3,800 m/s; <u>or</u></p> <p data-bbox="879 539 1066 568"><i>Technical Note</i></p> <p data-bbox="879 580 1267 943">'Sounding rate' is the product of the maximum speed (m/s) at which the sensor can operate and the maximum number of soundings per swath assuming 100% coverage. For systems that produce soundings in two directions (3D sonars), the maximum of the 'sounding rate' in either direction should be used.</p> <p data-bbox="751 965 1267 1093">b. Survey equipment, not specified in Category Code 6A001.a.1.a.2.a., having all of the following characteristics:</p> <ol data-bbox="820 1115 1267 1852" style="list-style-type: none"> <li data-bbox="820 1115 1267 1182">1. Designed or modified to operate at depths exceeding 100 m;</li> <li data-bbox="820 1205 1267 1294">2. Designed to take measurements at an angle exceeding 20° from the vertical;</li> <li data-bbox="820 1317 1267 1619">3. Having either of the following characteristics: <ol data-bbox="879 1406 1267 1619" style="list-style-type: none"> <li data-bbox="879 1406 1267 1473">a. Operating frequency below 350 kHz; <u>or</u></li> <li data-bbox="879 1496 1267 1619">b. Designed to measure seabed topography at a range exceeding 200 m from the acoustic sensor; <u>and</u></li> </ol> </li> <li data-bbox="820 1641 1267 1852">4. 'Enhancement' of the depth "accuracy" through compensation of all of the following: <ol data-bbox="879 1798 1267 1852" style="list-style-type: none"> <li data-bbox="879 1798 1267 1852">a. Motion of the acoustic sensor;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p style="text-align: center;">b. In-water propagation from sensor to the seabed and back; <u>and</u></p> <p style="text-align: center;">c. Sound speed at the sensor;</p> <p>3. Side Scan Sonar (SSS) or Synthetic Aperture Sonar (SAS), designed for seabed imaging and having all of the following characteristics, and specially designed transmitting and receiving acoustic arrays therefor:</p> <p style="padding-left: 2em;">a. Designed or modified to operate at depths exceeding 500 m;</p> <p style="padding-left: 2em;">b. An 'area coverage rate' of greater than 570 m<sup>2</sup>/s while operating at the maximum range that it can operate with an 'along track resolution' of less than 15 cm; <u>and</u></p> <p style="padding-left: 2em;">c. An 'across track resolution' of less than 15 cm;</p> <p style="text-align: center;"><u>Technical Notes</u></p> <p style="padding-left: 2em;">1. 'Area coverage rate' (m<sup>2</sup>/s) is twice the product of the sonar range (m) and the maximum speed (m/s) at which the sensor can operate at that range.</p> <p style="padding-left: 2em;">2. 'Along track resolution' (cm), for SSS only, is the product of azimuth (horizontal) beamwidth (degrees) and sonar range (m) and 0.873.</p> <p style="padding-left: 2em;">3. 'Across track resolution' (cm) is 75 divided by the signal bandwidth (kHz).</p> <p>b. Systems or transmitting and receiving arrays, designed for object detection or location, having any of the following characteristics:</p> <p style="padding-left: 2em;">1. A transmitting frequency below 10 kHz;</p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="692 454 1267 584">2. Sound pressure level exceeding 224 dB (reference 1 <math>\mu</math>Pa at 1 m) for equipment with an operating frequency in the band from 10 kHz to 24 kHz inclusive;</li> <li data-bbox="692 607 1267 736">3. Sound pressure level exceeding 235 dB (reference 1 <math>\mu</math>Pa at 1 m) for equipment with an operating frequency in the band between 24 kHz and 30 kHz;</li> <li data-bbox="692 759 1267 853">4. Forming beams of less than 1° on any axis and having an operating frequency of less than 100 kHz;</li> <li data-bbox="692 875 1267 943">5. Designed to operate with an unambiguous display range exceeding 5,120 m; <u>or</u></li> <li data-bbox="692 965 1267 1290">6. Designed to withstand pressure during normal operation at depths exceeding 1,000 m and having transducers with either of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="756 1111 1267 1178">a. Dynamic compensation for pressure; <u>or</u></li> <li data-bbox="756 1200 1267 1290">b. Incorporating other than lead zirconate titanate as the transduction element;</li> </ol> </li> <li data-bbox="628 1312 1267 1503">c. Acoustic projectors (including transducers), incorporating piezoelectric, magnetostrictive, electrostrictive, electrodynamic or hydraulic elements operating individually or in a designed combination, and having any of the following characteristics:</li> </ol> <p data-bbox="692 1525 775 1559"><i><u>Note 1</u></i></p> <p data-bbox="692 1570 1267 1798"><i>Whether acoustic projectors (including transducers), which are not specified by Category Code 6A001 and which are specially designed for other equipment, is included in Category Code 6A001.c. is determined by whether the other equipment is specified in Division 2 of Part 2 of this Schedule.</i></p>

Category Code	Item Description
	<p data-bbox="694 459 774 481"><u>Note 2</u></p> <p data-bbox="694 504 1260 660"><i>Category Code 6A001.a.1.c. does not include electronic sources which direct the sound vertically only, or mechanical (e.g. air gun or vapour-shock gun) or chemical (e.g. explosive) sources.</i></p> <p data-bbox="694 683 774 705"><u>Note 3</u></p> <p data-bbox="694 728 1260 1019"><i>Piezoelectric elements specified in Category Code 6A001.a.1.c. include those made from lead-magnesium-niobate/lead-titanate (<math>Pb(Mg_{1/3}Nb_{2/3})O_3</math>-<math>PbTiO_3</math>, or PMN-PT) single crystals grown from solid solution or lead-indium-niobate/lead-magnesium-niobate/lead-titanate (<math>Pb(In_{1/2}Nb_{1/2})O_3</math>-<math>Pb(Mg_{1/3}Nb_{2/3})O_3</math>-<math>PbTiO_3</math>, or PIN-PMN-PT) single crystals grown from solid solution.</i></p> <ol data-bbox="694 1041 1260 1456" style="list-style-type: none"> <li data-bbox="694 1041 1260 1131">1. Operating at frequencies below 10 kHz and having either of the following characteristics: <ol data-bbox="758 1153 1260 1456" style="list-style-type: none"> <li data-bbox="758 1153 1260 1456">a. Not designed for continuous operation at 100% duty cycle and having a radiated ‘free-field Source Level (<math>SL_{RMS}</math>)’ exceeding <math>(10\log(f) + 169.77)</math> dB (reference <math>1 \mu Pa</math> at 1 m) where <math>f</math> is the frequency in Hertz of maximum Transmitting Voltage Response (TVR) below 10 kHz; <u>or</u></li> </ol> </li> </ol>

Category Code	Item Description
	<p>b. Designed for continuous operation at 100% duty cycle and having a continuously radiated ‘free-field Source Level (<math>SL_{RMS}</math>)’ at 100% duty cycle exceeding <math>(10\log(f) + 159.77)</math> dB (reference <math>1 \mu\text{Pa}</math> at 1 m) where <math>f</math> is the frequency in Hertz of maximum Transmitting Voltage Response (TVR) below 10 kHz; <u>or</u></p> <p><i>Technical Note</i>  <i>The ‘free-field Source Level (<math>SL_{RMS}</math>)’ is defined along the maximum response axis and in the far field of the acoustic projector. It can be obtained from the Transmitting Voltage Response using the following equation: <math>SL_{RMS} = (TVR + 20\log V_{RMS})</math> dB (reference <math>1 \mu\text{Pa}</math> at 1 m), where <math>SL_{RMS}</math> is the source level, TVR is the Transmitting Voltage Response and <math>V_{RMS}</math> is the Driving Voltage of the Projector.</i></p> <p>2. Not used;</p> <p>3. Side-lobe suppression exceeding 22 dB;</p> <p>d. Acoustic systems and equipment, designed to determine the position of surface vessels or underwater vehicles and having both of the following characteristics, and specially designed components therefor:</p> <ol style="list-style-type: none"> <li>1. Detection range exceeding 1,000 m; <u>and</u></li> <li>2. Determined position error of less than 10 m rms (root mean square) when measured at a range of 1,000 m;</li> </ol> <p><i>Note</i>  <i>Category Code 6A001.a.1.d. includes:</i></p> <p>a. <i>Equipment using coherent “signal processing” between two or more beacons and the hydrophone unit carried by the surface vessel or underwater vehicle;</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="694 448 1268 548"><i>b. Equipment capable of automatically correcting speed-of-sound propagation errors for calculation of a point.</i></p> <p data-bbox="630 571 1268 772"><i>e. Active individual sonars, specially designed or modified to detect, locate and automatically classify swimmers or divers, having all of the following characteristics, and specially designed transmitting and receiving acoustic arrays therefor:</i></p> <ol data-bbox="694 784 1268 1019" style="list-style-type: none"> <li data-bbox="694 784 1268 817"><i>1. Detection range exceeding 530 m;</i></li> <li data-bbox="694 840 1268 929"><i>2. Determined position error of less than 15 m rms (root mean square) when measured at a range of 530 m; <u>and</u></i></li> <li data-bbox="694 952 1268 1019"><i>3. Transmitted pulse signal bandwidth exceeding 3 kHz;</i></li> </ol> <p data-bbox="694 1041 1268 1176"><i><u>N.B.</u> For diver detection systems specially designed or modified for military use, see Division 2 of Part 1 of this Schedule.</i></p> <p data-bbox="694 1198 1268 1366"><i><u>Note</u> For Category Code 6A001.a.1.e., where multiple detection ranges are specified for various environments, the greatest detection range is used.</i></p> <p data-bbox="550 1388 1268 1456"><i>2. Passive systems, equipment and specially designed components therefor, as follows:</i></p> <ol data-bbox="630 1467 1268 1534" style="list-style-type: none"> <li data-bbox="630 1467 1268 1534"><i>a. Hydrophones having any of the following characteristics:</i></li> </ol> <p data-bbox="694 1556 1268 1724"><i><u>Note</u> Whether hydrophones specially designed for other equipment is included in Category Code 6A001.a.2.a. is determined by whether the other equipment is included in that Category Code.</i></p>



Category Code	Item Description
	<p data-bbox="692 454 874 488"><u>Technical Note</u></p> <p data-bbox="692 499 1267 629"><i>Hydrophones consist of one or more sensing elements producing a single acoustic output channel. Those that contain multiple elements can be referred to as a hydrophone group.</i></p> <ol style="list-style-type: none"> <li data-bbox="692 647 1267 712">1. Incorporating continuous flexible sensing elements;</li> <li data-bbox="692 730 1267 898">2. Incorporating flexible assemblies of discrete sensing elements with either a diameter or length less than 20 mm and with a separation between elements of less than 20 mm;</li> <li data-bbox="692 916 1267 1630">3. Having any of the following sensing elements: <ol style="list-style-type: none"> <li data-bbox="754 999 991 1032">a. Optical fibres;</li> <li data-bbox="754 1050 1267 1180">b. ‘Piezoelectric polymer films’ other than polyvinylidene-fluoride (PVDF) and its co-polymers {P(VDF-TrFE) and P(VDF-TFE)};</li> <li data-bbox="754 1198 1246 1232">c. ‘Flexible piezoelectric composites’;</li> <li data-bbox="754 1249 1267 1417">d. Lead-magnesium-niobate/lead-titanate (i.e. <math>\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3</math>-<math>\text{PbTiO}_3</math>, or PMN-PT) piezoelectric single crystals grown from solid solution; <u>or</u></li> <li data-bbox="754 1435 1267 1630">e. Lead-indium-niobate/lead-magnesium-niobate/lead-titanate (i.e. <math>\text{Pb}(\text{In}_{1/2}\text{Nb}_{1/2})\text{O}_3</math>-<math>\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3</math>-<math>\text{PbTiO}_3</math>, or PIN-PMN-PT) piezoelectric single crystals grown from solid solution;</li> </ol> </li> <li data-bbox="692 1648 1267 1749">4. A ‘hydrophone sensitivity’ better than -180 dB at any depth with no acceleration compensation;</li> <li data-bbox="692 1767 1267 1830">5. Designed to operate at depths exceeding 35 m with acceleration compensation; <u>or</u></li> </ol>

Category Code	Item Description
	<p>6. Designed for operation at depths exceeding 1,000 m;</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>'Piezoelectric polymer film' sensing elements consist of polarised polymer film that is stretched over and attached to a supporting frame or spool (mandrel).</i></li> <li>2. <i>'Flexible piezoelectric composite' sensing elements consist of piezoelectric ceramic particles or fibres combined with an electrically insulating, acoustically transparent rubber, polymer or epoxy compound, where the compound is an integral part of the sensing elements.</i></li> <li>3. <i>'Hydrophone sensitivity' is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydrophone sensor, without a pre-amplifier, is placed in a plane wave acoustic field with an rms pressure of 1 <math>\mu</math>Pa. For example, a hydrophone of -160 dB (reference 1 V per <math>\mu</math>Pa) would yield an output voltage of <math>10^{-8}</math> V in such a field, while one of -180 dB sensitivity would yield only <math>10^{-9}</math> V output. Thus, -160 dB is better than -180 dB.</i></li> </ol> <p>b. Towed acoustic hydrophone arrays having any of the following characteristics:</p> <p><u>Technical Note</u></p> <p><i>Hydrophone arrays consist of a number of hydrophones providing multiple acoustic output channels.</i></p> <ol style="list-style-type: none"> <li>1. Hydrophone group spacing of less than 12.5 m or 'able to be modified' to have hydrophone group spacing of less than 12.5 m;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="692 454 1268 521">2. Designed or ‘able to be modified’ to operate at depths exceeding 35 m;</p> <p data-bbox="759 539 943 568"><i>Technical Note</i></p> <p data-bbox="759 580 1268 947"><i>‘Able to be modified’ in Category Codes 6A001.a.2.b.1. and 2. means having provisions to allow a change of the wiring or interconnections to alter hydrophone group spacing or operating depth limits. These provisions are: spare wiring exceeding 10% of the number of wires, hydrophone group spacing adjustment blocks or internal depth limiting devices that are adjustable or that control more than one hydrophone group.</i></p> <p data-bbox="692 965 1268 1032">3. Heading sensors specified in Category Code 6A001.a.2.d.;</p> <p data-bbox="692 1050 1214 1079">4. Longitudinally reinforced array hoses;</p> <p data-bbox="692 1097 1268 1164">5. An assembled array of less than 40 mm in diameter;</p> <p data-bbox="692 1182 874 1211">6. Not used;</p> <p data-bbox="692 1229 1268 1296">7. Hydrophone characteristics specified in Category Code 6A001.a.2.a.; <u>or</u></p> <p data-bbox="692 1314 1268 1413">8. Accelerometer-based hydro-acoustic sensors specified in Category Code 6A001.a.2.g.;</p> <p data-bbox="632 1431 1268 1664">c. Processing equipment, specially designed for towed acoustic hydrophone arrays, having “user-accessible programmability” and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;</p> <p data-bbox="632 1682 1268 1749">d. Heading sensors having both of the following characteristics:</p> <p data-bbox="692 1767 1187 1796">1. An accuracy of better than 0.5°; <u>and</u></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="692 454 1267 584">2. Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m;</p> <p data-bbox="692 607 1267 707"><i>N.B.</i> For inertial heading systems, see Category Code 7A003.c.</p> <p data-bbox="628 730 1267 792">e. Bottom or bay-cable hydrophone arrays, having any of the following characteristics:</p> <ol data-bbox="692 815 1267 1413" style="list-style-type: none"> <li data-bbox="692 815 1267 878">1. Incorporating hydrophones specified in Category Code 6A001.a.2.a.;</li> <li data-bbox="692 900 1267 1294">2. Incorporating multiplexed hydrophone group signal modules having both of the following characteristics: <ol data-bbox="756 1012 1267 1294" style="list-style-type: none"> <li data-bbox="756 1012 1267 1182">a. Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m; <u>and</u></li> <li data-bbox="756 1205 1267 1294">b. Capable of being operationally interchanged with towed acoustic hydrophone array modules; <u>or</u></li> </ol> </li> <li data-bbox="692 1317 1267 1413">3. Incorporating accelerometer-based hydro-acoustic sensors specified in Category Code 6A001.a.2.g.;</li> </ol> <p data-bbox="628 1435 1267 1659">f. Processing equipment, specially designed for bottom or bay cable systems, having “user-accessible programmability” and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;</p> <p data-bbox="628 1682 1267 1744">g. Accelerometer-based hydro-acoustic sensors having all of the following characteristics:</p> <ol data-bbox="692 1767 1267 1830" style="list-style-type: none"> <li data-bbox="692 1767 1267 1830">1. Composed of three accelerometers arranged along three distinct axes;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="692 454 1268 555">2. Having an overall ‘acceleration sensitivity’ better than 48 dB (reference 1,000 mV rms per 1 g);</p> <p data-bbox="692 568 1268 636">3. Designed to operate at depths greater than 35 m; <u>and</u></p> <p data-bbox="692 651 1268 685">4. Operating frequency below 20 kHz;</p> <p data-bbox="692 701 751 734"><u>Note</u></p> <p data-bbox="692 745 1268 813"><i>Category Code 6A001.a.2.g. does not include particle velocity sensors or geophones.</i></p> <p data-bbox="692 828 887 862"><u>Technical Notes</u></p> <p data-bbox="692 873 1268 936">1. <i>Accelerometer-based hydro-acoustic sensors are also known as vector sensors.</i></p> <p data-bbox="692 952 1268 1187">2. <i>‘Acceleration sensitivity’ is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydro-acoustic sensor, without a preamplifier, is placed in a plane wave acoustic field with a rms acceleration of 1 g (i.e. 9.81 m/s<sup>2</sup>).</i></p> <p data-bbox="544 1205 603 1238"><u>Note</u></p> <p data-bbox="544 1249 1268 1384"><i>Category Code 6A001.a.2. also includes receiving equipment, whether or not related in normal application to separate active equipment, and specially designed components therefor.</i></p> <p data-bbox="480 1400 1268 1496">b. Correlation-velocity and Doppler-velocity sonar log equipment, designed to measure the horizontal speed of the equipment carrier relative to the seabed, as follows:</p> <p data-bbox="544 1512 1268 1579">1. Correlation-velocity sonar log equipment having either of the following characteristics:</p> <p data-bbox="628 1594 1268 1662">a. Designed to operate at distances between the carrier and the seabed exceeding 500 m; <u>or</u></p> <p data-bbox="628 1677 1268 1747">b. Having speed “accuracy” better than 1% of speed;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Doppler-velocity sonar log equipment having speed “accuracy” better than 1% of speed;</p> <p><u>Note 1</u>  <i>Category Code 6A001.b. does not include depth sounders limited to any of the following:</i></p> <p>a. <i>Measuring the depth of water;</i></p> <p>b. <i>Measuring the distance of submerged or buried objects; <u>or</u></i></p> <p>c. <i>Fish finding.</i></p> <p><u>Note 2</u>  <i>Category Code 6A001.b. does not include equipment specially designed for installation on surface vessels.</i></p> <p>c. Not used.</p>
6A002	<p>Optical sensors or equipment and components therefor, as follows:</p> <p><u>N.B.</u>  <i>See also Category Code 6A102.</i></p> <p>a. Optical detectors as follows:</p> <p>1. “Space-qualified” solid-state detectors as follows:</p> <p><u>Note</u>  <i>For the purpose of Category Code 6A002.a.1., solid-state detectors include “focal plane arrays”.</i></p> <p>a. “Space-qualified” solid-state detectors having both of the following characteristics:</p> <p>1. A peak response in the wavelength range exceeding 10 nm but not exceeding 300 nm; <u>and</u></p> <p>2. A response of less than 0.1% relative to the peak response at a wavelength exceeding 400 nm;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. “Space-qualified” solid-state detectors having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A peak response in the wavelength range exceeding 900 nm but not exceeding 1,200 nm; <u>and</u></li> <li>2. A response “time constant” of 95 ns or less;</li> </ol> <p>c. “Space-qualified” solid-state detectors having a peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;</p> <p>d. “Space-qualified” “focal plane arrays” having more than 2,048 elements per array and having a peak response in the wavelength range exceeding 300 nm but not exceeding 900 nm;</p> <p>2. Image intensifier tubes and specially designed components therefor, as follows:</p> <p><u>Note</u></p> <p><i>Category Code 6A002.a.2. does not include non-imaging photomultiplier tubes having an electron sensing device in the vacuum space limited solely to either of the following:</i></p> <ol style="list-style-type: none"> <li><i>a. A single metal anode; <u>or</u></i></li> <li><i>b. Metal anodes with a centre-to-centre spacing greater than 500 µm.</i></li> </ol> <p><u>Technical Note</u></p> <p><i>‘Charge multiplication’ is a form of electronic image amplification and is defined as the generation of charge carriers as a result of an impact ionisation gain process. ‘Charge multiplication’ sensors may take the form of an image intensifier tube, solid state detector or “focal plane array”.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>a. Image intensifier tubes having all of the following characteristics:               <ul style="list-style-type: none"> <li>1. A peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm;</li> <li>2. Electron image amplification using either of the following:                   <ul style="list-style-type: none"> <li>a. A microchannel plate with a hole pitch (centre-to-centre spacing) of 12 µm or less; <u>or</u></li> <li>b. An electron sensing device with a non-binned pixel pitch of 500 µm or less, specially designed or modified to achieve ‘charge multiplication’ other than by a microchannel plate; <u>and</u></li> </ul> </li> <li>3. Any of the following photocathodes:                   <ul style="list-style-type: none"> <li>a. Multialkali photocathodes (e.g. S-20 and S-25) having a luminous sensitivity exceeding 350 µA/lm;</li> <li>b. GaAs or GaInAs photocathodes; <u>or</u></li> <li>c. Other “III/V compound” semiconductor photocathodes having a maximum “radiant sensitivity” exceeding 10 mA/W;</li> </ul> </li> </ul> </li> <li>b. Image intensifier tubes having all of the following characteristics:               <ul style="list-style-type: none"> <li>1. A peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,800 nm;</li> <li>2. Electron image amplification using either of the following:                   <ul style="list-style-type: none"> <li>a. A microchannel plate with a hole pitch (centre-to-centre spacing) of 12 µm or less; <u>or</u></li> </ul> </li> </ul> </li> </ul>



<i>Category Code</i>	<i>Item Description</i>
	<p>b. An electron sensing device with a non-binned pixel pitch of 500 <math>\mu\text{m}</math> or less, specially designed or modified to achieve ‘charge multiplication’ other than by a microchannel plate; <u>and</u></p> <p>3. “III/V compound” semiconductor (e.g. GaAs or GaInAs) photocathodes and transferred electron photocathodes, having a maximum “radiant sensitivity” exceeding 15 mA/W;</p> <p>c. Specially designed components as follows:</p> <ol style="list-style-type: none"> <li>1. Microchannel plates having a hole pitch (centre-to-centre spacing) of 12 <math>\mu\text{m}</math> or less;</li> <li>2. An electron sensing device with a non-binned pixel pitch of 500 <math>\mu\text{m}</math> or less, specially designed or modified to achieve ‘charge multiplication’ other than by a microchannel plate;</li> <li>3. “III/V compound” semiconductor (e.g. GaAs or GaInAs) photocathodes and transferred electron photocathodes;</li> </ol> <p><u>Note</u></p> <p><i>Category Code 6A002.a.2.c.3. does not include compound semiconductor photocathodes designed to achieve a maximum “radiant sensitivity” of either of the following:</i></p> <ol style="list-style-type: none"> <li>a. <i>10 mA/W or less at the peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm;</i> <u>or</u></li> <li>b. <i>15 mA/W or less at the peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,800 nm.</i></li> </ol>

Category Code	Item Description
	<p>3. Non-“space-qualified” “focal plane arrays” as follows:</p> <p><u>N.B.</u>  ‘Microbolometer’ non-“space-qualified” “focal plane arrays” are only specified in Category Code 6A002.a.3.f.</p> <p><u>Technical Note</u>  Linear or two-dimensional multi-element detector arrays are referred to as “focal plane arrays”.</p> <p><u>Note 1</u>  Category Code 6A002.a.3. includes photoconductive arrays and photovoltaic arrays.</p> <p><u>Note 2</u>  Category Code 6A002.a.3. does not include:</p> <ol style="list-style-type: none"> <li>a. Multi-element (not to exceed 16 elements) encapsulated photoconductive cells using either lead sulphide or lead selenide;</li> <li>b. Pyroelectric detectors using any of the following: <ol style="list-style-type: none"> <li>1. Triglycine sulphate and variants;</li> <li>2. Lead-lanthanum-zirconium titanate and variants;</li> <li>3. Lithium tantalate;</li> <li>4. Polyvinylidene fluoride and variants; <u>or</u></li> <li>5. Strontium barium niobate and variants;</li> </ol> </li> <li>c. “Focal plane arrays” specially designed or modified to achieve ‘charge multiplication’ and limited by design to have a maximum “radiant sensitivity” of 10 mA/W or less for wavelengths exceeding 760 nm, having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Incorporating a response limiting mechanism designed not to be removed or modified; <u>and</u></li> </ol> </li> </ol>

Category Code	Item Description
	<p data-bbox="692 454 1219 488">2. <i>Either of the following characteristics:</i></p> <p data-bbox="751 506 1260 600">a. <i>The response limiting mechanism is integral to or combined with the detector element; <u>or</u></i></p> <p data-bbox="751 620 1260 716">b. <i>The “focal plane array” is only operable with the response limiting mechanism in place.</i></p> <p data-bbox="756 736 941 768"><u>Technical Note</u></p> <p data-bbox="756 779 1260 909"><i>A response limiting mechanism integral to the detector element is designed not to be removed or modified without rendering the detector inoperable.</i></p> <p data-bbox="628 929 1260 992">d. <i>Thermopile arrays having less than 5,130 elements.</i></p> <p data-bbox="692 1012 876 1043"><u>Technical Note</u></p> <p data-bbox="692 1055 1260 1285"><i>‘Charge multiplication’ is a form of electronic image amplification and is defined as the generation of charge carriers as a result of an impact ionisation gain process. ‘Charge multiplication’ sensors may take the form of an image intensifier tube, solid state detector or “focal plane array”.</i></p> <p data-bbox="628 1305 1260 1368">a. <i>Non-“space-qualified” “focal plane arrays” having both of the following characteristics:</i></p> <p data-bbox="692 1388 1260 1485">1. <i>Individual elements with a peak response within the wavelength range exceeding 900 nm but not exceeding 1,050 nm; <u>and</u></i></p> <p data-bbox="692 1505 1214 1538">2. <i>Either of the following characteristics:</i></p> <p data-bbox="751 1559 1260 1621">a. <i>A response “time constant” of less than 0.5 ns; <u>or</u></i></p> <p data-bbox="751 1641 1260 1771">b. <i>Specially designed or modified to achieve ‘charge multiplication’ and having a maximum “radiant sensitivity” exceeding 10 mA/W;</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Non-“space-qualified” “focal plane arrays” having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Have individual elements with a peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,200 nm; <u>and</u></li> <li>2. Have either of the following characteristics: <ol style="list-style-type: none"> <li>a. A response “time constant” of 95 ns or less; <u>or</u></li> <li>b. Specially designed or modified to achieve ‘charge multiplication’ and having a maximum “radiant sensitivity” exceeding 10 mA/W;</li> </ol> </li> </ol> <p>c. Non-“space-qualified” non-linear (2-dimensional) “focal plane arrays” having individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;</p> <p><u>N.B.</u>  <i>Silicon and other material based ‘microbolometer’ non-“space-qualified” “focal plane arrays” are only specified in Category Code 6A002.a.3.f.</i></p> <p>d. Non-“space-qualified” linear (1-dimensional) “focal plane arrays” having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Have individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 3,000 nm; <u>and</u></li> <li>2. Either of the following characteristics: <ol style="list-style-type: none"> <li>a. A ratio of ‘scan direction’ dimension of the detector element to the ‘cross-scan direction’ dimension of the detector element of less than 3.8; <u>or</u></li> </ol> </li> </ol>

Category Code	Item Description
	<p data-bbox="751 454 1267 517">b. Signal processing in the detector elements;</p> <p data-bbox="692 539 751 566"><u>Note</u></p> <p data-bbox="692 577 1267 712"><i>Category Code 6A002.a.3.d. does not include “focal plane arrays” (not to exceed 32 elements) having detector elements limited solely to germanium material.</i></p> <p data-bbox="692 730 874 757"><u>Technical Note</u></p> <p data-bbox="692 768 1267 969"><i>For the purpose of Category Code 6A002.a.3.d., ‘cross-scan direction’ is defined as the axis parallel to the linear array of detector elements and the ‘scan direction’ is defined as the axis perpendicular to the linear array of detector elements.</i></p> <p data-bbox="628 987 1267 1155">e. Non-“space-qualified” linear (1-dimensional) “focal plane arrays” having individual elements with a peak response in the wavelength range exceeding 3,000 nm but not exceeding 30,000 nm;</p> <p data-bbox="628 1173 1267 1375">f. Non-“space-qualified” non-linear (2-dimensional) infrared “focal plane arrays” based on ‘microbolometer’ material, having individual elements with an unfiltered response in the wavelength range equal to or exceeding 8,000 nm but not exceeding 14,000 nm;</p> <p data-bbox="692 1393 874 1420"><u>Technical Note</u></p> <p data-bbox="692 1431 1267 1632"><i>For the purpose of Category Code 6A002.a.3.f., ‘microbolometer’ is defined as a thermal imaging detector that, as a result of a temperature change in the detector caused by the absorption of infrared radiation, is used to generate any usable signal.</i></p> <p data-bbox="628 1650 1267 1865">g. Non-“space-qualified” “focal plane arrays” having all of the following characteristics:</p> <ol data-bbox="692 1733 1267 1865" style="list-style-type: none"> <li>1. Have individual detector elements with a peak response in the wavelength range exceeding 400 nm but not exceeding 900 nm;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="694 448 1268 616">2. Specially designed or modified to achieve ‘charge multiplication’ and having a maximum “radiant sensitivity” exceeding 10 mA/W for wavelengths exceeding 760 nm; <u>and</u></p> <p data-bbox="694 638 1061 672">3. Greater than 32 elements;</p> <p data-bbox="478 683 1268 784">b. “Monospectral imaging sensors” and “multispectral imaging sensors”, designed for remote sensing applications and having either of the following characteristics:</p> <p data-bbox="542 795 1268 873">1. An Instantaneous-Field-Of-View (IFOV) of less than 200 <math>\mu</math>rad (microradians); <u>or</u></p> <p data-bbox="542 884 1268 985">2. Specified for operation in the wavelength range exceeding 400 nm but not exceeding 30,000 nm and having both of the following characteristics:</p> <p data-bbox="630 996 1268 1075">a. Providing output imaging data in digital format; <u>and</u></p> <p data-bbox="630 1086 1268 1120">b. Having either of the following characteristics:</p> <p data-bbox="694 1131 1013 1164">1. “Space-qualified”; <u>or</u></p> <p data-bbox="694 1176 1268 1288">2. Designed for airborne operation, using other than silicon detectors, and having an IFOV of less than 2.5 mrad (milliradians);</p> <p data-bbox="542 1299 606 1332"><u>Note</u></p> <p data-bbox="542 1344 1268 1512"><i>Category Code 6A002.b.1. does not include “monospectral imaging sensors” with a peak response in the wavelength range exceeding 300 nm but not exceeding 900 nm and only incorporating either of the following non-“space-qualified” detectors or non-“space-qualified” “focal plane arrays”:</i></p> <p data-bbox="542 1523 1268 1601"><i>a. Charge Coupled Devices (CCD) not designed or modified to achieve ‘charge multiplication’; <u>or</u></i></p> <p data-bbox="542 1612 1268 1713"><i>b. Complementary Metal Oxide Semiconductor (CMOS) devices not designed or modified to achieve ‘charge multiplication’.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. 'Direct view' imaging equipment incorporating any of the following:</p> <ol style="list-style-type: none"> <li>1. Image intensifier tubes specified in Category Code 6A002.a.2.a. or 6A002.a.2.b.;</li> <li>2. "Focal plane arrays" specified in Category Code 6A002.a.3.; <u>or</u></li> <li>3. Solid state detectors specified in Category Code 6A002.a.1.;</li> </ol> <p><u>Technical Note</u>  '<i>Direct view</i>' refers to imaging equipment that presents a visual image to a human observer without converting the image into an electronic signal for television display, and that cannot record or store the image photographically, electronically or by any other means.</p> <p><u>Note</u>  Category Code 6A002.c. does not include equipment as follows, when incorporating other than GaAs or GaInAs photocathodes:</p> <ol style="list-style-type: none"> <li>a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;</li> <li>b. Medical equipment;</li> <li>c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;</li> <li>d. Flame detectors for industrial furnaces;</li> <li>e. Equipment specially designed for laboratory use.</li> </ol> <p>d. Special support components for optical sensors, as follows:</p> <ol style="list-style-type: none"> <li>1. "Space-qualified" cryocoolers;</li> <li>2. Non-"space-qualified" cryocoolers having a cooling source temperature below 218 K (-55°C), as follows: <ol style="list-style-type: none"> <li>a. Closed cycle type with a specified Mean-Time-To-Failure (MTTF) or Mean-Time-Between-Failures (MTBF), exceeding 2,500 hours;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Joule-Thomson (JT) self-regulating minicoolers having bore (outside) diameters of less than 8 mm;</p> <p>3. Optical sensing fibres specially fabricated either compositionally or structurally, or modified by coating, to be acoustically, thermally, inertially, electromagnetically or nuclear radiation sensitive;</p> <p><u>Note</u> Category Code 6A002.d.3. does not include encapsulated optical sensing fibres specially designed for bore hole sensing applications.</p> <p>e. Not used.</p>
6A003	<p>Cameras, systems or equipment, and components therefor, as follows:</p> <p><u>N.B.</u> See also Category Code 6A203.</p> <p>a. Instrumentation cameras and specially designed components therefor, as follows:</p> <p><u>Note</u> Instrumentation cameras, specified in Category Codes 6A003.a.3. to 6A003.a.5., with modular structures should be evaluated by their maximum capability, using plug-ins available according to the camera manufacturer's specifications.</p> <p>1. High-speed cinema recording cameras using any film format from 8 mm to 16 mm inclusive, in which the film is continuously advanced throughout the recording period, and that are capable of recording at framing rates exceeding 13,150 frames/s;</p> <p><u>Note</u> Category Code 6A003.a.1. does not include cinema recording cameras designed for civil purposes.</p>



<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>2. Mechanical high speed cameras, in which the film does not move, capable of recording at rates exceeding 1,000,000 frames/s for the full framing height of 35 mm film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights;</li> <li>3. Mechanical or electronic streak cameras, as follows: <ol style="list-style-type: none"> <li>a. Mechanical streak cameras having writing speeds exceeding 10 mm/<math>\mu</math>s;</li> <li>b. Electronic streak cameras having temporal resolution better than 50 ns;</li> </ol> </li> <li>4. Electronic framing cameras having a speed exceeding 1,000,000 frames/s;</li> <li>5. Electronic cameras having both of the following characteristics: <ol style="list-style-type: none"> <li>a. An electronic shutter speed (gating capability) of less than 1 <math>\mu</math>s per full frame; <u>and</u></li> <li>b. A read out time allowing a framing rate of more than 125 full frames/s;</li> </ol> </li> <li>6. Plug-ins having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Specially designed for instrumentation cameras which have modular structures and which are specified in Category Code 6A003.a.; <u>and</u></li> <li>b. Enabling these cameras to meet the characteristics specified in Category Code 6A003.a.3., 6A003.a.4. or 6A003.a.5., according to the manufacturer's specifications;</li> </ol> </li> </ol> <p>b. Imaging cameras as follows:</p> <p><u>Note</u>  <i>Category Code 6A003.b. does not include television or video cameras, specially designed for television broadcasting.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>1. Video cameras incorporating solid state sensors, having a peak response in the wavelength range exceeding 10 nm, but not exceeding 30,000 nm and having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Having any of the following characteristics: <ol style="list-style-type: none"> <li>1. More than <math>4 \times 10^6</math> “active pixels” per solid state array for monochrome (black and white) cameras;</li> <li>2. More than <math>4 \times 10^6</math> “active pixels” per solid state array for colour cameras incorporating three solid state arrays; <u>or</u></li> <li>3. More than <math>12 \times 10^6</math> “active pixels” for solid state array colour cameras incorporating one solid state array; <u>and</u></li> </ol> </li> <li>b. Having any of the following characteristics: <ol style="list-style-type: none"> <li>1. Optical mirrors specified in Category Code 6A004.a.;</li> <li>2. Optical control equipment specified in Category Code 6A004.d.; <u>or</u></li> <li>3. The capability for annotating internally generated ‘camera tracking data’;</li> </ol> </li> </ol> </li> </ol> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>For the purpose of this entry, digital video cameras should be evaluated by the maximum number of “active pixels” used for capturing moving images.</i></li> <li>2. <i>For the purpose of this entry, ‘camera tracking data’ is the information necessary to define camera line of sight orientation with respect to the earth. This includes: 1) the horizontal angle the camera line of sight makes with respect to the earth’s magnetic field direction; and 2) the vertical angle between the camera line of sight and the earth’s horizon.</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Scanning cameras and scanning camera systems, having all of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. A peak response in the wavelength range exceeding 10 nm, but not exceeding 30,000 nm;</li> <li>b. Linear detector arrays with more than 8,192 elements per array; <u>and</u></li> <li>c. Mechanical scanning in one direction;</li> </ul> <p><u>Note</u></p> <p><i>Category Code 6A003.b.2. does not include scanning cameras and scanning camera systems, specially designed for any of the following:</i></p> <ul style="list-style-type: none"> <li>a. <i>Industrial or civilian photocopiers;</i></li> <li>b. <i>Image scanners specially designed for civil, stationary, close proximity scanning applications (e.g. reproduction of images or print contained in documents, artwork or photographs); <u>or</u></i></li> <li>c. <i>Medical equipment.</i></li> </ul> <p>3. Imaging cameras incorporating image intensifier tubes specified in Category Code 6A002.a.2.a. or 6A002.a.2.b.;</p> <p>4. Imaging cameras incorporating “focal plane arrays” having any of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Incorporating “focal plane arrays” specified in Category Codes 6A002.a.3.a. to 6A002.a.3.e.;</li> <li>b. Incorporating “focal plane arrays” specified in Category Code 6A002.a.3.f.; <u>or</u></li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="630 448 1260 515">c. Incorporating “focal plane arrays” specified in Category Code 6A002.a.3.g.;</p> <p data-bbox="606 537 686 571"><u>Note 1</u></p> <p data-bbox="606 571 1260 772"><i>Imaging cameras specified in Category Code 6A003.b.4. include “focal plane arrays” combined with sufficient “signal processing” electronics, beyond the read out integrated circuit, to enable as a minimum the output of an analogue or digital signal once power is supplied.</i></p> <p data-bbox="606 795 686 828"><u>Note 2</u></p> <p data-bbox="606 828 1260 996"><i>Category Code 6A003.b.4.a. does not include imaging cameras incorporating linear “focal plane arrays” with 12 elements or fewer, not employing time-delay-and-integration within the element and designed for any of the following:</i></p> <ul style="list-style-type: none"> <li data-bbox="630 1019 1260 1120">a. <i>Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;</i></li> <li data-bbox="630 1131 1260 1232">b. <i>Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;</i></li> <li data-bbox="630 1243 1260 1344">c. <i>Industrial equipment used for inspection, sorting or analysis of the properties of materials;</i></li> <li data-bbox="630 1355 1260 1433">d. <i>Equipment specially designed for laboratory use; <u>or</u></i></li> <li data-bbox="630 1444 925 1478">e. <i>Medical equipment.</i></li> </ul> <p data-bbox="606 1500 686 1534"><u>Note 3</u></p> <p data-bbox="606 1534 1260 1612"><i>Category Code 6A003.b.4.b. does not include imaging cameras having any of the following characteristics:</i></p> <ul style="list-style-type: none"> <li data-bbox="630 1624 1260 1691">a. <i>A maximum frame rate equal to or less than 9 Hz;</i></li> <li data-bbox="630 1702 1260 1859">b. <i>Having all of the following characteristics:</i> <ul style="list-style-type: none"> <li data-bbox="694 1758 1260 1859">1. <i>Having a minimum horizontal or vertical ‘Instantaneous-Field-of-View (IFOV)’ of at least 10 mrad (milliradians);</i></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="692 454 1267 521">2. <i>Incorporating a fixed focal-length lens that is not designed to be removed;</i></li> <li data-bbox="692 539 1267 607">3. <i>Not incorporating a 'direct view' display; <u>and</u></i></li> <li data-bbox="692 624 1267 692">4. <i>Having either of the following characteristics:</i> <ol style="list-style-type: none"> <li data-bbox="756 710 1267 808">a. <i>No facility to obtain a viewable image of the detected field-of-view; <u>or</u></i></li> <li data-bbox="756 826 1267 925">b. <i>The camera is designed for a single kind of application and designed not to be user modified; <u>or</u></i></li> </ol> </li> <li data-bbox="628 943 1267 1072">c. <i>The camera is specially designed for installation into a civilian passenger land vehicle and has all of the following characteristics:</i> <ol style="list-style-type: none"> <li data-bbox="692 1090 1267 1220">1. <i>The placement and configuration of the camera within the vehicle are solely to assist the driver in the safe operation of the vehicle;</i></li> <li data-bbox="692 1238 1267 1458">2. <i>Is only operable when installed in either of the following:</i> <ol style="list-style-type: none"> <li data-bbox="756 1323 1267 1458">a. <i>The civilian passenger land vehicle for which it was intended and the vehicle weighs less than 4,500 kg (gross vehicle weight); <u>or</u></i></li> <li data-bbox="756 1476 1267 1543">b. <i>A specially designed, authorised maintenance test facility; <u>and</u></i></li> </ol> </li> <li data-bbox="692 1561 1267 1688">3. <i>Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended.</i></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="694 448 885 481"><u>Technical Notes</u></p> <ol data-bbox="694 492 1260 1108" style="list-style-type: none"> <li data-bbox="694 492 1260 739">1. 'Instantaneous-Field-of-View (IFOV)' specified in Category Code 6A003.b.4. Note 3.b. is the lesser figure of the 'Horizontal IFOV' or the 'Vertical IFOV'.  'Horizontal IFOV' = horizontal Field of View (FOV) / number of horizontal detector elements  'Vertical IFOV' = vertical Field of View (FOV) / number of vertical detector elements</li> <li data-bbox="694 873 1260 1108">2. 'Direct view' in Category Code 6A003.b.4. Note 3.b. refers to an imaging camera operating in the infrared spectrum that presents a visual image to a human observer using a near-to-eye micro display incorporating any light-security mechanism.</li> </ol> <p data-bbox="606 1131 694 1164"><u>Note 4</u></p> <p data-bbox="606 1176 1260 1243">Category Code 6A003.b.4.c. does not include imaging cameras having any of the following characteristics:</p> <ol data-bbox="630 1254 1260 1769" style="list-style-type: none"> <li data-bbox="630 1254 1260 1288">a. Having all of the following characteristics: <ol data-bbox="694 1299 1260 1769" style="list-style-type: none"> <li data-bbox="694 1299 1260 1467">1. Where the camera is specially designed for installation as an integrated component into indoor and wall-plug-operated systems or equipment, limited by design for a single kind of application, as follows: <ol data-bbox="750 1478 1260 1769" style="list-style-type: none"> <li data-bbox="750 1478 1260 1579">a. Industrial process monitoring, quality control, or analysis of the properties of materials;</li> <li data-bbox="750 1590 1260 1668">b. Laboratory equipment specially designed for scientific research;</li> <li data-bbox="750 1680 1260 1713">c. Medical equipment;</li> <li data-bbox="750 1724 1260 1769">d. Financial fraud detection equipment;</li> </ol> </li> </ol> </li> </ol>

Category Code	Item Description
	<ol style="list-style-type: none"> <li data-bbox="692 454 1272 521">2. <i>Is only operable when installed in either of the following:</i> <ol style="list-style-type: none"> <li data-bbox="754 539 1272 607">a. <i>The system(s) or equipment for which it was intended; <u>or</u></i></li> <li data-bbox="754 624 1272 692">b. <i>A specially designed, authorised maintenance facility; <u>and</u></i></li> </ol> </li> <li data-bbox="692 710 1272 837">3. <i>Incorporates an active mechanism that forces the camera not to function when it is removed from the system(s) or equipment for which it was intended;</i></li> </ol> <p data-bbox="628 855 1272 987">b. <i>Where the camera is specially designed for installation into a civilian passenger land vehicle or passenger and vehicle ferries, and has all of the following characteristics:</i></p> <ol style="list-style-type: none"> <li data-bbox="692 1005 1272 1133">1. <i>The placement and configuration of the camera within the vehicle or ferry is solely to assist the driver or operator in the safe operation of the vehicle or ferry;</i></li> <li data-bbox="692 1151 1272 1218">2. <i>Is only operable when installed in any of the following:</i> <ol style="list-style-type: none"> <li data-bbox="754 1236 1272 1368">a. <i>The civilian passenger land vehicle for which it was intended and the vehicle weighs less than 4,500 kg (gross vehicle weight);</i></li> <li data-bbox="754 1386 1272 1518">b. <i>The passenger and vehicle ferry for which it was intended and having a Length Overall (LOA) 65 m or greater; <u>or</u></i></li> <li data-bbox="754 1536 1272 1603">c. <i>A specially designed, authorised maintenance test facility; <u>and</u></i></li> </ol> </li> <li data-bbox="692 1621 1272 1756">3. <i>Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended;</i></li> </ol>

Category Code	Item Description
	<p>c. Limited by design to have a maximum “radiant sensitivity” of 10 mA/W or less for wavelengths exceeding 760 nm, and having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Incorporating a response limiting mechanism designed not to be removed or modified;</li> <li>2. Incorporates an active mechanism that forces the camera not to function when the response limiting mechanism is removed; <u>and</u></li> <li>3. Not specially designed or modified for underwater use; <u>or</u></li> </ol> <p>d. Having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Not incorporating a ‘direct view’ or electronic image display;</li> <li>2. Has no facility to output a viewable image of the detected field of view;</li> <li>3. The “focal plane array” is only operable when installed in the camera for which it was intended; <u>and</u></li> <li>4. The “focal plane array” incorporates an active mechanism that forces it to be permanently inoperable when removed from the camera for which it was intended.</li> </ol> <p>5. Imaging cameras incorporating solid-state detectors specified in Category Code 6A002.a.1.</p>
6A004	<p>Optical equipment and components, as follows:</p> <p>a. Optical mirrors (reflectors) as follows:</p> <p><u>Technical Note</u></p> <p><i>For the purpose of Category Code 6A004.a., Laser Induced Damage Threshold (LIDT) is measured according to Ref. ISO 21254-1:2011.</i></p>



Category Code	Item Description
	<p data-bbox="544 454 600 483"><u>N.B.</u></p> <p data-bbox="544 495 1267 562"><i>For optical mirrors specially designed for lithography equipment, see Category Code 3B001.</i></p> <ol style="list-style-type: none"> <li data-bbox="544 577 1267 1137">1. “Deformable mirrors” having an active optical aperture greater than 10 mm and having either of the following characteristics, and specially designed components therefor:           <ol style="list-style-type: none"> <li data-bbox="632 730 1267 891">a. Having both of the following characteristics:               <ol style="list-style-type: none"> <li data-bbox="695 779 1267 846">1. A mechanical resonant frequency of 750 Hz or more; <u>and</u></li> <li data-bbox="695 853 1267 891">2. Have more than 200 actuators; <u>or</u></li> </ol> </li> <li data-bbox="632 904 1267 1137">b. A Laser Induced Damage Threshold (LIDT) being either of the following:               <ol style="list-style-type: none"> <li data-bbox="695 987 1267 1055">1. Greater than 1 kW/cm<sup>2</sup> using a “CW laser”; <u>or</u></li> <li data-bbox="695 1070 1267 1137">2. Greater than 2 J/cm<sup>2</sup> using 20 ns “laser” pulses at 20 Hz repetition rate;</li> </ol> </li> </ol> </li> <li data-bbox="544 1153 1267 1249">2. Lightweight monolithic mirrors having an average “equivalent density” of less than 30 kg/m<sup>2</sup> and a total mass exceeding 10 kg;</li> </ol> <p data-bbox="608 1272 663 1301"><u>Note</u></p> <p data-bbox="608 1312 1267 1402"><i>Category Code 6A004.a.2. does not include mirrors specially designed to direct solar radiation for terrestrial heliostat installations.</i></p> <ol style="list-style-type: none"> <li data-bbox="544 1429 1267 1525">3. Lightweight “composite” or foam mirror structures having an average “equivalent density” of less than 30 kg/m<sup>2</sup> and a total mass exceeding 2 kg;</li> </ol> <p data-bbox="608 1547 663 1576"><u>Note</u></p> <p data-bbox="608 1588 1267 1677"><i>Category Code 6A004.a.3. does not include mirrors specially designed to direct solar radiation for terrestrial heliostat installations.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>4. Mirrors specially designed for beam steering mirror stages specified in Category Code 6A004.d.2.a. with a flatness of <math>\lambda/10</math> or better (<math>\lambda</math> is equal to 633 nm) and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Diameter or major axis length greater than or equal to 100 mm; <u>or</u></li> <li>b. Having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Diameter or major axis length greater than 50 mm but less than 100 mm; <u>and</u></li> <li>2. A Laser Induced Damage Threshold (LIDT) being either of the following: <ol style="list-style-type: none"> <li>a. Greater than 10 kW/cm<sup>2</sup> using a “CW laser”; <u>or</u></li> <li>b. Greater than 20 J/cm<sup>2</sup> using 20 ns “laser” pulses at 20 Hz repetition rate;</li> </ol> </li> </ol> </li> </ol> <p>b. Optical components made from zinc selenide (ZnSe) or zinc sulphide (ZnS) with transmission in the wavelength range exceeding 3,000 nm but not exceeding 25,000 nm and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Exceeding 100 cm<sup>3</sup> in volume; <u>or</u></li> <li>2. Exceeding 80 mm in diameter or length of major axis and 20 mm in thickness (depth);</li> </ol> <p>c. “Space-qualified” components for optical systems, as follows:</p> <ol style="list-style-type: none"> <li>1. Components lightweighted to less than 20% “equivalent density” compared with a solid blank of the same aperture and thickness;</li> <li>2. Raw substrates, processed substrates having surface coatings (single-layer or multi-layer, metallic or dielectric, conducting, semiconducting or insulating) or having protective films;</li> <li>3. Segments or assemblies of mirrors designed to be assembled in space into an optical system with a collecting aperture equivalent to or larger than a single optic 1 m in diameter;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>4. Components manufactured from “composite” materials having a coefficient of linear thermal expansion equal to or less than <math>5 \times 10^{-6}</math> in any coordinate direction;</p> <p>d. Optical control equipment as follows:</p> <ol style="list-style-type: none"> <li>1. Equipment specially designed to maintain the surface figure or orientation of the “space-qualified” components specified in Category Code 6A004.c.1. or 6A004.c.3.;</li> <li>2. Steering, tracking, stabilisation and resonator alignment equipment as follows: <ol style="list-style-type: none"> <li>a. Beam steering mirror stages designed to carry mirrors having diameter or major axis length greater than 50 mm and having all of the following characteristics, and specially designed electronic control equipment therefor: <ol style="list-style-type: none"> <li>1. A maximum angular travel of <math>\pm 26</math> mrad or more;</li> <li>2. A mechanical resonant frequency of 500 Hz or more; <u>and</u></li> <li>3. An angular “accuracy” of 10 <math>\mu</math>rad (microradians) or less (better);</li> </ol> </li> <li>b. Resonator alignment equipment having bandwidths equal to or more than 100 Hz and an “accuracy” of 10 <math>\mu</math>rad or less (better);</li> </ol> </li> <li>3. Gimbals having all of the following characteristics: <ol style="list-style-type: none"> <li>a. A maximum slew exceeding 5°;</li> <li>b. A bandwidth of 100 Hz or more;</li> <li>c. Angular pointing errors of 200 <math>\mu</math>rad (microradians) or less; <u>and</u></li> <li>d. Having either of the following characteristics: <ol style="list-style-type: none"> <li>1. Exceeding 0.15 m but not exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 2 rad (radians)/s<sup>2</sup>; <u>or</u></li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="694 448 1268 582">2. Exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 0.5 rad (radians)/s<sup>2</sup>;</p> <p data-bbox="542 593 726 638">4. Not used;</p> <p data-bbox="478 649 1268 716">e. 'Aspheric optical elements' having all of the following characteristics:</p> <ol data-bbox="542 728 1268 974" style="list-style-type: none"> <li>1. Largest dimension of the optical-aperture greater than 400 mm;</li> <li>2. Surface roughness less than 1 nm (rms) for sampling lengths equal to or greater than 1 mm; <u>and</u></li> <li>3. Coefficient of linear thermal expansion's absolute magnitude less than <math>3 \times 10^{-6}/\text{K}</math> at 25°C.</li> </ol> <p data-bbox="542 985 742 1019"><u>Technical Notes</u></p> <ol data-bbox="542 1030 1268 1321" style="list-style-type: none"> <li>1. An 'aspheric optical element' is any element used in an optical system whose imaging surface or surfaces are designed to depart from the shape of an ideal sphere.</li> <li>2. It is not necessary to evaluate the surface roughness of the optical element against the criteria in Category Code 6A004.e.2. unless the optical element was designed or manufactured with the intent to meet, or exceed the control parameter.</li> </ol> <p data-bbox="542 1332 606 1366"><u>Note</u></p> <p data-bbox="542 1377 1268 1444">Category Code 6A004.e. does not include 'aspheric optical elements' having any of the following characteristics:</p> <ol data-bbox="542 1456 1268 1758" style="list-style-type: none"> <li>a. Largest optical-aperture dimension less than 1 m and focal length to aperture ratio equal to or greater than 4.5:1;</li> <li>b. Largest optical-aperture dimension equal to or greater than 1 m and focal length to aperture ratio equal to or greater than 7:1;</li> <li>c. Designed as Fresnel, flyeye, stripe, prism or diffractive optical elements;</li> </ol>

Category Code	Item Description
6A005	<p>d. Fabricated from borosilicate glass having a coefficient of linear thermal expansion greater than <math>2.5 \times 10^{-6}/K</math> at 25°C; <u>or</u></p> <p>e. An X-ray optical element having inner mirror capabilities (e.g. tube-type mirrors).</p> <p><u>N.B.</u> For ‘aspheric optical elements’ specially designed for lithography equipment, see Category Code 3B001.</p> <p>“Lasers”, other than those specified in Category Code 0B001.g.5. or 0B001.h.6., components and optical equipment, as follows:</p> <p><u>N.B.</u> See also Category Code 6A205.</p> <p><u>Note 1</u> Pulsed “lasers” include those that run in a Continuous Wave (CW) mode with pulses superimposed.</p> <p><u>Note 2</u> Excimer, semiconductor, chemical, CO, CO<sub>2</sub>, and ‘non-repetitive pulsed’ Nd:glass “lasers” are only specified in Category Code 6A005.d.</p> <p><u>Technical Note</u> ‘Non-repetitive pulsed’ refers to “lasers” that produce either a single output pulse or that have a time interval between pulses exceeding one minute.</p> <p><u>Note 3</u> Category Code 6A005 includes fibre “lasers”.</p> <p><u>Note 4</u> The control status of “lasers” incorporating frequency conversion (i.e. wavelength change) by means other than one “laser” pumping another “laser” is determined by applying the control parameters for both the output of the source “laser” and the frequency-converted optical output.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="478 448 558 481"><u>Note 5</u></p> <p data-bbox="478 492 1197 526"><i>Category Code 6A005 does not include “lasers” as follows:</i></p> <ul style="list-style-type: none"> <li data-bbox="478 537 981 571"><i>a. Ruby with output energy below 20 J;</i></li> <li data-bbox="478 582 662 616"><i>b. Nitrogen;</i></li> <li data-bbox="478 627 646 660"><i>c. Krypton.</i></li> </ul> <p data-bbox="478 683 662 716"><u>Technical Note</u></p> <p data-bbox="478 728 1260 896"><i>In Category Code 6A005, ‘Wall-plug efficiency’ is defined as the ratio of “laser” output power (or “average output power”) to total electrical input power required to operate the “laser”, including the power supply/conditioning and thermal conditioning/heat exchanger.</i></p> <ul style="list-style-type: none"> <li data-bbox="478 907 1260 974"><i>a. Non-“tunable” Continuous Wave “(CW) lasers” having any of the following characteristics:</i> <ul style="list-style-type: none"> <li data-bbox="542 996 1260 1064"><i>1. Output wavelength less than 150 nm, and output power exceeding 1 W;</i></li> <li data-bbox="542 1075 1260 1142"><i>2. Output wavelength of 150 nm or more but not exceeding 510 nm, and output power exceeding 30 W;</i></li> </ul> </li> </ul> <p data-bbox="606 1164 670 1198"><u>Note</u></p> <p data-bbox="606 1209 1260 1299"><i>Category Code 6A005.a.2. does not include Argon “lasers” having an output power equal to or less than 50 W.</i></p> <ul style="list-style-type: none"> <li data-bbox="542 1321 1260 1422"><i>3. Output wavelength exceeding 510 nm but not exceeding 540 nm, and having either of the following characteristics:</i> <ul style="list-style-type: none"> <li data-bbox="630 1444 1260 1512"><i>a. Single transverse mode output and output power exceeding 50 W; <u>or</u></i></li> <li data-bbox="630 1523 1260 1590"><i>b. Multiple transverse mode output and output power exceeding 150 W;</i></li> </ul> </li> <li data-bbox="542 1612 1260 1680"><i>4. Output wavelength exceeding 540 nm but not exceeding 800 nm, and output power exceeding 30 W;</i></li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>5. Output wavelength exceeding 800 nm but not exceeding 975 nm, and either of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Single transverse mode output and output power exceeding 50 W; <u>or</u></li> <li>b. Multiple transverse mode output and output power exceeding 80 W;</li> </ol> <p>6. Output wavelength exceeding 975 nm but not exceeding 1,150 nm, and either of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Single transverse mode output and output power exceeding 500 W; <u>or</u></li> <li>b. Multiple transverse mode output, and either of the following characteristics: <ol style="list-style-type: none"> <li>1. ‘Wall-plug efficiency’ exceeding 18% and output power exceeding 500 W; <u>or</u></li> <li>2. Output power exceeding 2 kW;</li> </ol> </li> </ol> <p><u>Note 1</u></p> <p><i>Category Code 6A005.a.6.b. does not include multiple transverse mode, industrial “lasers” with output power exceeding 2 kW and not exceeding 6 kW with a total mass greater than 1,200 kg. For the purpose of this Note, total mass includes all components required to operate the “laser”, e.g. “laser”, power supply, heat exchanger, but excludes external optics for beam conditioning and/or delivery.</i></p> <p><u>Note 2</u></p> <p><i>Category Code 6A005.a.6.b. does not include multiple transverse mode, industrial “lasers” having any of the following characteristics:</i></p> <ol style="list-style-type: none"> <li>a. <i>Output power exceeding 500 W but not exceeding 1 kW, and having both of the following characteristics:</i> <ol style="list-style-type: none"> <li>1. <i>Beam Parameter Product (BPP) exceeding 0.7 mm•mrad; <u>and</u></i></li> </ol> </li> </ol>

Category Code	Item Description
	<p>2. 'Brightness' not exceeding <math>1,024 \text{ W}/(\text{mm}\cdot\text{mrad})^2</math>;</p> <p>b. Output power exceeding 1 kW but not exceeding 1.6 kW, and having a BPP exceeding <math>1.25 \text{ mm}\cdot\text{mrad}</math>;</p> <p>c. Output power exceeding 1.6 kW but not exceeding 2.5 kW, and having a BPP exceeding <math>1.7 \text{ mm}\cdot\text{mrad}</math>;</p> <p>d. Output power exceeding 2.5 kW but not exceeding 3.3 kW, and having a BPP exceeding <math>2.5 \text{ mm}\cdot\text{mrad}</math>;</p> <p>e. Output power exceeding 3.3 kW but not exceeding 4 kW, and having a BPP exceeding <math>3.5 \text{ mm}\cdot\text{mrad}</math>;</p> <p>f. Output power exceeding 4 kW but not exceeding 5 kW, and having a BPP exceeding <math>5 \text{ mm}\cdot\text{mrad}</math>;</p> <p>g. Output power exceeding 5 kW but not exceeding 6 kW, and having a BPP exceeding <math>7.2 \text{ mm}\cdot\text{mrad}</math>;</p> <p>h. Output power exceeding 6 kW but not exceeding 8 kW, and having a BPP exceeding <math>12 \text{ mm}\cdot\text{mrad}</math>; <u>or</u></p> <p>i. Output power exceeding 8 kW but not exceeding 10 kW, and having a BPP exceeding <math>24 \text{ mm}\cdot\text{mrad}</math>.</p> <p><u>Technical Note</u></p> <p>For the purpose of Category Code 6A005.a.6.b. Note 2.a., 'brightness' is defined as the output power of the "laser" divided by the squared Beam Parameter Product (BPP), i.e. <math>(\text{output power})/\text{BPP}^2</math>.</p>



<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>7. Output wavelength exceeding 1,150 nm but not exceeding 1,555 nm and either of the following characteristics: <ol style="list-style-type: none"> <li>a. Single transverse mode output and output power exceeding 50 W; <u>or</u></li> <li>b. Multiple transverse mode output and output power exceeding 80 W;</li> </ol> </li> <li>8. Output wavelength exceeding 1,555 nm but not exceeding 1,850 nm, and output power exceeding 1 W;</li> <li>9. Output wavelength exceeding 1,850 nm but not exceeding 2,100 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li>a. Single transverse mode output and output power exceeding 1 W; <u>or</u></li> <li>b. Multiple transverse mode output and output power exceeding 120 W; <u>or</u></li> </ol> </li> <li>10. Output wavelength exceeding 2,100 nm and output power exceeding 1 W;</li> <li>b. Non-“tunable” “pulsed lasers” having any of the following characteristics: <ol style="list-style-type: none"> <li>1. Output wavelength less than 150 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li>a. Output energy exceeding 50 mJ per pulse and “peak power” exceeding 1 W; <u>or</u></li> <li>b. “Average output power” exceeding 1 W;</li> </ol> </li> <li>2. Output wavelength of 150 nm or more but not exceeding 510 nm, and having either of the following characteristics: <ol style="list-style-type: none"> <li>a. Output power exceeding 1.5 J per pulse and “peak power” exceeding 30 W; <u>or</u></li> <li>b. “Average output power” exceeding 30 W;</li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="694 459 758 481"><u>Note</u></p> <p data-bbox="694 504 1260 593"><i>Category Code 6A005.b.2.b. does not include Argon “lasers” having an “average output power” equal to or less than 50 W.</i></p> <ol style="list-style-type: none"> <li data-bbox="550 616 1260 705">3. Output wavelength exceeding 510 nm but not exceeding 540 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="630 728 1260 795">a. Single transverse mode output, and either of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="694 817 1260 884">1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 50 W; <u>or</u></li> <li data-bbox="694 896 1260 963">2. “Average output power” exceeding 50 W; <u>or</u></li> </ol> </li> <li data-bbox="630 974 1260 1041">b. Multiple transverse mode output, and either of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="694 1064 1260 1131">1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 150 W; <u>or</u></li> <li data-bbox="694 1142 1260 1209">2. “Average output power” exceeding 150 W;</li> </ol> </li> </ol> </li> <li data-bbox="550 1232 1260 1321">4. Output wavelength exceeding 540 nm but not exceeding 800 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="630 1344 1260 1411">a. “Pulse duration” less than 1 ps, and either of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="694 1433 1260 1500">1. Output energy exceeding 0.005 J per pulse and “peak power” exceeding 5 GW; <u>or</u></li> <li data-bbox="694 1512 1260 1579">2. “Average output power” exceeding 20 W; <u>or</u></li> </ol> </li> <li data-bbox="630 1590 1260 1657">b. “Pulse duration” equal to or exceeding 1 ps, and either of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="694 1680 1260 1747">1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 30 W; <u>or</u></li> <li data-bbox="694 1758 1260 1792">2. “Average output power” exceeding 30 W;</li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>5. Output wavelength exceeding 800 nm but not exceeding 975 nm, and any of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. “Pulse duration” less than 1 ps, and either of the following characteristics: <ul style="list-style-type: none"> <li>1. Output energy exceeding 0.005 J per pulse and “peak power” exceeding 5 GW; <u>or</u></li> <li>2. Single transverse mode output and “average output power” exceeding 20 W;</li> </ul> </li> <li>b. “Pulse duration” equal to or exceeding 1 ps and not exceeding 1 <math>\mu</math>s, and any of the following characteristics: <ul style="list-style-type: none"> <li>1. Output energy exceeding 0.5 J per pulse and “peak power” exceeding 50 W;</li> <li>2. Single transverse mode output and “average output power” exceeding 20 W; <u>or</u></li> <li>3. Multiple transverse mode output and “average output power” exceeding 50 W; <u>or</u></li> </ul> </li> <li>c. “Pulse duration” exceeding 1 <math>\mu</math>s, and any of the following characteristics: <ul style="list-style-type: none"> <li>1. Output energy exceeding 2 J per pulse and “peak power” exceeding 50 W;</li> <li>2. Single transverse mode output and “average output power” exceeding 50 W; <u>or</u></li> <li>3. Multiple transverse mode output and “average output power” exceeding 80 W;</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>6. Output wavelength exceeding 975 nm but not exceeding 1,150 nm, and any of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. “Pulse duration” of less than 1 ps, and any of the following characteristics: <ul style="list-style-type: none"> <li>1. Output “peak power” exceeding 2 GW per pulse;</li> <li>2. “Average output power” exceeding 30 W; <u>or</u></li> <li>3. Output energy exceeding 0.002 J per pulse;</li> </ul> </li> <li>b. “Pulse duration” equal to or exceeding 1 ps and less than 1 ns, and any of the following characteristics: <ul style="list-style-type: none"> <li>1. Output “peak power” exceeding 5 GW per pulse;</li> <li>2. “Average output power” exceeding 50 W; <u>or</u></li> <li>3. Output energy exceeding 0.1 J per pulse;</li> </ul> </li> <li>c. “Pulse duration” equal to or exceeding 1 ns but not exceeding 1 <math>\mu</math>s, and either of the following characteristics: <ul style="list-style-type: none"> <li>1. Single transverse mode output, and any of the following characteristics: <ul style="list-style-type: none"> <li>a. “Peak power” exceeding 100 MW;</li> <li>b. “Average output power” exceeding 20 W limited by design to a maximum pulse repetition frequency less or equal to 1 kHz;</li> <li>c. ‘Wall-plug efficiency’ exceeding 12%, “average output power” exceeding 100 W, and capable of operating at a pulse repetition frequency greater than 1 kHz;</li> </ul> </li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>d. “Average output power” exceeding 150 W, and capable of operating at a pulse repetition frequency greater than 1 kHz; <u>or</u></li> <li>e. Output energy exceeding 2 J per pulse; <u>or</u></li> </ul> <p>2. Multiple transverse mode output, and any of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. “Peak power” exceeding 400 MW;</li> <li>b. ‘Wall-plug efficiency’ exceeding 18% and “average output power” exceeding 500 W;</li> <li>c. “Average output power” exceeding 2 kW; <u>or</u></li> <li>d. Output energy exceeding 4 J per pulse; <u>or</u></li> </ul> <p>d. “Pulse duration” exceeding 1 <math>\mu</math>s, and either of the following characteristics:</p> <ul style="list-style-type: none"> <li>1. Single transverse mode output, and any of the following characteristics: <ul style="list-style-type: none"> <li>a. “Peak power” exceeding 500 kW;</li> <li>b. ‘Wall-plug efficiency’ exceeding 12% and “average output power” exceeding 100 W; <u>or</u></li> <li>c. “Average output power” exceeding 150 W; <u>or</u></li> </ul> </li> <li>2. Multiple transverse mode output, and any of the following characteristics: <ul style="list-style-type: none"> <li>a. “Peak power” exceeding 1 MW;</li> <li>b. ‘Wall-plug efficiency’ exceeding 18% and “average output power” exceeding 500 W; <u>or</u></li> <li>c. “Average output power” exceeding 2 kW;</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>7. Output wavelength exceeding 1,150 nm but not exceeding 1,555 nm, and either of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. “Pulse duration” not exceeding 1 <math>\mu</math>s, and any of the following characteristics: <ul style="list-style-type: none"> <li>1. Output energy exceeding 0.5 J per pulse and “peak power” exceeding 50 W;</li> <li>2. Single transverse mode output and “average output power” exceeding 20 W; <u>or</u></li> <li>3. Multiple transverse mode output and “average output power” exceeding 50 W; <u>or</u></li> </ul> </li> <li>b. “Pulse duration” exceeding 1 <math>\mu</math>s, and any of the following characteristics: <ul style="list-style-type: none"> <li>1. Output energy exceeding 2 J per pulse and “peak power” exceeding 50 W;</li> <li>2. Single transverse mode output and “average output power” exceeding 50 W; <u>or</u></li> <li>3. Multiple transverse mode output and “average output power” exceeding 80 W;</li> </ul> </li> </ul> <p>8. Output wavelength exceeding 1,555 nm but not exceeding 1,850 nm, and either of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Output energy exceeding 100 mJ per pulse and “peak power” exceeding 1 W; <u>or</u></li> <li>b. “Average output power” exceeding 1 W;</li> </ul> <p>9. Output wavelength exceeding 1,850 nm but not exceeding 2,100 nm, and either of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Single transverse mode and either of the following characteristics: <ul style="list-style-type: none"> <li>1. Output energy exceeding 100 mJ per pulse and “peak power” exceeding 1 W; <u>or</u></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="692 450 1268 517">2. "Average output power" exceeding 1 W; <u>or</u></p> <p data-bbox="628 533 1268 600">b. Multiple transverse mode and either of the following characteristics:</p> <p data-bbox="692 616 1268 683">1. Output energy exceeding 100 mJ per pulse and "peak power" exceeding 10 kW; <u>or</u></p> <p data-bbox="692 698 1268 766">2. "Average output power" exceeding 120 W; <u>or</u></p> <p data-bbox="544 781 1268 848">10. Output wavelength exceeding 2,100 nm and either of the following characteristics:</p> <p data-bbox="628 864 1268 931">a. Output energy exceeding 100 mJ per pulse and "peak power" exceeding 1 W; <u>or</u></p> <p data-bbox="628 947 1182 981">b. "Average output power" exceeding 1 W;</p> <p data-bbox="480 996 1268 1064">c. "Tunable" "lasers" having any of the following characteristics:</p> <p data-bbox="544 1079 1268 1146">1. Output wavelength less than 600 nm, and either of the following characteristics:</p> <p data-bbox="628 1162 1268 1229">a. Output energy exceeding 50 mJ per pulse and "peak power" exceeding 1 W; <u>or</u></p> <p data-bbox="628 1245 1241 1279">b. Average or CW output power exceeding 1 W;</p> <p data-bbox="608 1294 671 1328"><u>Note</u></p> <p data-bbox="608 1339 1268 1507"><i>Category Code 6A005.c.1. does not include dye "lasers" or other liquid "lasers", having a multimode output and a wavelength of 150 nm or more but not exceeding 600 nm and both of the following characteristics:</i></p> <p data-bbox="628 1523 1268 1590">1. <i>Output energy less than 1.5 J per pulse or a "peak power" less than 20 W; <u>and</u></i></p> <p data-bbox="628 1606 1230 1639">2. <i>Average or CW output power less than 20 W.</i></p> <p data-bbox="544 1655 1268 1756">2. Output wavelength of 600 nm or more but not exceeding 1,400 nm, and either of the following characteristics:</p> <p data-bbox="628 1771 1268 1839">a. Output energy exceeding 1 J per pulse and "peak power" exceeding 20 W; <u>or</u></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Average or CW output power exceeding 20 W; <u>or</u></p> <p>3. Output wavelength exceeding 1,400 nm, and either of the following characteristics:</p> <p>a. Output energy exceeding 50 mJ per pulse and “peak power” exceeding 1 W; <u>or</u></p> <p>b. Average or CW output power exceeding 1 W;</p> <p>d. Other “lasers”, not specified in Category Code 6A005.a., 6A005.b. or 6A005.c. as follows:</p> <p>1. Semiconductor “lasers” as follows:</p> <p><i>Note 1</i> Category Code 6A005.d.1. includes semiconductor “lasers” having optical output connectors (e.g. fibre optic pigtails).</p> <p><i>Note 2</i> The control status of semiconductor “lasers” specially designed for other equipment is determined by the control status of the other equipment.</p> <p>a. Individual single-transverse mode semiconductor “lasers” having either of the following characteristics:</p> <p>1. Wavelength equal or less than 1,510 nm and average or CW output power, exceeding 1.5 W; <u>or</u></p> <p>2. Wavelength greater than 1,510 nm and average or CW output power, exceeding 500 mW;</p> <p>b. Individual, multiple-transverse mode semiconductor “lasers” having any of the following characteristics:</p> <p>1. Wavelength of less than 1,400 nm, and average or CW output power exceeding 15 W;</p>



<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="692 454 1268 584">2. Wavelength equal to or greater than 1,400 nm and less than 1,900 nm, and average or CW output power exceeding 2.5 W; <u>or</u></li> <li data-bbox="692 607 1268 701">3. Wavelength equal to or greater than 1,900 nm, and average or CW output power exceeding 1 W;</li> </ol> <p data-bbox="628 723 1268 786">c. Individual semiconductor “laser” ‘bars’, having any of the following characteristics:</p> <ol style="list-style-type: none"> <li data-bbox="692 808 1268 902">1. Wavelength of less than 1,400 nm, and average or CW output power exceeding 100 W;</li> <li data-bbox="692 925 1268 1055">2. Wavelength equal to or greater than 1,400 nm and less than 1,900 nm, and average or CW output power exceeding 25 W; <u>or</u></li> <li data-bbox="692 1077 1268 1171">3. Wavelength equal to or greater than 1,900 nm, and average or CW output power exceeding 10 W;</li> </ol> <p data-bbox="628 1193 1268 1288">d. Semiconductor “laser” ‘stacked arrays’ (two-dimensional arrays) having any of the following characteristics:</p> <ol style="list-style-type: none"> <li data-bbox="692 1310 1268 1404">1. Wavelength less than 1,400 nm, and having any of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="756 1426 1268 1556">a. Average or CW total output power less than 3 kW, and having average or CW output ‘power density’ greater than 500 W/cm<sup>2</sup>;</li> <li data-bbox="756 1579 1268 1736">b. Average or CW total output power equal to or exceeding 3 kW but less or equal to 5 kW, and having average or CW output ‘power density’ greater than 350 W/cm<sup>2</sup>;</li> <li data-bbox="756 1758 1268 1823">c. Average or CW total output power exceeding 5 kW;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. Peak pulsed 'power density' exceeding 2,500 W/cm<sup>2</sup>; <u>or</u></p> <p><i>Note</i>  <i>Category Code 6A005.d.1.d.1.d. does not include epitaxially-fabricated monolithic devices.</i></p> <p>e. Spatially coherent average or CW total output power greater than 150 W;</p> <p>2. Wavelength greater than or equal to 1,400 nm but less than 1,900 nm, and having any of the following characteristics:</p> <p>a. Average or CW total output power less than 250 W, and average or CW output 'power density' greater than 150 W/cm<sup>2</sup>;</p> <p>b. Average or CW total output power equal to or exceeding 250 W but less or equal to 500 W, and having average or CW output 'power density' greater than 50 W/cm<sup>2</sup>;</p> <p>c. Average or CW total output power exceeding 500 W;</p> <p>d. Peak pulsed 'power density' exceeding 500 W/cm<sup>2</sup>; <u>or</u></p> <p><i>Note</i>  <i>Category Code 6A005.d.1.d.2.d. does not include epitaxially-fabricated monolithic devices.</i></p> <p>e. Spatially coherent average or CW total output power, exceeding 15 W;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="692 454 1267 551">3. Wavelength greater than or equal to 1,900 nm, and having any of the following characteristics:</p> <ul style="list-style-type: none"> <li data-bbox="751 568 1267 636">a. Average or CW output ‘power density’ greater than 50 W/cm<sup>2</sup>;</li> <li data-bbox="751 654 1267 721">b. Average or CW output power greater than 10 W; <u>or</u></li> <li data-bbox="751 739 1267 835">c. Spatially coherent average or CW total output power exceeding 1.5 W; <u>or</u></li> </ul> <p data-bbox="692 853 1267 920">4. At least one “laser” ‘bar’ specified in Category Code 6A005.d.1.c.;</p> <p data-bbox="692 938 874 972"><i><u>Technical Note</u></i></p> <p data-bbox="692 981 1267 1111"><i>For the purpose of Category Code 6A005.d.1.d., ‘power density’ means the total “laser” output power divided by the emitter surface area of the ‘stacked array’.</i></p> <ul style="list-style-type: none"> <li data-bbox="628 1128 1267 1258">e. Semiconductor “laser” ‘stacked arrays’, other than those specified in Category Code 6A005.d.1.d., having both of the following characteristics: <ul style="list-style-type: none"> <li data-bbox="692 1276 1267 1373">1. Specially designed or modified to be combined with other ‘stacked arrays’ to form a larger ‘stacked array’; <u>and</u></li> <li data-bbox="692 1391 1267 1458">2. Integrated connections, common for both electronics and cooling;</li> </ul> </li> </ul> <p data-bbox="692 1476 772 1509"><i><u>Note 1</u></i></p> <p data-bbox="692 1518 1267 1720"><i>‘Stacked arrays’, formed by combining semiconductor “laser” ‘stacked arrays’ specified by Category Code 6A005.d.1.e., that are not designed to be further combined or modified are specified by Category Code 6A005.d.1.d.</i></p>

Category Code	Item Description
	<p data-bbox="694 459 774 481"><u>Note 2</u></p> <p data-bbox="694 504 1260 660"><i>'Stacked arrays', formed by combining semiconductor "laser" 'stacked arrays' specified by Category Code 6A005.d.1.e., that are designed to be further combined or modified are specified by Category Code 6A005.d.1.e.</i></p> <p data-bbox="694 683 774 705"><u>Note 3</u></p> <p data-bbox="694 728 1260 851"><i>Category Code 6A005.d.1.e. does not include modular assemblies of single 'bars' designed to be fabricated into end-to-end stacked linear arrays.</i></p> <p data-bbox="606 873 798 896"><u>Technical Notes</u></p> <ol data-bbox="542 918 1260 1836" style="list-style-type: none"> <li data-bbox="630 918 1260 974">1. Semiconductor "lasers" are commonly called "laser" diodes.</li> <li data-bbox="630 996 1260 1131">2. A 'bar' (also called a semiconductor "laser" 'bar', a "laser" diode 'bar' or diode 'bar') consists of multiple semiconductor "lasers" in a one-dimensional array.</li> <li data-bbox="630 1153 1260 1243">3. A 'stacked array' consists of multiple 'bars' forming a two-dimensional array of semiconductor "lasers".</li> <li data-bbox="542 1265 1260 1467">2. Carbon monoxide (CO) "lasers" having either of the following characteristics: <ol data-bbox="630 1355 1260 1467" style="list-style-type: none"> <li data-bbox="630 1355 1260 1422">a. Output energy exceeding 2 J per pulse and "peak power" exceeding 5 kW; <u>or</u></li> <li data-bbox="630 1433 1260 1467">b. Average or CW output power exceeding 5 kW;</li> </ol> </li> <li data-bbox="542 1489 1260 1836">3. Carbon dioxide (CO<sub>2</sub>) "lasers" having any of the following characteristics: <ol data-bbox="630 1568 1260 1836" style="list-style-type: none"> <li data-bbox="630 1568 1260 1601">a. CW output power exceeding 15 kW;</li> <li data-bbox="630 1612 1260 1792">b. Pulsed output with a "pulse duration" exceeding 10 μs, and either of the following characteristics: <ol data-bbox="694 1736 1260 1836" style="list-style-type: none"> <li data-bbox="694 1736 1260 1803">1. "Average output power" exceeding 10 kW; <u>or</u></li> <li data-bbox="694 1814 1260 1836">2. "Peak power" exceeding 100 kW; <u>or</u></li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. Pulsed output with a “pulse duration” equal to or less than 10 <math>\mu</math>s, and either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Pulse energy exceeding 5 J per pulse; <u>or</u></li> <li>2. “Average output power” exceeding 2.5 kW;</li> </ol> <p>4. Excimer “lasers” having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Output wavelength not exceeding 150 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li>1. Output energy exceeding 50 mJ per pulse; <u>or</u></li> <li>2. “Average output power” exceeding 1 W;</li> </ol> </li> <li>b. Output wavelength exceeding 150 nm but not exceeding 190 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li>1. Output energy exceeding 1.5 J per pulse; <u>or</u></li> <li>2. “Average output power” exceeding 120 W;</li> </ol> </li> <li>c. Output wavelength exceeding 190 nm but not exceeding 360 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li>1. Output energy exceeding 10 J per pulse; <u>or</u></li> <li>2. “Average output power” exceeding 500 W; <u>or</u></li> </ol> </li> <li>d. Output wavelength exceeding 360 nm, and either of the following characteristics: <ol style="list-style-type: none"> <li>1. Output energy exceeding 1.5 J per pulse; <u>or</u></li> <li>2. “Average output power” exceeding 30 W;</li> </ol> </li> </ol> <p><u>N.B.</u>  <i>For excimer “lasers” specially designed for lithography equipment, see Category Code 3B001.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>5. “Chemical lasers” as follows:</p> <ol style="list-style-type: none"> <li>a. Hydrogen Fluoride (HF) “lasers”;</li> <li>b. Deuterium Fluoride (DF) “lasers”;</li> <li>c. “Transfer lasers”, as follows:               <ol style="list-style-type: none"> <li>1. Oxygen Iodine (O<sub>2</sub>-I) “lasers”;</li> <li>2. Deuterium Fluoride-Carbon dioxide (DF-CO<sub>2</sub>) “lasers”;</li> </ol> </li> </ol> <p>6. ‘Non-repetitive pulsed’ Nd: glass “lasers” having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. “Pulse duration” not exceeding 1 μs and output energy exceeding 50 J per pulse; <u>or</u></li> <li>b. “Pulse duration” exceeding 1 μs and output energy exceeding 100 J per pulse;</li> </ol> <p><i>Note</i>  ‘Non-repetitive pulsed’ refers to “lasers” that produce either a single output pulse or that have a time interval between pulses exceeding one minute.</p> <p>e. Components as follows:</p> <ol style="list-style-type: none"> <li>1. Mirrors cooled either by ‘active cooling’ or by heat pipe cooling;</li> </ol> <p><i>Technical Note</i>  ‘Active cooling’ is a cooling technique for optical components using flowing fluids within the subsurface (nominally less than 1 mm below the optical surface) of the optical component to remove heat from the optic.</p> <ol style="list-style-type: none"> <li>2. Optical mirrors or transmissive or partially transmissive optical or electro-optical components, other than fused tapered fibre combiners and Multi-Layer Dielectric gratings (MLDs), specially designed for use with specified “lasers”;</li> </ol> <p><i>Note</i>  Fibre combiners and MLDs are specified in Category Code 6A005.e.3.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. Fibre “laser” components as follows:</p> <ul style="list-style-type: none"> <li>a. Multimode to multimode fused tapered fibre combiners having both of the following characteristics: <ul style="list-style-type: none"> <li>1. An insertion loss better (less) than or equal to 0.3 dB maintained at a rated total average or CW output power (excluding output power transmitted through the single mode core if present) exceeding 1,000 W; <u>and</u></li> <li>2. Number of input fibres equal to or greater than 3;</li> </ul> </li> <li>b. Single mode to multimode fused tapered fibre combiners having all of the following characteristics: <ul style="list-style-type: none"> <li>1. An insertion loss better (less) than 0.5 dB maintained at a rated total average or CW output power exceeding 4,600 W;</li> <li>2. Number of input fibres equal to or greater than 3; <u>and</u></li> <li>3. Having either of the following characteristics: <ul style="list-style-type: none"> <li>a. A Beam Parameter Product (BPP) measured at the output not exceeding 1.5 mm•mrad for a number of input fibres not more than 5; <u>or</u></li> <li>b. A BPP measured at the output not exceeding 2.5 mm•mrad for a number of input fibres greater than 5;</li> </ul> </li> </ul> </li> <li>c. MLDs having both of the following characteristics: <ul style="list-style-type: none"> <li>1. Designed for spectral or coherent beam combination of 5 or more fibre “lasers”; <u>and</u></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="694 448 1268 548">2. CW “Laser” Induced Damage Threshold (LIDT) greater than or equal to 10 kW/cm<sup>2</sup>;</p> <p data-bbox="478 560 901 593">f. Optical equipment as follows:</p> <p data-bbox="542 616 598 649"><u><i>N.B.</i></u></p> <p data-bbox="542 660 1268 750"><i>For shared aperture optical elements, capable of operating in “Super High Power Laser” (“SHPL”) applications, see Division 2 of Part 1 of this Schedule.</i></p> <ol data-bbox="542 772 1268 1456" style="list-style-type: none"> <li>1. Dynamic wavefront (phase) measuring equipment capable of mapping at least 50 positions on a beam wavefront, and either of the following: <ol data-bbox="630 884 1268 1108" style="list-style-type: none"> <li>a. Frame rates equal to or more than 100 Hz and phase discrimination of at least 5% of the beam’s wavelength; <u>or</u></li> <li>b. Frame rates equal to or more than 1,000 Hz and phase discrimination of at least 20% of the beam’s wavelength;</li> </ol> </li> <li>2. “Laser” diagnostic equipment capable of measuring “SHPL” system angular beam steering errors of equal to or less than 10 μrad;</li> <li>3. Optical equipment and components, specially designed for a phased-array “SHPL” system for coherent beam combination to an “accuracy” of <math>\lambda/10</math> at the designed wavelength, or 0.1 μm, whichever is the smaller;</li> <li>4. Projection telescopes specially designed for use with “SHPL” systems;</li> </ol> <p data-bbox="478 1467 1268 1545">g. ‘Laser acoustic detection equipment’ having all of the following characteristics:</p> <ol data-bbox="542 1556 1268 1836" style="list-style-type: none"> <li>1. CW “laser” output power equal to or exceeding 20 mW;</li> <li>2. “Laser” frequency stability equal to or better (less) than 10 MHz;</li> <li>3. “Laser” wavelengths equal to or exceeding 1,000 nm but not exceeding 2,000 nm;</li> <li>4. Optical system resolution better (less) than 1 nm; <u>and</u></li> </ol>



<i>Category Code</i>	<i>Item Description</i>
6A006	<p>5. Optical Signal to Noise ratio equal to or exceeding <math>10^3</math>.</p> <p><u>Technical Note</u>  <i>'Laser acoustic detection equipment' is sometimes referred to as a "Laser" Microphone or Particle Flow Detection Microphone.</i></p> <p>"Magnetometers", "magnetic gradiometers", "intrinsic magnetic gradiometers", underwater electric field sensors, "compensation systems", and specially designed components therefor, as follows:</p> <p><u>N.B.</u>  <i>See also Category Code 7A103.d.</i></p> <p><u>Note</u>  <i>Category Code 6A006 does not include instruments specially designed for fishery applications or biomagnetic measurements for medical diagnostics.</i></p> <p>a. "Magnetometers" and sub-systems, as follows:</p> <ol style="list-style-type: none"> <li>1. "Magnetometers" using "superconductive" (SQUID) "technology" and having either of the following: <ol style="list-style-type: none"> <li>a. SQUID systems designed for stationary operation, without specially designed sub-systems designed to reduce in-motion noise, and having a 'sensitivity' equal to or lower (better) than 50 fT (rms) per square root Hz at a frequency of 1 Hz; <u>or</u></li> <li>b. SQUID systems having an in-motion-magnetometer 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz and specially designed to reduce in-motion noise;</li> </ol> </li> <li>2. "Magnetometers" using optically pumped or nuclear precession (proton/Overhauser) "technology" having a 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz;</li> <li>3. "Magnetometers" using fluxgate "technology" having a 'sensitivity' equal to or lower (better) than 10 pT (rms) per square root Hz at a frequency of 1 Hz;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="542 448 1268 795">4. Induction coil “magnetometers” having a ‘sensitivity’ lower (better) than any of the following:               <ol style="list-style-type: none"> <li data-bbox="630 526 1268 593">a. 0.05 nT (rms) per square root Hz at frequencies of less than 1 Hz;</li> <li data-bbox="630 616 1268 705">b. <math>1 \times 10^{-3}</math> nT (rms) per square root Hz at frequencies of 1 Hz or more but not exceeding 10 Hz; <u>or</u></li> <li data-bbox="630 728 1268 795">c. <math>1 \times 10^{-4}</math> nT (rms) per square root Hz at frequencies exceeding 10 Hz;</li> </ol> </li> <li data-bbox="542 817 1268 884">5. Fibre optic “magnetometers” having a ‘sensitivity’ lower (better) than 1 nT (rms) per square root Hz;</li> <li data-bbox="478 907 1268 996">b. Underwater electric field sensors having a ‘sensitivity’ lower (better) than 8 nanovolt per metre per square root Hz when measured at 1 Hz;</li> <li data-bbox="478 1019 1268 1433">c. “Magnetic gradiometers” as follows:               <ol style="list-style-type: none"> <li data-bbox="542 1064 1268 1164">1. “Magnetic gradiometers” using multiple “magnetometers” specified in Category Code 6A006.a.;</li> <li data-bbox="542 1187 1268 1288">2. Fibre optic “intrinsic magnetic gradiometers” having a magnetic gradient field ‘sensitivity’ lower (better) than 0.3 nT/m (rms) per square root Hz;</li> <li data-bbox="542 1310 1268 1433">3. “Intrinsic magnetic gradiometers”, using “technology” other than fibre-optic “technology”, having a magnetic gradient field ‘sensitivity’ lower (better) than 0.015 nT/m (rms) per square root Hz;</li> </ol> </li> <li data-bbox="478 1456 1268 1579">d. “Compensation systems” for magnetic or underwater electric field sensors resulting in a performance equal to or better than the specified parameters of Category Code 6A006.a., 6A006.b. or 6A006.c.;</li> <li data-bbox="478 1601 1268 1736">e. Underwater electromagnetic receivers incorporating magnetic field sensors specified by Category Code 6A006.a. or underwater electric field sensors specified by Category Code 6A006.b.</li> </ol>

Category Code	Item Description
6A007	<p><u>Technical Note</u>  <i>For the purpose of Category Code 6A006, ‘sensitivity’ (noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.</i></p> <p>Gravity meters (gravimeters) and gravity gradiometers, as follows:</p> <p><u>N.B.</u>  <i>See also Category Code 6A107.</i></p> <p>a. Gravity meters designed or modified for ground use and having a static “accuracy” of less (better) than 10 <math>\mu</math>Gal;</p> <p><u>Note</u>  <i>Category Code 6A007.a. does not include ground gravity meters of the quartz element (Worden) type.</i></p> <p>b. Gravity meters designed for mobile platforms and having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A static “accuracy” of less (better) than 0.7 mGal; <u>and</u></li> <li>2. An in-service (operational) “accuracy” of less (better) than 0.7 mGal having a ‘time-to-steady-state registration’ of less than 2 minutes under any combination of attendant corrective compensations and motional influences;</li> </ol> <p><u>Technical Note</u>  <i>For the purpose of Category Code 6A007.b., ‘time-to-steady-state registration’ (also referred to as the gravimeter’s response time) is the time over which the disturbing effects of platform induced accelerations (high frequency noise) are reduced.</i></p> <p>c. Gravity gradiometers.</p>
6A008	<p>Radar systems, equipment and assemblies, having any of the following characteristics, and specially designed components therefor:</p> <p><u>N.B.</u>  <i>See also Category Code 6A108.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="478 448 542 481"><u>Note</u></p> <p data-bbox="478 492 957 526"><i>Category Code 6A008 does not include:</i></p> <ul style="list-style-type: none"> <li data-bbox="478 537 989 571">– <i>Secondary Surveillance Radar (SSR);</i></li> <li data-bbox="478 582 829 616">– <i>Civil Automotive Radar;</i></li> <li data-bbox="478 627 1212 660">– <i>Displays or monitors used for Air Traffic Control (ATC);</i></li> <li data-bbox="478 672 925 705">– <i>Meteorological (weather) radar;</i></li> <li data-bbox="478 716 1260 862">– <i>Precision Approach Radar (PAR) equipment conforming to ICAO standards and employing electronically steerable linear (1-dimensional) arrays or mechanically positioned passive antennae.</i></li> </ul> <ul style="list-style-type: none"> <li data-bbox="478 873 1260 952">a. Operating at frequencies from 40 GHz to 230 GHz, and having either of the following characteristics: <ul style="list-style-type: none"> <li data-bbox="542 963 1181 996">1. An average output power exceeding 100 mW; <u>or</u></li> <li data-bbox="542 1008 1260 1086">2. Locating “accuracy” of 1 m or less (better) in range and 0.2 degree or less (better) in azimuth;</li> </ul> </li> <li data-bbox="478 1097 1260 1176">b. A tunable bandwidth exceeding <math>\pm 6.25\%</math> of the ‘centre operating frequency’;</li> </ul> <p data-bbox="542 1187 718 1220"><u>Technical Note</u></p> <p data-bbox="542 1232 1260 1299"><i>The ‘centre operating frequency’ equals one half of the sum of the highest plus the lowest specified operating frequencies.</i></p> <ul style="list-style-type: none"> <li data-bbox="478 1310 1260 1377">c. Capable of operating simultaneously on more than two carrier frequencies;</li> <li data-bbox="478 1388 1260 1489">d. Capable of operating in Synthetic Aperture Radar (SAR), Inverse Synthetic Aperture Radar (ISAR) mode, or Sideloading Airborne Radar (SLAR) mode;</li> <li data-bbox="478 1500 1165 1534">e. Incorporating electronically steerable array antennae;</li> <li data-bbox="478 1545 1133 1579">f. Capable of heightfinding non-cooperative targets;</li> <li data-bbox="478 1590 1260 1702">g. Specially designed for airborne (balloon or airframe mounted) operation and having Doppler “signal processing” for the detection of moving targets;</li> <li data-bbox="478 1713 1260 1792">h. Employing processing of radar signals and using either of the following: <ul style="list-style-type: none"> <li data-bbox="542 1803 1085 1836">1. “Radar spread spectrum” techniques; <u>or</u></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. “Radar frequency agility” techniques;</p> <p>i. Providing ground-based operation with a maximum “instrumented range” exceeding 185 km;</p> <p><i>Note</i>  <i>Category Code 6A008.i. does not include:</i></p> <p>a. <i>Fishing ground surveillance radar;</i></p> <p>b. <i>Ground radar equipment specially designed for enroute Air Traffic Control (ATC) and having all of the following characteristics:</i></p> <ol style="list-style-type: none"> <li>1. <i>A maximum “instrumented range” of 500 km or less;</i></li> <li>2. <i>Configured so that radar target data can be transmitted only one way from the radar site to one or more civil ATC centres;</i></li> <li>3. <i>Contains no provisions for remote control of the radar scan rate from the enroute ATC centre; and</i></li> <li>4. <i>Is permanently installed;</i></li> </ol> <p>c. <i>Weather balloon tracking radars.</i></p> <p>j. Being “laser” radar or Light Detection and Ranging (LIDAR) equipment, and having any of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. “Space-qualified”;</li> <li>2. Employing coherent heterodyne or homodyne detection techniques, and having an angular resolution of less (better) than 20 µrad (microradians); <u>or</u></li> <li>3. Designed for carrying out airborne bathymetric littoral surveys to International Hydrographic Organisation (IHO) Order 1a Standard (5th Edition February 2008) for Hydrographic Surveys or better, and using one or more “lasers” with a wavelength exceeding 400 nm but not exceeding 600 nm;</li> </ol> <p><i>Note 1</i>  <i>LIDAR equipment specially designed for surveying is only specified in Category Code 6A008.j.3.</i></p>

Category Code	Item Description
	<p><u>Note 2</u> Category Code 6A008.j. does not include LIDAR equipment specially designed for meteorological observation.</p> <p><u>Note 3</u> Parameters in the IHO Order 1a Standard 5th Edition February 2008 are summarised as follows:</p> <ul style="list-style-type: none"> <li>– Horizontal Accuracy (95% Confidence Level) = 5 m + 5% of depth</li> <li>– Depth Accuracy for Reduced Depths (95% confidence level) = <math>\pm\sqrt{(a^2 + (b*d)^2)}</math>, where: <ul style="list-style-type: none"> <li><math>a = 0.5</math> m = constant depth error, i.e. the sum of all constant depth errors</li> <li><math>b = 0.013</math> = factor of depth dependent error</li> <li><math>b*d</math> = depth dependent error, i.e. the sum of all depth dependent errors</li> <li><math>d</math> = depth</li> </ul> </li> <li>– Feature Detection = Cubic features &gt; 2 m in depths up to 40 m; 10% of depth beyond 40 m.</li> </ul> <p>k. Having “signal processing” sub-systems using “pulse compression”, and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A “pulse compression” ratio exceeding 150; <u>or</u></li> <li>2. A compressed pulse width of less than 200 ns; <u>or</u></li> </ol> <p><u>Note</u> Category Code 6A008.k.2. does not include two dimensional ‘marine radar’ or ‘vessel traffic service’ radar, having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. “Pulse compression” ratio not exceeding 150;</li> <li>b. Compressed pulse width of greater than 30 ns;</li> <li>c. Single and rotating mechanically scanned antenna;</li> <li>d. Peak output power not exceeding 250 W; <u>and</u></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="632 454 1134 488"><i>e. Not capable of “frequency hopping”.</i></p> <p data-bbox="480 506 1260 568">1. Having data processing sub-systems, and having either of the following characteristics:</p> <p data-bbox="547 589 1260 685">1. “Automatic target tracking” providing, at any antenna rotation, the predicted target position beyond the time of the next antenna beam passage; <u>or</u></p> <p data-bbox="608 703 667 736"><u>Note</u></p> <p data-bbox="608 745 1260 808"><i>Category Code 6A008.l.1. does not include conflict alert capability in ATC systems, or ‘marine radar’.</i></p> <p data-bbox="547 828 724 862">2. Not used;</p> <p data-bbox="547 882 724 916">3. Not used;</p> <p data-bbox="547 936 1260 1126">4. Configured to provide superposition and correlation, or fusion, of target data within six seconds from two or more “geographically dispersed” radar sensors to improve the aggregate performance beyond that of any single sensor specified in Category Code 6A008.f. or 6A008.i.</p> <p data-bbox="608 1146 667 1180"><u>N.B.</u></p> <p data-bbox="608 1189 1150 1223"><i>See also Division 2 of Part 1 of this Schedule.</i></p> <p data-bbox="608 1243 667 1276"><u>Note</u></p> <p data-bbox="608 1285 1260 1382"><i>Category Code 6A008.l.4. does not include systems, equipment and assemblies used for ‘vessel traffic service’.</i></p> <p data-bbox="480 1402 676 1435"><u>Technical Notes</u></p> <p data-bbox="480 1444 1260 1541">1. <i>For the purpose of Category Code 6A008, ‘marine radar’ is a radar that is used to navigate safely at sea, inland waterways or near-shore environments.</i></p> <p data-bbox="480 1561 1260 1657">2. <i>For the purpose of Category Code 6A008, ‘vessel traffic service’ is a vessel traffic monitoring and control service similar to Air Traffic Control (ATC) for “aircraft”.</i></p>

<i>Category Code</i>	<i>Item Description</i>
6A102	<p>Radiation hardened ‘detectors’, other than those specified in Category Code 6A002, specially designed or modified for protecting against nuclear effects (e.g. electromagnetic pulse (EMP), X-rays, combined blast and thermal effects) and usable for “missiles”, designed or rated to withstand radiation levels which meet or exceed a total irradiation dose of <math>5 \times 10^5</math> rads (silicon).</p> <p><i>Technical Note</i>  <i>In Category Code 6A102, a ‘detector’ is defined as a mechanical, electrical, optical or chemical device that automatically identifies and records, or registers a stimulus such as an environmental change in pressure or temperature, an electrical or electromagnetic signal or radiation from a radioactive material. This includes devices that sense by one time operation or failure.</i></p>
6A107	<p>Gravity meters (gravimeters) and components for gravity meters and gravity gradiometers, as follows:</p> <ol style="list-style-type: none"> <li>a. Gravity meters, other than those specified in Category Code 6A007.b., designed or modified for airborne or marine use, and having a static or operational accuracy equal to or less (better) than 0.7 milligal (mgal), and having a time-to-steady-state registration of two minutes or less;</li> <li>b. Specially designed components for gravity meters specified in Category Code 6A007.b. or 6A107.a. and gravity gradiometers specified in Category Code 6A007.c.</li> </ol>
6A108	<p>Radar systems and tracking systems, other than those specified in Category Code 6A008, as follows:</p> <ol style="list-style-type: none"> <li>a. Radar and laser radar systems designed or modified for use in space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104;</li> </ol> <p><i>Note</i>  <i>Category Code 6A108.a. includes the following:</i></p> <ol style="list-style-type: none"> <li>a. <i>Terrain contour mapping equipment;</i></li> <li>b. <i>Imaging sensor equipment;</i></li> <li>c. <i>Scene mapping and correlation (both digital and analogue) equipment;</i></li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p><i>d. Doppler navigation radar equipment.</i></p> <p>b. Precision tracking systems, usable for ‘missiles’, as follows:</p> <ol style="list-style-type: none"> <li>1. Tracking systems which use a code translator in conjunction with either surface or airborne references or navigation satellite systems to provide real-time measurements of in-flight position and velocity;</li> <li>2. Range instrumentation radars including associated optical/infrared trackers with all of the following capabilities: <ol style="list-style-type: none"> <li>a. Angular resolution better than 1.5 milliradians;</li> <li>b. Range of 30 km or greater with a range resolution better than 10 m rms; <u>and</u></li> <li>c. Velocity resolution better than 3 m/s.</li> </ol> </li> </ol> <p><u><i>Technical Note</i></u>  <i>In Category Code 6A108.b., ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
6A202	<p>Photomultiplier tubes having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Photocathode area of greater than 20 cm<sup>2</sup>; <u>and</u></li> <li>b. Anode pulse rise time of less than 1 ns.</li> </ol>
6A203	<p>Cameras and components, other than those specified in Category Code 6A003, as follows:</p> <p><u><i>N.B. 1</i></u>  <i>“Software” specially designed to enhance or release the performance of a camera or imaging device to meet the characteristics of Category Code 6A203.a., 6A203.b. or 6A203.c. is specified in Category Code 6D203.</i></p> <p><u><i>N.B. 2</i></u>  <i>“Technology” in the form of codes or keys to enhance or release the performance of a camera or imaging device to meet the characteristics of Category Code 6A203.a., 6A203.b. or 6A203.c. is specified in Category Code 6E203.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="478 448 542 481"><u>Note</u></p> <p data-bbox="478 492 1260 627"><i>Category Codes 6A203.a. to 6A203.c. do not include cameras or imaging devices if they have hardware, “software” or “technology” constraints that limit the performance to less than that specified above, provided they meet any of the following:</i></p> <ul style="list-style-type: none"> <li data-bbox="478 638 1260 705">a. <i>They need to be returned to the original manufacturer to make the enhancements or release the constraints;</i></li> <li data-bbox="478 716 1260 817">b. <i>They require “software” as specified in Category Code 6D203 to enhance or release the performance to meet the characteristics of Category Code 6A203; <u>or</u></i></li> <li data-bbox="478 828 1260 974">c. <i>They require “technology” in the form of keys or codes as specified in Category Code 6E203 to enhance or release the performance to meet the characteristics of Category Code 6A203.</i></li> </ul> <ul style="list-style-type: none"> <li data-bbox="478 985 1260 1052">a. <i>Streak cameras, and specially designed components therefor, as follows:</i> <ul style="list-style-type: none"> <li data-bbox="542 1064 1260 1131">1. <i>Streak cameras with writing speeds greater than 0.5 mm/μs;</i></li> <li data-bbox="542 1142 1260 1209">2. <i>Electronic streak cameras capable of 50 ns or less time resolution;</i></li> <li data-bbox="542 1220 1260 1288">3. <i>Streak tubes for cameras specified in Category Code 6A203.a.2.;</i></li> <li data-bbox="542 1299 1260 1444">4. <i>Plug-ins specially designed for use with streak cameras which have modular structures and that enable the performance specifications in Category Code 6A203.a.1. or 6A203.a.2.;</i></li> <li data-bbox="542 1456 1260 1601">5. <i>Synchronising electronics units, rotor assemblies consisting of turbines, mirrors and bearings specially designed for cameras specified in Category Code 6A203.a.1.;</i></li> </ul> </li> <li data-bbox="478 1612 1260 1680">b. <i>Framing cameras, and specially designed components therefor, as follows:</i> <ul style="list-style-type: none"> <li data-bbox="542 1691 1260 1758">1. <i>Framing cameras with recording rates greater than 225,000 frames per second;</i></li> <li data-bbox="542 1769 1260 1836">2. <i>Framing cameras capable of 50 ns or less frame exposure time;</i></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="544 454 1268 584">3. Framing tubes and solid-state imaging devices having a fast image gating (shutter) time of 50 ns or less specially designed for cameras specified in Category Code 6A203.b.1. or 6A203.b.2.;</li> <li data-bbox="544 607 1268 736">4. Plug-ins specially designed for use with framing cameras which have modular structures and that enable the performance specifications in Category Code 6A203.b.1. or 6A203.b.2.;</li> <li data-bbox="544 759 1268 889">5. Synchronising electronics units, rotor assemblies consisting of turbines, mirrors and bearings specially designed for cameras specified in Category Code 6A203.b.1. or 6A203.b.2.;</li> </ol> <p data-bbox="544 911 727 943"><i>Technical Note</i></p> <p data-bbox="544 954 1268 1115"><i>In Category Code 6A203.b., high speed single frame cameras can be used alone to produce a single image of a dynamic event, or several such cameras can be combined in a sequentially triggered system to produce multiple images of an event.</i></p> <ol style="list-style-type: none"> <li data-bbox="480 1137 1268 1196">c. Solid state or electron tube cameras, and specially designed components therefor, as follows: <ol style="list-style-type: none"> <li data-bbox="544 1218 1268 1276">1. Solid-state cameras or electron tube cameras with a fast image gating (shutter) time of 50 ns or less;</li> <li data-bbox="544 1299 1268 1429">2. Solid-state imaging devices and image intensifier tubes having a fast image gating (shutter) time of 50 ns or less specially designed for cameras specified in Category Code 6A203.c.1.;</li> <li data-bbox="544 1451 1268 1545">3. Electro-optical shuttering devices (Kerr or Pockels cells) with a fast image gating (shutter) time of 50 ns or less;</li> <li data-bbox="544 1568 1268 1697">4. Plug-ins specially designed for use with cameras which have modular structures and that enable the performance specifications in Category Code 6A203.c.1.;</li> </ol> </li> <li data-bbox="480 1720 1268 1845">d. Radiation-hardened TV cameras, or lenses therefor, specially designed or rated as radiation hardened to withstand a total radiation dose greater than <math>50 \times 10^3</math> Gy (silicon) (<math>5 \times 10^6</math> rad (silicon)) without operational degradation.</li> </ol>

Category Code	Item Description
6A205	<p data-bbox="544 454 727 488"><u>Technical Note</u></p> <p data-bbox="544 495 1262 595"><i>The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionising radiation.</i></p> <p data-bbox="480 663 1262 757">“Lasers”, “laser” amplifiers and oscillators, other than those specified in Category Codes 0B001.g.5., 0B001.h.6. and 6A005, as follows:</p> <p data-bbox="480 779 536 813"><u>N.B.</u></p> <p data-bbox="480 819 1137 853"><i>For copper vapour lasers, see Category Code 6A005.b.</i></p> <ol style="list-style-type: none"> <li data-bbox="480 869 1262 936">a. Argon ion “lasers” having both of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="544 954 1262 1021">1. Operating at wavelengths between 400 nm and 515 nm; <u>and</u></li> <li data-bbox="544 1039 1137 1072">2. An average output power greater than 40 W;</li> </ol> </li> <li data-bbox="480 1090 1262 1158">b. Tunable pulsed single-mode dye laser oscillators having all of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="544 1176 1262 1209">1. Operating at wavelengths between 300 nm and 800 nm;</li> <li data-bbox="544 1227 1123 1261">2. An average output power greater than 1 W;</li> <li data-bbox="544 1279 1086 1312">3. A repetition rate greater than 1 kHz; <u>and</u></li> <li data-bbox="544 1330 954 1364">4. Pulse width less than 100 ns;</li> </ol> </li> <li data-bbox="480 1382 1262 1449">c. Tunable pulsed dye laser amplifiers and oscillators, having all of the following characteristics: <ol style="list-style-type: none"> <li data-bbox="544 1467 1262 1500">1. Operating at wavelengths between 300 nm and 800 nm;</li> <li data-bbox="544 1518 1137 1552">2. An average output power greater than 30 W;</li> <li data-bbox="544 1570 1086 1603">3. A repetition rate greater than 1 kHz; <u>and</u></li> <li data-bbox="544 1621 954 1655">4. Pulse width less than 100 ns;</li> </ol> </li> </ol> <p data-bbox="544 1659 600 1693"><u>Note</u></p> <p data-bbox="544 1700 1262 1756"><i>Category Code 6A205.c. does not include single mode oscillators.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. Pulsed carbon dioxide “lasers” having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Operating at wavelengths between 9,000 nm and 11,000 nm;</li> <li>2. A repetition rate greater than 250 Hz;</li> <li>3. An average output power greater than 500 W; <u>and</u></li> <li>4. Pulse width of less than 200 ns;</li> </ol> <p>e. Para-hydrogen Raman shifters designed to operate at 16 <math>\mu\text{m}</math> output wavelength and at a repetition rate greater than 250 Hz;</p> <p>f. Neodymium-doped (other than glass) “lasers” with an output wavelength between 1,000 nm and 1,100 nm having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Pulse-excited and Q-switched with a pulse duration equal to or more than 1 ns, and having either of the following characteristics: <ol style="list-style-type: none"> <li>a. A single-transverse mode output with an average output power greater than 40 W; <u>or</u></li> <li>b. A multiple-transverse mode output having an average power greater than 50 W; <u>or</u></li> </ol> </li> <li>2. Incorporating frequency doubling to give an output wavelength between 500 nm and 550 nm with an average output power of more than 40 W;</li> </ol> <p>g. Pulsed carbon monoxide lasers, other than those specified in Category Code 6A005.d.2., having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Operating at wavelengths between 5,000 nm and 6,000 nm;</li> <li>2. A repetition rate greater than 250 Hz;</li> <li>3. An average output power greater than 200 W; <u>and</u></li> <li>4. Pulse width of less than 200 ns.</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
6A225	<p>Velocity interferometers for measuring velocities exceeding 1 km/s during time intervals of less than 10 microseconds.</p> <p><u>Note</u>  <i>Category Code 6A225 includes velocity interferometers such as VISARs (Velocity Interferometer Systems for Any Reflector), DLIs (Doppler Laser Interferometers) and PDV (Photonic Doppler Velocimeters) also known as Het-V (Heterodyne Velocimeters).</i></p>
6A226	<p>Pressure sensors, as follows:</p> <ol style="list-style-type: none"> <li>a. Shock pressure gauges capable of measuring pressures greater than 10 GPa, including gauges made with manganin, ytterbium, and either polyvinylidene fluoride (PVDF) or polyvinyl difluoride (PVF<sub>2</sub>);</li> <li>b. Quartz pressure transducers for pressures greater than 10 GPa.</li> </ol>
<b>6B</b>	<b>Test, Inspection and Production Equipment</b>
6B004	<p>Optical equipment as follows:</p> <ol style="list-style-type: none"> <li>a. Equipment for measuring absolute reflectance to an “accuracy” of equal to or better than 0.1% of the reflectance value;</li> <li>b. Equipment other than optical surface scattering measurement equipment, having an unobscured aperture of more than 10 cm, specially designed for the non-contact optical measurement of a non-planar optical surface figure (profile) to an “accuracy” of 2 nm or less (better) against the required profile.</li> </ol> <p><u>Note</u>  <i>Category Code 6B004 does not include microscopes.</i></p>
6B007	<p>Equipment to produce, align and calibrate land-based gravity meters with a static “accuracy” of better than 0.1 mGal.</p>

<i>Category Code</i>	<i>Item Description</i>
6B008	<p>Pulse radar cross-section measurement systems having transmit pulse widths of 100 ns or less, and specially designed components therefor.</p> <p><u>N.B.</u> See also Category Code 6B108.</p>
6B108	<p>Systems, other than those specified in Category Code 6B008, specially designed for radar cross-section measurement usable for 'missiles' and their sub-systems.</p> <p><u>Technical Note</u> In Category Code 6B108, 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p>
<b>6C</b>	<b>Materials</b>
6C002	<p>Optical sensor materials as follows:</p> <ol style="list-style-type: none"> <li>a. Elemental tellurium (Te) of purity levels of 99.9995% or more;</li> <li>b. Single crystals (including epitaxial wafers) of any of the following: <ol style="list-style-type: none"> <li>1. Cadmium zinc telluride (CdZnTe), with zinc content of less than 6% by 'mole fraction';</li> <li>2. Cadmium telluride (CdTe) of any purity level; <u>or</u></li> <li>3. Mercury cadmium telluride (HgCdTe) of any purity level.</li> </ol> </li> </ol> <p><u>Technical Note</u> 'Mole fraction' is defined as the ratio of moles of ZnTe to the sum of moles of CdTe and ZnTe present in the crystal.</p>

<i>Category Code</i>	<i>Item Description</i>
6C004	<p>Optical materials as follows:</p> <p>a. Zinc selenide (ZnSe) and zinc sulphide (ZnS) “substrate blanks”, produced by the Chemical Vapour Deposition (CVD) process and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A volume greater than 100 cm<sup>3</sup>; <u>or</u></li> <li>2. A diameter greater than 80 mm and a thickness of 20 mm or more;</li> </ol> <p>b. Electro-optic materials and non-linear optical materials, as follows:</p> <ol style="list-style-type: none"> <li>1. Potassium titanyl arsenate (KTA) (59400-80-5);</li> <li>2. Silver gallium selenide (AgGaSe<sub>2</sub>, also known as AGSE) (12002-67-4);</li> <li>3. Thallium arsenic selenide (Tl<sub>3</sub>AsSe<sub>3</sub>, also known as TAS) (16142-89-5);</li> <li>4. Zinc germanium phosphide (ZnGeP<sub>2</sub>, also known as ZGP, zinc germanium biphosphide or zinc germanium diphosphide); <u>or</u></li> <li>5. Gallium selenide (GaSe) (12024-11-2);</li> </ol> <p>c. Non-linear optical materials, other than those specified in Category Code 6C004.b., having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Dynamic (also known as non-stationary) third order non-linear susceptibility (<math>\chi^{(3)}</math>, chi 3) of 10<sup>-6</sup> m<sup>2</sup>/V<sup>2</sup> or more; <u>and</u></li> <li>b. Response time of less than 1 ms; <u>or</u></li> </ol> </li> <li>2. Second order non-linear susceptibility (<math>\chi^{(2)}</math>, chi 2) of 3.3 × 10<sup>-11</sup> m/V or more;</li> </ol> <p>d. “Substrate blanks” of silicon carbide or beryllium beryllium (Be/Be) deposited materials, exceeding 300 mm in diameter or major axis length;</p>



<i>Category Code</i>	<i>Item Description</i>
	<p>e. Glass, including fused silica, phosphate glass, fluorophosphate glass, zirconium fluoride (ZrF<sub>4</sub>) (7783-64-4) and hafnium fluoride (HfF<sub>4</sub>) (13709-52-9) and having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A hydroxyl ion (OH<sup>-</sup>) concentration of less than 5 parts per million (ppm);</li> <li>2. Integrated metallic purity levels of less than 1 parts per million (ppm); <u>and</u></li> <li>3. High homogeneity (index of refraction variance) less than <math>5 \times 10^{-6}</math>;</li> </ol> <p>f. Synthetically produced diamond material with an absorption of less than <math>10^{-5} \text{ cm}^{-1}</math> for wavelengths exceeding 200 nm but not exceeding 14,000 nm.</p>
6C005	<p>“Laser” materials as follows:</p> <ol style="list-style-type: none"> <li>a. Synthetic crystalline “laser” host material in unfinished form as follows: <ol style="list-style-type: none"> <li>1. Titanium doped sapphire;</li> <li>2. Not used;</li> </ol> </li> <li>b. Rare-earth-metal doped double-clad fibres having either of the following characteristics: <ol style="list-style-type: none"> <li>1. Nominal “laser” wavelength of 975 nm to 1,150 nm, and having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Average core diameter equal to or greater than 25 <math>\mu\text{m}</math>; <u>and</u></li> <li>b. Core ‘Numerical Aperture’ (‘NA’) less than 0.065; <u>or</u></li> </ol> </li> </ol> </li> </ol> <p><u>Note</u>  <i>Category Code 6C005.b.1. does not include double-clad fibres having an inner glass cladding diameter exceeding 150 <math>\mu\text{m}</math> and not exceeding 300 <math>\mu\text{m}</math>.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>2. Nominal “laser” wavelength exceeding 1,530 nm, and having both of the following characteristics:               <ol style="list-style-type: none"> <li>a. Average core diameter equal to or greater than 20 µm; <u>and</u></li> <li>b. Core ‘NA’ less than 0.1.</li> </ol> </li> </ol> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. For the purpose of Category Code 6C005, the core ‘Numerical Aperture’ (‘NA’) is measured at the emission wavelengths of the fibre.</li> <li>2. Category Code 6C005.b. includes fibres assembled with end caps.</li> </ol>
<b>6D</b>	<b>Software</b>
6D001	“Software” specially designed for the “development” or “production” of equipment specified in Category Code 6A004, 6A005, 6A008 or 6B008.
6D002	“Software” specially designed for the “use” of equipment specified in Category Code 6A002.b., 6A008 or 6B008.
6D003	<p>Other “software” as follows:</p> <ol style="list-style-type: none"> <li>a. “Software” as follows:           <ol style="list-style-type: none"> <li>1. “Software” specially designed for acoustic beam forming for the “real-time processing” of acoustic data for passive reception using towed hydrophone arrays;</li> <li>2. “Source code” for the “real-time processing” of acoustic data for passive reception using towed hydrophone arrays;</li> <li>3. “Software” specially designed for acoustic beam forming for “real-time processing” of acoustic data for passive reception using bottom or bay cable systems;</li> <li>4. “Source code” for “real-time processing” of acoustic data for passive reception using bottom or bay cable systems;</li> </ol> </li> </ol>

Category Code	Item Description
	<p>5. “Software” or “source code”, specially designed for both of the following:</p> <ol style="list-style-type: none"> <li>a. “Real-time processing” of acoustic data from sonar systems specified by Category Code 6A001.a.1.e.; <u>and</u></li> <li>b. Automatically detecting, classifying and determining the location of divers or swimmers;</li> </ol> <p><u>N.B.</u>  <i>For diver detection “software” or “source code”, specially designed or modified for military use, see Division 2 of Part 1 of this Schedule.</i></p> <ol style="list-style-type: none"> <li>b. Not used;</li> <li>c. “Software” designed or modified for cameras incorporating “focal plane arrays” specified in Category Code 6A002.a.3.f. and designed or modified to remove a frame rate restriction and allow the camera to exceed the frame rate specified in Category Code 6A003.b.4. Note 3.a.;</li> <li>d. “Software” specially designed to maintain the alignment and phasing of segmented mirror systems consisting of mirror segments having a diameter or major axis length equal to or larger than 1 m;</li> <li>e. Not used;</li> <li>f. “Software” as follows: <ol style="list-style-type: none"> <li>1. “Software” specially designed for magnetic and electric field “compensation systems” for magnetic sensors designed to operate on mobile platforms;</li> <li>2. “Software” specially designed for magnetic and electric field anomaly detection on mobile platforms;</li> <li>3. “Software” specially designed for “real-time processing” of electromagnetic data using underwater electromagnetic receivers specified in Category Code 6A006.e.;</li> <li>4. “Source code” for “real-time processing” of electromagnetic data using underwater electromagnetic receivers specified in Category Code 6A006.e.;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>g. “Software” specially designed to correct motional influences of gravity meters or gravity gradiometers;</p> <p>h. “Software” as follows:</p> <ol style="list-style-type: none"> <li>1. Air Traffic Control (ATC) “software” application “programs” designed to be hosted on general purpose computers located at Air Traffic Control (ATC) centres and capable of accepting radar target data from more than four primary radars;</li> <li>2. “Software” for the design or “production” of radomes and having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Specially designed to protect the “electronically steerable phased array antennae” specified in Category Code 6A008.e.; <u>and</u></li> <li>b. Resulting in an antenna pattern having an ‘average side lobe level’ more than 40 dB below the peak of the main beam level.</li> </ol> </li> </ol> <p><i>Technical Note</i>  ‘Average side lobe level’ in Category Code 6D003.h.2.b. is measured over the entire array excluding the angular extent of the main beam and the first two side lobes on either side of the main beam.</p>
6D102	“Software” specially designed or modified for the “use” of goods specified in Category Code 6A108.
6D103	“Software” which processes post-flight, recorded data, enabling determination of vehicle position throughout its flight path, specially designed or modified for ‘missiles’. <p><i>Technical Note</i>  In Category Code 6D103, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p>

<i>Category Code</i>	<i>Item Description</i>
6D203	“Software” specially designed to enhance or release the performance of cameras or imaging devices to meet the characteristics of Category Codes 6A203.a. to 6A203.c.
<b>6E</b>	<b>Technology</b>
6E001	“Technology” (according to the General Technology Note) for the “development” of equipment, materials or “software” specified in Category 6A, 6B, 6C or 6D.
6E002	“Technology” (according to the General Technology Note) for the “production” of equipment or materials specified in Category 6A, 6B or 6C.
6E003	Other “technology”, as follows: <ol style="list-style-type: none"> <li>a. “Technology” as follows:               <ol style="list-style-type: none"> <li>1. “Technology” “required” for the coating and treatment of optical surfaces to achieve an ‘optical thickness’ uniformity of 99.5% or better for optical coatings 500 mm or more in diameter or major axis length and with a total loss (absorption and scatter) of less than <math>5 \times 10^{-3}</math>;  <u>N.B.</u> <i>See also Category Code 2E003.f.</i>  <u>Technical Note</u> <i>‘Optical thickness’ is the mathematical product of the index of refraction and the physical thickness of the coating.</i></li> <li>2. “Technology” for the fabrication of optics using single point diamond turning techniques to produce surface finish “accuracies” of better than 10 nm rms on non-planar surfaces exceeding 0.5 m<sup>2</sup>;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. “Technology” “required” for the “development”, “production” or “use” of specially designed diagnostic instruments or targets in test facilities for “SHPL” testing or testing or evaluation of materials irradiated by “SHPL” beams.</p>
6E101	<p>“Technology” (according to the General Technology Note) for the “use” of equipment or “software” specified in Category Code 6A002, 6A007.b. and .c., 6A008, 6A102, 6A107, 6A108, 6B108, 6D102 or 6D103.</p> <p><u>Note</u>  <i>Category Code 6E101 only specifies “technology” for equipment specified in Category Codes 6A002, 6A007 and 6A008 when it is designed for airborne applications and are usable in “missiles”.</i></p>
6E201	<p>“Technology” (according to the General Technology Note) for the “use” of equipment specified in Category Code 6A003, 6A005.a.2., 6A005.b.2., 6A005.b.3., 6A005.b.4., 6A005.b.6., 6A005.c.2., 6A005.d.3.c., 6A005.d.4.c., 6A202, 6A203, 6A205, 6A225 or 6A226.</p> <p><u>Note 1</u>  <i>Category Code 6E201 only specifies “technology” for cameras specified in Category Code 6A003 if the cameras are also specified by any of the control parameters of Category Code 6A203.</i></p> <p><u>Note 2</u>  <i>Category Code 6E201 only specifies “technology” for lasers in Category Code 6A005.b.6. that are neodymium-doped and specified by any of the control parameters of Category Code 6A205.f.</i></p>
6E203	<p>“Technology”, in the form of codes or keys, to enhance or release the performance of cameras or imaging devices to meet the characteristics of Category Codes 6A203.a. to 6A203.c.</p>

<i>Category Code</i>	<i>Item Description</i>
<b>CATEGORY 7 — NAVIGATION AND AVIONICS</b>	
<b>7A</b>	<b>Systems, Equipment and Components</b>
	<u><i>N.B.</i></u>
	<i>For automatic pilots for underwater vehicles, see Category 8. For radar, see Category 6.</i>
7A001	Accelerometers as follows and specially designed components therefor:
	<u><i>N.B.</i></u>
	<i>See also Category Code 7A101.</i>
	<i>For angular or rotational accelerometers, see Category Code 7A001.b.</i>
	a. Linear accelerometers having any of the following characteristics:
	1. Specified to function at linear acceleration levels less than or equal to 15 g, and having either of the following characteristics:
	a. A “bias” “stability” of less (better) than 130 micro g with respect to a fixed calibration value over a period of one year; <u>or</u>
	b. A “scale factor” “stability” of less (better) than 130 parts per million (ppm) with respect to a fixed calibration value over a period of one year;
	2. Specified to function at linear acceleration levels exceeding 15 g but less than or equal to 100 g, and having both of the following characteristics:
	a. A “bias” “repeatability” of less (better) than 1,250 micro g over a period of one year; <u>and</u>
	b. A “scale factor” “repeatability” of less (better) than 1,250 parts per million (ppm) over a period of one year; <u>or</u>

<i>Category Code</i>	<i>Item Description</i>
7A002	<p data-bbox="526 448 1260 548">3. Designed for use in inertial navigation or guidance systems and specified to function at linear acceleration levels exceeding 100 g;</p> <p data-bbox="526 560 1260 705"><u>Note</u> <i>Category Codes 7A001.a.1. and 7A001.a.2. do not include accelerometers limited to measurement of only vibration or shock.</i></p> <p data-bbox="526 716 1260 795">b. Angular or rotational accelerometers, specified to function at linear acceleration levels exceeding 100 g.</p> <p data-bbox="478 851 1260 929">Gyros or angular rate sensors, having either of the following characteristics, and specially designed components therefor:</p> <p data-bbox="478 940 1260 1019"><u>N.B.</u> <i>See also Category Code 7A102.</i></p> <p data-bbox="478 1030 1260 1108"><i>For angular or rotational accelerometers, see Category Code 7A001.b.</i></p> <p data-bbox="478 1120 1260 1220">a. Specified to function at linear acceleration levels less than or equal to 100 g, and having either of the following characteristics:</p> <p data-bbox="542 1232 1260 1310">1. A rate range of less than 500 degrees per second, and having either of the following characteristics:</p> <p data-bbox="622 1321 1260 1456">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; <u>or</u></p> <p data-bbox="622 1467 1260 1545">b. An “angle random walk” of less (better) than or equal to 0.0035 degree per square root hour; <u>or</u></p> <p data-bbox="686 1556 1260 1657"><u>Note</u> <i>Category Code 7A002.a.1.b. does not include “spinning mass gyros”.</i></p>



<i>Category Code</i>	<i>Item Description</i>
	<p>2. A rate range greater than or equal to 500 degrees per second, and having either of the following characteristics:</p> <p>a. A “bias” “stability” of less (better) than 4 degrees per hour, when measured in a 1 g environment over a period of three minutes, and with respect to a fixed calibration value; <u>or</u></p> <p>b. An “angle random walk” of less (better) than or equal to 0.1 degree per square root hour; <u>or</u></p> <p><u>Note</u> Category Code 7A002.a.2.b. does not include “spinning mass gyros”.</p> <p>b. Specified to function at linear acceleration levels exceeding 100 g.</p>
7A003	<p>‘Inertial measurement equipment or systems’, having any of the following characteristics:</p> <p><u>N.B.</u> See also Category Code 7A103.</p> <p><u>Note 1</u> ‘Inertial measurement equipment or systems’ incorporate accelerometers or gyroscopes to measure changes in velocity and orientation in order to determine or maintain heading or position without requiring an external reference once aligned. ‘Inertial measurement equipment or systems’ include:</p> <ul style="list-style-type: none"> <li>– Attitude and Heading Reference Systems (AHRSs);</li> <li>– Gyrocompasses;</li> <li>– Inertial Measurement Units (IMUs);</li> <li>– Inertial Navigation Systems (INSs);</li> <li>– Inertial Reference Systems (IRSs);</li> <li>– Inertial Reference Units (IRUs).</li> </ul>

Category Code	Item Description
	<p><u>Note 2</u></p> <p>Category Code 7A003 does not include ‘inertial measurement equipment or systems’ which are certified for use on “civil aircraft” by civil authorities of one or more “participating states”.</p> <p><u>Technical Note</u></p> <p>‘Positional aiding references’ independently provide position, and include:</p> <ul style="list-style-type: none"> <li>a. Global Navigation Satellite Systems (GNSS);</li> <li>b. “Data-Based Referenced Navigation” (“DBRN”).</li> </ul> <p>a. Designed for “aircraft”, land vehicles or vessels, providing position without the use of ‘positional aiding references’, and having any of the following accuracies subsequent to normal alignment:</p> <ol style="list-style-type: none"> <li>1. 0.8 nautical miles per hour (nm/hr) “Circular Error Probable” (“CEP”) rate or less (better);</li> <li>2. 0.5% distanced travelled “CEP” or less (better); <u>or</u></li> <li>3. Total drift of 1 nautical mile “CEP” or less (better) in a 24-hour period;</li> </ol> <p><u>Technical Note</u></p> <p>The performance parameters in Category Codes 7A003.a.1., 7A003.a.2. and 7A003.a.3. typically apply to ‘inertial measurement equipment or systems’ designed for “aircraft”, vehicles and vessels, respectively. These parameters result from the utilisation of specialised non-positional aiding references (e.g. altimeter, odometer, velocity log). As a consequence, the specified performance values cannot be readily converted between these parameters. Equipment designed for multiple platforms are evaluated against each applicable Category Code 7A003.a.1., 7A003.a.2. or 7A003.a.3.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Designed for “aircraft”, land vehicles or vessels, with an embedded ‘positional aiding reference’ and providing position after loss of all ‘positional aiding references’ for a period of up to 4 minutes, having an “accuracy” of less (better) than 10 meters “CEP”;</p> <p><i>Technical Note</i>  <i>Category Code 7A003.b. refers to systems in which ‘inertial measurement equipment or systems’ and other independent ‘positional aiding references’ are built into a single unit (i.e. embedded) in order to achieve improved performance.</i></p> <p>c. Designed for “aircraft”, land vehicles or vessels, providing heading or True North determination and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A maximum operating angular rate less (lower) than 500 deg/s and a heading “accuracy” without the use of ‘positional aiding references’ equal to or less (better) than 0.07 deg sec(Lat) (equivalent to 6 arc minutes rms at 45 degrees latitude); <u>or</u></li> <li>2. A maximum operating angular rate equal to or greater (higher) than 500 deg/s and a heading “accuracy” without the use of ‘positional aiding references’ equal to or less (better) than 0.2 deg sec(Lat) (equivalent to 17 arc minutes rms at 45 degrees latitude); <u>or</u></li> </ol> <p>d. Providing acceleration measurements or angular rate measurements, in more than one dimension, and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Performance specified by Category Code 7A001 or 7A002 along any axis, without the use of any aiding references; <u>or</u></li> <li>2. Being “space-qualified” and providing angular rate measurements having an “angle random walk” along any axis of less (better) than or equal to 0.1 degree per square root hour.</li> </ol> <p><i>Note</i>  <i>Category Code 7A003.d.2. does not include ‘inertial measurement equipment or systems’ that contain “spinning mass gyros” as the only type of gyro.</i></p>

Category Code	Item Description
7A004	<p>‘Star trackers’ and components therefor, as follows:</p> <p><u>N.B.</u> See also Category Code 7A104.</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 Category Code 7A004.a. as follows:</p> <ol style="list-style-type: none"> <li>1. Optical heads or baffles;</li> <li>2. Data processing units.</li> </ol> <p><u>Technical Note</u> ‘Star trackers’ are also referred to as stellar attitude sensors or gyro-astro compasses.</p>
7A005	<p>Global Navigation Satellite Systems (GNSS) receiving equipment having either of the following characteristics and specially designed components therefor:</p> <p><u>N.B.</u> See also Category Code 7A105. For equipment specially designed for military use, see Division 2 of Part 1 of this Schedule.</p> <p>a. Employing a decryption algorithm specially designed or modified for government use to access the ranging code for position and time; <u>or</u></p> <p>b. Employing ‘adaptive antenna systems’.</p> <p><u>Note</u> Category Code 7A005.b. does not include GNSS receiving equipment that only uses components designed to filter, switch or combine signals from multiple omni-directional antennae that do not implement adaptive antenna techniques.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p><u>Technical Note</u>  <i>For the purpose of Category Code 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.</i></p>
7A006	<p>Airborne altimeters operating at frequencies other than 4.2 GHz to 4.4 GHz inclusive and having either of the following characteristics:</p> <p><u>N.B.</u>  <i>See also Category Code 7A106.</i></p> <p>a. “Power management”; <u>or</u>  b. Using phase shift key modulation.</p>
7A008	<p>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 travelled “Circular Error Probable” (“CEP”) and specially designed components therefor.</p> <p><u>Note</u>  <i>Category Code 7A008 does not include systems specially designed for installation on surface vessels or systems requiring acoustic beacons or buoys to provide positioning data.</i></p> <p><u>N.B.</u>  <i>See Category Code 6A001.a. for acoustic systems, and Category Code 6A001.b. for correlation-velocity and Doppler-velocity sonar log equipment.</i>  <i>See Category Code 8A002 for other marine systems.</i></p>
7A101	<p>Linear accelerometers, other than those specified in Category Code 7A001, designed for use in Inertial Navigation Systems (INSs) or in guidance systems of all types, usable in ‘missiles’, having both of the following characteristics, and specially designed components therefor:</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. A “bias” “repeatability” of less (better) than 1,250 micro g; <u>and</u></p> <p>b. A “scale factor” “repeatability” of less (better) than 1,250 parts per million (ppm).</p> <p><u>Note</u>  <i>Category Code 7A101 does not include accelerometers specially designed and developed as Measurement While Drilling (MWD) Sensors for use in downhole well service operations.</i></p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>In Category Code 7A101, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></li> <li>2. <i>In Category Code 7A101, the measurement of “bias” and “scale factor” refers to a one sigma standard deviation with respect to a fixed calibration over a period of one year.</i></li> </ol>
7A102	<p>All types of gyros, other than those specified in Category Code 7A002, usable in ‘missiles’, with a rated “drift rate” ‘stability’ of less than 0.5° (1 sigma or rms) per hour in a 1 g environment and specially designed components therefor.</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>In Category Code 7A102, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></li> <li>2. <i>In Category Code 7A102, ‘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 (IEEE Std 528-2001 paragraph 2.247).</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
7A103	<p>Instrumentation, navigation equipment and systems, other than those specified in Category Code 7A003, as follows; and specially designed components therefor:</p> <p>a. ‘Inertial measurement equipment or systems’, using accelerometers or gyros, as follows:</p> <ol style="list-style-type: none"> <li>1. Accelerometers specified in Category Code 7A001.a.3., 7A001.b. or 7A101 or gyros specified in Category Code 7A002 or 7A102;</li> </ol> <p><i>Note</i>  <i>Category Code 7A103.a.1. does not include equipment containing accelerometers specified in Category Code 7A001.a.3. that are designed to measure vibration or shock.</i></p> <ol style="list-style-type: none"> <li>2. Accelerometers specified in Category Code 7A001.a.1. or 7A001.a.2., designed for use in Inertial Navigation Systems (INSS) or in guidance systems of all types, and usable in ‘missiles’;</li> </ol> <p><i>Note</i>  <i>Category Code 7A103.a.2. does not include equipment containing accelerometers specified in Category Code 7A001.a.1. or 7A001.a.2. where such accelerometers are specially designed and developed as MWD (Measurement While Drilling) sensors for use in downhole well service operations.</i></p> <p><i>Technical Note</i>  <i>‘Inertial measurement equipment or systems’ specified in Category Code 7A103.a. incorporate accelerometers or gyros to measure changes in velocity and orientation in order to determine or maintain heading or position without requiring an external reference once aligned.</i></p> <p><i>Note</i>  <i>‘Inertial measurement equipment or systems’ in Category Code 7A103.a. include:</i></p> <ul style="list-style-type: none"> <li>– <i>Attitude and Heading Reference Systems (AHRSs);</i></li> <li>– <i>Gyrocompasses;</i></li> <li>– <i>Inertial Measurement Units (IMUs);</i></li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>– <i>Inertial Navigation Systems (INSs);</i></li> <li>– <i>Inertial Reference Systems (IRSs);</i></li> <li>– <i>Inertial Reference Units (IRUs).</i></li> </ul> <p>b. Integrated flight instrument systems which include gyrostabilisers or automatic pilots, designed or modified for use in ‘missiles’;</p> <p>c. ‘Integrated navigation systems’, designed or modified for ‘missiles’ and capable of providing a navigational accuracy of 200 m Circle of Equal Probability or less;</p> <p><u>Technical Note</u>  <i>An ‘integrated navigation system’ typically incorporates the following components:</i></p> <ol style="list-style-type: none"> <li>1. <i>An inertial measurement device (e.g. an Attitude and Heading Reference System (AHRS), Inertial Reference Unit (IRU), or Inertial Navigation System (INS));</i></li> <li>2. <i>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 or Doppler radar); and</i></li> <li>3. <i>Integration hardware and software.</i></li> </ol> <p>d. Three axis magnetic heading sensors, designed or modified to be integrated with flight control and navigation systems, other than those specified in Category Code 6A006, having both of the following characteristics, and specially designed components therefor:</p> <ol style="list-style-type: none"> <li>1. <i>Internal tilt compensation in pitch (<math>\pm 90</math> degrees) and roll (<math>\pm 180</math> degrees) axes; <u>and</u></i></li> <li>2. <i>Capable of providing azimuthal accuracy better (less) than 0.5 degrees rms at latitude of <math>\pm 80</math> degrees, reference to local magnetic field.</i></li> </ol> <p><u>Note</u>  <i>Flight control and navigation systems in Category Code 7A103.d. include gyrostabilisers, automatic pilots and Inertial Navigation Systems (INSs).</i></p>



<i>Category Code</i>	<i>Item Description</i>
	<p><u>Technical Note</u>  <i>In Category Code 7A103, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
7A104	<p>Gyro-astro compasses and other devices, other than those specified in Category Code 7A004, which derive position or orientation by means of automatically tracking celestial bodies or satellites and specially designed components therefor.</p>
7A105	<p>Receiving equipment for Global Navigation Satellite Systems (GNSS; e.g. GPS or Galileo), other than those specified in Category Code 7A005, having either of the following characteristics, and specially designed components therefor:</p> <ol style="list-style-type: none"> <li>a. Designed or modified for use in space launch vehicles specified in Category Code 9A004, sounding rockets specified in Category Code 9A104 or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a.; <u>or</u></li> <li>b. Designed or modified for airborne applications and having any of the following characteristics: <ol style="list-style-type: none"> <li>1. Capable of providing navigation information at speeds in excess of 600 m/s;</li> <li>2. Employing decryption, designed or modified for military or governmental services, to gain access to GNSS secured signal/data; <u>or</u></li> <li>3. 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.</li> </ol> </li> </ol> <p><u>Note</u>  <i>Category Codes 7A105.b.2. and 7A105.b.3. do not include equipment designed for commercial, civil or ‘Safety of Life’ (e.g. data integrity, flight safety) GNSS services.</i></p>

<i>Category Code</i>	<i>Item Description</i>
7A106	Altimeters, other than those specified in Category Code 7A006, of radar or laser radar type, designed or modified for use in space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.
7A115	<p>Passive sensors for determining bearing to specific electromagnetic source (direction finding equipment) or terrain characteristics, designed or modified for use in space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.</p> <p><u>Note</u>  <i>Category Code 7A115 includes sensors for the following equipment:</i></p> <ul style="list-style-type: none"> <li>a. <i>Terrain contour mapping equipment;</i></li> <li>b. <i>Imaging sensor equipment (both active and passive);</i></li> <li>c. <i>Passive interferometer equipment.</i></li> </ul>
7A116	<p>Flight control systems and servo valves, as follows; designed or modified for use in space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104 or “missiles”:</p> <ul style="list-style-type: none"> <li>a. Pneumatic, hydraulic, mechanical, electro-optical, or electro-mechanical flight control systems (including fly-by-wire and fly-by-light systems);</li> <li>b. Attitude control equipment;</li> <li>c. Flight control servo valves designed or modified for the systems specified in Category Code 7A116.a. or 7A116.b., and designed or modified to operate in a vibration environment greater than 10 g rms between 20 Hz and 2 kHz.</li> </ul>
7A117	“Guidance sets”, usable in “missiles” 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).

<i>Category Code</i>	<i>Item Description</i>
<b>7B</b>	<b>Test, Inspection and Production Equipment</b>
7B001	<p>Test, calibration or alignment equipment, specially designed for equipment specified in Category 7A.</p> <p><u>Note</u>  <i>Category Code 7B001 does not include test, calibration or alignment equipment for ‘Maintenance Level I’ or ‘Maintenance Level II’.</i></p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <u>‘Maintenance Level I’</u>  <i>The failure of an inertial navigation unit is detected on the “aircraft” by indications from the Control and Display Unit (CDU) or by the status message from the corresponding sub-system. By following the manufacturer’s manual, the cause of the failure may be localised at the level of the malfunctioning Line Replaceable Unit (LRU). The operator then removes the LRU and replaces it with a spare.</i></li> <li>2. <u>‘Maintenance Level II’</u>  <i>The defective LRU is sent to the maintenance workshop (the manufacturer’s or that of the operator responsible for level II maintenance). At the maintenance workshop, the malfunctioning LRU is tested by various appropriate means to verify and localise the defective Shop Replaceable Assembly (SRA) module responsible for the failure. This SRA is removed and replaced by an operative spare. The defective SRA (or possibly the complete LRU) is then shipped to the manufacturer. ‘Maintenance Level II’ does not include the disassembly or repair of controlled accelerometers or gyro sensors.</i></li> </ol>
7B002	<p>Equipment specially designed to characterise mirrors for ring “laser” gyros, as follows:</p> <p><u>N.B.</u>  <i>See also Category Code 7B102.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. Scatterometers having a measurement “accuracy” of 10 parts per million (ppm) or less (better);</p> <p>b. Profilometers having a measurement “accuracy” of 0.5 nm (5 angstrom) or less (better).</p>
7B003	<p>Equipment specially designed for the “production” of equipment specified in Category 7A.</p> <p><u>Note</u>  <i>Category Code 7B003 includes:</i></p> <ul style="list-style-type: none"> <li>– Gyro tuning test stations;</li> <li>– Gyro dynamic balance stations;</li> <li>– Gyro run-in/motor test stations;</li> <li>– Gyro evacuation and fill stations;</li> <li>– Centrifuge fixtures for gyro bearings;</li> <li>– Accelerometer axis align stations;</li> <li>– Fibre optic gyro coil winding machines.</li> </ul>
7B102	<p>Reflectometers specially designed to characterise mirrors, for “laser” gyros, having a measurement accuracy of 50 parts per million (ppm) or less (better).</p>
7B103	<p>“Production facilities” and “production equipment” as follows:</p> <p>a. “Production facilities” specially designed for equipment specified in Category Code 7A117;</p> <p>b. “Production equipment”, and other test, calibration and alignment equipment, other than that specified in Category Codes 7B001 to 7B003, designed or modified to be used with equipment specified in Category 7A.</p>
<b>7C</b>	<p><b>Materials</b></p> <p>None.</p>

<i>Category Code</i>	<i>Item Description</i>
<b>7D</b>	<b>Software</b>
7D001	“Software” specially designed or modified for the “development” or “production” of equipment specified in Category 7A or 7B.
7D002	“Source code” for the operation or maintenance of any inertial navigation equipment, including inertial equipment not specified in Category Code 7A003 or 7A004, or ‘Attitude and Heading Reference Systems’ (‘AHRs’).
	<i>Note</i>
	<i>Category Code 7D002 does not include “source code” for the “use” of gimballed ‘AHRs’.</i>
	<i>Technical Note</i>
	<i>‘AHRs’ generally differ from Inertial Navigation Systems (INSs) in that an ‘AHRs’ provides attitude and heading information and normally does not provide the acceleration, velocity and position information associated with an INS.</i>
7D003	<p>Other “software” as follows:</p> <ol style="list-style-type: none"> <li>a. “Software” specially designed or modified to improve the operational performance or reduce the navigational error of systems to the levels specified in Category Code 7A003, 7A004 or 7A008;</li> <li>b. “Source code” for hybrid integrated systems which improves the operational performance or reduces the navigational error of systems to the level specified in Category Code 7A003 or 7A008 by continuously combining heading data with any of the following: <ol style="list-style-type: none"> <li>1. Doppler radar or sonar velocity data;</li> <li>2. Global Navigation Satellite Systems (GNSS) reference data; <u>or</u></li> <li>3. Data from “Data-Based Referenced Navigation” (“DBRN”) systems;</li> </ol> </li> <li>c. Not used;</li> <li>d. Not used;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
7D004	<p>e. Computer-Aided-Design (CAD) “software” specially designed for the “development” of “active flight control systems”, helicopter multi-axis fly-by-wire or fly-by-light controllers or helicopter “circulation-controlled anti-torque or circulation-controlled direction control systems”, whose “technology” is specified in Category Code 7E004.b.1., 7E004.b.3. to 7E004.b.5., 7E004.b.7., 7E004.b.8., 7E004.c.1. or 7E004.c.2.</p> <p>“Source code” incorporating “development” “technology” specified in Category Code 7E004.a.2., 7E004.a.3., 7E004.a.5., 7E004.a.6. or 7E004.b., for any of the following:</p> <ul style="list-style-type: none"> <li>a. Digital flight management systems for “total control of flight”;</li> <li>b. Integrated propulsion and flight control systems;</li> <li>c. “Fly-by-wire systems” or “fly-by-light systems”;</li> <li>d. Fault-tolerant or self-reconfiguring “active flight control systems”;</li> <li>e. Not used;</li> <li>f. Air data systems based on surface static data; <u>or</u></li> <li>g. Three dimensional displays.</li> </ul> <p><i>Note</i>  <i>Category Code 7D004 does not include “source code” associated with common computer elements and utilities (e.g. input signal acquisition, output signal transmission, computer program and data loading, built-in test, task scheduling mechanisms) not providing a specific flight control system function.</i></p>
7D005	<p>“Software” specially designed to decrypt Global Navigation Satellite Systems (GNSS) ranging code designed for government use.</p>

<i>Category Code</i>	<i>Item Description</i>
7D101	“Software” specially designed or modified for the “use” of equipment specified in Category Code 7A001 to 7A006, 7A101 to 7A106, 7A115, 7A116.a., 7A116.b., 7B001, 7B002, 7B003, 7B102 or 7B103.
7D102	<p>Integration “software” as follows:</p> <ol style="list-style-type: none"> <li>a. Integration “software” for the equipment specified in Category Code 7A103.b.;</li> <li>b. Integration “software” specially designed for the equipment specified in Category Code 7A003 or 7A103.a.;</li> <li>c. Integration “software” designed or modified for the equipment specified in Category Code 7A103.c.</li> </ol>
7D103	<p><u>Note</u> A common form of integration “software” employs Kalman filtering.</p> <p>“Software” specially designed for modelling or simulation of the “guidance sets” specified in Category Code 7A117 or for their design integration with the space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.</p> <p><u>Note</u> “Software” specified in Category Code 7D103 remains within the description in that Category when combined with specially designed hardware specified in Category Code 4A102.</p>
7D104	<p>“Software” specially designed or modified for the operation or maintenance of “guidance sets” specified in Category Code 7A117.</p> <p><u>Note</u> Category Code 7D104 includes “software”, specially designed or modified to enhance the performance of “guidance sets” to achieve or exceed the accuracy specified in Category Code 7A117.</p>

<i>Category Code</i>	<i>Item Description</i>
<b>7E</b>	<b>Technology</b>
7E001	<p>“Technology” (according to the General Technology Note) for the “development” of equipment or “software”, specified in Category 7A, 7B or Category Codes 7D001, 7D002, 7D003, 7D005 and 7D101 to 7D103.</p> <p><u>Note</u> Category Code 7E001 includes key management “technology” exclusively for equipment specified in Category Code 7A005.a.</p>
7E002	<p>“Technology” (according to the General Technology Note) for the “production” of equipment specified in Category 7A or 7B.</p>
7E003	<p>“Technology” (according to the General Technology Note) for the repair, refurbishing or overhaul of equipment specified in Category Codes 7A001 to 7A004.</p> <p><u>Note</u> Category Code 7E003 does not include “technology” for maintenance, directly associated with calibration, removal or replacement of damaged or unserviceable LRUs and SRAs of a “civil aircraft” as described in ‘Maintenance Level I’ or ‘Maintenance Level II’.</p> <p><u>N.B.</u> See Technical Notes to Category Code 7B001.</p>
7E004	<p>Other “technology” as follows:</p> <p>a. “Technology” for the “development” or “production” of any of the following:</p> <ol style="list-style-type: none"> <li>1. Not used;</li> <li>2. Air data systems based on surface static data only, i.e. which dispense with conventional air data probes;</li> <li>3. Three dimensional displays for “aircraft”;</li> <li>4. Not used;</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="539 454 1268 555">5. Electric actuators (i.e. electromechanical, electrohydrostatic and integrated actuator package) specially designed for “primary flight control”;</li> <li data-bbox="539 566 1268 645">6. “Flight control optical sensor array” specially designed for implementing “active flight control systems”; <u>or</u></li> <li data-bbox="539 656 1268 790">7. “DBRN” systems designed to navigate underwater, using sonar or gravity databases, that provide a positioning “accuracy” equal to or less (better) than 0.4 nautical miles;</li> </ol> <p data-bbox="475 801 1268 902">b. “Development” “technology”, as follows, for “active flight control systems” (including “fly-by-wire systems” or “fly-by-light systems”):</p> <ol style="list-style-type: none"> <li data-bbox="539 925 1268 1093">1. Photonic-based “technology” for sensing “aircraft” or flight control component state, transferring flight control data, or commanding actuator movement, “required” for “fly-by-light systems” “active flight control systems”;</li> <li data-bbox="539 1104 722 1137">2. Not used;</li> <li data-bbox="539 1149 1268 1283">3. Real-time algorithms to analyse component sensor information to predict and preemptively mitigate impending degradation and failures of components within an “active flight control system”;</li> </ol> <p data-bbox="603 1305 667 1339"><i>Note</i></p> <p data-bbox="603 1350 1268 1417"><i>Category Code 7E004.b.3. does not include algorithms for purpose of off-line maintenance.</i></p> <ol style="list-style-type: none"> <li data-bbox="539 1429 1268 1529">4. Real-time algorithms to identify component failures and reconfigure force and moment controls to mitigate “active flight control system” degradations and failures;</li> </ol> <p data-bbox="603 1552 667 1585"><i>Note</i></p> <p data-bbox="603 1597 1268 1720"><i>Category Code 7E004.b.4. does not include algorithms for the elimination of fault effects through comparison of redundant data sources, or off-line pre-planned responses to anticipated failures.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>5. Integration of digital flight control, navigation and propulsion control data, into a digital flight management system for “total control of flight”;</p> <p><u>Note</u>  <i>Category Code 7E004.b.5. does not include:</i></p> <p>a. “Technology” for integration of digital flight control, navigation and propulsion control data, into a digital flight management system for “flight path optimisation”;</p> <p>b. “Technology” for “aircraft” flight instrument systems integrated solely for VOR, DME, ILS or MLS navigation or approaches.</p> <p>6. Not used;</p> <p>7. “Technology” “required” for deriving the functional requirements for “fly-by-wire systems” having both of the following characteristics:</p> <p>a. ‘Inner-loop’ airframe stability controls requiring loop closure rates of 40 Hz or greater; <u>and</u></p> <p><u>Technical Note</u>  <i>‘Inner-loop’ refers to functions of “active flight control systems” that automate airframe stability controls.</i></p> <p>b. Having any of the following characteristics:</p> <p>1. Corrects an aerodynamically unstable airframe, measured at any point in the design flight envelope, that would lose recoverable control if not corrected within 0.5 seconds;</p> <p>2. Couples controls in two or more axes while compensating for ‘abnormal changes in aircraft state’;</p> <p><u>Technical Note</u>  <i>‘Abnormal changes in aircraft state’ include in-flight structural damage, loss of engine thrust, disabled control surface, or destabilising shifts in cargo load.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="687 454 1268 521">3. Performs the functions specified in Category Code 7E004.b.5.; <u>or</u></p> <p data-bbox="751 539 1268 645"><i>Note</i> Category Code 7E004.b.7.b.3. does not include autopilots.</p> <p data-bbox="687 663 1268 860">4. Enables “aircraft” to have a stable controlled flight, other than during take-off or landing, at greater than 18 degrees angle of attack, 15 degrees side slip, 15 degrees/second pitch or yaw rate, or 90 degrees/second roll rate;</p> <p data-bbox="541 878 1268 983">8. “Technology” “required” for deriving the functional requirements for “fly-by-wire systems” to achieve both of the following:</p> <ul style="list-style-type: none"> <li data-bbox="624 1001 1268 1106">a. No loss of control of the “aircraft” in the event of a consecutive sequence of any two individual faults within the “fly-by-wire system”; <u>and</u></li> <li data-bbox="624 1115 1268 1220">b. Probability of loss of control of the “aircraft” being less (better) than <math>1 \times 10^{-9}</math> failures per flight hour;</li> </ul> <p data-bbox="541 1238 1268 1473"><i>Note</i> Category Code 7E004.b. does not include “technology” associated with common computer elements and utilities (e.g. input signal acquisition, output signal transmission, computer program and data loading, built-in test, task scheduling mechanisms) not providing a specific flight control system function.</p> <p data-bbox="477 1491 1268 1559">c. “Technology” for the “development” of helicopter systems, as follows:</p> <ul style="list-style-type: none"> <li data-bbox="541 1576 1268 1818">1. Multi-axis fly-by-wire or fly-by-light controllers, which combine the functions of at least two of the following into one controlling element: <ul style="list-style-type: none"> <li data-bbox="624 1693 927 1727">a. Collective controls;</li> <li data-bbox="624 1742 879 1776">b. Cyclic controls;</li> <li data-bbox="624 1792 858 1825">c. Yaw controls;</li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li data-bbox="539 454 1267 521">2. “Circulation-controlled anti-torque or circulation-controlled direction control systems”;</li> <li data-bbox="539 533 1267 600">3. Rotor blades incorporating “variable geometry airfoils”, for use in systems using individual blade control.</li> </ol>
7E101	<p data-bbox="475 678 1267 801">“Technology” (according to the General Technology Note) for the “use” of equipment specified in Category Codes 7A001 to 7A006, 7A101 to 7A106, 7A115 to 7A117, 7B001, 7B002, 7B003, 7B102, 7B103 and 7D101 to 7D103.</p>
7E102	<p data-bbox="475 880 1267 969">“Technology” for protection of avionics and electrical sub-systems against electromagnetic pulse (EMP) and electromagnetic interference (EMI) hazards, from external sources, as follows:</p> <ol style="list-style-type: none"> <li data-bbox="475 992 1267 1025">a. Design “technology” for shielding systems;</li> <li data-bbox="475 1037 1267 1104">b. Design “technology” for the configuration of hardened electrical circuits and sub-systems;</li> <li data-bbox="475 1126 1267 1193">c. Design “technology” for the determination of hardening criteria of Category Codes 7E102.a. and 7E102.b.</li> </ol>
7E104	<p data-bbox="475 1261 1267 1350">“Technology” for the integration of the flight control, guidance, and propulsion data into a flight management system for optimisation of rocket system trajectory.</p>

<i>Category Code</i>	<i>Item Description</i>
<b>CATEGORY 8 — MARINE</b>	
<b>8A</b>	<b>Systems, Equipment and Components</b>
8A001	<p>Submersible vehicles and surface vessels, as follows:</p> <p><u><i>N.B.</i></u>  <i>For equipment for submersible vehicles, see:</i></p> <ul style="list-style-type: none"> <li>– <i>Category 6 for sensors;</i></li> <li>– <i>Categories 7 and 8 for navigation equipment;</i></li> <li>– <i>Category 8A for underwater equipment.</i></li> </ul> <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 characteristics:</p> <ol style="list-style-type: none"> <li>1. Designed to ‘operate autonomously’ and having a lifting capacity of both the following: <ol style="list-style-type: none"> <li>a. 10% or more of their weight in air; <u>and</u></li> <li>b. 15 kN or more;</li> </ol> </li> <li>2. Designed to operate at depths exceeding 1,000 m; <u>or</u></li> <li>3. Having both of the following characteristics: <ol style="list-style-type: none"> <li>a. Designed to continuously ‘operate autonomously’ for 10 hours or more; <u>and</u></li> <li>b. ‘Range’ of 25 nautical miles or more;</li> </ol> </li> </ol> <p><u><i>Technical Notes</i></u></p> <ol style="list-style-type: none"> <li>1. <i>For the purpose of Category Code 8A001.b., ‘operate autonomously’ means fully submerged, without snorkel, all systems working and cruising at minimum speed at which the submersible can safely control its depth dynamically by using its depth planes only, with no need for a support vessel or support base on the surface, seabed or shore, and containing a propulsion system for submerged or surface use.</i></li> <li>2. <i>For the purpose of Category Code 8A001.b., ‘range’ means half the maximum distance a submersible vehicle can ‘operate autonomously’.</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<ul style="list-style-type: none"> <li>c. Unmanned, tethered submersible vehicles designed to operate at depths exceeding 1,000 m and having either of the following characteristics:               <ul style="list-style-type: none"> <li>1. Designed for self-propelled manoeuvre using propulsion motors or thrusters specified in Category Code 8A002.a.2.; <u>or</u></li> <li>2. Fibre optic data link;</li> </ul> </li> <li>d. Unmanned, untethered submersible vehicles having any of the following characteristics:               <ul style="list-style-type: none"> <li>1. Designed for deciding a course relative to any geographical reference without real-time human assistance;</li> <li>2. Acoustic data or command link; <u>or</u></li> <li>3. Optical data or command link exceeding 1,000 m;</li> </ul> </li> <li>e. Ocean salvage systems with a lifting capacity exceeding 5 MN for salvaging objects from depths exceeding 250 m and having either of the following:               <ul style="list-style-type: none"> <li>1. Dynamic positioning systems capable of position keeping within 20 m of a given point provided by the navigation system; <u>or</u></li> <li>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;</li> </ul> </li> <li>f. Not used;</li> <li>g. Not used;</li> <li>h. Not used;</li> <li>i. Not used.</li> </ul>
8A002	<p>Marine systems, equipment and components, as follows:</p> <p><u>N.B.</u></p> <p><i>For underwater communications systems, see Category 5 – Part 1 – Telecommunications.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>a. Systems, equipment and components, specially designed or modified for submersible vehicles and designed to operate at depths exceeding 1,000 m, as follows:</p> <ol style="list-style-type: none"> <li>1. Pressure housings or pressure hulls with a maximum inside chamber diameter exceeding 1.5 m;</li> <li>2. Direct current propulsion motors or thrusters;</li> <li>3. Umbilical cables, and connectors therefor, using optical fibre and having synthetic strength members;</li> <li>4. Components manufactured from material specified in Category Code 8C001;</li> </ol> <p><i>Technical Note</i>  <i>Category Code 8A002.a.4. includes 'syntactic foam' specified in Category Code 8C001 when an intermediate stage of manufacture has been performed and it is not yet in the final component form.</i></p> <p>b. Systems specially designed or modified for the automated control of the motion of submersible vehicles specified in Category Code 8A001, using navigation data, having closed loop servo-controls and having any of the following functions:</p> <ol style="list-style-type: none"> <li>1. Enabling a vehicle to move within 10 m of a predetermined point in the water column;</li> <li>2. Maintaining the position of the vehicle within 10 m of a predetermined point in the water column; <u>or</u></li> <li>3. Maintaining the position of the vehicle within 10 m while following a cable on or under the seabed;</li> </ol> <p>c. Fibre optic pressure hull penetrators;</p> <p>d. Underwater vision systems specially designed or modified for remote operation with an underwater vehicle, employing techniques to minimise the effects of back scatter and including range-gated illuminators or "laser" systems;</p> <p>e. Not used;</p> <p>f. Not used;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>g. Light systems specially designed or modified for underwater use, as follows:</p> <ol style="list-style-type: none"> <li>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;</li> <li>2. Argon arc light systems specially designed for use below 1,000 m;</li> </ol> <p>h. “Robots” specially designed for underwater use, controlled by using a dedicated computer and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Systems that control the “robot” using information from sensors which measure force or torque applied to an external object, distance to an external object, or tactile sense between the “robot” and an external object; <u>or</u></li> <li>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;</li> </ol> <p>i. Remotely controlled articulated manipulators specially designed or modified for use with submersible vehicles and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Systems which control the manipulator using information from sensors which measure either of the following: <ol style="list-style-type: none"> <li>a. Torque or force applied to an external object; <u>or</u></li> <li>b. Tactile sense between the manipulator and an external object; <u>or</u></li> </ol> </li> <li>2. Controlled by proportional master-slave techniques and having 5 degrees of ‘freedom of movement’ or more;</li> </ol> <p><i><u>Technical Note</u></i>  <i>Only functions having proportionally related motion control using positional feedback are counted when determining the number of degrees of ‘freedom of movement’.</i></p>



<i>Category Code</i>	<i>Item Description</i>
	<p>j. Air independent power systems specially designed for underwater use, as follows:</p> <ol style="list-style-type: none"> <li>1. Brayton or Rankine cycle engine air independent power systems having any of the following:           <ol style="list-style-type: none"> <li>a. Chemical scrubber or absorber systems, specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;</li> <li>b. Systems specially designed to use a monoatomic gas;</li> <li>c. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; <u>or</u></li> <li>d. Systems having all of the following characteristics:               <ol style="list-style-type: none"> <li>1. Specially designed to pressurise the products of reaction or for fuel reformation;</li> <li>2. Specially designed to store the products of the reaction; <u>and</u></li> <li>3. Specially designed to discharge the products of the reaction against a pressure of 100 kPa or more;</li> </ol> </li> </ol> </li> <li>2. Diesel cycle engine air independent systems having all of the following:           <ol style="list-style-type: none"> <li>a. Chemical scrubber or absorber systems, specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;</li> <li>b. Systems specially designed to use a monoatomic gas;</li> <li>c. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; <u>and</u></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>d. Specially designed exhaust systems that do not exhaust continuously the products of combustion;</p> <p>3. “Fuel cell” air independent power systems with an output exceeding 2 kW and having either of the following:</p> <p>a. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; <u>or</u></p> <p>b. Systems having all of the following characteristics:</p> <p>1. Specially designed to pressurise the products of reaction or for fuel reformation;</p> <p>2. Specially designed to store the products of the reaction; <u>and</u></p> <p>3. Specially designed to discharge the products of the reaction against a pressure of 100 kPa or more;</p> <p>4. Stirling cycle engine air independent power systems having both of the following:</p> <p>a. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; <u>and</u></p> <p>b. Specially designed exhaust systems which discharge the products of combustion against a pressure of 100 kPa or more;</p> <p>k. Not used;</p> <p>l. Not used;</p> <p>m. Not used;</p> <p>n. Not used;</p> <p>o. Propellers, power transmission systems, power generation systems and noise reduction systems, as follows:</p>

<i>Category Code</i>	<i>Item Description</i>
	<ol style="list-style-type: none"> <li>1. Not used;</li> <li>2. Water-screw propeller, power generation systems or transmission systems, designed for use on vessels, as follows: <ol style="list-style-type: none"> <li>a. Controllable-pitch propellers and hub assemblies, rated at more than 30 MW;</li> <li>b. Internally liquid-cooled electric propulsion engines with a power output exceeding 2.5 MW;</li> <li>c. “Superconductive” propulsion engines or permanent magnet electric propulsion engines, with a power output exceeding 0.1 MW;</li> <li>d. Power transmission shaft systems incorporating “composite” material components and capable of transmitting more than 2 MW;</li> <li>e. Ventilated or base-ventilated propeller systems, rated at more than 2.5 MW;</li> </ol> </li> <li>3. Noise reduction systems designed for use on vessels of 1,000 tonnes displacement or more, as follows: <ol style="list-style-type: none"> <li>a. Systems that attenuate underwater noise at frequencies below 500 Hz and consist of compound acoustic mounts for the acoustic isolation of diesel engines, diesel generator sets, gas turbines, gas turbine generator sets, propulsion motors or propulsion reduction gears, specially designed for sound or vibration isolation and having an intermediate mass exceeding 30% of the equipment to be mounted;</li> <li>b. ‘Active noise reduction or cancellation systems’ or magnetic bearings, specially designed for power transmission systems;</li> </ol> <p><i><u>Technical Note</u></i></p> <p><i>‘Active noise reduction or cancellation systems’ incorporate electronic control systems capable of actively reducing equipment vibration by the generation of anti-noise or anti-vibration signals directly to the source.</i></p> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>p. Pumpjet propulsion systems having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Power output exceeding 2.5 MW; <u>and</u></li> <li>2. Using divergent nozzle and flow conditioning vane techniques to improve propulsive efficiency or reduce propulsion-generated underwater-radiated noise;</li> </ol> <p>q. Underwater swimming and diving equipment as follows:</p> <ol style="list-style-type: none"> <li>1. Closed circuit rebreathers;</li> <li>2. Semi-closed circuit rebreathers;</li> </ol> <p><u>Note</u>  <i>Category Code 8A002.q. does not include individual rebreathers for personal use when accompanying their users.</i></p> <p><u>N.B.</u>  <i>For equipment and devices specially designed for military use, see Division 2 of Part 1 of this Schedule.</i></p> <p>r. Diver deterrent acoustic systems specially designed or modified to disrupt divers and having a sound pressure level equal to or exceeding 190 dB (reference 1 µPa at 1 m) at frequencies of 200 Hz and below.</p> <p><u>Note 1</u>  <i>Category Code 8A002.r. does not include diver deterrent systems based on underwater explosive devices, air guns or combustible sources.</i></p> <p><u>Note 2</u>  <i>Category Code 8A002.r. includes diver deterrent acoustic systems that use spark gap sources, also known as plasma sound sources.</i></p>
<b>8B</b>	<b>Test, Inspection and Production Equipment</b>
8B001	Water tunnels having a background noise of less than 100 dB (reference 1 µPa, 1 Hz), in the frequency range from 0 Hz to 500 Hz and designed for measuring acoustic fields generated by a hydro-flow around propulsion system models.

<i>Category Code</i>	<i>Item Description</i>
<b>8C</b>	<b>Materials</b>
8C001	<p>‘Syntactic foam’ designed for underwater use and having both of the following characteristics:</p> <p><i>N.B.</i></p> <p>See also Category Code 8A002.a.4.</p> <p>a. Designed for marine depths exceeding 1,000 m; <u>and</u></p> <p>b. A density less than 561 kg/m<sup>3</sup>.</p> <p><i>Technical Note</i></p> <p>‘Syntactic foam’ consists of hollow spheres of plastic or glass embedded in a resin “matrix”.</p>
<b>8D</b>	<b>Software</b>
8D001	<p>“Software” specially designed or modified for the “development”, “production” or “use” of equipment or materials, specified in Category 8A, 8B or 8C.</p>
8D002	<p>Specific “software” specially designed or modified for the “development”, “production”, repair, overhaul or refurbishing (re-machining) of propellers specially designed for underwater noise reduction.</p>
<b>8E</b>	<b>Technology</b>
8E001	<p>“Technology” (according to the General Technology Note) for the “development” or “production” of equipment or materials specified in Category 8A, 8B or 8C.</p>
8E002	<p>Other “technology”, as follows:</p> <p>a. “Technology” for the “development”, “production”, repair, overhaul or refurbishing (re-machining) of propellers specially designed for underwater noise reduction;</p> <p>b. “Technology” for the overhaul or refurbishing of equipment specified in Category Code 8A001, 8A002.b., 8A002.j., 8A002.o. or 8A002.p.</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. “Technology” (according to the General Technology Note) for the “development” or “production” of any of the following:</p> <ol style="list-style-type: none"> <li>1. Surface-effect vehicles (fully skirted variety) having all of the following characteristics: <ol style="list-style-type: none"> <li>a. Maximum design speed, fully loaded, exceeding 30 knots in a significant wave height of 1.25 m or more;</li> <li>b. Cushion pressure exceeding 3,830 Pa; <u>and</u></li> <li>c. Light-ship-to-full-load displacement ratio of less than 0.70;</li> </ol> </li> <li>2. Surface-effect vehicles (rigid sidewalls) with a maximum design speed, fully loaded, exceeding 40 knots in a significant wave height of 3.25 m or more;</li> <li>3. 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 or more; <u>or</u></li> <li>4. ‘Small waterplane area vessels’ having either of the following characteristics: <ol style="list-style-type: none"> <li>a. 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 or more; <u>or</u></li> <li>b. 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 or more.</li> </ol> </li> </ol> <p><u>Technical Note</u>  A ‘small waterplane area vessel’ is defined by the following formula: waterplane area at an operational design draft less than <math>2 \times (\text{displaced volume at the operational design draft})^{2/3}</math>.</p>

Category Code	Item Description
<b>CATEGORY 9 — AEROSPACE AND PROPULSION</b>	
<b>9A</b>	<p><b>Systems, Equipment and Components</b></p> <p><u>N.B.</u> For propulsion systems designed or rated against neutron or transient ionising radiation, see Division 2 of Part 1 of this Schedule.</p>
9A001	<p>Aero gas turbine engines having either of the following characteristics:</p> <p><u>N.B.</u> See also Category Code 9A101.</p> <p>a. Incorporating any of the “technologies” specified in Category Code 9E003.a., 9E003.h. or 9E003.i.; <u>or</u></p> <p><u>Note 1</u> Category Code 9A001.a. does not include aero gas turbine engines which meet both of the following:</p> <p>a. Certified by the civil aviation authority of a “participating state”; <u>and</u></p> <p>b. Intended to power non-military manned “aircraft” for which either of the following has been issued by civil aviation authority of a “participating state” for the “aircraft” with this specific engine type:</p> <ol style="list-style-type: none"> <li>1. A civil type certificate; <u>or</u></li> <li>2. An equivalent document recognised by the International Civil Aviation Organisation (ICAO).</li> </ol> <p><u>Note 2</u> Category Code 9A001.a. does not include aero gas turbine engines designed for Auxiliary Power Units (APUs) approved by the civil aviation authority of a “participating state”.</p> <p>b. Designed to power an “aircraft” to cruise at Mach 1 or higher, for more than 30 minutes.</p>

<i>Category Code</i>	<i>Item Description</i>
9A002	<p>‘Marine gas turbine engines’ with an ISO standard continuous power rating of 24,245 kW or more and a specific fuel consumption not exceeding 0.219 kg/kWh in the power range from 35% to 100%, and specially designed assemblies and components therefor.</p>
	<p><u>Note</u>  <i>The term ‘marine gas turbine engines’ includes those industrial, or aero-derivative, gas turbine engines adapted for a ship’s electric power generation or propulsion.</i></p>
9A003	<p>Specially designed assemblies or components, incorporating any of the “technologies” specified in Category Code 9E003.a., 9E003.h. or 9E003.i., for either of the following aero gas turbine engines:</p> <ol style="list-style-type: none"> <li>a. Specified in Category Code 9A001; <u>or</u></li> <li>b. Whose design or production origins are either non-“participating state” or unknown to the manufacturer.</li> </ol>
9A004	<p>Space launch vehicles, “spacecraft”, “spacecraft buses”, “spacecraft payloads”, “spacecraft” on-board systems or equipment, and terrestrial equipment, as follows:</p> <p><u>N.B.</u>  <i>See also Category Code 9A104.</i></p> <ol style="list-style-type: none"> <li>a. Space launch vehicles;</li> <li>b. “Spacecraft”;</li> <li>c. “Spacecraft buses”;</li> <li>d. “Spacecraft payloads” incorporating items specified in Category Code 3A001.b.1.a.4., 3A002.g., 5A001.a.1., 5A001.b.3., 5A002.c., 5A002.e., 6A002.a.1., 6A002.a.2., 6A002.b., 6A002.d., 6A003.b., 6A004.c., 6A004.e., 6A008.d., 6A008.e., 6A008.k., 6A008.l. or 9A010.c.;</li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>e. On-board systems or equipment, specially designed for “spacecraft” and having any of the following functions:</p> <ol style="list-style-type: none"> <li>1. ‘Command and telemetry data handling’;</li> </ol> <p><i>Note</i> For the purpose of Category Code 9A004.e.1., ‘command and telemetry data handling’ includes bus data management, storage, and processing.</p> <ol style="list-style-type: none"> <li>2. ‘Payload data handling’; <u>or</u></li> </ol> <p><i>Note</i> For the purpose of Category Code 9A004.e.2., ‘payload data handling’ includes payload data management, storage, and processing.</p> <ol style="list-style-type: none"> <li>3. ‘Attitude and orbit control’;</li> </ol> <p><i>Note</i> For the purpose of Category Code 9A004.e.3., ‘attitude and orbit control’ includes sensing and actuation to determine and control the position and orientation of a “spacecraft”.</p> <p><i>N.B.</i> For equipment specially designed for military use, see Division 2 of Part 1 of this Schedule.</p> <p>f. Terrestrial equipment specially designed for “spacecraft”, as follows:</p> <ol style="list-style-type: none"> <li>1. Telemetry and telecommand equipment;</li> <li>2. Simulators.</li> </ol>
9A005	<p>Liquid rocket propulsion systems containing any of the systems or components, specified in Category Code 9A006.</p> <p><i>N.B.</i> See also Category Codes 9A105 and 9A119.</p>

<i>Category Code</i>	<i>Item Description</i>
9A006	<p>Systems and components, specially designed for liquid rocket propulsion systems, as follows:</p> <p><u>N.B.</u> See also Category Codes 9A106, 9A108 and 9A120.</p> <ol style="list-style-type: none"> <li>a. Cryogenic refrigerators, flightweight dewars, cryogenic heat pipes or cryogenic systems, specially designed for use in space vehicles and capable of restricting cryogenic fluid losses to less than 30% per year;</li> <li>b. Cryogenic containers or closed-cycle refrigeration systems, capable of providing temperatures of 100 K (- 173°C) or less for “aircraft” capable of sustained flight at speeds exceeding Mach 3, launch vehicles or “spacecraft”;</li> <li>c. Slush hydrogen storage or transfer systems;</li> <li>d. High pressure (exceeding 17.5 MPa) turbo pumps, pump components or their associated gas generator or expander cycle turbine drive systems;</li> <li>e. High-pressure (exceeding 10.6 MPa) thrust chambers and nozzles therefor;</li> <li>f. Propellant storage systems using the principle of capillary containment or positive expulsion (i.e. with flexible bladders);</li> <li>g. Liquid propellant injectors with individual orifices of 0.381 mm or smaller in diameter (an area of <math>1.14 \times 10^{-3} \text{ cm}^2</math> or smaller for non-circular orifices) and specially designed for liquid rocket engines;</li> <li>h. One-piece carbon-carbon thrust chambers or one-piece carbon-carbon exit cones, with densities exceeding <math>1.4 \text{ g/cm}^3</math> and tensile strengths exceeding 48 MPa.</li> </ol>
9A007	<p>Solid rocket propulsion systems having any of the following characteristics:</p> <p><u>N.B.</u> See also Category Codes 9A107 and 9A119.</p> <ol style="list-style-type: none"> <li>a. Total impulse capacity exceeding 1.1 MNs;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Specific impulse of 2.4 kNs/kg or more, when the nozzle flow is expanded to ambient sea level conditions for an adjusted chamber pressure of 7 MPa;</p> <p>c. Stage mass fractions exceeding 88% and propellant solid loadings exceeding 86%;</p> <p>d. Components specified in Category Code 9A008; <u>or</u></p> <p>e. Insulation and propellant bonding systems, using direct-bonded motor designs to provide a ‘strong mechanical bond’ or a barrier to chemical migration between the solid propellant and case insulation material.</p> <p><u>Technical Note</u>  ‘Strong mechanical bond’ means bond strength equal to or more than propellant strength.</p>
9A008	<p>Components specially designed for solid rocket propulsion systems, as follows:</p> <p><u>N.B.</u>  See also Category Code 9A108.</p> <p>a. Insulation and propellant bonding systems, using liners to provide a ‘strong mechanical bond’ or a barrier to chemical migration between the solid propellant and case insulation material;</p> <p><u>Technical Note</u>  ‘Strong mechanical bond’ means bond strength equal to or more than propellant strength.</p> <p>b. Filament-wound “composite” motor cases exceeding 0.61 m in diameter or having ‘structural efficiency ratios (PV/W)’ exceeding 25 km;</p> <p><u>Technical Note</u>  ‘Structural efficiency ratio (PV/W)’ is the burst pressure (P) multiplied by the vessel volume (V) divided by the total pressure vessel weight (W).</p> <p>c. Nozzles with thrust levels exceeding 45 kN or nozzle throat erosion rates of less than 0.075 mm/s;</p>

<i>Category Code</i>	<i>Item Description</i>
	d. Movable nozzle or secondary fluid injection thrust vector control systems, capable of any of the following: <ol style="list-style-type: none"> <li>1. Omni-axial movement exceeding <math>\pm 5^\circ</math>;</li> <li>2. Angular vector rotations of <math>20^\circ/\text{s}</math> or more; <u>or</u></li> <li>3. Angular vector accelerations of <math>40^\circ/\text{s}^2</math> or more.</li> </ol>
9A009	Hybrid rocket propulsion systems having either of the following characteristics: <u>N.B.</u> <i>See also Category Codes 9A109 and 9A119.</i> <ol style="list-style-type: none"> <li>a. Total impulse capacity exceeding 1.1 MNs; <u>or</u></li> <li>b. Thrust levels exceeding 220 kN in vacuum exit conditions.</li> </ol>
9A010	Specially designed components, systems and structures, for launch vehicles, launch vehicle propulsion systems or “spacecraft”, as follows: <u>N.B.</u> <i>See also Category Codes 1A002 and 9A110.</i> <ol style="list-style-type: none"> <li>a. Components and structures, each exceeding 10 kg and specially designed for launch vehicles manufactured using any of the following:               <ol style="list-style-type: none"> <li>1. “Composite” materials consisting of “fibrous or filamentary materials” specified in Category Code 1C010.e. and resins specified in Category Code 1C008 or 1C009.b.;</li> <li>2. Metal “matrix” “composites” reinforced by any of the following:                   <ol style="list-style-type: none"> <li>a. Material specified in Category Code 1C007;</li> <li>b. “Fibrous or filamentary materials” specified in Category Code 1C010; <u>or</u></li> <li>c. Aluminides specified in Category Code 1C002.a.; <u>or</u></li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. Ceramic “matrix” “composite” materials specified in Category Code 1C007;</p> <p><u>Note</u> <i>The weight cut-off is not relevant for nose cones.</i></p> <p>b. Components and structures, specially designed for launch vehicle propulsion systems specified in Category Codes 9A005 to 9A009 manufactured using any of the following:</p> <ol style="list-style-type: none"> <li>1. “Fibrous or filamentary materials” specified in Category Code 1C010.e. and resins specified in Category Code 1C008 or 1C009.b.;</li> <li>2. Metal “matrix” “composites” reinforced by any of the following: <ol style="list-style-type: none"> <li>a. Materials specified in Category Code 1C007;</li> <li>b. “Fibrous or filamentary materials” specified in Category Code 1C010; <u>or</u></li> <li>c. Aluminides specified in Category Code 1C002.a.; <u>or</u></li> </ol> </li> <li>3. Ceramic “matrix” “composite” materials specified in Category Code 1C007;</li> </ol> <p>c. Structural components and isolation systems, specially designed to control actively the dynamic response or distortion of “spacecraft” structures;</p> <p>d. Pulsed liquid rocket engines with thrust-to-weight ratios equal to or more than 1 kN/kg and a response time (the time required to achieve 90% of total rated thrust from start-up) of less than 30 ms.</p>
9A011	<p>Ramjet, scramjet or combined cycle engines, and specially designed components therefor.</p> <p><u>N.B.</u> <i>See also Category Codes 9A111 and 9A118.</i></p>

<i>Category Code</i>	<i>Item Description</i>
9A012	<p data-bbox="480 454 1259 521">“Unmanned aerial vehicles” (“UAVs”), unmanned “airships”, related equipment and components, as follows:</p> <p data-bbox="480 539 536 568"><u>N.B.</u></p> <p data-bbox="480 580 855 609"><i>See also Category Code 9A112.</i></p> <p data-bbox="480 629 1259 725">a. “UAVs” or unmanned “airships”, designed to have controlled flight out of the direct ‘natural vision’ of the ‘operator’ and having either of the following characteristics:</p> <ol data-bbox="544 745 1259 1025" style="list-style-type: none"> <li data-bbox="544 745 1139 775">1. Having both of the following characteristics: <ol data-bbox="628 795 1259 976" style="list-style-type: none"> <li data-bbox="628 795 1259 862">a. A maximum ‘endurance’ greater than or equal to 30 minutes but less than 1 hour; <u>and</u></li> <li data-bbox="628 882 1259 976">b. Designed to take-off and have stable controlled flight in wind gusts equal to or exceeding 46.3 km/h (25 knots); <u>or</u></li> </ol> </li> <li data-bbox="544 996 1150 1025">2. A maximum ‘endurance’ of 1 hour or greater;</li> </ol> <p data-bbox="544 1046 738 1075"><u>Technical Notes</u></p> <ol data-bbox="544 1086 1259 1417" style="list-style-type: none"> <li data-bbox="544 1086 1259 1182">1. <i>For the purpose of Category Code 9A012.a., ‘operator’ is a person who initiates or commands the “UAV” or unmanned “airship” flight.</i></li> <li data-bbox="544 1202 1259 1299">2. <i>For the purpose of Category Code 9A012.a., ‘endurance’ is to be calculated for ISA conditions (Ref. ISO 2533:1975) at sea level in zero wind.</i></li> <li data-bbox="544 1319 1259 1417">3. <i>For the purpose of Category Code 9A012.a., ‘natural vision’ means unaided human sight, with or without corrective lenses.</i></li> </ol> <p data-bbox="480 1438 1110 1467">b. Related equipment and components, as follows:</p> <ol data-bbox="544 1487 1259 1870" style="list-style-type: none"> <li data-bbox="544 1487 724 1516">1. Not used;</li> <li data-bbox="544 1536 724 1565">2. Not used;</li> <li data-bbox="544 1585 1259 1718">3. Equipment or components, specially designed to convert a manned “aircraft” or manned “airship”, to a “UAV” or unmanned “airship”, specified in Category Code 9A012.a.;</li> <li data-bbox="544 1738 1259 1870">4. Air breathing reciprocating or rotary internal combustion type engines, specially designed or modified to propel “UAVs” or unmanned “airships”, at altitudes above 15,240 metres (50,000 feet).</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
9A101	<p>Turbojet and turbofan engines, other than those specified in Category Code 9A001, as follows:</p> <p>a. Engines having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. ‘Maximum thrust value’ greater than 400 N (achieved un-installed) excluding civil certified engines with a ‘maximum thrust value’ greater than 8,890 N (achieved un-installed); <u>and</u></li> <li>2. Specific fuel consumption of 0.15 kg/N/hr or less (at maximum continuous power at sea level static conditions using the ICAO standard atmosphere);</li> </ol> <p><i>Technical Note</i></p> <p><i>For the purpose of Category Code 9A101.a.1., ‘maximum thrust value’ is the manufacturer’s demonstrated maximum thrust for the engine type un-installed. The civil type certified thrust value will be equal to or less than the manufacturer’s demonstrated maximum thrust for the engine type.</i></p> <p>b. Engines designed or modified for use in “missiles” or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a.</p>
9A102	<p>‘Turboprop engine systems’ specially designed for unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a., and specially designed components therefor, having a ‘maximum power’ greater than 10 kW.</p> <p><i>Note</i></p> <p><i>Category Code 9A102 does not include civil certified engines.</i></p> <p><i>Technical Notes</i></p> <ol style="list-style-type: none"> <li>1. <i>For the purpose of Category Code 9A102, a ‘turboprop engine system’ incorporates both of the following:</i> <ol style="list-style-type: none"> <li>a. <i>Turboshaft engine; <u>and</u></i></li> <li>b. <i>Power transmission system to transfer the power to a propeller.</i></li> </ol> </li> <li>2. <i>For the purpose of Category Code 9A102, the ‘maximum power’ is achieved un-installed at sea level static conditions using the ICAO standard atmosphere.</i></li> </ol>

<i>Category Code</i>	<i>Item Description</i>
9A104	<p>Sounding rockets, capable of a range of at least 300 km.</p> <p><u>N.B.</u> See also Category Code 9A004.</p>
9A105	<p>Liquid propellant rocket engines or gel propellant rocket motors, as follows:</p> <p><u>N.B.</u> See also Category Code 9A119.</p> <ol style="list-style-type: none"> <li>a. Liquid propellant rocket engines or gel propellant rocket motors, usable in “missiles”, other than those specified in Category Code 9A005, integrated, or designed or modified to be integrated, into a liquid propellant or gel propellant propulsion system which has a total impulse capacity equal to or greater than 1.1 MNs;</li> <li>b. Liquid propellant rocket engines or gel propellant rocket motors, usable in complete rocket systems or unmanned aerial vehicles, capable of a range of 300 km, other than those specified in Category Code 9A005 or 9A105.a., integrated, or designed or modified to be integrated, into a liquid propellant or gel propellant propulsion system which has a total impulse capacity equal to or greater than 0.841 MNs.</li> </ol>
9A106	<p>Systems or components, other than those specified in Category Code 9A006 as follows, specially designed for liquid rocket propulsion or gel propellant rocket systems:</p> <ol style="list-style-type: none"> <li>a. Not used;</li> <li>b. Not used;</li> <li>c. Thrust vector control sub-systems, usable in “missiles”;</li> </ol> <p><u>Technical Note</u> Examples of methods of achieving thrust vector control specified in Category Code 9A106.c. are:</p> <ol style="list-style-type: none"> <li>a. Flexible nozzle;</li> <li>b. Fluid or secondary gas injection;</li> </ol>



Category Code	Item Description
	<p>c. Movable engine or nozzle;</p> <p>d. Deflection of exhaust gas stream (jet vanes or probes); <u>or</u></p> <p>e. Thrust tabs.</p> <p>d. Liquid, slurry and gel propellant (including oxidisers) control systems, and specially designed components therefor, usable in “missiles”, designed or modified to operate in vibration environments greater than 10 g rms between 20 Hz and 2 kHz;</p> <p><u>Note</u> The only servo valves, pumps and gas turbines specified in Category Code 9A106.d., are the following:</p> <p>a. Servo valves designed for flow rates equal to or greater than 24 litres per minute, at an absolute pressure equal to or greater than 7 MPa, that have an actuator response time of less than 100 ms;</p> <p>b. Pumps, for liquid propellants, with shaft speeds equal to or greater than 8,000 rpm at a maximum operating mode or with discharge pressures equal to or greater than 7 MPa;</p> <p>c. Gas turbines, for liquid propellant turbopumps, with shaft speeds equal to or greater than 8,000 rpm at the maximum operating mode.</p> <p>e. Combustion chambers and nozzles for liquid propellant rocket engines or gel propellant rocket motors specified in Category Code 9A005 or Category Code 9A105.</p>
9A107	<p>Solid propellant rocket engines, usable in complete rocket systems or unmanned aerial vehicles, capable of a range of 300 km, other than those specified in Category Code 9A007, having total impulse capacity equal to or greater than 0.841 MNs.</p> <p><u>N.B.</u> See also Category Code 9A119.</p>

<i>Category Code</i>	<i>Item Description</i>
9A108	<p>Components, other than those specified in Category Code 9A008, as follows, specially designed for solid rocket propulsion systems:</p> <ul style="list-style-type: none"> <li>a. Rocket motor cases and “insulation” components therefor, usable in sub-systems specified in Category Code 9A007 or Category Code 9A107;</li> <li>b. Rocket nozzles, usable in sub-systems specified in Category Code 9A007 or Category Code 9A107;</li> <li>c. Thrust vector control sub-systems, usable in “missiles”.</li> </ul> <p><i>Technical Note</i>  <i>Examples of methods of achieving thrust vector control specified in Category Code 9A108.c. are:</i></p> <ul style="list-style-type: none"> <li>a. <i>Flexible nozzle;</i></li> <li>b. <i>Fluid or secondary gas injection;</i></li> <li>c. <i>Movable engine or nozzle;</i></li> <li>d. <i>Deflection of exhaust gas stream (jet vanes or probes);</i>  <i>or</i></li> <li>e. <i>Thrust tabs.</i></li> </ul>
9A109	<p>Hybrid rocket motors and specially designed components, as follows:</p> <ul style="list-style-type: none"> <li>a. Hybrid rocket motors usable in complete rocket systems or unmanned aerial vehicles, capable of 300 km, other than those specified in Category Code 9A009, having a total impulse capacity equal to or greater than 0.841 MNs, and specially designed components therefor;</li> <li>b. Specially designed components for hybrid rocket motors specified in Category Code 9A009 that are usable in “missiles”.</li> </ul> <p><u><i>N.B.</i></u>  <i>See also Category Codes 9A009 and 9A119.</i></p>

<i>Category Code</i>	<i>Item Description</i>
9A110	<p>Composite structures, laminates and manufactures thereof, other than those specified in Category Code 9A010, specially designed for use in ‘missiles’ or the sub-systems specified in Category Code 9A005, 9A007, 9A105, 9A106.c., 9A107, 9A108.c., 9A116 or 9A119.</p> <p><u><i>N.B.</i></u> See also Category Code 1A002.</p> <p><u><i>Technical Note</i></u> In Category Code 9A110, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p>
9A111	<p>Pulse jet engines, usable in “missiles” or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a., and specially designed components therefor.</p> <p><u><i>N.B.</i></u> See also Category Codes 9A011 and 9A118.</p>
9A112	<p>“Unmanned aerial vehicles” (“UAVs”), other than those specified in Category Code 9A012, as follows:</p> <ol style="list-style-type: none"> <li>a. “Unmanned aerial vehicles” (“UAVs”) capable of a range of 300 km;</li> <li>b. “Unmanned aerial vehicles” (“UAVs”) having both of the following characteristics: <ol style="list-style-type: none"> <li>1. Having either of the following characteristics: <ol style="list-style-type: none"> <li>a. An autonomous flight control and navigation capability; <u>or</u></li> <li>b. Capability of controlled flight out of direct vision range involving a human operator; <u>and</u></li> </ol> </li> <li>2. Having either of the following characteristics: <ol style="list-style-type: none"> <li>a. Incorporating an aerosol dispensing system or mechanism with a capacity greater than 20 litres; <u>or</u></li> </ol> </li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Designed or modified to incorporate an aerosol dispensing system or mechanism with a capacity greater than 20 litres.</p> <p><u>Technical Notes</u></p> <p>1. <i>An aerosol consists of particulate or liquids other than fuel components, by products or additives, as part of the “payload” to be dispersed in the atmosphere. Examples of aerosols include pesticides for crop dusting and dry chemicals for cloud seeding.</i></p> <p>2. <i>An aerosol dispensing system or mechanism contains all those devices (mechanical, electrical, hydraulic, etc.), which are necessary for storage and dispersion of an aerosol into the atmosphere. This includes the possibility of aerosol injection into the combustion exhaust vapour and into the propeller slip stream.</i></p>
9A115	<p>Launch support equipment as follows:</p> <p>a. Apparatus and devices for handling, control, activation or launching, designed or modified for space launch vehicles specified in Category Code 9A004, sounding rockets specified in Category Code 9A104 or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a.;</p> <p>b. Vehicles for transport, handling, control, activation or launching, designed or modified for space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.</p>
9A116	<p>Re-entry vehicles, usable in “missiles”, and equipment designed or modified therefor, as follows:</p> <p>a. Re-entry vehicles;</p> <p>b. Heat shields and components therefor, fabricated of ceramic or ablative materials;</p>

<i>Category Code</i>	<i>Item Description</i>
	<p>c. Heat sinks and components therefor, fabricated of light-weight, high heat capacity materials;</p> <p>d. Electronic equipment specially designed for re-entry vehicles.</p>
9A117	<p>Staging mechanisms, separation mechanisms, and interstages, usable in “missiles”.</p> <p><u>N.B.</u> See also Category Code 9A121.</p>
9A118	<p>Devices to regulate combustion usable in engines, which are usable in “missiles” or unmanned aerial vehicles specified in Category Code 9A012 or 9A112.a., specified in Category Code 9A011 or 9A111.</p>
9A119	<p>Individual rocket stages, usable in complete rocket systems or unmanned aerial vehicles, capable of a range of 300 km, other than those specified in Category Codes 9A005, 9A007, 9A009, 9A105, 9A107 and 9A109.</p>
9A120	<p>Liquid or gel propellant tanks, other than those specified in Category Code 9A006, specially designed for propellants specified in Category Code 1C111 or ‘other liquid or gel propellants’, used in rocket systems capable of delivering at least a 500 kg payload to a range of at least 300 km.</p> <p><u>Note</u> In Category Code 9A120, ‘other liquid or gel propellants’ includes, but is not limited to, propellants specified in Division 2 of Part 1 of this Schedule.</p>

<i>Category Code</i>	<i>Item Description</i>
9A121	<p>Umbilical and interstage electrical connectors specially designed for “missiles”, space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104.</p> <p><u>Technical Note</u>  <i>Interstage connectors referred to in Category Code 9A121 also include electrical connectors installed between the “missile”, space launch vehicle or sounding rocket and their payload.</i></p>
9A350	<p>Spraying or fogging systems, specially designed or modified for fitting to aircraft, “lighter-than-air vehicles” or unmanned aerial vehicles, and specially designed components therefor, as follows:</p> <ol style="list-style-type: none"> <li>a. Complete spraying or fogging systems capable of delivering, from a liquid suspension, an initial droplet ‘VMD’ of less than 50 µm at a flow rate of greater than two litres per minute;</li> <li>b. Spray booms or arrays of aerosol generating units capable of delivering, from a liquid suspension, an initial droplet ‘VMD’ of less than 50 µm at a flow rate of greater than two litres per minute;</li> <li>c. Aerosol generating units specially designed for fitting to systems specified in Category Codes 9A350.a. and .b.</li> </ol> <p><u>Note</u>  <i>Aerosol generating units are devices specially designed or modified for fitting to aircraft such as nozzles, rotary drum atomisers and similar devices.</i></p> <p><u>Note</u>  <i>Category Code 9A350 does not include spraying or fogging systems and components that are demonstrated not to be capable of delivering biological agents in the form of infectious aerosols.</i></p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>Droplet size for spray equipment or nozzles specially designed for use on aircraft, “lighter-than-air vehicles” or unmanned aerial vehicles should be measured using either of the following:</i> <ol style="list-style-type: none"> <li>a. <i>Doppler laser method; <u>or</u></i></li> <li>b. <i>Forward laser diffraction method.</i></li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. In Category Code 9A350, 'VMD' means Volume Median Diameter and for water-based systems this equates to Mass Median Diameter (MMD).</p>
<p><b>9B</b></p>	<p><b>Test, Inspection and Production Equipment</b></p>
<p>9B001</p>	<p>Equipment, tooling or fixtures, specially designed for manufacturing gas turbine engine blades, vanes or "tip shrouds", as follows:</p> <p><u>N.B.</u> See also Category Code 2B226.</p> <p>a. Directional solidification or Single Crystal (SC) casting equipment;</p> <p>b. Casting tooling, manufactured from refractory metals or ceramics, as follows:</p> <ol style="list-style-type: none"> <li>1. Cores;</li> <li>2. Shells (moulds);</li> <li>3. Combined core and shell (mould) units;</li> </ol> <p>c. Directional-solidification or Single Crystal (SC) additive-manufacturing equipment.</p>
<p>9B002</p>	<p>On-line (real-time) control systems, instrumentation (including sensors) or automated data acquisition and processing equipment, having both of the following characteristics:</p> <p>a. Specially designed for the "development" of gas turbine engines, assemblies or components; <u>and</u></p> <p>b. Incorporating any of the "technologies" specified in Category Code 9E003.h. or 9E003.i.</p>
<p>9B003</p>	<p>Equipment specially designed for the "production" or test of gas turbine brush seals designed to operate at tip speeds exceeding 335 m/s and temperatures in excess of 773 K (500°C), and specially designed components or accessories therefor.</p>

<i>Category Code</i>	<i>Item Description</i>
9B004	Tools, dies or fixtures, for the solid state joining of “superalloy”, titanium or intermetallic airfoil-to-disk combinations described in Category Code 9E003.a.3. or 9E003.a.6. for gas turbines.
9B005	<p>On-line (real-time) control systems, instrumentation (including sensors) or automated data acquisition and processing equipment, specially designed for use with any of the following:</p> <p><u>N.B.</u> See also Category Code 9B105.</p> <p>a. Wind tunnels designed for speeds of Mach 1.2 or more;</p> <p><u>Note</u> Category Code 9B005.a. does not include wind tunnels specially designed for educational purposes and having a ‘test section size’ (measured laterally) of less than 250 mm.</p> <p><u>Technical Note</u> ‘Test section size’ means the diameter of the circle, or the side of the square, or the longest side of the rectangle, at the largest test section location.</p> <p>b. Devices for simulating flow-environments at speeds exceeding Mach 5, including hot-shot tunnels, plasma arc tunnels, shock tubes, shock tunnels, gas tunnels and light gas guns; <u>or</u></p> <p>c. Wind tunnels or devices, other than two-dimensional sections, capable of simulating Reynolds number flows exceeding <math>25 \times 10^6</math>.</p>
9B006	<p>Acoustic vibration test equipment capable of producing sound pressure levels of 160 dB or more (referenced to 20 <math>\mu</math>Pa) with a rated output of 4 kW or more at a test cell temperature exceeding 1,273 K (1,000°C), and specially designed quartz heaters therefor.</p> <p><u>N.B.</u> See also Category Code 9B106.</p>



<i>Category Code</i>	<i>Item Description</i>
9B007	Equipment specially designed for inspecting the integrity of rocket motors and using Non-Destructive Test (NDT) techniques other than planar X-ray or basic physical or chemical analysis.
9B008	Direct measurement wall skin friction transducers specially designed to operate at a test flow total (stagnation) temperature exceeding 833 K (560°C).
9B009	<p>Tooling specially designed for producing gas turbine engine powder metallurgy rotor components having both of the following characteristics:</p> <p>a. Designed to operate at stress levels of 60% of Ultimate Tensile Strength (UTS) or more measured at a temperature of 873 K (600°C); <u>and</u></p> <p>b. Designed to operate at 873 K (600°C) or more.</p> <p><u>Note</u> Category Code 9B009 does not include tooling for the production of powder.</p>
9B010	Equipment specially designed for the production of items specified in Category Code 9A012.
9B105	<p>‘Aerodynamic test facilities’ for speeds of Mach 0.9 or more, usable for ‘missiles’ and their sub-systems.</p> <p><u>N.B.</u> See also Category Code 9B005.</p> <p><u>Note</u> Category Code 9B105 does not include wind tunnels for speeds of Mach 3 or less with dimension of the ‘test cross section size’ equal to or less than 250 mm.</p> <p><u>Technical Notes</u></p> <p>1. In Category Code 9B105, ‘aerodynamics test facilities’ includes wind tunnels and shock tunnels for the study of airflow over objects.</p>

Category Code	Item Description
	<p>2. <i>In Note to Category Code 9B105, ‘test cross section size’ means the diameter of the circle, or the side of the square, or the longest side of the rectangle, or the major axis of the ellipse at the largest ‘test cross section’ location. ‘Test cross section’ is the section perpendicular to the flow direction.</i></p> <p>3. <i>In Category Code 9B105, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
9B106	<p>Environmental chambers and anechoic chambers, as follows:</p> <p>a. Environmental chambers having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Capable of simulating either of the following flight conditions:           <ol style="list-style-type: none"> <li>a. Altitude equal to or greater than 15 km; <u>or</u></li> <li>b. Temperature range from below 223 K (-50°C) to above 398 K (+125°C); <u>and</u></li> </ol> </li> <li>2. Incorporating, or ‘designed or modified’ to incorporate, a shaker unit or other vibration test equipment to produce vibration environments equal to or greater than 10 g rms, measured ‘bare table’, between 20 Hz and 2 kHz while imparting forces equal to or greater than 5 kN;</li> </ol> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. <i>Category Code 9B106.a.2. describes systems that are capable of generating a vibration environment with a single wave (e.g. a sine wave) and systems capable of generating a broad band random vibration (i.e. power spectrum).</i></li> <li>2. <i>In Category Code 9B106.a.2., ‘designed or modified’ means the environmental chamber provides appropriate interfaces (e.g. sealing devices) to incorporate a shaker unit or other vibration test equipment as specified in Category Code 2B116.</i></li> </ol>

Category Code	Item Description
	<p data-bbox="603 454 1268 521">3. In Category Code 9B106.a.2., 'bare table' means a flat table, or surface, with no fixture or fittings.</p> <p data-bbox="480 539 1268 607">b. Environmental chambers capable of simulating both of the following flight conditions:</p> <ol data-bbox="544 622 1268 936" style="list-style-type: none"> <li data-bbox="544 622 1268 757">1. Acoustic environments at an overall sound pressure level of 140 dB or greater (referenced to 20 <math>\mu</math>Pa) or with a total rated acoustic power output of 4 kW or greater; <u>and</u></li> <li data-bbox="544 772 1268 936">2. Having either of the following characteristics: <ol data-bbox="630 824 1268 936" style="list-style-type: none"> <li data-bbox="630 824 1268 857">a. Altitude equal to greater than 15 km; <u>or</u></li> <li data-bbox="630 869 1268 936">b. Temperature range from below 223 K (-50°C) to above 398 K (+125°C).</li> </ol> </li> </ol>
9B107	<p data-bbox="480 1003 1268 1137">'Aerothermodynamic test facilities', usable for 'missiles', 'missile' rocket propulsion systems, and re-entry vehicles and equipment specified in Category Code 9A116, having either of the following characteristics:</p> <ol data-bbox="480 1153 1268 1272" style="list-style-type: none"> <li data-bbox="480 1153 1268 1220">a. An electrical power supply equal to or greater than 5 MW; <u>or</u></li> <li data-bbox="480 1236 1268 1272">b. A gas supply total pressure equal to or greater than 3 MPa.</li> </ol> <p data-bbox="480 1288 678 1323"><u>Technical Notes</u></p> <ol data-bbox="480 1332 1268 1541" style="list-style-type: none"> <li data-bbox="480 1332 1268 1429">1. 'Aerothermodynamic test facilities' include plasma arc jet facilities and plasma wind tunnels for the study of thermal and mechanical effects of airflow on objects.</li> <li data-bbox="480 1438 1268 1541">2. In Category Code 9B107, 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</li> </ol>
9B115	<p data-bbox="480 1601 1268 1736">Specially designed "production equipment" for the systems, sub-systems and components specified in Category Codes 9A005 to 9A009, 9A011, 9A101, 9A102, 9A105 to 9A109, 9A111, 9A116 to 9A120.</p>

<i>Category Code</i>	<i>Item Description</i>
9B116	<p>Specially designed “production facilities” for the space launch vehicles specified in Category Code 9A004, or systems, sub-systems, and components specified in Category Codes 9A005 to 9A009, 9A011, 9A101, 9A102, 9A104 to 9A109, 9A111, 9A116 to 9A120 or ‘missiles’.</p> <p><i>Technical Note</i>  <i>In Category Code 9B116, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
9B117	<p>Test benches and test stands for solid or liquid propellant rockets or rocket motors, having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. The capacity to handle more than 68 kN of thrust; <u>or</u></li> <li>b. Capable of simultaneously measuring the three axial thrust components.</li> </ol>
<b>9C</b>	<b>Materials</b>
9C108	<p>“Insulation” material in bulk form and “interior lining”, other than those specified in Category Code 9A008, for rocket motor cases usable in “missiles” or specially designed for solid propellant rocket engines specified in Category Code 9A007 or 9A107.</p>
9C110	<p>Resin impregnated fibre prepregs and metal coated fibre preforms therefor, for composite structures, laminates and manufactures specified in Category Code 9A110, made either with organic matrix or metal matrix utilising fibrous or filamentary reinforcements having a “specific tensile strength” greater than <math>7.62 \times 10^4</math> m and a “specific modulus” greater than <math>3.18 \times 10^6</math> m.</p> <p><i>N.B.</i>  <i>See also Category Codes 1C010 and 1C210.</i></p>
	<p><i>Note</i>  <i>The only resin impregnated fibre prepregs specified in Category Code 9C110 are those using resins with a glass transition temperature (<math>T_g</math>), after cure, exceeding 418 K (145°C) as determined by ASTM D4065 or equivalent.</i></p>

<i>Category Code</i>	<i>Item Description</i>
<b>9D</b>	<b>Software</b>
9D001	“Software” specially designed or modified for the “development” of equipment or “technology”, specified in Category Codes 9A001 to 9A119, Category 9B or Category Code 9E003.
9D002	“Software” specially designed or modified for the “production” of equipment specified in Category Codes 9A001 to 9A119 or Category 9B.
9D003	“Software” incorporating “technology” specified in Category Code 9E003.h. and used in “FADEC Systems” for systems specified in Category 9A or equipment specified in Category 9B.
9D004	<p>Other “software” as follows:</p> <ul style="list-style-type: none"> <li>a. 2D or 3D viscous “software”, validated with wind tunnel or flight test data required for detailed engine flow modelling;</li> <li>b. “Software” for testing aero gas turbine engines, assemblies or components, specially designed to collect, reduce and analyse data in real time and capable of feedback control, including the dynamic adjustment of test articles or test conditions, as the test is in progress;</li> <li>c. “Software” specially designed to control directional solidification or Single Crystal (SC) material growth in equipment specified in Category Code 9B001.a. or 9B001.c.;</li> <li>d. Not used;</li> <li>e. “Software” specially designed or modified for the operation of items specified in Category Code 9A012;</li> <li>f. “Software” specially designed to design the internal cooling passages of aero gas turbine blades, vanes and “tip shrouds”;</li> <li>g. “Software” having both of the following characteristics: <ul style="list-style-type: none"> <li>1. Specially designed to predict aero thermal, aeromechanical and combustion conditions in aero gas turbine engines; <u>and</u></li> </ul> </li> </ul>

<i>Category Code</i>	<i>Item Description</i>
	<p>2. Theoretical modelling predictions of the aero thermal, aeromechanical and combustion conditions, which have been validated with actual aero gas turbine engine (experimental or production) performance data.</p>
9D005	“Software” specially designed or modified for the operation of items specified in Category Code 9A004.e. or 9A004.f.
9D101	“Software” specially designed or modified for the “use” of goods specified in Category Code 9B105, 9B106, 9B116 or 9B117.
9D103	<p>“Software” specially designed for modelling, simulation or design integration of the space launch vehicles specified in Category Code 9A004, sounding rockets specified in Category Code 9A104 or “missiles”, or the sub-systems specified in Category Code 9A005, 9A007, 9A105, 9A106.c., 9A107, 9A108.c., 9A116 or 9A119.</p> <p><u>Note</u>  <i>“Software” specified in Category Code 9D103 remains within the description of that Category when combined with specially designed hardware specified in Category Code 4A102.</i></p>
9D104	<p>“Software” as follows:</p> <p>a. “Software” specially designed or modified for the “use” of goods specified in Category Code 9A001, 9A005, 9A006.d., 9A006.g., 9A007.a., 9A009.a., 9A010.d., 9A011, 9A101, 9A102, 9A105, 9A106.d., 9A107, 9A109, 9A111, 9A115.a., 9A117 or 9A118.;</p> <p>b. “Software” specially designed or modified for the operation or maintenance of sub-systems or equipment specified in Category Code 9A008.d., 9A106.c., 9A108.c. or 9A116.d.</p>

<i>Category Code</i>	<i>Item Description</i>
9D105	<p>“Software” specially designed or modified to coordinate the function of more than one sub-system, other than that specified in Category Code 9D004.e., in space launch vehicles specified in Category Code 9A004 or sounding rockets specified in Category Code 9A104 or ‘missiles’.</p> <p><u>Note</u>  <i>Category Code 9D105 includes “software” specially designed for a manned “aircraft” converted to operate as “unmanned aerial vehicle”, as follows:</i></p> <ul style="list-style-type: none"> <li>a. <i>“Software” specially designed or modified to integrate the conversion equipment with the “aircraft” system functions; and</i></li> <li>b. <i>“Software” specially designed or modified to operate the “aircraft” as an “unmanned aerial vehicle”.</i></li> </ul> <p><u>Technical Note</u>  <i>In Category Code 9D105, ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>
<b>9E</b>	<p><b>Technology</b></p> <p><u>Note</u>  <i>“Development” or “production” “technology” specified in Category Codes 9E001 to 9E003 for gas turbine engines remains within the description of that Category when used for repair or overhaul. Excluded from that Category are: technical data, drawings or documentation for maintenance activities directly associated with calibration, removal or replacement of damaged or unserviceable Line Replaceable Units (LRUs), including replacement of whole engines or engine modules.</i></p>
9E001	<p>“Technology” (according to the General Technology Note) for the “development” of equipment or “software”, specified in Category Code 9A001.b., 9A004 to 9A012, 9A350, Category 9B or 9D.</p>

<i>Category Code</i>	<i>Item Description</i>
9E002	<p>“Technology” (according to the General Technology Note) for the “production” of equipment specified in Category Code 9A001.b., 9A004 to 9A011, 9A350 or Category 9B.</p> <p><u>N.B.</u> For “technology” for the repair of structures, laminates or materials, see Category Code 1E002.f.</p>
9E003	<p>Other “technology” as follows:</p> <p>a. “Technology” “required” for the “development” or “production” of any of the following gas turbine engine components or systems:</p> <ol style="list-style-type: none"> <li>1. Gas turbine blades, vanes or “tip shrouds”, made from Directionally Solidified (DS) or Single Crystal (SC) alloys and having (in the 001 Miller Index Direction) a stress-rupture life exceeding 400 hours at 1,273 K (1,000°C) at a stress of 200 MPa, based on the average property values;</li> </ol> <p><u>Technical Note</u> For the purpose of Category Code 9E003.a.1., stress-rupture life testing is typically conducted on a test specimen.</p> <ol style="list-style-type: none"> <li>2. Combustors having any of the following characteristics: <ol style="list-style-type: none"> <li>a. ‘Thermally decoupled liners’ designed to operate at ‘combustor exit temperature’ exceeding 1,883 K (1,610°C);</li> <li>b. Non-metallic liners;</li> <li>c. Non-metallic shells; <u>or</u></li> <li>d. Liners designed to operate at ‘combustor exit temperature’ exceeding 1,883 K (1,610°C) and having holes that meet the parameters specified by Category Code 9E003.c.;</li> </ol> </li> </ol>



Category Code	Item Description
	<p><u>Note</u></p> <p>The “required” “technology” for holes in Category Code 9E003.a.2. is limited to the derivation of the geometry and location of the holes.</p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. ‘Thermally decoupled liners’ are liners that feature at least a support structure designed to carry mechanical loads and a combustion facing structure designed to protect the support structure from the heat of combustion. The combustion facing structure and support structure have independent thermal displacement (mechanical displacement due to thermal load) with respect to one another, i.e. they are thermally decoupled.</li> <li>2. ‘Combustor exit temperature’ is the bulk average gas path total (stagnation) temperature between the combustor exit plane and the leading edge of the turbine inlet guide vane (i.e. measured at engine station T40 as defined in SAE ARP 755A) when the engine is running in a ‘steady state mode’ of operation at the certificated maximum continuous operating temperature.</li> </ol> <p><u>Technical Note</u></p> <p>The term ‘steady state mode’ defines engine operation conditions, where the engine parameters, such as thrust/power, rpm and others, have no appreciable fluctuations, when the ambient air temperature and pressure at the engine inlet are constant.</p> <p><u>N.B.</u></p> <p>See Category Code 9E003.c. for “technology” “required” for manufacturing cooling holes.</p> <ol style="list-style-type: none"> <li>3. Components that are any of the following: <ol style="list-style-type: none"> <li>a. Manufactured from organic “composite” materials designed to operate above 588 K (315°C);</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>b. Manufactured from either of the following:</p> <ol style="list-style-type: none"> <li>1. Metal “matrix” “composites” reinforced by any of the following:           <ol style="list-style-type: none"> <li>a. Materials specified in Category Code 1C007;</li> <li>b. “Fibrous or filamentary materials” specified in Category Code 1C010; <u>or</u></li> <li>c. Aluminides specified in Category Code 1C002.a.; <u>or</u></li> </ol> </li> <li>2. Ceramic “matrix” “composites” specified in Category Code 1C007; <u>or</u></li> </ol> <p>c. Stators, vanes, blades, tip seals (shrouds), rotating blings, rotating blisks, or ‘splitter ducts’, that are all of the following:</p> <ol style="list-style-type: none"> <li>1. Not specified in Category Code 9E003.a.3.a.;</li> <li>2. Designed for compressors or fans; <u>and</u></li> <li>3. Manufactured from material specified in Category Code 1C010.e. with resins specified in Category Code 1C008;</li> </ol> <p><u>Technical Note</u>  <i>A ‘splitter duct’ performs the initial separation of the air-mass flow between the bypass and core sections of the engine.</i></p> <p>4. Uncooled turbine blades, vanes or “tip shrouds”, designed to operate at a ‘gas path temperature’ of 1,373 K (1,100°C) or more;</p> <p><u>Technical Note</u>  <i>‘Gas path temperature’ is the bulk average gas path total (stagnation) temperature at the leading edge plane of the turbine component when the engine is running in a ‘steady state mode’ of operation at the certificated or specified maximum continuous operating temperature.</i></p>

Category Code	Item Description
	<p data-bbox="692 454 874 488"><u>Technical Note</u></p> <p data-bbox="692 495 1267 696"><i>The term ‘steady state mode’ defines engine operation conditions, where the engine parameters, such as thrust/power, rpm and others, have no appreciable fluctuations, when the ambient air temperature and pressure at the engine inlet are constant.</i></p> <p data-bbox="544 712 1267 846">5. Cooled turbine blades, vanes, “tip shrouds” other than those described in Category Code 9E003.a.1., designed to operate at a ‘gas path temperature’ of 1,693 K (1,420°C) or more;</p> <p data-bbox="608 862 790 896"><u>Technical Note</u></p> <p data-bbox="608 902 1267 1104"><i>‘Gas path temperature’ is the bulk average gas path total (stagnation) temperature at the leading edge plane of the turbine component when the engine is running in a ‘steady state mode’ of operation at the certificated or specified maximum continuous operating temperature.</i></p> <p data-bbox="692 1120 874 1153"><u>Technical Note</u></p> <p data-bbox="692 1160 1267 1361"><i>The term ‘steady state mode’ defines engine operation conditions, where the engine parameters, such as thrust/power, rpm and others, have no appreciable fluctuations, when the ambient air temperature and pressure at the engine inlet are constant.</i></p> <p data-bbox="544 1377 1267 1444">6. Airfoil-to-disk blade combinations using solid state joining;</p> <p data-bbox="544 1460 1267 1561">7. Gas turbine engine components using “diffusion bonding” “technology” specified in Category Code 2E003.b.;</p> <p data-bbox="544 1576 1267 1680">8. ‘Damage tolerant’ gas turbine engine rotor components using powder metallurgy materials specified in Category Code 1C002.b.; <u>or</u></p> <p data-bbox="608 1695 790 1729"><u>Technical Note</u></p> <p data-bbox="608 1736 1267 1839"><i>‘Damage tolerant’ components are designed using methodology and substantiation to predict and limit crack growth.</i></p>

<i>Category Code</i>	<i>Item Description</i>
	<p>9. Not used;</p> <p>10. Not used;</p> <p>11. Hollow fan blades;</p> <p>b. “Technology” “required” for the “development” or “production” of either of the following:</p> <ol style="list-style-type: none"> <li>1. Wind tunnel aero-models equipped with non-intrusive sensors capable of transmitting data from the sensors to the data acquisition system; <u>or</u></li> <li>2. “Composite” propeller blades or propfans, capable of absorbing more than 2,000 kW at flight speeds exceeding Mach 0.55;</li> </ol> <p>c. “Technology” “required” for manufacturing cooling holes, in gas turbine engine components incorporating any of the “technologies” specified by Category Code 9E003.a.1., 9E003.a.2. or 9E003.a.5., and having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Having all of the following characteristics: <ol style="list-style-type: none"> <li>a. Minimum ‘cross-sectional area’ less than 0.45 mm<sup>2</sup>;</li> <li>b. ‘Hole shape ratio’ greater than 4.52; <u>and</u></li> <li>c. ‘Incidence angle’ equal to or less than 25°; <u>or</u></li> </ol> </li> <li>2. Having all of the following characteristics: <ol style="list-style-type: none"> <li>a. Minimum ‘cross-sectional area’ less than 0.12 mm<sup>2</sup>;</li> <li>b. ‘Hole shape ratio’ greater than 5.65; <u>and</u></li> <li>c. ‘Incidence angle’ more than 25°;</li> </ol> </li> </ol> <p><u>Note</u>  <i>Category Code 9E003.c. does not include “technology” for manufacturing constant radius cylindrical holes that are straight through and enter and exit on the external surfaces of the component.</i></p>

Category Code	Item Description
	<p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. For the purpose of Category Code 9E003.c., the 'cross-sectional area' is the area of the hole in the plane perpendicular to the hole axis.</li> <li>2. For the purpose of Category Code 9E003.c., 'hole shape ratio' is the nominal length of the axis of the hole divided by the square root of its minimum 'cross-sectional area'.</li> <li>3. For the purpose of Category Code 9E003.c., 'incidence angle' is the acute angle measured between the plane tangential to the aerofoil surface and the hole axis at the point where the hole axis enters the aerofoil surface.</li> <li>4. Techniques for manufacturing holes in Category Code 9E003.c. include "laser", water jet, Electro-Chemical Machining (ECM) or Electrical Discharge Machining (EDM) methods.</li> </ol> <p>d. "Technology" "required" for the "development" or "production" of helicopter power transfer systems or tilt rotor or tilt wing "aircraft" power transfer systems;</p> <p>e. "Technology" for the "development" or "production" of reciprocating diesel engine ground vehicle propulsion systems having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. 'Box volume' of 1.2 m<sup>3</sup> or less;</li> <li>2. An overall power output of more than 750 kW based on 80/1269/EEC, Ref. ISO 2534 or national equivalents; <u>and</u></li> <li>3. Power density of more than 700 kW/m<sup>3</sup> of 'box volume';</li> </ol> <p><u>Technical Note</u></p> <p>'Box volume' in Category Code 9E003.e. is the product of three perpendicular dimensions measured in the following way:</p> <p><u>Length:</u></p> <p>The length of the crankshaft from front flange to flywheel face;</p>

Category Code	Item Description
	<p><u>Width:</u> The widest of any of the following:</p> <ol style="list-style-type: none"> <li>a. The outside dimension from valve cover to valve cover;</li> <li>b. The dimensions of the outside edges of the cylinder heads; <u>or</u></li> <li>c. The diameter of the flywheel housing;</li> </ol> <p><u>Height:</u> The largest of either of the following:</p> <ol style="list-style-type: none"> <li>a. The dimension of the crankshaft centre-line to the top plane of the valve cover (or cylinder head) plus twice the stroke; <u>or</u></li> <li>b. The diameter of the flywheel housing.</li> </ol> <p>f. “Technology” “required” for the “production” of specially designed components for high output diesel engines, as follows:</p> <ol style="list-style-type: none"> <li>1. “Technology” “required” for the “production” of engine systems having all of the following components employing ceramics materials specified in Category Code 1C007: <ol style="list-style-type: none"> <li>a. Cylinder liners;</li> <li>b. Pistons;</li> <li>c. Cylinder heads; <u>and</u></li> <li>d. One or more other components (including exhaust ports, turbochargers, valve guides, valve assemblies or insulated fuel injectors);</li> </ol> </li> <li>2. “Technology” “required” for the “production” of turbocharger systems with single-stage compressors and having all of the following characteristics: <ol style="list-style-type: none"> <li>a. Operating at pressure ratios of 4:1 or higher;</li> <li>b. Mass flow in the range from 30 kg to 130 kg per minute; <u>and</u></li> <li>c. Variable flow area capability within the compressor or turbine sections;</li> </ol> </li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p>3. “Technology” “required” for the “production” of fuel injection systems with a specially designed multifuel (e.g. diesel or jet fuel) capability covering a viscosity range from diesel fuel (2.5 cSt at 310.8 K (37.8°C)) down to gasoline fuel (0.5 cSt at 310.8 K (37.8°C)) and having both of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. Injection amount in excess of 230 mm<sup>3</sup> per injection per cylinder; <u>and</u></li> <li>b. Electronic control features specially designed for switching governor characteristics automatically depending on fuel property to provide the same torque characteristics by using the appropriate sensors;</li> </ol> <p>g. “Technology” “required” for the “development” or “production” of ‘high output diesel engines’ for solid, gas phase or liquid film (or combinations thereof) cylinder wall lubrication and permitting operation to temperatures exceeding 723 K (450°C), measured on the cylinder wall at the top limit of travel of the top ring of the piston;</p> <p><i>Technical Note</i></p> <p><i>‘High output diesel engines’ are diesel engines with a specified brake mean effective pressure of 1.8 MPa or more at a speed of 2,300 rpm, provided the rated speed is 2,300 rpm or more.</i></p> <p>h. “Technology” for gas turbine engine “FADEC Systems” as follows:</p> <ol style="list-style-type: none"> <li>1. “Development” “technology” for deriving the functional requirements for the components necessary for the “FADEC System” to regulate engine thrust or shaft power (e.g. feedback sensor time constants and accuracies, fuel valve slew rate);</li> <li>2. “Development” or “production” “technology” for control and diagnostic components unique to the “FADEC System” and used to regulate engine thrust or shaft power;</li> </ol>

<i>Category Code</i>	<i>Item Description</i>
	<p data-bbox="544 454 1268 584">3. “Development” “technology” for the control law algorithms, including “source code”, unique to the “FADEC System” and used to regulate engine thrust or shaft power;</p> <p data-bbox="544 607 608 633"><u>Note</u></p> <p data-bbox="544 645 1268 913"><i>Category Code 9E003.h. does not include technical data related to engine “aircraft” integration required by the relevant civil aviation certification authorities of a “participating state” to be published for general airline use (e.g. installation manuals, operating instructions, instructions for continued airworthiness) or interface functions (e.g. input/output processing, airframe thrust or shaft power demand).</i></p> <p data-bbox="480 936 1268 1025">i. “Technology” for adjustable flow path systems designed to maintain engine stability for gas generator turbines, fan or power turbines, or propelling nozzles, as follows:</p> <ol data-bbox="544 1048 1268 1413" style="list-style-type: none"> <li data-bbox="544 1048 1268 1144">1. “Development” “technology” for deriving the functional requirements for the components that maintain engine stability;</li> <li data-bbox="544 1167 1268 1263">2. “Development” or “production” “technology” for components unique to the adjustable flow path system and that maintain engine stability;</li> <li data-bbox="544 1285 1268 1413">3. “Development” “technology” for the control law algorithms, including “source code”, unique to the adjustable flow path system and that maintain engine stability;</li> </ol> <p data-bbox="544 1435 608 1462"><u>Note</u></p> <p data-bbox="544 1473 1268 1541"><i>Category Code 9E003.i. does not include “technology” for any of the following:</i></p> <ol data-bbox="544 1563 1268 1787" style="list-style-type: none"> <li data-bbox="544 1563 815 1590"><i>a. Inlet guide vanes;</i></li> <li data-bbox="544 1608 991 1635"><i>b. Variable pitch fans or propfans;</i></li> <li data-bbox="544 1653 943 1680"><i>c. Variable compressor vanes;</i></li> <li data-bbox="544 1697 951 1724"><i>d. Compressor bleed valves; <u>or</u></i></li> <li data-bbox="544 1742 1190 1769"><i>e. Adjustable flow path geometry for reverse thrust.</i></li> </ol>



<i>Category Code</i>	<i>Item Description</i>
	<p>j. “Technology” “required” for the “development” of wing-folding systems designed for fixed-wing “aircraft” powered by gas turbine engines.</p> <p><u>N.B.</u> For “technology” “required” for the “development” of wing-folding systems designed for fixed-wing “aircraft”, see also Division 2 of Part 1 of this Schedule.</p>
9E101	<p>a. “Technology” (according to the General Technology Note) for the “development” of goods specified in Category Code 9A101, 9A102, 9A104 to 9A111, 9A112.a. or 9A115 to 9A121.</p> <p>b. “Technology” (according to the General Technology Note) for the “production” of ‘UAVs’ specified in Category Code 9A012 or goods specified in Category Code 9A101, 9A102, 9A104 to 9A111, 9A112.a. or 9A115 to 9A121.</p> <p><u>Technical Note</u> In Category Code 9E101.b., ‘UAV’ means unmanned aerial vehicle systems capable of a range exceeding 300 km.</p>
9E102	<p>“Technology” (according to the General Technology Note) for the “use” of space launch vehicles specified in Category Code 9A004, goods specified in Category Codes 9A005 to 9A011, ‘UAVs’ specified in Category Code 9A012 or goods specified in Category Code 9A101, 9A102, 9A104 to 9A111, 9A112.a., 9A115 to 9A121, 9B105, 9B106, 9B115, 9B116, 9B117, 9D101 or 9D103.</p> <p><u>Technical Note</u> In Category Code 9E102, ‘UAV’ means unmanned aerial vehicle systems capable of a range exceeding 300 km.</p>

Made on 3 September 2018.

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*Singapore.*

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