II.

DRAFT

IMPLEMENTING DECREE

of … **2016**

on dual-use items in the nuclear area

The State Office for Nuclear Safety sets, according to § 236 of Act No..../...., the Atomic Act, to implement § 18(5), § 24(7), § 25(2)(d), § 166(6)(d), § 170(4) and § 171(5):

§ 1

List of dual-use items in the nuclear area

The list of dual-use items in the nuclear area is set by Annex 1 to this implementing decree.

§ 2

Requirements regarding the content of documents for the activities being approved, which is the export and import of nuclear items that are items of dual use in the nuclear area

The declaration of an end-user or a receiving country in the case of export of a dual-use item in the nuclear area needs to contain:

a) a statement that the dual-use item in the nuclear area will not be used for the purposes included in Article 4(1) of Council Regulation (EC) No 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items or for military end-use in the countries subject to Article 4(2) of the Regulation; and
b) the specification of the use and place of end-use of a dual-use item in the nuclear area, which must be in compliance with the data stated in the application for authorisation.

§ 3

End-user declaration template

The template for the end-user declaration of a dual-use item in the nuclear area when imported is set out in Annex 2 to this implementing decree.

§ 4

Scope and storage of recorded data about dual-use items in the nuclear area and the deadlines for their submission to the Office

(1) In the case of the export or import of dual-use items in the nuclear area, the data need to be recorded in the following scope:

a) the quantity, name and specification of a dual-use item in the nuclear area, in compliance with this implementing decree;

b) the name and address of the registered office of the supplier and the end-user of a dual-use item in the nuclear area, if these are legal entities, or their name or names and surname and permanent address, if these are natural persons;
c) the draft contract and other business documents that are related to the export or import of a dual-use item in the nuclear area;
d) the date of the executed import or export of a dual-use item in the nuclear area;
e) the date when the imported or exported dual-use item in the nuclear area entered or left the Czech Republic;
f) in the case of the import or export of a dual-use item in the nuclear area, information about when the item was handed over to the end-user; and
g) written confirmation from the end-user about the receipt of a dual-use item in the nuclear area.

(2) The holder of the authorisation for export or import of a dual-use item in the nuclear area must provide the Office with the data recorded according to (1)(a) to (f)

a) within five working days after the export or import is completed; and
b) according to (g) within 30 working days after a dual-use item in the nuclear area was handed over to the end-user.

§ 5

Requirements for a declaration concerning the end-use of a dual-use item in the nuclear area

The declaration concerning the end-use of a dual-use item in the nuclear area, if subject to transfer, needs to include
a) the quantity, name and specification of a dual-use item in the nuclear area in compliance with this implementing decree;
b) information about the type of end-use;
c) the date of the transfer;
d) data about the notifier, i.e.
    1. the name, or names, and surname if it is a natural person; or
    2. the name if it is a legal entity;
e) the address of the registered office or of the permanent residence of the end-user;
f) the commitment of the end-user
    1. not to use a dual-use item in the nuclear area or its part for any purpose that would be in contradiction with the Nuclear Non-Proliferation Treaty;
    2. to ensure that a dual-use item in the nuclear area or its part is not abused for military purposes; and
    3. to ensure that the further transfer of a dual-use item in the nuclear area or its part in the Czech Republic is announced to the office; and
g) the expected date when the information about the executed transfer of a dual-use item in the nuclear area is announced to the Office, following within the period of 30 working days after the transfer is executed.

§ 6

Notification

This implementing decree was notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for

the provision of information in the field of technical regulations and of rules on Information Society services.

Chair:

Annex 1 to Implementing Decree No. ...../..... .

THE LIST OF DEVICES, MATERIALS, SOFTWARE AND RELATED TECHNOLOGIES OF DUAL USE IN THE NUCLEAR AREA THAT ARE SUBJECT TO MONITORING REGIMES UPON IMPORT, EXPORT AND TRANSFER

1. INDUSTRIAL DEVICES

1.A. Devices, sets and components

1.A.1. Radiation shielding windows of high specific weight

Radiation shielding windows of high specific weight (lead glass or similar) that have all the following characteristics, and frames designed for them:

a) of the area on the cold side (shielding side of a window exposed to the lowest radiation according to the project proposal) larger than 0.09 m^2;
b) with a specific weight greater than 3 $g/cm^{3;}$ and
c) with a thickness of at least 100 mm.

1.A.2. Radiation-resistant TV cameras or their lenses

Radiation-resistant TV cameras or their lenses specially constructed or approved and radiation-resistant, capable of resisting an accumulated amount of radiation greater than 5 x 10^4 Gy (silicon) without quality degradation during operation.
Gy unit (silicon) is energy in joules per kilogram absorbed by an unshielded silicon sample exposed to ionising radiation.

1.A.3. Robots, terminal controllers and control units

1.A.3.a. Robots and terminal controllers that have some of the following qualities:

1.A.3.a.1 are specially constructed to comply with the national (state) standard for the handling of highly explosive materials; or

1.A.3.a.2 are specially constructed or calculated as radiation-resistant to resist an accumulated amount of radiation greater than 5 x 104 Gy (silicone) and were not subject to operating degradation.

Gy unit (silicon) is energy in joules per kilogram absorbed by an unshielded silicon sample exposed to ionising radiation.

1.A.3.b. Control units specially constructed for any robot or terminal controller included in Unit 1.A.3.a.

Item 1.A.3 does not include robots specially constructed for non-nuclear industrial reactions, e.g. car spray boxes.

A robot is a manipulation mechanism that can move along a linear track or from one point to another point, it can use sensors and has all the following features:
a) is multipurpose;
b) is able, by means of different movements in three dimensions, to place or position materials, parts, tools or special devices;

c) contains three or more servo-control systems of with closed and open regulation circuits, or with stepper motors; and
d) has user-accessible programmability by means of a learning/teaching method or repetition or by means of an electronic computer that can be controlled by programmable logic without mechanical interventions.

Sensors are detectors of physical phenomena the output of which (after being converted into a signal can be interpreted by a controller) is able to generate programmes or modify programmed instructions or numerical programme data. They can be sensors with machine vision, infrared imaging, acoustic imaging, touch, inertial location sensors, optical and acoustic distance or torque gauges.

User-accessible programmability is a feature that enables a user to enter, edit or replace programs by means others than a physical change of cables or mutual interconnection or by means of control functions, including input parameters.

In the meaning of Item 1.A.3, robots are not
a) manipulation mechanisms that are only controllable manually or remotely;
b) manipulation mechanisms with a fixed sequence that are automated moving devices performing mechanically programmed motions. The programme is mechanically limited by fixed stops, such as pins or cams. The sequence of motions, the choice of trajectories or angles are not variable and mechanically, electronically or electrically changeable;
c) mechanically controlled manipulation mechanisms with a variable sequence that are automated moving devices, operating according to mechanically fixed programmed motions. The programme is mechanically limited by fixed, but adjustable, stops, such as pins or cams. The sequence of motions and the selection of trajectories or angles is variable within a fixed programme model. Changes or modifications of a programme model (e.g. the change of pins or the replacement of the cams) in one or more axes of motion can be done only by means of mechanical operations;
d) manipulation mechanisms with a changeable sequence without control servo-motors that are automated moving devices, operating according to mechanically fixed programmed motions. The programme can be changed, but a certain sequence is executed only on the basis of a binary signal from a mechanically fixed electric binary device or adjustable stops; and
e) lifting cranes, which are handling systems in Cartesian coordinates manufactured as an integral part of a vertical array of storage bins and constructed to make access to the content of those bins more accessible when put in or taken out.
Terminal controllers can be jaws, active tool units and any other tools that are attached to the base plate at the end of a robot manipulator arm.
Active toll units are devices using motion power, process energy or can sense a workpiece.

1.A.4. Remotely controlled manipulators
Remotely controlled manipulators that can be used for operations of radiochemical separation or in hot chambers that have some of the following features:

1.A.4.a. manipulators capable of permeating a hot cell wall (through-the-wall operations) with a thickness of 0.6 m or more; or

1.A.4.b. manipulators capable of bridging the top of a hot cell wall with a thickness of 0.6 m or more(through-the-wall operations).

1.B. Testing and production equipment

1.B.1. Moulding machines with continuous moulding, moulding machines capable of continuous moulding of hollow cylinders and mandrels.

1.B.1.a. Moulding machines with the following features:

1) three or more cylinders (active or guiding); and

2) that, according to the specification of a producer, can be equipped with numerical control units or a computer control.

1.B.1.b. Rotating moulding machines designed for fluid moulding of cylinders with an inner diameter between 75 mm and 400 mm.

Item 1.B.1.a includes machines that have one cylinder intended for metal deformation and two auxiliary cylinders that support a mandrel, but that do not play a role in the process of deformation.

1.B.2. Machine tools

Machine tools or combinations thereof for the following purposes: machining and cutting of metals, ceramic or composite materials that, according to the manufacturer's specifications, can be equipped with electronic devices for controlled machining (copying) simultaneously in two or more axes.

Item 1.B.2 is not related to rod automatic lathes (Swissturn), limited to machining of only bar material fed by a spindle, if the maximum machined bar diameter is equal to or less than 42 mm, without the possibility of mounting into chucks. Machines can also drill or mill machining parts with diameters smaller than 42 mm.

1.B.2.a. Lathes that have an accuracy of setting with all compensations available of better (less) than 6 μm in accordance with the international standard ISO 230/2 (1988) Tests of Machine Tools Guidelines (hereinafter "ISO 230/2 (1988)") along any linear axis (overall positioning) for machines capable of machining diameters greater than 35 mm.

1.B.2.b. Machine tools for milling that have some of the following qualities:

1.B.2.b.1. the accuracy of setting with all compensations available is better (less) than 6 μm in accordance with ISO 230/2 (1988) along any linear axis (overall positioning),

1.B.2.b.2. two or more controlled (copying) rotary axes; or

1.B.2.b.3. five or more axes that can be coordinated simultaneously for controlled machining (copying).

Item 1.B.2.b does not include milling machines whose axes move more than 2 m and whose total accuracy of the setting on the axes x is worse (more) than 30 μm in accordance with ISO 230/2 (1988).

1.B.2.c Machine tools for grinding that have some of the following qualities:

1.B.2.c.1. the accuracy of setting with all compensations available is better (less) than 4 μm in accordance with ISO 230/2 (1988) along any linear axis (overall positioning);

1.B.2.c.2. two or more controlled (copying) rotary axes; or

1.B.2.c.3. five or more axes that can be coordinated simultaneously for controlled machining (copying).

Item 1.B.2.c does not include cylindrical external, internal, or external-internal grinding machines for which the machined part may have an outer diameter or a maximum length of 150 mm and the axes are limited to x, z, and jig grinders that do not have a z axis or a w

axis with an overall accuracy better (less) than 4 microns (0.004 mm). The accuracy of the setting is in accordance with ISO 230/2 (1988).

1.B.2.d. Electrical Discharge Machines that have two or more degrees of freedom/looseness that can be coordinated simultaneously for controlled machining (copying). Instead of individual test protocols, the mentioned levels of setting accuracy can be used, which are determined by the following procedures from measurements according to ISO 230/2 (1988) or the national equivalent for each machine tool model if they are set or accepted by national authorities. The mentioned accuracy of the setting is determined in the following way:

a) the selection of five machines of the model that will be assessed;
b) measurement of the accuracy of the linear axes according to ISO 230/2 (1988);
c) the determination of the value of the accuracy (A) for each axis of each machine according to ISO 230/2 (1988);
d) determining an average accuracy value for each axis. This average value becomes the mentioned accuracy of the setting for each axis of the model (Ax, Ay, etc.);
e) since Item 1.B.2 refers to each linear axis, there will be as many mentioned accuracy values for the setting as there are linear axes;
f) if any axis of a machine tool that does not belong under Items 1.B.2.a, 1.B.2.b or 1.B.2.c has the stated accuracy of setting of 6 μm or better (less) in grinding machines and 8 μm or better (less) for milling machines and lathes, both in accordance with ISO 230/2 (1988).

Item 1.B.2 does not apply to special machine tools limited to the production of gear mechanisms, crankshaft and camshaft, blade and miller or worm extruding machines.

The naming of the axes is in accordance with international standard ISO 841 Systems of Industrial Automation and Integration – Digital Control of Machines – Coordinate System and Motion Terminology (hereinafter referred to as "ISO 841").

Axes that are secondary parallel rotation axes are not counted in the total number of the controlled (copying) axes (e.g. the w axis in horizontal carousels or a secondary rotation axis the centre line of which is parallel with a primary rotation axis).
The rotation axes do not have to rotate by 360°. The rotation axis can be driven by a linear drive, e.g. by a screw or by a ridge gear.

For the purpose of Item 1.B.2, the number of axes that can be coordinated for controlled machining simultaneously is the number of axes along which or around which simultaneous and subsequent movements between a workpiece and a tool are performed when a workpiece is being machined. This does not include any other axes along which or around which other relative movements within the machine are performed, e.g. systems of abrasive discs in grinding machines, parallel rotation axes designed for fitting the workpieces themselves, or co-linear axes designed for manipulation with the same workpiece in such a way that it is held at the opposite ends in a fastening/clamping device.

Machine tools that have at least two out of the three machining, milling or grinding abilities (e.g. a machine tool that is able to mill) needs to be assessed according to each of the respective Items I .B.2.a, I .B.2.b and I .B.2.c. Items 1.B.2.b.3 and 1.B.2.c.3 include machines on the basis of parallel linear kinematic design (e.g. hexapod) that have for or more axes out of which none is a rotation axis.

1.B.3. Machines, devices or dimensional inspection systems

1.B.3.a. Computer-controlled or numerically controlled dimensional inspection machines that have one of the following characteristics:

1.B.3.a.1. have only two axes and the maximum permissible error (MPE) in length measurements along any axis (one dimensional), defined as any combination E0x MPE, E0y MPE or MPE E0z equal to or less (better) than (1.25 + L / 1 000) μm (where L is the measured length in mm) at any point within the range of the machine (in the length of the axis), according to ISO 10360-2 (2009) Geometrical Product Specifications (hereinafter referred to as "ISO 10360-2"); or

1.B.3.a.2. have three or more axes and the maximum permissible dimensional (volumetric) error of length measurement (value E0, MPE is equal to or less than 1.7 + L / 800) μm (where L is the measured length in mm) at any point within the measuring range of the machine (in the length of the axis), according to ISO 10360-2.

The value of E0, MPE of the most accurate configuration of the CMM specified by the manufacturer in accordance with ISO 10360-2 (for example, the most accurate of the following: probe, needle length, motion parameters, environment) and with all compensations available must be compared with the threshold value of 1.7 + L / 800 μm.

1.B.3.b. The following instruments for displacement/feed measurement:

1.B.3.b.1. contactless measuring systems with a resolution equal to or better (less) than 0.2 μm within a measuring range up to 0.2 mm;

1.B.3.b.2. systems with a linear variable differential transformer (LVDT), which have the following characteristics:

a) linearity equal to or less (better) than 0.1 % of the measured values from 0 to the full measuring range, the LVDT within a measuring range up to 5 mm or linearity equal to or less (better) than 0.1 % of values measured from 0-5 mm for LDVT with a measuring range of more than 5 mm; and

b) the variation (deviation - drift) is equal to or better (less) than 0.1 % per day at a standard ambient temperature ± 1 K;

1.B.3.b.3. measuring systems that have the following characteristics:

a) contain a laser; and

b) at least 12 hours at a temperature range of ± 1 K they maintain standard temperature and standard pressure:

1) resolution over the entire measuring range of 0.1 μm or better; and

2) accuracy of the measurement equal to or better (less) than (0.2 + L / 2 000) μm, where L is the measured length in millimetres.

Item 1.B.3.b.3 does not include measuring interferometer systems without a closed or open loop with feedback, containing a laser to measure slide movement errors of machine tools, tools for measuring dimensions or similar devices.

Under 1.B.3.b, linear displacement denotes the change of the distance between the measuring sensor and the measured object.

1.B.3.c. Angular measuring instruments having an angular position deviation equal to or better (less) than 0.00025°.

Item 1.B.3.c does not apply to optical instruments, such as autocollimators, using collimated light to detect the angular displacement of a mirror (e.g. laser).

1.B.3.d. Systems for simultaneous linear-angular inspection of hemispheres, having the following characteristics:

1) measurement accuracy along any linear axis equal to or better (less) than 3.5 μm per 5 mm; and

2) angular position deviation is equal to or less than 0.02°.

Item 1.B.3 includes machine tools that can be used as measuring tools if they meet or exceed the criteria specified for the measuring machine function. Machines in Item 1.B.3 are subject to inspection if they exceed the control limits in any interval within their operating range.

All parameters of the measured values in Item 1.B.3 are plus/minus values, not the total range.

1.B.4. Induction furnaces (vacuum or inert gas) with controlled atmosphere and their current supplies

1.B.4.a. Induction furnaces with the following features:

1.B.4.a.1 are capable of operation at temperatures over 1 123 K (850 °C);

1.B.4.a.2 have induction coils of a diameter of 600 mm or less; and

1.B.4.a.3 are designed for power inputs of 5 kW and higher.

Item 1.B.4.a. does not include furnaces designed for the processing of semiconductor wafers.

1.B.4.b. Current supplies with a rated power of 5 kW or more, specially designed for induction furnaces specified in Item 1.B.4.a.

1.B.5. Isostatic presses and related devices

1.B.5.a. Isostatic presses with the following features:

1) are capable of a maximum working pressure of 69 MPa or greater;

2) have a chamber with an inside diameter exceeding 152 mm.

1.B.5.b. Press tools and moulds specially designed for isostatic presses specified in Item 1.B.5.a.

Under 1.B.5, isostatic presses are devices that are able to create pressure in closed spaces through various media (gas, liquid, solid particles, etc.) so that the workpiece or material is subject to equal pressure in all directions.
Under 1.B.5, the internal dimensions of a chamber refer to a space in which the operating temperature and pressure are achieved simultaneously, without the inclusion of fixtures. This dimension is the smaller dimension out of the inner diameter of the pressure chamber or the interior diameter of the insulated furnace chamber, depending on which of the two chambers is located inside the other.

1.B.6. Vibration test systems, equipment and components

1.B.6.a. Electrodynamic vibration test systems that have the following characteristics:

1) use feedback or a closed regulation circuit and incorporate a digital controller;

2) are capable of vibrations between 20 MHz and 2 000 Hz at effective acceleration of 10 g or more; and

3) are capable of transmitting forces of at least 50 kN, measured on a bare table.

1.B.6.b. Digital controllers, combined with specially developed software for vibration testing, with a frequency bandwidth in real time greater than 5 kHz, which are designed for use in the systems specified in Item 1.B.6.a.

1.B.6.c. Vibration shaker units with or without associated amplifiers, capable of transmitting forces of at least 50 kN, measured on a bare table, which are usable in the systems specified in Item 1.B.6.a.

1.B.6.d. Load-bearing structures for the tested pieces, and electronic units designed to combine multiple shaker units into a complete shaker system capable of providing an effective combined force of at least 50 kN, which are usable in the systems specified in Item 1.B.6.a.

Under 1.B.6, a bare table means a flat table or surface with no fixtures or fittings.

1.B.7. Vacuum or other melting and casting furnaces with a controlled atmosphere and related equipment

1.B.7.a. Arc melting and casting furnaces with the following characteristics:

1) a volume of melt electrodes between 1 000 cm3 and 20 000 cm3; and

2) the ability to operate at melting temperatures above 1 973 K (1 700 °C).

1.B.7.b. Melting furnaces with an electron beam or plasma furnaces that have the following characteristics:

1) input power of 50 kW or greater; and

2) the ability to operate at melting temperatures above 1 473 K (1 700 °C).

1.B.7.c Computer control and monitoring systems specially configured for furnaces specified in Items 1.B.7.a or 1.B.7.b.

1.C. Materials

None.

1.D. Software

1.D.1. Software specially designed or modified for the use of devices specified in Items 1.A.3, 1.B.1, 1.B.3, 1.B.5, 1.B.6.a, 1. B.6.b, 1.B.6.d or 1.B.7.

Software specially designed or modified for systems specified in Item 1.B.3.d includes software for simultaneous measurements of wall thickness and outline.

1.D.2. Software specially designed or modified for the development, production or use of equipment specified in Item 1.B.2.

Item 1.D.2 does not apply to software intended for the programming of parts that generates codes of numerical control commands but does not allow direct use of the device for the machining of different parts.

1.D.3. Software for any combination of electronic devices or systems that enables these devices to function as a numerical control unit for machine tools capable of controlling five or more controlled (copy) axes that can be coordinated simultaneously for controlled machining (copying).

Software is a controlled item regardless of whether it is exported separately or whether it is inside a numerical control unit or any other electronic device or system.

Item 1.D.3 does not apply to software specially designed or modified by the manufacturer of a control unit or machine tool to operate a machine tool that is not included under 1.B.2.

1.E. Technology

1.E.1. Technology that is connected with the management of manufacturing processes for the development, production or use of equipment, materials or software specified in Items 1.A to 1.D.

2. MATERIALS

2.A. Devices, sets and components

2.A.1. Crucibles made of materials resistant to melted metal actinides

2.A.1.a. Crucibles with the following features:

1) volume between 150 cm3 (150 ml) and 8 000 cm3 (8 litres); and

2) are made of materials listed below, or mixtures thereof, or coated with them, with a total impurity content of 2 % or less by weight:

a) calcium fluoride (CaF2);

b) calcium zirconate (CrO 3);

c) cerium sulfide (Ce2S3);

d) erbium oxide (Er2O3);

e) hafnium oxide (HfO2);

f) magnesium oxide (MgO);

g) nitrided alloy of niobium, titanium and tungsten (about 50 %, 30 % Ti, 20 % W);

h) yttrium oxide (Y2O3); or

i) zirconium dioxide (ZrO2).

2.A.1.b. Crucibles with the following features:

1) a volume between 50 cm3 (50 ml) and 2 000 cm3 (2 litres); and

2) made of tantalum with a purity of 99.9 per cent by weight or greater or are lined with it.

2.A.1.c. Crucibles with the following features:

1) a volume between 50 cm3 (50 ml) and 2 000 cm3 (2 litres); and

2) made of tantalum with a purity of 98 per cent by weight or greater or are lined with it; and

3) are coated with carbide, nitride or tantalum bromide or any combination of these compounds.

2.A.2. Platinum catalysts

Platinum catalysts specially designed or modified for isotope exchange reaction between hydrogen and water for the recovery of tritium from heavy water or for the production of heavy water.

2.A.3. Composite structures in the form of tubes

Composite structures in the form of tubes with the following characteristics:

a) an internal diameter between 75 mm and 400 mm; and

b) they are made of any fibrous or filamentary materials specified in Item 2.C.7.a or carbon pre-impregnated materials specified in Item 2.C.7.c.

2.B. Testing and production equipment

2.B.1. Facilities, plants and technical equipment for the production of tritium

2.B.1.a. Facilities or plants for the production, regeneration (recovery), extraction, concentration or handling of tritium,

2.B.1.b. Technical equipment at the plants or facilities, namely

2.B.1.b.1. hydrogen or helium refrigeration units capable of cooling to a temperature of 23 K (-250 °C) or lower, with a heat-removal capacity of greater than 150 W;

2.B.1.b.2. systems of storage and purification of hydrogen isotopes that are used as a storage or cleaning medium for metal hydrides.

2.B.2. Facilities, plants and systems and technical equipment for the separation of lithium isotopes

2.B.2.a. Facilities or plants for the separation of lithium isotopes;

2.B.2.b. The following technologies and technical equipment for the separation of lithium isotopes, on the basis of the process of lithium-mercury amalgams:

2.B.2.b.1. packed columns for liquid-liquid exchange specially designed for lithium amalgams;

2.B.2.b.2. pumps for mercury or lithium amalgams;

2.B.2.b.3. lithium amalgam electrolysis cells;

2.B.2.b.4. evaporators for concentrated lithium hydroxide solutions;

2.B.2.c. ion exchange systems specially designed for the separation of isotopes of lithium and components specially designed for them;

2.B.2.d. chemical exchange systems (using crown ethers, cryptands and lariat ethers) specially designed for the separation of isotopes of lithium and components specially designed for them.

2.C. Materials

2.C.1. Aluminium

Aluminium alloys with the following characteristics:

a) the lowest tensile strength of 460 MPa at 293 K (20 °C); and

b) are in the form of tubes or solid cylinders (including forgings) with an outside diameter exceeding 75 mm.

The requirement for tensile strength under 2.c.1 refers to the aluminium alloys both before and after heat treatment.

2.C.2. Beryllium

Beryllium metal, alloys containing more than 50 weight per cent of beryllium, beryllium compounds and products from them, their waste or remains.

Item 2.C.2 does not include metal windows for X-ray machines and measuring equipment for wells, oxidised products or semi-finished products specially designed for electronic component parts or as substrates for electronic circuits and beryl (silicate of beryllium and aluminium) in the form of emeralds or aquamarines.

2.C.3. Bismuth

Bismuth with the following characteristics:

a) high purity (99.99 per cent by weight or greater); and

b) silver content of less than 10 weight ppm.

2.C.4. Boron
Boron-enriched isotope B-10 in a proportion greater than occurs in nature, such as elemental boron, boron compounds, mixtures and materials containing boron, products made of it, their waste or remains.

Under 2.C.4, mixtures containing boron also include boron-loaded materials. The proportion of boron isotopes occurring in nature is about 18.5 weight per cent of the isotope B-10 (20 atomic per cent).

2.C.5. Calcium
Calcium with the following characteristics:
a) contains less than 1 000 weight parts per million of metallic impurities other than magnesium; and
b) contains less than 10 weight parts per million of boron.

2.C.6. Chlorine trifluoride (ClF_3)

2.C.7. Fibrous or filamentary materials, and pre-impregnated materials
2.C.7.a. Carbon or aramid fibrous or filamentary materials, having the following characteristics:
2.C.7.a.1. specific modulus of at least 12.7×10^6 m; or
2.C.7.a.2. specific tensile strength of 23.5×10^4 m or greater.

Item 2.C.7.a does not include aramid fibrous or filamentary materials with a content by weight of ester modifier bound to fibre surface of less than 0.25 %.

2.C.7.b. Glass fibrous or filamentary materials with the following characteristics:
1) specific modulus of at least 3.18×10^6 m; or
2) specific tensile strength of 7.62×10^4 m or greater.
2.C.7.c. Continuous filament yarn, roving, wires or tapes impregnated with thermosetting resin, of a width of 15 mm or less (pre-impregnated laminates), made from carbon or glass fibrous or filamentary materials as specified in Items 2.C.7.a or 2.C.7.b.

The matrix of the composite is formed by resin.
Under 2.C.7, a specific modulus is Young's modulus in N/m^2 divided by specific weight in N/m3, measured at a temperature of 296 ± 2 K (23 ± 2 °C) and relative humidity of 50 ± 5 %.
Under 2.C.7, specific tensile strength is the ultimate tensile strength in N/m^2 divided by the specific weight in N/m3, measured at a temperature of 296 ± 2 K (23 ± 2 °C) and relative humidity of 50 ± 5 %.

2.C.8. Hafnium
Hafnium metal, alloys and compounds of hafnium and their products that contain more than 60 weight per cent hafnium, manufactures thereof, waste or scrap.

2.C.9. Lithium
Lithium enriched in the lithium-6 (6 Li) isotope to greater than its natural isotopic abundance (the content of isotope 6 Li in natural lithium is approximately 6.5 weight

per cent (7.5 atomic per cent)), 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.
Item 2.C.9 includes thermoluminescent dosimeters.

2.C.10. Magnesium
Magnesium with the following characteristics:
a) contains less than 200 weight parts per million of metallic impurities other than calcium; and
b) contains less than 10 weight parts per million of boron.

2.C.11. Martensitic steel
Martensitic steel with a tensile strength of at least 1 950 MPa at a temperature of 293 K (20 °C).

Item 2.C.11 includes shapes in which no linear dimension is greater than 75 mm.
Item 2.C.11 refers to martensitic steel both before or after heat treatment.

2.C.12. Radium (^{226}Ra)
Radium (^{226}Ra), alloys of ^{226}Ra, compounds of ^{226}Ra, compounds containing ^{226}Ra, products made from them and instruments containing these materials.

Item 2.C.12 does not include products or instruments containing less than 0.37 GBq of ^{226}Ra and medical applicators.

2.C.13. Titan
Titan alloys with the following characteristics:
a) a tensile strength at 293 K (20 °C) of 900 MPa or more; and
b) are in the form of tubes or solid cylinders (including forgings) with an outside diameter exceeding 75 mm.
Item 2.C.13 refers to titan alloys both before or after heat treatment.

2.C.14. Tungsten
Tungsten, tungsten carbide, and alloys containing more than 90 % tungsten by weight, with the following characteristics:
a) a hollow cylindrical symmetry (including cylinder segments) with an inside diameter of 100-300 mm; and
b) a weight greater than 20 kg.
Item 2.C.14 does not include a section specially designed for use as weights or collimators of γ radiation.

2.C.15. Zircon
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 and products of these materials, waste or scrap.
Item 2.C.15 does not comprise zirconium in the form of foil having a thickness of up to 0.10 mm.

2.C.16. Nickel powder and porous nickel metal
2.C.16.a. Nickel powder with the following characteristics:

1) a purity of 99.0 weight per cent of nickel or greater; and
2) an average particle size of less than 10 μm as measured by ASTM B330.

2.C.16.b. Porous nickel metal produced from materials specified in Item 2.C.16.a.

Item 2.C.16 fibre excludes nickel powders, single porous nickel metal sheets with an area of 1 000 cm^2 or less and nickel powder that is specially prepared for the production of filters of gaseous diffusion barriers used in the process of gaseous diffusion enrichment. This means compounds and powders containing nickel or alloys with a nickel content of at least 60 %, specially adapted for the manufacture of filters of gaseous diffusion barriers, which are selected items in the nuclear field.

Item 2.C.16.b refers to porous metal formed by compacting and sintering the materials in 2.C.16.a to form a metal material with fine pores interconnected throughout the structure.

2.C.17. Tritium

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 these materials.

Item 2.C.17 does not include products containing less than 1.48×10^3 GBq of tritium.

2.C.18. Helium (^{3}He)

Helium-3 (^{3}He), mixtures containing helium-3 and products or devices containing any of these materials.

Item 2.C.18 does not include products containing less than 1 g of He-3.

2.C.19. Radionuclides suitable for making neutron sources based on alpha-n reaction:

^{225}Actinium	^{244}Curium	^{209}Polonium
^{227}Actinium	^{253}Einsteinium	^{210}Polonium
^{253}Californium	^{254}Einsteinium	^{223}Radium
^{240}Curium	^{148}Gadolinium	^{227}Thorium
^{241}Curium	^{236}Plutonium	^{228}Thorium
^{242}Curium	^{238}Plutonium	^{230}Uranium
^{243}Curium	^{208}Polonium	^{232}Uranium

In the following forms:

a) elemental;
b) compounds with a total alpha activity of 37 GBq/kg or greater;
c) mixtures with a total alpha activity of 37 GBq/kg or greater;
d) products or devices containing any of these materials.

Item 2.C.19 does not include products or devices containing less than 3.7 GBq activity.

2.C.20. Rhenium

Rhenium and alloys with a content of 90 % rhenium by weight or more and alloys of rhenium and tungsten with a content of 90 % by weight and any mixtures of rhenium and tungsten that meet the following characteristics:

a) take the form of a hollow with cylindrical symmetry (including cylinder segments) with an inside diameter of 100-300 mm; and
b) are have a weight of more than 20 kg.

2.D. Software
None.

2.E. Technology
2.E.1. Technology that is connected with the management of manufacturing processes for the development, production or use of equipment, materials or software specified in Items 2.A to 2.D.

3. EQUIPMENT AND COMPONENTS FOR URANIUM ISOTOPE SEPARATION (other than selected items in the nuclear field)

3.A. Devices, sets and components

3.A.1. Frequency converters or generators
Frequency converters or generators can be used as motor drives with variable or fixed frequency with the following characteristics:
a) multiphase output power of 40 VA or higher;
b) operate in the frequency range of 600 Hz or higher and
c) have frequency control that is less than 0.2 %.
Frequency converters in Item 3.A.1 are also known as changers or inverters.
The characteristics in Item 3.A.1 can be met by the following devices:
a) generators;
b) electronic test equipment;
c) AC power supplies;
d) drives with a variable motor revolutions;
e) variable speed drives (VSD);
f) with variable frequency drives (VFD);
g) adjustable frequency drives; or
h) adjustable speed drives.

Item 3.A.1 applies only to frequency converters intended for specific industrial machines or consumables (e.g. machine tools, vehicles) if the converters can meet the above-mentioned characteristics after being dissembled.

Software specially designed to enhance or start the power of frequency converters or generators to meet the characteristics of Item 3.A.1 is included in Items 3.D.2 and 3.D.3.
Frequency converters and generators specially designed or modified for use in gas centrifuges are selected items in the nuclear field. This means frequency converters (also known as changers or inverters) specially designed or modified to supply specially designed or modified annular stators for high-speed multiphase AC hysteresis or reluctance motors that are selected items in the nuclear field.

3.A.2. Lasers, laser amplifiers and oscillators
3.A.2.a. Lasers on the basis of copper vapour with the following characteristics:
1) operating at wavelengths between 500 nm and 600 nm; and
2) have an average power of 30 W or higher.
3.A.2.b. Lasers on the basis of argon ions with the following characteristics:
1) operating at wavelengths between 400 nm and 515 nm; and
2) have an average power of 40 W or higher.

3.A.2.c. Lasers with neodymium other than glass with an output wavelength between 1 000 nm and 1 100 nm, with the following characteristics:

1) have impulse excitation and resonator quality modulation, with a pulse duration equal to or greater than 1 ns and have the following characteristics:

a) single-transverse output mode with an average output power exceeding 40 W; or

b) multiple-transverse output mode with an average output power exceeding 50 W; or

2) include frequency doubling to give an output wavelength between 500 nm and 550 nm with an average output power greater than 40 W.

3.A.2.d. Tunable pulsed mono-aspect oscillators on the basis of dyestuff with the following characteristics:

1) operating at wavelengths between 300 nm and 800 nm; and
2) with an average power exceeding 1 W;
3) with a repetitive frequency exceeding 1 kHz;
4) with a pulse width less of than 100 ns.

3.A.2.e. Tunable amplifiers and oscillators on the basis of dyestuff with the following characteristics:

1) operating at wavelengths between 300 nm and 800 nm; and
2) with an average power exceeding 30 W;
3) with a repetitive frequency exceeding 1 kHz;
4) with a pulse width less of than 100 ns.

Item 3.A.2.e does not include mono-aspect oscillators.

3.A.2.f. Alexandrite lasers with the following characteristics:

1) operating at wavelengths between 720 nm and 800 nm; and
2) with a band width of 0.005 nm or smaller;
3) with a repetitive frequency exceeding 125 Hz;
4) with average power exceeding 30 W.

3.A.2.g. Lasers on the basis of carbon dioxide with the following characteristics:

1) operating at wavelengths between 9 000 nm and 11 000 nm; and
2) with a repetitive frequency exceeding 250 Hz;
3) with an average power exceeding 500 W;
4) with a pulse width less than 200 ns.

Item 3.A.2.g does not include higher power (typically 1 to 5 kW) industrial lasers on the basis of Cd, used, for example, for cutting or welding; these lasers are either continuous wave or pulsed with a pulse width greater than 200 ns.

3.A.2.h. Excimer lasers (XeF, XeCl, KrF) with the following characteristics:

1) operating at wavelengths between 240 nm and 360 nm; and
2) with a repetitive frequency exceeding 250 Hz;
3) with average power exceeding 500 W.

3.A.2.i. Para-hydrogen Raman shifters designed to operate at 16 μm output wavelength and at a repetition rate greater than 250 Hz.

3.A.2.j. Pulse lasers on the basis of carbon dioxide with the following characteristics:

1) operating at wavelengths between 5 000 nm and 6 000 nm; and
2) with a repetitive frequency exceeding 250 Hz;
3) with an average power exceeding 200 W; and
4) with a pulse width less than 200 ns.

Item 3.A.2.j does not include higher power (usually 1 to 5 kw) industrial lasers on the basis of CO, used, for example, for cutting or welding; these lasers are either continuous wave or pulsed with a pulse width greater than 200 ns.

3.A.3. Valves

Valves with the following features:

a) a nominal diameter of 5 mm or greater;

b) have a bellows seal;

c) they are made of aluminium, aluminium alloy, nickel or nickel alloy with a nickel content greater than 60 per cent by weight or are coated with such materials.

For valves with different inlet and outlet diameters, the nominal diameter parameter under 3.A.3.a refers to the smallest of these averages.

3.A.4. Superconducting solenoidal electromagnets

Superconducting solenoidal electromagnets with the following characteristics:

a) they are capable of creating magnetic fields greater than 2 T (tesla);

b) have an L/D ratio (length divided by inner diameter) greater than 2;

c) have an inner diameter greater than 300 mm;

d) have a magnetic field homogeneity better than 1 % over the central 50 % of the inner volume.

Item 3.A.4 does not apply to magnets specially designed for, and exported as parts of, medical nuclear magnetic resonance imaging systems.

A component may be physically present within other deliveries. In case of a separate supply of a component from different sources, the related export documents specify the relationship between that component and the item.

3.A.5. Sources of direct electric current

Sources of direct electric current of high output with the following characteristics:

a) are capable for a period of eight hours to continuously produce a voltage of 100 V at an output current of 500 A or more; and

b) have a current control or voltage stability better than 0.1 % over a period of eight hours.

3.A.6. High-voltage sources of direct electric current

High-voltage sources of direct electric current of high output with the following characteristics:

a) are capable for a period of eight hours to continuously produce a voltage of 20 kV at an output current of at least 1 A; and

b) have a current control or voltage stability better than 0.1% over a period of eight hours.

3.A.7. Pressure transmitters

All types of pressure transmitters capable of measuring absolute pressure that meet the following characteristics:

a) the pressure sensors are made of aluminium, aluminium alloys, aluminium oxide (alumina or sapphire), nickel, nickel alloys with a nickel content greater than 60 per cent by weight or fully fluorinated hydrocarbon polymers or protected by these materials;

b) a seal, if included, necessary to seal the pressure sensors and in direct contact with the working medium, made of aluminium or aluminium alloys, aluminium oxide (alumina or sapphire), nickel, nickel alloys with a nickel content greater than 60 weight per cent or fully fluorinated hydrocarbon polymers or protected by these materials; and

c) have the following characteristics:

1) a scale range to 13 kPa and an accuracy of better than ± 1 % in the whole scale; or

2) a scale of 13 kPa and an accuracy of better than ± 130 Pa for measurements at 13 kPa.

Pressure transducers under 3.A.7 are devices that convert pressure measurements into a signal.

The accuracy for the purposes of Item 3.A.7 includes non-linearity, hysteresis and repeatability at the ambient temperature.

3.A.8. Vacuum pumps

Vacuum pumps with the following characteristics:

a) an input throat diameter of at least 380 mm;

b) pumping speed equal to or greater than 15 m3/s and

c) they are capable of forming a vacuum better than 13.3 mPa.

The pumping speed is determined at the measurement point with nitrogen gas or air.

The highest vacuum is determined at the inlet to the pump at the blocked inlet.

3.A.9. Seal scroll compressors and vacuum pumps with bellows seals

Seal scroll compressors and vacuum pumps with bellows seals with the following characteristics:

a) reach an input volume flow of 50 m3 h or higher;

b) reach a pressure ratio of 2:1 or higher; and

c) all surfaces that come into contact with working gas are made of the following materials:

1) aluminium or aluminium alloy;

2) aluminium oxide;

3) stainless steel;

4) nickel or nickel alloy;

5) phosphor bronze; or

6) fluoropolymers.

In the scroll compressor or a vacuum pump, the sucked gas is trapped in the pocket in a crescent shape, bounded by a pair of coupled spiral walls, one of which is stationary and the other moves along a circle, thereby gradually decreasing the initial volume of the gas pockets, and the pressure rises in these pockets.

In a spiral compressor or vacuum pump with a bellows-type seal, the working gas is completely isolated from the lubricated parts of the pump and the outer atmosphere by metal bellows. The bellows is fastened at one end to the moving coil and at the other end to a fixed pump cover.

Fluoropolymers include, among other things, the following materials:

a) polytetrafluoroethylene (PTFE);

b) fluorinated ethylene propylene (FEP);

c) perfluoroalkoxy (PFA);

d) polychlorotrifluoroethylene (PCTFE);

e) vinylidene fluoride-hexafluoropropylene copolymer.

3.B. Testing and production equipment

3.B.1. Electrolytic cells for fluorine production

Electrolytic cells for fluorine production with a production capacity of higher than 250 g of fluorine per hour.

3.B.2. Equipment for the production or assembly of the rotor, rotor balancing equipment, moulding machines for the production of bellows and mandrels

3.B.2.a. Equipment for the installation of the assembly of gas centrifuge rotors, baffles and end caps.

Item 3.B.2.a includes precise mandrels, clamps and tools for storing by hot pressing.

3.B.2.b. Rotor straightening equipment for achieving alignment of rotor tube sections.

Equipment referred to in Item 3.B.2.b normally consists of precise measuring sensors connected to a computer that controls the action of, for example, pneumatic rams used for aligning the rotor tube sections.

3.B.2.c. Mandrels and dies for forming bellows for the production of single spiral convolution bellows. Bellows under this item have the following characteristics:

1) an internal diameter between 75 mm and 400 mm; and

2) a length of 12.7 mm or greater;

3) the depth of the spiral is greater than 2 mm; and,

4) are made of high-strength aluminium alloys, martensitic steel or high-strength fibrous or filamentary materials.

3.B.3. Multiplane balancing machines for centrifuges - fixed or portable, horizontal or vertical

3.B.3.a. Balancing equipment for centrifuges designed for balancing flexible rotors with a length of 600 mm, which have the following characteristics:

1) a swing or pivot diameter of greater than 75 mm;

2) a weight range from 0.9 to 23 kg; and

3) are capable of balancing at a speed of revolution greater than 5 000 per minute.

3.B.3.b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor components that have the following characteristics:

1) a swing or pivot diameter of greater than 75 mm;

2) a weight range from 0.9 to 23 kg; and

3) are capable of balancing to a residual imbalance of 0.010 kg x mm/kg per plane or better; and

4) a belt drive.

3.B.4. Filament winding machines and related equipment

3.B.4.a. Filament winding devices with the following characteristics:

1) motions for putting into the correct position, wrapping and winding of fibres are coordinated and programmed in two or more axes;

2) are specially designed for the manufacture of composite structures or laminates from fibrous or filamentary materials;

3) are capable of winding cylindrical tubes with an inner diameter between 75 and 650 mm and a length of at least 300 mm.

3.B.4.b. Coordinating and programming control for the filament winding devices specified in Item 3.B.4.a.

3.B.4.c. Precise spindles for the filament winding devices specified in Item 3.B.4.a.

3.B.5. Electromagnetic isotope separators

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

Item 3.B.5 includes separators capable of enriching stable isotopes or isotopes of uranium. A separator capable of separating the isotopes of lead with a one-mass unit is capable of enriching the isotopes of uranium with a weight difference of three units.

Item 3.B.5 includes separators with which the ion sources or the collectors are in the magnetic field and those configurations in which they are outside this field.

3.B.6. Mass spectrometers

Mass spectrometers capable of measuring ions of 230 atomic mass units or greater and with a resolution of better than two parts in 230, and ion sources for these devices:

3.B.6.a. mass spectrometers with inductively coupled plasma (ICP-MS - inductively coupled plasma mass spectrometry);

3.B.6.b. mass spectrometers with glow discharge (GDMS – glow discharge mass spectrometry);

3.B.6.b. mass spectrometers with thermal ionisation (TIMS – thermal ionisation mass spectrometry);

3.B.6.d. electron bombardment mass spectrometers that have the following features:

1) the input system of the molecular beam, which injects a collimated beam of analyte molecules into the ion source, where the molecules are ionised by an electron beam; and

2) one or more cold traps that can be cooled to a temperature of 193 K (-80 °C) or less for separation of the analyte molecules that are ionised by the electron beam;

3.B.6.e. mass spectrometers equipped with a micro ion source designed for the use for actinides or actinide fluorides.

Item 3.B.6.d. includes mass spectrometers that are usually used for the isotopic analysis of UF6gas samples.

Mass spectrometers under 3.B.6.d are also called spectrometers with electron impact or spectrometers with electron ionisation.

Under 3.B.6.d.2, a freeze separator is a device that separates gas molecules by means of their condensing or freezing on cold surfaces. For the purposes of this item, a cryogenic gas pump with a closed loop is not a freeze trap.

3.C. Materials

None.

3.D. Software

3.D.1. Software specially designed to be used with equipment specified in Item 3.A.1, 3.B.3 or 3.B.4.

3.D.2. Software or encryption keys/codes specifically designed to enhance or launch performance characteristics of a device that is not included in Item 3.A.1 so that it meets or exceeds the characteristics specified in Item 3.A.1.

3.D.3. Software specially designed to strengthen or launch device performance characteristics, regulated by Item 3.A.1.

3.E. Technology

3.E.1. Technology that is connected with the management of manufacturing processes for the development, production or use of equipment, materials or software specified in Items 3.A to 3.D.

4. EQUIPMENT RELATED TO PLANTS FOR HEAVY WATER PRODUCTION (other than selected items in the nuclear field)

4.A. Devices, sets and components

4.A.1. Special fillings

Special fillings used in separating heavy water from ordinary water, with the following characteristics:

a) they are made of phosphor bronze mesh chemically treated to improve wettability; and

b) are designed for use in vacuum distillation towers.

4.A.2. Circulating pumps

Circulating pumps for dilute or concentrated solutions of potassium amide catalyst in liquid ammonia (KNH2/NH3), with the following characteristics:

a) airtight (hermetic);

b) power greater than 8.5 m3/h; and

c) have the following characteristics:

1) are designed for concentrated potassium amide solutions (1 % or greater) with an operating pressure of 1.5 MPa to 60 MPa; or

2) are designed for dilute potassium amide solutions (less than 1 %) with an operating pressure of 20 to 60 MPa.

4.A.3. Turboexpanders or a turboexpander-compressor

Turboexpanders or a turboexpander-compressor with the following characteristics:

a) are designed for operation with an outlet temperature of 35 K (-238 °C) or less; and

b) are designed for a throughput of hydrogen gas of 1 000 kg/h or greater.

4.B. Testing and production equipment

4.B.1. Water-hydrogen sulfide exchange tray columns and internal contactors (built-in)

4.B.1.a. water-hydrogen sulfide exchange tray columns with the following characteristics:

1) are capable of operating at pressures of 2 MPa or higher;

2) are fabricated from fine alloy (carbon) steel with an austenitic grain size number of ASTM 5 or larger; and

3) have a diameter of at least 1.8 m.

4.B.1.b. internal (built-in) contactors for water-hydrogen sulfide exchange tray columns specified in Item 4.B.1.a.

4.B.2. Cryogenic columns for hydrogen distillation

Cryogenic columns for hydrogen distillation with the following characteristics:

a) designed for operation at internal temperatures of 35 K (- 238 C);

b) designed for operation at an internal pressure of 0.5 to 5 MPa;

c) produced from

1) fine-grained stainless steel of the 300 series with low sulfur content and with an austenitic ASTM grain size number of 5 or greater; or

2) equivalent materials suitable for cryogenic conditions and compatible with hydrogen; and

d) with an internal diameter of at least 30 cm and an effective length of at least 4 m.

Effective length is the active height of the packing material in a wrapped column or active height of the inner plates of the contactors in a plate column.

4.B.3.
The item is not used.

4.C. Materials
None.

4.D. Software
None.

4.E. Technology
4.E.1. Technology that is connected with the management of manufacturing processes for the development, production or use of equipment, materials or software specified in Items 4.A to 4.D.

5. TEST AND MEASUREMENT EQUIPMENT FOR THE DEVELOPMENT OF NUCLEAR EXPLOSIVE DEVICES

5.A. Devices, sets and components

5.A.1. Photomultiplier tubes
Photomultiplier tubes with the following characteristics:

a) photocathode area is greater than 20 cm^2;

b) pulse rise time is shorter than 1 ns.

5.B. Testing and production equipment

5.B.1. Flash X-ray generators or pulsed electron accelerators
Flash X-ray generators or pulsed electron accelerators with either of the following sets of characteristics:

5.B.1.a.

1) the pulse energy of accelerated electrons is 500 keV or greater but less than 25 MeV; and

2) a figure of merit (K) of 0.25 or greater, or

5.B.1.b.

1) pulse energy of accelerated electrons of 25 MeV or greater; and

2) peak power greater than 50 MW.

The subject matter of Item 5.B.1 is not accelerators that are part of the equipment intended for purposes other than the generation of electron beam or X-ray radiation (such as electron microscope), and those designed for medical purposes.

The figure of merit K is defined as: $K = 1.7 \times 10^3 \times V^{2.65} \times Q$, where V is electron pulse energy in million electron volts. Q is the total accelerated charge in coulombs if the period of the accelerator beam pulse is not more than 1 μs. If the accelerator beam pulse duration is longer than 1 μs., Q is the maximum accelerated charge per 1 μs. Q equals the integral of i with respect to t for 1 μs or beam pulse duration, whichever is the shorter time interval $Q = \int idt$ (Q = integral idt), where i is the beam current in amperes and t is time in seconds.

Pulsed power = (pulse potential in volts) x (beam pulse current in amperes).
The duration of the beam pulse in a device based on microwave accelerating cavities is either 1 μs, or the duration of a beam bunch packet resulting from one microwave modulator pulse, whichever time period is shorter.
The pulse current of a beam bunch in a device based on microwave accelerating cavities is the average current per time duration of a beam bunch packet.

5.B.2. High-speed gun systems
High-speed gun systems (driving, gas, coil, electromagnetic, electro-thermal or other advanced systems) capable of accelerating projectiles to 1.5 km/s or greater.
This item does not include gun elements specially designed for high-speed weapon systems.

5.B.3. The following high-speed cameras and display devices and their components:

5.B.3.a. the following streak cameras and their specially designed components:
5.B.3.a.1. streak cameras with recording speeds greater than 0.5 mm/s;
5.B.3.a.2. electronic streak cameras with a time resolution of 50 ns or less;
5.B.3.a.3. streak tubes for cameras specified in Item 5.B.3.a.2;
5.B.3.a.4. cartridges specially designed for use with streak cameras that have modular construction and that allow performance specifications contained in Items 5.B.3.a.1 or 5.B.3.a.2;
5.B.3.a.5. synchronising electronic units, rotor assemblies consisting of turbines, mirrors and bearings specially designed for cameras specified in Item 5.B.3.a.1.

5.B.3.b. framing cameras and components specially designed for them:
5.B.3.b.1. framing cameras with recording rates greater than 225 000 frames per second;
5.B.3.b.2. framing cameras capable of a shooting time frame of 50 ns or less;
5.B.3.b.3. framing tubes and solid-state imaging devices with a shutter speed display time of 50 ns or less, specially designed for cameras specified in Items 5.B.3.b.1 or 5.B.3.b.2;
5.B.3.b.4. cartridges specially designed for use with framing cameras that have a modular construction and that allow the performance specifications contained in Items 5.B.3.b.1 or 5.B.3.b.2;
5.B.3.b.5. synchronising electronic units, rotor assemblies consisting of turbines, mirrors and bearings specially designed for cameras specified in Items 5.B.3.b.1 or 5.B.3.b.2.

5.B.3.c. Solid-state cameras or electron tubes and components specially designed for them:
5.B.3.c.1. solid-state cameras or electron tubes with a shutter speed display time of 50 ns or less;

5.B.3.c.2. imaging instruments on the principle of a fixed base and image intensifier with a shutter speed display time of 50 ns or less, specially designed for cameras specified in Item 5.B.3.c.1;
5.B.3.c.3. electro-optical shutter-device (cells of Kerr or Pockels type) with a shutter speed display time of 50 ns or less;
5.B.3.c.4. cartridges specially designed for use with cameras that have a modular construction and that allow the performance specifications contained in Item 5.B.3.c.1.

Software specially designed to enhance or launch the power of frequency converters or generators in order to meet the mentioned characteristics is included in Items 5.D.1 a 5.D.2.

High-speed cameras with a single frame are used individually to capture a single image of a dynamic event, or several such cameras combined in a gradual roll-out to acquire more impressions of the event.

5.B.4.
The item is not used.

5.B.5. Specialised instruments for hydrodynamic experiments:
5.B.5.a. velocity interferometers for measuring velocities exceeding 1 km/concourse time intervals of less than 10 μs;
5.B.5.b. gauges of impact pressure capable of measuring pressures greater than 10 GPa, and gauges with manganin, ytterbium and polyvinylidene bifluoride (PVBF, PVF2);
5.B.5.c. quartz pressure transducers for pressures greater than 10 GPa.

Item 5.B.5.a includes velocity interferometers, such as VISAR (velocity interferometer systems for any reflector) systems, DLI (Doppler laser interferometers) systems and (PDF photonic Doppler velocimetry) systems, also known as Het-V (velocimetry using heterodyne principle).

5.B.6. High-speed pulse generators
High-speed pulse generators and pulse heads with the following characteristics:
a) output voltage greater than 6 V and a resistive load of less than 55 Q; and
b) a pulse transition time less than 500 ps.

The pulse transition time under 5.B.6.b is the time interval between 10 % and 90 % of the voltage amplitude.
Pulse heads are pulse-forming circuits designed to take the stress of a step function and to shape this feature in various forms, such as a rectangle, triangle, jump, pulse, exponential or monocyclic types. Pulse heads can be an integral part of the pulse generator, can be cartridges for the device or they can be external trailers.

5.B.7. Explosion chambers
Containment vessels, chambers, containers, and other similar containment devices designed for testing high-explosive substances or devices that have the following characteristics:
a) are created to capture the effects of a detonation of equivalent to 2 kg of TNT or greater; and
b) have structural elements or features enabling the transfer of diagnostic or measured information in real time or with a delay.

5.C. Materials
None.

5.D. Software
5.D.1. Software or encryption keys/codes specifically designed to enhance or start performance characteristics of a device that is not included in Item 5.B.3 so that it meets or exceeds the characteristics specified in Item 5.B.3.
5.D.2. Software or encryption keys/codes specifically designed to enhance or launch performance characteristics of equipment included in Item 5.B.3.

5.E. Technology
5.E.1. Technology that is connected with the management of manufacturing processes for the development, production or use of equipment, materials or software specified in Items 5.A to 5.D.

6. COMPONENTS FOR NUCLEAR EXPLOSIVE DEVICES

6.A. Devices, sets and components

6.A.1. Detonators and multipoint initiation systems
6.A.1.a. The following electrically driven explosive detonators:
6.A.1.a.1. exploding bridge (EB);
6.A.1.a.2. exploding bridge wire (EBW);
6.A.1.a.3. impact detonators;
6.A.1.a.4. exploding foil initiators.
6.A.1.b. Arrangements using single or multiple detonators designed to almost simultaneously initiate an explosive surface greater than 5 000 mm2 using a single firing signal for detonation with an initiation time over the entire surface of less than 2.5 μs.

The subject matter of Item 6.A.1 is not detonators using only primary explosives, such as lead azide.
All detonators that are the subject matter of Item 6.A.1 utilise small electrical conductors (bridges or foils) that explosively vapourise after a fast electrical pulse of high current passes through. In non-slapper types, an exploding conductor starts a chemical detonation of a highly explosive material such as PETN (pentaerythritol tetranitrate), which it touches. In slapper detonators, the explosive vapourisation of the electrical conductor puts a flyer or striker into motion, which starts a chemical detonation. In some types, a striker is driven by magnetic force. An EB detonator or a slapper-type detonator can serve as explosive foil. An alternative name for the detonator is the word "initiator."

6.A.2. Detonating devices and equivalent high-current pulse generators
6.A.2.a. Detonator firing systems (trigger systems, launch systems), including electrically charged, explosively driven and optically controlled firing systems designed to control multiple controlled detonators specified by Item 6.A.1.
6.A.2.b. Modular electrical pulse generators (pulsers) with the following characteristics:
1) are designed as portable, mobile or for use in difficult conditions;
2) are capable of delivering their energy in less than 15 μs at loads of less than 40 Ω;
3) the output current exceeds 100 A;
4) no dimension greater than 30 cm;

5) weight is less than 30 kg; and
6) are intended for use in an extended temperature range of 223 K to 373 K (-50 °C to 100 °C) or for use in space.

6.A.2.c. Micro-firing units with the following characteristics:
1) no dimension greater than 35 mm;
2) the rated voltage is equal to or greater than 1 kV; and
3) the capacity is equal to or greater than 100 nF.

Optically controlled firing systems include systems of starting and charging by laser. Explosively driven explosive launch systems include ferroelectric and ferromagnetic types of explosive firing systems.
Item 6.A.2.b includes xenon flashlamp drivers.

6.A.3. Switching devices

6.A.3.a. Tubes and cold cathode tubes, including gas and vacuum tubes, operating similarly to a spark gap, with the following characteristics:
1) contain at least three electrodes;
2)nominal anode peak voltage of 2.5 kV or higher;
3) nominal anode peak current of 100 A or more; and
4) an anode time delay of 10 μs or less.

6.A.3.b. Triggered spark gaps with the following characteristics:
1) anode time delay of 15 μs or less; and
2) rated peak current of 500 A or greater.

6.A.3.c. Modules or assemblies with a fast switching function with the following characteristics:
1) a nominal anode peak voltage of greater than 2 kV;
2) a nominal anode peak current of 500 A or more; and
3) a switching time of 1 μs or less.

Item 6.A.3.a includes krytron gas tubes and vacuum sprytron tubes.

6.A.4. Pulse discharge capacitors

Pulse discharge capacitors with either of the following sets of characteristics:

6.A.4.a.
1) a nominal voltage of greater than 1.4 kV;
2) stored energy greater than 10 J;
3) a capacity of greater than 0.5 μF; and
4) series inductance of less than 50 μH, or

6.A.4.b.
1) a nominal voltage of greater than 750 V;
2) a capacity of greater than 0.25 μF; and
3) a series inductance of less than 10 μH.

6.A.5. Systems for generating neutrons

Systems for generating neutrons, including tubes that have the following characteristics:
a) designed for operation without an external vacuum system; and
b) they use
1) electrostatic acceleration to induce a tritium-deuterium nuclear reaction; or
2) electrostatic acceleration to induce a deuterium-deuterium nuclear reaction, and capable of performing 3 x 109 neutrons/second or higher.

6.A.6. Strip conductors

Strip conductors for signal transmission to provide a route with low inductance to detonators, which have the following characteristics:

a) a nominal voltage of greater than 2 kV; and

b) inductance of less than 20 nH.

6.B. Testing and production equipment

None.

6.C. Materials

6.C.1. Highly explosive materials

Highly explosive materials or mixtures containing more than 2 per cent by weight of any of the following substances:

6.C.1.a. cyclotetramethylentetranitramine (HMX) (CAS 2691-41-0);

6.C.1.b. cyklotrimethylentrinitramine (RDX) (CAS 121-82-4);

6.C.1.c triaminotrinitrobenzene (TATB) (CAS 3058-38-6);

6.C.1.d.aminodinitrobenzo-furoxan or 7-amino-4,6-nitro-1-oxide (ADNBF) (CAS 97096-78-1);

6.C.1.e. 1,1-diamino-2,2-dinitroethylen (DADE or FOX7) (CAS 145250-81-3);

6.C.1.f. 2,4-dinitroimidazol (DNI) (CAS 5213-49-0);

6.C.1.g. diamino azoxy furazan (DAAOF or DAAF) (CAS 78644-89-0);

6.C.1.h. diaminotrinitrobenzen (DATB) (CAS 1630-08-6);

6.C.1.i. dinitroglykoluril (DNGU or DINGU) (CAS 55510-04-8);

6.C.1.j. 2,6-Bis(picrylamino)-3,5-dinitropyridin (PYX) (CAS 38082-89-2);

6.C.1.k. 3,3‘-diamino-2,2‘,4,4‘,6,6‘,-hexanitrobifenyl or dipicramid (DIPAM) (CAS 17215-44-0);

6.C.1.l. diamino azofurazan (DAAzF) (CAS 78644-90-3);

6.C.1.m. 1,4,5,8-tetranitro-pyridazino[4,5-d] pyridazin (TNP) (CAS 229176-04-9);

6.C.1.n. hexanitrostilben (HNS) (CAS 20062-22-0); or

6.C.1.o. any explosive with a crystal density greater than 1.8 g/cm3 that has a detonation velocity greater than 8 000 m/s.

6.D. Software

None.

6.E. Technology

6.E.1. Technology that is connected with the management of manufacturing processes for the development, production or use of equipment, materials or software specified in Items 6.A to 6.D.

Explanations to the annex:

1. The description of the items listed in the annex includes new and used items.

2. If the description of the items listed in the annex contains further determination or specification, the item includes all variations of the item.

3. The titles of the categories are used for the ease of reference and do not affect the interpretation of the definitions of the items.

4. A technology relating to any item listed in the annex is the minimum technology required for the installation, operation, maintenance and repair of the item. The technology does not include information in the public domain or basic scientific research.

5. The software does not include:
   a) software generally available to the public, that is, software that is sold without restrictions of inventory in stock in retail stores and is designed for installation by the user without further substantial support by the supplier; or
   b) software in the public sphere, that is, technology or software that has been made available without restrictions on its further use (restrictions on copyright do not exclude technology or software from the public sphere).

1. Accuracy - usually measured as the value of inaccuracy, defined as the largest deviation set value (positive or negative) from an accepted standard or true value.
2. Angular position deviation - is the biggest difference between the angular position and the actual very accurately measured angular position after the workpiece mounted to the table has been deviated from its starting position.
3. Shape machining inspection - more numerically controlled motions performed in accordance with instructions that specify the next required position and the required speeds of the feed to that position. These feed rates are varied relative to each other so that a desired contour is created in accordance with ISO 2806 - 1980: Industrial automation systems - numerical machine control.
4. Fibrous or filamentary materials - are continuous filaments (monofilament), yarn, strands, tows or tapes:
   a) a filament (thread) or monofilament is the smallest part of a fibre, typically with a diameter of several micrometres;
   b) a roving is a bundle of usually 12 to 120 of approximately parallel strands;
   c) a strand is a bundle of generally more than 200 fibres (filaments) arranged approximately in parallel;
   d) tape is a material consisting mainly of interlaced or DC-fibre yarns (filaments), strands, rovings, yarns or wires, usually pre-impregnated resin;
   e) a tow is a bundle of fibres (filaments), usually approximately parallel;
   f) yarn is a bundle of twisted strands.
5. Linearity - (usually measured as non-linearity) is the largest deviation of the actual characteristics (average of the upper and lower data readings) - positive or negative - from the line laid so that it minimises the greatest deviation.
6. Measurement uncertainty - is the characteristic parameter that specifies in what range around the output value the value of the measured variable is with 95 % certainty. This includes uncorrected systematic deviations, uncorrected backlash and random deviations.
7. Firmware - is a sequence of elementary instructions, maintained in a special storage device, the implementation of which is initiated by the introduction of reference instructions into an instruction register.
8. Numerical control - automatic control of a process performed by a device that uses numeric data usually introduced during the process in accordance with ISO 2382: Information technology.
9. Positioning accuracy - to be determined and presented in numerically controlled machine tools in accordance with Item 1.B.2 in logical accordance with the following requirements:
   a) Test conditions (ISO 230/2 (1988), (3):
      1) A machine tool and device for measuring accuracy are kept at the same ambient temperature for a period of 12 hours before the measurement and during the measurement. During the period prior to the measurement, the machine sled is continuously cycled and is also cycled during the measurement of accuracy.
      2) The machine is equipped with any mechanical, electronic or software compensation balanced together with the machine.
      3) The measurement accuracy of the measuring equipment is at least four times more accurate than the expected machine tool accuracy.
      4) The power system of the sled drives meets the following requirements:
         a) line voltage deviations are not greater than ± 10 % of the nominal rated voltage,
         b) frequency deviations from the normal frequency are not greater than ± 2 Hz and
         c) outages or intermittent operation are not allowed.
   b) Test programme (ISO 230/2 (1988), (4)):
      1) The feed speed (speed of the sled) during the measurement corresponds to the fastest work movement. In the case of machine tools that produce optical quality surfaces, the feed rate is not more than 50 mm per minute.
      2) Measurements should be performed incrementally - from one axis operation limit to another, without returning to the starting position for each movement towards the target position.
      3) Axes that are not measured remain during the axis testing in mid-operation.
   c) Presentation of test results (ISO 230/2 (1988), (2)). Measurement results include:
      1) positioning accuracy (A) and

2) main reversal error (B).

10. Program - the sequence of instructions to implement the process as feasible for an electronic computer or convertible into a mould.

11. Resolution - the smallest readable increment on a measuring gauge, in digital instruments it is the lowest valid digit (in accordance with ANSI B-89.1.12).

12. Software - a set of one or more programs or microprograms permanently stored on any tangible medium.

13. Technical data - may take the form of drawings, plans, diagrams, models, formulas, technical projects and specifications, manuals and instructions written or recorded on other media or devices such as a disc, tape or permanent memory.

14. Technical assistance - may take the form of instructions, skills, training, working knowledge, consulting services and may involve the transfer of technical data.

15. Technology - specific information needed for the development, production or use of any of the items in the list. Such information may take the form of technical data or technical assistance.

In the annex, the International System of Units (SI) is used. In all cases, the official recommended control variables should be quantities defined in SI units. Parameters of some machine tools are given in their customary units, which are not SI units.

In the annex, the following abbreviations are used (including prefixes indicating their quantity):

CAS	---	Chemical Abstracts Service
Ci	---	curie
dBmW	---	decibel relative to 1 milliwatt
K	---	kelvin
kN	---	kilonewton
MeV	---	million electron volts
μF	---	micro farad
N	---	newton
nF	---	nano farad
nH	---	nano henry
Ω	---	ohm
RMS	---	mean-square deviation
T	---	tesla
TIR	---	total instrument range

Annex 2 to Implementing Decree No ……

Declaration

of an end-user of a dual-use item in the nuclear field

Data of an end-user who is a legal entity

Name:
Registered office address:
ID:

Data of an end-user who is a natural person

Name, or names, and surname:
Address of the place of business:
Date of birth:

The specification of a nuclear item that is the subject matter of the declaration

The method and purpose of using a nuclear item that is the subject matter of the declaration

I declare that

a) I will not use a dual-use item in the nuclear area or its parts for a purpose connected with the development of chemical, biological or nuclear weapons or other nuclear explosive devices, with the production thereof, manipulation thereof, with their operation, maintenance, storage, detection, identification or expansion or with the development, production, maintenance or storage of rocket systems capable of carrying such weapons;
b) I will not export a dual-use item in the nuclear field or a part thereof without the authorisation by the State Office for Nuclear Safety; and
c) I will notify the State Office for Nuclear Safety of the transfer of a dual-use item in the nuclear area.

_____

Date and signature