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STATUTORY INSTRUMENTS

2024 No. 346

CUSTOMS TRADE

The Export Control (Amendment) Regulations 2024

<i>Made</i>	- - - -	<i>7th March 2024</i>
<i>Laid before Parliament</i>		<i>11th March 2024</i>
<i>Coming into force</i>	- -	<i>1st April 2024</i>

The Secretary of State makes these Regulations in exercise of the powers conferred by sections 1, 2, 4, 5 and 7 of the Export Control Act 2002(1) and Article 15(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 (Recast)(2).

Citation, commencement and extent

1.—(1) These Regulations may be cited as the Export Control (Amendment) Regulations 2024 and come into force on 1st April 2024.

(2) Regulations 1 and 2 extend to England and Wales, Scotland and Northern Ireland.

(3) Regulation 3 extends to England and Wales, and Scotland.

Amendments to the Export Control Order 2008

2.—(1) The Export Control Order 2008(3) is amended as follows.

(2) In Schedule 2 (Military Goods, Software and Technology)—

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- (1) [2002 c. 28](#); see section 11 for defined terms used in these provisions. Sections 1, 2, 4 and 5 were amended by article 6(2)(c) of the Treaty of Lisbon (Changes in Terminology) Order 2011 ([S.I. 2011/1043](#)); sections 5 and 11 were amended by regulation 2 of the Trade etc. in Dual-Use Items and Firearms etc. (Amendment) (EU Exit) Regulations 2019 ([S.I. 2019/771](#)), as amended by regulation 9 of the Export Control (Amendment) (EU Exit) Regulations 2020 ([S.I. 2020/1502](#)).
- (2) [EUR 2009/428](#); Article 15 was amended by regulation 3 of the Trade etc. in Dual-Use Items and Firearms etc. (Amendment) (EU Exit) Regulations 2019 ([S.I. 2019/771](#)), as amended by regulation 2 of the Trade etc. in Dual-Use Items and Firearms etc. (Amendment) (EU Exit) (No. 2) Regulations 2019 ([S.I. 2019/806](#)).
- (3) [S.I. 2008/3231](#); relevant amending instruments are [S.I. 2010/2007](#), [2012/1910](#), [2014/1069](#), [2015/940](#), [2017/85](#), [697](#), [2018/165](#), [939](#), [2019/137](#), [989](#), [1159](#), [2021/586](#), [2022/1042](#), [2023/302](#).

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- (a) in the Technical Note to entry ML4.b., for “*purpose of ML4.b.*” substitute “*purposes of ML4.b.*”;
- (b) in the Note to entry ML7—
 - (i) for “*Abstract*” substitute “*Abstracts*”;
 - (ii) for “(e.g. *hydrates*)” substitute “(e.g. *hydrates, isotopically-labelled forms or all possible stereoisomers*)”;
- (c) in the Note to entry ML8—
 - (i) for “*Abstract*” substitute “*Abstracts*”;
 - (ii) for “(e.g. *hydrates*)” substitute “(e.g. *hydrates, isotopically-labelled forms or all possible stereoisomers*)”;
- (d) in paragraph 1 of the Technical Note to entry ML8, for “*A ‘mixture’*” substitute “*For the purposes of ML8, excluding ML8.c.11. and ML8.c.12., a ‘mixture’*”;
- (e) in paragraph 2 of the Technical Note to entry ML8, for “*Particle size is*” substitute “*For the purposes of ML8, particle size is*”;
- (f) in the Technical Note in entry ML8.a., for “*An ‘explosive co-crystal’*” substitute “*For the purposes of ML8.a., an ‘explosive co-crystal’*”;
- (g) in entry ML8.d.3., after Note 2 on a new line insert—

<i>“Note 3:</i>	<i>ML8.d.3. does not control iodine pentafluoride (CAS 7783-66-6).”;</i>
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- (h) in the Technical Notes to entry ML8.h., before paragraph 1 on a new line, insert “*For the purposes of ML8.h.*”;
- (i) in the Technical Note to entry ML9.a.2.a.—
 - (i) for “*Mountings*” substitute “*For the purposes of ML9.a.2.a., ‘mountings’*”;
 - (ii) for “*purpose of*” substitute “*purposes of*”;
- (j) in entry ML9.a.2.c. for the Technical Notes, substitute—

<i>“Technical Note:</i>	<i>For the purposes of ML9.a.2.c.2., ‘pre-wet or wash down system’ is a seawater spray system capable of simultaneously wetting the exterior superstructure and decks of a vessel.”;</i>
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- (k) after entry ML9.a.2.d.4., on a new line, insert—

<i>“Technical Note:</i>	<i>For the purposes of ML9.a.2., ‘CBRN protection’ is a self-contained interior space containing features such as over-pressurisation, isolation of ventilation systems, limited ventilation openings with</i>
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CBRN filters and limited personnel access points incorporating air-locks.”;

- (l) in entry ML17.e.3., for “electro-magnetic pulse (EMP)” substitute “‘electromagnetic pulse’ (‘EMP’)”;
- (m) in the Technical Note to entry ML17.e.3., for “*Electro-magnetic pulse*” substitute “*For the purposes of ML17.e.3., ‘EMP’*”;
- (n) in entry ML18.a.—
 - (i) at the beginning, for “Specially” substitute “Equipment specially”;
 - (ii) omit “production equipment”;
- (o) for entry ML18.b. substitute—

“b.

Environmental test facilities, specially designed for the certification, qualification or testing of goods specified in this Schedule, and specially designed equipment therefor, not specified elsewhere in this Schedule”;

- (p) in entry PL5001.f., for “*article 9*” substitute “*article 42S*”.
- (3) In Schedule 3 (UK Controlled Dual-Use Goods, Software and Technology)—
 - (a) in the section headed “Definitions” insert at the appropriate place—

“‘circuit element’ is a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.”;

“‘digital computer’ means equipment which can, in the form of one or more discrete variables, perform all of the following—

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

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

“‘discrete component’ is a separately packaged ‘circuit element’ with its own external connections.”;

“‘electronic assemblies’ means a number of electronic components (i.e., ‘circuit elements’, ‘discrete components’, integrated circuits, etc.) connected together to

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perform (a) specific function(s), replaceable as an entity and normally capable of being disassembled.”;

“Process Design Kit” (“PDK”) is a software tool provided by a semiconductor manufacturer to ensure that the required design practices and rules are taken into account in order to successfully produce a specific integrated circuit design in a specific semiconductor process, in accordance with technological and manufacturing constraints (each semiconductor manufacturing process has its particular “PDK”);”;

(b) after entry PL9012 on a new line insert—

“

Electronics and related equipment, materials, software and technology

- PL9013 The export or “transfer by electronic means” of the following goods, “software” or “technology”, is prohibited to any destination:
- a. Systems, equipment and components, as follows:
1. Complementary Metal Oxide Semiconductor (CMOS) integrated circuits, not controlled in 3A001.a.2. in Annex I to “the dual-use Regulation”, designed to operate at an ambient temperature equal to or less (better) than 4.5 K (-268.65°C).
- Note: The status of wafers (finished or unfinished), in which the function has been determined, are to be evaluated against the parameters of PL9013.a.1.*
- Technical note:*
- For the purposes of PL9013.a.1., CMOS integrated circuits are also referred to as cryogenic CMOS or cryoCMOS integrated circuits.*
2. Equipment designed for dry etching, having any of the following:
- a. Equipment designed or modified for isotropic dry etching, having a largest ‘silicon germanium-to-silicon (SiGe:Si) etch selectivity’ of greater than or equal to 100:1; or
- b. Equipment designed or modified for anisotropic dry etching, having all of the following:

1. Radio Frequency (RF) power source(s) with at least one pulsed RF output;
2. One or more fast gas switching valve(s) with switching time less than 300 ms; and
3. Electrostatic chuck with 20 or more individually controllable variable temperature elements.

Note 1: PL9013.a.2. includes etching by 'radicals', ions, sequential reactions or non-sequential reactions.

Note 2: PL9013.a.2.b. includes etching using RF pulse excited plasma, pulsed duty cycle excited plasma, pulsed voltage on electrodes modified plasma, cyclic injection and purging of gases combined with a plasma, plasma atomic

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layer etching
or plasma
quasi-atomic
layer etching.

Technical Notes:

1. For the purposes of PL9013.a.2.a., 'silicon germanium-to-silicon (SiGe:Si) etch selectivity' is measured for a Ge concentration of greater than or equal to 30% ($\text{Si}_{0.70}\text{Ge}_{0.30}$).
2. For the purposes of PL9013.a.2. Note 1., 'radical' is defined as an atom, molecule or ion that has an unpaired electron in an open electron shell configuration.
3. Scanning Electron Microscope (SEM) equipment designed for imaging semiconductor devices or integrated circuits, having all of the following:
 - a. Stage placement accuracy less (better) than 30 nm,
 - b. Stage positioning measurement performed using laser interferometry,
 - c. Position calibration within a Field-Of-View (FOV) based on laser interferometer length-scale measurement,

- d. Collection and storage of images having more than 2×10^8 pixels,
 - e. FOV overlap of less than 5% in vertical and horizontal directions,
 - f. Stitching overlap of FOV less than 50 nm, and
 - g. Accelerating voltage more than 21 kV.
- Note 1:* PL9013.a.3. includes SEM equipment designed for chip design recovery.
- Note 2:* PL9013.a.3. does not control SEM equipment designed to accept a Semiconductor Equipment and Materials International (SEMI) standard wafer carrier, such as a 200 mm or larger Front Opening Unified Pod (FOUP).
4. Integrated circuits having an aggregate bidirectional transfer rate of 600 Gbyte/s or more over all inputs and outputs and to or from other integrated circuits, not including volatile memories, and having or being programmable to have any of the following:
- a. One or more digital processor units executing machine instructions having a 'total processing performance' of 6000 or more,
 - b. One or more digital 'primitive computational units', excluding those units contributing to the execution of machine instructions specified in PL9013.a.4.a., having a 'total processing performance' of 6000 or more,
 - c. One or more analogue 'primitive computational units' having a 'total processing performance' of 6000 or more, or
 - d. Any combination of digital processor units and 'primitive

computational units' on an integrated circuit whose 'total processing performance' across PL9013.a.4.a., PL9013.a.4.b. and PL9013.a.4.c. add up to 6000 or more.

Note: Integrated circuits specified in PL9013.a.4. include Graphical Processor Units (GPUs), Tensor Processing Units (TPUs), neural processors, in-memory processors, vision processors, text processors, co-processors/accelerators, adaptive processors, Field Programmable Logic Devices (FPLDs) and Application-Specific Integrated Circuits (ASICs).

Technical Notes:

For the purposes of PL9013.a.4.,

1. 'Total Processing Performance' ('TPP') is the bit length per operation multiplied by the processing performance measured in Tera Operations Per Second (TOPS) over all processor units on the integrated circuit. For example, the 'TPP' for an integrated circuit having two digital processor units that are each capable of 200 TOPS at 16 bits is 6400 (2 processors \times 200 TOPS \times 16 bits = 6400). In PL9013.a.4.c., the 'TPP' of each analogue 'primitive computational unit' is the processing performance expressed in TOPS multiplied by 8.
2. A 'primitive computational unit' is defined as containing zero or more modifiable weights, receiving one or more inputs, and producing one or more outputs. A computational unit is said to perform $2N-1$ operations whenever an output

is updated based on N inputs, where each modifiable weight contained in the processing element counts as an input. Each input, weight, and output might be an analogue signal level or a scalar digital value represented using one or more bits. Such units include:

*Artificial
neurons*

*Multiply
accumulate
(MAC) units*

*Floating-
Point Units
(FPUs)*

*Analogue
multiplier
units*

*Processing
units using
memristors,
spintronics, or
magnonics*

*Processing
units using
photonics or
non-linear
optics*

*Processing
units using
analogue or
multi-level
non-volatile
weights*

*Multi-value or
multi-level
units*

Spiking units

3. *Operations relevant to the calculation of TOPS include both scalar operations and the scalar constituents of composite operations such as vector operations, matrix operations, and tensor operations. Scalar*

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operations include integer operations, floating-point operations (often measured by FLOPS), fixed-point operations, bit-manipulation operations and/or bitwise operations.

4. *The rate of TOPS is the maximum value theoretically possible when all processing units are operating simultaneously. The rate of TOPS and aggregate bidirectional transfer rate is assumed to be the highest value the manufacturer claims in a manual or brochure for the chip.*

5. *The bit length of an operation is equal to the highest bit length of any input or output of that operation. Additionally, if the processor unit is designed for operations that achieve different bits × TOPS values, the highest bits × TOPS value should be used.*

6. *For processing units that provide processing of both sparse and dense matrices, the TOPS values are the values for processing of dense matrices (e.g., without sparsity).*

N.B.: *For “digital computers” and “electronic assemblies” containing integrated circuits specified in PL9013.a.4., see PL9014.a.2*

5. Parametric signal amplifiers having all of the following:

- a. Designed for operation at an ambient temperature below 1 K (-272.15°C),
- b. Designed for operation at any frequency from 2 GHz up to and including 15 GHz, and
- c. A noise figure less (better) than 0.015 dB at any frequency from

2 GHz up to and including 15 GHz at 1 K (-272.15°C).

Note: Parametric signal amplifiers include Travelling Wave Parametric Amplifiers (TWPAs).

Technical Note:

For the purposes of PL9013.a.5., parametric signal amplifiers may also be referred to as Quantum-Limited Amplifiers (QLAs).

6. Cryogenic cooling systems and components, as follows:

- a. Systems rated to provide a cooling power greater than or equal to 600 μ W at or below a temperature of 0.1 K (-273.05°C) for a period of greater than 48 hours;
- b. Two-stage pulse tube cryocoolers rated to maintain a temperature below 4 K (-269.15°C) and provide a cooling power greater than or equal to 1.5 W at or below a temperature of 4.2 K (-268.95°C).

7. ‘Extreme Ultraviolet’ (‘EUV’) masks and ‘EUV’ reticles, designed for integrated circuits, other than those specified in 3B001.g. in Annex I to “the dual-use Regulation”, and having a mask ‘substrate blank’ specified in 3B001.j. in Annex I to “the dual-use Regulation”;

Technical Notes:

For the purposes of PL9013.a.7.,

1. *Masks or reticles with a mounted pellicle are considered masks and reticles. A pellicle is a membrane integrated with a frame, designed to protect a mask or reticle from particle contamination.*
2. *‘Extreme Ultraviolet’ (‘EUV’) refers to electromagnetic spectrum wavelengths greater than 5 nm and less than 124 nm.*

3. *‘Substrate blanks’ are monolithic compounds with dimensions suitable for the production of optical elements such as mirrors or optical windows.*
8. Cryogenic wafer probing equipment having all of the following:
 - a. Designed to test devices at temperatures less than or equal to 4.5 K (-268.65°C); and
 - b. Designed to accommodate wafer diameters greater than or equal to 100 mm.
- b. Materials as follows:
 1. Epitaxial materials consisting of a ‘substrate’ having at least one epitaxially grown layer of any of the following:
 - a. Silicon having an isotopic impurity less than 0.08% of silicon isotopes other than silicon-28 or silicon-30; or
 - b. Germanium having an isotopic impurity less than 0.08% of germanium isotopes other than germanium-70, germanium-72, germanium-74, or germanium-76.
 2. Fluorides, hydrides, or chlorides of silicon or germanium, containing any of the following:
 - a. Silicon having an isotopic impurity less than 0.08% of silicon isotopes other than silicon-28 or silicon-30; or
 - b. Germanium having an isotopic impurity less than 0.08% of germanium isotopes other than germanium-70, germanium-72, germanium-74, or germanium-76.
 3. Silicon, silicon oxides, germanium or germanium oxides, containing any of the following:
 - a. Silicon having an isotopic impurity less than 0.08% of

silicon isotopes other than silicon-28 or silicon-30; or

- b. Germanium having an isotopic impurity less than 0.08% of germanium isotopes other than germanium-70, germanium-72, germanium-74, or germanium-76.

Note:

PL9013.b.3. includes 'substrates', lumps, ingots, boules and preforms.

Technical Note:

For the purposes of PL9013.b., 'substrate' is a sheet of base material with or without an interconnection pattern and on which or within which "discrete components" or integrated circuits or both can be located.

- c. "Software" as follows:
1. "Software" specially designed for the "development" or "production" of equipment specified in PL9013.a.2., PL9013.a.3., PL9013.a.5., PL9013.a.7. or PL9013.a.8.
 2. "Software" specially designed for the "use" of equipment specified in PL9013.a.2.
 3. "Software" designed to extract 'Geometrical Database Standard II' ('GDSII') or equivalent standard layout data and perform layer-to-layer alignment from Scanning Electron Microscope (SEM) images, and generate multi-layer 'GDSII' data or the circuit netlist.

Technical Note:

For the purposes of PL9013.c.3., 'Geometrical Database Standard II' ('GDSII') is a database file format for data exchange of integrated circuit or integrated circuit layout artwork.

- d. "Technology" as follows:
1. "Technology" according to the General Technology Note in Annex I to "the dual-use Regulation" for the "development" or "production" of equipment or materials specified in PL9013.a.1., PL9013.a.2., PL9013.a.3., PL9013.a.4., PL9013.a.5., PL9013.a.6., PL9013.a.7., PL9013.a.8. or PL9013.b.

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Note: PL9013.d.1. does not control “Process Design Kits” (“PDKs”).

2. “Technology” according to the General Technology Note in Annex I to “the dual-use Regulation” for the “development” or “production” of integrated circuits or devices, using ‘Gate all-around Field-Effect Transistor’ (‘GAAFET’) structures.

Note 1: PL9013.d.2. includes ‘process recipes’.

Technical Note:

For the purposes of PL9013.d.2. Note 1., a ‘process recipe’ is a set of conditions and parameters for a particular process step.

Note 2: PL9013.d.2. does not control tool qualification or maintenance “technology”.

Note 3: PL9013.d.2. does not control “Process Design Kits” (“PDKs”).

Technical Note:

For the purposes of PL9013.d.2., ‘Gate all-around Field-Effect Transistor’ (‘GAAFET’) means a device having a single or multiple semiconductor conduction channel element(s) with a common gate structure that surrounds and controls current in all of the semiconductor conduction channel elements.

Note: This definition includes nanosheet or nanowire field-effect and surrounding gate transistors and other ‘GAAFET’ semiconductor channel element structures.

Computers and related equipment, materials, software and technology

PL9014 The export or “transfer by electronic means” of the following goods, “software” or “technology”, is prohibited to any destination:

- a. Systems, equipment and components, as follows:
1. Quantum computers and related “electronic assemblies” and components therefor, as follows:

- a. Quantum computers as follows:
1. Quantum computers supporting 34 or more, but fewer than 100, ‘fully controlled’, ‘connected’ and ‘working’ ‘physical qubits’, and having a ‘C-NOT error’ of less than or equal to 10^{-4} ;
 2. Quantum computers supporting 100 or more, but fewer than 200, ‘fully controlled’, ‘connected’ and ‘working’ ‘physical qubits’, and having a ‘C-NOT error’ of less than or equal to 10^{-3} ;
 3. Quantum computers supporting 200 or more, but fewer than 350, ‘fully controlled’, ‘connected’ and ‘working’ ‘physical qubits’, and having a ‘C-NOT error’ of less than or equal to 2×10^{-3} .
 4. Quantum computers

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- supporting
350 or more,
but fewer than
500, ‘fully
controlled’,
‘connected’
and ‘working’
‘physical
qubits’, and
having a ‘C-
NOT error’ of
less than or
equal to 3×10^{-3} ;
5. Quantum
computers
supporting
500 or more,
but fewer than
700, ‘fully
controlled’,
‘connected’
and ‘working’
‘physical
qubits’, and
having a ‘C-
NOT error’ of
less than or
equal to 4×10^{-3} ;
6. Quantum
computers
supporting
700 or more,
but fewer than
1,100, ‘fully
controlled’,
‘connected’
and ‘working’
‘physical
qubits’, and
having a ‘C-
NOT error’ of
less than or
equal to 5×10^{-3} ;
7. Quantum
computers
supporting
1,100 or more,
but fewer than

2,000, ‘fully controlled’, ‘connected’ and ‘working’ ‘physical qubits’, and having a ‘C-NOT error’ of less than or equal to 6×10^{-3} .

8. Quantum computers supporting 2,000 or more ‘fully controlled’, ‘connected’ and ‘working’ ‘physical qubits’;

b. Qubit devices and qubit circuits, containing or supporting arrays of ‘physical qubits’, and specially designed for items specified in PL9014.a.1.a.;

c. Quantum control components and quantum measurement devices, specially designed for items specified in PL9014.a.1.a.

Note 1: PL9014.a.1. includes circuit model (or gate-based) and one-way (or measurement-based) quantum computers.

Note 2: PL9014.a.1. does not control adiabatic (or annealing) quantum computers.

Note 3: Items specified in PL9014.a.1. may not necessarily physically contain any qubits. For example, quantum computers based on photonic schemes do not permanently contain a physical item that can be identified as a qubit. Instead, the photonic qubits are generated while the computer

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is operating and then later discarded.

Note 4: PL9014.a.1.b. includes the following:

semiconductor, superconducting, and photonic qubit chips and chip arrays;

surface ion trap arrays;

other qubit confinement technologies; and

coherent interconnects between such items.

Note 5: PL9014.a.1.c. includes items designed for calibrating, initialising, manipulating or measuring the resident qubits of a quantum computer.

Technical Notes:

For the purposes of PL9014.a.1.:

1. A 'physical qubit' is a two-level quantum system used to represent the elementary unit of quantum logic by means of manipulations and measurements that are not error corrected. 'Physical qubits' are distinguished from logical qubits, in that logical qubits are error-corrected qubits comprised of many 'physical qubits'.
2. 'Fully controlled' means the 'physical qubit' can be calibrated, initialised, gated, and read out, as necessary.
3. 'Connected' means that two-qubit gate operations can be performed between any arbitrary pair of the available

- ‘working’ ‘physical qubits’.*
This does not necessarily entail all-to-all connectivity.
4. *‘Working’ means that the ‘physical qubit’ performs universal quantum computational work according to the system specifications for qubit operational fidelity.*
 5. *Supporting 34 or more ‘fully controlled’, ‘connected’, ‘working’ ‘physical qubits’ refers to the capability of a quantum computer to confine, control, measure and process the quantum information embodied in 34 or more ‘physical qubits’.*
 6. *‘C-NOT error’ is the average physical gate error for the nearest-neighbour two-‘physical qubit’ Controlled-NOT (C-NOT) gates.*
2. Computers, “electronic assemblies” and components containing one or more integrated circuits specified in PL9013.a.4.
- Note: Computers include “digital computers”, hybrid computers, and analogue computers.*
- b. Materials as follows:
This entry is not used.
- c. “Software” as follows:
1. “Software” specially designed or modified for the “development” or “production” of equipment specified in PL9014.a.1.b., PL9014.a.1.c. or PL9014.a.2.
- d. “Technology” as follows:
1. “Technology” according to the General Technology Note in Annex I to “the dual-use Regulation” for the “development” or “production” of equipment specified in PL9014.a.1.b., PL9014.a.1.c. or PL9014.a.2, or software specified in PL9014.c.1.
 2. “Technology” according to the General Technology Note in Annex I to “the dual-

use Regulation” for the “use” of equipment specified in PL9014.a.2.

Materials processing and related equipment, materials, software and technology

PL9015 The export or “transfer by electronic means” of the following goods, “software” or “technology”, is prohibited to any destination:

- a. Systems, equipment and components, as follows:
 - 1. Additive manufacturing equipment, designed to produce metal or metal alloy components, having all of the following, and specially designed components therefor:
 - a. having at least one of the following consolidation sources:
 - 1. ‘Lasers’;
 - 2. Electron beam; or
 - 3. Electric arc;
 - b. having a controlled process atmosphere of any of the following:
 - 1. Inert gas; or
 - 2. Vacuum (equal to or less than 100 Pa);
 - c. having any of the following 'in-process monitoring' equipment in a 'co-axial configuration' or 'paraxial configuration':
 - 1. Imaging camera with a peak response in the wavelength range exceeding 380 nm but not exceeding 14,000 nm;
 - 2. Pyrometer designed to measure temperatures

- greater than 1,273.15 K (1,000°C); or
- 3. Radiometer or spectrometer with a peak response in the wavelength range exceeding 380 nm but not exceeding 3,000 nm; and
- d. A closed loop control system designed to modify the consolidation source parameters, build path, or equipment settings during the build cycle in response to feedback from 'in-process monitoring' equipment specified in PL9015.a.1.c.

Technical Notes

For the purposes of PL9015.a.1.,

- 1. *'Laser' is an item that produces spatially and temporally coherent light through amplification by stimulated emission of radiation.*
- 2. *'In-process monitoring', also known as in-situ process monitoring, pertains to the observation and measurement of the additive manufacturing process including electromagnetic or thermal emissions from the melt pool.*
- 3. *'Co-axial configuration', also known as on-axis or inline configuration, pertains to one or more sensors that are mounted in an optical path shared by the 'laser' consolidation source.*
- 4. *'Paraxial configuration' pertains to one or more sensors that are physically mounted onto or integrated into the 'laser', electron beam*

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or electric arc consolidation source component.

5. *For both ‘co-axial configuration’ and ‘paraxial configuration’, the field of view of the sensor(s) is fixed to the moving reference frame of the consolidation source and moves in the same scan trajectories of the consolidation source throughout the build process.*

b. Materials as follows:

This entry is not used.

c. “Software” as follows:

1. “Software” specially designed or modified for the “development” or “production” of equipment specified in PL9015.a.1.

d. “Technology” as follows:

1. “Technology” according to the General Technology Note in Annex I to “the dual-use Regulation” for the “development” or “production” of equipment specified in PL9015.a.1. or software specified in PL9015.c.1.
2. “Technology”, not specified in Annex I to “the dual-use Regulation”, for the “development” or “production” of ‘coating systems’ having all of the following:
- a. Designed to protect ceramic ‘matrix’ ‘composite’ materials specified in 1C007 in Annex I to “the dual-use Regulation” from corrosion; and
 - b. Designed to operate at temperatures exceeding 1,373.15 K (1,100#).

Technical Notes:

For the purposes of PL9015.d.2.:

1. *‘Coating systems’ consist of one or more layers (e.g., bond, interlayer, top coat) of material deposited on the substrate.*
2. *‘Matrix’ means a substantially continuous phase that fills*

the space between particles, whiskers or fibres.

3. *‘Composite’ means a ‘matrix’ and an additional phase or additional phases consisting of particles, whiskers, fibres or any combination thereof, present for a specific purpose or purposes.’.*

Amendments to Council Regulation (EC) No 428/2009

3.—(1) Annex I (list of dual-use items) to 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 (Recast)(4) is amended as follows.

(2) In the section headed “ACRONYMS AND ABBREVIATIONS USED IN THIS ANNEX”, insert at the appropriate place—

“AIP	Air Independent Propulsion”.
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(3) In the section headed “DEFINITIONS OF TERMS USED IN THIS ANNEX”—

(a) insert at the appropriate place—

““Charge multiplication” (6) is a form of electronic image amplification defined as the generation of charge carriers as a result of an impact ionisation gain process. “Charge multiplication” sensors may take the form of an image intensifier tube, solid state detector or “focal plan array”.”;

““High output diesel engines” (9) are diesel engines with a specified brake mean effective pressure of 1.8 MPa or more at a speed of 2,300 r.p.m., provided the rated speed is 2,300 r.p.m. or more.”;

(b) in the definition of “Vulnerability disclosure” for “purpose” substitute “purposes”.

(4) In the section headed “[1A] Systems, Equipment and Components”—

(a) in the Note to entry 1A003, for “production” substitute ““production””;

(b) in entry 1A007, after “NB: SEE ALSO MILITARY GOODS CONTROLS, 3A229 AND 3A232.”, on a new line, insert—

“Technical Note:

For the purposes of 1A007., the word initiator or igniter is sometimes used in place of the word detonator.”;

(c) in entry 1A007, for the Technical Notes substitute—

“Technical Note:

For the purposes of 1A007.b., the detonators of concern all utilise a small electrical conductor (bridge, bridge wire, or foil) that explosively vaporises when a fast, high-current electrical pulse is passed through it. In non-slapper types, the exploding conductor starts a chemical detonation

(4) EUR 2009/428; relevant amending instruments are [S.I. 2019/771](#), [2022/410](#), [2023/302](#), [695](#) and [1048](#).

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in a contacting high explosive material such as PETN (pentaerythritoltetranitrate). In slapper detonators, the explosive vaporization of the electrical conductor drives a flyer or slapper across a gap, and the impact of the slapper on an explosive starts a chemical detonation. The slapper in some designs is driven by magnetic force. The term exploding foil detonator may refer to either an EB or a slapper-type detonator.”.

(5) In the section headed “[1B] Test, Inspection and Production Equipment”—

(a) for the words from “[1B001] Equipment” through to “therefor:” substitute—

“[1B001] Equipment designed for the “production” of “composite” structures or laminates or “fibrous or filamentary materials”, as follows, and specially designed components and accessories therefor:”;

(b) in entry 1B001.d., for “adapted for the production of reinforcement fibres” substitute “modified for the “production” of “fibrous or filamentary materials” specified in 1C010”;

(c) in entry 1B001.e., for “for producing prepregs specified in 1C010.e. by the hot melt method” substitute “specially designed or modified for the production of prepregs by the ‘hot melt method’”;

(d) after entry 1B001.e., on a new line, insert—

“Technical Note:

For the purposes of 1B001.e., the 'hot melt method' is the process of applying pressure and heat to impregnate “fibrous or filamentary materials” with resin that has been pre-laminated onto a carrier substrate, such as film or paper.”.

(6) In the section headed “[1C] Materials”—

(a) after entry 1C011.d., on a new line insert—

“e.	Iodine pentafluoride (CAS 7783-66-6).”;
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(b) after entry 1C350.89., on a new line insert—

“90.	Dipropylamine (CAS 142-84-7).”;
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(c) after entry 1C351.d.23., on a new line insert—

“24.	Neosaxitoxin (NEO).”.
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(7) In the section headed “[2B] Test, Inspection and Production Equipment”—

(a) in entry 2B116.a., for “Vibration test systems employing feedback or closed loop techniques and incorporating a digital controller” substitute ““Vibration test systems incorporating a digital controller’ and employing feedback or closed loop techniques”;

(b) after entry 2B116.a., on a new line, insert—

“Technical note:

In Item 2B116.a., 'vibration test systems incorporating a digital controller' are those systems, the functions of which are, partly or entirely, automatically controlled by stored and digitally coded electrical signals.”;

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- (c) in entry 2B209.b., for “400 mm” substitute “650 mm”;
 - (d) in paragraph 1 of the Technical Note to entry 2B228.c., for “400 mm” substitute “650 mm”;
 - (e) in entry 2B351, after “monitoring systems” insert “,”;
 - (f) in entry 2B351.a., for “at concentrations” substitute “with a ‘minimum detection limit’”;
 - (g) after entry 2B351.b., on a new line insert—

“Technical Note:

The 'minimum detection limit' of a toxic gas monitor or monitoring system is the lowest detectable concentration of the analyte required to produce a signal greater than three times the standard deviation of the toxic gas monitor's or monitoring system's signal when measuring a blank sample.

In the case of toxic gas monitors or monitoring systems having a deadband or programmed zero suppression, the 'minimum detection limit' is the lowest detectable concentration required to produce a reading.”.

-
- (8) In the section headed “[3A] Systems, Equipment and Components”—
 - (a) in entry 3A001.b.7.a., for “90” substitute “110”;
 - (b) in entry 3A001.b.7.b.1., for “90” substitute “110”;
 - (c) in entry 3A001.b.7.b.2., for “90” substitute “110”;
 - (d) in entry 3A001.b.7.c.2., for “31,62 mW (15 dBm) anywhere within the frequency range exceeding 43,5 GHz but not exceeding 90” substitute “100mW (20 dBm) anywhere within the frequency range exceeding 43.5 GHz but not exceeding 110”;
 - (e) in entry 3A001.b.7.c.3., for the words “To an output power” to “exceeding 110 GHz” substitute “Not used”;
 - (f) in entry 3A002.c.2.—
 - (i) for “150” substitute “160”;
 - (ii) for “90” substitute “110”;
 - (g) in entry 3A002.c.3., for “90” substitute “110”;
 - (h) in entry 3A002.c.4.a., for “170” substitute “520”;
 - (i) in entry 3A002.c.4.b.1., for “15” substitute “8”;
 - (j) in entry 3A002.c.4.b.2., for “15” substitute “8”;
 - (k) after entry 3A002.d.1.b., on a new line insert—

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“Technical Note:

For the purposes of 3A002.d.1.a., 'pulse duration' is defined as the time interval from the point on the leading edge that is 50% of the pulse amplitude to the point on the trailing edge that is 50% of the pulse amplitude.”;

- (l) in entry 3A002.d.2., for “90” substitute “110”;
 - (m) in entry 3A002.d.3.g., for “90” substitute “110”;
 - (n) in entry 3A002.d.4.a., for “90” substitute “110”;
 - (o) in entry 3A002.d.4.b., for “90” substitute “110”;
 - (p) in entry 3A002.d.6., for “90” substitute “110”;
 - (q) in Note 1 to entry 3A002.d., for “*For the purpose of 3A002.d., signal generators include*” substitute “*3A002.d. includes*”;
 - (r) for the Technical Notes to entry 3A002.d., substitute—
-

“Technical Note:

For the purposes of 3A002.d., the maximum output frequency of an arbitrary waveform or function generator is calculated by dividing the sample rate, in samples/second, by a factor of 2.5.”;

- (s) in entry 3A002.e.1.—
 - (i) for “31,62” substitute “100”;
 - (ii) for “15” substitute “20”;
 - (iii) for “90” substitute “100”;
- (t) for entry 3A002.e.2. substitute “2. Not used”.
- (9) In the section headed “[3B] Test, Inspection and Production Equipment”—
 - (a) in entry 3B001.a.2., after “antimony,” insert “oxygen”;
 - (b) in paragraph 1 of the Technical Notes to entry 3B001.e.1., for “*production*” substitute “*“production”*”.
- (10) In the section headed “[3C] Materials”—
 - (a) in entry 3C001, after “Hetero-epitaxial materials” insert “, not specified in PL9013.b. in Schedule 3 to the Export Control Order 2008,”;
 - (b) in entry 3C003.a., for “better” substitute “greater (better)”;
 - (c) in entry 3C003.b., for “better” substitute “greater (better)”;
 - (d) in entry 3C004, for “better” substitute “greater (better)”.

(11) In the section headed “[5A1] Systems, Equipment and Components”, in entry 5A001.b.2.b., for “better” substitute “less (better)”.

(12) In the section headed “[5D1] Software”—

(a) in entry 5D001.e.—

(i) for “by” substitute “for”;

(ii) after “law enforcement” insert “purposes”;

(b) in entry 5D001.e.2. after “movement” insert “or location”.

(13) In the section headed “[5A2] Systems, Equipment and Components”—

(a) in entry 5A002.a., omit “where that cryptographic capability is usable, has been activated, or can be activated by any means other than secure “cryptographic activation”,”;

(b) in the Technical Notes to entry 5A002.a., in paragraph 1—

(i) for “*and performs any cryptographic function*” substitute “*for a cryptographic function or capability that is usable or can be made usable,*”;

(ii) for paragraph g. substitute—

“g. *Wireless “personal area network” functionality implementing only published or commercial cryptographic standards;*

h. *Cryptographic operations specially designed for and limited to banking use or money transactions, including the collection and settlement of fares or credit functions;*

i. *Key management in support of and limited to functions and capabilities described in paragraph a. to h. above; or*

j. *Cryptographic functions or capabilities that have not been activated or enabled, and can only be activated or enabled by means of secure “cryptographic activation”.*

N.B.

For ‘cryptographic activation token’ items, see 5A002.b., 5D002.b. and 5E002.b.”;

(c) in Note 1.b. to entry 5A002.a.—

(i) for “*cryptographic capability for data confidentiality specified in 5A002.a.*” substitute “*‘cryptology for data confidentiality’ having a ‘described security algorithm’*”;

(ii) after “*without*” insert “*secure*”;

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- (d) in Note 2.a.1.a. to entry 5A002.a., for “*cryptographic capability*” insert “*‘cryptography for data confidentiality’ having a ‘described security algorithm’*”;
- (e) for Note 2.a.1.a.1. to entry 5A002.a substitute—

“1. *It is restricted for use in equipment or systems to which 5A002.a. does not apply for reasons other than the Cryptography Note (Note 3 in Category 5 – Part 2); and*”;

- (f) in Note 2.a.1.b.3. to entry 5A002.a., for “*cryptographic capability*” substitute “*‘cryptography for data confidentiality’ having a ‘described security algorithm’*”;
- (g) in Note 2.a.2. to entry 5A002.a., omit “*‘specially designed or modified, and limited, for items specified by paragraph a.1. of this Note’*”;
- (h) for Note 2.b. to entry 5A002.a. substitute—

“b. *Not used.*”;

- (i) for Note 2.c. to entry 5A002.a. substitute—

“c. *Portable or mobile radiotelephones designed for civil use, other than satellite telephones, that are not capable of any of the following:*

- 1. *Transmitting encrypted data directly to another radio telephone or equipment (other than Radio Access Network (RAN) equipment); or*
- 2. *Passing encrypted data through RAN equipment (e.g., Radio Network Controller (RNC) or Base Station Controller (BSC));”;*

- (j) in Note 2.e. to entry 5A002.a.—
 - (i) after “*devices*” insert “*designed*”;
 - (ii) from the words “*that implement only*” to the end, substitute—

“meeting all of the following:

1. *The non-customised devices satisfy the provisions of the Cryptography Note (Note 3 in Category 5 – Part 2); and*
2. *The 'cryptography for data confidentiality' having a 'described security algorithm' of the non-customised devices is not affected by the customisation, and implements only published or commercial cryptographic standards;”;*

(k) for Note 2.f. to entry 5A002.a. substitute—

<i>“f.</i>	<i>Not used.</i>	
	<i>N.B.</i>	<i>See paragraph g. of Technical Note 1 to 5A002.a. for items previously described in this Note 2.f.”;</i>

- (l) in Note 2.g. to entry 5A002.a., for “16” substitute “32”;
 - (m) in Note 2.h. to Note 2.j. to entry 5A002.a. for each instance of ““information security” functionality” substitute “‘cryptography for data confidentiality’ having a ‘described security algorithm’”;
 - (n) in Note 2.i.1. to entry 5A002.a., for “Uses” substitute “Implements”;
 - (o) in Note 2.i.2.b. to entry 5A002.a., for “that is not specified in 5D002;” substitute “to which 5D002 does not apply;”.
- (14) In the section headed “[6A] Systems, Equipment and Components”—
- (a) in entry 6A001.a.1.d., for “underwater” substitute “submersible”;
 - (b) in paragraph a. of the Note to entry 6A001.a.1.d.2., for “underwater” substitute “submersible”;
 - (c) in entry 6A001.a.2.a.4., for “better” substitute “greater (better)”;
 - (d) in entry 6A001.a.2.a.6., for “better” substitute “greater (better)”;
 - (e) in entry 6A001.a.2.b. omit the Technical Note;
 - (f) after entry 6A001.a.2.b.8. at the end, on a new line, insert—

“Technical Note:

For the purposes of 6A001.a.2.b., 'able to be modified' means having provisions to allow a change of the wiring or interconnections to alter hydrophone group spacing or operating depth limits. These

*provisions are:
 spare wiring
 exceeding 10% of
 the number of
 wires,
 hydrophone
 group spacing
 adjustment blocks
 or internal depth
 limiting devices
 that are
 adjustable or that
 control more than
 one hydrophone
 group.”;*

- (g) in entry 6A001.a.2.d.1., for “better” substitute “less (better)”;
- (h) in entry 6A001.a.2.g.2., for “better” substitute “greater (better)”;
- (i) in entry 6A001.b.1.b., for “better” substitute “less (better)”;
- (j) in entry 6A001.b.2., for “better” substitute “less (better)”;
- (k) in entry 6A002.a.2. omit the Technical Note;
- (l) in entry 6A002.a.2.a.2.b., for “charge multiplication” substitute “charge multiplication”;
- (m) in entry 6A002.a.2.c.2., for “charge multiplication” substitute “charge multiplication”;
- (n) in Note 2.c. to entry 6A002.a.3., for “charge multiplication” substitute “charge multiplication”;
- (o) in entry 6A002.a.3.a.2.b., for “charge multiplication” substitute “charge multiplication”;
- (p) in entry 6A002.a.3.b.2.b., for “charge multiplication” substitute “charge multiplication”;
- (q) in entry 6A002.a.3.g.2., for “charge multiplication” substitute “charge multiplication”;
- (r) in paragraph 1 and 2 of the Note to entry 6A002.b.2.b, in both instances for “charge multiplication” substitute “charge multiplication”;
- (s) in entry 6A003.a.3., for “better” substitute “less (better)”;
- (t) in entry 6A005.f.3.a., for “less” substitute “less (better)”;
- (u) in entry 6A005.g.2., for “better (less)” substitute “less (better)”;
- (v) in entry 6A005.g.4., for “better (less)” substitute “less (better)”;
- (w) in entry 6A006.a.1.a., for “lower” substitute “less”;
- (x) in entry 6A006.a.1.b., for “lower” substitute “less”;
- (y) in entry 6A006.a.2., for “lower” substitute “less”;
- (z) in entry 6A006.a.3., for “lower” substitute “less”;
- (z1) in entry 6A006.a.4., for “lower” substitute “less”;
- (z2) in entry 6A006.a.5., for “lower” substitute “less”;
- (z3) in entry 6A006.b., for “lower” substitute “less”;
- (z4) in entry 6A006.c.2., for “lower” substitute “less”;

(z5) in entry 6A006.c.3., for “lower” substitute “less”.

(15) In the section headed “[6B] Test, Inspection and Production Equipment”, in entry 6B004.a. for “better” substitute “less (better)”.

(16) In the section headed “[6C] Materials”, for the Technical Notes to entry 6C005 substitute—

“Note: 6C005.b. includes fibres assembled with end caps.

Technical Note:

For the purposes of 6C005.b, the core 'Numerical Aperture' ('NA') is measured at the emission wavelengths of the fibre.1.”;

(17) In the section headed “[6E] Technology”, in entry 6E003.a.2. for “better” substitute “less (better)”.

(18) In the section headed “[7A] Systems, Equipment and Components”—

(a) in the paragraph beginning with “NB: at the beginning” for “*underwater*” substitute “*submersible*”;

(b) for the Technical Note to entry 7A003.b., substitute—

“Note: 7A003.b. refers to systems in which ‘inertial measurement equipment or systems’ and other independent ‘positional aiding references’ are built into a single unit (i.e., embedded) in order to achieve improved performance.”.

(19) In the section headed “[8A] Systems, Equipment and Components”—

(a) in entry 8A002.a.4. omit the Technical Note;

(b) in entry 8A002.d.1., for “an underwater” substitute “a submersible”;

(c) in entry 8A002.o., after “reduction systems” insert “and related equipment”;

(d) in entry 8A002.o.2.d.—

(i) omit “shaft”;

(ii) for “material components and capable of transmitting more than 2 MW” substitute “shafts and designed to transmit power exceeding 10 MW”;

(e) in entry 8A002.o.3., after “reduction systems” insert “and related equipment”.

(20) In the section headed “[9A] Systems, Equipment and Components”—

(a) in entry 9A006.a., for “specially designed for use in space vehicles and capable of restricting” substitute “designed to restrict”;

(b) for entry 9A006.b. substitute—

“b. Cryogenic containers or closed-cycle refrigeration systems, designed to maintain or produce temperatures less than or equal to 100 K (- 173.15° C);”.

(21) In the section headed “[9B] Test, Inspection and Production Equipment” in entry 9B010, for “production” substitute “‘production’”.

(22) In the section headed “[9D] Software” in the Note to entry 9D004.b., for “production” substitute ““production””.

(23) In the section headed “[9E] Technology”—

- (a) in entry 9E001, omit “9A001.b.”;
- (b) in entry 9E002, omit “9A001.b.”;
- (c) in entry 9E003.f., for “high output diesel engines” substitute ““high output diesel engines””;
- (d) in entry 9E003.g. for “high output diesel engines” substitute ““high output diesel engines””;
- (e) in entry 9E003.g. omit the Technical Note.

Signed by authority of the Secretary of State

7th March 2024

Nusrat Ghani
Minister of State
Department for Business and Trade

EXPLANATORY NOTE

(This note is not part of the Regulations)

These Regulations amend the Export Control Order 2008 (S.I. 2008/3231) (“the 2008 Order”) and 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 (Recast) (EUR 2009/428) (“the assimilated Dual-Use Regulation”).

Regulation 2 amends Schedule 2 to the 2008 Order, updating controls lists to reflect amendments to the Wassenaar Arrangement Munitions List. Regulation 2 also amends Schedule 3 to the 2008 Order, introducing new controls on certain specific emerging technology that the UK is implementing alongside a number of other like-minded countries, in order to strengthen the national controls and address weaknesses in the multilateral system.

Regulation 3 amends Annex I to the assimilated Dual-Use Regulation, which lists dual-use goods, software and technology subject to export controls. These amendments reflect changes to the Wassenaar Arrangement dual-use list as well as changes to the control lists administered by other multilateral export control regimes, including the Australia Group, Nuclear Suppliers Group and the Missile Technology Control Regime, in line with UK’s commitments as a member of these regimes.

An impact assessment has not been produced for this instrument as no, or no significant, impact on the private, voluntary or public sectors is foreseen. An Explanatory Memorandum is available from the Export Control Joint Unit, Old Admiralty Building, London SW1A 2DY. The Explanatory Memorandum has also been published alongside the instrument on the www.legislation.gov.uk website, and a copy has been placed in the Libraries of both Houses of Parliament.