

1022.1. con't.

- d. Electrical discharge machines (EDM) of the non-wire type which have two or more rotary axes which can be coordinated simultaneously for "contouring control";
 - e. Machine tools for removing metals, ceramics or "composites":
 1. By means of:
 - a) Water or other liquid jets, including those employing abrasive additives;
 - b) Electron beam; **or**
 - c) "Laser" beam; **and**
 2. Having two or more rotary axes which:
 - a) Can be coordinated simultaneously for "contouring control"; **and**
 - b) Have a positioning accuracy of less (better) than 0.003°;
 - f. Deep-hole-drilling machines and turning machines modified for deep-hole-drilling having a maximum depth-of-bore capability exceeding 5,000 mm and specially designed components therefor.
2. Non-"numerically controlled" machine tools for generating optical quality surfaces, as follows, and specially designed components therefor:
 - a. Turning machines using a single point cutting tool and having all of the following characteristics:
 1. Slide positioning accuracy less (better) than 0.0005 mm per 300 mm of travel;
 2. Bidirectional slide positioning repeatability less (better) than 0.00025 mm per 300 mm of travel;
 3. Spindle "run out" and "camming" less (better) than 0.0004 mm TIR;
 4. Angular deviation of the slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over full travel; **and**
 5. Slide perpendicularity less (better) than 0.001 mm per 300 mm of travel;

Technical Note:
The bidirectional slide positioning repeatability (R) of an axis is the maximum value of the repeatability of positioning at any position along or around the axis determined using the procedure and under the conditions specified in part 2.11 of ISO 230/2: 1988.
 - b. Fly cutting machines having all of the following characteristics:
 1. Spindle "run out" and "camming" less (better) than 0.0004 mm TIR; **and**
 2. Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over full travel.
 3. "Numerically controlled" or manual machine tools, and specially designed components, controls and accessories therefor, specially designed for the shaving, finishing, grinding or honing of hardened ($R_c = 40$ or more) spur, helical and double-helical gears with a pitch diameter exceeding 1,250 mm and a face width of 15% of pitch diameter or larger finished to a quality of AGMA 14 or better (equivalent to ISO 1328 class 3).
 4. Hot "isostatic presses", having all of the following, and specially designed dies, moulds, components, accessories and controls therefor:
 - a. A controlled thermal environment within the closed cavity and possessing a chamber cavity with an inside diameter of 406 mm or more; **and**

b. Any of the following:

1. A maximum working pressure exceeding 207 MPa;
2. A controlled thermal environment exceeding 1,773 K (1,500°C); **or**
3. A facility for hydrocarbon impregnation and removal of resultant gaseous degradation products.

Technical Note:

The inside chamber dimension is that 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, depending on which of the two chambers is located inside the other.

5. Equipment specially designed for the deposition, processing and in-process control of inorganic overlays, coatings and surface modifications, as follows, for non-electronic substrates, by processes shown in the Table and associated Notes following 1025.3.f., and specially designed automated handling, positioning, manipulation and control components therefor:
 - a. "Stored programme controlled" chemical vapour deposition (CVD) production equipment having all of the following:
 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. Any of the following:
 - a) Incorporating high vacuum (equal to or less than 0.01 Pa) rotating seals; **or**
 - b) Incorporating *in situ* coating thickness control;
 - b. "Stored programme controlled" ion implantation production equipment having beam currents of 5 mA or more;
 - c. "Stored programme controlled" electron beam physical vapour deposition (EB-PVD) production equipment incorporating all of the following:
 1. Power systems rated for over 80 kW;
 2. A liquid pool level "laser" control system which regulates precisely the ingots feed rate; **and**
 3. A computer controlled rate monitor operating on the principle of photo-luminescence of the ionised atoms in the evaporant 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 reduced pressure controlled atmosphere (equal to or less than 10 kPa measured above and within 300 mm of the gun nozzle exit) in a vacuum chamber capable of evacuation down to 0.01 Pa prior to the spraying process; **or**
 2. Incorporating *in situ* coating thickness control;
 - e. "Stored programme controlled" sputter deposition production equipment capable of current densities of 0.1 mA/mm² or higher at a deposition rate of 15 µm/hr or more;
 - f. "Stored programme controlled" cathodic arc deposition production equipment incorporating a grid of electromagnets for steering control of the arc spot on the cathode;