

2. All measurement values in 1022.6. represent permissible positive and negative deviations from the target value, i.e., not total band.

NOTES:

1. Machine tools which can be used as measuring machines are embargoed if they meet or exceed the criteria specified for the machine tool function or the measuring machine function.
2. A machine described in 1022.6. is embargoed if it exceeds the embargo threshold anywhere within its operating range.
3. Governments may permit, as administrative exceptions, the shipment of equipment embargoed by 1022.6.b.1. to civil end-users not engaged in aerospace or nuclear activities.

1022. 7. "Robots", as follows, and specially designed controllers and "end-effectors" therefor:

- a. Capable in real time of full three-dimensional image processing or full three-dimensional scene analysis to generate or modify "programmes" or to generate or modify numerical programme data;

NOTE:

The scene analysis limitation does not include approximation of the third dimension by viewing at a given angle, or limited grey scale interpretation for the perception of depth or texture for the approved tasks (2 1/2 D).

- b. Specially designed to comply with national safety standards applicable to explosive munitions environments; *or*
- c. Specially designed or rated as radiation-hardened beyond that necessary to withstand normal industrial (i.e., non-nuclear industry) ionizing radiation;

1022. 8. Assemblies, units or inserts specially designed for machine tools, or for equipment embargoed by 1022.6. or 7., as follows:

- a. Spindle assemblies, consisting of spindles and bearings as a minimal assembly, with radial ("run out") or axial ("camming") axis motion in one revolution of the spindle less (better) than 0.0006 mm TIR;
- b. Linear position feedback units (e.g., inductive type devices, graduated scales, infrared systems or "laser" systems) having an overall "accuracy" less (better) than $(800 + (600 \times L \times 10^{-3}))$ nm (L equals the effective length in mm);
- c. Rotary position feedback units, e.g., inductive type devices, graduated scales, infrared systems or "laser" systems, having an "accuracy" less (better) than 0.00025°;
- d. Slide way assemblies consisting of a minimal assembly of ways, bed and slide having all of the following characteristics:
 1. A yaw, pitch or roll of less (better) than 2 seconds of arc TIR (reference: ISO/DIS 230/1) over full travel;
 2. A horizontal straightness of less (better) than 2 micrometre per 300 mm length; *and*
 3. A vertical straightness of less (better) than 2 micrometre per 300 mm length;
- e. Single point diamond cutting tool inserts, having all of the following characteristics:
 1. Flawless and chip-free cutting edge when magnified 400 times in any direction;
 2. Cutting radius from 0.1 to 5 mm inclusive; *and*
 3. Cutting radius out-of-roundness less (better) than 0.002 mm TIR;

1022. 9. Specially designed printed circuit boards with mounted components and "software" therefor, or "compound rotary tables", 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 1022.

1023. MATERIALS

None.

1024. SOFTWARE

1024. 1. "Software" specially designed or modified for the "development", "production" or "use" of equipment embargoed by 1021. or 1022.;

1024. 2. Specific "software", as follows:

a. "Software" to provide "adaptive control" and having both of the following characteristics:

1. For "flexible manufacturing units" (FMUs) which consist at least of equipment described in b.1. and b.2. of the definition of "flexible manufacturing unit"; *and*
2. 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:
 - a. Machine vision (optical ranging);
 - b. Infrared imaging;
 - c. Acoustical imaging (acoustical ranging);
 - d. Tactile measurement;
 - e. Inertial positioning;
 - f. Force measurement;
 - g. Torque measurement;

NOTE:

1024.2.a. does not embargo "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.

1024. 2. b. "Software" for electronic devices other than those described in 1022.1.a. or b., which provides the "numerical control" capability of the equipment embargoed by 1022.1.

1025. TECHNOLOGY

1025. 1. Technology according to the General Technology Note for the "development" of equipment or "software" embargoed by 1021., 1022. or 1024.;

1025. 2. Technology according to the General Technology Note for the "production" of equipment embargoed by 1021. or 1022.;

1025. 3. Other technology, as follows:

a. Technology:

1. For the "development" of interactive graphics as an integrated part in "numerical control" units for preparation or modification of part programmes;
2. For the "development" of generators of machine tool instructions (e.g., part programmes) from design data residing inside "numerical control" units;
3. For the "development" of integration "software" for incorporation of expert systems for advanced decision support of shop floor operations into "numerical control" units;

b. Technology for metal-working manufacturing processes, as follows:

1. Technology for the design of tools, dies or fixtures specially designed for the following processes:
 - a. "Superplastic forming";
 - b. "Diffusion bonding";
 - c. "Direct-acting hydraulic pressing";
2. Technical data consisting of process methods or parameters as listed below used to control:
 - a. "Superplastic forming" of aluminium alloys, titanium alloys or "superalloys":
 1. Surface preparation;
 2. Strain rate;
 3. Temperature;
 4. Pressure;
 - b. "Diffusion bonding" of "superalloys" or titanium alloys:
 1. Surface preparation;
 2. Temperature;
 3. Pressure;
 - c. "Direct-acting hydraulic pressing" of aluminium alloys or titanium alloys:
 1. Pressure;
 2. Cycle time;
 - d. "Hot isostatic densification" of titanium alloys, aluminium alloys or "superalloys":
 1. Temperature;
 2. Pressure;
 3. Cycle time;

c. Technology for the "development" or "production" of hydraulic stretch-forming machines and dies therefor, for the manufacture of airframe structures;

d. Technology for:

- The application of inorganic overlay coatings or