SCHEDULE 1

PROHIBITED GOODS–MISCELLANEOUS CONTENTS

PART II

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	C

	which can be achieved and maintained exceeds 1,773 K (1,500°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) 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.	
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	C

	wavelengths exceeding 1,000 nm	
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 a rate exceeding 5,000 mm^2 /min	C
(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 an isolated vacuum environment	C
	(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	C

cassette-to-cassette and load lock wafer handling	
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	
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, molybdenum) coated substrates (eg glass, quartz, sapphire) for the preparation of masks having dimensions exceeding 125 mm × 125 mm; C

(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 C

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	
(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	C

	comparison for the automatic detection of defects, errors or contaminants of 600 nanometre or less in or on processed wafers or substrates	
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 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	C
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 and for evaluating frequency response, modulation transfer function, uniformity of responsivity or noise	C
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	A

two or more axes, specially designed for the manufacture of composite airframes and missile structures	
(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 of composites or partially processed composites	B
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	C

and devices specified in head (a), (b) or (c) above	
(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	C

	utilized for development of gas turbine aero-engine internal flow systems (gas path seals, air-oil seals and disc cavity flow fields)		
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 measuring the three axial thrust components	A	
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)	C

	and data acquisition equipment specially designed for water tunnels	
	(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	C

	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)	
or		
	(2) manufactured for use at normal operating temperatures over 150°C either by use of special materials or by special heat treatment	C
	(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 following: outer rings, inner rings, retainers, balls, rollers and sub-assemblies	C
	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 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	C
(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 heads (a) to (f) above (inclusive) so as to enhance the capability of such individual processes	C
	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	D

which relates to that substrate

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)

1. Coating process	*2. Substrate*	*3. Resultant coating*
	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 (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

1. Coating process	*2. Substrate*	*3. Resultant coating*
		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
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

1. Coating process	*2. Substrate*	*3. Resultant coating*
	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)
	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 programmes or to generate or modify numerical programme data	C
	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 devices specified in entry IL1099 in Group 3A	C
(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