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DECREE
of …

amending Decree No 376/2016 on dual-use items in the nuclear area

Pursuant to § 236 of Act No 263/2016, the Atomic Act, as amended by Act No 83/2025, the State Office for Nuclear Safety lays down the following to implement § 24(7), § 25(2)(d), § 166(7)(d) and § 169(4):

Article I

Decree No 376/2016 on dual-use items in the nuclear area is amended as follows:

1. In the introductory sentence, the words ‘§ 18(5)’ are deleted.
2. In the introductory sentence, the words ‘§ 166(6)(d)’ are replaced by the words ‘§ 166(7)(d)’.
3. In the heading of § 1, the word ‘Essentials’ is replaced by the words ‘Requirements for the content of documentation for the activity being permitted, which is the import or export of dual-use items in the nuclear area and essentials’.
4. In the introductory part of § 1, the word ‘transfer’ is replaced by the words ‘import or export’.
5. In § 1(b), the words ‘indication of the method’ are replaced by the words ‘method and place’.
6. In § 1(c), the word ‘anticipated’ is inserted at the beginning and the word ‘transfer’ is replaced by the words ‘import or export’.
7. In the introductory part of § 1(d), the word ‘notifier’ is replaced by the word ‘applicant’.
8. In § 1(d)(1), the word ‘surname’ is inserted after the word ‘names,’ and the word ‘surname’ is replaced by the words ‘date of birth’.
9. In § 1(d)(2), the words 'and identification number' are inserted after the word 'name'.
10. In § 1(f)(2), the words ‘for military purposes and” are replaced by ‘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.’.
11. § 1(f)(3) is deleted.
12. § 1(g) is deleted.
13. § 2 is deleted.

14. In the introductory part of § 3(1), the word 'export' is replaced by the word 'import' and the word 'import' is replaced by the word 'export'.
15. In § 3(1)(b), the words ‘, identification number’ are inserted after the word ‘name’, the word ‘and’ is deleted, the words ‘, date of birth’ are inserted after the word ‘surname’ and the words ‘or place of business’ are inserted after the word ‘residence’.
16. In § 3(1)(c), the words ‘and other commercial’ are replaced by the words ‘or other’.
17. In the introductory part of § 3(2), the word 'export' is replaced by the word 'import' and the word 'import' is replaced by the word 'export'.
18. In § 3(2)(a), the word 'export' is replaced by the word 'import' and the word 'import' is replaced by the word 'export'.
19. Annex 1 reads as follows:

‘Annex 1 to Decree No 376/2016

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

1. INDUSTRIAL EQUIPMENT

1.A. **Equipment, assemblies and components 1.A.1. High-density radiation shielding windows**

High-density radiation shielding windows (lead glass or similar) that have all the following characteristics, and frames specially designed for them:

a. 'Cold side' greater than 0.09 m^2.

b. Density greater than 3 g/cm^3.

c. A thickness of 100 mm or greater.

In Item 1.A.1.a., ‘cold side’ means the viewing side of the window exposed to the lowest radiation according to design.

1.A.2. Radiation-hardened television cameras or their lenses

Radiation-hardened television cameras, or their lenses, specially designed or recognised as radiation-hardened, capable of withstanding an aggregate radiation dose greater than 5 x 10^4 Gy (silicon) without degradation of their characteristics during operation.

The term Gy (silicon) refers to energy in Joules per kilogram absorbed by an unshielded silicon sample exposed to ionising radiation.

1.A.3. Robots, end effectors, and control units

a. Robots and end effectors that have one of the following qualities:

1. Specially constructed to comply with the national standard for the handling of highly explosive materials.

2. Specially constructed or approved and radiation-hardened, capable of resisting a cumulative amount of radiation greater than 5×10^4 Gy (silicon) without degradation of their characteristics during operation.

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

b. Control units specially constructed for any robot or end effector included in Item 1.A.3.a.

Item 1.A.3 does not include robots specially designed for non-nuclear industrial applications, such as car paint spraying boxes. *In Item 1.A.3 'robot' means a manipulation mechanism, which may be of the continuous path or of the point-to-point variety, may use sensors, and has all of the following characteristics:*

a) is multi-purpose;

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 with closed or open control circuits or with stepper motors; and

d) has user-accessible programmability by means of a learning/repetition method or by means of an electronic computer, which may be a programmable logic controller, i.e. without mechanical intervention.

Sensors are detectors of physical phenomena whose output (after conversion to a signal that can be interpreted by a controller) is capable of generating programmes or modifying programmed instructions or numerical programme data. This includes sensors with machine vision, infrared imaging, acoustical imaging, tactile feel, inertial position measuring, optical or acoustic ranging or with the ability to measure force or torque.

In the above definition ´user-accessible programmability´ means the facility allowing a user to load, modify, or replace programs by means other than:

a) by physical modification of wiring or interconnection; or

b) by setting control functions including initial parameters.

The following are not robots as defined in Item 1.A.3:

a) manipulation mechanisms that are merely manually or remotely controllable;

b) manipulation mechanisms with a fixed sequence that are automated devices performing mechanically programmed motions. The program is mechanically limited by fixed stops, such as pins or cams. The sequence of movements, selection of trajectories or angles are not variable or changeable mechanically, electronically or electrically;

c) mechanically controlled manipulation mechanisms with a variable sequence that 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 movements and selection of trajectories or angles is variable

within a fixed program template. Changes or modifications of a program model (particularly change of pins or 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 program can be changed, but a certain sequence is only carried out on the basis of a binary signal from mechanically fixed electrical binary devices or adjustable stops;

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 making the content of these bins accessible when put in or taken out.

End effectors set out in Item 1.A.3 can be jaws, active tool units and any other tools that are attached to the mounting plate at the end of a robot manipulator arm.

Active tool units are devices for applying momentum, process energy to the machined object or for sensing the machined object.

1.A.4. Remotely controlled manipulators

Remotely controlled manipulators that can be used for radiochemical separation operations or in hot cells that have some of the following features:

1. The capability pass through a hot cell wall (through-wall operation) with thickness 0.6 m or greater.

2. The capability of bridging over the top of a hot cell wall with a thickness of 0.6 m or more (over-wall operation).

1.B. **Testing and production equipment**

1.B.1. Continuous forming machines and rotary forming machines capable of continuous forming and mandrels

a. Forming machines having both of the following characteristics:

1. Having three or more active or guiding cylinders.

2. According to the manufacturer’s technical specification, they can be equipped with numerical control units or can be controlled by a computer.

b. Mandrels for rotary forming designed for continuous forming of cylindrical rollers with an internal diameter of 75 mm to 650 mm.

Item 1.B.1.a includes machines that have only a single roller designed to deform metal plus two auxiliary rollers that support the mandrel, but do not participate directly in the deformation process.

1.B.2. Machine tools

Machine tools, as follows, and any combination thereof, for milling or cutting metals, ceramics or composites that, according to the manufacturer’s technical specifications, can be equipped with electronic devices for simultaneous controlled machining (copying) in two or more axes.

a. Lathes with a positioning accuracy with all achievable compensations better (less) than 6 µm in accordance with the international standard ISO 230-2:2014 Test code for machine tools (hereinafter 'ISO 230-2:2014') along any linear axis (overall positioning) for machines capable of machining a diameter greater than 35 mm.
Item 1.B.2.a does not apply to automatic rod lathes (Swissturn) limited to machining of only bar material fed by a spindle, if the maximum machined bar diameter is less than or equal to 42 mm, without the possibility of mounting in chucks. Machines can also drill or mill lathed parts with diameters less than 42 mm.
b. Machine tools for milling that have some of the following characteristics:
1. Their positioning accuracy with all achievable compensations is better (less) than 6 µm in accordance with ISO 230-2:2014 along any linear axis (overall positioning).
2. They have two or more controlled (copying) rotary axes.
3. They have five or more axes that can be coordinated simultaneously for controlled machining (copying).
Item 1.B.2.b does not include milling machines having both of the following characteristics:
1. The x-axis moves more than 2 m.
2. The overall positioning accuracy of the x-axis setting is worse (greater) than 30 µm in accordance with ISO 230-2:2014.
c. Machine tools for grinding that have some of the following qualities:
1. Their positioning accuracy with all achievable compensations is better (less) than 4 µm in accordance with ISO 230/2 (1988) along any linear axis (overall positioning).
2. They have two or more controlled (copying) rotary axes.
3. They have five or more axes that can be coordinated simultaneously for controlled machining (copying).
Item 1.B.2.c does not include the following:
1. Cylindrical exterior, interior, and exterior-interior grinders, having all of the following characteristics:
a. The have a maximum possible external diameter or length of the machined component of 150 mm.
b. The axes are limited to x, z, and c.
2. Coordinate grinders that do not have a z-axis or a w-axis with an overall positioning accuracy better (less) than 4 µm in accordance with ISO 230-2:2014.
d. Electrical discharge machines that have two or more controlled (copying) rotary axes and that can be coordinated simultaneously for controlled machining (copying).
Instead of individual test protocols, these positioning accuracies can be used as stipulated using the following procedures from measurements according to ISO 230/2 (1988) or the national equivalent for each machine tool model if they are stipulated or accepted by national authorities.
These positioning accuracies are stipulated as follows:
1. The selection of five machines of the model to be evaluated.
2. Measurement of the accuracy of the linear axis in accordance with ISO 230-2:2014.
3. Determination of the accuracy value (A) for each axis of each machine according to the calculation method described in 230-2:2014.
4. Determination of the average accuracy value for each axis. This average value becomes the stated positioning accuracy for each axis of the model (A_x, A_y etc.).

5. Since Item 1.B.2 refers to each linear axis, there will be as many stated positioning accuracies as there are linear axes.
6. 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 a stated positioning accuracy of 6 μm or better (less) for grinding machines and 8 μm or better (less) for milling machines and lathes, both in accordance with ISO 230/2 2014, then the manufacturer of the milling machine will confirm the positioning accuracy level every 18 months.
Item 1.B.2. does not apply to special-purpose machine tools limited only to the production of any of the following parts:

a) toothed gears;
b) crankshafts or camshafts;
c) knives and cutting tools;
d) extruder worm gears.

The naming of the axes is in accordance with the international standard ISO 841:2001 Industrial automation systems and integration – Numerical control of machines – Coordinate system and motion nomenclature.
Axes that are secondary parallel rotation axes are not included in the total number of controlled (copying) axes, especially the w axis in horizontal carousels or a secondary rotation axis the centre line of which is parallel with a primary rotation axis.
The rotary axes do not have to rotate 360°. A rotary axis can be driven by a linear drive, e.g., a screw or a rack-and- pinion.
For the purpose of Item 1.B.2, the number of axes that can be coordinated simultaneously for controlled machining 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 rotary 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.
A machine tool having at least two of three turning, milling or grinding capabilities (e.g., a turning machine with milling capability) must be evaluated against each applicable item 1.B.2.a, 1.B.2.b and 1.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. hexapods) that have for or more axes out of which none is a rotary axis.

1.B.3. Machines, devices or systems for dimensional checks
a. Computer-controlled or numerically controlled dimensional measuring machines having any of the following characteristics:
1. They 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 'ISO 10360-2:2009').

2. They have three or more axes and the maximum permissible dimensional (volumetric) error of length measurement (value E0, MPE is equal to or less (better) 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 10360-2-2009.
The value of E0, MPE of the most accurate configuration of the computerised or numerically controlled dimensional measuring machine specified by the manufacturer according to ISO 10360-2:2009 (for example, the most accurate of the following: probe, needle length, motion parameters, environment) and with all compensations available must be compared to a threshold value of 1.7 + L/800 µm

b. The following instruments for displacement/feed measurement:
1. Non-contact type measuring systems with a resolution equal to or better (less) than 0.2 µm within a measuring range up to 0.2 mm.
2. Linear variable differential transformer (LVDT) systems having both of the following characteristics:
a.1. Linearity equal to or less (better) than 0.1% of the value measured from 0 to the full measurement range, for a linear variable differential transformer within a measurement range up to 5 mm; or
2. linearity equal to or less (better) than 0.1% of the value measured from 0 to 5 mm for a linear variable differential transformer with a measuring range of more than 5 mm.
b. Fluctuation (drift) is equal to or better (less) than 0.1% per day at a standard ambient temperature ± 1 K (± 1°C).
3. Measuring systems that have both of the following characteristics:
a. They contain a laser.
b. The ability to maintain for at least 12 hours at a standard temperature with a deviation of ± 1 K (± 1°C) and standard pressure:
1. Resolution over their full measurement range of 0.1 µm or better.
2. Measurement accuracy 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.
In Item 1.B.3.b 'linear displacement' means the change of distance between the measuring probe and the measured object.
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 instrument such as autocollimators using collimated light to detect the angular displacement of a mirror, for example, a laser.
d. Systems for simultaneous linear-angular inspection of hemispheres having both of the following characteristics:

1. Measurement accuracy along any linear axis equal to or better (less) than 3.5 µm per 5 mm.
2. Angular deviation of position equal to or less than 0.02°.

Item 1.B.3 includes machine tools, other than those specified in item 1.B.2., that can be used as measuring machines if they meet or exceed the criteria specified for the function of measuring machines.
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. Controlled atmosphere induction furnaces (vacuum or inert gas) and their energy sources
a. Furnaces with all of the following characteristics:
1. Capable of operating at temperatures above 1123 K (850°C).
2. Induction coils with a diameter of at most 600 mm.
3. Designed for power inputs of 5 kW and higher.
Item 1.B.4.a does not include furnaces designed for the production of semiconductor wafers.
b. Power sources with a rated output of 5 kW or more, specially designed for induction furnaces specified in Item 1.B.4.a.
1.B.5. Isostatic presses and related equipment
a. Isostatic presses having both of the following characteristics:
1. The ability to achieve a greatest working pressure of 69 MPa and above.
2. Chamber cavity with an inner diameter greater than 152 mm.
b. Tools, forms, and controls specially designed for isostatic presses specified in Item 1.B.5.a.
In Item 1.B.5, 'isostatic presses' means equipment capable of creating pressure in an enclosed cavity through various media (for example gas, liquid, solid particles, etc.) to create equal pressure in all directions within the cavity upon a workpiece or material.
In Item 1.B.5, the internal dimensions of a chamber refer to a space in which the operating temperature and pressure are achieved without the inclusion of fixtures. This dimension is the smaller dimension of the inner diameter of the pressure chamber or the inner 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
a. Electrodynamic vibration test systems that have all of the following characteristics:
1. They make use of techniques with feedback or a regulated circuit and include a digital control unit.
2. They have the ability to vibrate at an acceleration of 10 g_0 or more at a mean quadratic value between 20 Hz and 2 000 Hz.
3. They are capable of imparting forces of 50 kN or greater measured 'bare table'.
b. Digital controllers, combined with specially developed software for vibration testing, with a frequency bandwidth in real time greater than 5 kHz, that are designed for use in the systems specified in Item 1.B.6.a.
c. Vibration thrusters (shaker units), with or without associated amplifiers, capable of imparting a force of 50 kN or greater measured 'bare table', that are usable for the systems specified in Item 1.B.6.a.

d. Supports for the tested pieces and electronic units designed to combine multiple shaker units into a complete vibration test system capable of providing an effective combined force of at least 50 kN, measured 'bare table' that are usable in the systems specified in Item 1.B.6.a.
In Item 1.B.6, bare table means a flat table or surface with no fixtures or fittings.

1.B.7. Vacuum or other controlled atmosphere metallurgical melting and casting furnaces and related equipment
a. Arc remelting furnaces, arc melting furnaces and arc melting and casting furnaces, having both of the following characteristics:
1. Volume of hot melt electrodes 1 000 cm^3 to 20 000 cm^3
2. Ability to operate at melting temperatures above 1 973 K (1700°C).
b. Electron beam melting furnaces, plasma atomisation furnaces, or plasma melting furnaces, with both of the following characteristics:
1. A power greater than or equal to 50 kW.
2. Capable of operating at temperatures above 1 473 K (1200°C).
c. Computer control and monitoring systems specially configured for furnaces specified in Items 1.B.7.a or 1.B.7.b.
d. Plasma torches specially designed for furnaces specified in item 1.B.7.b., having both of the following characteristics:
1. Operation with an input power greater than 50 kW
2. Capable of operating at temperatures above 1 473 K (1200°C).
e. Electron beam guns specially designed for the furnaces specified in Item 1.B.7.b. with an input power greater than 50 kW.

1.C. **Materials**

none

1.D. **Software**

1.D.1. Software specially designed or modified for the use of equipment 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 parts programming software that generates numerical control command codes but does not allow the direct use of the equipment for machining various 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 checked 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 milling machine tool for controlling milling machines that are not specified in Item 1.B.2.

1.E. **Technology**

1.E.1. Technology related to the development, production or use of equipment, materials or software specified in items 1.A. to 1.D.

2. MATERIALS

2.A. **Equipment, assemblies and components**

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

a. Crucibles having both of the following characteristics:

1. Volume of between 150 cm^3 (150 mL) and 8 000 cm^3 (8 L).

2. 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 (CaF_2);

b) calcium zirconate ($CaZrO_3$);

cerium sulphide (Ce_2S_3);

d. erbium oxide (Er_2O_3);

e) hafnium oxide (HfO_2);

f) Magnesium oxide (MgO);

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

h. yttrium oxide (Y_2O_3); or

i) zirconium dioxide (ZrO_2).

b. Crucibles that have both of the following characteristics:

1. A volume of between 50 cm^3 (50 mL) and 2 000 cm^3 (2 L).

2. Made of or lined with tantalum having a purity of 99.9% or greater by weight;

c. Crucibles that have all of the following characteristics:

1. A volume of between 50 cm^3 (50 mL) and 2 000 cm^3 (2 L).

2. Made of or lined with tantalum having a purity of 99.9% or greater by weight.

3. Coated with tantalum carbide, nitride, boride, or any combination thereof.

2.A.2. Platinum-coated catalysts

Water-resistant platinum-coated catalysts specially designed or prepared for promoting the hydrogen isotope exchange reaction between hydrogen and water for the recovery of tritium from water or for the production or concentration of heavy water.

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

Composite structures in the form of thin-walled tubes with all of the following characteristics:
1. Inner diameter between 75 mm and 650 mm.

2. Thickness 12 mm or less.

3. 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 and plants for the production of tritium and equipment for them

a. Facilities or plants for the production, recovery, extraction, concentration or handling of tritium.

b. Equipment in plants and facilities for the production of tritium, namely:

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. Hydrogen isotope storage or purification systems using metal hydrides as the storage or purification medium.

2.B.2. Lithium isotope separation facilities or plants, and systems and equipment for them

a. Facilities or plants for the separation of lithium isotopes.

b. Equipment for the separation of lithium isotopes based on the lithium-mercury amalgam process, as follows:

1. Packed liquid-liquid exchange columns specially designed for lithium amalgams.
2. Mercury or lithium amalgam pumps.

3. Lithium amalgam electrolysers.

4. Concentrated lithium hydroxide solution evaporators.

c. Ion exchange systems specially designed for the separation of isotopes of lithium and components specially designed for them.

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

2.C. **Materials**
2.C.1. Aluminium

Aluminium alloys with both of the following characteristics:

a. Tensile strength of 460 MPa or greater at 293 K (20°C).

b. In the form of tubes or cylinders (including forgings) with an outer diameter exceeding 75 mm.

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

2.C.2. Beryllium

Metallic beryllium, alloys containing more than 50% beryllium by weight, beryllium compounds and products made from them, their waste or residues.

Item 2.C.16 does not include the following:

a. Metal windows for X-ray machines or for bore-hole logging devices.

b. Oxide structures in the form of products or semi-finished products specially designed for electronic component parts or as substrates for electronic circuits.

c. Beryl (silicate of beryllium and aluminium) in the form of emeralds or aquamarines.

2.C.3. Bismuth

Bismuth with both of the following characteristics:

a. Purity of 99.99% by weight or higher.

b. Silver content of less than 10 ppm by weight.

2.C.4. Boron

Boron enriched with isotope ^{10}B in a ratio greater than occurs in nature, as: the element, boron compounds, mixtures containing boron, products made from them, waste or residues of any of the above forms.

In Item 2.C.4, mixtures containing boron also include boron-doped materials.

The proportion of boron isotopes occurring in nature is about 18.5% by weight of isotope ^{10}B, which is 20 atomic percent.

2.C.5. Calcium

Calcium with both of the following characteristics:

a. Contains less than 200 weight parts per million of metallic impurities other than calcium.
b. Contains less than 10 parts per million by weight of boron.

2.C.6. Chlorine trifluoride (ClF_3)

2.C.7. Fibrous or filamentary materials, and pre-impregnated laminates

a. Carbon or aramid fibrous or filamentary materials having either of the following characteristics:

1. A specific modulus of at least 12.7×10^6 m.

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%.

b. Glass fibrous or filamentary materials with both of the following characteristics:

1. A specific modulus of at least 3.18×10^6 m.

2. Specific tensile strength of 7.62×10^4 m or greater.

c. Continuous filament yarn, roving, cables 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 composite matrix consists of resin.

In Item 2.C.7, the specific modulus is Young's modulus in N/m^2 divided by specific weight in N/m^3, measured at a temperature of 296 ± 2 K (23 ± 2°C) and relative humidity of 50 ± 5%.

In Item 2.C.7, specific tensile strength is the ultimate tensile strength in N/m^2 divided by the specific weight in N/m^3, measured at a temperature of 296 ± 2 K (23 ± 2°C) and relative humidity of 50 ± 5%.

2.C.8. Hafnium

Metallic hafnium, hafnium alloys and hafnium compounds containing more than 60 percent hafnium by weight, products made from them, and waste and scrap in any of these forms.

2.C.9. Lithium

Lithium enriched with isotope ^{6}Li in a ratio greater than that found in nature, as well as products
and equipment containing enriched lithium, namely: elements, alloys, compounds, mixtures containing lithium, products made from them, waste and residues of any of the aforementioned forms.

Item 2.C.9 does not include thermoluminescent dosimeters.

The content of isotope ^{6}Li in natural lithium is approximately 6.5 percent by weight, which is 7.5 atomic percent.

2.C.10. Magnesium

Magnesium with both of the following characteristics:

a. Contains less than 200 parts per million by weight of metallic impurities other than calcium.
b. Contains less than 10 parts per million by weight 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 does not include shapes with no linear dimension exceeding 75 mm.

Item 2.C.11 refers to martensitic steel before or after heat treatment.

2.C.12. Radium (^{226}Ra)

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

Item 2.C.12 does not include:

a. Medical applicators.

b. Products or devices containing less than 0.37 GBq of ^{226}Ra.

2.C.13. Titanium

Titanium alloys with both of the following characteristics:

a. Tensile strength of 900 MPa or more at a temperature of 293 K (20°C).

b. b) In the form of tubes or solid cylinders (including forgings) with an outer diameter greater than 75 mm.

Item 2.C.13 refers to titanium alloys both before or after heat treatment.

2.C.14. Tungsten

Tungsten, tungsten carbide, and alloys containing more than 90% tungsten by weight, having both of the following characteristics:

a. In forms with hollow cylindrical symmetry (including cylinder segments) and with an inner diameter between 100 mm and 300 mm.

b. A mass greater than 20 kg.

Item 2.C.14 does not include products specially designed as weights or gamma-ray collimators.

2.C.15. Zirconium

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 in any of these forms.

Item 2.C.15 does not include zirconium in the form of foil having a thickness of at most 0.10 mm.

2.C.16. Nickel powder and porous nickel metal

a. Nickel powder with both of the following characteristics:

1. Nickel purity 99.0% or greater by weight.

2. Average particle size less than 10 µm, measured according to ASTM B330.

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

Item 2.C.16 does not include the following:

a. Filamentary nickel powders.

b. b. Individual porous nickel metal sheets with an area of 1000 cm^2 or less.

Item 2.C.16. also does not include nickel powder specially prepared for the manufacture of baffles used in the uranium enrichment process by gaseous diffusion. In this case, it is a selected item in the nuclear area.

Item 2.C.16.b applies 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, its compounds or mixtures containing tritium with a tritium to hydrogen atomic ratio exceeding 1: 1000 and products or equipment containing such materials.

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

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

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

Item 2.C.18 does not include products or devices containing less than 1 g ^{3}He.

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. Element.

b. Compounds with a total alpha activity of 37 GBq/kg or greater.

c. Compounds 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 containing 90% or more rhenium by weight and alloys of rhenium and tungsten containing 90% or more by weight of any combination of rhenium and tungsten that meet both of the following characteristics:

a. Form with hollow cylindrical symmetry (including cylinder segments) with an inner diameter between 100 mm and 300 mm.

b. Weight of more than 20 kg.

2.D. **Software**

none

2.E. **Technology**

2.E.1. Technology related to the development, production or use of equipment, materials or software specified in items 2.A. to 2.D.

3. EQUIPMENT AND COMPONENTS FOR ISOTOPIC SEPARATION OF URANIUM (OTHER THAN SELECTED ITEMS IN THE NUCLEAR AREA)

3.A. **Equipment, assemblies 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 all of the following characteristics:

a. Multiphase output capable of providing power of 40 VA or greater.

b. Frequency band of 600 Hz or higher.

c. Frequency control better (lower) than 0.2%.

Frequency converters included in Item 3.A.1 are also known as inverters.

The characteristics specified in Item 3.A.1 may be met by the following equipment: generators, electronic test equipment, AC power supplies, variable motor speed drives, variable speed drives (VSD), variable frequency drives (VFD), adjustable frequency drives (AFD), or adjustable speed drives (ASD).

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

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 changers and generators specially designed or prepared for use in the enrichment process using gas centrifuges are selected items in the nuclear area.

3.A.2. Lasers, laser amplifiers and oscillators

a. Copper vapour lasers having both of the following characteristics:

1. Operate at wavelengths between 500 nm and 600 nm.

2. Average power of 30 W or higher.

b. Argon ion lasers with both of the following characteristics:

1. Wavelength range between 400 nm and 515 nm.

2. Average power 40 W or greater.

c. Lasers doped with neodymium (other than glass) with an output wavelength between 1 000 nm and 1 100 nm, with any of the following characteristics:

1. Pulse-excited and Q-switched with a pulse duration equal to or greater than 1 ns and having any of the following characteristics:

a. Output with a simple transverse mode having an average output power greater than 40 W.

b. Output with multiple transverse modes with an average power greater than 50 W.

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

d. Tunable pulsed single-mode dye laser oscillators having all of the following characteristics:

1. Operating at wavelengths between 300 nm and 800 nm.

2. Average output power greater than 1 W.

3. Repetition frequency higher than 1 kHz.

4. Pulse width less than 100 ns.

e. Tunable dye-based amplifiers and oscillators having all of the following characteristics:

1. Operating at wavelengths between 300 nm and 800 nm.

2. Average output power greater than 30 W.

3. Repetition frequency higher than 1 kHz.

4. Pulse width less than 100 ns.

Item 3.A.2.e does not include single-mode oscillators.

f. Alexandrite lasers having all of the following characteristics:

1. Operating at wavelengths between 720 nm and 800 nm.

2. Bandwidth of 0.005 nm or less.

3. Repetition frequency higher than 125 Hz.

4. Average output power greater than 30 W.

g. Pulsed carbon dioxide (CO_2) lasers having all of the following characteristics:

1. Operating at wavelengths between 9 000 nm and 11 000 nm.

2. Repetition frequency higher than 250 Hz.

3. Average output power greater than 500 W.

4. Pulse width less than 200 ns.

Item 3.A.2.g. does not include more powerful (typically 1 kW to 5 kW) industrial carbon dioxide lasers used, for example, for cutting or welding. These lasers are either continuous lasers or pulsed lasers with a pulse width greater than 200 ns.

h. Pulsed excimer lasers (XeF, XeCl, KrF) having all of the following characteristics:

1. Operating at wavelengths between 240 nm and 360 nm.

2. Repetition frequency higher than 250 Hz.

3. Average output power greater than 500 W.

i. Para-hydrogen Raman phase shifters designed to operate at an output wavelength of 16 µm

and a repetition frequency greater than 250 Hz.

j. Pulsed carbon monoxide (CO) lasers having all of the following characteristics:

1. Operating at wavelengths between 5 000 nm and 6 000 nm.

2. Repetition frequency higher than 250 Hz.

3. Average output power exceeding 200 W.

4. Pulse width less than 200 ns.

Item 3.A.2.g. does not include more powerful (typically 1 kW to 5 kW) industrial carbon monoxide lasers used, for example, for cutting or welding.; these lasers are either continuous lasers or pulsed lasers with a pulse width greater than 200 ns.

3.A.3. Valves

Valves having all of the following characteristics:

a. Nominal size equal to or greater than 5 mm.

b. Bellows seals.

c. Made of aluminium, aluminium alloy, nickel or nickel alloy with a nickel content greater than 60 percent by weight or are coated with such materials.

For valves with different inlet and outlet diameter, the nominal size parameter in Item 3.A.3.a refers to the smallest diameter.

3.A.4. Superconducting solenoid electromagnets

Superconducting solenoid electromagnets having all of the following characteristics:

a. The ability to generate a magnetic field greater than 2 T.

b. b. An L/D ratio (length divided by inner diameter) greater than 2.

c. Inner diameter greater than 300 mm.

d. 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 part of medical nuclear magnetic resonance imaging systems.

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

3.A.5. Direct current power supplies

High-power direct current power supplies having both of the following characteristics:

a. Capable of continuously producing, over a period of 8 hours, a voltage of at least 100 V at an output current of 500 A or more.

b. Current or voltage stability better than 0.1% over 8 hours.

3.A.6. High-voltage direct current power supplies

High-voltage direct current power supplies having both of the following characteristics:

a. Capable of continuously producing, over a period of 8 hours, a voltage of at least 20 kV at an output current of at least 1 A.

b. Current or voltage stability better than 0.1% over 8 hours.

3.A.7. Pressure transducers

All types of pressure transducers capable of measuring absolute pressure, having all of the following characteristics:

a. Pressure sensors made of aluminium, aluminium alloys, aluminium oxide (alumina or sapphire), nickel, nickel alloys with a nickel content greater than 60 percent by weight or fully fluorinated hydrocarbon polymers or protected by these materials.

b. Seals, 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 percent by weight or fully fluorinated hydrocarbon polymers or protected by these materials.

c. Having:

1. A total measuring range of less than 13 kPa and an accuracy of better than 1% of the total measuring range, or

2. an overall measuring range of 13 kPa and accuracy better than ± 130 Pa for measurement at 13 kPa.

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

In Item 3.A.7 'accuracy' includes non-linearity, hysteresis, and repeatability of measurement at ambient temperature.

3.A.8. Vacuum pumps

Vacuum pumps having all of the following characteristics:

a) Input throat diameter of at least 380 mm.

b. Pumping speed is equal to or greater than 15 m^3/s.

c. c. Capable of producing a vacuum better than 13.3 mPa.

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

The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off.

3.A.9. Scroll compressors with bellows seal type and vacuum scroll vacuum pumps with bellows seal type

Bellows-type scroll compressors and vacuum scroll pumps with bellows-type plugs, having all of the following characteristics:

a. Inlet volume flow rate of 50 m^3/h or higher.

b. Pressure ratio 2: 1 or greater.

c. All surfaces that come into contact with the working gas, made from any 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.

3.B. **Testing and production equipment**

3.B.1. Electrolytic cells for fluorine production

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

3.B.2. Equipment for manufacturing or assembling rotors, equipment for balancing rotors, mandrels, and dies for manufacturing bellows

a. Equipment for assembling gas centrifuge rotor assemblies, bulkheads and terminals.

Item 3.B.2.a. includes precision mandrels, clamps and machines for joining by thermal expansion

and contraction.

b. Equipment for aligning the rotor to bring the sections of the rotor tube of a gas centrifuge into alignment with a common axis.

Equipment specified in Item 3.B.2.b normally consists of precision measuring probes linked to a computer that subsequently controls the action of, for example, pneumatic rams used for aligning the rotor tube sections.

c. Mandrels and dies for forming bellows for the production of single spiral convolution bellows.

The bellows in Item 3.B.2.c. have all of the following characteristics:

1. inner diameter between 75 mm and 650 mm;

2. a length of 12.7 mm or greater;

3. the depth of a single spiral greater than 2 mm;

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

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

Balancing equipment for centrifuges designed for balancing flexible rotors with a length of 600 mm that have all of the following characteristics:

1. Circular diameter, or diameter of the pivot pin greater than 75 mm.

2. Weight range from 0.9 kg to 23 kg.

3. Capable of balancing at rotary speeds greater than 5 000 RPM.

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

1. Bearing journal diameter greater than 75 mm.

2. Weight range from 0.9 kg to 23 kg.

3. Minimum achievable residual imbalance of 10 g x mm/kg in one plane or better.

4. Belt drive.

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

a. Filament winding machines having all of the following characteristics:

1. Movements for positioning, winding, and coiling fibres, coordinated and programmed in two or more axes.

2. Specially designed for the manufacture of composite structures or laminates from fibrous or filamentary materials.

3. Capability to wind cylindrical tubes with an internal diameter between 75 mm and 650 mm

and at least 300 mm long.

b. Coordination and program control for fibre winding equipment specified in item 3.B.4.a.

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 at least 50 mA.

Item 3.B.5 includes separators capable of enriching stable isotopes or uranium isotopes.

A separator capable of separating the isotopes of lead with a single mass unit difference is capable of enriching the isotopes of uranium with a difference of three mass 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 with a mass of 230 atomic units and greater and having a resolution better than two particles out of 230, and ion sources for such spectrometers:
a. Inductively coupled plasma mass spectrometers (ICP/MS).

b. Glow-discharge mass spectrometers (GDMS).

c. Thermal ionisation mass spectrometers (TIMS).

d. Electron bombardment mass spectrometers having both of the following characteristics:

1. A molecular beam entry system that injects a collimated beam of analyte molecules into the ion source, where the molecules are ionised by an electron beam.

2. One or more cold traps that can be cooled to a temperature of 193 K (-80°C) or less to separate analyte molecules that are not ionised by the electron beam.

e. Mass spectrometers equipped with a microfluorination 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 UF_6 gas samples.

Mass spectrometers in Item 3.B.6.d are also called electron impact spectrometers or electron ionisation spectrometers.

In Item 3.B.6.d.2, a cold trap 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 helium gas pump with a closed loop is not a cold trap.

3.C. **Materials**

none

3.D. **Software**

3.D.1. Software specially designed for the use of equipment specified in Items 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 improve or launch device performance characteristics, regulated by Item 3.A.1.

3.E. **Technology**

3.E.1. Technology related to the development, production or use of equipment, materials or software specified in items 3.A. to 3.D.

4. HEAVY WATER PRODUCTION PLANT EQUIPMENT (OTHER THAN SELECTED ITEMS IN THE NUCLEAR AREA)

4.A. **Equipment, assemblies and components**

4.A.1. Special fillings

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

1. a. Made of phosphor bronze mesh chemically treated to improve wettability.

2. b. Designed for use in vacuum distillation towers.

4.A.2. Circulating pumps

Pumps capable of circulating concentrated or diluted potassium amide catalyst (KNH_2/NH_3) solutions having all of the following characteristics:

a. Airtight (hermetically sealed).

b. Power greater than 8.5 m^3/h.

c. Having any of the following characteristics:

1. Intended for concentrated potassium amide solutions (1% or greater), an operating pressure of 1.5 MPa to 60 MPa; or

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

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

Turboexpanders or turboexpander-compressor assemblies, having both of the following characteristics:

a. Designed to operate at exit temperatures of 35 K (-238°C) or less.

b. Designed for hydrogen gas flow of 1 000 kg/h or greater.

4.B. **Testing and production equipment**

4.B.1. *(This code is reserved for future use)*

4.B.2. Cryogenic columns for hydrogen distillation

Cryogenic columns for hydrogen distillation having all of the following characteristics:

a. Designed for operation at internal temperatures from 15 K (-258°C) to 35 K (-238°C).

b. Designed for operation at internal pressures from 0.1 MPa to 1 MPa.

c. Manufactured from:

1. Austenitic stainless steel; or

2. equivalent materials suitable for cryogenic conditions and compatible with hydrogen at temperatures from 15 K (-258°C) to 35 K (-238°C).

d. With an inner diameter of at least 30 cm and an effective length of at least 4 m.

The effective length refers to the active height of the filling material in the filling columns, or the active height of the inner plates of the contactors of the plate column.

Equivalent materials specified in Item 4.B.2.c.2 include, for example (but are not limited to):

a) aluminium;

b) aluminium alloys;

c) copper alloys;

d) nickel alloys;

e) titanium alloys.

4.B.3. *(This code is reserved for future use)*

4.C. **Materials**

none

4.D. **Software**

none

4.E. **Technology**

4.E.1. Technology related to 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. **Equipment, assemblies and components**

5.A.1. Photomultipliers

Photomultipliers having both of the following characteristics:

a. Photocathode area is greater than 20 cm^2.

b. Anode 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 having either of the following two sets of characteristics:

a.
1. Accelerators with a maximum electron energy of 500 keV or greater, but less than 25 MeV.

2. The efficiency (K) is 0.25 or greater.

b.
1. Accelerators with a maximum electron energy of 25 MeV or greater.

2. Highest power output greater than 50 MW.

Item 5.B.1 does not apply to accelerators that are part of the equipment intended for purposes other than the generation of an electron beam or X-ray radiation (such as an electron microscope), and equipment designed for medical purposes.

Efficiency (K) is defined as: $K = 1.7 \times 10^3 V^{2.65}Q$. V is the highest energy of electrons in millions of electron volts. If the pulse duration of the beam produced by the accelerator is 1 µs or less, then Q is the total accelerated charge in coulombs. If the pulse duration of the beam produced by the accelerator is longer than 1 µs, then Q represents the maximum accelerated charge per 1 µs. Q equals the integral of i with respect to t, over the lesser of 1 µs or the time duration of the beam pulse $Q = \int idt$ (Q=integral of idt) where i is the beam current in amperes and t is the time in seconds.

Pulsed power = (pulse potential in volts) x (beam pulse current in amperes).

In devices based on microwave acceleration chambers, the beam pulse duration is either 1 µs or the duration of the beam packet generated by a single pulse of the microwave modulator, whichever is shorter.

In machines based on microwave accelerating cavities, the peak beam current is the average current for the duration of the beam packet.

5.B.2. High-speed artillery systems

High-speed artillery 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 artillery elements specially designed for high-speed weapon systems.

5.B.3. The following high-speed cameras and imaging equipment and their components

Software specially designed to enhance or enable the performance of cameras or imaging equipment to meet the characteristics listed below is included in items 5.D.1. and 5.D.2.

a. The following streak cameras and their specially designed components:

1. Streak cameras with a recording speed greater than 0.5 mm/µs.

2. Electronic streak cameras with a time resolution of 50 ns or better.

3. Streak tubes for cameras specified in Item 5.B.3.a.2.

4. Plug-in modules specially designed for use with streak cameras that have a modular design and enable the performance specifications listed in items 5.B.3.a.1. or 5.B.3.a.2.

5. Electronic synchronisation units, rotor assemblies consisting of turbines, mirrors

and bearings specially designed for cameras specified in Item 5.B.3.a.1.

b. Framing cameras and components specially designed for them:

1. Framing cameras with recording rates greater than 225 000 frames per second.

2. Framing cameras capable of frame exposure times of 50 ns or less.

3. Framing tubes and solid-state framing devices with fast imaging time (exposure time) of 50 ns or less, specially designed for cameras specified in items 5.B.3.b.1. or 5.B.3.b.2.

4. Plug-in modules specially designed for use with framing cameras with modular construction, which permit the performance specifications in items 5.B.3.b.1 or 5.B.3.b.2.

5. Electronic synchronisation 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.

c. Semiconductor or tube-based cameras and specially designed components for them:

1. Semiconductor or tube-based cameras with fast imaging time (exposure time) of 50 ns or less.

2. Semiconductor framing devices and image intensifiers having high-speed imaging time (exposure time) of 50 ns or less, specially designed for cameras specified in 5.B.3.c.1.

3. Electro-optical shutters (Kerr or Pockels cells) with a high-speed imaging time (exposure time) of 50 ns or less.

4. Plug-in modules specially designed for use with cameras that have a modular design and that enable the performance specifications listed in items 5.B.3.c.1.

5.B.4. *(This code is reserved for future use.)*

5.B.5. Specialised instrumentation for hydrodynamic experiments

a. Velocity interferometers for measuring velocities exceeding 1 km/s during time intervals of less than 10 μs.

b. Shock pressure gauges capable of measuring pressures exceeding 10 GPa, including gauges containing manganin, ytterbium and polyvinylidene fluoride (PVDF)/polyvinyl difluoride (PVF_2).

c. b. Manganin 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) and microwave velocity interferometers, including optic-microwave mixing velocimeters.

5.B.6. High-speed pulse generators

High-speed pulse generators and their pulse heads, having both of the following characteristics:

a. Output voltage greater than 6 V and resistive load less than 55 Ω.

b. Pulse transition time less than 500 ps.

The pulse transition time in Item 5.B.6.b is the time interval between 10% and 90% of the voltage amplitude.

Pulse heads are pulse-forming circuits designed to accept the function of voltage jumps and shape them into different pulse shapes, which can be of the rectangular, triangular, jump, impulse, exponential or monocyclic type. Pulse heads can be an integral part of the pulse generator, can be cartridges for the device or they can be externally connected devices.

5.B.7. Explosion chambers

Containers for highly explosive substances, chambers, containers and other similar containment devices designed for testing highly explosive substances or explosive devices, having both of the following characteristics:

a. Designed to fully capture the effects of an explosion of 2 kg or more of trinitrotoluene (TNT) equivalent.

b. Structural elements or characteristics 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 launch 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 to which Item 5.B.3 applies.

5.E. **Technology**

5.E.1. Technology related to 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. **Equipment, assemblies and components**

6.A.1. Detonators and multipoint initiation systems

a. Electrically controlled explosive detonators:

1. Exploding bridge (EB).

2. Exploding bridge wire (EBW).

3. Slapper detonators.

4. Exploding foil initiators (EFI).

b. Arrangements using single or multiple detonators designed to almost simultaneously initiate an explosive surface greater than 5 000 mm^2 using a single firing signal for detonation with an initiation time over the entire surface of less than 2.5 μs.

Item 6.A.1. does not include detonators that use 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 vaporise after a fast high-current electrical pulse passes through. In non-slapper types, an exploding conductor initiates the chemical detonation of a highly explosive material such as PETN (pentaerythritol tetranitrate) that it is touching. In slapper detonators, the explosive vaporisation of the electrical conductor drives a flyer across a gap, and its impact on an explosive initiates a chemical detonation. In some types, the striker is driven by magnetic force. An explosive foil detonator may be an EB

detonator or a slapper detonator. Sometimes the term 'initiator' is used in place of the term 'detonator'.

6.A.2. Detonating devices and equivalent high-current pulse generators

a. Detonator firing sets (initiating systems, detonating systems), including electronically charged, explosively or optically fired firing sets designed to activate multiple controlled detonators specified in item 6.A.1.

b. Modular electrical pulse generators (impulse generators) having have all of the following characteristics:

1. Designed for portable, mobile, or for use in adverse conditions.

2. 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 exceeds 30 cm.

5. Weight less than 30 kg.

6. Designed for use in an extended temperature range from 223 K to 373 K (from -50°C to 100°C), or specified as suitable for aerospace applications.

c. Micro-firing units having the following characteristics:

1. No dimension exceeds 35 mm.

2. Nominal voltage equal to or greater than 1 kV.

3. Capacity is equal to or greater than 100 nF.

Optically fired firing kits include both laser-initiated and laser-charged systems. Explosively fired firing sets include explosive ferroelectric and explosive ferromagnetic types of firing sets. Item 6.A.2.b includes xenon flashlamp drivers.

6.A.3. Switching devices

a. Cold cathode tubes, including gas filled, operating similarly to spark gaps, having all of the following characteristics:

1. Contain at least three electrodes.

2. Nominal peak anode voltage of 2.5 kV or higher.

3. Nominal anode peak current of 100 A or more.

4. Anode time delay of 10 μs or less.

b. Triggered spark gaps having both of the following characteristics:

1. Anode time delay of 15 μs or less.

2. Nominal peak current of 500 A or greater.

c. Modules or assemblies with a fast switching function having all of the following characteristics:

1. Nominal anode peak voltage greater than 2 kV.

2. Nominal anode peak current of 500 A or more.

3. Switching time 1 μs or less.

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

6.A.4. Pulse discharge capacitors

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

a.

1. Nominal voltage higher than 1.4 kV.

2. Stored energy greater than 10 J.

3. Capacity greater than 0.5 μF.

4. Series inductance less than 50 nH.

b.

1. Nominal voltage higher than 750 V.

2. Capacity greater than 0.25 μF.

3. Series inductance less than 10 nH.

6.A.5. Neutron generator systems

Neutron generator systems, including tubes, having both of the following characteristics:

Designed for operation without an external vacuum system.

b. Have the ability to:

1. Use electrostatic acceleration to induce a tritium-deuterium nuclear reaction, or

2. use electrostatic acceleration to induce a deuterium-deuterium nuclear reaction

and a power capacity of 3×10^9 neutrons/s or more.

6.A.6. Strip conductors

Strip conductors for securing a low inductance path to detonators having the following characteristics:

1. Nominal voltage higher than 2 kV.

2. Inductance lower 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 percent by weight of any of the following substances:

a. cyclotetramethylenetetranitramine (HMX) (CAS 2691-41-0);

b. cyclotrimethylenetrinitramine (RDX) (CAS 121-82-4);

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

d. Aminodinitrobenzo-furoxane or 7-amino-4,6-nitrobenzofurazan-1-oxide (ADNBF)

(CAS 97096-78-1);

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

f. 2,4-dinitroimidazole (DNI) (CAS 5213-49-0);

g. diaminoazoxyfurazan (DAAOF or DAAF) (CAS 78644-89-0);

h. diaminotrinitrobenzene (DATB) (CAS 1630-08-6);

i. dinitroglycoluril (DNGU or DINGU) (CAS 55510-04-8);

b) 2,6-Bis(picrylamino)-3,5-dinitropyridine (P j) 2,6-Bis(picrylamino)-3,5-dinitropyridine (PYX) (CAS 38082-89-2);

a. 3,3'-diamino-2,2',4,4',6,6'-hexanitrobiphenyl or dipicramide (DIPAM) (CAS 17215-44-0),

b. diaminoazofurazan (DAAzF) (CAS 78644-90-3);

c. 1,4,5,8-tetranitro-pyridazino[4,5-d] pyridazine (TNP) (CAS 229176-04-9);

d. hexanitrostilbene (HNS) (CAS 20062-22-0); or

e. any explosive with a specific crystal density greater than 1.8 g/cm^3 having a detonation rate exceeding 8 000 m/s.

6.D. **Software**

none

6.E. **Technology**

6.E.1. Technology related to the development, production or use of equipment, materials or software specified in items 6.A. to 6.D.

Explanatory notes to the Annex:

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

· If the description of an item listed in the annex does not contain any further details or specifications, the item includes all variants of that item.

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

· 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. Technology does not include information in the public domain or basic scientific research.

· Software does not include:

· 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

· software in the public domain, which is technology or software that has been made available without restriction for further use; copyright restrictions do not exclude technology or software from the public domain.

· 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.
· 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.

· Contour milling control - Multiple numerically controlled motions, to be carried out in accordance with instructions that specify the following required position and the required feed rates to that position. These feed rates are varied relative to each other so that a desired contour is created in accordance with ISO 2806:1994: Industrial automation systems – Numerical control of machines.

· Fibrous or filamentary materials – are monofilaments, yarns, roving, cables or tapes:

· A filament (thread) or monofilament is the smallest part of a fibre, typically with a diameter of several micrometres.

· A roving is a bundle of usually 12 to 120 of approximately parallel strands.

· A strand is a bundle of usually more than 200 filaments arranged approximately parallel to each other.

· Tape is a material consisting mainly of interlaced or parallel fibres (filaments), strands, rovings, tows, or yarns, usually pre-impregnated with resin.

· A tow is a bundle of fibres (filaments), usually approximately parallel.

· Yarn is a bundle of twisted strands.

· 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 a line laid so that it minimises the greatest deviations.

· Measurement uncertainty - a 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 tolerance and random deviations.

· 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.

· Numerical control - automatic control of a process performed by a device that uses numeric data usually introduced during the process in accordance with ISO 2382:2015 Information technology.

· Positioning accuracy – to be determined and presented for numerically controlled machine tools in accordance with Item 1.B.2 in logical accordance with the following requirements:

· Test conditions (ISO 230-2:2014, par. 3):

· For 12 hours before and during measurements, the machine tool and accuracy measuring equipment will be kept at the same ambient temperature. During the period prior to the measurement, the machine sled is continuously cycled and is also cycled during the measurement of accuracy.

· The machine is equipped with any mechanical, electronic, or software compensation balanced together with the machine.

· Accuracy of measuring equipment for the measurements is at least four times more accurate than the expected machine tool accuracy.

· The power system of the slide drives meets the following requirements:

· line voltage deviations are not greater than ± 10% of the nominal rated voltage;

· frequency deviations from the normal frequency are not greater than ± 2 Hz; and

· outages or intermittent operation are not allowed.

· Test program (ISO 230-2:2014, par. 4):

· Feed rate (velocity of slides) during measurement is the fastest operating movement. In the case of machine tools that produce optical quality surfaces, the feed rate is at most 50 mm per minute.

· 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.

· Axes not being measured remain at mid-travel during test of an axis.

Presentation of test results (ISO 230-2:2014, par. 2). Measurement results include:

· positioning accuracy'(A) and

· main reversal error (B).

· Program - the sequence of instructions to implement the process as feasible for an electronic computer or convertible into this form.

· Resolution – is the smallest readable increment on the measuring instrument, for digital instruments it is the lowest valid digit, in accordance with ANSI B-89.1.12.

· Software – a set of one or more programs or firmware

· Technical data – may take the form of drawings, plans, diagrams, models, formulas, technical designs and specifications, manuals and instructions in written or digital form.

· Technical assistance – may take the form of instruction, skills, training, working knowledge, consulting services, and may include the transfer of technical data.

· 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.
The annex uses the International System of Units (SI). In all cases, the official control quantity should be considered to be the quantity defined in SI units. Parameters of some machine tools are given in their customary units, which are not SI units.

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

CAS --- Chemical Abstracts Service

Ci --- curie

dBmW --- decibel relative to 1 milliwatt

K --- kelvin

kN --- kilonewton

MeV – megaelectronvolt

µF --- microfarad

N --- newton

nF --- nanofarad

nH --- nanohenry

Ω --- ohm

RMS --- root mean square

T --- tesla

TIR --- total instrument range’.

20. Annex 2 reads as follows:

‘Annex 2 to Decree No 376/2016

DECLARATION

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

Information on an end user who is a corporate entity

Name	
Registered office	
Identification number	

Information on an end-user who is an individual

Name(s) and surname	
Permanent address/place of	

residence/registered office	
Date of birth	

Quantity, name, and specification of a dual-use item in the nuclear area

Manner and place of the end-use of a dual-use item in the nuclear area

I declare that

a) I shall not use the dual-use item in the nuclear area or part thereof for a purpose connected with the development of chemical, biological or nuclear weapons or other nuclear explosive devices, their production, their handling, their operation, maintenance, storage, detection, identification or proliferation or with the development, production, maintenance or storage of rocket systems capable of carrying such weapons;
b) I shall not export the dual-use item in the nuclear area or part thereof without the permission of the State Office for Nuclear Safety.

.....

Date and signature'.

Article II

Effective date

This Decree will come into effect on 1 April 2026.