SCHEDULE 1

PROHIBITED GOODS–MISCELLANEOUS CONTENTS

PART II

Note: The goods in this Part are for convenience specified by reference to the classification system used by the Department of Trade and Industry for export control purposes.

GROUP 1

Note: Goods specified in the heads of this Group may also be specified in Groups 3E, 3F and 3G of this Part of this Schedule.

Military aircraft and helicopters, Arms and related material, Ammunition, Military Stores and Appliances, and Security and Para-Military Equipment

ML1	Small arms and machine guns, the following: and specially designed components therefor–	
	(a) Rifles, carbines, revolvers, pistols, machine pistols and machine guns	C
	(b) Smooth-bore weapons specially designed for military use	C
	(c) Weapons using caseless ammunition	C
	except–	
	air weapons (other than those declared by the Firearms (Dangerous Air Weapons) Rules 1969(**1**) to be specially dangerous).	
PL5018	Smooth-bore weapons other than those specially designed for military use	C
	except–	
	air weapons (other than those declared by the Firearms (Dangerous Air Weapons' Rules 1969 to be specially dangerous).	
PL5003	Mountings for machine guns	C

(**1**) S.I. 1969/47.

ML2	Large calibre armament or weapons and projectors the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Guns, howitzers, cannon, mortars, tank destroyers, projectile launchers, military flame throwers, recoilless rifles	C
	(b) Military smoke, gas and pyrotechnic projectors or generators	C
ML3	Ammunition, including projectiles, and specially designed components and specially designed ODMA software therefor, for the equipment mentioned in entries ML1, ML2 and ML26	C
PL5021	Ammunition, including projectiles, and specially designed components and specially designed ODMA software therefor, for the equipment specified in entry PL5018	C
ML4	Bombs, torpedoes, rockets and missiles, the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Bombs, torpedoes, grenades (including smoke grenades), smoke canisters, rockets, mines, missiles, depth charges, fire bombs, incendiary bombs and military demolition charges, devices and kits, pyrotechnic flare signals for military use, cartridges and simulators	A
	(b) Apparatus and devices specially designed for the handling, control,	A

	activation, powering with one time operational output, launching, laying, sweeping, discharging, detonation or detection of items specified in head (a)	
	(c) Military fuel thickeners, including compounds (eg octal) or mixtures of such compounds (eg napalm) specifically formulated for the purpose of producing materials which, when added to petroleum products, provide gel-type incendiary material for use in bombs, projectiles, flamethrowers or other implements of war	C
PL5019	Radomes specially designed to withstand a combined thermal shock greater than 41.8 kJ/m accompanied by a peak overpressure of greater than 49 kPa	C
PL5005	Apparatus and devices specially designed for the refuelling or disruption of items specified in head (a) of entry ML4 in this Group and specially designed components therefor	C
PL5006	Apparatus and devices specially designed for dealing with improvised explosive devices or with other explosive devices not specified in head (a) of entry ML4, and specially designed ODMA software therefor	C
	In this entry “improvised explosive devices” means devices placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals, designed	

	to destroy, disfigure or harass. They may incorporate military stores, but are normally devised from non-military components.	
PL5026	Quartz crystals and assemblies thereof in worked, semi-finished, or mounted form, specially designed for equipment specified in entry ML4 in this Group, which have any of the following characteristics–	
	(a) Radiation hardened	C
	(b) An operating temperature range wider than 120° C	C
	(c) Rated to have an acceleration sensitivity of less than 1×10^{-9}: of the operating frequency per g (where g=9.81 metres/ sec^2) over a vibration test frequency range from 10 Hz to 2 KHz sinewave and with a maximum level of acceleration not exceeding 20 g	C
PL5024	Electrical pulsers capable of precisely timed, multiple initiations of explosives, controlled to ten microseconds or less, capable of delivering an output current greater than 100 amperes into a load of less than 40 ohms, and specially designed components and equipment therefor	C
ML5	Fire control systems and sub-systems, specially designed for military use, the following: and specially designed components and accessories and specially designed ODMA software therefor–	
	(a) Fire control, gun laying, night sighting, missile tracking and guidance equipment	A

		and target surveillance equipment	
		(b) Range, position and height finders, spotting instruments, detection, recognition or identification equipment and sensor integration equipment	A
		(c) Electronic, electro-optic, gyroscopic, acoustic and optical aiming or sighting devices	C
		(d) Bomb sights, bombing computers, gun sights and periscopes	C
ML6	Vehicles specially designed or modified for military use, the following: and specially designed components and specially designed ODMA software therefor–		
		(a) Tanks and self-propelled guns	C
		(b) Military type armed or armoured vehicles, and vehicles fitted with mounting for arms	C
		(c) Armoured railway trains	C
		(d) Military half-tracks	C
		(e) Military type recovery vehicles	C
		(f) Gun-carriers and tractors specially designed for towing artillery	C
		(g) Trailers specially designed to carry ammunition	C
		(h) Amphibious and deep water fording military vehicles	C
		(i) Military mobile repair shops specially designed	C

	to service military equipment	
	(j) All other military vehicles specially designed or modified for military use, including tank transporters, tracked amphibious cargo carriers, high speed tractors and heavy artillery transporters	A
	(k) Pneumatic tyre casings of a kind specially constructed to be bullet proof or to run when deflated	C
	(l) Engines for the propulsion of the vehicles specified in heads (a) to (j), and specially designed components therefor	C
	(m) Tyre inflation pressure control systems, operated from inside a moving vehicle, specially designed or modified for military use	C
	(n) Large deflection suspensions specially designed or modified for military use	C
	In this entry "specially modified for military use" means a structural, electrical or mechanical modification which entails replacing a component with at least one specially designed military component, or adding at least one such component.	
ML7	Toxicological agents and tear gas and related equipment, components, materials and technology the following: and specially designed ODMA software therefor–	
	(a) Biological agents, chemical agents and	C

radioactive materials adapted for use in war to produce casualties in humans or animals, or to damage crops	
(aa) Tear gases and riot control agents, the following–	
(1) Bromobenzyl cyanide (CR)	C
(2) oChlorobenzylidenemalononitrile (CS)	C
(3) Phenylacyl chloride (w-Chloroacetophenone) (CN)	C
(b) Equipment specially designed and intended for the dissemination of the materials specified in head (a)	C
(c) Equipment specially designed and intended for defence against the materials specified in head (a) and for their detection and identification	C
(d) Components specially designed for the items specified in head (b) or (c)C	
(e) Biopolymers specially designed or processed for detection and identification of chemical warfare (CW) agents specified in head (a) and the cultures of specific cells used to produce them	C
(f) Biocatalysts for decontamination and degradation of CW agents, and biological systems therefor, the following–	

(1) biocatalysts, specially designed for decontamination and degradation of CW agents described in head (a) resulting from directed laboratory selection or genetic manipulation of biological systems;	C
(2) biological systems, the following: expression vectors, viruses or cultures of cells containing the genetic information specific to the production of biocatalysts specified in subhead (f)(1)	C
(g) Technology, the following–	
(1) technology for the development, production or use of toxicological agents, related equipment or components, agents, or materials specified in heads (a) to (d), or of tear gas	D
(2) technology for the development, production or use of biopolymers, and cultures of specific cells to produce them, specified in head (e) D	
(3) technology exclusively for the incorporation of biocatalysts specified in subhead (f)(1) into military carrier substances or military material	D
(h) Noxious chemicals, the following–	
(1) Bromobenzyl cyanide	C

(2) oChlorobenzylidenemalononitrile (oChlorobenzalmalononitrile)	C
(3) monoChloromethyl chlorformate	C
(4) 2-Chlorotriethylamine	C
(5) Dibenzoxazepine	C
(6) Dibromodimethyl ether	C
(7) Dichloromodimethyl ether	C
(8) 2:2'-Dichlorotriethylamine	C
(9) Diphenylaminechloroarsine	C
(10) Diphenylchloroarsine	C
(11) Diphenylcyanoarsine	C
(12) Ethyl NN-dimethylphosphoramidocyanidate	C
(13) Ethyldibromoarsine	C
(14) Ethyldichloroarsine	C
(15) Lewisite (chlorovinyldichloroarsine and dichlorodivinylchloroarsine)	C
(16) Methyldichloroarsine	C
(17) Mustard gas (dichlorodiethyl sulphide)	C
(18) Phenylcarbylamine chloride (phenylaminocarbonyl chloride)	C
(19) Phenylacyl chloride (w-Chloroacetophenone)	C
(20) Phenyldibromoarsine	C
(21) Phenyldichloroarsine	C

(22) Pinacolyl methylphosphonofluoridate	C
(23) isoPropyl methylphosphonofluoridate	C
(24) 2:2':2" Trichlorotriethylamine	C

In this entry–

"anti-idiotypic antibodies" means antibodies which bind to the specific antigen binding sites of other antibodies;

"biocatalysts" means enzymes and other biological compounds which bind to and accelerate the degradation of CW agents;

"biopolymers" means the following biological macromolecules:

(1) enzymes;

(2) antibodies, monoclonal, polyclonal or anti-idiotypic;

(3) specially designed or specially processed receptors;

"enzymes" means biocatalysts for specific chemical or biochemical reactions;

"expression vectors" means carriers (eg plasmid or virus) which are used to introduce genetic material into host cells;

"monoclonal antibodies" means proteins which bind to one antigenic site and are produced by a single clone of cells;

	"polyclonal antibodies" means a mixture of proteins which bind to the specific antigen and are produced by more than one clone of cells;	
	"receptors" means biological macromolecular structure capable of binding ligands, the binding of which affects physiological functions;	
	"riot control agents" means substances which produce temporary, irritating or disabling physical effects which disappear within minutes of removal from exposure.	
	"tear gases" means gases which produce temporary, irritating or disabling physical effects which disappear within minutes of removal from exposure;	
PL5009	Explosives and propellants, and related substances and software, the following–	
	(a) Explosives as defined in section 3 of the Explosives Act 1875(2) except those specially designed for toys, novelty goods and display fireworks	C
	(b) Military propellants and fuels not elsewhere specified in this Schedule	A
	(c) Military pyrotechnics	C
	(d) Additives, precursors, stabilisers and specially designed software, for any of the materials	

(2) 1875 c. 17. In this entry–

	specified in heads (a) to (c) above (inclusive) A	
ML9	Vessels (including ships) of war and special naval equipment, the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Combatant vessels or vessels (surface or underwater) specially designed or modified for offensive or defensive action, whether or not converted to non-military use and regardless of current state of repair or operating condition	C
	(b) Engines, the following–	
	(1) diesel engines specially designed for submarines with both of the following characteristics	C
	(A) a power output of 1.12 MW (1,500 hp) or more;	
	(B) a rotary speed of 700 rev/min or more;	
	(2) electric motors, specially designed for submarines, having all of the following characteristics	C
	(A) a power output of more than 0.75 MW (1,000 hp);	
	(B) quick reversing;	
	(C) liquid cooled;	
	(D) totally enclosed;	
	(3) non-magnetic diesel engines specially designed for military purposes with a power output of 37.3 kW (50 hp) or more	C

	(c) Underwater detection devices specially designed for military purposes and controls thereof	C
	(d) Submarine and torpedo nets	C
	(e) Compasses and equipment therefor and ship’s course indicators, specially designed for submarines	C
	(f) Hull penetrators and connectors specially designed for military purposes that enable interaction with equipment external to a vessel	C
	(g) Silent bearings specially designed for military purposes and equipment containing those bearings	C
ML10	Aircraft and helicopters, unmanned airborne vehicles, aero-engines and aircraft or helicopter equipment, associated equipment and components, specially designed for military purposes, the following: and specially designed ODMA software therefor–	
	(a) Combat aircraft and helicopters and other aircraft and helicopters specially designed for military purposes, including military reconnaissance, assault, military training and logistic support and all aircraft and helicopters having special structural features such as multiple hatches, special doors, ramps and reinforced floors, for transporting and airdropping troops,	A

military equipment and supplies, and specially designed components therefor	
(b) Aero-engines specially designed or adapted for use with aircraft and helicopters specified in head (a) of this entry, and specially designed components therefor	A
(c) Unmanned airborne vehicles, including remotely piloted air vehicles (RPVs), and autonomous, programmable vehicles specially designed or modified for military purposes, and their launchers, ground support and associated equipment for command and control	A
(d) Airborne equipment, including airborne refuelling equipment, specially designed for use with the aircraft and helicopters and the aero-engines specified in head (a) or (b) of this entry, and specially designed components therefor	C
(e) Pressure refuellers, pressure refuelling equipment, equipment specially designed to facilitate operations in confined areas and ground equipment, developed specially for aircraft and helicopters specified in head (a) of this entry, or for aero-engines specified in head (b) of this entry	C
(f) Pressurised breathing equipment and partial	C

pressure suits for use in aircraft and helicopters, anti-g suits, military crash helmets and protective masks, liquid oxygen converters used for aircraft, helicopters and missiles, catapults and cartridge actuated devices utilised in emergency escape of personnel from aircraft and helicopters	
(cont.) (g) Parachutes used for combat personnel, cargo dropping and aircraft deceleration, the following–	
(1) parachutes for–	
(a) pin point dropping of rangers	C
(b) dropping of paratroopers	C
(2) cargo parachutes	C
(3) paragliders (drag parachutes, drogue parachutes for stabilisation and attitude control of dropping bodies, e.g., recovery capsules, ejection seats, bombs)	C
(4) drogue parachutes for use with ejection seat systems for deployment and inflation sequence regulation of emergency parachutes	C
(5) recovery parachutes for guided missiles, drones and space vehicles	C
(6) approach parachutes and landing deceleration parachutes	C
(7) other military parachutes	C

	(h) Automatic piloting systems for parachuted loads; equipment specially designed or modified for military purposes for controlled opening jumps at any height, including oxygen equipment	C
ML11	Electronic equipment specially designed for military use and specially designed components and specially designed ODMA software therefor	A
ML12	Photographic and electro-optical imaging equipment, the following: and specially designed components and specially designed software therefor–	
	(a) Air reconnaissance cameras and associated equipment designed for military purposes	C
	(b) Other cameras and electro-optical imaging devices, including infrared and imaging radar sensors, whether recording or transmitting via data link, designed for military including reconnaissance purposes	C
	(c) Specialised equipment for the cameras and electro-optical imaging devices specified in head (b) above designed to make the recorded or transmitted information militarily useful	C
	(d) Film processing and printing machines designed for military purposes	C
ML13	Special armoured equipment, the following:	

	(a) Armoured plate	C
	(b) Combinations and constructions of metallic and non-metallic materials specially designed to provide ballistic protection for military systems	C
	(c) Military helmets	C
	(d) Body armour, bullet-proof or bullet-resistant clothing, flack suits and specially designed components therefor	C
PL5014	Specially designed components for the equipment specified in entry ML13 head (a), (b) or (c), in this Group	C
ML14	Specialised equipment for military training or for simulating military scenarios, and specially designed components and accessories and specially designed ODMA software therefor	C
ML15	Military infrared, thermal imaging and image intensifier equipment, and specially designed components and specially designed ODMA software therefor	C
ML16	Forgings, castings and semi-finished products specially designed for products specified in entry ML1, ML2, ML3, ML4, ML6 or ML10 above	C
PL5020	Forgings, castings and semi-finished products specially designed for products specified in entry PL5003, PL5005, PL5006 or PL5018 above	C
ML17	Miscellaneous equipment and materials, the following: and specially designed components and specially designed ODMA software therefor:	
	(a) Self-contained diving and underwater	

	swimming apparatus, the following–	
	(1) closed and semi-closed circuit (rebreathing) apparatus	C
	(2) specially designed components for use in the conversion of open-circuit apparatus to military use	C
	(3) articles designed exclusively for military use with self-contained diving and underwater swimming apparatus	C
	(b) Firearms silencers (mufflers)	C
	(c) Power-controlled searchlights and control units therefor, designed for military use	C
	(d) Construction equipment built to military specifications, specially designed for airborne transport	C
	(e) External fittings, coatings and treatments for the suppression of acoustic, radar, infrared and other emissions, specially designed for military use	C
	(f) Field engineer equipment specially designed for use in a combat zone	C
PL5002	Telescopic sights for firearms	C
ML18	Equipment and technology for the production of items specified in this Group, the following: and specially designed ODMA software therefor–	
	(a) Specially designed or modified production equipment for the	A

	production of products specified in this Group and specially designed components therefor	
	(b) Specially designed environmental test facilities, and specially designed equipment therefor, for the certification, qualification, or testing of products specified in this Group	A
	(c) Production technology, even if the equipment with which such technology is to be used is not specified in this Group	B
	(d) Technology specific to the design of, the assembly of components into, and the operation, maintenance and repair of, complete production installations even if the components themselves are not specified in this Group	B
	In this entry "production" means design, examination, manufacture, testing and checking.	
PL5017	Equipment and technology for the development of the goods specified in this Group and specially designed ODMA software therefor	C
ML20	Cryogenic and superconductive equipment, the following: and specially designed components and accessories and specially designed ODMA software therefor–	
	(a) Equipment specially designed or configured to be installed in a vehicle for military ground,	C

	marine, airborne or space applications and capable of operating while in motion and of producing or maintaining temperatures below 103 K (−170°C)	
	(b) Superconductive electrical equipment (rotating machinery and transformers) designed for operation at temperatures below 103 K (−170°C), and which are specially designed or configured to be installed in a vehicle for military ground, marine, airborne or space applications and capable of operating while in motion	C
	except direct-current hybrid homopolar generators that have single-pole normal metal armatures which rotate in a magnetic field produced by superconducting windings, provided those windings are the only superconducting component in the generator.	
ML22	Electrically triggered shutters of the photochromic or electro-optical type having a shutter speed of less than 100 microseconds, and specially designed ODMA software therefor; except shutters specially designed for high-speed cameras	C
ML23	Directed energy weapons (DEW) systems, the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Laser systems specially designed for destruction or effecting mission-abort of a target	C

(b) Particle beam systems capable of destruction or effecting mission-abort of a target	C
(c) High power radio-frequency (RF) systems capable of destruction or effecting mission-abort of a target	C
(d) Specially designed components for systems specified in head (a), (b) or (c) above, including	C
(1) prime power generation, energy storage, switching, power conditioning and fuel-handling equipment	C
(2) target acquisition and tracking sub-systems	C
(3) sub-systems capable of assessing target damage, destruction or mission-abort	C
(4) beam-handling, propagation and pointing equipment	C
(5) equipment with rapid beam slew capability for rapid multiple target operations	C
(6) adaptive optics	C
(7) current injectors for negative hydrogen ion beams which provide average injection currents over 50 mA with beam brightness (defined as current divided by the the product of orthogonal transverse, normalised root mean square emittances) greater than 40 A/(cm^2 $mrad^2$) at kinetic energies of moren than 20 keV	C

	(8) specially designed components for the equipment specified in sub-heads (1) to (7) above	C
	(e) Equipment specially designed for the detection and identification of, and defence against, systems specified in head (a), (b) or (c) above, and specially designed ODMA software therefor	C
	(f) Physical test models and related documentation for the systems, equipment and components specified in heads (a) to (e) above	C
ML24	Software not elsewhere specified, the following–	
	(a) Software specially designed for:	
	(1) modelling, simulation or evaluation of military weapon systems	C
	(2) development, monitoring, maintenance or up-dating of software embedded in military weapon systems	C
	(3) modelling or simulating military operation scenarios, not specified in entry ML14 in this group	C
	(4) Command, Communications, Control and Intelligence (C_3I) applications	C
	(b) Software for determining the effects of conventional, nuclear, chemical or biological warfare weapons	C

ML26	Kinetic energy weapon systems and associated equipment, the following: and specially designed components and specially designed ODMA softwaretherefor–	
	(a) Kinetic energy weapons systems specially designed for destruction or effecting mission-abort of a target	C
	(b) Specially designed test and evaluation facilities and test models, including diagnostic instrumentation and targets, for dynamic testing of kinetic energy projectiles and systems	C
	(c) Specially designed subsystems for systems specified in head (a) or (b) above, including the following	C
	(1) launch-propulsion-subsystems capable of accelerating masses larger than 0.1 g to velocities in excess of 1.6 km/s, in single or rapid fire modes;	
	(2) prime power generation, energy storage, thermal management, conditioning, switching and fuel-handling equipment;	
	(3) target acquisition, tracking, fire control and damage assessment subsystems;	
	(4) homing seeker, guidance and divert propulsion (lateral acceleration) subsystems for projectiles.	

PL5001	Security and para-military police equipment, the following–	
	(a) Acoustic devices represented by the manufacturers or suppliers thereof as suitable for riot control purposes, and specialised components therefor	C
	(b) Anti-riot shields and components therefor	C
	(c) Leg-irons, shackles (excluding handcuffs) and gangchains, specially designed for restraining human beings	C
	(d) Portable anti-riot devices for administering an electric shock or an incapacitating substance, and specialised components therefor	C
	(e) Water cannon and components therefor	C
	(f) Riot control vehicles which have been specially designed or modified to be electrified to repel boarders	C

GROUP 2

ATOMIC ENERGY MINERALS AND MATERIALS AND NUCLEAR FACILITIES, EQUIPMENT AND APPLIANCES

Note 1: For the purposes of this Group "crude forms" and "semi-fabricated forms" have the same meaning as in Group 3H.

Note 2: Goods specified in this Group may also be specified in Group 3 of this Part of this Schedule.

GROUP 2A

Atomic Energy Minerals and Materials

A1	Special and other fissile materials	C
	except–	
	(1) when contained in a sensing component or	

instrument, up to three effective grammes;

(2) when contained in heart pacemakers.

In this entry–

"special fissile materials" means plutonium-239, uranium-233, uranium enriched in the isotopes 235 or 233, and any material containing the foregoing;

"uranium enriched in the isotopes 235 or 233" means uranium containing the isotopes 235 or 233, or both, in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is more than the ratio of the isotope 235 to the isotope 238 occurring in nature (isotopic ratio 0.72 per cent);

"other fissile materials" means previously separated americium-242m, curium-245 and -247, californium-249 and -251, neptunium-237, isotopes of plutonium other than -239 and any material containing the foregoing;

"effective gramme" of special or other fissile material means

(a) for plutonium isotopes and uranium-233, the isotope weight in grammes;

(b) for uranium enriched 1 per cent or greater in the isotope U-235, the element weight in grammes multiplied

	by the square of its enrichment expressed as a decimal weight fraction;	
	(c) for uranium enriched below 1 per cent in the isotope U-235, the element weight in grammes multiplied by 0.0001;	
	(d) for americium-242m, curium-245 and -247, californium-249 and -251 and neptunium-237, the isotope weight in grammes multiplied by 10;	
	"previously separated" means the application of any process intended to increase the concentration of the controlled isotope.	
A2	Natural and depleted uranium, in any form, or incorporated in any substance in which the concentration of uranium exceeds 0.05%, by weight	C
	In this entry–	
	"natural uranium" means uranium containing the mixtures of isotopes occurring in nature.	
	"depleted uranium" means uranium depleted in the isotope 235 below that occurring in nature.	
PL6001	Source material, the following–	
	Thorium, in any form, or incorporated in any substance in which the concentration of thorium exceeds 0.05%	C
	except alloys containing less than 5% thorium.	
A3	Deuterium, heavy water, deuterated paraffins, and	C

	simple or complex lithium deuterides, and mixtures and solutions containing deuterium, in which the isotopic ratio of deuterium to hydrogen exceeds 1:5,000	
PL6012	Compounds of deuterium	C
A4	Zirconium metal, alloys containing more than 50% zirconium by weight, compounds in which the ratio of hafnium content to zirconium content is less than one part to five hundred parts by weight, and goods composed wholly of any such metal, alloy or compound	C
	except–	
	Zirconium in the form of foil or strip having a thickness not exceeding 0.01 mm.	
A5	Nickel powder and porous nickel metal, the following–	
	(a) Powder with a nickel content of 99% or more and a mean particle size of less than 100 micrometres, whether compacted or not	C
	(b) Porous nickel metal material produced from materials specified in head (a) above except single porous nickel metal sheets not exceeding 930 cm^2 intended for use in batteries for civil applications	C
PL6011	Graphite, nuclear-grade, having a purity level of less than 5 parts per million boron equivalent and with a density greater than 1.5 gcm^3	C
A7	Lithium, the following–	
	(a) Lithium metal, and hydrides and alloys	C

	containing lithium enriched in the lithium-6 isotope to a concentration higher than 7.5% on an atom percentage basis	
	(b) Any other materials containing lithium enriched in the 6 isotope (including compounds, mixtures and concentrates)	C
	except–	
	lithium enriched in the 6 isotope incorporated in thermoluminescent dosimeters.	
A8	Hafnium, the following–	
	Hafnium metal, and alloys and compounds of hafnium containing more than 60% hafnium by weight, in crude, fabricated or semi-fabricated form	C
A9	Beryllium, the following–	
	(a) Beryllium and alloys containing more than 50 per cent of beryllium, in crude or semi-fabricated forms	C
	(b) Beryllium compounds	C
	(c) Manufactures of any of the foregoing except metal windows for medicalX-ray machines and oxide shapes in fabricated or semi-fabricated forms specially designed for electronic component parts or as substrates for electronic circuits	C
PL6002	Fluorine	C
PL6003	Chlorine trifluoride	C
A12	Tritium, and compounds and mixtures containing tritium in which the ratio of tritium to hydrogen by atoms exceeds 1 part in 1,000, and products	C

	containing one or more of the foregoing except (i) labelled compounds not exceeding 100 curies activity (in this exception "labelled compounds" means compounds in which one of the atoms is a different isotope from that found normally); (ii) tritium contained in luminous paint, self-luminous products, gas and aerosol detectors, electron tubes, lighting or static elimination devices, ion generating tubes, detector cells of gas chromatography devices, and calibration standards; (iii) compounds and mixtures of tritium, where the separation of the consitutents cannot result in the evolution of an isotopic mixture of hydrogen in which the ratio of tritium to hydrogen by atoms exceeds 1 part in 1,000.	
A14	Specially designed or prepared materials for the separation of isotopes of natural uranium, depleted uranium and special and other fissile materials, including specially designed chemical exchange resins Note 1: see entries A1 and A2 in this Group for the special and other fissile materials to which this entry refers. Note 2: for isotopic separation plants, see the entry in Group 2B relating thereto.	C
A15	Wet proofed platinised catalysts specially designed or prepared for promoting	C

	hydrogen isotope exchange between hydrogen and water for the recovery of tritium from heavy water or for heavy water production	
PL6005	Calcium containing less than 100 parts per million by weight of impurities other than magnesium and less than 10 parts per million by weight of boron	C
PL6006	Alloys containing a higher percentage of magnesium than of any other element and 10% or more of lithium	C
PL6014	UF_6-resistant fully fluorinated hydrocarbon polymers specially prepared for the manufacture of gaseous diffusion barriers, having a purity of 99.9 per cent or more, a particle size less than 10 microns and a high degree of particle size uniformity	C

GROUP 2B

Nuclear Facilities, Equipment and Appliances

B1	Plant for the separation of isotopes of natural and depleted uranium, and other fissile materials, and specially designed or prepared equipment and components therefor, the following–	
	(a) Plant specially designed for separating isotopes of natural and depleted uranium, and other fissile materials, the following–	
	(1) Gaseous diffusion separation plant	C
	(2) Gas centrifuge separation plant	C
	(3) Aerodynamic separation plant	C

(4) Chemical exchange separation plant	C
(5) Ion-exchange separation plant	C
(6) Atomic vapour laser isotopic separation plant	C
(7) Molecular laser isotopic separation plant	C
(8) Plasma separation plant	C
(9) Electromagnetic separation plant	C
(b) Equipment and components, the following: specially designed or prepared for–	
(1) Gaseous diffusion separation process–	
(A) Valves wholly made of or lined with aluminium, aluminium alloys, nickel or alloy containing 60% or more nickel, 40 mm or more in diameter, with bellows seals	C
(B) Blowers and compressors (turbo, centrifugal and axial flow types) wholly made of or lined with aluminium, aluminium alloys, nickel or alloy containing 60% or more nickel and having a capacity of 1,000 litres per minute or more, including compressor seals	C
(C) Gaseous diffusion barriers made of porous metallic, polymer or ceramic materials resistant to corrosion by UF_6 with a pore size under 100 nm, a thickness of 5 mm or	C

less, and, for tubular forms, a diameter of 25 mm or less	
(D) Gaseous diffuser housings	C
(E) Heat exchangers made of aluminium, copper, nickel or alloys containing more than 60% nickel, or combinations of these metals as clad tubes, designed to operate at sub-atmospheric pressure with a leak rate that limits the pressure rise to less than 10 Pa (0.1 millibar) per hour under a pressure differential of 100 kPa (1 bar)	C
(2) Gas centrifuge separation process–	
(A) Gas centrifuges	C
(B) Complete rotor assemblies	C
(C) Rotor tube cylinders with a thickness of 12 mm or less, a diameter of between 75 mm and 400 mm, made from any of the following high strength-to-density ratio materials–	
(a) Maraging steel capable of an ultimate tensile strength of 2.05 GN/m^2 or more	C
(b) Aluminium alloys capable of an ultimate tensile strength of 460 MN/m^2 or more	C

or

(c) Fibrous and filamentary materials with a specific modulus of more than 3.18×10^6 m and a specific tensile	C

	strength greater than 76.2 $\times 10^3$ m	
	(D) Magnetic suspension bearings consisting of an annular magnet suspended within a housing containing a damping medium, and having the magnet coupling with a pole piece or second magnet fitted to the top cap of the rotor	C
	(E) Specially prepared bearings comprising a pivot-cup assembly mounted on a damper	C
	(F) Rings or bellows with a wall thickness of 3 mm or less and a diameter of between 75 mm and 400 mm and designed to give local support to a rotor tube or to join a number together, made from any of the following high strength-to-density ratio materials–	
	(a) Maraging steel capable of an ultimate tensile strength of 2.05 GN/m^2 or more	C
	(b) Aluminium alloys capable of an ultimate tensile strength of 460 MN/m^2 or more	C
or		
	(c) Fibrous and filamentary materials with a specific modulus of more than 3.18×10^6 m and a specific tensile strength greater than 76.2 $\times 10^3$ m	C
	(G) Baffles of between 75 mm and 400 mm diameter for mounting inside a rotor tube, made	

	from any of the following high strength-to-density ratio materials–	
	(a) Maraging steel capable of an ultimate tensile strength of 2.05 GN/m^2 or more	C
	(b) Aluminium alloys capable of an ultimate tensile strength of 460 MN/m^2 or more	C
	(c) Fibrous and filamentary materials with a specific modulus of more than 3.18×10^6 m and a specific tensile strength greater than 76.2×10^3 m	C
	(H) Top and bottom caps of between 75 mm and 400 mm diameter to fit the ends of a rotor tube, made from any of the following high strength-to-density ratio materials–	
	(a) Maraging steel capable of an ultimate tensile strength of 2.05 GN/m^2 or more	C
	(b) Aluminium alloys capable of an ultimate tensile strength of 460 MN/m^2 or more	C
or		
	(c) Fibrous and filamentary materials with a specific modulus of more than 3.18×10^6 and a specific tensile strength greater than 76.2×10^3 m	C
	(I) Molecular pumps comprised of cylinders having internally machined or extruded helical grooves and	C

internally machined bores	
(J) Ring-shaped motor stators for multiphase AC hysteresis or reluctance motors for synchronous operation within a vacuum in the frequency range of 600 to 2,000 Hz and a power range of 50 to 1,000 Volt-Amps	C
(K) Frequency changers specially designed or prepared to supply motor stators for gas centrifuge enrichment, having all of the following characteristics, and specially designed components therefor–	C
(a) Multiphase output of 600 to 2,000 Hz;	
(b) Frequency control better than 0.1%;	
(c) Harmonic distortion of less than 2%; and	
(d) An efficiency greater than 80%;	
(3) Aerodynamic separation process–	
(A) Separation nozzles consisting of slit-shaped, curved channels having a radius of curvature less than 1 mm and having a knife-edge contained within the nozzle which separates the gas flowing through the nozzle into two streams	C
(B) Tangential inlet flow-driven cylindrical or conical tubes, specially designed for uranium isotope separation	C
(C) UF^6-hydrogen helium compressors wholly made of or	C

lined with aluminium, aluminium alloys, nickel or alloy containing 60% or more nickel, including compressor seals	
(D) Aerodynamic separation element housing, designed to contain vortex tubes or separation nozzles	C
(E) Heat exchangers made of aluminium, copper, nickel, or alloys containing more than 60% nickel, or combinations of these metals as clad tubes, designed to operate at pressures of 600 kPa (6 bar) or less	C
(4) Chemical exchange separation process–	
(A) Fast-exchange liquid-liquid centrifugal contactors or fast exchange liquid-liquid pulse columns made of fluorocarbon lined materials	C
(B) Electrochemical reduction cells designed to reduce uranium from one valence state to another	C
(5) Ion-exchange separation process– Fast reacting ion-exchange resins, pellicular and reticulated resins in which the active chemical exchange groups are limited to a coating on the surface of an inert particle or fibre	C
(6) Atomic vapour laser isotopic separation process–	
(A) High power electron beam guns with total	C

power of more than 50 kW and strip or scanning electron beam guns with a delivered power of more than 2.5 kW/cm for use in uranium vaporization systems	
(B) Trough shaped crucible and cooling equipment for molten uranium	C
(C) Product and tails collector systems made of or lined with materials resistant to the heat and corrosion of uranium vapour	C
(D) Lasers and components designed for atomic vapour laser isotopic separation, the following–	
(a) Lasers to pump dye lasers–	
(1) Copper vapour lasers of 40 W or more	C
(2) Argon ion lasers of more than 40 W	C
(3) ND:YAG lasers that can be frequency doubled and thereby have an average power of more than 40 W	C
(b) Other lasers and accessories–	
(1) Tunable pulsed dye laser amplifiers and oscillators	C
except–	
single mode oscillators, with an average power of more than 30W, a repetition rate of more than 1 kHz and a wavelength between 500 nm and 700 nm.	

(2) Modulators for controlling and modifying dye laser bandwidth	C
(3) Tunable pulsed single mode dye oscillators capable of an average power of more than 1W, and having a repetition rate of more than 1 KHz, a pulse width less than 100 ns, a wavelength between 500 nm and 700 nm and frequency modulation for bandwidth expansion	C
(7) Molecular laser isotopic separation process–	
(A) Para-hydrogen Raman shifters designed to operate at 16 micrometres output wavelength and at a repetition rate of more than 250 Hz	C
(B) Supersonic expansion nozzles designed for UF^6 carrier gas	C
(C) Uranium fluoride (UF^5) product filter collectors	C
(D) Equipment for fluorinating UF^5 to UF^6	C
(E) UF^6 carrier gas compressors wholly made of or lined with aluminium, aluminium alloys, nickel or alloy containing 60% or more nickel, including compressor seals	C
(F) Lasers designed for molecular laser isotopic separation, the following–	

(a) Alexandrite lasers with a bandwidth of 0.005 nm (3.0 GHz) or less, a repetition rate of more than 125 Hz, and an average power of more than 30W	C
(b) Pulsed carbon dioxide lasers with a repetition rate of more than 250 Hz, an average power of more than 1.2 kW and a pulse length less than 200 ns	C
(c) Pulsed excimer lasers (XeF, XeC1, KrF) with a repetition rate of more than 250 Hz and an average power of more than 250W	C
(8) Plasma separation process–	
(A) Product and tails collectors made of or lined with materials resistant to the heat and corrosion of uranium vapour	C
(B) Radio frequency ion excitation coils for frequencies of more than 100 kHz and capable of handling more than 40 kW power	C
(C) Microwave power sources and superconductive electromagnets designed for use in the plasma separation process, the following–	
(a) Microwave power sources of more than 30 GHz and greater than 50 kW for ion production	C
(b) Solenoidal superconductive electromagnets of more than 30 cm	C

	inner diameter, with a magnetic field of more than 2 T and uniform to better than 1% over the central 80% of the inner volume	
	(9) Taking on-line samples of feed, product or tails from UF^6 gas streams–	
	UF^6 mass spectrometers/ ion sources having all of the following characteristics	C
	(A) Unit resolution for mass of more than 320 amu;	
	(B) Ion sources constructed of or lined with nichrome or monel, or nickel plated;	
	(C) Electron bombardment ionization sources; and	
	(D) Collector systems suitable for isotopic analysis.	
PL6013	(turbo, centrifugal and axial flow types) wholly made of or lined with nickel alloy, phosphor bronze, stainless steel, aluminium or aluminium alloy, corrosion resistant to uranium hexafluoride (UF_6) or hydrogen fluoride (HF) and having a capacity of 1,000 litres per minute or greater, including compressor seals	C
B2	Specially designed or prepared equipment and components, for plant for the reprocessing of irradiated nuclear reactor fuel elements, the following–	
	(a) Fuel element chopping or shredding machines, ie remotely	C

	operated equipment to cut, chop, shred or shear irradiated nuclear reactor fuel assemblies, bundles or rods	
	(b) Dissolvers (ie criticality safe tanks) specially designed or prepared for the dissolution of irradiated nuclear reactor fuel, which are capable of withstanding hot, highly corrosive liquids, and which can be remotely loaded and maintained	C
	(c) Counter-current solvent extractors and ion-exchange processing equipment, specially designed or prepared for use in a plant for the reprocessing of irradiated natural uranium, depleted uranium or special or other fissile materials	C
	(d) Process control instrumentation specially designed or prepared for monitoring or controlling the reprocessing of irradiated source or special or other fissile materials	C
In this entry "plant for the reprocessing of irradiated nuclear reactor fuel elements" includes equipment and components which normally come into direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams.		
Note 1: See also entry PL6016 in this Group.		
Note 2: For process control equipment for Lithium, see entry PL6010 in this Group.		

PL6016	Specially designed or prepared equipment and components, for plant for the reprocessing of irradiated nuclear reactor fuel elements, the following–	
	(a) Holding or storage vessels resistant to the corrosive effects of nitric acid	C
	(b) Systems for the conversion of plutonium nitrate to plutonium oxide	C
	(c) Systems for the production of plutonium metal	C
	In this entry "plant for the reprocessing of irradiated nuclear reactor fuel elements" includes equipment and components which normally come into direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams.	
B3	Nuclear reactors, ie reactors capable of operation so as to maintain a controlled, self-sustaining fission chain reaction, and equipment and components specially designed or prepared for use in connection with a nuclear reactor, the following–	
	(a) Pressure vessels and metal vessels as complete units or as parts therefor, which are specially designed or prepared to contain the core of a nuclear reactor and are capable of withstanding the operating pressure of the primary coolant, including the top plate for a reactor pressure vessel	C

(b) Fuel element handling equipment, including reactor fuel charging and discharging machines	C
(c) Control rods specially designed or prepared for the control of the reaction rate in a nuclear reactor, the neutron absorbing part and the support or suspension structures therefor, and control rod guide tubes	C
(d) Electronic controls for controlling the power levels in nuclear reactors, including reactor control rod drive mechanisms and radiation detection and measuring instruments to determine neutron flux levels	C
(e) Pressure tubes specially designed or prepared to contain fuel elements and the primary coolant in a nuclear reactor at an operating pressure in excess of 50 bars (atmospheres)	C
(f) Coolant pumps specially designed or prepared for circulating the primary coolant of nuclear reactors	C
(g) Internals specially designed or prepared for the operation of a nuclear reactor, including but not limited to core support structures, thermal shields, baffles, core grid plates and diffuser plates	C
(h) Heat exchangers	C

In this entry a "nuclear reactor" means the items within or attached directly

	to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain, come into direct contact with or control the primary coolant of the reactor core.	
B4	Plant specially designed for the fabrication of nuclear reactor fuel elements and specially designed equipment therefor	C
	Note: A plant for the fabrication of nuclear reactor fuel elements includes equipment which (1) normally comes into direct contact with or directly processes or controls the production flow of nuclear materials, (2) seals the nuclear material within the cladding, (3) checks the integrity of the cladding or the seal, or (4) checks the finish treatment of the solid fuel.	
B5	Plant for the production of heavy water, deuterium or deuterium compounds, and specially designed or prepared equipment and components therefor, the following–	
	(a) Plant for the production of heavy water, deuterium or deuterium compounds, the following–	
	(1) Hydrogen sulphide-water exchange plant	C
	(2) Ammonia-hydrogen exchange plant	C
	(3) Hydrogen distillation plant	C
	(b) Equipment and components, the following: designed for–	
	(1) Hydrogen sulphide-water exchange process–	

(A) Tray exchange towers	C
(B) Hydrogen sulphide gas compressors	C
(2) Ammonia-hydrogen exchange process–	
(A) High-pressure ammonia-hydrogen exchange towers	C
(B) High-efficiency stage contactors	C
(C) Submersible stage recirculation pumps	C
(D) Ammonia crackers designed for pressures of more than 3 MPa (30 bar)	C
(3) Hydrogen distillation process–	
(A) Hydrogen cryogenic distillation towers and cold boxes designed for operation below 35 K	C
(B) Turboexpanders or turboexpander-compressor sets designed for operation below 35 K	C
(4) Heavy water concentration process to reactor grade level (99.75% deuterium oxide)–	
(A) Water distillation towers containing specially designed packings	C
(B) Ammonia distillation towers containing specially designed packings	C
(C) Catalytic burners for conversion of fully enriched deuterium to heavy water	C
(D) Infrared absorption analysers capable of on-	C

	line hydrogen-deuterium ratio analysis where deuterium concentrations are equal to or more than 90%	
B6	Plant for the production of uranium hexafluoride (UF^6) and specially designed or prepared equipment and components therefor, the following–	
	(a) Plant for the production of UF^6	C
	(b) Equipment and components specially designed or prepared for UF^6 production, the following–	
	(1) Fluorination and hydrofluorination screw and fluid bed reactors and flame towers	C
	(2) Distillation equipment for the purification of UF^6	C
PL6015	Equipment for the handling or processing of UF^6 , and specially designed components therefor made from or lined with UF^6 resistant materials, the following–	
	(a) Feed autoclaves for passing UF^6 to gaseous diffusion or centrifuge cascades	C
	(b) Desublimers or cold traps used to remove UF^6 from gaseous diffusion or centrifuge cascade	C
	(c) Product and tails stations for trapping and transferring UF^6 into containers	C
	(d) Liquefaction stations where UF^6 gas is	C

	compressed and cooled to form liquid UF6	
	(e) Piping systems and header systems for handling UF6 within gaseous diffusion or centrifuge cascades	C
	(f) Vacuum manifolds, vacuum headers and vacuum pumps having a suction capacity of 5 m^3/minute or more	C
C1	Neutron generator systems, including tubes, designed for operation without an external vacuum system and utilizing electrostatic acceleration to induce a tritium-deuterium nuclear reaction	C
C2	Power generating or propulsion equipment specially designed or adapted for use with military, space, marine or mobile nuclear reactors	C
C3	Electrolytic cells for the production of fluorine with a production capacity greater than 250 g of fluorine per hour	C
C4	Equipment specially designed or prepared for the separation of isotopes of lithium, the following–	
	(a) Packed liquid-liquid exchange columns specially designed for lithium amalgams	C
	(b) Amalgam pumps	C
	(c) Amalgam electrolysis cells	C
	(d) Evaporators for concentrated lithium hydroxide solution	C
C5	Equipment specially designed for the production or recovery of tritium	C

C6	Frequency changers (converters or inverters) specially designed or prepared to supply motor stators for gas centrifuge enrichment, having all the following characteristics, and specially designed components therefor (a) A multi-phase electrical output of between 600 to 2,000 Hz; (b) Frequency control better than 0.1%; (c) Harmonic distortion of less than 2%; (d) An efficiency greater than 80%.	C
PL6007	Equipment specially designed for the manufacture or assembly of gas centrifuges capable of the enrichment or separation of isotopes, and specially designed parts, components and equipment therefor (For gas centrifuge plant, see entry B1, plant for separation of isotopes, in this Group.)	C
PL6008	Mass spectrometers and mass spectrometer sources designed for measuring the isotopic composition of uranium hexafluoride (UF^6) gas, uranium and uranyl compounds	C
PL6009	Pressure gauges capable of measuring pressures to 100 Torr (13332.2 N/m^2) or less having sensing elements of nickel, nickel alloy, phosphor bronze, stainless steel, aluminium or aluminium alloy, corrosion resistant to uranium hexafluoride (UF^6) or hydrogen fluoride (HF); and such sensing elements	C
PL6010	Process control equipment or instrumentation specially	C

	designed or prepared for monitoring or controlling the reprocessing of irradiated lithium	

GROUP 3

STRATEGIC GOODS AND TECHNOLOGIES NOT SPECIFIED IN GROUPS 1 AND 2

GROUP 3A

Metal Working Machinery and Associated Equipment

IL1001	Technology for metal-working manufacturing processes and specially designed software, the following–	
	(a) Technology for the design of tools, dies and fixtures specially designed for any of the following processes–	
	(1) hot die forging	D
	(2) superplastic forming	D
	(3) diffusion bonding	D
	(4) direct-acting hydraulic pressing	D
	(b) Technology consisting of the parameters listed below in connection with the process referred to in the relevant sub-head–	
	(1) hot die forging–	
	(i) temperature	D
	(ii) strain rate	D
	(2) superplastic forming of aluminium alloys, titanium alloys and superalloys–	
	(i) surface preparation	D
	(ii) strain rate	D
	(iii) temperature	D
	(iv) pressure	D

(3) diffusion bonding of superalloys and titanium alloys–	
(i) surface preparation	D
(ii) temperature	D
(iii) pressure	D
(4) direct-acting hydraulic pressing of aluminium alloys, and titanium alloys–	
(i) pressure	D
(ii) cycle time	D
(5) hot isostatic densification of titanium alloys, aluminium alloys and superalloys–	
(i) temperature	D
(ii) pressure	D
(iii) cycle time	D

In this entry–

(a) "hot die forging" means a deformation process where die temperatures are at the same nominal temperature as the workpiece and exceed 850 K (577°C);

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

(c) "diffusion bonding" means a solid-state

	molecular joining of at least two separate metals into a single piece with a joint strength equivalent to that of the weakest material;	
	(d) "direct-acting hydraulic pressing" means a deformation process which uses a fluid-filled flexible bladder in direct contact with the workpiece;	
	(e) "hot isostatic densification" means a process of pressurizing a casting at temperatures exceeding 375 K (102°C) in a closed cavity through various media (gas, liquid, solid particles, etc) to create equal force in all directions to reduce or eliminate internal voids in the casting;	
PL7031	Production equipment for inert gas and vacuum atomising processes, specially designed components therefor and related technology, the following–	
	(a) Production equipment designed or modified for inert gas and vacuum atomising processes to achieve sphericity and uniform size of particles in metal powders, whatever the type of metal and whether or not the powder is specified in this Schedule, and specially designed components therefor	A
	(b) Technology for inert gas and vacuum atomising processes to achieve sphericity and uniform size of particles in metal powders,	B

	whatever the type of metal and whether or not the powder is specified in this Schedule	
PL7027	Flow forming machines and machines combining the functions of spin forming and flow forming, having both the following characteristics: and specially designed components and specially designed software therefor	A
	(a) specially designed or adapted for use with numerical or computer controls;	
	(b) having more than two axes which can be co-ordinated simultaneously for contouring control.	
IL1080	Specially designed equipment, tooling and fixtures and technology for the manufacture or measuring of gas turbine blades or vanes, the following: and specially designed components and accessories therefor and specially designed ODMA software for the equipment, components and accessories–	
	(1) Specially designed equipment, tooling, fixtures, components and accessories, the following–	
	(a) Blade or vane aerofoil or root automatic measuring equipment	C
	(b) Precision vacuum investment casting equipment, including core-making equipment	C
	(c) Small-hole drilling equipment for producing holes having depth more than four times their diameter and less than	C

0.76 mm (0.03 inch) in diameter	
(d) Directional solidification casting equipment and directional recrystallization equipment	C
(e) Segmented cast blade or vane bonding equipment	C
(f) Integral blade-and-disc casting equipment	C
(g) Blade or vane coating equipment, except furnaces, molten-metal baths and ion-plating baths	C
(h) Ceramic blade or vane moulding and finishing machines	C
(i) Moulds, cores and tooling for the manufacture and finishing of–	
(1) cast hollow turbine blades or vanes	C
(2) turbine blades or vanes produced by powder compaction	C
(j) Composite metal turbine blade or vane moulding and finishing machines	C
(k) Inertial blade or vane welding machines	C
(l) Machinery and equipment for the manufacture of blades or vanes in the compressor section of aircraft or aircraft-derived gas turbine engines where the technology is the same as for the manufacture of blades or vanes in the turbine section	C

	(2) Technology (except installation, operation and maintenance technology) for use of the following equipment	
	(a) Blade or vane belt grinding machines	D
	(b) Blade or vane edge radiusing machines	D
	(c) Blade or vane aerofoil milling or grinding machines	D
	(d) Blade or vane blank performing machines	D
	(e) Blade or vane rolling machines	D
	(f) Blade or vane aerofoil shaping machines except metal removing types	D
	(g) Blade or vane root grinding machines	D
	(h) Blade or vane aerofoil scribing equipment	D
	(i) Machinery and equipment for the manufacture of blades or vanes in the compressor section of aircraft or aircraft-derived gas turbine engines where the technology is the same as for the manufacture of blades or vanes in the turbine section	D
	In this entry–	
	“manufacture” or	
	“making” includes refurbishing.	
IL1081	Specially designed or modified equipment, tools, dies, moulds and fixtures for the manufacture or inspection of aircraft, airframe structures or aircraft fasteners, the following: and specially designed components and	

accessories therefor and specially designed ODMA software for the equipment, components and accessories–	
(a) Equipment, tools, dies, moulds or fixtures for:	
(1) hydraulic stretch forming–	
(i) whose machine motions or forces are digitally controlled or controlled by electrical analogue devices	C
or	
(ii) which are capable of thermal-conditioning the workpiece	C
(2) the milling of aircraft skins or spars, except those which do not present an improvement on machinery in production ten years preceding the year of export	C
(b) Tools, dies, moulds or fixtures for–	
(1) diffusion bonding	C
(2) superplastic forming	C
(3) hot die forging	C
(4) direct-acting hydraulic pressing of aluminium alloys and titanium alloys	C
(5) the manufacture, inspection, inserting or securing of specially designed high-strength aircraft fasteners	C
The definitions in entry IL1001 of the processes and control of the metal working manufacturing technologies mentioned above, apply also for the purposes of this entry.	

IL1086	Specially designed or modified equipment, tools, dies, moulds, fixtures and gauges for the manufacture or inspection of aircraft and aircraft-derived gas turbine engines, the following: and specially designed components and accessories and specially designed ODMA software for the equipment, components and accessories–	
	(a) Equipment, tools, dies, moulds, fixtures and gauges–	
	(1) for automated production inspection	C
	(2) for automated welding	C
	(b) Tools, dies, fixtures and gauges–	
	(1) for solid-state joining by inertial welding or thermal bonding	C
	(2) for manufacture and inspection of high-performance gas turbine bearings	C
	(3) for rolling specially configured rings such as nacelle rings	C
	(4) for forming and finishing turbine discs	C
	(c) Compressor or turbine disc broaching machines	C
	This head includes only broaching machines specially designed for the manufacture of aircraft or aircraft-derived gas turbine engines and not general purpose broaching machines specially adapted for that purpose.	
IL1088	Gear making or finishing machinery, the following–	

	(a) Bevel gear making machinery, the following–	
	(1) gear grinding machinery (non-generating type)	C
	(2) other machinery capable of the production of bevel gears of module finer than 0.5 mm (diametrical pitch finer than 48) and meeting a quality standard better than DIN 58405 Class 6	C
	(b) Machinery capable of producing gears in excess of AGMA quality level 13 or equivalent	C
	For the purposes of this entry DIN 3963 Class 4 shall be considered equivalent to AGMA quality level 13.	
IL1091	Numerical control units, numerically controlled machine tools, components, specially designed parts and sub-assemblies, software and technology, the following–	
	(a) Numerical control units for machine tools, having any of the following characteristics, and specially designed ODMA software and specially designed components therefor–	
	(1) more than three interpolating axes can be co-ordinated simultaneously for contouring control	W
	(2) two or three interpolating axes can be co-ordinated simultaneously for contouring control and	
	(A) the smallest programmable increment,	W

namely the input resolution, for any linear axis is less than 0.001 mm	
NOTE: In case of units with only two linear axes one of them may have a smallest programmable increment of less than 0.001 mm but not less than 0.0005 mm.	
(B) interpolation of third order or higher is possible (e.g. spline or involute interpolation) W	
(C) word size of more than 32 bit (excluding parity bits) W	
(D) capable of real-time processing of data to modify, during the machining operation, tool path, feed rate and spindle data by either–	
(a) automatic calculation and modification of part programme data for machining in two or more axes by means of measuring cycles and access to source data	W
or	
(b) adaptive control, with more than one physical variable measured and processing by means of a computing model (strategy) to change one or more machining instructions to optimize the process	W
(E) capable of receiving directly (on-line) and processing computer aided design (CAD) data for internal preparation of machine instructions	W

except–

numerical control units which are either:

(a) modified for and incorporated in machines not specified in this Schedule; or

(b) specially designed for machines not specified in this Schedule;

(b) Machine tools, for removing, cutting or spark eroding metals, ceramics or composites, the following–

(1) machine tools for turning which have all the following characteristics W

(A) according to the manufacturer's technical specifications, can be equipped with numerical control units specified in head (a) above, even when not equipped with such units at delivery;

(B) have two or more axes which can be co-ordinated simultaneously for contouring control;

(C) have any of the following–

(a) two or more contouring rotary axes;

(b) run out (out-of-true running) less (better) than 0.0008 mm total indicator reading (TIR);

(c) camming (axial displacement) less (better) than 0.0008 mm total indicator reading (TIR); or

(d) the positioning accuracies, with all compensations available, are better than–

(1) overall positioning along any linear axis of–	
(A) 0.006 mm for a total length of axis travel L equal to or shorter than 500 mm; or	
(B) (0.006 + 0.001 × (L −500)/500) mm if L is longer than 500 mm and shorter than 5,500 mm; or	
(C) 0.016 mm if L is equal to or longer than 5,500 mm; or	
(2) of any rotary axis, 0.001°;	
(2) machine tools for milling which have all the following characteristics	W
(A) according to the manufacturer's technical specifications, can be equipped with numerical control units specified in head (a) above, even when not equipped with such units at delivery;	
(B) have two or more axes which can be co-ordinated simultaneously for contouring control;	
(C) have any of the following–	
(a) two or more contouring rotary axes;	
(b) one or more contouring tilting spindles;	
(c) run out (out-of-true running) less (better) than $2 \times D \times 10^{-5}$ mm total indicator reading (TIR) where D equals the diameter of the spindle in mm;	

(d) the positioning accuracies, with all compensations available, are better than–

(1) overall positioning along any linear axis of–

(A) 0.006 mm, if none of the axes exceeds a total length of axis travel L of 650 mm;

(B) if the total length of axis travel L of any axis islonger than 650 mm, 0.008 mm or (0.008 + 0.0015 × (L −500)/500) mm whichever is higher, for axes up to 5,500 mm of travel; or

(C) 0.023 mm for any axis the total length L of which is equal to or longer than 500 mm; or

(2) of any rotary axis, 0.0010 or

(e) a motor power of any spindle of more than 75 kW;

(3) machine tools for grinding which have all the following characteristics W

(A) according to the manufacturer's technical specifications, can be equipped with numerical control units specified in head (a) above, even when not equipped with such units at delivery;

(B) have two or more axes which can be co-ordinated simultaneously for contouring control;

(C) have any of the following–

(a) two or more contouring rotary axes;

(b) one or more contouring tilting spindles;

(c) run out (out-of-true running) less (better) than 0.0008 mm total indicator reading (TIR); or

(d) the positioning accuracies, with all compensations available, are better than–

(1) overall positioning along any linear axis of–

(A) 0.004 mm, for a total length of axis travel L equal to or shorter than 300 mm;

(B) (0.004 + 0.001 × (L −300)/300) mm if L is longer than 300 mm, and shorter than 3,300 mm; or

(C) 0.014 mm if L is equal to or longer than 3,300 mm; or

(2) of any rotary axis, 0.001°;

except–
tool or cutter grinding machines having all the following characteristics–

(a) no more than four axes can be co-ordinated simultaneously for contouring control;

(b) no more than two rotary axes can be co-ordinated simultaneously for contouring control;

(c) run out (out-of-true running) more (worse) than 0.0008 mm total indicator reading (TIR);

(d) the positioning accuracies, with all compensations available, are not better than:

(1) overall positioning along any linear axis of 0.004 mm; or	
(2) of any rotary axis, 0.001°; and	
(e) a maximum slide travel along any axis of less than 200 mm;	
(4) electrical discharge machines (EDM) of the wire feed type which have five or more contouring axes and which can be equipped with one of the following–	
(A) numerical control units specified in head (a) above even when not equipped with such units at delivery	W
(B) electronic controllers specified in head (b) in entry IL1391 inGroup 3D	W
(5) electrical discharge machines (EDM) of the non-wire type which have two or more contouring rotary axes and which can be equipped with one of the following–	
(A) numerical control units specified in head (a) above even when not equipped with such units at delivery	W
(B) electronic controllers specified in head (b) in entry IL1391 inGroup 3D	W
(6) machine tools for removing metals ceramics or composites, having all the following characteristics	W
(A) acting by means of–	

(a) water or other liquid jets, whether or not employing abrasive additives;	
(b) electron beam; or	
(c) laser beam; and	
(B) according to the manufacturer's technical specifications, can be equipped with numerical control units specified in head (a) above, even when they are not equipped with such units at delivery; and	
(C) having two or more rotary axes which–	
(a) can be co-ordinated simultaneously for contouring control; and	
(b) have a positioning accuracy of better than 0.01°;	
(c) Technology for–	
(1) the development of numerical control units for machine tools specified in head (a) above	D,I,L,Y
(2) the production of numerical control units which have either of the following characteristics:	
(A) specified in head (a) above	D,I,L,Y
(B) containing a microprocessor with both of the following	D,I,L,Y
(a) a word length of 32 bit; and	
(b) a bus architecture of 32 bit;	
(3) the development of numerically controlled machine tools for removing, cutting or	D,I,L,Y

spark eroding metals, ceramics or composites specified inhead (b) above	
(4) the production of numerically controlled machine tools which have either of the following characteristics–	
(A) specified in head (b) above	D,I,L,Y
(B) a positioning accuracy along any linear axis of better than 0.02 mm	D,I,L,Y
(5) the development of components specified in head (d) or (e) below	D,I,L,Y
(6) the production of components or sub-assemblies, which have either of the following characteristics–	
(A) specified in head (d) or sub-head (e)(2) below	D,I,L,Y
(B) not specified in sub-head (d)(2) or (d)(3) below	D,I,L,Y
(7) the development of interactive graphics as an integrated part in numerical control units for preparation or modification of part programmes	D,I,L,Y
(8) the development of generators of machine tool instructions (eg part programmes) from design data residing inside numerical control units	D,I,L,Y
(9) the incorporation of expert systems for advanced decision support of shop floor operations	D,I,L,Y

(10) the development of flexible manufacturing units used with the software specified in sub-head (b)(5)(E) in entry IL1566 in Group 3G	D,I,L,Y
(d) Components and specially designed parts for machine tools specified inhead (b) above, the following–	
(1) spindle assemblies, consisting of spindles and bearings as a minimal assembly, with run-out (out-of-true running) less than–	
(A) 0.0008mm total indicator reading (TIR) for machine tools for turning or grinding	W
(B) $2 \times D \times 10^{-5}$ mm total indicator reading (TIR), where D equals the diameter of the spindle in mm, for machine tools for milling	W
(2) linear position feedback units (eg inductive type devices, graduated scales, laser or infrared systems) having, with compensation, an overall accuracy better than ± (0.0015 + L × 10−6)mm, where L equals the effective length in mm of the linear measurement	W
(3) rotary position feedback units (eg inductive type devices, graduated scales, laser or infrared systems) having, with compensation, an accuracy better than ± 0.00025°	W
(4) slide way assemblies consisting of a minimal	W

assembly of ways, bed and slide with all of the following characteristics	
(A) a yaw, pitch or roll of less than 2 seconds of arc, total indicator reading (TIR);	
(B) a horizontal straightness of less than 0.004mm; and	
(C) a vertical straightness of less than 0.004mm;	
(5) ball screws, having all of the following characteristics	W
(A) a sum of tolerance of mean travel deviation (e) and half the travel variation (Vu) less than $(0.0025 + 5 \times 10^{-6} \times L)$mm, where L is the useful travel in mm of the ball screw;	
(B) a tolerance of travel variation (V300) within 300mm travel of the ball screw less than 0.004mm; and	
(C) a run-out (out-of-true running) of the journal diameter related to the screw shaft outer diameter less than 0.005mm total indicator reading (TIR), at an axial distance of 3 or more times the screw shaft outer diameter from the end of the journal;	
(6) single point diamond cutting tool inserts having all of the following characteristics	W
(A) a flawless and chip-free cutting edge when magnified 400 times in any direction;	

(B) a cutting radius out-of-roundness less than 0.002mm total indicator reading (TIR); and	
(C) a cutting radius between 0.1 and 5.0mm;	
(7) linear induction motors used as drives for slides having all the following characteristics	W
(A) a stroke longer than 200mm for linear slides;	
(B) a nominal force rating above 45 N; and	
(C) a minimal controlled incremental movement less than 0.001mm for linear motion;	
(e) Specially designed components or sub-assemblies, capable of upgrading, according to the manufacturer's specifications, numerical control units, machine tools or feed-back devices to or above the levels specified in head (a) or (b), or in sub-head (d)(2) or (d)(3) above, the following–	
(1) printed circuit boards with mounted components and softwaretherefor	W
(2) compound rotary tables	W

In this entry–

"accuracy", usually measured in terms of inaccuracy, means the maximum deviation, positive or negative, of an indicated value from an accepted standard or true value;

(cont.)

"adaptive control" means a control system that adjusts the response from conditions detected during the operation;

"camming" (axial displacement) means axial displacement in one revolution of the main spindle measured in a plane perpendicular to the spindle faceplate, at a point next to the circumference of the spindle faceplate;

"compound rotary table" means a table allowing the workpiece to rotate and tilt about two non-parallel axes, which can be co-ordinated simultaneously for contouring control;

"contouring control" means two or more numerically controlled motions operating in accordance with instructions that specify the next required position and the required feed rates to that position. These feed rates are varied in relation to each other so that a desired contour is generated;

"numerical control" means the automatic control of a process performed by a device that makes use of numeric data usually introduced as the operation is in progress;

"positioning accuracy" of numerically controlled machine tools is to be determined and presented in accordance with ISO/DIS 230/2, paragraph

2.13, in conjunction with the requirements below:

(a) test conditions:–

(1) for 12 hours before and during measurements, the machine tools and accuracy measuring equipment will be kept at the same ambient temperature. During the premeasurement time the slides of the machine will be continuously cycled in the same manner that the accuracy measurements will be taken;

(2) the machine shall be equipped with any mechanical, electronic, or software compensation to be exported with the machine;

(3) accuracy of measuring equipment for the measurements shall be at least 4 times more accurate than the expected machine tool accuracy;

(4) power supply for slide drives shall be the following:–

(A) line voltage variation shall not be greater than ± 10 per cent of nominal rated voltage;

(B) frequency variation shall not be greater than ± 2 Hz of normal frequency;

(C) lineouts or interrupted service are not permitted.

(b) test programme:–

(1) feed rate (velocity of slides) during measurement shall

be the rapid traverse rate; NOTE: In case of machine tools which generate optical quality surfaces, the feed rate shall be equal to or less than 50mm per minute;

(2) measurements shall be made in an incremental manner from one limit of the axis travel to the other without returning to the starting position for each move to the target position;

(3) axes not being measured shall be retained at mid travel during test of an axis.

(c) presentation of test results:–

the results of the measurements must include:–

(1) position accuracy (A); and

(2) the mean reversal error (B);

"run out" (out-of-true running) means radial displacement in one revolution of the main spindle measured in a plane perpendicular to the spindle axis at a point on the external or internal revolving surface to be tested;

"tilting spindle" means a tool holding spindle which alters, during the machining process, the angular position of its centre line with respect to any other axis.

"machine tools for removing, cutting or spark eroding metal, ceramics or composites" are the following:

(a) machine tools for turning, including–

(1) horizontal turning machines;

(2) vertical turning machines;

(3) turning centres, with or without milling or grinding options;

(4) machines for generating optical quality surfaces;

(b) machine tools for milling, including–

(1) boring machines;

(2) boring-milling machines;

(3) milling machines;

(4) machining centres, with or without turning or grinding options;

(5) machine tools for routing;

(c) machine tools for grinding, with or without milling or turning options, including–

(1) jig grinding machines;

(2) contour grinding machines;

(3) tool and cutter grinding machines;

(d) machine tools using electric discharge for machining;

(e) other machines tools, as follows:

(1) water and other liquid jet machines;

	(2) electron beam cutting machines; or	
	(3) ser cutting machines.	
	Any term used in this entry shall bear the meaning it has in entry IL1565 and entry IL1566 in Group 3G.	
PL7005	Machines, internal grinding, (except hand-held drills) of the kind incorporating, or specially designed for the utilisation of, grinding heads designed or rated for operation at speeds in excess of 120,000 revolutions per minute	W
IL1099	Dimensional inspection systems or devices, the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Manual dimensional inspection machines with two or more axes, and having a measurement uncertainty equal to or less (better) than (0.25 + L/1000) micrometre in any axis (L is measured length in mm)	C
	except optical comparators.	
	(b) Computer controlled or numerically controlled dimensional inspection machines having both of the following characteristics	C
	(1) two or more axes;	
	(2) a one dimensional (1D) length measurement uncertainty equal to or less (better) than (1.5 + L/1000) micrometre tested with a probe of an accuracy of less (better) than 0.2 micrometre (L is measured length in mm);	

(c) Linear angular displacement measuring devices, the following–	
(1) linear measuring instruments having any of the following characteristics–	
(A) non-contact type measuring systems with a resolution equal to or less than 0.2micrometre within a measuring range up to 0.2mm	C
(B) linear voltage differential transformer systems having both of the following characteristics	C
(a) linearity equal to or less (better) than 0.1% within a measuring range up to and including 5mm; and	
(b) drift equal to or less (better) than 0.1% per day at a standard ambient test room temperature ± 1K; or	
(C) measuring systems having both the following characteristics	C
(a) contain a laser;	
(b) maintain for at least 12 hours, over a temperature range of ± 1K around a standard temperature and at a standard pressure–	
(1) a resolution over their full scale of ± 0.1micrometre or better; and	
(2) a measurement uncertainty equal to or less (better) than (0.2 + L/2000) micrometre (L is measured length in mm);	

(2) angular measuring instruments having an angular position deviation equal to or less (better) than 0.00025°	C

except–

optical instruments, such as autocollimators, using collimated light to detect angular displacement of a mirror;

(d) Systems for simultaneous linear-angular inspection of hemishells, having both of the following characteristics	C
(1) measurement uncertainty along any linear axis equal to or less (better) than 3.5micrometre per 5mm;	
(2) angular position deviation equal to or less (better) than 0.02°	
NOTE: Specially designed ODMA software for the systems described in this head includes software for simultaneous measurement of wall thickness and contour.	

In this entry–

"angular position deviation" means the maximum difference between angular position and the actual, very accurately measured angular position, after the workpiece mount of the table has been turned out of its initial position;

"linearity" (usually measures in terms of non-linearity) means the maximum deviation of

	the actual characteristic (average of upscale and downscale readings), positive or negative, from a straight line so positioned as to equalise and minimise the maximum deviations;	
	"measurement uncertainty" means the characteristic parameter which specifies in what range about the output value the correct value of the measurable variable lies with a confidence level of 95%. It includes the uncorrected systematic deviations, the uncorrected backlash and the random deviations;	
	"resolution" means the least increment of a measuring device; on digital instruments, the least significant bit.	

GROUP 3B

Chemical and Petroleum Equipment

IL1131	Pumps (except vacuum pumps) designed to move molten metals by electro-magnetic forces	C
PL7029	Equipment for the production and handling of goods specified in PL7028, specially designed components therefor and related technology, the following:	
	(a) Equipment, excluding mixers, for the production, handling and acceptance testing of goods specified in PL7028, and specially designed components therefor	A

	(b) Technology for the production of goods specified in PL7028	B
PL7030	Mixers designed for propellants specified in PL5009 or PL7028, having all the following characteristics: and specially designed components therefor	A
	(a) with provision for mixing under vacuum in the range zero to 13.326 kPa with temperature control capability of the mixing chamber;	
	(b) having either of the following characteristics;	
	(i) having explosion proof electric or hydraulic motor;	
	(ii) having an emergency system to open the system to atmosphere in the case of fire in the mixing chamber; and	
	(c) being either of the following types:	
	(i) batch mixers having a total volumetric capacity of 110 litres or more, or	
	(ii) continuous mixers.	

GROUP 3C

Electrical and Power-Generating Equipment

IL1205	Electro-chemical, semiconductor and radioactive devices for the direct conversion of chemical, solar or nuclear energy to electrical energy, the following–	
	(a) Electro-chemical devices, the following: and specially designed components therefor–	

(1) fuel cells operating at temperatures of 523 K (250°C) or less, including regenerative cells, ie cells for generating electric power, to which all the consumable components are supplied from outside the cell	C
Note: the temperature of 523 K or less refers to the fuel cell and not to the fuel conditioning equipment, which may be either an ancillary or an integral part of the fuel cell battery and which may operate at over 523 K.	
(2) primary cells (non-rechargeable) and batteries, having any of the following characteristics–	
(i) reserve (water, electrolyte or thermally activated) batteries possessing a means of activation and having a rated unactivated storage life of three years or more at an ambient temperature of297 K (24°C)	
(ii) utilizing lithium or calcium (including alloys in which lithium or calcium are constituents) as electrodes and having an energy density at a discharge current equal to C/24 hours (C being the nominal capacity at 297 K (24°C) in ampere-hours) of more than 300 watt-hours per kilogramme at 297 K (24°C) and more than 100 watt-hours per	C

kilogramme at 244 K (−29°)	
Note: Energy density is obtained by multiplying the average power in watts (average voltage in volts times average current in amperes) by the duration of the discharge in hours to 80% of the open-circuit voltage and dividing by the total mass of the cell (or battery) in kilogrammes;	
(iii) using an air electrode together with either lithium or aluminium counter-electrodes and having a power output of 5 kilowatts or more or an energy output of 5 kilowatt-hours or more	C
(3) secondary (rechargeable) cells and batteries having either of the following characteristics after more than 20 charge/discharge cycles at a discharge current equal to C/5 hours (C being the nominal capacity in ampere-hours)–	
(i) utilizing nickel and hydrogen as the active constituents and having an energy density of 55 watt hours per kilogramme or more at 297 K (24°C)	C
(ii) utilizing lithium or sodium as electrodes or reactants and having an energy density of 55 watt-hours per kilogramme or more at the rated operating temperature	C

Note: Energy density is obtained by multiplying the average power in watts (average voltage in volts times average current in amperes) by the duration of the discharge in hours to 75% of the open-circuit voltage and divided by the total mass of the cell (or battery) in kilogrammes;	
(4) molten salt electrolyte cells and batteries which normally operate at temperatures of 773 K (500°C) or below	C
(b) Photo-voltaic cells, the following: and specially designed components therefor–	
(1) cells with a power output of 140 W or more per sq m under 1 kW per sq m tungsten 2,800 K (2,527°C) illumination	C
(2) all gallium arsenide photo-voltaic cells including those having a power output of less than 40 W per sq m measured using the technique in sub-head (1) to this head	C
(3) cells with a power output of 4.5 kW or more per sq m under 100 kW per sq m silicon carbide at 1,750 K(1,477°C) illumination	C
(4) electromagnetic cells (including laser) and ionized particle radiation resistant cells	C
(c) Power sources based on radio-active materials systems other than nuclear reactors	C

except–

(i) those having an output power of less than 0.5 W and a total weight (force) of more than 890 N (90.7 kg);

(ii) those specially designed and developed for medical use within the human body.

There are excluded from this entry cells and power source devices, the following: and specially designed components therefor–

(a) fuel cells specified in sub-head (a)(1) above, provided they are not space qualified, with a maximum output power more than 10 kilowatts and which use gaseous pure hydrogen and oxygen/air reactants, alkaline electrolyte and a catalyst supported by carbon either pressed on a metal mesh electrode or attached to a conducting porous plastic;

(b) lithium primary (non-rechargeable) cells or batteries specified in sub-head (a)(2)(ii) which:

(1) are specially designed for consumer applications; or

(2) are specially designed for civil applications and have a nominal capacity less than or equal to 35 ampere-hours and discharge current of less than C/10 hours (C as defined for the purpose of sub-head (a)(2)(ii)).

(c) lithium secondary (rechargeable) cells and batteries specified in sub-

	head (a)(3)(ii) above which: (1) are specially designed for consumer applications; (2) have a nominal capacity less than or equal to 0.5 ampere-hour and an energy density of less than 40 watt-hours per kilogramme at 273 K (0°C) and a discharge current of less than C/10 hours (C as defined for the purpose of sub-head (a)(3)); (d) sodium secondary (rechargeable) cells and batteries specified in sub-head (a)(3)(ii) above which are specially designed for consumer or civil industrial applications and which are not space qualified. In this entry "space qualified" refers to products which are stated by the manufacturer as designed and tested to meet the special electrical, mechanical or environmental requirements for use in rockets, satellites or high-altitude flight systems operating at altitudes of 100 km or more.	

GROUP 3D

General Industrial Equipment

IL1310	Systems and components specially designed for producing metal alloys, metal alloy powder or alloyed materials specified in entry IL1610 in Group 3H	C
PL7019	Vacuum or controlled environment (inert gas) induction furnaces having either uncooled or gas cooled	

	induction coils 300 mm or less in diameter and capable of operating above 850°C	
	L,I,S,Y	
IL1312	Isostatic presses, the following: and specially designed dies, moulds, components, accessories and controls and specially designed ODMA software therefor–	
	(a) Those having a controlled thermal environment within the closed cavity and possessing an inside chamber dimension of 127 mm or more	C
	(b) Those having any of the following characteristics:	
	(1) Maximum working pressure exceeding 207 MPa	C
	(2) A maximum inside chamber dimension exceeding 406 mm, when the controlled thermal environment which can be achieved and maintained exceeds 1,773 K (1,500°C)	C
	or	
	(3) Having a facility for hydrocarbon impregnation and removal of resultant gaseous degradation products	C
	In this entry “isostatic presses” are equipment capable of pressurising a closed cavity through various media (gas, liquid, solid particles, etc) to create equal pressure in all directions within the cavity upon a workpiece or material.	
	The “inside chamber dimension” is the internal	

	dimension of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension is the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber.	
PL7032	Isostatic presses having all of the following characteristics: and specially designed dies, moulds, components, accessories, controls and software therefor (a) a maximum working pressure of 69 MPa or greater; (b) designed to achieve and maintain a controlled thermal environment of 873K (600°C) or greater; and (c) possessing an inside chamber dimension of 254 mm or greater. In this entry "isostatic presses" are equipment capable of pressurising a closed cavity through various media (gas, liquid, solid particles, etc) to create equal pressure in all directions within the cavity upon a workpiece or material. The "inside chamber dimension" is the internal dimension of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber.	A
IL1353	Manufacturing and testing equipment for optical fibre,	

	optical cable and other cables, the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Equipment specially designed to manufacture cable specified in head (a) or (d) of entry IL1526 in Group 3F	C
	(b) Equipment specially designed to manufacture optical fibre specified in entry IL1526 in Group 3F	C
	(c) Equipment specially designed to manufacture optical fibre preforms specified in entry IL1767 in Group 3I	C
	(d) Optical fibre and optical fibre preform characterisation equipment using semiconductor lasers for the testing of optical fibres or optical fibre preforms at operating wavelengths exceeding 1,000 nm	C
IL1355	Equipment for the manufacture or testing of electronic components and materials, the following: and specially designed components and accessories and specially designed ODMA software therefor–	
	(a) Equipment specially designed for the manufacture or testing of electron tubes or optical elements specified in entry IL1555, IL1556 or IL1558 in Group 3F, and specially designed components therefor	C
	(b) Equipment which is specially designed for the	

manufacture or testing of semiconductor devices, integrated circuits and assemblies, systems which incorporate or have the characteristics of such equipment and equipment which is used or capable of being modified for use in the manufacture or testing of imaging devices, electro-optical devices and acoustic wave devices (except quartz furnace tubes, furnace liners, paddles, boats other than specially designed caged boats, bubblers, cassettes and crucibles specially designed for the equipment specified in this head), the following–	
(1) Equipment for the processing of materials for the manufacture of electronic components and materials, the following–	
(a) Equipment for producing polycrystalline silicon specified in head (f) to entry IL1757 of Group 3I	C
(b) Equipment specially designed for purifying or processing III/V and II/VI semiconductor materials specified in entry IL1757 of Group 3I, except crystal pullers	C
(c) Crystal pullers and furnaces, the following–	
(1) Annealing or recrystallising equipment other than constant temperature furnaces employing high rates of energy transfer capable of processing wafers at	C

	a rate exceeding 5,000 mm^2 /min	
	(2) Stored programme controlled crystal pullers having any of the following characteristics–	
	(A) Rechargeable without replacing the crucible container	C
	(B) Capable of operation at pressures above 250 kPa	C
or		
	(C) Capable of pulling crystals of a diameter exceeding 100 mm diffusion and oxidation furnaces.	C
except–		
	(d) Stored programme controlled equipment for epitaxial growth having any of the following characteristics–	
	(1) Capable of producing a layer thickness uniformity across the wafer of equal to or better than ±3.5%	C
	(2) Rotation of individual wafers during processing	C
or		
	(3) Metallo-organic chemical vapour deposition (MOCVD) reactors	C
	(e) Molecular beam epitaxial growth equipment	C
	(f) Magnetically enhanced sputtering equipment with specially designed integral load locks capable of transferring wafers in	C

	an isolated vacuum environment	
	(g) Equipment specially designed for ion implantation, ion-enhanced or photo-enhanced diffusion, having any of the following characteristics–	
	(1) Patterning capability	C
	(2) Accelerating voltage for more than 200 keV	C
or		
	(3) Capable of high energy oxygen implant into a heated substrate	C
	(h) Stored programme controlled equipment for the selective removal (etching) by means of anisotropic dry methods (eg plasma), the following–	
	(1) Batch types having either of the following characteristics–	
	(A) End-point detection, other than optical emission spectroscopy types	C
or		
	(B) Reactor operational (etching) pressure of 26.66 Pa or less	C
	(2) Single wafer types having any of the following characteristics–	
	(A) End-point detection, other than optical emission spectroscopy types	C
	(B) Reactor operational (etching) pressure of 26.66 Pa or less	C

or	
(C) Cassette-to-cassette and load locks wafer handling	C
(i) Chemical vapour deposition (CVD) equipment, eg plasma-enhanced CVD (PECVD) or photo-enhanced CVD, for semiconductor device manufacturing, having either of the following capabilities, for deposition of oxides, nitrides, metals or polysilicon–	
(1) Chemical vapour deposition equipment operating below 105 Pa	C
or	
(2) PECVD equipment operating either below 60 Pa or having automatic cassette-to-cassette and load lock wafer handling	C
except– low pressure chemical vapour deposition (LPCVD) systems or reactive sputtering equipment.	
(j) Electron beam systems specially designed or modified for mask making or semiconductor device processing, having any of the following characteristics–	
(1) Electrostatic beam deflection	C
(2) Shaped, non-Gaussian beam profile	C
(3) Digital-to-analogue conversion rate exceeding 3 MHz	C

(4) Digital-to-analogue conversion accuracy exceeding 12 bit	C
or (5) Target-to-beam position feedback control precision of 1 micrometre or finer	C
except– electron beam deposition systems or general purpose scanning electron microscopes.	
(k) Surface finishing equipment for the processing of semiconductor wafers, the following–	
(1) Specially designed equipment for backside processing of wafers thinner than 100 micrometre and the subsequent separation thereof	C
(2) Specially designed equipment for achieving a surface roughness of the active surface of a processed wafer with a two-sigma value of 2 micrometre or less, total indicator reading (TIR)	C

except–
single-side lapping and polishing equipment for wafer surface finishing.

(l) Interconnection equipment which is specially designed to permit the integration of any equipment specified in this entry into a complete system, and common single or multiple vacuum chambers	C
(m) Stored programme controlled equipment	

using lasers for the repair or trimming of monolithic integrated circuits, when such equipment has either of the following characteristics–	
(1) A positioning accuracy less than ±1 micrometre	C
or (2) A spot size (kerf width) less than 3 micrometre	C
(2) Masks, mask substrates, mask-making equipment and image transfer equipment for the manufacture of electronic devices or components, the following–	
(a) Finished masks and reticles, and designs therefor	C

except–

(1) Finished masks or reticles, for the production of integrated circuits not specified in Part II of this Schedule;	
(2) Masks or reticles, having both of the following characteristics–	
(A) Their design is based on geometries of 2.5 micrometre or more; and	
(B) The design does not include special features to alter the intended use by means of production equipment or software.	
(b) Mask substrates, the following–	
(1) Hard surface (eg chromium, silicon,	C

molybdenum) coated substrates (eg glass, quartz, sapphire) for the preparation of masks having dimensions exceeding 125 mm × 125 mm;	
(2) Substrates specially designed for X-ray masks	C
(c) Equipment specially designed for computer aided design (CAD) of semiconductor devices or integrated circuits	C

except–

general purpose computers which are not specially designed for computer aided design of semiconductor devices or integrated circuits.

(d) Equipment for mask or reticle fabrication, the following–	
(1) Photo-optical step and repeat cameras capable of producing arrays larger than 100 mm × 100 mm, or capable of producing a single exposure larger than 6 mm × 6 mm in the image (ie focal) plane, or capable of producing line widths of less than 2.5 micrometre in the photoresist on the substrate	C
(2) Mask or reticle fabrication equipment using ion or laser beam lithography capable of producing line widths of less than 2.5 micrometre	C
(3) Equipment for altering masks or reticles or adding pellicles to remove defects	C

except–

(i) mask fabrication equipment using photo-optical methods, which was commercially available before 1st January 1980: (ii) mask fabrication equipment using photo-optical methods, which has a performance level no better than equipment referred to in exception (i) above.	
(e) Stored programme controlled equipment for the inspection of masks, reticles or pellicles with both of the following characteristics	C
(1) A resolution of 250 nanometre or finer; and	
(2) A precision of 750 nanometre or finer over a distance in one or two co-ordinates of 63.5 mm or more.	
except– general purpose scanning electron microscopes except when specially designed and instrumented for automatic pattern inspection.	
(f) Align and expose equipment for wafer production using photo-optical methods, including both projection image transfer equipment and step and repeat equipment, capable of performing any of the following functions–	
(1) Production of a pattern size of less than 2.5 micrometre	C

(2) Alignment with a precision finer than ± 250 nanometre(3 sigma)	C
(3) Machine-to-machine overlay no better than ± 300 nanometre	C
except– photo-optical contact and proximity mask align and expose equipment and contact image transfer equipment.	
(g) Electron beam, ion beam or X-ray equipment for projection image transfer capable of producing patterns less than 2.5 micrometre	C
(h) Equipment using lasers for direct write on wafers capable of producing patterns less than 2.5 micrometre	C
(3) Stored programme controlled inspection equipment using optical image acquisition techniques for pattern comparison for the automatic detection of defects, errors or contaminants of 600 nanometre or less in or on processed wafers or substrates	C

except–

(i) equipment for printed circuit boards or chips;

(ii) general purpose scanning electron microscopes, other than those specially designed and instrumented for automatic pattern inspection.

(4) Specially designed stored programme controlled measuring and

analysis equipment, the following–	
(a) Equipment for the measurement of oxygen or carbon content in semiconductor materials	C
(b) Equipment for line width measurement with a resolution of 1 micrometre or finer	C
(c) Flatness measurement instruments capable of measuring deviations from flatness of 10 micrometre or less with a resolution of 1 micrometre or finer	C
(5) Equipment for the assembly of integrated circuits, the following–	
(a) Stored programme controlled die bonders having all of the following characteristics–	C
(1) Specially designed for hybrid integrated circuits;	
(2) X-Y stage positioning travel exceeding 37.5 × 37.5 mm;	
(3) Placement accuracy in the X-Y plane of finer than ±10 micrometre.	
(b) Stored programme controlled equipment for producing multiple bonds in a single operation (eg beam lead bonders, chip carrier bonders, tape bonders)	C
(c) Semi-automatic or automatic hot cap sealers, in which the cap is heated locally to a higher temperature than the body of the package, specially designed for	C

ceramic microcircuit packages specified in head (b) to entry IL1564 in Group 3F and which have a throughput equal to or more than one package per minute	
except– general purpose resistance type spot welders.	
(6) Stored programme controlled wafer probing equipment having any of the following characteristics–	
(A) Positioning accuracy finer than 2.5 micrometre	C
(B) Capable of testing devices having more than 68 terminals	C
or (C) Capable of testing at a frequency exceeding 1 GHz	C
(7) Test equipment, the following–	
(A) Stored programme controlled equipment specially designed for testing discrete semiconductor devices (including photocells and solar cells) and unencapsulated dice, capable of testing at frequencies over 18 GHz	C
(B) Stored programme controlled equipment specially designed for testing integrated circuits and assemblies thereof, capable of functional testing–	
(a) At a pattern rate exceeding 20 MHz	C
or	

	(b) At a pattern rate exceeding 10 MHz but not exceeding 20 MHz and capable of testing packages of more than 68 terminals	C
	except the following–	
	1. equipment specially designed for testing integrated circuits not specified in entry IL1564 in Group 3F; 2. test equipment specially designed for testing assemblies or a class of assemblies for home and commercial entertainment applications; 3. test equipment specially designed for testing electronic components, assemblies and integrated circuits not specified in entry IL1564 in Group 3F provided such test equipment does not incorporate computing facilities with user accessible programmability.	
	(C) Equipment specially designed for determining the performance of focal-plane arrays at wavelengths of more than 1,200 nm, using stored programme controlled measurements or computer aided evaluation and having any of the following characteristics–	
	(a) Using scanning light spot diameters under 120 nanometre	C
	(b) Designed for measuring photosensitive performance parameters	C

and for evaluating frequency response, modulation transfer function, uniformity of responsivity or noise	
or (c) Designed for evaluating arrays capable of creating images with more than 32 × 32 line elements	C
(8) Filters for clean rooms, capable of providing an air environment of 10 or less particles of 300 nanometre or smaller per 28.32 litres, and filter materials therefor	C
(9) Electron beam test systems, capable of operating at or below 3 keV, for non-contactive probing of powered-up semiconductor devices having any of the following characteristics–	
(A) Stroboscopic capability with either beam blanking or detector strobing	C
(B) An electron spectrometer for voltage measurements with a resolution of less than 500 mV	C
or (C) Electrical tests fixtures for performance analysis of integrated circuits	C
except– scanning electron microscopes, other than when specially designed and instrumented for non-contactive	

probing of a powered-up semiconductor device.

(10) Stored programme controlled multifunctional focussed ion beam systems specially designed for manufacturing, repairing, physical layout analysis and testing of masks or semiconductor devices and having either of the following characteristics–

(A) Target-to-beam position feedback control precision of 1micrometre or finer	C
or	
(B) Digital-to-analogue conversion accuracy exceeding 12 bit	C

(11) Particle measuring systems employing lasers designed for measuring particle size and concentration in air, having both of the following characteristics–

(A) Capable of measuring particle sizes of 200nanometre or less at a flow rate of 28.32litres/min or more	C
and	
(B) Capable of characterising Class 10 clean air or better	C

In this entry, references to–

"masks" are to masks used in ultraviolet photo-lithography, visible light photo-lithography, electron beam lithography, X-ray lithography, and ultraviolet lithography;

"batch types" of equipment are to those types which are not specially designed for production processing of single wafers. Such machines can process two or more wafers simultaneously with common process parameters, e.g.RF power, temperature, etch gas species or flow rates;

"single wafer types" of machine are to machines which are specially designed for the production processing of single wafers and include–

(i) machines which use automatic wafer handling to load single wafers; and

(ii) machines which can load and process several wafers for simultaneous processing but in which the etching parameters can be determined separately for each wafer;

"stored program controlled equipment" are to equipment controlled by using instructions stored in electronic storage which a processor can execute in order to direct the performance of predetermined functions;

"magnetically enhanced sputtering equipment" are to equipment incorporating a cathode assembly having an integral magnetic structure for enhancing the plasma intensity.

IL1357	Equipment for the production of fibres specified in entry IL1763 in Group 3I or their composites, the following: and specially designed components and accessories and specially designed ODMA software therefor–	
	(a) Filament winding machines of which the motions for positioning, wrapping and winding fibres are co-ordinated and programmed in three or more axes, specially designed to fabricate composite structures or laminates from fibrous and filamentary materials; and co-ordinating and programming controlstherefor	A
	(b) Tape-laying machines of which the motions for positioning and laying tape and sheets are co-ordinated and programmed in two or more axes, specially designed for the manufacture of composite airframes and missile structures	A
	(c) Multidirectional, multidimensional weaving machines and interlacing machines, including adapters and modification kits, for weaving, interlacing or braiding fibres to manufacture composite structures, except textile machinery which has not been modified for the above end-uses	A
	(d) Specially designed or adapted equipment for the production of fibrous and filamentary materials	

	specified in head (a) or (b) in entry IL1763 in Group 3I, the following–	
	(1) equipment for converting polymeric fibres (such as polyacrylonitrile, rayon, or polycarbosilane) including special provision to strain the fibre during heating	A
	(2) equipment for the vapour deposition of elements or compounds on heated filamentary substrates	A
	(3) equipment for the wet-spinning of refractory ceramics (such as aluminium oxide) A	
	(e) Specially designed or adapted equipment for special fibre surface treatment or for producing prepregs and preforms specified in head (c) in entry IL1763 in Group 3I	A
	NOTE	
	Specially designed or adapted components and accessories for the machines specified in this entry include, but are not limited to, moulds, mandrels, dies, fixtures and tooling for pressing, curing, carbonising, graphitising, casting, sintering or bonding of preforms, composite structures, laminates and manufactures thereof specified in head (d) to entry IL1763 in Group 3I.	
PL7045	Technology for the regulation of temperature, pressure or atmosphere in autoclaves or hydroclaves, being equipment specified in entry IL1357 head (e), for the production	B

	of composites or partially processed composites	
IL1358	Equipment specially designed for the manufacture or testing of magnetic recording media specified in entry IL1572 in Group 3G, the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Equipment which incorporates specially designed modifications for the application of magnetic coating to flexible disk recording media with a packing density exceeding 2,460 bit per cm	C
	(b) Equipment specially designed for the application of magnetic coating to non-flexible (rigid) disk type recording media not excepted in paragraph (vi) of head (d) of entry IL1572 in Group 3G	C
	(c) Stored programme controlled equipment for monitoring, grading, exercising or testing recording media, other than tape, specified in head (d) of entry IL1572 in Group 3G	C
	except–	
	diskette unit test equipment.	
IL1361	Test facilities and equipment for the design or development of aircraft orgas turbine aero-engines, the following: and specially designed components and accessories and specially designed ODMA software therefor–	

(a) Wind tunnels for speeds of Mach0.9 or greater	A
(b) Devices for simulating flow-environments of Mach5 and above, regardlessof the actual Mach number at which the devices operate, including hot shot tunnels, plasma arc tunnels, shock tubes, shock tunnels, gas tunnels and light gas guns	C
(c) Wind tunnels and devices, other than two dimensional (2-D) sections that have unique capabilities for simulating Reynolds number flow in excessof 25×10^6 , at transonic velocities	C
(d) Automated control systems, instrumentation (including sensors) and automated data-acquisition equipment, specially designed for use with wind tunnels and devices specified in head (a), (b) or (c) above	C
(e) Models, specially designed for use with wind tunnels or with the devices specified in head (b) or (c) above, of aircraft, helicopters, airfoils, spacecraft, space-launch vehicles, rockets or surface-effect vehicles specified in the entries in Groups 1 and 3E relating thereto or of surface-effect vehicles specified in head (b) of entry IL1416 relating to vessels	C

		(f) Specially designed electromagnetic interference and electromagnetic pulse (EMI/EMP) simulators	C
		(g) Specially designed test facilities and equipment for the development of gas turbine aero-engines and components, the following–	
		(1) special test facilities capable of applying dynamic flight loads, measuring performance or simulating the design operating environments for rotating assemblies or aero-engines	C
		(2) test facilities, test rigs and simulators for measuring combustion system and hot gas flow path performance, heat transfer and durability for static assemblies and aero-engine components	C
		(3) specially designed test rigs, equipment or modified gas turbine engines which are utilized for development of gas turbine aero-engine internal flow systems (gas path seals, air-oil seals and disc cavity flow fields)	C
PL7040	Test benches and test stands for solid or liquid propellant rockets or rocket motors, the following: and specially designed software therefor–		
		(a) those capable of more than 90kN (20,000lbs) of thrust	A
		(b) those capable of simultaneously	A

	measuring the three axial thrust components		
PL7041	Environmental chambers and anechoic chambers, having both the following characteristics: and specially designed software therefor	A	
	(a) capable of simulating either:		
	(i) altitudes of 15,000 metres or greater; or		
	(ii) temperatures in the range from minus 50°C or below to plus 125°C or higher; and		(b)
	(i) in the case of environmental chambers, providing vibration environments of 10g RMS or greater between 20Hz and 2,000Hz and imparting forces of 6kN or greater; or		
	(ii) in the case of anechoic chambers, providing acoustic environments having either of the following characteristics:		
	(1) an overall sound pressure level of 140dB or greater (referencedto 2 × 10^{-5} (N/m^2); or		
	(2) a rated power output of 4kW or greater.		
IL1362	Vibration test equipment and components and software therefor, the following–		
	(a) Vibration test equipment using digital control techniques, with a thrust of 50kN (11,250lbs) or more, and specially designed components and specially designed software therefor	A	

	(b) High intensity acoustic test equipment capable of producing an overall sound pressure level of 140dB or greater (referenced to 2 × 10^{-5} N/m^2) or with a rated output of 4kW or greater and specially designed components and specially designed ODMA software therefor	C
	except–	
	analogue equipment.	
	(c) Ground vibration (including modal survey) test equipment that uses digital control techniques, and specially designed components and specially designed ODMA software therefor	C
IL1363	Specially designed water tunnel equipment, components, accessories and databases for the design and development of vessels, the following: and specially designed ODMA software therefor–	
	(a) Automated control systems, instrumentation (including sensors) and data acquisition equipment specially designed for water tunnels	C
	(b) Automated equipment to control air pressure acting on the surface of the water in the test section during the operation of the water tunnel	C
	(c) Components and accessories for water tunnels, the following–	
	(1) balance and support systems	C

	(2) automated flow or noise measuring devices	C
	(3) models of hydrofoil vessels, surface-effect vehicles, SWATH vessels and specially designed equipment and components specified in heads (a), (b), (c), (e), (f), (g) and (h) in entry IL1416 in Group 3E for use in water tunnels	C
	(d) Databases generated by use of equipment specified in this entry	C
	In this entry "database" shall have the same meaning as in entry IL1566 inGroup 3G.	
IL1370	Machine tools for generating optical quality surfaces, specially designed components and accessories therefor, the following: and specially designed ODMA software therefor–	
	(a) Turning machines using a single point cutting tool and having all of the following characteristics	C
	(1) slide positioning accuracy less (better) than 0.0005mm per 300mm of travel total indicator reading (TIR);	
	(2) slide positioning repeatability less (better) than 0.00025mm per 300mm of travel total indicator reading (TIR);	
	(3) spindle runout (radial and axial) less than 0.0004mm total indicator reading (TIR);	
	(4) angular deviation of the slide movement (yaw, pitch and roll) less (better) than 2 seconds of	

arc total indicator reading (TIR) over full travel;	
(5) slide perpendicularity less than 0.001 mm per 300 mm of travel total indicator reading (TIR);	
(b) Fly cutting machines having both of the following characteristics	C
(1) spindle run-out (radial and axial) less than 0.0004 mm total indicator reading (TIR);	
(2) angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc total indicator reading (TIR) over full travel;	
(c) Specially designed components, the following–	
(1) spindle assemblies, consisting of spindles and bearings as a minimal assembly	C

except–

those assemblies with axial and radial axis motion measured along the spindle axis in one revolution of the spindle equal to or greater (worse) than 0.0008 mm total indicator reading (TIR);

(2) linear induction motors used as drives for slides, having all the following characteristics	C
(A) stroke longer than 200 mm;	
(B) nominal force rating greater than 45 N;	
(C) minimum controlled incremental movement less than 0.001 mm;	

	(d) Specially designed accessories, namely single point diamond cutting tool inserts having all the following characteristics	C
	(1) flawless and chip-free cutting edge when magnified 400 times in any direction;	
	(2) cutting radius between 0.1 and 5 mm;	
	(3) cutting radius out-of-roundness less than 0.002 mm total indicator reading (TIR).	
IL1371	Anti-friction bearings, the following–	
	(a) Ball and roller bearings having an inner bore diameter of 10 mm or less and tolerances of ABEC 5, RBEC 5 or better and either of the following characteristics–	
	(1) made of special materials, that is to say, with rings, balls or rollers made from any steel alloy or other material (including but not limited to high-speed tool steels, Monel metal, beryllium, metalloids, ceramics and sintered metal composites), except the following; low-carbon steel, SAE–52100 high carbon chromium steel, SAE–4615 nickel molybdenum steel, AISI–440C (SAE–51440C) stainless steel (or national equivalents)	C
	or	
	(2) manufactured for use at normal operating temperatures over 150°C	C

	either by use of special materials or by special heat treatment	
	(b) Ball and roller bearings (exclusive of separable ball bearings and thrust ball bearings) having an inner bore diameter exceeding 10 mm and having tolerances of ABEC 7, RBEC 7 or better and either of the following characteristics–	
	(1) made of special materials, that is to say with rings, balls or rollers made from any steel alloy or other material (including but not limited to high-speed tool steels, Monel metal, beryllium, metalloids, ceramics and sintered metal composites), except the following: low-carbon steel, SAE–52100 high carbon chromium steel, SAE–4615 nickel molybdenum steel, AISI–440C (SAE–51440C) stainless steel (or national equivalents)	C
or		
	(2) manufactured for use at normal operating temperatures over150°C either by use of special materials or by special heat treatment	C
	(c) Ball and roller bearings having tolerances better than ABEC 7	C
	(d) Gas-lubricated foil bearings	C
	(e) Bearing parts usable only for bearings specified in this entry, the	C

	following: outer rings, inner rings, retainers, balls, rollers and sub-assemblies	
	There shall be excluded from this entry hollow bearings.	
IL1385	Specially designed production equipment for compasses, gyroscopes (gyros), accelerometers and inertial equipment, specified in entry IL1485 in Group 3E	A
PL7044	Equipment and facilities specially designed for the production of the following goods:	
	(a) goods specified in the following entries, heads or sub-heads in this Schedule:	
	(i) IL1465	A
	(ii) IL1746, sub-head (k) (1) A	
	(iii) PL7017	A
	(iv) PL7018	A
	(v) PL7026	A
	(b) gas turbine aero engines certified or uncertified with 8.89 kN (2000 lbs) thrust or less (uninstalled) and with a thrust specific fuel consumption for maximum power at sea level static, standard atmosphere, equal to or less than 0.046 kg/N/hr (0.45 lb/lbf/hr) A	
IL1388	Specially designed equipment for the deposition, processing and in-process control of inorganic overlays, coatings and surface modifications, for non-electric substrates by processes specified in entry IL1389 in this Group, the following: and specially	

designed automated handling, positioning, manipulation and control components and specially designed ODMA software therefor–		
	(a) Stored programme controlled chemical vapour deposition (CVD) production equipment with both of the following characteristics–	C
	(1) process modified for one of the following–	
	(a) pulsating CVD;	
	(b) controlled nucleation thermal decomposition (CNTD); or	
	(c) plasma enhanced or plasma assisted CVD; and	
	(2) having any of the following characteristics–	
	(a) incorporating high vacuum (less than or equal to 10^{-7} atm) rotating seals;	
	(b) operating at reduced pressure (less than 1 atm); or	
	(c) incorporating in situ coating thickness control;	
	(b) Stored programme controlled ion implantation production equipment having beam currents of 5 mA or higher	C
	(c) Stored programme controlled electron beam physical vapour deposition (EB–PVD) production equipment with either of the following characteristics	C

(i) incorporating power systems greater than 80 kW; or	
(ii) (1) incorporating power systems greater than 50 kW; and (2) having both of the following characteristics:	
(a) incorporating a liquid pool level laser control system which regulates precisely the ingots feed rate; and (b) incorporating a computer controlled rate monitor operating on the principle of photo-luminescence of the ionised atoms in the vaporant stream to control the deposition rate of a coating containing two or more elements.	
(d) Stored programme controlled plasma spraying production equipment having any of the following characteristics–	
(1) operating at atmospheric pressure discharging molten or partially molten material particles into air or inert gas (shrouded torch) at nozzle exit gas velocities greater than 750 m/sec calculated at 293 K at1 atmosphere	C
(2) operating at reduced measure controlled atmosphere (less than or equal to 100 millibar (0.1 atm) measured above and within 30 cm of the gun nozzle exit) in a	C

vacuum chamber capable of evacuation down to10^{-4} millibar prior to the spraying process at reduced measure controlled atmosphere (less than or equal to 100 millibar (0.1 atm) measured above and within 30 cm of the gun nozzle exit) in a vacuum chamber capable of evacuation down to10^{-4} millibar prior to the spraying process	
(3) incorporating in situ coating thickness control	C
(e) Stored programme controlled sputter deposition production equipment capable of current densities of 5mA/cm^2 or higher at a deposition rate of10 micrometres/hr or higher	C
(f) Stored programme controlled cathodic arc deposition production equipment with either of the following characteristics–	
(1) incorporating target areas larger than 45.6 cm^2	C
or	
(2) incorporating a magnetic field steering control of the arc spot on the cathode	C
(g) Deposition process or surface modification equipment for stored programme controlled production processing which enables the combining of any individual deposition processes specified in	C

	heads (a) to (f) above (inclusive) so as to enhance the capability of such individual processes	
	For the purpose of this entry "stored programme controlled" means controlled by using instructions stored in an electronic storage which a processor can execute in order to direct the performance of predetermined functions.	
IL1389	Technology and specially designed ODMA software therefor, the following–	
	(a) Technology for application to non-electronic devices designed to achieve, by any process specified in column 1 of the Table below on any substrate specified in that part of column 2 of the Table which relates to that process, any inorganic overlay coating or inorganic surface modification coating specified in that part of column 3 of the Table which relates to that substrate	D
	except that this head does not include technology for single stage pack cementation of solid airfoils.	
	(b) Specially designed ODMA software for the technology included in head (a) D	
	Note: The processes included in column 1 are defined in Notes A(a)–(i) below. Other terms used in the Table are defined in Notes B(1)–(8) below.	

Table

1. Coating process	*2. Substrate*	*3. Resultant coating*
A. chemical vapour deposition (CVD)	superalloys	aluminides for internal surfaces, alloyed aluminides or noble metal modified aluminides
	titanium or titanium alloys	carbides aluminides or alloyed aluxinides
	ceramics	silicides or carbides,
	carbon-carbon, carbon-ceramic, or metal matrix composites	silicides, carbides mixtures thereof or dielectric layers
	copper or copper alloys	tungsten or dielectric layers
	silicon carbide or cemented tungsten carbide	carbides, tungsten, mixtures thereof or dielectric layers
B. electron-beam physical vapour deposition (EB-PVD)	superalloys	alloyed silicides, alloyed aluminides MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium), modified zirconia (except calcia-stabilized zirconia) or mixtures thereof (including mixtures of the above with silicides or aluminides)
	ceramics	silicides or modified zirconia (except calcia-stabilized zirconia)
	aluminium alloys	MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium), modified zirconia (except calcia-stabilized zirconia) or mixtures thereof
	corrosion resistant steel	MCrAlX (except CoCrA1Y which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium) modified zirconia

1. Coating process	*2. Substrate*	*3. Resultant coating*
		(except calcia-stabilized zirconia)
	carbon-carbon, carbon-ceramic, or metal matrix composites	silicides, carbides, mixtures thereof or dielectric layers
	copper or copper alloys	tungsten or dielectric layers
	silicon carbide or cemented tungsten carbide	carbides, tungsten, mixtures thereof or dielectric layers
C. electro-phoretic deposition	superalloys	alloyed aluminides or noble metal modified aluminides
D. pack cementation	superalloys	alloyed aluminides or noble metal modified aluminides
(see also A above)	carbon-carbon, carbon-ceramic or metal matrix composites	silicides, carbides or mixtures thereof
	aluminium alloys	aluminides or alloyed aluminides
E. plasma spraying (high velocity or low pressure only)	superalloys	MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium), modified zirconia (except calcia-stabilized zirconia) or mixtures thereof
	aluminium alloys	MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium), modified zirconia (except calcia-stabilized zirconia), silicides or mixtures thereof
	corrosion resistant steel	MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium), modified zirconia (except calcia-stabilized zirconia) or mixtures thereof
	titanium or titanium alloys	carbides or oxides

1. Coating process	*2. Substrate*	*3. Resultant coating*
F. slurry deposition	refractory metals carbon-carbon, carbon-ceramic or metal matrix composites	fused silicides or fused aluminides silicides, carbides or mixtures thereof
G. sputtering (high rate reactive or radio frequency only)	superalloys	alloyed silicides, alloyed aluminides noble metal modified aluminides, MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium), modified zirconia (except calcia-stabilized zirconia), platinum or mixtures thereof (including mixtures of the above with silicides or aluminides)
	ceramics	silicides, platinum or mixtures thereof
	aluminium alloys	MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium), modified zirconia (except calcia-stabilized zirconia) or mixtures thereof
	corrosion resistant steels	MCrAlX (except CoCrAlY which contains less than 22 weight per cent of chromium and less than 12 weight per cent of aluminium and less than 2 weight per cent of yttrium) modified zirconia (except calcia-stabilized zirconia) or mixtures thereof
	titanium or titanium alloys	borides or nitrides
	carbon-carbon, carbon-ceramic or metal matrix composites	silicides, carbides, mixtures thereof or dielectric layers
	copper or copper alloys	tungsten or dielectric layers
	silicon carbide or cemented tungsten carbide	carbides, tungsten or dielectric layers
H. ion implantation	high temperature bearing steels	tantalum, chromium or niobium (columbium)

1. Coating process	2. Substrate	3. Resultant coating
	beryllium or beryllium alloys	borides
	carbon-carbon, carbon-ceramic or metal matrix	silicides, carbides, mixtures thereof or dielectric layers
	titanium or titanium alloys	borides or nitrides
	silicon nitride or cemented tungsten carbide	nitrides, carbides or dielectric layers
	sensor window materials transparent to electromagnetic waves, as follows: silica, alumina, silicon, germanium, zinc sulphide, zinc selenide or gallium	arsenide dielectric layers

Notes:

A. The definitions of processes specified in column 1 of the Table are as follows:

(a) "Chemical Vapour Deposition" (CVD) is an overlay coating or surface modification coating process wherein a metal, alloy, composite or ceramic is deposited upon a heated substrate. Gaseous reactants are reduced or combined in the vicinity of a substrate resulting in the deposition of the desired elemental, alloyed or compounded material on the substrate. Energy for this decomposition or chemical reaction process is provided by the heat of the substrate.

(1) CVD includes the following processes: out-of-pack, pulsating, controlled nucleation thermal decomposition (CNTD), plasma enhanced or plasma assisted processes.

(2) "Pack" means a substrate immersed in a powder mixture.

(3) The gaseous material utilized in an out-of-pack process is produced using the same basic reactions and parameters as the pack cementation process, except that the substrate to be coated is not in contact with the powder mixture.

(b) "Electron beam physical vapour deposition" (EB PVD) is an overlay coating process conducted in a vacuum chamber, wherein an electron beam is directed onto the surface of a coating material causing vaporization of the material and resulting in condensation of the resultant vapours onto a substrate positioned appropriately, and includes a case where gases are added to the chamber during the processing.

(c) "Electrophoretic deposition" is a surface modification coating or overlay coating process in which finely divided particles of a coating material suspended in a liquid dielectric medium migrate under the influence of an electrostatic field and are deposited on an electronically conducting substrate.

NB: Heat treatment of parts after coating materials have been deposited on the substrate, in order to obtain the desired coating, is an essential step in the process.

(d) "Pack cementation" is a surface modification coating or overlay coating process wherein a substrate is immersed in a powder mixture, a so-called pack, that consists of:

(1) the metallic powders that are to be deposited (usually aluminium, chromium, silicon or combinations thereof);

(2) an activator (normally a halide salt); and

(3) an inert powder, most frequently alumina.

The substrate and powder mixture is contained within a retort which is heated to between 1030 K to 1375 K for sufficient time to deposit the coating.

(e) "Plasma spraying" is an overlay coating process wherein a gun (spray torch), which produces and controls a plasma, accepts powder coating materials, melts them and propels them towards a substrate, whereon an integrally bonded coating is formed.

(1) "High velocity plasma spraying" means such spraying at more than 750 metres per second.

(2) "Low pressure plasma spraying" means such spraying at less than ambient atmospheric pressure.

(f) "Slurry deposition" is a surface modification coating or overlay coating process wherein a metallic or ceramic powder with an organic binder is suspended in a liquid and is applied to a substrate by either spraying, dipping or painting; subsequently air or oven dried, and heat treated to obtain the desired coating.

(g) "Sputtering" is an overlay coating process wherein positively charged ions are accelerated by an electric field towards the surface of a target (coating material). The

kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on the substrate.
NB: Triode, magnetron or radio frequency sputtering to increase adhesion of coating and rate of deposition are included.
(h) "Ion implantation" is a surface modification coating process in which the element to be alloyed is ionized, accelerated through a potential gradient and implanted into the surface region of the substrate. It includes processes in which the source of the ions is a plasma surrounding the substrate and processes in which ion implantation is performed simultaneously with electron beam physical vapour deposition or sputtering.
(i) "Cathodic arc deposition" employs a cathode which is consumable and has an arc discharge established on the surface by a momentary contact of ground trigger. Arc spots form and begin to erode randomly but uniformly the cathode surface creating a highly ionised plasma. The anode can be either a cone attached to the periphery of the cathode through an insulator or the chamber can be used as an anode. Substrates appropriately positioned receive deposits from the ionised plasma. Substrate biasing is used for non-line-of-sight deposition. A gas can be introduced in the vicinity of the substrate surface in order to react during deposition to synthesise compound coatings.

B. The definitions of other terms used in the Table are as follows–
(1) "Coating process" includes coating repair and refurbishing as well as original coating.
(3) Multiple stage coatings in which an element or elements are deposited prior to application of the aluminide coating, even if these elements are deposited by another coating process, are included in the term "alloyed aluminide coating", but the multiple use of single-stage pack cementation processes to achieve alloyed aluminides is not included in the term "alloyed aluminide coating".
(3) Multiple-stage coatings in which the noble metal or noble metals are laid down by some other coating process prior to application of the aluminide coating are included in the term "noble metal modified aluminide coating".
(4) "Mixtures" consist of infiltrated material, graded compositions, co-deposits and multilayer deposits and are obtained by one or more of the coating processes specified in this Table.
(5) "MCrAlX" refers to an alloy where M equals cobalt, iron, nickel or combinations thereof and X equals hafnium, yttrium, silicon or other minor additions in various proportions and combinations.
(6) "Aluminium alloys" as a substrate in this Table means alloys usable at temperatures above 500 K (227°C).
(7) "Corrosion resistant steel" means such steel as complies with AISI (American Iron and Steel Institute) 300 series or equivalent national standard for steels.
(8) "Refractory metals" as a substrate in this Table means the following metals and their alloys: niobium (columbium), molybdenum, tungsten and tantalum.

PL7033	CVD Furnaces designed or modified for the densification of carbon-carbon composites, and specially designed components and specially designed software therefor	A
IL1391	Robots, robot controllers and robot end-effectors, the following: and specially designed components and specially designed ODMA software therefor–	
	(a) Robots having any of the following characteristics–	
	(1) capable of employing feedback information in real-time processing from vision systems to generate or modify	C

programmes or to generate or modify numerical programme data

except–

(A) those capable of processing no more than 100,000 pixels using an industrial television camera, or no more than 65,536 pixels using a solid-state camera;

(B) those using a single-scene analysis processor having neither a word size of more than 32 bit (excluding parity bits) nor parallel processing for the same task;

(C) those having software not capable of full three-dimensional mathematical modelling or full three-dimensional scene analysis; NOTE: The above exception includes approximation of the third dimension by viewing at a given angle, and limited grey scale interpretation for the perception of depth or texture for the approved tasks (21/2D);

(D) those having no user-accessible programmability other than by input reference images through the system's camera; or

(E) those capable of no more than one scene analysis every 0.1 second;

The exceptions in paragraphs (A), (B), (C), (D) and (E) above do not apply to technological documents the information in which includes

information relating to goods excluded by paragraphs (A), (B), (C), (D) or (E) other than that necessary for the operation, repair or maintenance of the robot.	
(2) specially designed to comply with national safety standards applicable to explosive munitions environments	C
(3) incorporating means of protecting hydraulic lines against externally induced punctures caused by ballistic fragments (eg, incorporating self-sealing lines) and designed to use hydraulic fluids with flash points higher than 839K (566°C)	C
(4) specially designed for underwater use (namely incorporating special techniques or components for sealing, pressure compensation or corrosion resistance)	C
(5) operable at altitudes exceeding 30,000 m	C
(6) specially designed for outdoor applications and meeting military specifications therefor	C
(7) specially designed or rated for operating in an electro-magnetical pulse (EMP) environment	C
(8) specially designed or rated as radiation-hardened beyond that necessary to withstand normal industrial (namely non-nuclear industry) ionising radiation	C
(9) equipped with precision measuring	C

	devices specified in entry IL1099 in Group 3A	
	(10) specially designed to move autonomously its entire structure through three-dimensional space in a simultaneously co-ordinated manner	C
	except–	
	(A) systems in which the robot moves along a fixed path;	
	(B) robots specially designed for household use or those modified from household robots for educational purposes (pre-university), if not specified elsewhere in this entry;	
	(b) Electronic controllers or end-effectors specially designed for robots specified in head (a) above	C

GROUP 3E

Aircraft, Spacecraft, Marine Equipment and Ships (Other than Warships and Naval Equipment)

IL1401	Reciprocating diesel engine development and production technologies, including specially designed software, the following–	
	(a) Development and production technology, including specially designed software, for reciprocating diesel engine ground vehicle propulsion	D

systems having all of the following characteristics–	
(1) a box volume of $1.2m^3$ or less;	
(2) an overall power output of more than 750 kW based on 80/1269/EEC, ISO 2534 or national equivalents;	
(3) a power density of more than 700 kW/m^3 of box volume.	
(b) Development and production technology for solid or dry film cylinder wall lubrication permitting operation at temperatures in excess of 723 K (450°C) measured on the cylinder wall at the top limit of travel of the top ring of the piston	D
(c) Production technology for specially designed components for high output diesel engines, the following:	
(1) Production technology for any specially designed components when used in low heat rejection	D

engines and employing ceramic material specified in entry IL1733	
(2) Production technology for turbocharger systems with single-stage compressors and having all of the following characteristics	D
(A) operating at pressure ratios of 4:1 or higher;	
(B) A mass flow in the range from 30 to 130 kg per minute; and	
(C) Variable flow area capability within the compressor or turbine sections;	
(3) Production technology for diesel fuel injection systems having all of the following characteristics	D
(A) Maximum fuel injection pressure of 1×10^8 pascal (1,000 bar) or more;	
(B) Injection amount in excess of 230 mm^3 injection per cylinder;	
(C) Injection nozzle hole of 0.254 mm or less;	

(D) Capability to complete fuel injection in 30 crank angle degrees or less;

(E) Electronic features for control of the fuel injection quantity, timing and duration throughout the engine speed and load range, through the use of appropriate sensors; and

(F) Designed for engines of more than eight cylinders.

In this entry–

"box volume" means the product of three dimensions at right angles to each other measured in the following way–

Length: the length of the crankshaft from front flange to flywheel face;
Width: the greatest of the following:
(a) the outside dimension from valve cover to valve cover;
(b) the dimension of the outside edges of

the cylinder heads; or
(c) the diameter of the flywheel housing;

Height: the greater of the following:
(a) the dimension of the crankshaft centreline to the top plane of the valve cover (or cylinder head) plus 2 times the stroke; or
(b) the diameter of the flywheel housing;

"high output diesel engines" means diesel engines with a specified brake mean effective pressure of 180 kPa or more at a speed of 2,300 rpm, provided the rated speed is 2,300 rpm or more.

IL1416 Vessels (including ships and surface-effect vehicles), water-screw propellers and hub assemblies, water-screw propeller systems, moisture and particulate separator systems and specially designed components, the following–

	(a) Hydrofoil vessels with automatically controlled foil systems which are capable of speeds of above 40 knots in rough water (Sea State Five)	S,I(b) Surface-effect vehicles	C

except hovercraft having all the following characteristics:

(1) designed to carry fewer than 5 passengers including the driver;

(2) dry mass less than 500 kg;

(3) maximum speed less than 50 knots (90 km/h) at Sea State 0;

(4) not designed for operation above Sea State 3;

(c) SWATH vessels having underwater hulls whose cross-sectional area varies along the longitudinal axis between points two major diameters from the bow and two major diameters from the stern	C
(d) Ships and vessels fitted with any of the following–	
(1) equipment specified in Group 1, in entry	S,I

IL1485 in this Group or in entry IL1501, IL1502 or IL1510 in Group 3F		
(2) degaussing facilities	S,I	
		or
(3) closed ventilation systems designed into the vessel which are designed to maintain air purity and positive pressure regardless of the conditions external to the vessel except where those closed ventilation systems are specially designed for and incorporated in the vessel's medical facilities only	C	
(e) Water-screw propellers and hub assemblies, the following–		
(1) supercavitating propellers rated at greater than 7.46 MW (10,000 hp)	C	
(2) controllable-pitch propellers and hub assemblies rated at above 29.83 MW (40,000 hp) capacity	C	

(f) Water-screw propeller systems, the following–	
(1) contrarotating propeller systems rated at greater than 14.92 MW (20,000 hp)	C
(2) ventilated, base-ventilated and super-ventilated propeller systems and semi-submerged propeller systems (or surface propellers) rated at more than 2.24 MW (3,000 hp)	C
(3) systems employing pre-swirl and post-swirl techniques for smoothing the flow into a propeller so as to improve propulsive efficiency of–	
(i) SWATH vessels, hydrofoil vessels, and surface-effect vessels	C
or	
(ii) other vessels whose propeller rotational speed is above 200 rpm, or having propellers with a rating exceeding 44.74 MW (60,000 hp) per shaft	C

(4) pumpjet systems	C
(g) Moisture and particulate separator systems which are capable of removing 99.9 per cent of particles larger than 2 micrometres in diameter with a maximum pressure loss of 1.6 kPa (16 millibar) for gas turbine engine air inlets	C
(gg) Technology for moisture and particulate separator systems specified inhead (g) above, the following–	
(1) technology for preventing water leakage around the filter stages	D
(2) technology for integrating the components of such a system	D
(h) Specially designed components for vessels specified in head (a), (b) or (c) above, the following–	
(1) advanced hull forms which incorporate any of the following–	
(i) stepped hulls for hydrofoil vessels	C

(ii) hulls for air cushion vehicles with trapezoidal platforms	C
(iii) hulls for surface effect vehicles with catamaran-like sidewalls	C
(iv) hulls for wing-in ground effect vehicles	C
(v) underwater hulls and struts for SWATH vessels	C
(2) fully submerged subcavitating or supercavitating hydrofoils	C
(3) lightweight structural components for SWATH vessels, hydrofoil vessels and surface effect vehicles, constructed using anisotropic, orthotropic or sandwich construction methods	C

In this subhead–

"anisotropic construction methods" means the use of fibre reinforcing members aligned so that the load-carrying ability of the structure can be primarily orientated in the direction of expected stress.

"orthotropic construction methods" means the means of stiffening plates, in which the structural members are at right angles to each other. "sandwich construction methods" means the use of structural members or plates which are fabricated and permanently affixed in layers to enhance their strength and reduce their weight.	
(4) flexible skirts, seals and fingers for surface effect vehicles	C
(5) systems for automatically controlling the stability of SWATH vessels, hydrofoil vessels or surface-effect vehicles	C
(6) power transmission shaft systems which incorporate composite material components, for SWATH vessels, hydrofoil vessels or surface effect vehicles	C
(7) lightweight, high capacity	C

(K factor greater than 150) gearing (planetary, cross-connect and multiple input/output gears and bearings) for SWATH vessels, hydrofoil vessels and surface effect vehicles	
(8) water-cooled electrical propulsion machinery (motor and generator), including AC-AC synchronous and AC-DC systems, sectored-disc and concentric-drum rotors for DC homopolar machines, for SWATH vessels, hydrofoil vessels and surface effect vehicles	C
(9) superconducting electrical propulsion machinery for SWATH vessels, hydrofoil vessels and surface effect vehicles	C
(10) lift fans for surface-effect vehicles, rated at greater than 300 kW (400 hp)	C
(11) waterjet propulsor systems rated at an input of 2.24 MW (3,000 hp) or greater for	C

	hydrofoil vessels or surface-effect vehicles	
	In this entry "pumpjet systems" means propulsion systems which utilise divergent nozzle and flow conditioning vane techniques to improve propulsive efficiency or reduce propulsion generated underwater radiated noise.	
PL7009	Other vessels (including ships), the following: and specially designed components therefor–	
	(a) Vessels having special structural features for landing personnel and/or vehicles on a beach	I
	(b) Vessels capable of supporting helicopter operations and maintenance	I
	(c) Vessels capable of submerging	I
	(d) Vessels not elsewhere specified in this Part of this Schedule of below 100 tonnes GRT including inflatable craft in an inflated or uninflated state except light vessels,	I

		fire floats and dredgers	
		(e) Ships with decks and platforms specially strengthened to receive weapons	S,L
IL1417	Submersible systems, including those incorporated in a submersible vehicle, and specially designed components, the following: and specially designed ODMA software therefor–		
		(a) Automatically-controlled atmosphere-regeneration systems specially designed or modified for submersible vehicles which, in a single chemical-reaction cycle, ensure carbon dioxide removal and oxygen renewal	C
		(b) Systems specially designed or modified for the automated control of the motion of a submersible vehicle using navigation data and having closed-loop servo-controls so as to–	

(1) enable the vehicle to move within 10m of a predetermined point in the water column	C
(2) maintain the position of the vehicle within 10m of a predetermined point in the water column	C
(3) maintain the position of the vehicle within 10m while following a cable on or under the sea bed	C

except–

automated control systems incorporated in underwater bulldozers or trench-cutters not capable of operating at depths greater than 100 metres and possessing only negative buoyancy.

(c) Underwater vision systems, the following–	
(1) television systems (comprising camera, lights, monitor and signal transmission equipment) specially designed or modified for remote operation with a submersible vehicle, having a limiting	C

resolution, when measured in the air, of more than 500 lines or underwater television cameras having a limiting resolution, when measured in the air, of more than 600 lines, using IEEE Standard 208/1960 or any equivalent standard	
(2) systems specially designed or modified for remote operation with a submersible vehicle employing techniques to minimize the effects of back-scatter including range-gated illuminators and laser systems	C

except–

television cameras used merely through a porthole.

(d) Remotely controlled articulated manipulators specially designed or modified for use with submersible vehicles and having any of the following characteristics–	
(1) systems which control	C

the manipulator using information from sensors which measure force or torque applied to an external object, distance from an external object, or tactile sense between the manipulator and an external object

except systems where force or torque are only measured and then displayed to the operator.

(2) controlled by proportional master-slave techniques or by using a dedicated stored-programme computer	C
(3) capable of exerting a force of 250N or more or a torque of 250Nm or more and using titanium based alloys of fibrous and filamentary composite materials in their structural members	C

(e) Photographic cameras and associated equipment specially designed or modified for underwater use, having a film format of 35mm or larger, and

capable of any of the following–	
(1) film advancement of more than 5 frames per second	C
(2) annotating the film with data provided by a source external to the camera	C
(3) taking more than 400 full frame exposures without changing the film	C
(4) autofocusing or remote focusing specially designed or modified for use under water	C
(5) automatic back focal distance correction	C
(6) passive or automatic compensation control specially designed to permit underwater camera housings to be useable at depths exceeding 1,000m	C
(7) titanium underwater camera housing specially designed for depths exceeding 1,000m	C
(8) automatic exposure control by using sensing	C

devices in or external to the camera if the camera is capable of operating at depths of more than 300m	
(f) Light systems specially designed or modified for underwater use, the following–	
(1) stroboscopic lights capable of–	
(A) light output energy of more than 250 Joules per flash	C
(B) flash rates of more than 5 flashes per second at a light output energy of more than 10 Joules per flash	C
(2) other lights and associated equipment, designed for operation with equipment specified in sub-head (e)(1) or (e)(8) above	C
(g) Specially designed components for the equipment specified in heads (a) to (f) above	C
(h) Air-independent power systems specially designed for	

underwater use and specially designed components therefor, the following–	
(1) Brayton, Stirling or Rankine Cycle Engine air-independent power systems having any of the following characteristics–	
(A) specially designed chemical scrubber or absorber sub-systems to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust	C
(B) specially designed sub-systems for utilising a monoatomic gas	C
(C) specially designed devices for underwater noise reduction in frequencies less than 10KHz, or special mounting devices for shock mitigation	C
(D) specially designed systems for pressurising products of reaction or for fuel reformation, specially designed systems	C

for the storage of products of the reaction, and specially designed systems for discharging the products of the reaction against a pressure of 100kPa (1 bar) or more	
(2) Diesel Cycle Engine air-independent systems having all of the following characteristics	C
(A) specially designed chemical scrubber or absorber sub-systems to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;	
(B) specially designed sub-systems for utilising a monoatomic gas;	
(C) specially designed devices for underwater noise reduction in frequencies less than 10kHz, or special mounting devices for shock mitigation;	
(D) specially designed exhaust systems that do not continuously	

exhaust products of combustions;	
(3) Alkaline, phosphoric acid or ion exchange membrane fuel cell air-independent power systems with an output exceeding 2kW and operating at a temperature of less than 523K having any of the following characteristics–	
(A) specially designed enclosures for underwater noise reduction in frequencies less than 10kHz, or special mounting devices for shock mitigation	C
(B) specially designed systems for pressurising products of reaction or for fuel reformation, specially designed systems for the storage of products of the reaction, and specially designed systems for discharging the products of the reaction against a pressure of 100kPa (1 bar) or more	C
(4) Specially designed components for sub-systems	C

	specified in sub-head (h)(1)(C), (h)(2)(C) or (h)(3)(A) above	
	(i) Technology, the following–	
	(A) technology for air-independent power systems specified in sub-head (h)(1), (h)(2) or (h)(3) above	D
	(B) technology for sub-systems and specially designed components specified in sub-head (h)(1)(A), (h)(1)(B), (h)(1)(C), (h)(3)(A) or (h)(4) above	D
	(C) technology for sub-systems specified in sub-head (h)(2)(A), (h)(2)(B) or (h)(2)(C) above	D
	In this entry "limiting resolution" in television is a measure of resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart.	
IL1418	Deep submergence vehicles and autonomous submersible vehicles, the following–	
	(a) Deep submergence vehicles, manned or unmanned, tethered or	C

untethered, capable of operating at depths exceeding 1,000m, and specially designed or modified associated systems and equipment therefor, including the following–	
(1) pressure housings or pressure hulls;	
(2) propulsion motors and thrusters;	
(3) hull penetrators or connectors.	
(b) Other manned underwater vehicles which are able to operate autonomously for ten hours or more, provided their maximum range underwater exceeds 15 nautical miles	C

In this entry–

“operate autonomously” means operate fully submerged, without snorkel, all systems working and cruising at the minimum speed at which the submersible can safely control its depth

	dynamically by using its depth planes only, with no need for a support vessel or support base on the surface, sea-bed or shore, and containing a propulsion system for submerged or surface use;	
	“range” means half the maximum distance the vehicle can cover.	
IL1431	Marine gas turbine engines (marine propulsion or shipboard power generation engines), whether originally designed as such or adapted for such use, and specially designed components therefor	C
	Note: for the purpose of this entry “shipboard power generation” does not include offshore platform applications.	
IL1460	Aircraft and helicopters, including tilt wing and tilt rotor aircraft, aero-engines and aircraft and helicopter equipment, and technology therefor, the following–	
	(a) Aircraft and helicopters, except those which do not contain equipment	C

specified in Group 1 or in the entries IL1485 or IL1501 in Groups 3E and 3F and which are of types which are in bona fide normal civil use	
(b) Technology for aircraft and helicopter airframes (including airframes for tilt wing and tilt rotor aircraft), for aircraft propellers, and for aircraft and helicopter airframe, aircraft-propeller and helicopter-rotor-systems components, and specially designed ODMA software therefor, the following–	
(1) design technology using computer-aided aerodynamic analyses for integration of the fuselage, propulsion system and lifting and control surfaces to optimize aerodynamic performance throughout the flight regime of an aircraft	B
(2) technology for the design of active flight	

control, the following–	
(i) technology for configuration design for inter-connecting multiple microelectronic processing elements (on-board computers) to achieve high-speed data transfer and high-speed data integration for control law implementation	D
(ii) technology for control law compensation for sensor location and dynamic airframe loads, namely compensation for sensor vibration environment and for variation of sensor location from centre of gravity	D
(iii) technology for electronic management of systems redundancy and data redundancy for fault detection, fault tolerance and fault isolation	D
except– technology for the design of physical redundancy in hydraulic or mechanical systems or in electrical wiring;	

(iv) technology for design of flight controls which permit in-flight reconfiguration of force and moment controls	D
(3) design technology for integration of flight control, navigation and propulsion control data into a flight management system for flight path optimization	B
(4) design technology for protection of avionic and electrical sub-systems against electromagnetic pulse (EMP) and electromagnetic interference (EMI) hazards from sources external to the aircraft, the following–	
(i) technology for design of shielding systems	B
(ii) technology for the configuration design of hardened electrical circuits and sub-systems	B
(iii) technology for determination of hardening criteria for the above	B

(5) technology for the design, production and reconstruction of adhesively bonded airframe structural members designed to withstand operational temperatures in excess of 120°C	D

except–

airframe structural members for engine nacelles and thrust reversers.

(6) technology for the design and production of propeller blades constructed wholly or partly of composite materials, and specially designed hubs therefor	D

except–

technology for the production of propeller blades–

(a) constructed wholly of wood or glass-fibre-reinforced plastics ;

(b) constructed mainly of wood or glass-fibre-reinforced plastics and which use other materials only in the leading edge or tip; or

(c) constructed mainly of glass-fibre-reinforced or carbon-fibre reinforced plastics.	
(7) technology for the design and production of digital electronic synchrophasers specially designed for propellers; technology for the design of digital electronic controls for propellers; and technology for the production of digital electronic controls for the propeller blades and hubs specified in sub-head (b)(6) above	D
(8) technology for the design and production of active laminar flow control lifting surfaces including design data used to substantiate the design approach	D
(9) technology for the development of helicopter multi-axis fly-by-light or fly-by-wire controllers which combine the functions of at least two of the following into	D

one controlling element	
(i) collective controls;	
(ii) cyclic controls;	
(iii) yaw controls.	
(10) technology for the development of circulation controlled anti-torque or directional control systems for helicopters	D
Note: “Circulation-controlled anti-torque and directional control systems” utilise air blown over aerodynamic surfaces to increase or control the forces generated by the surfaces. Buried fan-in-fin anti-torque designs fitted or not fitted with guide vanes such as the fenestron are excluded from this subhead.	
(11) technology for the development of helicopter rotor blades incorporating variable geometry airfoils utilizing trailing edge flaps or tabs or pivoted nose	D

droop, which can be controlled in position in flight	
(12) technology for the development of active control of helicopter blades and other surfaces used to generate aerodynamic forces and moments	D
Note: “Active control” (of helicopter blades and other surfaces used to generate aerodynamic forces and moments) functions to prevent undesirable helicopter vibrations, structural loads or helicopter rotor dynamic behaviour by autonomously processing outputs from multiple sensors and then providing necessary preventive commands to effect automatic control.	
(13) technology for the development and production of integrated automatic propulsion and airfoil control	D

systems for tilt wing and tilt rotor aircraft	
(c) Helicopter power transfer systems and technology therefor	C
except– (i) helicopter power transfer systems for use in civil helicopters only, the following– (1) those which have been in civil use in civil helicopters for more than eight years; (2) those which do not contain, and were not fabricated utilizing, any of the technologies shown in Table 2 below; (3) those for replacement in or servicing of specific, previously exported helicopters; (ii) technological documents resulting from helicopter powertransfer system performance	

and installation design studies; fabrication technology, or overhaul and refurbishing technology for specific helicopter power transfer systems in civil use in civil helicopters for more than eight years, unless listed in Table 2 below. Note: Documents resulting from helicopter power transfer system performance and installation design studies do not include documents containing technology for: computer-aided design (CAD); computer aided design/ manufacturing (CAD/CAM); or parametric performance analysis, engine analysis and selection, or component design utilizing unpublished technical data.	
(d) Gas turbine engines and auxiliary power units (APUs) for use in aircraft or helicopters and technology therefor	A
except–	

(i) those for use in civil aircraft or civil helicopters only, the following–

(1) jet, turboprop and turboshaft aircraft engines in civil use in civil aircraft or civil helicopters for more than eight years;

(2) gas turbine powered aircraft APUs in civil use in bona fide civil aircraft or civil helicopters for more than eight years;

(ii) technological documents resulting from aircraft performance and installation design studies; fabrication technology, or overhaul and refurbishing technology for specific gas turbine aero-engines or gas turbine powered aircraft APUs in civil use in civil aircraft or civil helicopters for

more than twelve years, unless listed in Table 1 below. Note: Aircraft performance and installation design studies does not include technology for: computer-aided design (CAD); computer-aided design/manufacturing (CAD/CAM); or parametric engine performance analysis, engine cycle analysis and selection, or component aerodynamic design utilizing unpublished technical data.	
(e) Specially designed components for gas turbine engines APUs and helicopter power transfer systems specified in heads (c) and (d) above, the following–	
(1) embodying technologies listed in Table 1 or 2 below	C
(2) hot-section components	C
(3) engine control system components	C
(4) gas turbine engine or APU rotor system	C

	components (including bearings)	

NOTES:

1. The period of civil use referred to in heads (c) and (d) above begins with the date that the particular engine or helicopter power transfer system (model and specifications) or its most recent modification was certified as airworthy for commercial service or commercial navigability under the standards and requirements of the government of the country in which it was manufactured: modification does not include minor safety or operational changes which do not significantly enhance the performance of a particular gas turbine aero-engine or improve its reliability. For the purposes of this entry:

(a) A gas turbine aero-engine which is recertified as the result of incorporating any technology listed in Table 1 below is to be treated as a newly certified engine. Recertification which does not result from incorporation of such technology, or modifications which do not require recertification by national authorities, will not affect the period of civil use of the engine;

(b) Modification of a gas turbine APU by incorporation of any technology listed in Table 1 will cause it to be treated as a new APU. Other modifications will not affect the period of civil use of the APU.

(c) Modification of a helicopter power transfer system by incorporation of any technology listed in Table 2 will restart the period of civil use for the helicopter power transfer system as though it were newly certified in a helicopter. Other modifications will not affect the period of civil use of the helicopter power transfer system.

2. This entry does not include gas turbine engines, APUs and helicopter power transfer systems for civil use and modifications (and technology therefor) certified or recertified for civil use, as described in Note 1 prior to the1st January 1979, other than: Helicopters over 4,530 kg empty weight, and power transmissions systems therefor.

Note: Empty weight is understood to include normal installation and normal minimum crew, but does not include fuel or payload.

Aero-engines, the following–

(i) Piston engines;
(ii) Jet engines of less than 2,625 kg thrust;
(iii) Turboprop or turboshaft engines of less than 2,500 horsepower or with a residual thrust of less than 453 kg.

3. Head (d) above does not include those engines which contain none of the technologies listed in Table 1 below for use in civil aircraft or civil helicopters.

Table 1

Technology relating to the following
I. Materials and manufacturing procedures
Ceramic, ceramic-composite or composite hot-section components (combustor, turbine blades and vanes, seals, discs, flow path)
Turbine blades on basis of directional solidification or monocrystal technology • directional solidification • monocrystal technology
Turbine blades consisting of several parts connected by diffusion bonding
Fibre technology in frames or in highly stressed discs, castings, blades and vanes
Protective coating technology for air-cooled turbine blades and vanes with internal and external cooling passages and their related flow paths capable of operating in high gas temperature environments (in excess of 1,499°C), irrespective of the actual gas temperature environment in

whcih they will be used, involving applications of metallic or ceramic materials by vapour, pack, plasma, electron team, sputtering or sintering processes

Metallic coatings
- plasma sprayed
- other

Ceramic Coatings

Application of powder metallurgy for fan compressor and turbine blades or vanes; discs, wheels, ruduction gears, engine main shafts and framees
- discs
- fan, compressor and turbine blades or vanes, wheels, reduction gears, engine main shafts and frames

Cooled components on basis of electrostream or laser drilling methods;
- electrostream drilling
- laser drilling

Electron beam drlling for small holes in turbine blades and vanes

Titanium or superalloy-casting on basis of centrifugal techniques

Ceramic core casting technology for casting holes in turbine blades and vanes

II. Construction methods

Adjustable flow path geometry and associated control system for:
- fans
- gas generator turbine(s)
- fan/power turbine(s)
- propelling nozzles

(Adjustable flow path geometry and associated control systems do not include: inlet guide vanes, variable pitch fans, variable stators or bleed valves for compressors.)

Full authority or hybrid digital electronic control and respective sensor equipment

High temperature (capable of utilizing gases heated above 1,100°C) heat exchangers for preheating compressor exit air

Combustors with combustion in several stages

Maintenance of compressor or turbine tip clearance through methods employing active compensating casing technology:
- compressor alone
- turbine alone
- compressor and turbine

Ceramic bearings

Nozzles with thrust vectoring (not includng reverse thrust)

Table 2

Technology relating to the following

I. Materials and manufacturing procedures

A. Rotor heads, containing:
- Hot-isostatically pressed materials

B. Gear boxes, containing:
- Navikoff-type gears
- Gears or gear support structures based on materials applying directional solidification or monocrystal technology
- High contact-ratio double-helical (arrow-shaped) gears
- Fibre technology
- Hot-isostatically pressed components
- Gear tooth surfaces hardened by vacuum carburizing or ion nitriding

C. Drive shaft systems containing super-critical drive shafts

II. Construction methods

A. Components fabricated by diffusion bonding

B. High-survivability loss-of-lubrication technology for high-speed bearings (DN equal to or greater and 2.4 million where D is expressed in millimetres and N in rpm)

In this entry–

"civil aircraft" and "civil helicopters" means only those types of civil aircraftr and civil helicopters which are listed by designation in published airworthiness certification lists by the civil aviation authorities to fly commercial civil internal and external routes or for normal civil, private or business use.

"helicopter power transfer systems" means all those components which transfer power from the engine to the main and tail rotor blade(s).
Note: Aero-engines, APUs or helicopter power transfer systems which have any special

	feature designed for a military application are specified in the entry ML10 in Group 1.	
PL7026	Propulsion equipment and components therefor, the following–	
	ramjet engines	A
	scramjet engines	A
	pulsejet engines	A
	combined cycle engines	A
	devices to regulate combustion in goods specified in head (a), (b), (c) or (d) above	A
	specially designed components for goods specified in head (a), (b), (c), (d) or (e) above	A
PL7010		L,Z
PL7016		W
PL7011		L,I,Y,Z
IL1465	Spacecraft and launch vehicles, the following–	
	(a) spacecraft, manned or unmanned (not including their payloads)	A
	except scientific mission space probes which do not contain equipment specified in head (c) below or elsewhere in this Schedule.	
	(b) Launch vehicles	A
	(c) Propulsion systems, guidance equipment, attitude control equipment and on-board communications equipment for remote control of equipment specified in heads (a) or (b) above	A
	(d) Specially designed components for equipment specified in head (a), (b) or (c) above	A

	In this entry "spacecraft" means active and passive satellites and space probes.	
PL7017	Liquid and slurry propellant control systems, having both the following characteristics and specially designed components therefor, except pumps and servo valves (a) designed for propellants and related substances specified in PL5009 or PL7028; (b) designed or modified to operate in environments of more than 10 g RMS between 20 Hz and 2000 Hz	A
PL7018	Pumps and servo valves for liquid and slurry propellant systems, having all the following characteristics (a) designed for propellants and related substances specified in PL5009 or PL7028; and (b) designed or modified to operate in environments of more than 10 g RMS between 20 Hz and 2000 Hz; and (c) (i) in the case of servo valves, having both the following characteristics: (1) having an actuator response time of less than 100×10^{-3} seconds; and (2) designed for a flow rate of 24 litres per minute or greater at an absolute pressure of 7000 kPa (1000psi) or greater; or	A

	(ii) in the case of pumps, having both the following characteristics: (1) a shaft speed of 8000 r.p.m. or greater; and (2) providing a discharge pressure of 7000 kPa (1000psi) or greater.	
PL7037	Vehicles designed or modified for the ground support of goods specified in IL1465	A
	In this entry "ground support" means support in the form of transport, handling, control, activation or launching equipment for land or sea based goods.	
IL1485	Inertial navigation systems, inertial equipment, gyroscopes (gyros) and accelerometers, and specially designed ODMA software therefor, the following: and specially designed components therefor–	
	(a) Gyro compasses with provision for determining and transmitting ship's level reference data (roll, pitch) in addition to own ship's course data	C
	(b) Integrated digital flight instrument systems which include gyrostabilisers or automatic digital flight control systems for aircraft and specially designed ODMA software for the integration thereof	A
	except– (1) flight instrument systems integrated solely for VOR/ILS or MLS navigation and approaches;	

(2) integrated flight instrument systems which– (i) have been in normal civil use for more than two years; and (ii) are standard equipment of civil aircraft and civil helicopters; An "integrated flight instrument system" means a primary instrument and display system using digital data processing techinques to provide manoeuvre guidance information	
(c) Gyro-astro compasses and other devices which derive position or orientation by means of automatically tracking celestial bodies	A
(d) Gyro-stabilisers used for other purposes than aircraft control except (1) those for stabilising an entire surface vessel; (2) those which have been in normal civil use for more than two years;	C
(e) Automatic pilots used for purposes other than aircraft control and specially designed ODMA software for the integration thereof except– marine types for surface vessels;	C
(f) Accelerometers designed for use in inertial navigation systems or in guidance systems of all t;ypes, having either	

	of the following charactgeristics–	
	(1) a threshold of 0.05 g or less	A
	(2) a non-linearity of less than 0.25 per cent of the full scale output	A
	(g) Gyros with a rated free directional drift rate (rated free precession) of less than 0.5° (1 sigma or root mean square value) per hour in a 1 g environment	A
	(h) Continuous output accelerometers and gyros, specified to function at acceleration levels greater than 100 g	A
	(i) Inertial or other equipment using accelerometers specified in head (f) or (h) above or gyros specified in head (g) or (h) above, and systems incorporating such equipment, and specially designed ODMA software for the integration thereof	A
	(j) Specially designed test calibration and alignment equipment for goods specified in heads (a) to (i) above	A

GROUP 3F

Note: Goods specified in the heads of this Group may also be specified in Group 1 of this Part of this Schedule

Electronic equipment including Communications, Radar, and Scientific Instruments and Apparatus

PL7004	Electrical or electronic equipment, whether or not separately specified in an entry in this Schedule, in respect of which a certificate has been issued to the knowledge of the	W

	exporter by or on behalf of the Secretary of State to the effect that the equipment to which the certificate relates meets or has been modified or designed to meet government standards concerned with the limitation of compromising electromagnetic radiation	
IL1501	Navigation, direction finding, radar and airborne communication equipment and technology, the following–	
	(a) Airborne communication equipment having any of the following characteristics: and specially designed components and specially designed ODMA software therefor,	
	(1) designed to operate at frequencies greater than 156 MHz	C
	(2) incorporating facilities for–	
	(i) the rapid selection of more than 200 channels per equipment; or	C
	(ii) equipment using frequency synthesis techniques except equipment operating in the frequency range of 108 to 137 MHz with 760 channels or fewer at not less than 25kHz spacing, and which has been in normal civil use for at least one year;	C
	(3) rated for continuous operation over a range of ambient temperatures extending from below −55°C to above +55°C	C
	(4) designed for modulating methods	C

employing any form of digital modulation using time and frequency redundancy such as Quantized Frequency Modulation (QFM) except–

equipment which does not have the characteristics referred to in sub-head (a)(4) above and

(a) is to equip civil aircraft, or

(b) is normal standard equipment incorporated in civil aircraft.

(b) Navigation and direction finding equipment and technology, the following and specially designed components and specially designed ODMA software and specialised testing, calibrating and training/simulating equipment therefor–	A

(1) airborne navigation equipment and direction finding equipment and technology, the followingt–

(i) equipment designed to make use of Doppler frequency phenomena, except nagivation equipment to be installed in civil aircraft or civil helicopters, and which is normal standard equipment

	of a type installed in civil aircraft or civil helicopters	
	(ia) technology for navigation equipment using Doppler frequency phenomena	B
	(ii) equipment utilising the constant velocity or the rectilinear propagation characteristics of electro-magnetic waves having frequency less than 4×10^{14} Hz (0.75 micrometres) except–	A
	(a) standard commercial airborne equipment needed to equip civil aircraft or civil helicopters or as normal standard equipment incorporated in civil aircraft or civil helicopters being exported for civil commercial use provided such equipment is in conformity with ICAO standards and assures no functions exceeding those resulting from such standards, is not designed to make use of hyperbolic grids at frequencies greater than 3 MHz; Note: Normal standard equipment includes Marker beacons ILS, VOR (OMNI), Omega, Loran A and B; or (b) Loran C equipment having all of the following characteristics: (a) it has been in normal civil use for	

a period of more than one yhear;

(b) it is standard commercial equipment:

(1) needed to equip civil aircraft or civil helicopters; or

(2) incorporated in civil aircraft or civil helicopters;

(c) it is equivalent in all characteristics and performances to standard equipment of aircraft not specified in entry IL1460 in Group 3E;

(d) it is in conformity with ICAO standards;

(e) it is not designed to make use of hyperbolic grids at frequencies higher than 3 MHz;

(f) it does not contain electronic equipment which:

(1) can compute the position of the aircraft in one co-ordinate system when furnished position information in another co-ordinate system (namely co-ordinate conversion equipment);

(2) is specified in entry IL1565 in Group 3G;
(3) has been in normal civil use for a period of less than one year

or
(c) direction finding equipment specially designed for search and rescue purposes and operating at a frequency of 121.5 MHz or 243 MHz, and personal locator beacons operating in this form (which may also have an additional channel selectable for voice mode only);
(iii) radio altimeters, the following–

(a) pulse modulated	A
(b) frequency modulated having a displayed electrical output accuracy better than ±0.914 m over the range between 0 and 30.4 m or better than ±3% above 30.4 m except– standard commercial airborne equipment needed to equip civil aircraft or civil helicopters or as normal standard equipment incorporated in civil aircraft or civil helicopters being exported for civil commercial use, provided such equipment is equivalent in all charcteristics and	A

performance to standard equipment of aircraft not specified in entry IL1460 in Group 3E, and which are frequency-modulated radio altimeters which have been in normal civil use for a period of more than one year;	
(c) frequency modulated which have been in normal civil use for less than one year	A
(iiia) technology for radio altimeters referred to in sub-head (b)(1)(ii)(b) above even when excluded from that sub-head	B
(iv) direction finding equipment operating at frequencies greater than 5 MHz	A
(v) equipment rated for continuous operation over a range of ambient temperatures extending from below −55°C to above +55°C	A
(2) Ground and marine equipment for use with airborne navigation equipment utilising the constant velocity or the rectilinear propagation characteristics of electro-magnetic waves having a frequency less than 4×10^{14} Hz (0.75 micrometres)	C
except– ground and marine equipment for use with airborne navigation equipment using the constant velocity or rectilinear propagation characteristics of electro-magnetic waves having a frequency less than 4	C

$\times 10^{14}$ (wavelength 0.75 micrometre), provided, in the case of ground equipment, it is for use at civil airports or for civil use in association with civil airborne equipment, and– (1) is in conformity with ICAO standards and assures no function exceeding those resulting from such standards; and (2) is not designed to make use of hyperbolic grids at frequencies greater than 3 MHz; (3) ground and marine direction finding equipment operating at frequencies greater than 30 MHz	
except– equipment, other than single side band equipment, operating at frequencies up to 157 MHz and employing a loop system or a system employing a number of spaced vertical aerials uniformly disposed around the circumference of a circle, excluding electronically commutated types; (4) timing receivers whose only function is automatically providing time derived from satellite signals to within 1 millisecond of universal Co-ordinate Time (UCT) or better	C
(5) ground or marine navigation and geodetic positioning systems designed for use with satellite-provided timing	C

positioning or navigation information

except– C

equipment which can only be used with TRANSIT satellite systems or other systems not also specified elsewhere in this Schedule, and which is also not specified in sub-head (b)(4) above. There shall be excluded from sub-heads (b)(4) and (5) global positioning satellite receivers which have all of the following characteristics:

(1) capable only of processing the L1 channel (also called the Standard Positioning Service (SPS channel));

(2) capable of only the Short-Term Code (Coarse Acquisition Code (C/A)) code with short term generation cycle;

(3) no decryption capabilities;

(4) including no cesium beam standards; and

(5) including no null steerable antennae

(c) Radar equipment and specially designed components, specialised testing, calibrating and training/simulating equipment and specially designed software therefor, the following–

(1) airborne radar equipment

except–

airborne civil weather-radar conforming to international standards for civil weather radar provided it does not include any of the following characteristics–

(a) phased array antennas;

(b) frequency agility;

(c) spread spectrum; or

(d) any signal processing specially designed for tracking of vehicles.

(2) ground and marine radar equipment, the following–

(i) equipment operating at a frequency not in normal civil use or at a frequency of more than 10.5 GHz	A
(ii) equipment operating at a frequency of less than 1.5 GHz and having a peak output power from the transmitter greater than 2.5 MW; or operating at a frequency witin the range of 1.5 to 3.5 GHz and having a peak output power from the transmitter greater than 1.5 MW; or operating at a frequency within the range of 3.5 to 6 GHz and having a peak output power from the transmitter greater than1 MW; or operating at a frequency within the range of 6 to 10.5 GHz and having a peak output power from the transmitter greater than 500 kW	A
(iii) equipment operating at a frequency of less	A

than 3.5 GHz and having an 80 per cent or better probability of detection for a 10 sq.m. target at a free space range of 250 nautical miles; or operating at a frequency within the range of 3.5 to 10.5 GHz and having an 80 per cent or better probability of detection for 10 sq.m. target at a free space range of 100 nautical miles	
(iv) equipment utilising other than pulse modulation with a constant or staggered pulse repetition frequency, in which the carrier frequency of the transmitted signal is not changed deliberately between groups of pulses, from pulse to pulse, or within a single pulse	A
except commercial civil airport radar using a carrier frequency that may change from pulse to pulse between two fixed frequencies separated in time and in frequency by constant magnitudes	A
(v) equipment utilising a Doppler technique for any purpose other than M.T.I. systems using a conventional double or triple pulse delay line cancellation technique	A
except those utilised for surveillance and control radar for aerial navigation in civil airports	
(vi) equipment including any digital signal	A

processing techniques used for automatic target tracking, or having a facility for electronic tracking	
(vii) equipment including signal processing techniques (other than those specified in sub-head (c)(2)(vi) above, which have been in normal civil use for a period of less than two years)	A
(viii) equipment ground radar, having been in commercial use for a period of less than one year	A

There shall be excluded from head (c), secondary radar equipment specially designed for civil air traffic identification and control purposes.

The following shall be excluded from this entry–

(a) equipment assemblies for civil marine automatic radar plotting aids or electronic relative motion analyzers designed to achieve the requirements published by the International Maritime Organization in accordance with the Safety of Life at Sea (SOLAS) Conventions, provided the designed tracking speeds do not exceed relative values of greater than 150 knots (77.1 metres/second);

(b) ground radar of the hand-held and automobile-mounted type used for vehicle speed monitoring by police authorities and operating

	in the frequency band from 10.5 to 10.55 GHz;	
	In this entry the terms “civil aircraft” and “civil helicopters” include only those types of civil aircraft and civil helicopters which are listed by designation in published airworthiness certification lists by any civil aviation authority to fly commercial civil internal and external routes or for normal civil, private or business use.	
IL1502	Communication, detection or tracking equipment of a kind using ultra-violet radiation, infrared radiation or ultrasonic waves, and specially designed components and specially designed software therefor	C
	except–	
	(1) the following ultrasonic devices–	
	(a) operating in contact with a controlled material to be inspected;	
	(b) used for industrial cleaning, sorting or materials handling;	
	(c) used for emulsification;	
	(d) used for homogenisation;	
	(e) used in simple educational devices;	
	(f) used in simple entertainment devices;	
	(2) underwater ultrasonic communications systems which do not have any of the following–	
	(a) electronic beam steering;	
	(b) encryption techniques; or	

(c) a carrier frequency outside the range from 20 to 60 kHz;

(3) the following equipment–

(a) industrial equipment employing cells not specified in the entry IL1548;

(b) industrial and civilian intrusion alarm, traffic and industrial movement control and counting systems;

(c) medical equipment;

(d) industrial equipment used for inspection, sorting or analysis of the properties of materials;

(e) simple educational devices which employ photocells;

(f) simple devices for entertainment or for home use which employ photocells;

(g) flame detectors for industrial furnaces;

(h) equipment for non-contact temperature measurement for laboratory or industrial purposes using a single detector cell with no scanning of the detector;

(i) instruments capable of measuring radiated power or energy having a response time constant exceeding 10 ms;

(j) equipment designed for measuring radiated power or energy for laboratory, agricultural or industrial purposes, using a single detector cell with no scanning of the detector, and single detector cell assemblies or probes specially designed therefor, having a response time constant exceeding 1 microsecond;

(k) infrared geodetic equipment, provied that equipment uses a lighting source other than a laser and is manually operated, or uses a lighting source (other than a laser or a light-emitting diode) remote from the measuring equipment;

(l) infrared communication equipment with characteristics not exceeding those referred to in entry IL1519;

(4) the following equipment–

(a) infrared thermal imaging equipment having all the following characteristics:

(1) the detector is a single element;

(2) the detector is neither a charge coupled device (CCD) nor an integrate-while-scan device;

(3) the detector is either:

(i) not cooled; or

(ii) cooled by using a liquid nitrogen Dewar vessel; and

(4) the equipment is:

(i) non-ruggedised, medical equipment; or

(ii) has both of the following:

(a) a resolution not exceeding 22,500 resolvable elements; and

(b) a Noise Equivalent Temperature Difference (NETD) (or temperature sensitivity) of no less than 1K;

(b) infrared viewing equipment having all the following characteristics:

(1) the detector is a pyroelectric vidicon without reticle;

(2) the equipment is designed for fire fighting and buried body detection; and

(3) the optimal sensitivity is in the wavelength range from 8 to 14 micrometers.

Note: This entry includes infrared or ultra-violet sensing devices not specified in Group 1 of Part II of this Schedule and which contain image intensifiers specified in entry IL 1555 in this Group.

IL1510	Marine or terrestrial acoustic systems or equipment specially designed for detecting or locating underwater or subterranean objects or features or for determining the position of surface or underwater vehicles, the following, and specially designed components and specially designed ODMA software therefor–

(a) Marine systems or equipment–

(1) Active (transmitting or transmitting and receiving) systems or equipment, the following–

(A) Wide swath bathymetric survey systems capable of both of the following	C
(a) Measuring depths of more than 300 m below the water surface; and	
(b) Taking measurements at an angle exceeding 10° (0.175 rad) from the vertical	
(B) Object detection or location systems having any of the following characteristics–	
(a) Transmitting frequency below 15 kHz	C
(b) Sound pressure level exceeding 224 dB (reference 1 micropascal at 1 metre) for equipment with an operating frequency at or above 15 kHz and at or below 24 kHz	C
(c) Sound pressure level exceeding 235 dB (reference 1 micropascal at 1 metre) for equipment with an operating frequency exceeding 24 but not exceeding 30 kHz	C
(d) Transmission bandwidth exceeding ± 10% of the design centre frequency	C
(e) Designed to withstand pressure during normal operation at depths exceeding 1 km;	C
or	
(f) Capable of measuring distances over 5 km	C

except–

depth sounders operating vertically below the apparatus and which do not include a scanning function used solely for measuring the depth of water or the distance of submerged or buried objects or for fish-finding.

(C) Acoustic projectors, including transducers, incorporating piezoelectric, magnetostrictive, electrostrictive, electrodynamic or hydraulic elements operating individually or in a designed combination, other than specially designed components for equipment described elsewhere in this entry, and having any of the following characteristics–

(a) An instantaneous radiated acoustic power density exceeding 10 W/m^2 /Hz for devices operating at frequencies below 100 kHz	C
(b) A continuously radiated acoustic power density exceeding 1 W/m^2 /Hz	C

for devices operating at frequencies below 100 kHz

(c) Designed to withstand pressure during normal operation at depths exceeding 1 km	C
(d) Projecting sound with a beamwidth less than 3° (0.0524 rad) for devices operating at frequencies below 100 kHz	C
or	
(e) With side-lobe suppression exceeding 22 dB	C

except– electronic noise sources for vertical use only, mechanical noise sources or chemical noise sources.	
(D) Acoustic systems or equipment for determining the position of surface or underwater vehicles, having any of the following characteristics–	
(a) Capable of processing responses from more than eight beacons in the calculation of a point	C
(b) Using coherent signal processing between two or more beacons and the hydrophone unit carried by surface or underwater vehicle	C
(c) Having devices for automatically correcting speed-of-sound propagation errors for calculation of a point	C
(d) Capable of operating at a range of more than 1 km with a positional accuracy of within 20 m or better when measured at a range of 1 km	C
(e) Having transducers, acoustic modules or hydrophones designed to withstand pressure at depths exceeding 1 km	C
or	
(f) Having beacons with either of the following characteristics–	
(1) Designed to operate normally at depths exceeding 1 km	C
or	
(2) Synchronised with each other using sing-	C

around or other self-calibrating techniques	
(2) Passive (receiving, whether or not related in normal application to separate active equipment) systems or equipment, the following–	
(A) Hydrophones or transducers having either–	
(a) Continuous flexible sensors or assemblies of discrete sensors with dimensions under 20 mm which approximate a continuous flexible sensor	C
or	
(b) Sensors made of materials other than magnetostrictive nickel-iron alloys or rigid piezoelectric ceramics or crystals	C
(B) Hydrophones or transducers incorporating sensors made of rigid piezoelectric ceramic or crystals and having any of the following characteristics–	
(a) A sensitivity better than −180 dB at any depth with no acceleration compensation	C
(b) A sensitivity better than −192 dB with acceleration compensation	C
(c) A sensitivity better than −204 dB when designed for normal operation at depths exceeding 100 m	C
or	

(d) Designed for operation at depths exceeding 1 km	C
(C) Towed acoustic hydrophone arrays having any of the following characteristics–	
(a) Operating at dephs exceeding 100 m	C
(b) Operating at tow speeds over 14.8 km/hour	C
(c) Using heading sensors–	
(1) Incorporated within the array hosing	C
(2) Having an accuracy within ± 0.5° (0.0087 rad)	C
(d) Hydrophone groups uniformly spaced at less than 25m	C
(e) An assembled array diameter under 40 mm	C
(f) Using other than metallic strength members	C
(g) Multiplexed hydrophone group signals	C
(h) A configuration for multiple or overlapping acoustic aperture operation	C
(i) Hydrophone characteristics specified in sub-head (a)(2)(A) or (B)	C
or	
(j) Longitudinally reinforced array-hoses	C
(D) Processing equipment specially designed for acoustic	

hydrophone or geophone arrays, having any of the following characteristics–	
(a) Electronically-steerable beamforming capabilities	C
(b) Side-lobe suppression techniques	C
(c) Real-time at-sea capability to integrate seismic acoustic data received from two or more arrays	C
(d) Cancellation of array flow or acceleration noise	C
(e) Either of the following features provided it has user-accessible programmability–	
(1) Fast Fourier Transform of 1,024 complex points in less than 40 ms	C
or	
(2) An equivalent multiply rate exceeding 800,000 operations per second	C
or	
(f) User-accessible programmability for–	
(1) Time domain processing and correlation	C
or	
(2) Frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes	C

	(b) Terrestrial systems or equipment having either of the following characteristics–	
	(1) Capable of conversion by the user to underwater or marine applications specified in this entry	C
	or	
	(2) Employing geophones or other transducers specified in this entry	C
	In this entry–	
	"acoustic power density" is obtained by dividing the output acoustic power by the product of the area of the radiating surface and the frequency of operation;	
	the sensitivity of a hydrophone is defined as 20 times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V reference, when the hydrophone sensor, without a pre-amplifier, is placed in a plane wave acoustic field having an rms pressure of 1 micropascal.	
IL1516	Receivers, the following: and specially designed components, accessories and specially designed ODMA software therefor–	
	(a) Digitally controlled radio receivers (whether or not computer controlled) which–	
	(1) search or scan automatically a part of the electromagnetic spectrum, and indicate or identify the received signals; and	

(2) complete the switching operation in less than 4.5ms	C

except–

non-ruggedised, pre-set radio receivers designed for use in civil communications which have 1,000 selective channels or fewer;

(b) Receivers for spread spectrum and frequency agile systems, having a total transmitted bandwidth which is–	
(1) 100 or more times the bandwidth of any one information channel; and	
(2) in excess of 50 kHz	C
(c) Receivers which incorporate digital signal processing	C

except–

receivers which are specially designed for internationally allocated civil frequency bands only and which do not permit user-accessible programmability of the digital signal processing circuits.

In this entry–

"spread spectrum" means the technique whereby energy in a narrow-band communication channel is spread over a much wider energy spectrum under the control of a random of pseudo-random bit stream; on receipt, the signal is correlated with the same bit stream to achieve the reverse process of reducing the bandwidth to its original form; by allocating different bit streams to different subscribers transmitting

	simultaneously, significantly greater use can be made of available bandwidth;	
	"frequency agility" means a system in which the transmission frequency of a single communication channel is made to change by discrete steps under the control of a similar bit stream (sometimes known as frequency hopping).	
IL1517	Radio transmitters, the following: and specially designed components therefor–	
	(a) Transmitters or transmitter-amplifiers designed to operate at output frequencies greater than 960 MHz	C
	(b) Transmitters or transmitter-amplifiers designed to provide any of the following features–	
	(1) any system of pulse modulation (this does not include amplitude, frequency or phase-modulated televisions or telegraphic transmitters or pulse-width modulated sound broadcasting transmitters)	C
	(2) rated for operation over a range of ambient temperatures extending from below −40°C to above + 60°C	C
	(c) Transmitters for spread spectrum and frequency agile systems having a total transmitted bandwidth which is–	C
	(1) 100 or more times greater than the	

	bandwidth of any one information channel; and	
	(2) in excess of 50 kHz;	
	There shall be excluded from this entry transmitters or transmitter-amplifiers, or systems containing such equipment, accessories and sub-assemblies therefor, with any of the following characteristics–	
	(i) specially designed for medical applications and operating at ISM frequencies;	
	(ii) having an output power of not more than 10 W, which are specially designed for–	
	(1) industrial or civil intrusion detection and alarm;	
	(2) industrial and traffic detection, counting, speed measurement, identification and movement control; or	
	(3) carrying information from equipment within paragraph (a) or (b)(1) or (b)(2) to this exception or the information from environmental, air or water pollution detection or measurement systems.	
	(iii) transmitters using wideband amplifiers designed for non-frequency agile civil applications.	
	For the purposes of this entry "spread spectrum" and "frequency agile" are as defined in entry IL1516 above.	
PL7003	Burst transmitters and associated receiving equipment (except simple on-line morse or other data signal convertors	W

	or standard items of ADP equipment) and specialized assemblies, sub-assemblies and components therefor In this entry a "burst transmitter" is any electronic equipment or device for use with radio or other communications systems, whether part of a transmitter or modulation device or ancillary to it, which has a capability to accept and store data (telegraphic, speech or other) and to transmit these at transmission speeds/bit rates which are multiples of the input keying speed/bit rates, the purpose or effect of which is to reduce total message duration time and thus to evade detection by other than the intended recipient.	
PL7020	Telemetering and telecontrol equipment suitable for use with aircraft (piloted or pilotless), space vehicles or weapons (guided or unguided), and specially designed test equipment therefor except– equipment specially designed to be used for remote control of model planes, boats or vehicles and having an electric strength of not more than 200 microvolts per metre at a distance of 500 metres.	A
IL1519	Telecommunication transmission equipment, measuring and test equipment, the following: and specially designed components, accessories and specially designed ODMA software therefor– (a) Telecommunication transmission equipment employing digital techniques (including	

the digital processing of analogue signals) and having any of the following characteristics–	
(1) designed for a total digital transfer rate which, at the highest multiplex level, exceeds–	
(A) 45 Mbit/s	C
(B) 8.5 Mbit/s, in the case of stored programme controlled digital cross-connection equipment	C
or	
(C) 90 Mbit/s, to take account of line coding and overhead, for:	
(a) line terminating equipment	C
(b) intermediate amplifier equipment	C
(c) repeater equipment	C
(d) regenerator equipment	C
(e) translation encoders (transcoders)	C
(2) designed for a data signalling rate which exceeds–	
(A) 9,600 bit/s, when using the bandwidth of one voice channel	C
or	
(B) 64,000 bit/s, when using baseband	C
or	
(3) employing a laser having a transmission wavelength exceeding 1,000nm	C
(b) Telecommunication transmission equipment	

employing lasers and any of the following techniques–	
(1) in the case of equipment which has a bandwidth which exceeds 45 MHz or an operating wavelength longer than 1,370 nm, analogue techniques	C
(2) optical heterodyne or homodyne detection techniques (also called coherent optical transmission techniques)	C
or	
(3) wavelength division multiplexing techniques	C
(c) Electronic measuring or test equipment, including bit error rate test sets, specially designed for equipment designed for the total digital transfer rate specified in sub-head (a)(1) above	C
(d) Technology for the development or production of equipment employing digital transmission techniques for operation at a total digital transfer rate at the highest multiplex level exceeding 8.5 Mbit/s	D

There shall be excluded from this entry:

(a) telemetering, telecommand and telesignalling equipment designed for industrial purposes (being sensing heads for the conversion of information into electrical signals, and for the systems used transmitting these electrical signals long distances and translating them into coded data, into control signals and into display signals);

(b) facsimile equipment not specified by entry IL1527 in Group 3F;

(c) equipment employing exclusively the direct current transmission technique.

In this entry:

"data signalling rate" has the meaning as in entry IL1567 in Group 3G;

"telecommunication transmission equipment" means equipment which is–

(a) any, or any combination, of the following:

(1) line terminating equipment;

(2) intermediate amplifier equipment;

(3) repeater equipment;

(4) regenerator equipment;

(5) translation encoders (transcoders);

(6) multiplex equipment;

(7) modulators or demodulators (modems);

(8) transmultiplex equipment; or

(9) stored programme controlled digital cross-connection equipment; and

(b) designed for use in single or multi-channel communication via:

(1) wire (line);

(2) coaxial cable;

(3) optical fibre cable; or

(4) electromagnetic radiation.

IL1520	Radio relay communication equipment, specially designed test equipment, software and technology, the following: and specially designed components and accessories therefor–	
	(a) Radio relay communication equipment designed for use at frequencies exceeding 960 MHz	W

except–

(1) microwave radio links for fixed civil installations, which–

(A) employ analogue transmission; and

(B) are designed for operation at fixed frequencies not exceeding23.6 GHz;

(2) microwave radio links which

(A) employ digital transmission techniques;

(B) are designed for operation at a total digital transfer rate not exceeding 45 Mbit/s or, taking into account line coding and overhead, 90 Mbit/s;

(C) if the total digital transfer rate exceeds 8.5 Mbit/s, do not employ quadrature-amplitude-modulation (QAM) techniques above level 4; and

(D) operate at fixed frequencies not exceeding 23.6 GHz;

(3) ground communication radio equipment designed for civil use with temporarily fixed services and at fixed frequencies not exceeding23.6 GHz with a power output of not more than 5W;

(4) civil sound or television broadcast receiving stations for satellite reception, which–

(A) are designed to comply with ITU standards;

(B) are specially designed for use at fixed frequencies allocated by the International Telecommunications Union (ITU) for civil television or sound radio satellite broadcasting; and

(C) operate at frequencies not exceeding 31 GHz;

(5) equipment which is–

(A) specially designed for the transmission of television signals; and

(B) operates at frequencies not exceeding 23.6 GHz;

(6) equipment which is–

(A) specially designed to be installed and operated in satellite earth stations for the following civil uses–

(a) communication and direct broadcast;

(b) telemetry-tracking-and-command; or

(c) weather or meteorological purposes; and	
(B) designed for an operating frequency not exceeding 31 GHz;	
(b) Tropospheric scatter communication equipment	C
except–	
equipment which has all the following characteristics, namely, that it:	
(1) is designed for fixed civil use;	
(2) operates at fixed frequencies of 2.7 GHz or less;	
(3) uses frequency modulation; and	
(4) has a power amplifier output of 10 kW or less;	
(c) Stand-alone radio transmission media simulators or channel estimators and specially designed ODMA software therefor, specially designed for testing equipment specified in head (a) or (b) above	C
except–	
equipment in which the adjustments can only be made manually;	
(d) Technology:	
(1) for equipment employing quadrature-amplitude-modulation (QAM) techniques or otherwise specified in head (a) above	D
except–	

technology for equipment employing quadrature-amplitude-modulation techniques, where such technology is for the installation, operation or maintenance of such equipment;

(2) for equipment specified in paragraph (6) of the exception to head (a) above — D

except–

technology for the installation, operation or maintenance of such equipment;

(3) for equipment excluded from this entry by paragraph (1) or (2) below — D

except–

technology for the installation, operation or maintenance of such equipment;

There shall be excluded from this entry–

(1) equipment for civil television transmission or for general commercial traffic, which–

(a) is not designed for operation at a total digital transfer rate exceeding 45 Mbit/s;

(b) does not employ quadrature-amplitude-modulation (QAM) techniques; and

(c) has a maximum operating frequency not exceeding 23.6 GHz;

(2) analogue microwave transmission equipment for civil industrial use (for example, remote

	supervision, control and metering of oil and gas pipelines, use in electricity networks and other civil public utility services including use in telephone channels for the operation of electricity networks and in the engineering service circuits required for the maintenance of telecommunication links), provided the maximum operating frequency does not exceed 23.6 GHz.	
PL7008	Tropospheric scatter communication equipment using analogue or digital modulation techniques	
	L,I	
IL1522	Lasers, the following: and specially designed components and accessories therefor including amplification stages–	
	(a) Gas lasers, the following–	
	(1) Excimer lasers having any of the following characteristics–	
	(A) An output wavelength not exceeding 150 nm and having either of the following characteristics–	
	(a) An output energy exceeding 50 mJ per pulse	C
	or	
	(b) An average or continuous wave (CW) output power exceeding 1 W	C
	(B) An output wavelength exceeding 150 nm but not exceeding 190 nm	

and having either of the following characteristics–	
(a) An output energy exceeding 1.5 J per pulse	C
or	
(b) An average or CW output power exceeding 120 W	C
(C) An output wavelength exceeding 190 nm but not exceeding 360 nm and having either of the following characteristic–	
(a) An output energy exceeding 5 J per pulse	C
or	
(b) An average or CW output power exceeding 500 W	C
(D) An output wavelength exceeding 360 nm and having either of the following characteristics–	
(a) An output energy exceeding 1.5 J per pulse	C
or	
(b) An average or CW output power exceeding 30 W	C
(2) Metal vapour lasers, the following–	
(A) Copper (Cu) lasers with an average or CW output power exceeding 20 W	C
(B) Gold (Au) lasers with an average or CW output power exceeding5	C
(C) Sodium (Na) lasers with an output power exceeding 5 W	C

(3) Carbon monoxide (CO) lasers having either of the following characteristics–	
(A) An output energy exceeding 2 J Per pulse and a pulsed peak power exceeding 5,000 W	C
or	
(B) An average or CW output power exceeding 5,000 W	C
(4) Carbon dioxide (CO^2) lasers having any of the following characteristics–	
(A) A CW output power exceeding 10 kW	C
(B) A pulsed output with a pulse duration exceeding 10 microsecond and having either of the following characteristics–	
(a) An average output power exceeding 10 kW	C
or	
(b) A pulse peak power exceeding 100 kW	C
(C) A pulsed output (including those which run in a CW mode with pulses superimposed) with a pulse duration not exceeding 10 microsecond but exceeding 500 ns and having either of the following characteristics–	
(a) A pulse energy exceeding 5 J	C
or	
(b) An average output power exceeding 1.2 kW	C

(D) A pulsed output with a pulse duration not exceeding 500 ns and having either of the following characteristics–	
(a) A pulse energy exceeding 2 J	C
or	
(b) An average output power exceeding 1.2 kW	C
(5) Chemical lasers, the following–	
(A) Hydrogen Fluoride (HF) lasers	C
(B) Deuterium Fluoride (DF) lasers	C
(C) Oxygen Iodine (O^2 I) lasers	C
(6) Gas discharge and ion lasers, the following–	
(A) Nitrogen lasers with either of the following characteristics–	
(a) An output energy exceeding 1.5 J per pulse and a pulsed peak power exceeding 120 W	C
or	
(b) An average or CW output power exceeding 120 W	C
(B) Krypton ion or argon ion lasers with either of the following characteristics–	
(a) An output energy exceeding 1.5 J per pulse and a pulsed peak power exceeding 30 W	C
or	
(b) An average or CW output power exceeding 30 W	C

(7) Other gas lasers having any of the following characteristics–	
(A) An output wavelength not exceeding 150 nm and having either of the following characteristics–	
(a) An output energy exceeding 50 mJ per pulse and a pulsed peak power exceeding 1 W	C
or	
(b) An average or CW output power exceeding 1 W	C
(B) An output wavelength exceeding 150 nm but not exceeding 800 nm and having either of the following characteristics–	
(a) An output energy exceeding 1.5 J per pulse and a pulsed peak power exceeding 30 W	C
or	
(b) An average or CW output power exceeding 30 W	C
(C) An output wavelength exceeding 800 nm but not exceeding 1,400 nm and having either of the following characteristics–	
(a) An output energy exceeding 0.25 J per pulse and a pulsed peak power exceeding 10 W	C
or	

(b) An average or CW output power exceeding 10 W	C
(D) An output wavelength exceeding 1,400 nm and an average or CW output power exceeding 1 W	C
(b) Semiconductor lasers or laser diodes, the following–	
(1) Individual semiconductor lasers having either of the following characteristics–	
(A) An average output power exceeding 100 mW	C
or	
(B) A wavelength exceeding 1,000 nm	C
(2) Arrays of semiconductor lasers incorporating individual semiconductor lasers, having any of the following characteristics–	
(A) An output energy exceeding 500 microjoules per pulse and a pulsed peak power exceeding 10 W	C
(B) An average or CW output power exceeding 10 W	C
or	
(C) A wavelength exceeding 1,000 nm	C
(c) Solid state lasers (including titanium-sapphire and alexandrite lasers), the following–	

(1) Tunable lasers having any of the following characteristics–	
(A) an output wavelength less than 600 nm and having either of the following characteristics–	
(a) An output energy exceeding 50 mJ per pulse and a pulsed peak power exceeding 1 W	C
or	
(b) An average or CW output power exceeding 1 W	C
(B) An output wavelength of 600 nm or more but not exceeding 1,400 nm and having either of the following characteristics–	
(a) An output energy exceeding 0.5 J per pulse and a pulsed peak power exceeding 20 W	C
or	
(b) An average or CW output power exceeding 20 W	C
(C) An output wavelength exceeding 1,400 nm and having either of the following characteristics–	
(a) An output energy exceeding 50 mJ per pulse and a pulsed peak power exceeding 1 W	C
or	
(b) An average or CW output power exceeding 1 W	C
(2) Non-tunable lasers, including rare earth	

doped solid-state lasers, the following–	
(A) Ruby lasers having an output energy exceeding 20 J per pulse	C
(B) Neodymium glass lasers having an output energy exceeding 20 J per pulse	C
(C) Neodymium doped (other than glass) lasers having an output wavelength between 1,000 nm and 1,100 nm and any of the following characteristics–	
(a) Pulse-excited and Q-switched, having either of the following characteristics–	
(1) A single transverse mode output having any of the following characteristics–	
(A) A peak power exceeding 100 MW	C
(B) An average output power exceeding 20 W	C
or	
(C) A pulsed energy exceeding 2 J	C
(2) A multiple-transverse mode output having any of the following characteristics–	
(A) A peak power exceeding 200MW	C
(B) An average output power exceeding 50W	C
or	
(C) A pulsed energy exceeding 2J	C
(b) Pulse-excited (including those which run in a continuously	

excited mode with pulse excitation superimposed), and non-Q-switched, having either of the following characteristics–	
(1) A single transverse mode output having either of the following characteristics–	
(A) A peak power exceeding 100kW	C
or	
(B) An average output power exceeding 50W	C
(2) A multiple transverse mode output having either of the following characteristics–	
(A) A peak power exceeding 1MW	C
or	
(B) An average power exceeding 500W	C
(c) Continuously excited and having either of the following characteristics–	
(1) A single transverse mode output having either of the following characteristics–	
(A) A peak power exceeding 100kW	C
or	
(B) An average or CW output power exceeding 50W	C
(2) A multiple-transverse mode output having either of the following characteristics–	
(A) A peak power exceeding 1MW	C
or	

(B) An average or CW output power exceeding 500W	C
(D) Other non-tunable lasers, having any of the following characteristics–	
(a) A wavelength less than 150nm and having either of the following characteristics–	
(1) An output energy exceeding 50mJ per pulse and a pulsed peak power exceeding 1W	C
or	
(2) An average or CW output power exceeding 1W	C
(b) A wavelength of 150nm or more but not exceeding 800nm and having either of the following characteristics–	
(1) An output energy exceeding 1.5 joules per pulse and a pulsed peak power exceeding 30W	C
or	
(2) An average or CW output power exceeding 30W	C
(c) A wavelength exceeding 800nm but not exceeding 1,400nm and having any of the following characteristics–	
(1) Q-switched lasers with any of the following characteristics–	
(A) An output energy exceeding 0.5J per pulse and a pulsed peak power exceeding 50W	C

(B) An average output power exceeding 10W for single-mode lasers	C
or	
(C) An average output power exceeding 30W for multimode lasers	C
(2) Non-Q-switched lasers with either of the following characteristics–	
(A) An output energy exceeding 2J per pulse and a pulsed peak power exceeding 50W	C
or	
(B) An average or CW output power exceeding 50W	C
(d) A wavelength exceeding 1,400nm and having either of the following characteristics–	
(1) An output energy exceeding 100mJ per pulse and a pulsed peak power exceeding 1W	C
or	
(2) An average or CW output power exceeding 1W	C
(d) Dye and other liquid lasers, having any of the following characteristics–	
(1) A wavelength less than 150nm and having either of the following characteristics–	
(A) An output energy exceeding 50mJ per pulse and a pulsed peak power exceeding 1W	C
or	

(B) An average or CW output power exceeding 1W	C
(2) A wavelength of 150nm or more but not exceeding 800nm, and having any of the following characteristics–	
(A) An output energy exceeding 1.5J per pulse and a pulsed peak power exceeding 20W	C
(B) An average or CW output power exceeding 20W	C
or	
(C) A pulsed single longitudinal mode oscillator with an average output power exceeding 1W and a repetition rate exceeding 1kHz if the pulse duration is less than 100ns	C
(3) A wavelength exceeding 800nm but not exceeding 1,300nm, and having either of the following characteristics–	
(A) An output energy exceeding 0.5J per pulse and a pulsed peak power exceeding 10W	C
or	
(B) An average or CW output power exceeding 10W	C
(4) A wavelength exceeding 1,300nm, and having either of the following characteristics–	
(A) An output energy exceeding 100mJ per	C

	pulse and a pulsed peak power exceeding 1W	
	or	
	(B) An average or CW output power exceeding 1W	C
	(e) Free electron lasers	C
	excepted from this entry are helium-neon and helium-cadmium lasers.	
	In this entry–	
	"tunable" refers to the ability of a laser to produce an output at any wavelength within its tuning range. A line-selectable laser which can operate only on discrete wavelengths is not tunable;	
	"specially designed components" includes active and passive components in semi-fabricated forms as well as in fabricated forms;	
	a "laser" is an assembly of components designed to produce a coherent light which is amplified by stimulated emission of radiation.	
	Note: Lasers contained in equipment described in other entries in this Schedule are dealt with in the appropriate entry.	
PL7021	Laser-radar (lidar) equipment, and specially designed components therefor	A
	except–	
	when specially designed for surveying or meteorological observation.	
IL1526	Optical fibres, optical fibre cables and other cables and	

components and accessories, the following–

(a) Unarmoured or single-armoured ocean cable having an attenuation of 1.62dB/km (3.0 dB per nautical mile) or less, measured at a frequency of 600kHz	C
(b) Optical-fibre communication cable or optical fibres therefor, having any of the following characteristics–	
(1) the optical fibre is designed for single mode light propagation	C
(2) the optical fibre–	
(i) is designed for multimode light propagation; and	
(ii) has an attenuation of less than 1.0 dB/km at a wavelength of 1300nm	C
(3) the optical fibre is capable of withstanding a proof test tensile strength of 1.1×10^9 N/m^2 or more	C
(4) the optical fibre is specially designed for underwater use or	C
(5) the optical fibre is specially designed to be insensitive to nuclearradiation	C
except pigtails (that is to say, pieces of optical fibre or optical fibre cable no longer than 50m, whether attached to components or instruments or not) which are not nuclear radiation hardened.	

(c) Optical fibres for sensing purposes, having any of the following characteristics–	
(1) specially fabricated either compositionally or structurally, or modified by coating to be acoustically, thermally, inertially, electromagnetically or nuclear radiation sensitive	C
(2) modified structurally or by coating to have either–	
(i) a beat length of more than 50cm (low birefringence), except if designed for operation at wavelengths of less than 650nm; or	
(ii) a beat length of less than 5cm (high birefringence)	C
(d) Secure communication cable, being either coaxial or multiconductor communication cable protected by mechanical or electrical means from physical damage or intrusion in such a manner that communications security is maintained between terminals without the necessity for encryption	C
except cable which is armoured only by either a tough outer sheath or by an electromagnetic screen	
(e) Components and accessories specially designed for the optical fibres or cable specified in this entry including	C

	fibre-optic bulkhead or hull penetration connectors impervious to leakage at any depth for use in ships or vessels, and multiport fibre-optic couplers (including T, star, bidirectional and wavelength division multiplexing and demultiplexing couplers) except connectors for use with optical fibres or cable with a repeatable coupling loss of 0.5dB or more. In this entry– "beat length" means the distance, over which two orthogonally polarised signals, initially in phase, must pass in order to achieve 2Pi radian(s) phase difference; "proof test" consists of on-line or off-line production screen testing that dynamically applies a prescribed tensile stress over a 0.5 to 3m length of fibre at a running rate of 2 to 5m/s while passing between capstans approximately 15cm in diameter. The ambient temperature is a nominal 20°C and relative humidity 40%.	
IL1527	Crytographic equipment designed to ensure secrecy of communications (such as telegraphy, telephony, facsimile, video, and data communications) or of stored information; and specially designed components therefor, and software controlling or computers performing the functions of such cryptographic equipment	C

except simple cryptographic devices or equipment ensuring only the privacy of communications, the following–

(a) equipment for voice transmission making use of fixed frequency inversions or fixed band scrabbling techniques in which the transposition changes occur not more frequently than once every 10seconds;

(b) standard civil facsimile and video equipment designed to ensure the privacy of communications by an analogue transmission using non-standard practices for intended receivers only (video system equipment effecting the transposition of analogue data);

(c) video systems for pay television and similar restricted audience television, including industrial and commercial television equipment using other than standard commercial sweep systems

Note 1. This entry includes video systems which, for secrecy purposes, use digital techniques (conversion of an analogue, ievideo or facsimile signal into a digital signal).

Note 2. Digital computers and digital differential analysers (incremental computers) designed or modified for, or combined with, any cypher machines, cryptographic equipment devices or techniques including software,

	microprogramme control (firmware).	
IL1529	Electronic equipment for testing, or measuring for microprocessor or microcomputer development, the following: and specially designed software therefor–	
	(a) Any testing or measuring equipment–	
	(1) not specified in any other entry in this Schedule	C
	(2) designed for use at frequencies exceeding 18GHz	C
	except the following equipment having a maximum specified operating frequency of 26.5GHz or less–	
	(1) power meters;	
	(2) broadband noise sources;	
	(3) noise figure meters;	
	(b) Logic analysers having any of the following characteristics: and specially designed accessories and specially designed components therefor–	
	(1) more than a total 64 channels	C
	(2) a synchronous (state) channel sampling rate of more than 50MHz	C
	(3) an asynchronous (timing) channel sampling rate of more than 200MHz	C
	(4) probe interfaces and inverse assemblers, except those designed for use with a microprocessor	C

or microcomputer microcircuit family which contains at least one microprocessor or microcomputer microcircuit that is not specified in entry IL1564	
(c) Caesium frequency standards having both of the following characteristics	C
(1) designed as reference standards for laboratory use;	
(2) either of the following:	
(A) a long-term drift (ageing) over 24 hours or more of 1 part or less in 10^{10}; or	
(B) a short-term drift (instability) over a period from 1 to 100seconds of 1 part or less in 10	12
(d) Equipment containing Caesium frequency standards, having any of the following characteristics–	
(1) designed for mobile use and having a long-term drift (ageing) over24 hours or more of 1 part or less in 10^{9}	C
(2) designed for fixed ground use and having a long-term drift (ageing) over 24 hours or more of 5 parts or less in 10^{10}	C
(3) a short-term drift (instability) over a period from 1 to 100seconds of 1 part or less than 10^{12}	C
(e) Comb frequency generators designed for use at frequencies exceeding 12.5GHz	C

(f) Specially calibrated microwave instrumentation receivers capable of measuring amplitude and phase simultaneously and designed for use at frequencies exceeding 1GHz	C
(g) Digital counters, the following–	
(1) those capable of performing frequency measurements above 20GHz	C
(2) those capable of performing either the frequency or the change in phase or frequency within a pulse (pulse frequency profiling) using either internally or externally gated sampling intervals of 100ns or less	C
(3) those capable of measuring burst frequencies exceeding 250MHz for a burst duration of less than 2ms	C
(i) Digital voltage measuring equipment capable of more than 1,000 readings per second with a resolution of more than 4½ digits, not including changes in range or polarity	C
except–	
(A) visual quantisation apparatus capable of providing an average value, displayed or not, of the results of the measurement;	
(B) multichannel analysers of all types used in nuclear experimentation;	

(C) industrial telemeasuring devices in which a pre-set storage value is used as a basis for measuring.	
(j) General purpose data communication protocol analysers, testers and simulators for X.25 level 3 and above as well as Integrated Service Digital Network protocols (CCITT-ISO)	C
(k) Microprocessor or microcomputer development instruments or systems (including specially designed accessories and personality modules) which are capable of developing software or programming microcircuits specified in entry IL1564 in Group 3F, the following–	
(A) Cross-hosted assemblers and cross-hosted compilers	C
(B) Adapter interfaces for prototypes and/or emulation probes	C
(C) Debuggers	C
except–	
1. Personality modules which contain only one of the accessories specified in (A) to (C) above;	
2. Microprocessor or microcomputer development instruments or systems having all the following characteristics–	
(a) they can be used to develop software for, or to programme a	

family of microprocessor or microcomputer microcircuits not designed or produced in a country listed in Schedule 2;

(b) they can be used only for microprocessor or microcomputer microcircuits having both–

(1) an operand (data) word length of no more than 16 bit; and

(2) an arithmetic logic unit (ALU) not wider than 32 bit;

(c) the family contains at least one microprocessor or microcomputer microcircuit which is excluded from entry IL1564 in Group 3F.

In this entry–

"burst frequency" measurement means the capability of counter to start only when the input signal is present and stop counting at the completion of the burst;

"comb frequency generators" means apparatus which generate a spectrum of harmonics;

"family" means a group of microprocessor or microcomputer microcircuits which have–

(a) the same architecture;

(b) the same basic instruction set; and

(c) the same basic technology (egonly NMOS or only CMOS);

"frequency (heterodyne) converters" means equipment which down-converts as unknown frequency by mixing it with an accurately known frequency. This accurately known reference frequency is derived from a crystal, by multiplication of its frequency and passing it through a harmonic generator. By mixing the appropriate harmonic and the unknown frequency, an accurate third frequency results;

"pulse frequency profiling" means the capability of measuring the changes of frequency (or phase) within a pulse as a function of time; such changes in frequency would be present in a transmitted pulse-compression radar pulse (chirp radar). This profiling may be achieved by internal or external gating. Pulse frequency profiling is not intended to include frequency modulation tolerance while it is being frequency modulated;

"transfer oscillators" means oscillators based on the principle of harmonic mixing. The known reference frequency is derived from a local oscillator instead of from a crystal. The unknown frequency is mixed with the local oscillator frequency, the two are phase-locked by tuning the local oscillator

	and can then be measured by a counter.	
IL1531	Frequency synthesisers, and equipment containing such frequency synthesisers, and technology, the following–	
	(a) Frequency synthesisers containing frequency standards specified in head (c) in entry IL1529 in Group 3F	C
	(b) Instrument frequency synthesisers and synthesised signal generators, and specially designed components and accessories therefor, designed for ground use, and producing output frequencies the accuracy of which and the short term and long term stability of which are controlled by, derived from, or disciplined by the input frequency or internal master standard frequency, and having any of the following characteristics–	
	(1) a maximum synthesised output frequency of more than 550 MHz	C
	(2) any of the following noise characteristics–	
	(A) a single sideband (SSB) phase noise better than −120 dBc/Hz when measured at a 20 kHz offset from the carrier frequency	C
	(B) a single sideband (SSB) phase noise better than −106 dBc/Hz when measured at a 100 Hz offset from the carrier frequency	C

(C) an integrated phase noise better than −60 dBc/Hz referred to a 30kHz band centred on the carrier, excluding the 1Hz band centred on this carrier	C
or	
(D) an integrated AM noise better than −70 dBc/Hz referred to a30 kHz band centred on the carrier, excluding the 1Hz band centred on this carrier	C
except– synthesised signal generators having the characteristics specified in paragraph (1) or (2)(A) above and a maximum synthesised output frequency of 1,400 MHz or a single sideband phase noise of not less than −136 dBc/Hz when measured at an offset of 20 kHz from a carrier frequency of 100 MHz, provided that the technology supplied is the minimum necessary for the installation, operation and maintenance of the generator;	
(3) electrically programmable in frequency, with a frequency switching time of less than 5ms	C
(4) electrically programmable in phase, with a switching time from one selected phase value to another of less than 10ms, except where incorporating pre-emphasis networks from frequency modulation	C

(5) a level of spurious components in the output, measured relatively to the selected output frequency, better than–	
(A) −60 dB harmonic	C
or	
(B) −92dB non-harmonic	C
(6) more than 3 different selected synthesised output frequencies available simultaneously from one or more outputs	C
(7) facilities for pulse modulation of the output frequency	C
(c) Airborne communication equipment using frequency synthesisers, the following: and specially designed components and accessories therefor–	
(1) equipment designed to receive or transmit frequencies of more than156 MHz	C
(2) equipment which incorporates facilities for the rapid selection of more than 200 channels per item of equipment	C

except equipment which operates in the frequency range of 108 to 137 MHz, incorporates facilities for the rapid selection of 760 channels or fewer at not less than 25 kHz channel spacing and has been in normal civil use for at least one year;

(3) equipment with a frequency switching time of less than 10 ms	C

(4) frequency synthesisers designed for the airborne communication equipment specified above (whether supplied therewith or separately), exceeding any of the parameters referred to in head (b) above	C
(d) Radio transmitters using frequency synthesis and incorporating transmitter drive units, exciters and master oscillators, the following: and specially designed components and accessories therefor–	
(1) equipment having an output frequency of more than 550 MHz	C
except:	
(A) television broadcasting transmitters having all of the following characteristics–	
(a) an output frequency not exceeding 960 MHz;	
(b) a frequency resolution of not better than 1 kHz; and	
(c) there is incorporated in or driving the transmitter a manually-operated frequency synthesiser which has an output frequency not exceeding 120MHz;	
(B) ground communication equipment designed for civil use in the land mobile or marine services (for example cellular radio communications systems, amateur radio or	

portable radiophone) and having all the following characteristics–	
(a) an operating frequency of not more than 1.3 GHz;	
(b) a power output of 50 W or less for mobile units, or 300 W or less for fixed units;	
(c) in the case of cellular radio base stations, use of analogue radio transmission only;	
(d) a transmitter frequency switching time of 2 ms or more;	
(e) a frequency resolution of not better than 2.5 kHz;	
(f) none of the features specified in head (c) of entry IL1517 in Group 3F;	
(2) equipment having more than three different selected synthesised output frequencies available simultaneously from one or more outputs	C
(3) equipment with facilities for pulse modulation of the output frequency of the transmitter or of the incorporated frequency synthesiser	C
(4) frequency synthesisers designed for radio transmitters incorporating transmitter drive units, exciters and master oscillators (whether supplied therewith or separately) exceeding any of the parameters referred to in head (b) above	C

except–
those specially designed for radio telephones described in the exception in paragraph (1)(B) above;

(e) Technology for equipment referred to in paragraph (1)(B) of the exception to head (d) above, where such technology is for the development or production of digital equipment or of specially designed ODMA software for use in digital civil land mobile networks D

There shall be excluded from this entry equipment in which the output frequency is produced by the addition or subtraction of two or more crystal oscillator frequencies, whether or not followed by multiplication of the result.

In this entry–

"frequency switching time" means the maximum time (ie delay), when switched from one selected output frequency to another selected output frequency, to reach:

(a) a frequency within 100 Hz of the final frequency; or

(b) an output level within 1.0 dB of the final output level;

"frequency synthesiser" means any kind of frequency source or signal generator, regardless of actual technique used, providing a multiplicity

	of simultaneous or alternative output frequencies, from one or more outputs, controlled by, derived from or disciplined by a lesser number of standard (or master) frequencies.	
PL7013	Transceivers having an output frequency of up to 32 MHz and using frequency synthesis with a frequency resolution of 10 Hz or better	X
	In this entry “transceiver” means equipment which comprises a radio transmitter and a radio receiver and which uses part or all of the same circuitry in both transmit and receive modes.	
IL1533	Signal analysers, including spectrum analysers and network analysers, the following: and specialy designed components, accessories and specially designed ODMA software therefor–	
	(a) Signal analysers having any of the following characteristics–	
	(1) capable of analysing frequencies exceeding 18 GHz	C
	(2) capable of analysing frequencies exceeding 2.3 GHz with a frequency span of more than 2.3 Ghz	C
	(3) using time compression of the input signal	C
	(b) Dynamic signal analysers, except those having a real-time bandwidth less than 5.12 kHz	C

(c) Swept frequency network analysers or sweep generators, the following–	
(1) Those for the automatic measurement of complex equivalent circuit parameters over a range of frequencies and having a maximum operating frequency exceeding 20 GHz;	C
(2) Those which cannot be controlled remotely for the measurement of complex equivalent circuit parameters over a range of frequencies and having a maximum operating frequency exceeding 40 GHz	C
except– equipment for continuous wave, point-to-point measurement.	
(d) Scalar network analysers having a maximum operating frequency exceeding20 GHz	C

There shall be excluded from this entry–

(a) optical spectrum analysers such as–

(1) prism or grating monochrometers;

(2) optical interferometers;

(3) optical spectrometers;

(b) equipment using only constant percentage bandwidth filters (also known as octave or fractional octave filters);

(c) medical equipment containing, as an integral part, signal analyser.

	In this entry–	
	“signal analysers” means apparatus capable of measuring and displaying basic properties of the single-frequency components of multi-frequency signals;	
	“dynamic signal analysers” means signal analysers which use digital sampling and transformation techniques to form a Fourier spectrum display of the given waveform including amplitude and phase information;	
	“real-time bandwidth” for dynamic signal analysers is the widest frequency range which the analyser can output to display or mass storage without causing any discontinuity in the analysis of the input data. For analysers with more than one channel, the channel configuration yielding the widest real-time bandwidth shall be used to make the calculation;	
	“frequency span” means the maximum range of the frequency segment displayed.	
IL1534	Flatbed microdensitometers (except cathode-ray types), having any of the following characteristics: and specially designed components therefor–	
	(a) A recording or scanning rate exceeding 5,000 data points per second	C
	(b) A figure of merit better (less) than 0.1,	C

		defined as the product of the density resolution (expressed in density units) and the spatial resolution (expressed in micrometres)	
		except equipment with a spatial resolution not better (less) than 2 micrometres and a density resolution not better (less) than 0.01 density unit.	
		(c) An optical density range greater than 0 to 4	C
	Note: Density resolution expressed in density units is measured over the optical density range of the instrument.		
IL1537	Microwave (including millimetric wave) equipment, capable of operating at frequencies of over 10.5 GHz, the following:		
		(a) Rigid and flexible waveguides designed for use at frequencies in excess of 26.5 GHz	C
		(b) Waveguides having a bandwidth ratio above 1.7:1	C
		(c) Directional couplers having a bandwidth ratio above 1.7:1 and directivity over the band of 20 dB or more	C
		(d) Phased array antennae and sub-assemblies, designed to permit electronic control of beam shaping and pointing, and specially designed components therefor, including duplexers, phase shifters and associated high-speed diode switches	C

except– duplexers and phase shifters specially designed for use in civil television systems and in other civil radar or communication systems not specified elsewhere in this Schedule;	
(e) Other antennae specially designed for operation at frequencies above 30 GHz, having a diameter of less than 1 m, and specially designed components therefor	C
(f) Microwave assemblies and sub-assemblies (including active circuit elements), capable of being used at frequencies above 23.6 GHz and havingcircuits fabricated by the same processes as are used in integrated circuit technology	C
(g) Microwave assemblies and sub-assemblies, which contain band-pass or band-stop filters and are capable of operating at 23.6 GHz or more	C
(h) Amplifiers having an instantaneous bandwidth of more than half an octave (the highest operating frequency being more than 1.5 times the lowest operating frequency)	C
except– parametric or paramagnetic amplifiers which–	
(a) are specially designed for medical applications;	

	(b) are specially designed for use in simple educational devices (those designed for use in teaching basic principles and demonstrating the operation of those principles in educational institutions), and operate at industrial, scientific or medical (ISM) frequencies; or	
	(c) have an output power of not more than 10 W and are specially designed for–	
	(1) systems for the detection of industrial or civilian intrusion and related alarm systems;	
	(2) traffic or industrial movement control and counting systems;	
	(3) systems for the detection of environmental pollution of air or water; or	
	(4) simple educational devices (those designed for use in teaching basic principles and demonstrating the operation of those principles in educational institutions).	
PL7022	Solid state switches having all the following characteristics	C
	(a) an anode peak voltage in the range 2,000 to 6,000 volts; and	
	(b) an anode peak current rating of 500 amperes or more; and	
	(c) a turn on time of 1 microsecond or less.	
PL7023	Cold cathode tubes and switches, the following–	

	(a) Triggered spark gaps rated for a peak current of 500 amperes	C
	except– cold cathode relay tubes or decade counter tubes.	
	(b) Cold cathode tubes, gas krytron tubes, vacuum krytron tubes, tubes which operate in a manner similar to a spark gap and contain three or more electrodes whether gas-filled or not, and having both the following characteristics	C
	(1) Rated for an anode peak voltage of 2,500 volts or more;	
	(2) Rated for peak currents of 100 amperes or more;	
	except– ignitrons,	
	In this entry–	
	“triggered spark gap” means a tube with a structure consisting of two opposed anodes with shapes resembling flattened hemispheres, and with one or more triggering probes placed approximately in the centre of one anode. The strucure is sealed and contains a mixture of gases, principally nitrogen, under less than atmospheric pressure.	
IL1548	Photosensitive components, including linear and focal plane arrays, the following: and dice and wafers therefor–	
	(a) Photosensitive components, including photodiodes, phototransistors,	

photothyristors, photoconductive cells and similar photosensitive components, having either of the following characteristics–	
(1) having a peak sensitivity at a wavelength longer than 1,200 nanometres or shorter than 190 nanometres	C
or	
(2) having a peak sensitivity at a wavelength shorter than 300 nanometres and having an efficiency of less than 0.1 per cent relative to peak response at wavelengths longer than 400 nanometres	C
except vacuum photodiodes specially designed for use in spectrophotometry having a peak response at a wavelength shorter than 300 nanometres.	
(b) Semiconductor photodiodes and phototransistors with a response time constant of 95 ns or less measured at the operating temperature for which the time constant reaches a minimum	C
except semiconductor photodiodes which are not space qualified with a response time constant of 0.5 ns or more and with a peak sensitivity at a wavelength neither longer than 1,050 nm nor shorter than 300 nm.	

(c) Photosensitive components specially designed or rated as electromagnetic, including laser and ionized-particle radiation resistant	A
(d) Linear and focal plane arrays (hybrid or monolithic) having the characteristics specified in head (a)(1) or (2) or (b) above, and specially designed components therefor	C

There shall be excluded from this entry–

(a) germanium photo devices with a peak sensitivity at a wavelength shorter than 1,750 nanometres;

(b) infrared singleor multi-element (not to exceed 16 elements) encapsulated photoconductive cells or pyroelectric detectors using any of the following–

(1) Lead sulphide;

(2) Triglycine sulphate and variants;

(3) Lead-lanthanum-zirconium titanate and variants;

(4) Lithium tantalate;

(5) Polyvinylidene fluoride and variants;

(6) Strontium barium niobate and variants; or

(7) Lead selenide;

(c) single-element encapsulated mercury-cadmium-telluride (HgCdTe) uncooled (295 K ambient temperature

	operation) photo-electromagnetic (pem) or photoconductive (pc) mode photodetectors with a peak sensitivity at a wavelength shorter than 11,000 nanometres.	
	In this entry–	
	the “time constant” is the time taken from the application of a light stimulus for the current increment to reach a value of 1–1/e times the final value (ie 63 per cent of the final value);	
	“space qualified” means products which are stated by the manufacturer as designed and tested to meet the special electrical, mechanical or environmental requirements for use in rockets, satellites or high-altitudes flight systems operating at altitudes of 100 km or more.	
IL1549	Photomultiplier tubes having any of the following characteristics–	
	(a) Solar blind types for which the long wavelength cutoff is below 350 nm, where the long wavelength cutoff is defined as 10 per cent of the maximum sensitivity	C
	except– Photomultiplier tubes specially designed for use in spectrophotometry having a peak sensitivity at a wavelength shorter than 300 nm.	
	(b) Having an anode pulse rise time of less than 1 ns	C
	(c) Containing microchannel-plate electron multipliers	C

IL1553	Flash discharge type X-ray systems, including tubes, having all of the following characteristics–	C
	(a) Peak power greater than 500 MW;	
	(b) Output voltage greater than 500 kV;	
	(c) Pulse width less than 0.2 microsecond.	
PL7042	Radiographic equipment, the following: and specially designed software therefor–	
	(a) equipment capable of delivering electromagnetic radiation produced by bremsstrahlung from accelerated electrons of 2MeV or greater	A
	(b) equipment using radioactive sources of 1MeV or greater, except those specially designed for medical purposes	A
IL1555	Electron tubes, the following: and specially designed components therefor–	
	(a) Electron tubes for image conversion or intensification (including those designed for streak or framing cameras), incorporating either–	
	(1) microchannel-plate electron multipliers	C
	(2) semi-transparent photocathodes incorporating epitaxially grown layers of compound semiconductors such as gallium arsenide	C
	(b) Electron tubes for television or cameras, having	

	any of the following characteristics–	
	(1) incorporating microchannel-plate electron multipliers	C
	(2) coupled with electron tubes specified in head (a) above	C
	(3) ruggedised and having a maximum length-to-bulb diameter ratio of 5:1 or less	C
	except–	
	commercial standard X-ray amplifier tubes.	
IL1556	Optical elements and elements for optical tubes, the following–	
	(a) Non-flexible fused fibre-optic plates or bundles, having all of the following characteristics–	C
	(1) a fibre pitch (centre-to-centre spacing) of less than 10 micrometres;	
	(2) a light-absorbing medium surrounding each fibre, or interstitially placed between fibres; and	
	(3) a diameter greater than 13 mm.	
	(b) Microchannel-plates for electron image amplification, having both of the following characteristics–	C
	(1) 15,000 or more hollow tubes per plate; and	
	(2) hole pitch (centre-to-centre spacing) of less than 25 micrometres.	
	(c) Semi-transparent photocathodes	C

		incorporating epitaxially grown layers of compound semiconductors, such as gallium arsenide	
		(d) Diffractive type optical elements specially designed for display screens, with any of the following characteristics–	
		(1) a transmission of more than 90 per cent outside the reflection band and a reflection or more than 75 per cent inside the reflection band, which has less than 15 nanometres bandwidth and is matched to the frequency of the display light source	C
		(2) a rear projection screen brightness gain of more than 10 times the gain of a Lambertian scatterer with an equivalent area, and less than 10 per cent variation in brightness across the exit aperture	C
	or		
		(3) specially designed for use in helmet-mounted displays	C
IL1558	Electronic vacuum tubes (valves) and cathodes, the following: and other components specially designed for those tubes–		
		(a) Tubes in which space charge control is utilized as the primary functional parameter, including triodes and tetrodes, the following–	C
		(1) tubes rated for continuous wave operation having	

either of the following characteristics–	
(A) above 4 GHz at maximum rated anode dissipation	C
(B) within the frequency range 0.3 to 4 GHz and for which, under any condition of cooling, the product of the maximum rated anode dissipation (expressed in kW) and the square of the maximum frequency (expressed in GHz) at the maximum rated anode dissipation is greater than 10, except tubes specially designed for television transmitters operating in the frequency range of 0.47 to 0.96 GHz and rated for operation without a grid current, for which the product of the rated anode dissipation (expressed in kW) and the square of the maximum frequency (expressed in GHz) may reach 20	C
(2) tubes, rated only for pulse operation, having either of the following characteristics–	
(A) above 1 GHz, with maximum peak pulse output power greater than 45 kW	C
(B) between 0.3 and 1 GHz and for which, under any condition of cooling, the product of the peak pulse output power (expressed in kW) and the square of the maximum frequency (expressed in GHz) exceeds 45	C

(3) tubes specially designed for use as pulse modulators for radar or similar applications, having a peak anode voltage rating of 100 kV or more, or rated for a peak pulse power of 20 MW or more	C
except– tubes specially designed for civil telecasting according to CCIR or OIR standards and specially designed components therefor. The above exception does not apply to technological documents the information in which includes information relating to goods excluded by the above exception.	
(b) Tubes which utilise interaction between a beam of electrons and microwave elements and in which the electrons travel in a direction perpendicular to the applied magnetic field, including magnetrons, cross-field amplifier tubes and cross-field oscillator tubes	C
except–	
(i) fixed frequency and tunable pulsed magnetrons and crossed-field amplifier tubes which are in normal civil use, the following–	
(1) magnetrons designed to operate at frequencies below 3 GHz with a maximum rated peak output power of 5 MW or less, or between 3 to 12 GHz with the product of	

the maximum rated peak output power (expressed in kW) and the frequency (expressed in GHz) less than 4,200 and a frequency tuning time of more than 100 ms;

(2) crossed-field amplifier tubes designed to operate at frequencies below 4 GHz with a maximum rated average output power of 1.2 kW or less, a bandwidth of 200 MHz or less and a gain of less than 15 dB;

(ii) fixed frequency continuous wave magnetrons designed for medical use or for industrial heating or cooking purposes operating at a frequency of 2.375 GHz + 0.05 GHz or 2.45 GHz + 0.05 GHz with a maximum rated output power not exceeding 6 kW or, at a frequency lower than 1 GHz, with a maximum rated output power not exceeding 35 kW;

(c) Tubes which utilise interaction between a beam of electrons and microwave elements or cavities and in which the electrons travel in a direction parallel to the applied magnetic field (eg klystrons or travelling wave tubes)	C

except–

(i) continuous wave tubes having all of the following characteristics–

(1) designed for use in civil ground communication;

(2) instantaneous bandwidth tubes with any of the following sets of characteristics–

(a) tubes with–

(1) an instantaneous bandwidth of half an octave or less, (ie the highest operating frequency is not higher than 1.5 times the lowest operating frequency);

(2) the product of the rated output power (expressed in kW) and the maximum operating frequency (expressed in GHz) does not exceed 0.3;

(b) tubes which–

(1) have an instantaneous bandwidth of 10% or less (ie the highest operating frequency does not exceed 1.1 times the lowest operating frequency);

(2) the product of the rated output power (expressed in kW) and the maximum operating frequency (expressed in GHz) does not exceed 5;

(3) operate in standard international telecommunications bands;

(c) tubes which–

(1) have an instantaneous bandwidth of 3% or less (ie the highest operating frequency does not exceed 1.03 times the lowest operating frequency) (2) the product of the rated output power (expressed in kW) and the maximum

operating frequency (expressed in GHz) does not exceed 25; and

(3) operate in standard international telecommunications bands;

(3) an operating frequency no higher than 20 GHz;

(4) no multiple grid including shadow grid electron guns;

(5) collectors with no more than two depressed stages;

(ii) pulsed tubes, having all of the following characteristics–

(1) for civil applications;

(2) an instantaneous bandwidth of half an octave or less, (ie the highest operating frequency is not higher than 1.5 times the lowest operating frequency);

(3) collectors with no more than two depressed stages;

(4) having either of the following sets of characteristics–

(a)
(1) peak saturated output power not exceeding 1 kW,

(2) an average output power not exceeding 40 W, and

(3) operating frequency not exceeding 10 GHz; or

(b)
(1) peak saturated output not exceeding 100 W,

(2) an average output power not exceeding 20 W, and	
(3) operating frequency between 10 and 20 GHz;	
(iii) fixed frequency pulsed tubes, having all of the following characteristics–	
(A) for civil applications;	
(B) operating frequencies below 3.5 GHz;	
(C) having a peak output power of 1.6 MW or less; and	
(D) having an operating bandwidth of less than 1%	
(iv) tubes, having all of the following characteristics–	
(A) used as fixed frequency or voltage tunable oscillator tubes;	
(B) designed to operate at frequencies below 20 GHz; and	
(C) having a maximum output power of less than 3 W;	
(d) Tubes which utilize interaction between an electron beam and microwave elements or cavities but do not require a magnetic field to control or focus the electron beam, except low power reflex oscillator klystrons designed to operate at frequencies below 20 GHz and at a maximum output power of less than 3 W	C
(e) Tubes which utilize interaction between a	C

beam of electrons and microwave elements or cavities in which the electrons drift in a direction parallel to the applied magnetic field but also require for their operation a large component of velocity transverse to the direction of the applied magnetic field, including gyrotrons, ubitrons and peniotrons except gyrotron oscillators	
(f) Tubes designed to withstand on any axis an acceleration of short duration (shock) greater than 1,000 g	C
(g) Tubes designed for operation in ambient temperatures exceeding 437 K	C
(h) Tubes of a type specified in head (c), (d) or (e) above, which are designed to operate with no filament or cathode heating element as indicated by the absence of heating supply connections	C
(i) Tubes which utilize a modulated beam of electrons striking one or more semiconductor diodes to provide power gain	C
(j) Cathodes for electronic vacuum tubes, the following–	
(1) Specially designed for tubes specified in heads (a) to (i)	C
(2) Impregnated cathodes capable of producing a current density exceeding	C

	$0.5A/cm^2$ at rated operating conditions	
	In this entry–	
	"frequency tuning time" is the time required to change the operating frequency from a starting frequency, through the maximum frequency, through the minimum frequency, and return to the starting frequency ie one complete tuning cycle. Frequency tuning time: $T=1/(2f^0)$ f^0 : dither rate.	
IL1560	High energy storage capacitors, the following–	
	(a) Capacitors with a repetition rate of less than 10Hz having all of the following characteristics–	C
	(1) A voltage rating equal to or more than 5 kV;	
	(2) An energy density equal to or more than 250J/kg; and	
	(3) A total energy equal to or more than 25kJ.	
	(b) Capacitors with a repetition rate of 10Hz or more having all of the following characteristics–	C
	(1) A voltage rating equal to or more than 5kV;	
	(2) An energy density equal to or more than 50J/kg;	
	(3) A total energy equal to or more than 100J; and	
	(4) A charge/discharge cycle life equal to or more than 10,000.	

	There shall be excluded from this entry–	
	electrolytic or tantalum capacitors.	
IL1561	Materials specially designed for use as absorbers of electromagnetic waves having frequencies exceeding 2×10^8 Hz and less than 3×10^{12}Hz	A
	except the following–	
	(magnetic materials which provide absorption contained in paint are not included in this exception) (a) Hair type absorbers, whether constructed of natural or synthetic fibres, with non-magnetic loading to provide absorption;	
	(b) Absorbers whose incident surface is non-planar in shape, and which have no magnetic loss;	
	(c) Planar absorbers having all of the following characteristics–	
	(1) Made of the following materials–	
	(A) Plastic foam materials (flexible or non-flexible) with carbon-loading, or organic materials, including binders, providing more than5 per cent echo compared with metal over a bandwidth exceeding ±15 per cent on the centre frequency of the incident energy and not capable of withstanding temperatures exceeding 450K (177°C); or	
	(B) Ceramic materials providing more than 20 per cent echo compared	

	with metal over a bandwidth exceeding ±15 per cent of the centre frequency of the incident energy, and not capable of withstanding temperatures exceeding 800K (527°C);	
	(2) Their tensile strength is less than 7×10^6 N/m^2 ; and	
	(3) Their compressive strength is less than 14×10^6 N/m^2 . (Absorption test samples for (c)(1)(A) or (B) above should be a square at least 5 wavelengths (of centre frequency) on a side and positioned in the far field of the radiating element.)	
PL7043	Coatings, including paints, for reduced observability, specially designed for reduced or tailored reflectivity or emissivity in the infra red or ultra violet regions of the electromagnetic spectrum, and specially designed software therefor	A
IL1564	Integrated circuits, including packages therefor, assemblies, modules and substrates, the following–	
	(a) Integrated circuits, the following: and modules and unfinished wafers with a defined pattern in which the function has been determined, which have performances and functions equivalent to integrated circuits specified in this head–	
	(1) Designed or rated as radiation hardened	A
	(2) Rated for operation at an ambient temperature	A

below 219K (−54°C) or above 397K (+ 124°C)	
except– audio amplifier or voltage regulator integrated circuits, or integrated circuits for medical electronic prostheses or car and train engine electronics.	
(3) Silicon-based microprocessor microcircuits, microcomputer microcircuits and microcontroller microcircuits, including Digital Signal Processors (DSP) and Floating Processor Units (FPU), having any of the following characteristics–	
(A) An external data bus width of more than 16 bit with an arithmetic logic unit with an access width or more than 32 bit	C
(B) A maximum clock frequency of more than 20MHz;	C
or (C) Random access storage (RAM) of more than 512 Bytes within the package	C
except– silicon-based microcomputer microcircuits or microcontroller microcircuits having an operand (data) word length of 8 bit or less.	
(4) Silicon-based peripheral integrated circuits specially designed to support integrated circuits	C

specified in (3) to head (a) above	
(5) Silicon-based storage integrated circuits, the following–	
(A) Fusible link or avalanche breakdown programmable read only memories (PROMS) having a storage capacity of more than 128 kbits per package	C
(B) Electrically erasable programmable read only memories (EEPROMs) or electrically alterable read only memories (EAROMs), having a storage capacity of more than 64 kbits per package	C
(C) Ultra-violet erasable programmable read only memories (UV-EPROMs) having a storage capacity of more than 256 kbits per package, including unprogrammable one-time programmable read-only memories (OTP ROMs) which use the same technology as UV-EPROMs for their semiconductor chips, but have no optical window for ultra-violet irradiation	C
(D) Dynamic random access memories (DRAMs) having a storage capacity exceeding–	
(a) 1 Mbit per package	C
or (b) 256 kbits per package if they have a maximum access time of less than 80ns	C
(E) Static random-access memories (SRAMs)	

having a storage capacity exceeding either of the following–	
(a) 256 kbits per package	C
or (b) 64 kbits per package if they have a maximum access time of less than 80ns	C
(6) Converter integrated circuits, the following–	
(A) Analogue-to-digital converters having either–	
(a) A resolution of 12 bits with a conversion time of less than 500ns	C
or (b) A resolution of more than 12 bits with a conversion time of less than 5 microseconds	C
except– analogue-to-digital converters designed for digital voltmeters which are not specified in entry IL1529 in Group 3F.	
(B) Digital-to-analogue converters having either–	
(a) A resolution of 12 bits with a maximum settling time to rated linearity of less than–	
(1) 500ns for voltage output converters	C
or	
(2) 25ns for current output converters	C
or	
(b) A resolution of more than 12 bits, with a maximum settling time to rated linearity of less than–	

(1) 3 microseconds for voltage output converters	C
or	
(2) 1 microsecond for current output converters	C
(7) Optical integrated circuits having any of the following characteristics–	
(A) Containing more than 2,048 elements	C
(B) Having a peak sensitivity at a wavelength longer than 1,200nm or shorter than 190nm	C
(C) Having a peak sensitivity at a wavelength shorter than 300nm and having an efficiency of less than 0.1 per cent relative to peak response at wavelengths longer than 400nm	C
(D) Having a response time constant of 95ns or less measured at the operating temperature for which the time constant reaches a minimum	C
or	
(E) Containing semiconductor lasers specified in entry IL1522 inGroup 3F	C
except– optical integrated circuits which are not space qualified and which have both of the following characteristics–	
(1) A response time constant of 500 picosecond or more; and	
(2) A peak sensitivity at a wavelength neither	

longer than 1,050nm nor shorter than 300nm;	
(8) Sample-and-hold integrated circuits having an acquisition time of less than 500ns	C
(9) Unprogrammed, silicon-based, programmable gate arrays or logic arrays having both of the following characteristics–	C
(A) More than 28 terminals; and	
(B) An equivalent gate count of more than 200 per package	
(10) Fuzzy logic or neural network integrated circuits	C
(11) Integrated circuits designed for Integrated Services Digital Network (ISDN) functions	C
Note: For the purposes of this sub-head, "designed" means that the integrated circuit was manufactured for the specific purpose of providing ISDN functions.	
(12) Unfinished wafers	C
except– those with a defined pattern, in which the function has been determined, and not specified in any paragraph of head (a) to this entry.	
(13) Integrated circuits, other than those described in (1) to (12) above, having any of the following characteristics–	

(A) Based upon any compound semiconductor	C
except– compound semiconductor integrated circuits which are designed for, and by virtue of circuit design limited to use in any of the following applications–	
(1) Civil audio, radio or TV equipment operating below 1 GHz; or	
(2) Mobile telephone and cordless telephone equipment operating below 1 GHz.	
(B) Mixed-signal integrated circuits (combining analogue and digital functions) which can operate above 1.2 GHz or which have a typical basic gate propagation delay time of less than 1 ns	C
(C) Digital (logic) integrated circuits having a typical basic gate propagation delay time of less than 1 ns	C
except– silicon-based digital (logic) integrated circuits with 28 terminals or less. or	
(D) Having more than 128 terminals	C
except– silicon based integrated circuits having all of the following characteristics– (a) They have no user-accessible microprogrammability;	

(b) The design or programme is originated either by the manufacturer alone or in concert with the user of the integrated circuit;
(c) The design and programme are fixed at the time of manufacture;
(d) The design, basic functions and performance of the integrated circuit are for civil end-use; and
(e) They are designed or programmed by the manufacturer for any of the following applications only:

(1) Car electronics (eg entertainment, instrumentation, safety, comfort, operations or pollution control);
(2) Home electronics (eg audio and video equipment, appliances, safety, education, comfort, remote controlled toys or amusement);
(3) Timekeeping applications (eg watches or clocks);
(4) Personal communications up to 150 MHz, including amateur radio communication and intercom;
(5) Cameras specified in this Schedule including cine cameras but excluding imaging microcircuits;
(6) Medical electronic prostheses

(eg, cardiac pacemakers, hearing aids); or

(7) Civil telephone subscriber sets providing neither ISDN functions nor encryption;

(f) Integrated circuits specified in sub-head (a)(9) or (a)(13) or microcontroller microcircuits or microcomputer microcircuits specified in sub-head (a)(3), having all the following characteristics: provided such items are not specially designed components for equipment specified elsewhere in this Schedule–

(1) They have no user-accessible microprogrammability;

(2) They are for civil end-use and substantially restricted to that application;

(3) The design and programme are originated either by the manufacturer alone or in concert with the user of the integrated circuit;

(4) The manufacturer has established that the design and programme are fixed at the time of manufacture; and

(5) The manufacturer has established that the design, basic functions and performance of the integrated circuit

are suitable only for an end-use of a civil nature. Note: Integrated circuits specially designed for mobile (radio) telephone which use frequency synthesisers are specially designed components specified in entry IL1531 in Group 3F.	
(b) Ceramic packages for integrated circuits designed for hermetically sealed pin or pad grid array, leadless carrier or surface-mounted configurations, having either–	
(1) Pin, pad or lead nominal spacings of less than 1.25 mm; or	C
(2) More than 68 terminals	C
(c) Ceramic substrates, having more than three layers of interconnections not including the ground plane	C
(d) Technological documents the information in which relates to the design, development or processing of wafers or chips for any type of integrated circuit specified in this Schedule	D
Note:	
For assemblies, modules, integrated circuits and substrates, which are specially designed for or which have the same functional characteristics as other equipment, refer to the entry that specifies such equipment.	In this entry–

"assembly" means two or more electronic components connected together to perform a specific function and normally capable of being disassembled;

"basic gate power dissipation" means the power dissipation value corresponding to the basic gate utilized within a family of monolithic integrated circuits. This may be specified, for a given family, either as the power dissipation per typical gate or as the typical power dissipation per gate;

"basic gate propagation delay time" means the propagation delay time value corresponding to the basic gate utilized within a family of monolithic integrated circuits. This may be specified, for a given family, either as the propagation delay time per typical gate or as the typical propagation delay time per gate;

"circuit element" means a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc;

"discrete component" means a separately packaged circuit element with its own external connections;

"film type integrated circuit" means an array of circuit elements and metallic interconnections formed by deposition of a film on an insulating substrate;

"hybrid integrated circuit" means any combination of integrated circuits, circuit elements or discrete components connected together to perform a specific function;

"manufacturer" means a person who designs an integrated circuit for an application of his choice and does not include a person who programmes an integrated circuit on behalf of a user;

"microcomputer microcircuit" means a monolithic integrated circuit or multichip integrated circuit containing an arithmetic logic unit (ALU) capable of executing general purpose instructions from an internal storage (or on an internal storage augmented by an external storage) on data contained therein;

"microprocessor microcircuit" means a monolithic integrated circuit or multichip integrated circuit containing an arithmetic logic unit (ALU) capable of executing a series of general purpose instructions from an external storage;

"module" means two or more electronic components connected together to perform a specific function and not normally capable of being disassembled;

“monolithic integrated circuit” means a combination of passive or active circuit elements or both which:

(a) is formed by means of diffusion processes, implantation processes or deposition processes in or on a single semiconducting piece of material;

(b) can be considered as indivisibly associated; and

(c) performs the function of a circuit;

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

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

“speed” means the shortest time required to fetch two operands from an external storage outside any work register, add them and return the result to the same or another external storage location using that addressing mode which yields the shortest execution time;

"speed-power dissipation product" means the product of the speed and the typical power dissipation which shall be taken at the clock frequency used in the speed computation. The typical power dissipation must be the lowest of the following:

(a) the specified typical internal power dissipation;

(b) one half the maximum internal power dissipation;

(c) the product of the nominal supply voltage and typical total supply current; or

(d) one half of the product of the nominal supply voltage and maximum total supply current;

"substrate" means a sheet of base material with or without an interconnection pattern and on which or within which discrete components, integrated circuits or both can be located;

"user-accessible microprogrammability" means the facility allowing a user to insert, modify or replace microprogrammes;

"user-accessible programmability" means the facility allowing a user to insert, modify or replace programmes by means other than:

	(a) a physical change in wiring or interconnections; or	
	(b) the setting of function controls including entry of parameters.	
PL7039	Analogue-to-digital converter integrated circuits having all of the following characteristics	A
	(a) a resolution of 8 bits or more;	
	(b) rated operation in the temperature range from below −54°C to above +125°C;	
	(c) hermetically sealed.	

GROUP 3G

Electronic Equipment including Computers, Software and Telecommunications, and Photographic Equipment

IL1565	Electronic computers, related equipment, equipment or systems containing electronic computers, and technology therefor, the following: and specially designed components for such electronic computers and related equipment:	
	(a) analogue computers and related equipment therefor, which are designed or modified	

for use in airborne vehicles, missiles or space vehicles and rated for continuous operation at temperatures from below 228K (−45°C) to above 328K (+55°C) A	
(b) equipment or systems containing analogue computers specified in head (a) above	A
(c) analogue computers and related equipment therefor, other than those specified in head (a) above	A

except–

(1) those which neither:

(A) are capable of containing more than 20 summers, integrators, multipliers or function generators;

nor

(B) have facilities for readily varying the interconnections of such components;

(2) those which have all the following characteristics:

(A) they use neither:

(a) optical computation devices; nor

(b) acoustic wave devices specified in entry IL1586 in Group 3G;

(B) the rated errors for summers, inverters and integrators are not less than:

(a) static : 0.01%;

(b) total at 1 kHz: 0.15%;

(C) the rated errors for multipliers are not less than:

(a) static : 0.025%;

(b) total at 1 kHz: 0.25%;

(D) the rated errors

for fixed function generators (log and sine/cosine) are not less than: static: 0.1%;

(E) they have no more than 350 operational amplifiers; and

(F) they have no more than four integrator time scales switchable during one programme;

Note

For the purposes of paragraph (2) above–

1. the percentage in sub-paragraph (B)(a) applies to the actual output voltage; all the other percentages apply to full scale, that is, from maximum negative to maximum positive reference voltages;

2. total errors at 1 kHz for sub-paragraphs (B)(b) and (C)(b) above are to be measured with those resistors incorporated in the inverter,

summer or integrator which provide the least error;

3. total error measurements include all errors of the unit resulting from, for example, tolerances of resistors and capacitors, tolerances of input and output impedances of amplifiers, the effects of loading, the effects of phase shift or the generating of functions.

(d) hybrid computers and related equipment therefor, having all the following characteristics A

(1) the analogue section is specified in head (c) above;

(2) the digital section has an internal fixed or alterable storage of more than 2,048 bit; and

(3) facilities are included for

processing numerical data from the analogue section in the digital section or vice versa;

(e) digital computers or analogue computers specified in head (c) above, containing equipment for interconnecting analogue computers with digital computers and whether or not contained in or associated with other equipment or systems A

(f) digital computers and related equipment therefor, and having any of the following characteristics–

(1) designed or modified for use in airborne vehicles, missiles or space vehicles and rated for continuous

operation at temperatures from below 228K (−45°C) to above 328K (+ 55°C)	A
(2) designed or modified to limit electromagnetic radiation to levels much less than those required by government civil interference specifications	W
(3) designed as ruggedised or radiation-hardened equipment and capable of meeting military specifications for ruggedised or radiation-hardened equipment	A
(4) modified for military use	W
(5) designed or modified for certifiable multi-level security or certifiable user isolation applicable to government classified	W

material or to applications requiring an equivalent level of security	
(g) equipment or systems containing digital computers specified in head (f) above	A
(h) digital computers and related equipment therefor, other than those specified in head (e) or (f) above, whether or not contained in or associated with other equipment or systems including	W
(A) digital computers and related equipment therefor, designed or modified for–	
(a) signal processing	W
(b) image enhancement	W
(c) local area networks	W

except data communication systems located within a single piece of equipment (e.g., television set, car);	
(d) multi-data-stream processing	W
except digital computers and related equipment which:	
(a) utilise staged (pipelined) instruction interpretation for conventional single instruction single data sequence processing; or	
(b) have an arithmetical unit implemented with bit-slice microprocessor microcircuits.	
(e) combined recognition, understanding and interpretation of image, continuous (connected)	W

speech or connected work text other than signal processing or image enhancement	
(f) real time processing of sensor data having both the following characteristics	W
(1) concerning events occurring outside the computer using facility; and	
(2) provided by equipment specified in entry IL1501, IL1502 or IL1510 in Group 3F;	
(h) fault tolerance	W
except: digital computers and related equipment which utilise:	
(a) error detection or correction algorithms in main storage;	
(b) the interconnection	

of two digital computers so that if the active central processing unit fails an idling but mirroring central processing unit can continue the system's functioning;

(c) the interconnection of two central processing units by data channels or by use of shared storage to permit one central processing unit to perform other work until the second central processing unit fails, at which time the first central processing unit takes over in order to continue the system's functioning; or

(d) the synchronisation of two

central processing units by software so that one central processing unit recognises when the other central processing unit fails and recovers tasks from the failing unit;

(j) user-accessible microprogrammability W

except digital computers and related equipment whose user-accessible microprogrammability is limited to:–

(a) loading, reloading or inserting of microprogrammes provided by the supplier ; or

(b) simple loading of microprogrammes which may or may not be provided by the supplier but which are neither designed to be accessible

to the user nor accompanied by training or software for user accessibility;	
(m) wide area networks	W
(C) related equipment, the following–	
(a) disk drives for rigid magnetic media (hard disks) or non-rigid magnetic media (floppy disks), including cartridge type magnetic disk media, exceeding any of the following limits–	
(1) a gross capacity of 165 MByte	W
(2) maximum bit transfer rate:	
(A) for disk drives for rigid magnetic media (hard disks)–10.3 Mbit/s	W

(B) for disk drives for non-rigid magnetic media (floppy disks) or cartridge type magnetic disk drives–16 Mbit/s	W
(3) an access rate of 56 accesses per second	W
(b) disk drives for optical media (write-once-read-multiple-times (WORM) disks) exceeding any of the following limits:–	
(1) a net capacity of 3.2 GByte	W
(2) maximum bit transfer rate of 8 Mbit/s	W
(3) an access rate of 15 accesses per second	W
(c) disk drives for erasable optical or magneto-	W

optical media	
(d) solid state storage equipment, other than main storage, (also known as solid state disks or RAM disks) exceeding a net capacity of 2 MByte	W
(e) input/ output control units designed for use with disk drives or solid state storage equipment, with any of the following characteristics–	
(1) designed for use with equipment specified in paragraph (h) (C)(a), (b), (c) or (d) above	W
(2) having more than one independent read/write channel	W
(3) having user- accessible programmability or user- accessible microprogrammability	W

or	
(4) having a transfer rate exceeding 16 Mbit/s	W
(f) magnetic tape drives exceeding either of the following limits:	
(1) a maximum bit packing density of 246 bit/mm	W
or	
(2) a maximum bit transfer rate of 10 Mbit/s	W
(g) streamer tape drives with a maximum bit transfer rate exceeding16 Mbit/s	W
(h) input/ output control units designed for use with tape drives, with any of the following characteristics–	
(1) designed for use with tape drives specified in paragraph (h)(C)(f) or (g) above	W

(2) having more than two independent read/write channels	W
(3) having user-accessible programmability or user-accessible microprogrammability	W
or	
(4) having a transfer rate exceeding 16 Mbit/s	W
(i) communication control units or directly connected data channel combinations, exceeding a total transfer rate of 3.6 Mbit/s	W
(j) communication control units or communication channel combinations, having a maximum data signalling rate for any communication channel exceeding 9,600 bit/s	W
(k) displays or monitors having more than 1,024	W

resolvable elements in the perpendicular dimension and 1,280 resolvable elements in the other dimension and, except in the case of direct driven video monitors, with more than 256 colours or shades of grey

except–

1. displays or monitors not specially designed for electronic computers;

2. monochrome displays for systems specially designed for and limited to graphic arts, desktop publishing, document image publishing (e.g., printing, publishing) which have displays not exceeding 1,200 resolvable elements in the

perpendicular dimension and 1,600 resolvable elements in the other dimension;

(l) graphic accelerators or graphic coprocessors W

There shall be excluded from head (h)–

(C) digital computers (other than those specified in sub-heads (h)(A)(d) to (m) above) and related, equipment therefor, having all of the following characteristics–

(a) shipped as complete systems;

(b) designed and announced by the manufacturer for identifiable civil use;

(c) not specially designed for any equipment specified in this Schedule;

(d) total processing data rate not exceeding 275 Mbit/s;

(e) total connected net capacity of main storage not exceeding32 MByte;

(f) not including a microprocessor or microcomputer microcircuit with an external data bus width of more than 32 bit or an arithmetic logic unit with an access width of more than 32 bit;

(g) not including related equipment specified in sub-head (h)(C) above other than input/output control unit, magnetic disk drive (hard disk) combinations having all of the following characteristics:

(1) a total connected

net capacity not exceeding 2 GByte;

(2) a maximum bit transfer rate of any disk drive not exceeding 20.6 Mbit/s; and

(3) no more than five independent disk drives exceeding a maximum bit transfer rate of 16 Mbit/s;

(h) except in the case of workstations designed for and limited to graphic arts (e.g., printing, publishing), not having both of the following characteristics–

(1) they are stand-alone graphics work stations designed or modified for the generation, transformation and display of twoor three-dimensional vectors; and

(2) they exceed either of the following limits:

(A) block move data rate of 3 million pixels per second; or

(B) maximum bit transfer rate of the channel for direct access to the main storage (Direct Memory Access (DMA) channel) of 15 Mbit/s; and

(i) not including equipment specified in sub-head (a)(2) of entry IL1519 in Group 3F or in entry IL1567 in this Group;

(D) graphic accelerators or graphic coprocessors not exceeding a block move data rate of 3 million pixels per second;

(E) related equipment for signal processing or image enhancement or both not exceeding an equivalent multiply rate of 6.5 million operations per second;

(F) related equipment for local area networks, not exceeding a data signalling rate of 20 Mbit/s and having no inter-network gateways, or related equipment specially designed for connecting local area networks within a computer using facility;

(G) digital computers or related equipment therefor, provided that:

(a) they are for medical applications;

(b) they are substantialy restricted to medical applications by reason of their design and performance;

(c) they do not have user-accessible programmability other than that allowing for insertion of the original or modified programmes supplied by the original manufacturer;

(d) in the case of computers or equipment for signal processing, image enhancement or multi-data-stream processing, it

(1) is essential for the medical application; and

(2) is designed or modified for the identifiable and dedicated

medical application;

(e) in the case of any digital computer which is not designed or modified but is essential for the medical application, it does not exceed a total processing data rate of 550 Mbit/s;

(H) digital computers or related equipment, contained in or associated with other equipment or systems where–

(a) the computer or related equipment is essential for the operation of that other equipment or systems; and

(b) the computer or related equipment is not a principal element of that other equipment or system;

(j) Technology, the following–

(1) technology applicable to the–

(A) D development, production or use (i.e., installation, operation and maintenance) of electronic computers or related equipment, whether or not such electronic computers or related equipment are specified in this entry

except–

(a) technology which is unique to related equipment not specified in this Schedule;

(b) the minimum technical information necessary for the use of electronic computers or related equipment when shipped together with or solely for use with such electronic computers or related equipment; or

(c) the minimum technical information for the production of electronic computers and related equipment not specified in sub-head (h) (A) or related equipment excluded by exception (C) to head (h), being information relating to–

(1) assembling of prefabricated components

or sub-assemblies;
(2) loading of basic diagnostic systems software;
(3) performing basic go/no go testing of finished products;
Note:

"assembling" means for the purpose of this exception, the testing, and integrating into finished products, of components and sub-assemblies, including mounting components on to printed circuit boards or into other assemblies.

(B) D development, production

or use of equipment or systems specified in head (b) or (g) of this entry

(2) technology for the integration of–

(A) electronic computers or related equipment specified in this Schedule into other equipment or systems, whether or not the other equipment or systems are specified in this entry	D

except– technology for the integration of computers or related equipment into other equipment or systems, which is unique to such the other equipment or systems provided that such other equipment

	or systems are not specified in this Schedule;	
	(B) electronic computers or related equipment not specified in this Schedule, into equipment or systems specified in this entry	D

In this entry–

"access rate"–

(a) of an input/output control unit drum or disk drive combination (R_{ad}) means either the access rate of an input/output control unit (R_{ac}) or the sum of the individual access rates of all independent seek mechanisms (R_{as}), whichever is smaller;

Thus: $R_{ad} = \min (R_{ac}; \text{SUM } R_{as})$;

(b) of an input/output

Thus:

$$R_{as} = \frac{1}{t_{aa}};$$

For the purpose of this definition–

"average access time"of a seek mechanism (t_{aa}) means the sum of the average seek time (t_{sa}) and the latency time (t^1);

Thus: $t_{aa} = t_{sa} + t_1$;

"average seek time" (t_{sa}) means the sum of the maximum seek time (t_{smax}) and twice the minimum seek time control unit (R_{ac})–

(1) with rotational position sensing (rps), means the sum of the individual access rates of all independent seek mechanisms (R_{as}) connected to the control unit;

Thus: R_{ac} = SUM R_{as} (with rps);

(2) without rotational position sensing (rps), means the number (C) of independent read/ write channels connected to the control unit divided by the least latency time (t_{1min}) (t_{smin}), divided by three;

Thus:

$$t_{sa} = \frac{t_{max} + 2t_{smin}}{3}$$

“maximum seek time” (t_{smax})

(1) for fixed head devices, is zero;

(2) for moving head or moving media devices, means the rated time to move between the two most widely separated tracks;

“minimum seek time” (t_{smin})

(1) for fixed head devices, is zero;

(2) for moving head or moving media devices, means

of any connected independent seek mechanism;

Thus:

$$R_{ac} = \frac{C}{t_{imin}} \text{ (without rps);}$$

(c) of a seek mechanism (R_{as}), means the reciprocal of the average access time (t_{aa}) of the seek mechanism;

the rated time to move from one track to an adjacent track.

“latency time” (t^1) means the rotational period divided by twice the number of independent read/write heads per track;

“analogue computer” means equipment which can, in the form of one or more continuous variables:

(a) accept data;

(b) process data; and

(c) provide output of data;

“associated” with equipment or systems means:

(a) can feasibly be either:

(1) removed from such equipment

or systems; or

(2) used for other purposes; and

(b) is not essential to the operation of such equipment or systems;

"block move data rate" means the maximum number of pixels which can be moved per second from one location to another in the storage which functions as the frame buffer;

"computer using facility" means the end-user's contiguous and accessible facilities:

(a) housing the computer operating area and those end-user functions which are supported

by the electronic computer and its related equipment; and
(b) not extending beyond 1,500 metres in any direction from the centre of the computer operating area;

For the purpose of this definition–
"computer operating area" means the immediately contiguous and accessible area around the electronic computer, where the normal operating, support and service functions take place;
"data device" means equipment capable of transmitting or receiving sequences of digital information;
"data signalling

tdmax), means the product of:
(1) the maximum number of binary digit (bit) positions per unformatted track; and
(2) the number of tracks which simultaneously can be read or written, divided by the rotational period;
(b) of a magnetic tape drive (R

$_{ttmax}$), means the product of:
(1) the maximum bit packing density;
(2) the number of data bits per character (ANSI) or per row (ISO); and
(3) the maximum tape read/write speed;
"most immediate storage" means the portion of the main storage most directly accessible by the central processing unit:
(a) for single

rate" means that rate as defined in ITU Recommendation 53-36, taking into account that, for non-binary modulation, baud and bit per second are not equal. Binary digits for coding, checking and synchronisation functions are included;

NB.: It is either the maximum one-way rate, i.e., the maximum rate in either transmission or reception, whichever is the greater;

"digital computer" means equipment which can, in the form of one or more discrete variables:

(a) accept data;

(b) store data or instructions in fixed or alterable

level main storage, this is the internal storage;

(b) for hierarchical main storage, this is:

(1) the cache storage;

(2) the instruction stack; or

(3) the data stack;

"multi-data-stream processing" means the microprogramme or equipment architecture technique which permits processing two or more data sequences under the control of one or more instruction sequences by means such as:

(a) parallel processing;

(b) structured arrays of processing elements;

(c) Single Instruction Multiple Data

(writable) storage devices;
(c) process data by means of a stored sequence of instructions which is modifiable; and
(d) provide output of data;
NB: Modifications of a stored sequence of instructions include replacement of fixed storage devices, but not a physical change in wiring or interconnections;
"electronic computer" does not include related equipment which contains an electronic computer, but which lacks user-accessible programmability;
"equivalent multiply rate" means the maximum achievable number of multiplication operations

(SIMD) operations; or
(d) Multiple Instruction Multiple Data (MIMD) operations;
"net capacity" of a drum, disk or cartridge-type streamer tape drive or a bubble memory, means the total capacity designed to be accessible to the digital computer excluding error control bits;

which can be performed per second considering that, in the case of simultaneous multiplication operations, all multiplication rates have to be summed in order to arrive at the equivalent multiply rate:

(a) assuming

(1) optimal operand locations in the most immediate storage; and

(2) operand lengths at least 16 bit, or more if this allows for faster operation; and

(b) ignoring

(1) set-up operations;

(2) pipeline filling operations;

(3) initialization;

(4) interrupts; and

(5) data reordering times;

NB: Simultaneous multiplication operations can occur because of:

(a) multiple arithmetic units for operations such as complex multiplication, convolution or recursive filtering;

(b) parallel pipelining;

(c) more than one arithmetic unit in one data processing unit; or

(d) more than one data processing unit in one system.

"fault tolerance" means the ability to perform correctly without human intervention after failure of any assembly, so that there is no single point in the system the failure of which could cause catastrophic failure of the system's functioning;

"gateway" means the function, realised by any combination of equipment and software, of carrying out the conversion of conventions for representing, processing or communicating information used in one system into the corresponding but different conventions used in another system;

"gross capacity" means the product of:
(a) the maximum number of binary digit (bit) positions per unformatted track; and
(b) the total number of tracks including spare tracks and tracks not accessible to the user;
"hybrid computer" means equipment which can:
(a) accept data;
(b) process data, in both analogue and digital representations; and
(c) provide output of data;
"image digitiser" means a device for directly converting an analogue representation of an image into a digital representation;
"image enhancement" means the processing

of externally derived information-bearing images by algorithms such as time compression, filtering, extraction, selection, correlation, convolution or transformations between domains (e.g., fast Fourier transform or Walsh transform). This does not include algorithms using only linear or rotational transformation of a single image, such as translation, feature extraction, registration or false coloration;

"internetwork gateway" means a gateway for two systems which are themselves local area networks, wide area networks or both;

"local area network"

means a data communication system which:
(a) allows any number of independent data devices to communicate directly with each other; and
(b) is confined to a geographical area of moderate size (e.g., office building, plant, campus, warehouse);
"main storage" means the primary storage for data or instructions for rapid access by a central processing unit. It consists of the internal storage of a digital computer and any hierarchical extension thereto, such as cache storage or non-sequentially

accessed extended storage;

NB: For the determination of the size of main storage the cache storage is excluded, provided that: (a) its size does not exceed 6.25% (1/16th) of the size of main storageexcluding cache storage; and (b) it is designed to contain only data already contained in mainstorage;

"maximum bit packing density" means the density of recording specified in accordance with the appropriate

ANSI or ISO Standard (egANSI X3.14–1979, ISO 1863–1975; ANSI X3.22–1973, ISO 1873–1976; ANSI X3.39–1973, ISO 3788–1976; ANSI X3.48–1977, ISO 3407–1976; ANSI X3.56–1977, ISO 4057–1979; ANSI X3.54–1976); "maximum bit transfer rate" (a) of a drum or disk drive (R

an element is a "principal element" when its replacement value is more than 35% of the total value of the system of which it is an element. Element value is the cost of the element for the manufacturer of the system, or by the system integrator. Total value is the normal international selling price to unrelated parties at the point of manufacture or consolidation of shipment;

"real time processing" means processing of data by an electronic computer in response to an external event according to time requirements imposed by the external event;

"related equipment" means the following equipment, contained in or associated with an electronic computer:

(a) equipment for interconnecting analogue computers with digital computers;

(b) equipment for interconnecting digital computers;

(c) equipment for interfacing electronic computers

to local area networks or to wide area networks;
(d) communication control units;
(e) other input/output control units;
(f) recording or reproducing equipment; or
(g) displays;

"signal processing" means the processing of externally derived information-bearing signals by algorithms such as time compression, filtering, extraction, selection, correlation, convolution or transformations between domains(eg, fast Fourier transform or fast Walsh transform).

"total processing data rate"–
(a) of a single central processing unit, is its

processing data rate;

(b) of multiple central processing units which do not share direct access to a common main storage, is the individual processing data rate of each central processing unit, ie, each unit is separately treated as a single central processing unit as in (a) above;

(c) of multiple central processing units which partially or fully share direct access to a common main storage at any level, is the sum of:

(1) the highest of the individual processing data rates of all central processing

units; and

(2) 0.75 times the processing data rate of each remaining central processing unit, sharing the same main storage;

assuming the configuration of equipment which would maximize this sum of rates.

For the purpose of this definition–

"processing data rate" is the maximum of the floating point processing data rate (R_f) or the fixed point processing data rate (R_x).

NB: The processing data rate of a central processing unit implemented with two or more microprocessor microcircuits, not including any dedicated microprocessor microcircuit used solely for display, keyboard or input/output control, is the sum of the individual processing data rates of all these microprocessor microcircuits.

"floating point processing data rate" (R_f) is the sum of:

(1) 0.85 times the number of bits in a fixed point instruction (n_{ix})or 0.85 times the number of bits in a floating

point instruction (n_{if}), if no fixed point instructions are implemented;

(2) 0.15 times the number of bits in a floating point instruction (n_{if});

(3) 0.40 times the number of bits in a fixed point operand (n_{ox}) or 0.40 times the number of bits in a floating point operand (n_{of}), if no fixed point instructions are implemented; and

(4) 0.15 times the

number of bits in a floating point operand (n_{of}); divided by the sum of: (1) 0.85 times the execution time for a fixed point addition (t_{ax}) or for a floating point addition (t_{af}), if no fixed point instructions are implemented; (2) 0.09 times the execution time for a floating point addition (t_{af}); and (3) 0.06 times the execution time for a floating point multiplication (t_{mf}) or for the fastest available subroutine (t_{msub}) to simulate a floating point multiplication instruction, if no floating point multiplication instructions are implemented;

Thus:

$$R_f = \frac{(0.85)n_{ix} + (0.15)n_{im} + (0.40)n_{ax} + (0.15)n_{af}}{(0.85)t_{ax} + (0.09)t_{af} - (0.06)t_{mf}}$$

or if no fixed point instructions are implemented, then:

$$R_f = \frac{(1.00)n_{mf} + (0.55)n_{af}}{(0.94)t_{af} + (0.06)t_{mf}}$$

or if no floating point multiplication instructions are implemented ($t_{mf} = t_{msub}$) then:

$$R_f = \frac{(0.85)n_{ix} + (0.15)n_{im} - (0.40)n_{ax} + (0.15)n_{af}}{(0.85)t_{ax} + (0.09)t_{af} + (0.06)t_{msub}}$$

NB: If a digital computer has neither

floating point addition nor floating point multiplication instructions, then its floating point processing data rate is equal to zero;

"fixed point processing data rate" (Rx) is the sum of:

(1) 0.85 times the number of bits in a fixed point addition instruction ($n_{ia}x$);

(2) 0.15 times the number of bits in a fixed point multiplication instruction (n_{imx}); and

(3) 0.55 times the number of bits in a fixed point

operand (n_{ox});

divided by the sum of:

(1) 0.85 times the execution time for a fixed point addition (t_{ax}); and

(2) 0.15 times the execution time for a fixed point multiplication (t_{mx}) or for the fastest available subroutine (t_{msub}) to simulate a fixed point multiplication instruction if no fixed point multiplication instructions are implemented;

Thus:

$$Rx = \frac{(0{\cdot}85)n_{ax} + (0{\cdot}15)n_{mx} + (0{\cdot}55)n_{ox}}{(0{\cdot}85)t_{ax} + (0{\cdot}15)t_{mx}}$$

or if no fixed point multiplication

instructions are implemented ($t_{mx} = t_{msub}$), then:

$$Rx = \frac{(0{\cdot}85)n_{iax} + (0{\cdot}15)n_{imx} + (0{\cdot}55)n_{iax}}{(0{\cdot}85)t_{ax} - 0{\cdot}15)t_{msub}}$$

NB: If a digital computer has neither fixed point addition nor fixed point multiplication instructions, then its fixed point processing data rate is equal to zero.

“number of bits” in a:

- fixed point addition instruction (n_{iax})–
- fixed point multiplication instruction (n_{imx})–
- floating point addition instruction (n_{iaf})
- floating point multiplication instruction (n_{imf})–

means the number of bits in the appropriate shortest single fixed or floating point instruction length which permits full direct addressing of the main storage;

NB:1. When multiple instructions are required to simulate an appropriate single instruction, the number of bits in the above instructions is 16 bit plus the number of bits (b_{iax}, b_{imx}, b_{iaf}, b_{imf}) which permits full direct addressing of the main storage.

Thus: $n_{iax} = 16 + b_{iax}$;

$n_{im}x = 16 + b_{imx}$

$n_{ia}f = 16 + b_{iaf}$

$n_{im}f = 16 + b_{imf}$

NB:2. If the addressing capability of an instruction is expanded by using a base register, then the number of bits in an instruction, fixed or floating point, addition or multiplication, is the number of bits in the instruction with the standard address length including the number of bits necessary to use the base register.

"number of bits in a fixed point operand" (n_{ox}) is

(a) the shortest

fixed point operand length; or
(b) 16 bit;

whichever number is higher;

"number of bits in a floating point operand" (n_{of}) is
(a) the shortest floating point operand length; or
(b) 30 bit;
whichever number is higher;
and for the purpose of these definitions "execution time" is
(a) the time certified or openly published by the manufacturer for the execution of the fastest appropriate instruction under the following conditions:
(1) no indexing or indirect operations are included;
(2) the instruction is in

the most immediate storage;

(3) one operand is in the accumulator or in a location of the most immediate storage which is acting as the accumulator;

(4) the second operand is in the most immediate storage; and

(5) the result is left in the accumulator or the same location in the most immediate storage which is acting as the accumulator;

(b) if only the maximum and minimum execution times of the instructions are published, the sum of:

(1) the maximum execution time of an instruction (t_{max}); and

(2) twice the minimum exception time of this instruction (t_{min});

divided by three;

Thus:

$$t = \frac{t_{max} + 2t_{min}}{3}$$

(t stands for any of the values t_{ax}, t_{af}, t_{mx} or t_{mf});

(c) for central processing units which simultaneously fetch more than one instruction from one storage location, the average of the execution times when executing instructions fetched from all possible locations within the stored word;

(d) if the longest fixed point operand length is smaller than 16-bit, the time required for the fastest available subroutine to ssimulate a 16 bit fixed point operation;

Note:1. If the addressing capability of an instruction is expanded by using a base register, then the execution time shall include the time for adding the content of the base register to the address part of the instruction.

2. When

calculating processing data rate for computers with cache sizes smaller than 64 kbytes, the execution time of the appropriate instructions shall be calculated as follows: (cache hit rate) × (execution time when both instruction and operand are in cache storage) + (1 − cache hit rate) × (execution time when neither instruction nor operand are in cache storage), the "cache hit rate” being:

1.00 for cache size of 64 kbyte or more
0.95 " “32” "
0.90 " “16” "
0.85 " “8” "
0.75 " “4” "
0.65 " “2” "
0.50 " “1” "

The cache hit rate for computers with cache sizes smaller than 1 kbyte shall be treated as zero.

"total transfer rate"–

(a) of input/output control unit drum, disk or cartridge-type streamer tape drive combinations (R_{td}tot), is the sum of the individual transfer rates of all input/output control unit drum, disk or cartridge-type streamer tape drive combinations (R_{td}) provided with the system which can be sustained simultaneously, assuming the configuration of equipment which would maximise this sum of rates;Thus: R_{tdtot} = SUM R_{td}

(b) of input/output control unit magnetic tape drive combinations (R_{tt}tot) including cartridge tape streamer tape drive combinations, means the sum of the individual transfer rates of all input/output control unit magnetic tape drive combinations (R_{tt}) provided with the system which can be sustained simultaneously, assuming the configuration of equipment which would maximize this sum of rates; Thus: R_{tttot} = SUM R_{tt}.

(c) of input/output or

communication control unit directly connected data channel combinations, means the sum of the individual transfer rates of all data channels provided with the system which can be sustained simultaneously, assuming the configuration of equipment which would maximize this sum of rates.

For the purpose of this definition,

"transfer rate"–

(1) of an input/output control unit drum or disk drive combination (R_{td}) other than a cartridge-type streamer tape drive combination,

is the smaller of either:

(A) the input/output control unit transfer rate (R_{tc}); or

(B) the sum of the individual transfer rates of all independent seek mechanisms (R_{ts});

Thus: R_{td} =min (R_{tc}; Sum R_{ts})

(2) of an input/output control unit (R_{tc})

(A) with rotational position sensing (rps), is the product of:

(a) the number of independent

read/ write channels (C); and

(b) the highest maximum bit transfer rate ($R_{tsmaxmax}$) of all independent seek mechanisms; or

(B) without rotational position sensing (rps), is two thirds of this product;

Thus: $R_{tc} = C.R_{tsmaxmax}$ (with rps);

$$R_{tc} = \frac{2C.R_{tsmaxmax}}{3} \quad \text{(without rps)}$$

(without rps)

(3) of an independent seek mechanism (R_{ts}), is the product of:

(A) the maximum bit transfer rate (R_{tsmax}); and

(B) the

rotational period (t_r); divided by the sum of:

(A) the rotational period (t_r);

(B) the minimum seek time (t_{smin}); and

(C) the latency time (t^1);

Thus:

$$R_{rd} = \frac{R_{bmax} \times t_r}{t_r - t_{smin} + t_l}$$

(4) of an input/output control unit cartridge-type streamer or magnetic tape drive combination (R_{tt}), is the product of:

(1) the number of independent read/write channels (C); and

(2) the highest maximum bit

transfer rate ($R_{ttmaxmax}$) of all tape drives;

Thus: $R_{tt} = C.R_{ttmaxmax}$

"minimum seek time" (t_{smin})–

(1) for fixed head devices, is zero; or

(2) for moving head or moving media devices, is the rated time to move from one track to an adjacent track;

"latency, time" (t^1) is the rotational period divided by twice the number of independent read/write heads per track;

"user-accessible microprogrammability" means the facility allowing a user to insert, modify or replace microprogrammes;

"user-accessible

programmability" means the facility allowing a user to insert, modify or replace programmes by means other than:

(a) a physical change in wiring or interconnections; or

(b) the setting of function controls including entry of parameters;

"wide area network" means a data communication system which:

(a) allows an arbitrary number of independent data devices to communicate with each other;

(b) may include local area networks; and

(c) is designed to interconnect geographically dispersed facilities.

	Any term used in this entry shall bear the meaning it has in entry IL1566 in this Group.	
IL1566	Software and technology therefor, the following: Note: Software for equipment described in entry IL1565 is dealt with in this entry. Specially designed ODMA software for equipment described in other entries in this Schedule except entry IL1565, is dealt with in the appropriate entry.	
	(a) Software, the following:	
	(1) software designed or modified for any computer that is part of a computer series designed and produced in any country specified in	W

Schedule 2 to this Order

except application software designed for and limited to:

(A) accounting, general ledger, inventory control, payroll, accounts receivable, personnel records, wages calculation or invoice control;

(B) data and text manipulation such as sort/merge, text editing, data entry or word processing;

(C) data retrieval from established data files for purposes of report generation or inquiry for the functions described in (A) or (B) above; or

(D) the non-real time processing of pollution sensor data at fixed sites or in civil

vehicles for civil environmental monitoring purposes;	
(2) software designed or modified for the design, development or production of items specified in this Schedule	A
(3) software designed or modified for:	
(A) hybrid computers specified in entry IL1565 in this Group	A
(B) one or more of the functions referred to in paragraphs (A)(a) to (m) of head (h) of entry IL1565 or for digital computers or related equipment designed or modified for such functions	W
except (a) specially designed software in	

machine executable form for digital computers and related equipment therefor which are excluded by exception (G) or (H) to head (h) of entry IL1565;

(b) software for equipment specified in paragraph (A) (c) or (m) of head (h) of entry IL1565 unless the software performs:

(1) multi-data-stream processing or load sharing functions; or

(2) datagram or fast select functions as defined in level III of CCITT

X.25 or equivalent;	
(4) software for computer-aided design, manufacture, inspection or testing of items specified in this Schedule	W
(5) software designed or modified to provide certifiable multi-level security or certifiable user-isolation applicable to government-classified material or to applications requiring an equivalent level of security, or software to certify such software	W
(6) software specially designed for computer aided design (CAD) of patterned substrates, having any of the following characteristics:–	

(A) automatically transforming schematic functional descriptions into pattern layouts	W
(B) simulation of the performance of the circuit layout	W
(C) automatic generation of test string lists (i.e., test vectors) for substrates having more than two layers (including the ground plane) of interconnections	W
(D) automatic placement or routing which is designed for performingimpedance matching or crosstalk analysis and crosstalk matching	W
except automatic software for the generation of test string lists for continuity	

testing of substrates.	
(7) software specially designed for the computer aided design of semiconductor devices or integrated circuits having any of the following characteristics–	
(A) automatic transformation of schematic diagrams, functional block descriptions or logic diagrams into physical layouts	W
(B) circuit verification rules	W
(C) automatic routing for physical layout	W
(D) automatic placement for physical layout	W
(E) automatic generation of test vectors;	W

or (F) simulation of the physically laid out circuits	W
(b) Software, the following:	
(1) development systems, the following:	
(A) development systems employing high-level language and designed for or containing programmes or databases special to the development or production of:	
(a) specially designed software specified elsewhere in this Schedule	W
(b) software specified in sub-head (a)(2) or (a)(3) of this entry, including any subset designed or modified for use as part	W

of such a development system	
(B) development systems employing high-level language and designed for or containing the software tools and databases for the development or production of software or any subset designed or modified for use as part of a development system such as, or equivalent to:	
(a) Ada Programming Support Environment (APSE)	W
(b) any subset of APSE, the following:	
(1) Kernel APSE	W
(2) Minimal APSE	W
(3) Ada compilers specially designed as an	W

integrated subset of APSE	
or	
(4) any other subset of APSE	W
(c) any superset of APSE	W
or (d) any derivative of APSE	W
(2) programming systems, the following:	
(A) cross-hosted compilers and cross-hosted assemblers	W
(B) compilers or interpreters designed or modified for use as part of a development system specified in sub-head (1) above	W
(C) disassemblers, decompilers or other software which converts programmes in object or assembly language into a	W

higher level language

except simple debugging application software, such as mapping, tracing, check-point/restart, breakpoint, dumping and the display of the storage contents or their assembly language equivalent;

(3) diagnostic systems or maintenance systems, designed or modified for use as part of a development system specified in sub-head (1) above W

(4) operating systems, the following:

(A) operating systems designed or modified for digital computers or related equipment, exceeding any of the

following limits;	
(1) central processing unit storage combinations–	
(a) total processing data rate of 1,000 Mbit/s;	
(b) total connected capacity of main storage of 128 MByte	W
(2) input/output control unit, drum or disk drive combinations–	
(a) total connected net capacity of 12 GByte;	
(b) maximum bit transfer rate of any drum or disk drive of 25 Mbit/s	W
(B) operating systems providing on-line transaction data processing which permits integrated teleprocessing and on-line	W

updating of databases	
(5) application software, the following:	
(A) software for cryptologic or cryptoanalytic applications	W
(B) artificial intelligence software, including expert system software, which enables a digital computer to perform functions that are normally associated with human perception and reasoning or learning	W
(C) database management systems which are designed to handle distributed databases for:	
(a) fault tolerance by using techniques such as maintenance of	W

duplicated databases	
or	
(b) integrating data at a single site from independent remote databases	W
(D) software designed to adapt software resident on one digital computer for use on another digital computer	W

except software to adapt between two digital computers not specified in entry IL1565.

(E) software to provide adaptive control and having both the following characteristics	W
(a) for flexible manufacuring units (FMUs) which include equipment described in (b)(1) and (b)(2) of the definition of flexible	

manufacturing unit below; and

(b) capable of generating or modifying, in real time processing, programmes or data by using the signals obtained simultaneously by means of at least two detection techniques, such as:

(1) machine vision (optical ranging);

(2) infrared imaging;

(3) acoustical imaging (acoustical ranging);

(4) tactile measurement;

(5) inertial positioning;

(6) force measurement;

(7) torque measurement;

except software which only provides rescheduling of functionally identical equipment within flexible manufacturing units using pre-stored part programmes and a pre-stored strategy for the distribution of the part programmes.

(c) Technology applicable to the development, production or use (i.e. installation, operation and maintenance) of software, whether or not the software is specified in this entry D

except–

(1) technical data in the public domain;

(2) the minimum technical information necessary for the use of software not specified in this entry.

There shall be excluded from this entry–
1. software not exceeding 5,000

statements in source language, excluding data, provided that:

(a) the software is neither designed nor modified for use as a module of a larger software module or system which in total exceeds this limit; and

(b) the software is not specified in sub-head (b)(5) above;

2. software initially exported to a country specified in Schedule 2 to this Order prior to 1st January, 1984, provided that:

(a) the software is

identical to and in the same language form (source or object) as that initially exported, allowing minor updates for the correction of errors which do not modify the initially exported functions;

(b) the accompanying documentation does not exceed the level of the initial export; and

(c) the software is exported to the same destination as the initial export;

3. the minimum technical information for the

use (i.e. installation, operation and maintenance) of software licensed for export, when shipped together with or solely for use with such software; 5.

5. software which is either:

(a) standard commercially available software:

(1) designed for installation by the user without further support by the supplier; and

(2) designed for use on digital computers and related equipment therefor which are excepted by

paragraph (C) to head (h) of entry IL1565 in this Group; and
(3) generally available to the public; or
(b) software in the public domain.

In this entry:
"adaptive control" means a control system that adjusts the response from conditions detected during the operation;
"application software" means software other than development systems, diagnostic systems, maintenance systems, operating systems and programming systems not falling

within any of the other defined categories of software;

"cross-hosted programming systems" means programming systems which produce programmes for a model of electronic computer different from that used to run the programming system, that is, they have code generators for equipment different from the host computer;

"database" means a collection of data for one or more particular applications, which is physically located and maintained in one or more electronic computers or related equipment;

"database management systems"

means application software to manage and maintain a database in one or more prescribed logical structures for use by other application software independent of the specific methods used to store or retrieve the database;

"data device" means equipment capable of transmitting or receiving sequences of digital information;

"development systems" means software to develop or produce software, including software to manage those activities. Examples of a development system are programming support environments, software development

environments and programmer-productivity aids;
"diagnostic systems" means software to isolate or detect software or equipment malfunctions;
"distributed database" means a database which is physically located and maintained in part or as a whole in two or more interconnected electronic computers or related equipment, so that inquiries from one location can involve database access in other interconnected electronic computers or related equipment;
"flexible manufacturing unit" (FMU), (sometimes also referred to as flexible manufacturing system (FMS) or

flexible manufacturing cell (FMC)) means a combination of at least:

(a) a digital computer including its own main storage and its own related equipment; and

(b) two or more of the following:

(1) a machine tool for removing, cutting or spark eroding metals, ceramics or composites;

(2) a computer controlled or numerically controlled dimensional inspection machine or a digitally controlled measuring

machine specified in head (c) of entry IL1099 in Group 3A; (3) a robot specified in entry IL1391 in Group 3D; (4) digitally controlled equipment specified in entry IL1080, IL1081, IL1086 or IL1088 in Group 3A; (5) stored-programme-controlled equipment specified in head (b) of entry IL1355 in Group 3D; (6) digitally controlled equipment specified in entry IL1357 inGroup 3D;

(7) digitally controlled electronic equipment specified in entry IL1529 in Group 3F;

"generally available to the public" means

(a) available at retail selling points, other than those specializing in selling electronic computers to the general public in model series which are not excepted by paragraph (C) to head (h) of entry

IL1565 in this Group; and

(b) sold from stock by means of:

(1) over-the-counter transactions;

(2) mail order transactions;

(3) telephone call transactions;

“high-level language” means a programming language that does not reflect the structure of any one given electronic computer or that of any one given class of electronic computers;

“maintenance systems” means software to:

(a) modify software or its associated documentation in order to correct faults, or for other updating purposes; or

(b) maintain equipment;

"on-line updating" means processing in which the contents of a database can be amended within a period of time useful to interact with an external request;

"operating systems" means software to control:

(a) the operation of a digital computer or of related equipment; or

(b) the loading or execution of programmes;

"programming systems" means software to convert a convenient

expression of one or more processes (source code or source language) into equipment executable form (object code or object language);
"self-hosted software for programming systems" means software to produce programmes for the same model of electronic computer as that used to run the programming system, ie, they only have code generators for the host computer;
"standard commercially available" means for software that which is:

(a) commonly supplied to general purchasers or users of equipment

in countries specified in Schedule 2 to this Order, but not precluding the personalization of certain parameters for individual customers wherever located;
(b) designed and produced for civil applications;
(c) not designed or modified for any digital computer which is part of a digital computer series designed and produced in a country specified in Schedule 2; and
(d) supplied in a

	commonly distributed form.	
	Any term used in this entry shall bear the meaning it has in entry IL1565 in this Group.	
IL1567	Stored-programme-controlled, communication switching equipment or systems and technology therefor, the following: and specially designed components therefor and specially designed ODMA software for the use of such equipment or systems–	W
	(a) Communication equipment or systems for data (message) switching (including those for local area networks or for wide area networks)	
	except data (message) switching equipment or systems, provided that–	W

(1) the equipment or systems are designed for fixed civil use according to the requirements of either:

(A) CCITT Recommendations F.1 to F.79 for store-and-forward systems (Volume II–Fascicle II.4, VIIth plenary assembly,10th–21st November 1980); or

(B) ICAO Recommendations for store-and-forward civil aviation communication networks (Annex 10 to the Convention on International Civil Aviation, including all amendments agreed up to and including 14th December 1981, published by ICAO);

(3) the maximum data signalling rate of any circuit does not exceed 9,600 bit/s;

(4) the equipment or systems do not contain digital computers or related equipment specified in–

(A) head (f) of entry IL1565 in this Group; or

(B) paragraphs (a), (b) or (d) to (j) (inclusive) of sub-head (h) (A) of entry IL1565;

(5) the software supplied:

(A) is limited to the minimum specially designed operating systems, diagnostic systems, maintenance systems or application software necessary for the installation, operation and maintenance of the equipment and systems and is in machine executable form; and

(B) does not include software–

(a) specified in entry IL1527 in Group 3F, in sub-head (a) (5) in entry IL1566 in this Group or in entry ML11 in Group 1, or

(b) that permits user-modification of generic software or its associated documentation; and

(6) the equipment or systems are

designed for installation by the user without support from the supplier;

(b) Communication equipment or systems for stored-programme-controlled circuit switching

except– D

(1) key telephone systems, provided that–

(A) access to an external connection is obtained by pressing a special button (key) on a telephone, rather than by dial or key-pad as on

a PABX;
(B) they are not designed to be upgraded for use as PABXs;
(C) the software supplied:
(a) is limited to the minimum specially designed operating systems, diagnostic systems, maintenance systems or application software necessary for the installation, operation and maintenance of the equipment or systems, and is in machine-executable

form; and (b) does not include software: (1) specified in entry IL1527 in Group 3F, in sub-head (a) (5) in entry IL1566 in this Group or in entry ML11 in Group 1, or (2) that permits user-modification of generic software or its associated documentation; and (D) the equipment or systems are designed for installation by the user without support from the supplier;

(2) stored-programme-controlled circuit switching equipment or systems, provided that–

(A) the equipment or systems are designed for fixed civil use in stored-programme-controlled telegraph circuit switching for data;

(C) the equipment or systems do not contain digital computers or related equipment specified in head (f) of entry IL1565 or in paragraphs (a) to (j) inclusive or paragraph (m) of sub-head (h) (A) of entry IL1565;

(D) the equipment or systems do not have either of the following characteristics:

(a) multi-level call pre-emption (including over-riding or seizing of busy subscriber lines, trunk circuits or switches), other than for single-level call pre-emption (such as executive override); or

(b) common channel signalling;

(E) the maximum internal bit rate per channel does not exceed 9,600 bit/s;

(F) the telegraph circuits (whether or not operating as telephone circuits) are capable of carrying any type of telegraph or telex signal compatible with a voice channel bandwidth of 3,100 Hz;

(G) the software supplied:

(a) is limited to the minimum specially designed operating systems, diagnostic systems, maintenance systems or application software necessary for the installation, operation and maintenance of the equipment or systems and is in machine-executable form; and (b) does not include software: (1) specified in entry IL1527 in Group 3F or in sub-head (a) (5) in entry IL1566 in this Group or in entry ML11 in Group 1; (2) that permits user-modification of generic software or its associated documentation; (H) the equipment or systems are designed for installation by the user without support from the supplier;

(3) stored-programme-controlled telephone circuit switching equipment or systems, provided that–

(A) the equipment or systems are designed for fixed civil use as space-division analogue exchanges or time-division analogue exchanges which are PABXs;

(B) the equipment or systems do not

contain digital computers or related equipment specified in head (f) of entry IL1565 in this Group, or in paragraphs (a) to (j) inclusive or paragraph (m) of sub-head (h) (A) of entry IL1565;
(C) any communication channels or terminal devices used for administrative and control purposes:
(a) can only be used for those

purposes; and (b) do not exceed a maximum data signalling rate of 9,600 bits; (D) voice channels are limited to 3,100 Hz; (F) the equipment or systems do not have: (a) multi-level call pre-emption (including over-riding or seizing of busy subscriber lines, trunk circuits or switches) other than for single-

level call pre-emption (such as executive override); or
(b) common channel signalling;
(G) the software supplied:
(a) is limited to the minimum specially designed operating systems, diagnostic systems, maintenance systems or application software necessary for the installation, operation and maintenance of the equipment or systems; and is in machine-executable form; and

(b) does not include software:

(1) specified in entry IL1527 in Group 3F, or in sub-head (a) (5) in entry IL1566 in this Group or in entry ML11 inGroup 1; or

(2) that permits user-modification of generic software or its associated documentation; and

(H) the equipment or systems are designed for installation by the user without support from the supplier;

(4) stored-programme-controlled, telephone circuit switching equipment or systems, provided that–

(A) the equipment or systems are designed for fixed civil use as space-division digital exchanges or time-division digital exchanges, which are PABXs;

(B) the equipment or systems do not have

more than 512 ports;
(C) the equipment or systems do not support any form of Integrated Services Digital Networks;
(D) the equipment or systems do not contain digital computers or related equipment specified in head (f) of entry IL1565 in this Group or in paragraphs (a) to (j) inclusive or paragraph (m) of sub-

head (h) (A) of entry IL1565;

(E) the PABXs do not have any of the following characteristics:

(a) multi-level call pre-emption (including over-riding or seizing of busy subscriber lines, trunk circuits or switches) other than single-level call pre-emption (such as executive over-ride);

(b) common channel signalling;

(c) dynamic adaptive routing;
(d) digital synchronisation circuitry which uses equipment specified in head (d) of entry IL1529 in Group 3F;
(f) centralised network control which is:
(A) based on network management protocol; and
(B) capable of receiving data from the nodes and processing such data to control traffic and directionalise paths;

(F) any communication channels or terminal devices used for administrative and control purposes:
(a) can only be used for those purposes; and
(b) do not exceed 9,600 bit/s;
(G) the software supplied–
(a) is limited to the minimum specially designed operating systems, diagnostic systems, maintenance systems or application software necessary for the

installation, operation and maintenance of the equipment or systems and is in machine-executable form;
(b) does not include software:
(1) specified in entry IL1527 in Group 3F, or in sub-head (a) (5) in entry IL1566 in this Group or in entry ML11 inGroup 1, or
(2) that permits user-modification of

generic software or its associated documentation; and

(H) the equipment or systems are designed for installation by the user without support from the supplier;

(c) Technology applicable to the development, production, installation, operation or maintenance of stored-programme-controlled, communication switching equipment or systems (including equipment or systems referred to in the exceptions to heads (a) and (b) above, if the technology exceeds the minimum technical information necessary for the installation, operation and maintenance of such equipment or systems)

In this entry–

"affiliated equipment" means the following equipment:

(a) input/output (I/O) control units;

(b) recording or reproducing equipment;

(c) displays; or

(d) other peripheral equipment;

"common channel signalling" means a signalling method in which a single channel between exchanges conveys, by means of labelled messages, signalling information relating to a multiplicity of circuits or calls and other information such as that used for network management;

"communication channel" means the transmission path or circuit including the terminating transmission and receiving equipment (modems) for transferring digital information between distant locations;

"data device" means equipment capable of transmitting or receiving sequences of digital information;

"data (message) switching" means a technique, including store-and-forward or packet switching, for:

(a) accepting

data groups (including messages, packets or other digital or telegraphic information groups which are transmitted as a composite whole);

(b) storing (buffering) data groups as necessary;

(c) processing part or all of the data groups, as necessary, for the purpose of:

(1) control (routing, priority, formating, code conversion, error control, retransmission or journaling);

(2) transmission; or

(3) multiplexing; and

(d) retransmitting processed data groups when transmission or receiving facilities are available;

"data-signalling rate" means the maximum rate in either transmission or reception, taking into account that, for non-binary modulation, baud and bit per second are not equal; (binary digits for coding, checking, and synchronization functions are included);

"digital computer" means equipment which can, in the form of one or more discrete variables:

(a) accept data;

(b) store data or instructions in fixed or alterable storage devices;

(c) process data by means of a stored sequence of instructions which is modifiable; and

(d) provide output of data;

"fast select" means a facility applicable to virtual calls, which allows data terminal equipment to expand the possibility of transmitting data in call set-up and clearing packets beyond the basic capabilities of a virtual call;

"local area network" means a data communication system which:

(a) allows any number of independent data devices to communicate directly with each other; and

(b) is confined to a geographical area of moderate size (such as an office building, a plant, a campus, or a warehouse);

"PABX" (private automatic branch exchange) means an automatic telephone exchange (whether or not incorporating a position

for an attendant) designed to provide access to the public network and serving extensions within an institution;
"packet" means a group of binary digits (including call control signals and data) which is switched as a composite whole, the call control signals, data and if present error control information being arranged in a specified format;
"packet-mode operation" means the transmission of data by means of addressed packets, whereby a transmission channel is occupied for the duration of the packet only and the channel is then available

for use by packets being transferred between different data terminal equipments; (in certain data communication networks the data may be formated into a packet or divided and then formated into a number of packets, either by the data terminal equipment or by equipment within the network, for transmission and multiplexing purposes);

"space-division analogue exchange" means a space-division exchange, which uses an analogue (including sampled analogue) signal within the switching matrix, and

which can route digital signals, subject to the bandwidth limitations of the equipment; (such exchanges in public networks commonly pass digital data rates of several kilobit per second per voice channel of 3,100 Hz);
"space-division digital exchange" means a space-division exchange, which accommodates the transmission through the switching matrix of digital signals requiring a bandwidth wider than a voice channel of 3,100 Hz;
"space-division exchange" means an exchange in which different streams

of data or voice signals are routed through the switching matrix along physically different paths; (the signal being routed through the matrix may be analogue, such as conventional amplitude-modulation, or pulse amplitude-modulation, or digital, such as pulse code modulation, delta modulations or data);

"stored-programme-controlled circuit switching" means a technique

(a) for establishing, on demand and until released, a direct (space-division switching) or logical (time-division switching) connection between circuits, and

(b) which is based on switching control information derived from any source or circuit and processed according to the stored programme by one or more electronic computers;

"stored-programme-controlled telegraph circuit switching" means techniques essentially identical to those for stored-programme-controlled telephone circuit switching, for establishing connections between telegraph (for example telex) circuits based solely on a subscriber type of signalling information;

"stored-programme-controlled telephone circuit switching" means a technique

(a) for establishing within an exchange, on demand and until released, an exclusive direct (space-division switching) or logical (time-division switching) connection between calling and called telephone circuits;

(b) based solely on a subscriber type of telephone signalling information derived from the calling circuit; and

(c) processed according to the stored programmes by one or more electronic computers;

for this purpose the telephone circuits may carry any type of signal (including telephone or telex), comparable with a voice channel bandwidth of 3,100 Hz or less;

"terminal device" means a data device which:

(a) does not include process control sensing and actuating devices; and

(b) is capable of:

(1) accepting or producing a physical record;

(2) accepting a manual input; or

(3) producing a visual output;

for the purpose of this definition a combination of such equipment (such as a combination of printer and paper tape punch or reader) which is connected to a single data channel or communications channel, constitutes a single terminal device;

"terminal exchange" means an exchange which performs the function of one or more of the following–

(a) a local exchange used for terminating subscribers' lines;

(b) a remote switching unit which performs some functions of a local exchange and operates under a measure of control from the parent exchange; or

(c) a local exchange which is used as a switching point for traffic between subordinate local exchanges (and which is generally 2-wire but may also provide 4-wire connections to and from the national long-distance network);

"time-division analogue exchange" means a time-division exchange in which the parameter associated with an individual segment of a stream of data or voice signals varies continuously;

"time-division digital exchange" means a time-division exchange in which the parameter associated with an individual segment of a stream of data or voice signals is one of the finite number of digitally coded values; "time-division exchange" means an exchange in which segments of different streams of data or voice are interleaved in time and routed through the switching matrix along a common physical path; (the matrix may also include one or more stages of space-division switching; and the signal being routed though the matrix may be analogue (such as pulse amplitude modulation) or digital (such as pulse code modulation, delta modulation or data); "total data signalling rate" means the sum of the individual data signalling rates of all communication channels which have been provided with the system and can be sustained simultaneously, assuming a configuration of equipment that would maximize this sum of rates;

"transit exchange" means an exchange that performs the function of a terminal exchange or one or both of the following:

(a) a switching point for traffic between other exchanges in the national network (otherwise known as a "trunk exchange" and generally

4-wire); or

(b) a 4-wire exchange serving outgoing, incoming or transit international calls;

"trunk circuit" means a circuit with associated equipment terminating in two exchanges.

Any term used in this entry shall bear the meaning it has in entry IL1565 or entry IL1566 in this Group.

IL1568 Analogue-to-digital and digital-to-analogue converters, position encoders and transducers, the following: and specially designed components and test equipment therefor–

(a) Electrical input type analogue-to-digital converters having any of the

	following characteristics–	
	(1) a conversion rate of more than 200,000 complete conversions per second at rated accuracy	C
	(2) an accuracy in excess of 1 part in more than 10,000 of full scale over the specified operating temperature range	C
or		
	(3) a figure of merit of 1×10^8 or more (being the number of complete conversions per second divided by the accuracy)	C
	(b) Electrical input type digital-to-analogue converter equipment having either of the following characteristics–	
	(1) A resolution of 12 bits with a	

	maximum settling time to rated linearity of less than–	
	(A) 25 ns for current output type converter equipment	C
or		
	(B) 200 ns for voltage output type converter equipment	C
or		
	(2) A resolution of more than 12 bits with a maximum settling time to rated linearity of less than–	
	(A) 1 microsecond for current output type converter equipment	C
or		
	(B) 3 microseconds for voltage output type converter equipment	C
	(c) Solid-state synchro-to-digital or digital-to-synchro converters and	C

resolver-to-digital or digital-to-resolver converters (including multipole resolvers) having a resolution of better than ± 1 part in 5,000 per full synchro revolution for single speed synchro systems or ± 1 part in 40,000 for dual speed systems	
(d) Mechanical input type position encoders and transducers, excluding complex servo-follower systems, the following–	
(1) rotary types having–	
(i) a resolution of better than 1 part in 265,000 of full scale; or	C
(ii) an accuracy better than	C

	±2.5 arc-seconds	
	(2) linear displacement types having a resolution of better than5 micrometres	C
	(e) Any equipment specified in heads (a) to (d) above (inclusive) which is designed to operate below 218 K (−55°C) or above 398 K (+ 125°C)	C
	In this entry–	
	"settling-time" means the time required for the output to come within one half bit of the final value when switching between any two levels of the converters.	
PL7038	Electrical input type analogue-to-digital converter printed circuit boards or modules, having all the following characteristics	A
	(a) a resolution	

		of 8 bits or more; (b) rated for operation in the temperature range from below −45°C to above + 55°C; (c) containing integrated microcircuits specified in PL7039.
IL1571	Magnetometers, magnetometer systems and related equipment, the following: and specially designed components therefor–	
		(a) C Magnetometers and magnetometer systems having or capable of having a sensitivity better than ± 1.0 gamma (± 10^{-5} oersteds), except magnetometers having sensitivities not better than ± 0.1 gamma (± 10^{-6} oersteds) where the

reading rate capability is no faster than once per half-second	
(b) Magnetometer test facilities able to control magnetic field values to an accuracy of 1.0 gamma (10^{-5} oersteds) or less	C
(c) Magnetic compensation systems utilizing digital computers, non-magnetic platforms and calibration systems	C

In this entry–

“sensitivity” means the visually recognized minimum sinusoidal signal in the frequency range of 0.025 Hz to 1.5 Hz when signal-to-noise ratio is higher than 1;

“secially designed components” includes non-magnetic pumping lamps and heating coils, cryogenic magnetic componentry, enhanced resonance gases, and any form of dynamic signal-processing gradient compensation provided as part of, or designed for use with, magnetometers specified in this entry. Enhanced resonance gases are gases of isotopes of cesium, rubidium and other metals which exhibit very sharp bands of response to pumping frequencies in optically pumped magnetometers;

“magnetometer systems” use magnetic sensors,

	including those designed to operate at cryogenic temperatures, compensation systems, displays, recorders and associated electronics for signal processing, target parameter detection, gradient compensation and dynamic range control.	
IL1572	Recording or reproducing equipment, recording media and technology, the following: and specially designed components, accessories and software therefor– (a) Recording or reproducing equipment using magnetic techniques	C
	except– (i) equipment specially designed for– (1) audio	C

programmes on tape or disk;

(2) analogue recording or reproducing of video programmes on tape or disk, save magnetic heads mounted on servo-mechanisms which include piezoelectric transducers and have a gap width less than0.75 micrometre; or

(3) digital reproducing (ie play-back only) of video programmes from tape or disk;

(ii) equipment specially designed to use magnetic card, tag, label or bank cheque recording media with a magnetic surface area not exceeding85 cm^2 ;

(iii) analogue magnetic tape recorders, including equipment permitting the recording of digital signals (eg using a high density digital recording (HDDR) module), having all of the following characteristics–

(a) bandwidth at maximum speed not exceeding 300 kHz per track;

(b) recording density not exceeding 2,000 magnetic flux sine waves

per linear cm per track;
(c) not including recording or reproducing heads designed for use in equipment with characteristics superior to those defined in paragraph (a) or (b) above;
(d) tape speed not exceeding 155 cm/s;
(e) number of recording tracks, excluding audio voice track, not exceeding 28;
(f) start-stop time not less than 25 ms;
(g) equipped

with tape-derived (off-tape) servo speed control and with a time displacement (base) error, measured in accordance with applicable IRIG or EIA documents, of no less than ±1 microsecond;

(h) using only direct or FM recording;

(i) not ruggedized for military use;

(j) not rated for continuous operation in ambient temperatures from below 233K to above 328K (from below −40°C to above + 55°C); and

(k) not specially designed for underwater use;

(iv) digital recording or reproducing equipment having all of the following characteristics–

(a) cassette/ cartridge tape drives or magnetic tape drives which do not exceed;

(1) a maximum bit packing density of 131 bit per mm per track; or

(2) a maximum bit transfer rate

of 2.66 Mbit/s;

(b) not ruggedized for military use;

(c) not specially designed for underwater use; and

(d) not rated for continuous operation in ambient temperatures from below 233K to above 328K (from below −40°C to above +55°C).

(b) Recording or reproducing equipment using laser beams which produce patterns or images directly on the recording surface or reproduce from such surfaces

except– C
(i) equipment specially designed for the production of audio or video disk masters for the replication or entertainmentor education-type disks;
(ii) facsimile equipment such as used for commercial weather imagery and commercial wire photos and text;
(iii) consumer-type reproducers for audio or video disks employing non-erasable media;
(iv) equipment specially designed for gravure (printing plate) manufacturing.
(c) Graphics instruments capable of continuous direct

recording of sine waves at frequencies exceeding 20 kHz

(d) Recording media used in equipment specified in head (a) or (b) above	C
except–	D

(i) magnetic tape having all of the following characteristics–

(a) specially designed for television recording and reproduction or for instrumentation;
(b) being a standard commercial product;
(c) not designed for use in satellite applications;
(d) been in use in quantity for at least two years;

(e) a tape width not exceeding 25.4 mm;

(ee) a tape length not exceeding 6,000 m;

(f) a magnetic coating thickness not less than;

(1) 2.0 micrometres (0.079 mil) if the tape length does not exceed 1,450 m; or

(2) 5.0 micrometres (0.1975 mil) if the tape length does not exceed 6,000 m;

(g) a magnetic coating

material consisting of doped or undoped gamma-ferric oxide or chromium dioxide;

(h) a base material consisting only of polyester;

(i) a rated intrinsic coercivity not exceeding 64 kA/m (804 oersted); and

(j) a retentivity not exceeding 0.16 T (1,600 gauss);

(ii) magnetic tape having all of the following characteristics–

(a) specially designed for television recording and reproduction or for instrumentation;

(b) being a standard commercial product;

(c) having either of the following sets of characteristics–

(1)

(A) a tape width not exceeding 50.8 mm;

(B) not designed for use in satellite applications;

(C) a magnetic coating material consisting of doped or undoped gamma-ferric oxide or chromium dioxide;

(D) a rated intrinsic coercivity not exceeding

64 kA/m (804 oersted); and
(E) a tape length not exceeding 1,096 m; or
(2) (A) a tape width not exceeding 25.4 mm;
(B) a magnetic coating material consisting of chromium dioxide;
(C) a base material consisting only of polyester; and
(D) a rated intrinsic coercivity not exceeding 60 kA/m

(750 oersted);

(iii) video or audio magnetic tape having either of the following sets of characteristics–

(a)

(1) being contained in a cassette;

(2) specially designed for television or audio recording and reproduction;

(3) being a standard commercial product;

(4) a rated intrinsic coercivity not exceeding 128 kA/m (1,600 oersted);

(5) a retentivity not exceeding 0.30 T

(3,000 gauss);

(6) a tape length not exceeding 650 m; and

(7) a magnetic coating thickness not less than 2.0 micrometres; or

(b)

(1) a magnetic coating material consisting of undoped gamma-ferric oxide;

(2) a rated intrinsic coercivity not exceeding 28 kA/m (350 oersted);

(3) a tape width not exceeding 50.8

mm; and (4) a base material consisting only of polyester;

(iv) computer magnetic tape having all of the following characteristics–

(a) designed for digital recording and reproduction;

(b) a magnetic coating certified for a maximum packing density of 2,460 bit per cm or 3,560 flux changes per cm along the length of the tape;

(c) a magnetic coating thickness not less than

3.6 micrometre;
(d) a tape width not exceeding 25.4 mm;
(e) a tape length not exceeding 1,100 m; and
(f) a base material consisting only of polyester;
(v) computer flexible disk cartridges having both of the following characteristics–
(a) designed for digital recording and reproduction; and
(b) not exceeding a gross capacity of 33 million bit;
(vi) rigid magnetic disk recording

media having all of the following characteristics–

(a) being a standard commercial product;

(b) non servo-written;

(c) a packing density not exceeding 866 bit per cm;

(d) not exceeding 80 tracks per cm; and

(e) conforming to any of the following specifications:

(1) unrecorded single disk cartridges (front loading (2315-type)) designed to meet ANSI X3.52–1976;

(2) unrecorded

single disk cartridges (top loading (5440-type)) designed to meet International Standard ISO 3562–1976;
(3) unrecorded six-disk packs (2311 type) designed to meet ANSI X3.46–1974 or International Standard ISO 2864–1974(E); or
(4) unrecorded eleven-disk packs (2316 type) designed to meet ANSI X3.58–1977 or International Standard ISO

3564–1976.

(e) Technology for the development, production or use of recording or reproducing equipment specified in this entry

except–

(i) technology, which is unique to equipment excluded by any exception (i)(1), (i)(2) or (ii) or head (a), or excluded from heads (b) or (c) of this entry, other than technology for the design or production of–

(a) cylindrical structures used to record or reproduce video signals in a helical scan system recorder or reproducer; or (b) recorded alignment tapes used in the production of recording or reproducing equipment;

(ii) the minimum technology necessary for the use of equipment which is excluded under this entry.

(f) Technology for continuous coating of magnetic tape, whether the tape is specified in this entry or not, the following–

(1) technology for the formulation of coating material	D
(2) technology for the application of coating material to the backing	D

(g) Technology for the manufacture of flexible disk recording media, whether the media is specified in this entry or not, the following–	
(1) technology for the formulation of coating material	D
(2) technology for the application of coating material to the flexible backing	D
(h) Technology for the development or production of rigid disk recording media, whether the media is specified in this entry or not	D

In this entry–

"recording media" means all types and forms of specialised media used

		in recording techniques, including but not limited to tapes, drums, disks and matrices;
		"recording density" for direct recorders means the recording bandwidth divided by the tape speed;
		"recording density" for FM recorders means the sum of the carrier frequency and the deviation divided by the tape speed;
		"packing density" for digital recorders means the number of bits per second per track divided by the tape speed.
IL1573	Superconductive electromagnets and solenoids, the following: except when specially designed for magnetic	

resonance imaging (MRI) medical equipment–	
(a) Those which have a non-uniform distribution of current-carrying windings, measured along the axis of symmetry, when specially designed for gyrotron application	C
except those rated for both–	
(1) magnetic induction of less than 1 tesla; and	
(2) overall current density in the windings of less than 10,000 A/cm^2 ;	
(b) Those which are specially designed to be fully charged or discharged in less than one minute, provided that	C
(1) the maximum energy	

delivered during discharge divided by the duration of the discharge is more than 500 kJ per minute;

(2) the inner diameter of the current-carrying windings is more than 6 cm; and

(3) they are rated for magnetic induction of more than 8 tesla or overall current density in the windings of more than 10,000 A/cm^2 .

In this entry "overall current density" means the total number of ampere-turns in the coil (ie the sum of the number of turns multiplied by the maximum current carried by each turn) divided by the total cross-section of the coil (comprising the superconducting filaments, the metallic matrix in which the superconducting

	filaments are embedded, the encapsulating material, any cooling channels, etc.).	
IL1574	Electronic devices, circuits and systems containing components manufactured from superconductive materials, and specially designed for operation at temperatures below the critical temperature of at least one of their superconductive constituents performing functions such as the following– (1) electromagnetic sensing and amplification; (2) current switching; (3) frequency selection; (4) electromagnetic energy storage at resonant frequencies above 1 MHz. There shall be excluded from this entry equipment specially designed for civil research	C

on materials characterisation which contain superconducting quantum interference devices (SQUIDS), and which have all of the following characteristics–

(a) The equipment is of at least 16,400 mm^3 volume, and the SQUID is attached in such a manner that any attempt to remove or modify the SQUID for use elsewhere would destroy it;

(b) The energy sensitivity is not better than 10−28 J per Hz; and

(c) Magnetic shielding is required for insensitivity to magnetic field fluctuations external to the equipment, and the removal of this shielding would prevent the superconducting magnetic sensing circuitry from functioning.

Note:

This entry includes Josephson-effect devices and superconducting quantum interference devices (SQUIDS).

In this entry–

the "critical temperature" (sometimes referred to as the transition temperature) of a specific superconductive material means the temperature at which the material loses all resistance to the flow of direct current;

"superconductive" refers to materials (ie metals, alloys or compounds) which can lose all electrical resistance (ie which can attain infinite electrical conductivity and carry very large electrical currents without Joule heating). The superconductive state of a material is individually characterised by a critical temperature, a critical magnetic field, which is a function of temperature, and a critical current density, which is a function of both magnetic field and temperature.

IL1585	Cameras, components and photographic recording media therefor, the following–	
	(a) High speed cinema recording cameras and equipment, the following–	
	(1) Cameras in which the film is continuously advanced throughout the recording period, and	C

which are capable of recording at framing rates exceeding 13,150 frames per second, using any camera and film combination from the standard 8 mm to the 90 mm size inclusive	
(2) Special optical or electronic devices which supplement, replace or are interchangeable with standard camera components for the purpose of increasing the number of frames per second above the limit in sub-head (a) (1) above	C
(b) Mechanical high speed cameras in which the film does not move, and which are capable of recording at rates	C

exceeding 1,000,000 frames per second for the full framing height of standard 35 mm wide photographic film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights	
(c) Cameras incorporating electron tubes specified in entry IL1555 in Group 3F, except television or video cameras specially designed for television broadcasting use	C
(d) Mechanical or electronic streak cameras having writing speeds of 10 mm/microsecond and above	C

(e) Electronic framing cameras having a speed exceeding 10^6 frames per second	C
(f) Video cameras incorporating solid state sensors, having any of the following characteristics–	
(1) more than 4 × 10^6 active pixels per solid state array for monochrome (black and white) cameras	C
(2) more than 4 × 10^6 active pixels per solid state array for colour cameras incorporating three solid state arrays	C
(3) more than 12 × 10^6 active pixels for solid state array colour cameras incorporating one solid state array	C

(g) Electronic cameras having both of the following characteristics	C
(1) an electronic shutter speed (gating capability) of less than 10 microseconds per full frame;	
(2) a read out time allowing a frame rate of more than 125 full frames per second;	
(h) Camera shutters with speeds of 50 ns or less per operation, and specialised parts and accessories therefor	C

i) Films, the following–

(1) having a speed of ISO 10,000 (or its equivalent) or better	C
(2) colour film having a spectral sensitivity extending	C

		beyond 7,200 Angstroms or below 2,000 Angstroms	
		(j) Cameras incorporating linear detector arrays exceeding a size of 4,096 elements per array and mechanical scanning in one direction	C
	In this entry–		
		"active pixel" is a minimum element of the solid state array (sensor) which has a photoelectric transfer function and which is exposed to the light.	
IL1586	Acoustic wave devices, the following: and specially designed components therefor–		
		(a) Surface acoustic wave and surface skimming (shallow bulk)	

acoustic wave devices which permit direct processing of signals, (including convolvers, correlators (fixed, programmable and memory), oscillators, bandpass filters, delay lines (fixed and tapped) and non-linear devices) having either of the following characteristics–

(1) a carrier frequency of greater than 400 MHz	C
(2) a carrier frequency of 400 MHz or less, (except those specially designed for home electronics and entertainment type applications) having any of the following characteristics–	

(i) a side-lobe rejection of greater than 45 dB	C
(ii) a product of the maximum delay time and the bandwidth (time in microseconds and bandwidth in MHz) greater than 100	C
(iii) a dispersive delay of greater than 10 microseconds	C
(iv) an insertion loss of less than 10 dB	C
(b) Bulk (volume) acoustic wave devices which permit direct processing of signals at frequencies over 1 GHz, including fixed delay lines, non-linear and pulse compression devices	C
(c) Acousto-optic signal-	C

	processing devices employing an interaction between acoustic waves (bulk wave or surface wave) and light waves which permit the direct processing of signals or images, including spectral analysis, correlation and convolution	
	In this entry "acoustic wave devices" means signal processing devices employing elastic waves in materials such as lithium niobate, lithium tantalate, bismuth germanium oxide, silicon, quartz, zinc oxide, aluminium oxide (sapphire), gallium arsenide and alpha-aluminium phosphate (berlinite).	
IL1595	Gravity meters (gravimeters), gravity gradiometers and specially designed	A

components therefor

except–

(a) Gravity meters for land use having either of the following characteristics–

(1) static accuracies of not less than 100 microgal; or

(2) being of the Worden type;

(b) Marine gravimetric systems having either of the following characteristics–

(1) static accuracy of 1 milligal or more; or

(2) an in-service (operational) accuracy of 1 milligal or more with a time to steady state registration of two minutes or greater under any combination of attendant corrective compensations and motional influences.

GROUP 3H

Metals, Minerals and their Manufactures

In this Group, the following definitions apply

"crude forms" means anodes, balls, bars (including notched bars and wire bars), billets, blocks, blooms, brickets, cakes, cathodes, crystals, cubes, dice, grains, granules, ingots, lumps, pellets, pigs, powder, rondelles, shot, slabs, sponge, sticks;

"semi-fabricated forms" means (whether or not coated, plated, drilled or punched)–

(i) in the form of wrought or worked materials fabricated by rolling, drawing, extruding or grinding, (i.e. angles, channels, circles, discs, dust, flakes, foils and leaf, forging, plate, powder, pressings and stampings, ribbons, rings, rods (including bare welding rods, wire rods, and rolled wire), sections, shapes, sheets, strip, pipe and tubes (including tube rounds, squares, and hollows), drawn or extruded wire);

(ii) cast material produced by casting in sand, die, metal, plaster or other types of moulds, including high pressure castings, sintered forms and forms made by powder metallurgy.

PL7025 Pyrolitic deposition technology and specially designed

	components related thereto, the following–	
	(a) Technology relating to the production of pyrolitically derived materials formed on a mould, mandrel or other substrate from precursor gases which decompose in the 1,573K (1,300°C) to 3,173K (2,900°C) temperature range at pressures of 130Pa to 20kPa	B
	(b) Nozzles specially designed for any of the processes referred to in head (a) A	
IL1610	Metal alloys, metal alloy powder or alloyed materials, the following: except metal alloys, metal alloy powder or alloyed materials for coating substrates–	
	(a) Metal alloys, the following: when made from a metal alloy powder or particulate material specified in head (b) below–	
	(1) Nickel alloys with a stress-rupture life of 10,000 hours or longer at 923K (650°C) and at a stress of 550MPa	C
	(2) Cobalt alloys with a stress-rupture life of 10,000 hours or longer at 923K (650°C) and at a stress of 400MPa	C
	(3) Niobium alloys with a stress-rupture life of 10,000 hours or longer at 1,073K (800°C) and at a stress of 400MPa	C
	(4) Titanium alloys with a stress-rupture life of 10,000 hours or longer	C

	at 723K (450°C) and at a stress of 200MPa	
	(5) Aluminium alloys with a tensile strength of–	
	(A) 240MPa or more at 473K (200°C)	C
or		
	(B) 415MPa or more at 298K (25°C)	C
	(6) Magnesium alloys with a tensile strength of 345MPa or more and a corrosion rate of less than 1mm/year in 3% sodium chloride aqueous solution measured in accordance with ASTM standard G–31 or national equivalents	C
	(b) Metal alloy powder or particulate material having both of the following characteristics	C
	(1) Made from any of the following composition systems–	
	(A) Nickel alloys (Ni-Al-X or Ni-X-Al);	
	(B) Cobalt alloys (Co-Cr-X or Co-X-Cr);	
	(C) Niobium alloys (Nb-Al-X or Nb-X-Al), Nb-Si-X or Nb-X-Si, Nb-Ti-X or Nb-X-Ti);	
	(D) Titanium alloys (Ti-Al-X or Ti-X-Al);	
	(E) Aluminium alloys (Al-Mg-X or Al-X-Mg), Al-Zn-X or Al-X-Zn, Al-Fe-X or Al-X-Fe); or	
	(F) Magnesium alloys (Mg-Al-X or Mg-X-Al);	
(Note: X equals one or more alloying elements.)		

	and	
	(2) Made in a controlled environment by any of the following processes–	
	(A) Vacuum atomisation;	
	(B) Gas atomisation;	
	(C) Rotary atomization;	
	(D) Splat quenching;	
	(E) Melt spinning and comminution;	
	(F) Melt extraction and comminution; or	
	(G) Mechanical alloying.	
	(c) Alloyed materials, in the form of uncomminuted flakes, ribbons or thin rods produced in a controlled environment by splat quenching, melt spinning or melt extraction, used in the manufacture of metal alloy powder or particulate material specified in head (b) above	C
	In this entry–	
	metal alloys are those containing a higher percentage by weight of the stated metal than of any other element; stress-rupture life should be measured in accordance with ASTM standardE-139 or national equivalents.	
IL1631	Magnetic metals and materials, the following–	
	(a) Those having either of the following characteristics–	
	(i) Initial relative permeability: 120,000	C

	or more and thickness 0.05mm or less	
	Note: Measurement of initial permeability must be carried out on materials which are fully annealed. (ii) Remanence: 98.5% or over of maximum magnetic flux for materials having magnetic permeability	C
	(b) Grain-oriented iron alloy sheets or strips of a thickness of 0.1mm or less	C
	(c) Magnetostrictive alloy having either of the following characteristics–	
	(1) saturation magnetostriction more than 5×10^{-4} ;	C
or		
	(2) magnetomechanical coupling factor (k) more than 0.8	C
	(d) Amorphous alloy strips having both of the following characteristics–	C
	(1) composition having a minimum 75 per cent by weight of one or more of the elements iron, cobalt and nickel; and	
	(2) saturation magnetic induction (Bs) of 1.6tesla or more, and either–	
	(i) strip thickness of 0.020mm or less; or	
	(ii) electrical resistivity of 2×10^{-4} ohm-cm or more.	
IL1672	Nickel or titanium-based alloys in the form of aluminides,	

	in crude or semi-fabricated forms, the following: and scrap thereof–	
	(a) Nickel aluminides containing 10 per cent or more by weight of aluminium	C
	(b) Titanium aluminides containing 12 per cent or more by weight of aluminium	C
IL1675	Superconductive materials and composite conductors, the following–	
	(a) Superconductive materials of all types, the following	C
	(1) ving a critical temperature, at zero magnetic induction, of 9.85K or higher; and	
	(2) in quantities of more than 25g;	
	(b) Superconductive niobium-titanium wire not embedded in a metallic matrix with a cross section area of less than 3.14×10^{-4} mm^2 (ie. 20 micrometre diameter for circular filaments)	C
	(c) Composite conductors containing at least one superconductive constituent having a critical temperature, at zero magnetic induction, of 9.3K or higher	C
	except– such conductors which–	
	(1) have superconductive filaments embedded in a copper or copper-based mixture matrix; and	
	(2) have either of the following two sets of characteristics–	

(A) the superconductive constituent or filament–

(a) has a cross section area of more than 3.14 × 10^{-4} mm^2 (ie. 20 micrometre diameter for circular filaments);

(b) is either non-coated, or insulated with–

(1) varnish;

(2) glass fibre;

(3) polyamide; or

(4) polyimide; and

(c) does not remain in the superconductive state when–

(1) evaluated in sample lengths of less than 1m; and

(2) exposed to a magnetic field with an induction of more than 12tesla at a temperature of 4.2K (−268.95°C); or

(B) the composite conductor contains–

(a) superconductive niobium-titanium wire with a cross section area of more than 9.5 × 10^{-5} mm^2 (ie. 11 micrometre diameter for circular filaments); and

(b) a total mass (including the mass of the matrix) not exceeding 10kg.

In this entry–

"superconductive" means materials (ie. metals, alloys or compounds) which can lose all

	electrical resistance, ie. which can attain infinite electrical conductivity and carry very large electrical currents without Joule heating. The superconductive state of a material is individually characterised by a critical temperature, a critical magnetic field which is a function of temperature, and a critical current density which is a function of both magnetic field and temperature; "critical temperature" means the temperature at which the material loses all resistance to the flow of direct current. Critical temperature (sometimes referred to as the transition temperature) is of a specific superconductive material.	
PL7035	Tungsten and alloys of tungsten, in the form of uniform spherical or atomised particles of 500micrometre diameter or less with a purity of 97% or greater	A
PL7036	Molybdenum and alloys of molybdenum, in the form of uniform spherical or atomised particles of 500micrometre diameter or less with a purity of 97% or greater	A
PL7001	Aluminium alloys, the following: tubes, bars or forged forms having an outside diameter greater than 75mm and less than 400mm and a tensile strength of460 $\times 10^6$ N/m^2 or greater	W
PL7002	Maraging steels (steels generally characterised	

	by high nickel, very low carbon content and the use of substitutional elements to produce age-hardening), whether or not finally heat treated, having either of the following characteristics–	
	(a) Capable of ultimate tensile strength of 1.5 × 10^9 Pa or greater, measured at 20°C, in the form of sheet, plate or tubing with a wall or plate thickness equal to or less than 5.0mm (0.2inch);	A
	or	
	(b) Capable of ultimate tensile strength of 2.049 × 10^9 Pa or greater, measured at 20°C, in the form of sheet, bar or tubing or having three orthogonal dimensions of 75mm or greater	A
PL7012	Tantalum (or Tantalum lined) crucibles for casting actinide metals	W

GROUP 3I

Chemicals, Metalloids and Petroleum Products

IL1710	Fluids and lubricating materials, the following–	
	(a) Hydraulic fluids which contain any of the following compounds or materials as their principal ingredients:	
	(1) Highly refined super-dewaxed petroleum (mineral)	C

oils, synthetic hydrocarbon oils or silahydrocarbon oils, having all of the following characteristics–

(A) Flash point exceeding 477K (204°C);

(B) Pour point 239K (−34°C) or lower;

(C) Viscosity index 75 or more; and

(D) Thermal stability 616K (343°C); (Silahydrocarbon oils are those oils which contain exclusively silicon, hydrogen and carbon.) (2) Chlorofluorocarbons having all of the following characteristics– C

(A) No flash point;

(B) Autogenous ignition temperature exceeding 977K (704°C);

(C) Pour point 219K (−54°C) or lower;

(D) Viscosity index 80 or more; and

(E) Boiling point 473K (200°C) or higher;

(chlorofluorocarbons are those chemicals

which contain exclusively carbon, fluorine and chlorine); or	
(3) Monomeric or polymeric forms of perfluoropolyalkylether-triazines or perfluoroaliphatic ethers	C
(b) Lubricating materials containing any of the following compounds or materials as their principal ingredients–	
(1) Monomeric or polymeric forms of perfluoropolyalkylether-triazines or perfluoroaliphatic ethers	C
(2) Phenylene or alkylphenylene ethers or thio-ethers, or their mixtures, containing more than two ether or thio-ether functions or mixtures thereof	C
(3) Polychlorotrifluoroethylene (oily and waxy modifications only)	
or	
(4) Fluorinated silicone fluids with kinematic viscosity of less than 5,000mm^2/s (5,000 centistokes)	C

measured at 298K (25°C)	
(c) Damping or flotation fluids made of at least 85% of any of the following compounds or materials–	
(1) Dibromotetrafluoroethane having a purity exceeding 99.8% and containing less than 25 particles of 200 micrometre or larger in size per 100ml	C
(2) Polychlorotrifluoroethylene (oily and waxy modifications only)	
or	
(3) Polybromotrifluoroethylene	C
(d) Cooling fluids made of at least 85% of any of the following compounds or materials–	
(1) Monomeric or polymeric forms of perfluoropolyalkylether-triazines or perfluoroaliphatic ethers	C
(2) Perfluoroalkylamines	C
or	
(3) Perfluorocycloalkanes or perfluoroalkanes with all of	C

the following characteristics–

(A) Density at 298K (25°C) of 1.5g/ml or more;

(B) In a liquid state at 273K (0°C); and

(C) Containing 60% or more by weight of fluorine.

In this entry–

(a) Flash point is determined using the Cleveland Open Cup Method described in ASTM D-92 or national equivalents;

(b) Pour point is determined using the method described in ASTM D-97 or national equivalents;

(c) Viscosity index is determined using the method described in ASTM D-2270 or national equivalents;

(d) Thermal stability is determined by the following test procedure or national equivalents: Twenty ml of the fluid under test is placed in a 46ml type 317 stainless steel chamber containing one each of 12.5mm (nominal) diameter balls of M-10 tool steel, 52100 steel and naval bronze (60% Cu, 39% Zn, 0.75% Sn). The chamber is purged with nitrogen, sealed at atmospheric pressure and the temperature raised to and maintained at 644 + 6K (371 + 6°C) for six hours. The specimen will be considered thermally stable if, on completion of the above procedure, all of the following conditions are met:

(1) The loss in weight of each ball is less than 10mg/mm^2 of ball surface;

(2) The change in original viscosity as determined at 311K (38°C) is less than 25%; and

(3) The total acid or base number is less than 0.40;

(e) Autogenous ignition temperature is determined using the method described in

	ASTM E-659 or national equivalents.	
IL1715	Boron, the following–	
	(a) Boron element (metal) in all forms	C
	(b) Boron compounds, mixtures, and composites containing 5% or more of boron (except pharmaceutical preparations packaged for retail sale), the following–	
	(1) non-ceramic boron-nitrogen compounds (eg borazanes, borazines and boropyrazoyls)	C
	(2) boron hydrides (eg boranes), except sodium boron hydride, potassium boron hydride, monoborane, diborane and triborane	C
	(3) organoboron compounds, including metallo-organoboron compounds	C
PL7006	Boron compounds and mixtures in which the boron-10 isotope comprises more than 20% of the total boron content	W
IL1733	Base materials, non-composite ceramic	

materials, ceramic-ceramic composite materials and precursor materials for the manufacture of high temperature fine technical ceramic products, the following–

(a) Base materials having all the following characteristics–	A
(1) any of the following compositions–	
(i) single or complex oxides of zirconium, and complex oxides of silicon or aluminium;	
(ii) single or complex borides of zirconium or titanium;	
(iii) single or complex carbides of silicon or boron; or	
(iv) single or complex nitrides of silicon, boron, aluminium or zirconium;	
(2) total metallic impurities, excluding intentional additions, of less than–	
(i) 1,000ppm for single oxides or carbides;	
(ii) 5,000ppm for complex compounds, single borides or	

single nitrides; and	
(3) average particle size less than or equal to 5 micrometres and no more than 10% of the particles larger than 10 micrometres except for zirconia where these limits are 1 micrometre and 5 micrometres respectively.	
(b) Non-composite ceramic materials, in crude or semi-fabricated form, composed of any material specified in head (a) above, except abrasives	A
(c) Ceramic-ceramic composite materials containing finely dispersed particles or phases or any non-metallic fibrous or whisker-like materials, whether externally introduced or grown in situ	

during processing, where the following materials form the host matrix–

(1) all oxides, including glasses	A

(2) carbides or nitrides of silicon or boron	A
(3) borides or nitrides of zirconium or borides, carbides or nitrides of hafnium	A
(4) any combination of the materials specified in sub-heads (c)(1) to (3) above	A

except–

manufactured products or components not specified elsewhere in this Schedule.

(d) Precursor materials, (ie. special-purpose polymeric or metallo-organic materials for producing any base or phases of the materials specified inhead (b) or (c) above), the following–	
(1) polycabosilanes and polydiorganosilanes (for producing silicon carbide) A	
(2) polysilazanes (for producing silicon nitride) A	
(3) polycarbosilazanes for producing ceramics with silicon, carbon	A

		and nitrogen components	
	In this entry–		
		(a) a "matrix" means a substantially continuous phase that fills the space between particles, whiskers or fibres;	
		(b) a "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.	
IL1746	Non-fluorinated polymeric substances, the following:		
		(a) Polyimides (including maleimides)	C
		except– fully cured polyimide or polyimide-based film, sheet, tape or ribbon having a maximum thickness of 0.254mm, whether or not coated or laminated with heator pressure-sensitive resinous substances of an adhesive nature,	

which contain no fibrous reinforcing materials, and which have not been coated or laminated with carbon, graphite, metals or magnetic substances.	
(b) Polybenzimidazoles	C
(c) Aromatic polyamides, including heterocyclic aromatic polyamides characterised as aromatic owing to the presence of a benzene ring	C
(d) Polybenzothiazoles	C
(e) Polyoxadiazoles	C
(f) Polyphosphazenes (polyphosphonitriles)	C
(g) Polystyrylpyridine (PSP)	C
(h) Thermoplastic liquid crystal copolymer composed of the following–	C
(1) Either of the following–	
(A) Phenylene, biphenylene or naphthalene; or	
(B) Methyl, tertiary-butyl or phenyl substituted	

phenylene, biphenylene or naphthalene; and

(2) Any of the following acids–

(A) Terephthalic acid;

(B) 6-hydroxy-2 naphthoic acid; or

(C) 4-hydroxybenzoic acid;

except–manufactures thereof, having both of the following characteristics–

(A) A tensile modulus of less than 15GPa in any direction; and

(B) Specially designed for non-aerospace, non-electronic, civil applications;

(i) Polybenzoxazoles	C
(j) Polyarylene ether ketones, the following–	
(1) Polyether ether ketone (PEEK)	C
(2) Polyether ketone ketone (PEKK)	C

(3) Polyether ketone (PEK)	C
(4) Polyether ketone ether ketone ketone (PEKEKK)	C
(k) Butadiene polymers, the following–	
(1) Carboxyl terminated polybutadiene (CTPB)	C
(2) Hydroxyl terminated polybutadiene (HTPB)	C
(3) Thiol terminated polybutadiene (TTPB)	C
(4) Vinyl terminated polybutadiene (VTPB)	C
(5) Cyclised 1,2-polybutadiene	C
(6) Mouldable copolymers of butadiene and acrylic acid	C
(7) Mouldable terpolymers of butadiene, acrylonitrile and acrylic acid or any of the homologues of acrylic acid	C
(l) Carboxyl terminated polyisoprene	C
(m) Polyarylene ketones	C
(n) Polyarylene sulphides, except	C

	polyphenylene sulphide	
PL7028	Propellants for spacecraft, and related substances, the following: and specially designed software therefor–	
	(a) propellants specially designed for goods specified in IL1465	A
	(b) additives, precursors and stabilisers, for any material specified in head (a) above	A
IL1754	Fluorinated compounds and materials, and manufactures thereof, the following–	
	(a) Unprocessed polymeric materials and intermediates, the following–	
	(1) Fluoroelastomeric compounds where the polymer backbone consists of at least 95% of–	
	(A) A combination of two or more of the following monomers–	C
	(a) Tetrafluoroethylene; (b) Vinylidene fluoride; (c) Hexafluoropropylene;	

(d) Bromotrifluoroethylene; (e) Iodotrifluoroethylene; (f) Perfluoromethylvinylether; (g) Perfluoropropoxypropylvinylether; except– the copolymer of vinylidene fluoride and hexafluoropropylene, or the terpolymer of vinylidene fluoride, hexafluoropropylene and tetrafluoroethylene;	
(B) A copolymer of tetrafluoroethylene and propylene; or	C
(C) A terpolymer of tetrafluoroethylene, vinylidene fluoride and propylene	C
(2) Copolymers of vinylidene fluoride having 75% or more beta crystalline structure without stretching	C
(3) Fluorinated silicone rubbers, and intermediates for their production, containing 30% or more of combined fluorine	C
(4) Fluorinated polyimides, and hexafluoroacetone and other	C

	intermediates for their production, containing 30% or more of combined fluorine	
	(5) Fluorinated phosphazene elastomers, and intermediates for their production, containing 30% or more of combined fluorine	C
	(b) Manufactures, the following–	
	(1) Electric wire and cable coated with or insulated with any of the materials specified in sub-head (a)(1)(B) or (a)(1)(C) above	C
except–		
oil well logging cable;		
	(2) Seals, gaskets, rods, sheets, sealants or fuel bladders made, to the extent of more than 50%, of any of the compounds specified in sub-head (a)(1), (a)(3), (a)(4) or (a)(5) above, and specially designed for aerospace or aircraft use	C
	(3) Piezoelectric polymers and copolymers made from	C

	vinylidene fluoride, having both of the following characteristics	
	(A) In sheet or film form; and	
	(B) With a thickness of more than 200 micrometre.	
	(4) Reinforced tubing (including connectors and fittings for use with such tubing) incorporating coagulated dispersion grades of polytetrafluoroethylene, copolymers of tetrafluoroethylene and hexafluoropropylene, or any of the fluorocarbon compounds specified in sub-head (a) (1) above and designed for operating (working) pressures of 21 MPa or more, whether or not specially processed to make the flow surfaces electrically conductive	C
IL1757	Compounds and materials, the following–	
	(a) Monocrystalline silicon in the form of ingots	C

(rods), and slices or wafers thereof, having a resistivity of more than 1000 ohm-cm	
(b) Gallium of a purity equal to or more than 99.9999% and gallium III/V compounds of any purity level	C
except–	
(1) Gallium phosphide; or	
(2) Other gallium III/V compounds having all of the following characteristics–	
(A) Dislocation density (etch pit density–EPD) exceeding 100 per mm^2 ;	
(B) Carrier concentration exceeding 1×10^{14} per mm^3 ; and	
(3) Carrier mobility less than 0.3 m^2 /V-s;	
(c) Indium of a purity more than 99.9995% and III-V indium compounds containing more than 1% indium	C
(d) Hetero-epitaxial materials consisting of a monocrystalline insulating substrate	C

	epitaxially layered with silicon, III/V compounds of gallium or indium or II/VI compounds of sulphur, selenium or tellurium	
	(e) Elemental Cadmium (Cd) and Tellerium (Te) of purity levels equal to or more than 99.9995% and cadmium terullide (CdTe) compounds of a purity level equal to or more than 99.99% or single crystals of cadmium terullide (CdTe) of any purity level	C
	(f) Rods of polycrystalline silicon having either of the following characteristics–	
	(1) Boron impurity concentration (P-type) equal to or less than 0.052 parts per thousand million atomic	C
	or (2) P-type resistivity equal to or more than 5,000 ohm-cm	C
(Purity verified in accordance with ASTM		

F574-83 standard or equivalents, and resistivity measured in accordance with ASTM F43-83 standard or equivalents (see also ASTM F723-82 standard for the conversion between resistivity and density of doping agents)).		
	(g) Compounds having a purity level (based upon the amount of the primary constituent) of 99.5% or more and used as the silicon source in the deposition of epitaxial layers of silicon, silicon oxide or silicon nitride, and dichlorosilane ($SiC1_2H_2$) having a purity level of 97% or more	C
	(h) Single crystal sapphire substrates	C
	(i) Boron oxide (B^2 0^3) in powder or cast form with a purity of 99.9% or more, containing 1,000 or less parts per million of water	C
	(j) Resist materials, the following–	
	(1) Negative type resists, optimised for photolithography	C

at a wavelength of less than 350 nm	
(2) Positive type resists optimised for photolithography at a wavelength of less than 370 nm	C
except– positive type resists not optimised for a specific wavelength	
(3) All resists for use with electron beams or ion beams with a sensitivity of 50 microcoulomb/ cm^2 or less	C
(4) All resists for use with X-rays with a sensitivity of 50 mJ/cm^2 or less	C
(5) All resists optimised for surface imaging technologies, including silyated resists	C
(6) Image reversal resists	C
(k) Monocrystalline lithium niobate	C
(l) Metallo-organic compounds of beryllium, magnesium, zinc, cadmium, mercury, aluminium, gallium, indium,	C

phosphorus, arsenic or antimony having a purity (metal basis) of 99.999% or more	
(m) Hydrides of phosphorus, arsenic, antimony, selenium or tellurium having a purity of 99.999% or more, even diluted in neutral gases	C
except– those with the addition of 20% molar or more of rare gases or hydrogen. Notes: 1. Silyation techniques are processes incorporating oxidation of the resist surface to enhance performance for both wet and dry developing. 2. III/V compounds are polycrystalline or binary or complex monocrystalline products consisting of elements of groups IIIA and VA of Mendeleyev's periodic classification table (gallium arsenide, gallium-aluminium	

		arsenide, indium phosphide, etc.). 3. II/VI compounds are polycrystalline or binary or complex monocrystalline products consisting of elements of groups IIB and VIA of Mendeleyev's periodic classification table (cadmium telluride, cadmium-mercury telluride, cadmium-zinc telluride, etc.).	
PL7034	Graphites, the following:		
		(a) fine grain recrystallised bulk graphites having a bulk density of 1.72g/cc or greater, measured at 15°C	A
		(b) pyrolytic reinforced graphites	A
		(c) fibrous reinforced graphites	A
IL1759	Syntactic foam for underwater use and microspheres, the following–		
		(a) Syntactic foam having either of the following characteristics–	

(1) designed for marine depths exceeding 1,000 m	C
(2) a density less than 0.561 g/cm^3 unless designed for use at marine depths less than 100 m	C
(b) Hollow microspheres (microballoons) for use in syntactic foam, having all of the following characteristics–	C
(1) made from glass or plastic;	
(2) a true particle density of more than 0.16 g/cm^3 and less than 0.41 g/cm^3 ;	
(3) a bulk density of more than 0.088 g/cm^3 and less than 0.23 g/cm^3 ;	
(4) a compressive strength more than 2.8 MPa;	
(5) a particle size range of 20 to 200 micrometre; and	
(6) a floater content of at least 94 per cent by volume.	

In this entry–

"syntactic foam" means hollow spheres of plastic or glass

	embedded in a resin matrix.	
IL1763	Fibrous and filamentary materials which may be used in organic matrix, metallic matrix or carbon matrix composite structures or laminates, and such composite structures and laminates and technology therefor, the following: and specially designed ODMA software therefor–	
	(a) Fibrous and filamentary materials with specific modulus greater than3.18 × 10^6 m and specific tensile strength greater than 7.62 × 10^4 m	A
	(b) Fibrous and filamentary materials having both of the following characteristics–	C
	(1) specific modulus greater than 2.54 × 10^6 m; and	
	(2) melting or sublimation point higher than 1,922 K (1,649°C) in an inert environment except– (A) carbon fibres having a specific modulus less than 5.08 × 10^6 m and a specific	

tensile strength less than 2.54×10^4 m;	
(B) discontinuous, multiphase, polycrystalline alumina fibres in chopped fibre or random mat form, containing 3% by weight or more silica, having a specific modulus less than 10×10^6 m; (C) molybdenum and molybdenum alloy fibres; (D) discontinuous ceramic fibres having their melting point or sublimation point lower than 2,043K (1,770°C) in an inert environment;	
(c) Resin or pitch-impregnated fibres (prepregs), metal or carbon-coated fibres (preforms) or carbon fibre preforms made with materials specified in head (a) or (b) above	C
(d) Composite structures, laminates and manufactures thereof for products and components made either with an organic	C

matrix, a carbon matrix or a metal matrix utilising materials specified in head (a), (b) or (c) above	
except– manufactured products or composites not specified elsewhere in this Schedule.	
(e) Technology for fibrous and filamentary materials and for composite structures and laminates, the following–	
(1) technology which is unique to the spinning and subsequent treatment of precursor materials into fibres specially designed for processing into carbon filamentary materials specified in head (a) or (b) above	D
(2) technology for the production of fibrous and filamentary materials specified in head (a) or (b) above	D
(3) technology for the production of prepregs specified in	D

head (c) above using pressure impregnation or chemical vapour deposition, and for preforms specified in head (c) above using vacuum or pressure impregnation of chemical vapour deposition	
(4) technology for the development and production of composite structures, laminates and manufactures specified in head (d) above	D
(5) technology for rigidisation and densification processes specially designed for the manufacture of carbon-carbon composite materials, the following–	
(i) for impregnation, infiltration or deposition into carbon fibre preforms	D
(ii) for carbonisation	D
(iii) for graphitisation	D
(iv) for hot isostatic pressing	D

In this entry–

1. the term “fibrous and

filamentary materials" includes:

(a) continuous monofilaments;

(b) continuous yarns and rovings;

(c) tapes, fabrics, random mats and braids;

(d) chopped fibres, staple fibres and coherent fibre blankets;

(e) whiskers, either monocrystalline or polycrystalline, of any length;

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

3. "specific tensile" strength is ultimate tensile strength in pascals, equivalent to N/m^2 divided

	by specific weight in N/m^3 measured at a temperature of (296 ± 2) K (23 ± 2)°C) and a relative humidity of (50 ± 5)%; 4. “carbon fibre preform” means an ordered arrangement of uncoated or coated fibres intended to constitute a framework of a part before the matrix is introduced to form a composite; 5. “matrix” means a substantially continuous phase that fills the space between particles, whiskers or fibres; 6. “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.	
PL7046	Resaturated pyrolized (ie carbon-carbon) materials designed for use in goods specified in entry IL1465 or ML4	A

IL1767	Preforms of glass or of any other material specially designed for the fabrication of optical fibres specified in head (b) or (c) in entry IL1526 in Group 3F relating to cable and wire In this entry “optical fibre preforms” means bars, ingots, or rods of glass, plastic or other materials which have been specially processed for use in fabricating optical fibres.	C
PL7007	Chemicals, the following–	
	(a) Ammonium hydrogen fluoride	A
	(b) Arsenic trichloride	A
	(c) Benzilic acid	A
	(d) 2-chloroethanol	A
	(e) Diethylaminoethanol	A
	(f) Diethyl ethylphosphonate	A
	(g) Diethyl methylphosphonite	A
	(h) Diethyl-N, N-dimethylphosphoramidate	A
	(i) Diethyl phosphite	A
	(j) Di-isopropylamine	A
	(k) Dimethylamine	A
	(l) Dimethylamine hydrochloride	A

(m) Dimethyl ethylphosphonate	A
(n) Dimethyl methylphosphonate	A
(o) Dimethylphosphite	A
(p) Ethyl phosphinyl dichloride	A
(q) Ethyl phosphinyl difluoride	A
(r) Ethyl phosphonyl dichloride	A
(s) Ethyl phosphonyl difluoride	A
(t) 3-hydroxy-1-methylpiperidine	A
(u) Hydrogen fluoride	A
(v) Methyl benzilate	A
(w) Methyl phosphinyl dichloride	A
(x) Methyl phosphinyl difluoride	A
(y) Methyl phosphonyl dichloride	A
(z) Methyl phosphonyl difluoride	A
(aa) N,N-diisopropyl-(Beta)-aminoethane thiol	A
(bb) N,N-diisopropyl-(Beta)-amino ethanol	A

(cc) N,N-diisopropyl-(Beta)-aminoethyl chloride	A
(dd) O-ethyl-2-di-isopropylaminoethyl methylphosphonite	A
(ee) Pinacolone	A
(ff) Pinacolyl alcohol	A
(gg) Phosphorus oxychloride	A
(hh) Phosphorus pentachloride	A
(ii) Phosphorus pentasulphide	A
(jj) Phosphorus trichloride	A
(kk) Potassium bifluoride	A
(ll) Potassium cyanide	A
(mm) Potassium fluoride	A
(nn) 3-quinuclidinol	A
(oo) 3-quinuclidone	A
(pp) Sodium bifluoride	A
(qq) Sodium cyanide	A
(rr) Sodium fluoride	A
(ss) Sodium sulphide	A
(tt) Thiodiglycol	A
(uu) Thionyl chloride	A
(vv) Tri-ethanolamine	A

(ww) Triethyl phosphite	A
(xx) Trimethyl phosphite	A

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Semi-finished products	ML 16 and PL 5020
Shackles	PL 5001
Shutters, electronically triggered	ML 22
Sighting devices	ML 5
Silencers, firearm	ML 17b
Silent bearings	ML 9
Small arms	ML 1
Smoke canisters	ML 4a
Smoke generators	ML 2
Smoke grenades	ML 4a
Smoke projectors	ML 2b
Smooth bore weapons	ML 1
Software	ML 24
Stabilisers, explosives	PL 5009
Submarine nets	ML 9
Submarines	ML 9
Superconductive equipment	ML 20
Surface vessels	ML 9
Tank destroyers	ML 2a
Tanks	ML 6
Tear gas	ML 7
Technology for development	PL 5017
Telescopic sights	PL 5002
Thermal imaging equipment	ML 15
Torpedoes	ML 4a
Torpedo nets	ML 9
Toxicological agents	ML 7

Trailers, ammunition	ML 6
Training equipment	ML 14
2:2':2" Trichlorotriethylamine	ML 7
Underwater detection devices	ML 9
Underwater swimming apparatus	ML 17a
Underwater vessels	ML 9
Unmanned airborne vehicles	ML 10
Vehicles	ML 6
Vehicles modified for military use	ML 6
Vessels	ML 9
Water cannon	PL 5001
Weapons using caseless ammunition	ML 1

ATOMIC AND NUCLEAR LISTS–GROUP 2

Beryllium (metal compounds and products)	A 9
Blowers	PL 6013
Calcium	PL 6005
Chemical exchange separation units	B 1
Chlorine trifluoride	PL 6003
Compressors	PL 6013
Deuterated paraffins	A 3
Deuterium	A 3
Deuterium production plant	B 5
Electrolytic cells (fluorine production)	C 3
Electromagnetic separation units	B 1
Fabrication plant, fuel element	B 4
Fissile materials	A 1
Fluorinated hydrocarbon polymers	PL 6014
Fluorine	PL 6002
Fluorine production	C 3
Frequency changers, gas centrifuge	C 6
Fuel element fabrication plant	B 4
Gas centrifuges	B 1
Gas centrifuges, manufacture	PL 6007
Gaseous diffusion barriers	B 1
Gaseous diffusion housings	B 1

Aircraft	IL 1460, PL 7016 and PL 7010
Aircraft components	PL 7011
Aircraft control technology	IL 1460 b
Aircraft design equipment and facilities	IL 1361
Aircraft fastener inspection equipment	IL 1081
Aircraft fastener manufacturing equipment	IL 1081
Aircraft inspection equipment	IL 1081
Aircraft manufacturing equipment	IL 1081
Aircraft propulsion systems technology	IL 1460 b
Aircraft technology	IL 1460 b
Align and expose equipment	IL 1355 b 2
Alloyed materials	IL 1610 c
Altimeters	IL 1501 b
Aluminides of titanium	IL 1672
Alumium alloys	PL 7001
Ammonium hydrogen fluoride	PL 7007
Amorphous alloy strips	IL 1631 f
Analogue computers	IL 1565
Analogue exchanges	IL 1567 b
Analogue tape recorders	IL 1572 a
Analogue transmission equipment	IL 1519
Analogue to digital converters	IL 1564 a, IL 1568 and PL 7038
Anechoic chambers	PL 7041
Angular measuring instruments	IL 1099 c
Annealing furnaces	IL 1355 b 1
Antennas	IL 1537, IL 1501 and 1520
Application software	IL 1566 a, b
Aromatic polyamides	IL 1746 c
Arsenic trichloride	PL 7007
Articulated manipulators	IL 1417 d
Artificial intelligence	IL 1566 b
Assemblies with mounted components	IL 1564
Assemblies, electronic	IL 1564
ATE	IL 1355 b 7
Atmosphere regeneration systems	IL 1417 a

Disc cartridges	IL 1572 d
Disc drives	IL 1565 h and IL 1572 a
Disc packs	IL 1572 d
Displays	IL 1565 h
DNC	IL 1091 c
Doppler systems	IL 1501 b and c
DRAMs	IL 1564 a
Drum drives	IL 1565 h
Dry etchers	IL 1355 b 1
DVMs	IL 1529 i
Dynamic adaptive routing	IL 1567 b
Dynamic random access memories	IL 1564 a
Dynamic signal analysers	IL 1533 b
EAROMs	IL 1564 a
Electrical discharge machines (EDM)	IL 1091 b
Electrical, electronic equipment	PL 7004
	(reduced electromagnetic radiation)
Electro-chemical devices	IL 1205 a
Electrolyte cells	IL 1205 a
Electron beam deposition systems	IL 1355 b 1 and IL 1388 c
Electron beam microfabrication systems	IL 1355 b 1
Electron beam physical vapour deposition	IL 1388 c
Electron beam test systems	IL 1355 b 9
Electron tubes	IL 1555
Electron tubes for electron streak cameras	IL 1555
Electron tubes for framing cameras	IL 1555
Electron tubes for image conversion	IL 1555 a
Electron tubes for image intensification	IL 1555 a
Electron tubes for television cameras	IL 1555 b
Electron tubes for video cameras	IL 1555 b
Electronic assemblies	IL 1564
Electronic components	IL 1564
Electronic components, manufacture and test	IL 1355
Electronic equipment, reduced radiation	PL 7004
Electronic instruments	IL 1529

Flexible disc drives	IL 1565 h and IL 1572 a
Flexible disc media	IL 1572 d
Flight data recorders	IL 1572 a
Flight instrument systems	IL 1485 b
Floppy disc drives	IL 1565 h and IL 1572 a
Floppy disc media	IL 1572 d
Flotation fluids	IL 1710 c
Flow forming machines	PL 7031
Fluorinated coated electric wire and cable	IL 1754 c
Fluorinated compounds and manufactures	IL 1754
Focal plane array	IL 1548 d
Frequency agile radio systems	IL 1516 c
Frequency generators	IL 1529 e
Frequency standards	IL 1529 c
Frequency synthesizers	IL 1531
Fuel cells	IL 1205 a
Functional testers	IL 1355 b 7
Furnaces for the densification of composites	PL 7033
Fuzzy logic	IL 1564 a
Gallium	IL 1757 b
Gas turbine blade or vane manufacture	IL 1080
Gas turbine blade or vane technology	IL 1080
Gas turbine blade or vane testing	IL 1080
Gas turbine engine inspection equipment	IL 1086
Gas turbine engine manufacture	IL 1086
Gas turbine engines, marine	IL 1431
Gate arrays	IL 1564
Gear finishing machinery	IL 1088
Gear making machinery	IL 1088
Geodetic equipment	IL 1502
Geodetic positioning systems	IL 1501 b
Geophones	IL 1510
Glass preforms for optical fibres	IL 1767
Global positioning satellite receivers	IL 1501 b
Graphic accelerators	IL 1565 h

Hydrofoil vessels	IL 1416 a
Hydrogen fluoride	PL 7007
Hydrophones	IL 1510
3-hydroxy-1-methylpiperidine	PL 7007
ICs	IL 1564
Image enhancement	IL 1565 h 1
Image transfer equipment	IL 1355 b 2
In-circuit testers	IL 1355 b 7
Incremental recorders	IL 1572 a
Indium	IL 1757 c
Inert gas atomising production equipment	PL 7031 a
Inert gas induction furnaces	PL 7019
Inertial equipment	IL 1485 i
Inertial equipment manufacture	IL 1385
Inertial navigation systems	IL 1485
Inertial test equipment	IL 1385 b
Infrared systems	IL 1502
Infrared thermal imaging equipment	IL 1502
Infrared viewing equipment	IL 1502
Input/output control equipment	IL 1565 h
Instrument frequency synthesizers	IL 1531 b
Instrumentation recorders	IL 1572 a
Instrumentation tape	IL 1572 d
Instruments, electronic	IL 1529
Integrated circuit testers	IL 1355 b 7
Integrated circuits	IL 1564
Interlacing machines	IL 1357
Interpretation of image	IL 1565 h
Ion beam systems	IL 1355 b 10
Ion implantation production equipment	IL 1355 b 1 and IL 1388 b
Ion implantation	IL 1355 b 1 and IL 1388 b
ISDN ICs	IL 1564 a
Isostatic presses	IL 1312 and PL 7032
Jet engine production equipment	PL 7044
Josephson-effect devices	IL 1574

Key telephone systems	IL 1567 b
Klystrons	IL 1558 c and d
Laser ring gyro test equipment	IL 1385 a
Lasers	IL 1522 a
Launch vehicles	IL 1465 b
Lidar equipment	PL 7021 b
Light systems for underwater use	IL 1417 f
Line-width measurement equipment	IL 1355 b 4
Linear arrays	IL 1548 d
Linear displacement measuring devices	IL 1099 c
Linear induction motors	IL 1370 c
Liquid phase epitaxy (LPE)	IL 1355 b 1
Lithium niobate	IL 1757 k
Lithographic equipment, semiconductor	IL 1355 b 2
Local area networks	IL 1565 h and IL 1567 a
Logic analysers	IL 1529 b
Loran C equipment	IL 1501 b
Low temperature devices	IL 1574
Low temperature superconductive materials	IL 1675
LPE, (liquid phase epitaxy)	IL 1355 b 1
Lubricating fluids	IL 1710 a
Lubricating materials	IL 1710 b
Machine tools	IL 1091 b
Machine tools for grinding	IL 1091 b and PL 7005
Machine tools for removing material	IL 1091 b
Machine tools for turning	IL 1091 b
Machining centres	IL 1091 b
Magnetic compensation systems	IL 1571 c
Magnetic disc coating equipment	IL 1358
Magnetic disc media	IL 1572 d
Magnetic media testing equipment	IL 1358
Magnetic metals	IL 1631
Magnetic tape	IL 1572 d
Magnetic tape recorders	IL 1565 h and IL 1572 a
Magnetometer systems	IL 1571

Nozzles	PL 7025 a
Numerical control (NC) units	IL 1091 a
Numerically controlled machine tools	IL 1091
O-ethyl-2-di-isopropylaminoethyl methylphosphonite	PL 7007
Ocean cable	IL 1526 a
Operating systems	IL 1566 b
Optical disk drives	IL 1565 h
Optical elements	IL 1556
Optical elements, diffractive type	IL 1556 d
Optical fibre cable	IL 1526 c
Optical fibre characterisation equipment	IL 1353
Optical fibre connectors	IL 1526 e
Optical fibre couplers	IL 1526 e
Optical fibre manufacturing equipment	IL 1353
Optical fibre sensors	IL 1526 d
Optical fibres	IL 1526 c and d
Optical integrated circuits	IL 1564
Optical quality surface manufacture	IL 1370
Oxidation furnaces	IL 1355 b 1
Oxygen/carbon content measuring equipment	IL 1355 b 4
PABXs	IL 1567 b
Packet switching	IL 1567
Panoramic radio receivers	IL 1516 a
Parametric amplifiers	IL 1537 h
Particle measuring systems	IL 1355 b 11
PCBs with mounted components	IL 1564
PCM testers	IL 1519 d
Pellicles	IL 1355 b 2
Peniotrons	IL 1558 e
Peripheral equipment	IL 1565 h
Phase slip devices	IL 1574
Phased array antenna	IL 1537 d
Phosphorus oxychloride	PL 7007
Phosphorus pentachloride	PL 7007

Positioning systems, acoustic	IL 1510
Potassium bifluoride	PL 7007
Potassium cyanide	PL 7007
Potassium fluoride	PL 7007
Potassium trichloride	PL 7007
Power sources, radio-active	IL 1205 c
Precursor materials	IL 1733
Preform characterisation equipment	IL 1353
Preforms of glass	IL 1767
Presses, isostatic	IL 1312 and PL 7032
Pressure regulators	PL 7017
Primary cells	IL 1205 a
Private automatic exchanges	IL 1567 b
Programmable logic arrays	IL 1564
Programmable read only memories	IL 1564 a
Programming systems	IL 1566 b
PROMs	IL 1564 a
Propellant production equipment	PL 7029 a
Propellants for spacecraft	PL 7028
Propeller hubs	IL 1416
Propellers, marine	IL 1416
Propulsion systems, spacecraft	IL 1465 c
Proximity-effect devices	IL 1574
Pullers, semiconductor crystal	IL 1355 b 1
Pulsejets	PL 7026
Pumpjet systems	IL 1416 f
Pumps	IL 1131 and PL 7018
Pyrolitic deposition systems	PL 7025
Pyrolitic deposition technology	PL 7025 a
Pyrolitic detectors	IL 1548
Quadrature amplitude modulation technology	IL 1520 d
Quartz crystals	PL 5026
Quasiparticle devices or detectors	IL 1574
3-quinuclidinol	PL 7007
3-quinuclidone	PL 7007

Scalar network analyzers	IL 1533 d
Scanning electron microscopes	IL 1355 b 1
Scramjets	PL 7026
Secondary cells	IL 1205 a
Seismic/geophysical recorders	IL 1572 a
SEMs	IL 1355
Semiconductor CAD	IL 1355 b 2
Semiconductor photodiodes	IL 1548 b
Semiconductor phototransistors	IL 1548 b
Semiconductor processing equipments	IL 1355 b 1
Sensors, robot	IL 1391 c
Separator systems, vessel	IL 1416
Ships, craft	IL 1416 and PL 7009
Signal analyzers	IL 1533 a
Signal generators	IL 1529 and IL 1351
Signal processing	IL 1565 h
Signal processing devices	IL 1586
Silicon	IL 1757
Silicon microcomputer microcircuits	IL 1564 a
Silicon microprocessor microcircuits	IL 1564 a
Simulators, EMI/EMP	IL 1361
SIS devices	IL 1574
SNS bridges	IL 1574
Sodium bifluoride	PL 7007
Sodium cyanide	PL 7007
Sodium fluoride	PL 7007
Sodium sulphide	PL 7007
Software	IL 1566
Software definitions	IL 1566
Software, technology	IL 1566 c
Solar cells	IL 1205 b
Solid state storage equipment	IL 1565 h
Solid state switches	PL 7022
Sonar systems	IL 1510
Space division analogue exchanges	IL 1567 b

Space-division digital exchange	IL 1567
Spacecraft	IL 1465 a
SPC communication switching	IL 1567
SPC communication switching technology	IL 1567 c
SPC telegraph circuit switching	IL 1567 b
SPC telephone circuit switching	IL 1567 b
SPC telephone circuit switching exchanges	IL 1567
Spectrum analyzers	IL 1533
Spread spectrum receivers	IL 1516 c
SPS circuit switching	IL 1565 h l and IL 1567
Sputter deposition production equipment	IL 1388 e
Sputtering equipment	IL 1355 b l and IL 1388 e
SQUIDs	IL 1574
SRAMs	IL 1564 d
Static random access memories	IL 1564 a
Statistical multiplexers	IL 1519 and IL 1567
Steel alloy	PL 7002
Steerable parachutes	PL 7016
Step and repeat cameras	IL 1355 b 2
Stirling cycle engines	IL 1417 h
Storage integrated circuits	IL 1564 a
Store and forward	IL 1567
Stored programme controlled communications	IL 1567
Streak cameras	IL 1585 d
Streamer tape drives	IL 1565 h and IL 1572 a
Submersible systems	IL 1417
Submersibles	IL 1418
Substrates	IL 1564
Superconducting materials	IL 1574
Superconducting quantum interference devices (SQUID)	IL 1754
Superconductive electromagnets	IL 1573
Superconductive materials	IL 1675
Superconductive solenoids	IL 1573
Superplastic forming technology	IL 1001

Vacuum induction furnaces	PL 7019
Vacuum photodiodes	IL 1548 a
Valves	PL 7018
Vessel models	IL 1363
Vessel propulsion systems	IL 1416
Vessels	IL 1416 and PL 7007
Vibration test equipment	IL 1362
Video cameras	IL 1585 f
Video recorders	IL 1572 a
Video tape	IL 1572 a and d
Vision systems, robot	IL 1391
Wafer defect inspection equipment	IL 1355 b 3
Wafer polishers	IL 1355 b 1
Wafer probers	IL 1355 b 6
Water tunnels	IL 1363
Waveguides	IL 1537
Waving machines	IL 1357
Weak-link devices	IL 1574
Wide area networks	IL 1565 h and IL 1567 a
Wide swath bathymetric survey systems	IL 1510 a
Winchester disc drives	IL 1565 h and IL 1572 a
Wind tunnel, instrumentation	IL 1361
Wind tunnel, models	IL 1361
Wind tunnels	IL 1361
Wire bonders	IL 1355 b 5
X-ray systems	IL 1553
X-ray tubes	IL 1553
Zone-refining equipment	IL 1355 b 1