

recording at rates exceeding 1,000,000 frames/s for the full framing height of 35 mm film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights;

a.3. Mechanical or electronic streak cameras having writing speeds exceeding 10 mm/ μ s;

a.4. Electronic framing cameras having a speed exceeding 1,000,000 frames/s;

a.5. Electronic cameras, having all of the following:

a.5.a. An electronic shutter speed (gating capability) of less than 1 μ s per full frame; *and*

a.5.b. A read out time allowing a framing rate of more than 125 full frames per second.

a.6. Plug-ins, having all of the following characteristics:

a.6.a. Specially designed for instrumentation cameras which have modular structures and that are controlled by 6A003.a; *and*

a.6.b. Enabling these cameras to meet the characteristics specified in 6A003.a.3, 6A003.a.4 or 6A003.a.5, according to the manufacturer's specifications.

b. Imaging cameras, as follows:

Note: 6A003.b does not control television or video cameras specially designed for television broadcasting.

b.1. Video cameras incorporating solid state sensors, having a peak response in the wavelength range exceeding 10nm, but not exceeding 30,000 nm and any of the following:

b.1.a. More than 4×10^6 "active pixels" per solid state array for monochrome (black and white) cameras;

b.1.b. More than 4×10^6 "active pixels" per solid state array for color cameras incorporating three solid state arrays; *or*

b.1.c. More than 12×10^6 "active pixels" for solid state array color cameras incorporating one solid state array;

Technical Note: For the purposes of this entry, digital video cameras should be evaluated by the maximum number of "active pixels" used for capturing moving images.

b.2. Scanning cameras and scanning camera systems, having all of the following:

b.2.a. A peak response in the wavelength range exceeding 10 nm, but not exceeding 30,000 nm;

b.2.b. Linear detector arrays with more than 8,192 elements per array; *and*

b.2.c. Mechanical scanning in one direction;

b.3. Imaging cameras incorporating image intensifier tubes having the characteristics listed in 6A002.a.2.a;

b.4. Imaging cameras incorporating "focal plane arrays" having the characteristics listed in 6A002.a.3.

Note: 6A003.b.4 does not control imaging cameras incorporating linear "focal plane arrays" with twelve elements or fewer, not employing time-delay-and-integration within the element, designed for any of the following:

a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;

b. Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;

c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;

d. Equipment specially designed for laboratory use; *or*

e. Medical equipment.

■ 33. In Supplement No. 1 to part 774 (the Commerce Control List), Category 6—Sensors, Export Control Classification Number (ECCN) 6A004 is amended by revising the "items" paragraph in the List of Items Controlled section, to read as follows:

6A004 Optics.

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List of Items Controlled

Unit: * * *

Related Controls: * * *

Related Definitions: * * *

Items:

a. Optical mirrors (reflectors), as follows:

a.1. "Deformable mirrors" having either continuous or multi-element surfaces, and specially designed components therefor, capable of dynamically repositioning portions of the surface of the mirror at rates exceeding 100 Hz;

a.2. Lightweight monolithic mirrors having an average "equivalent density" of less than 30 kg/m² and a total mass exceeding 10 kg;

a.3. Lightweight "composite" or foam mirror structures having an average "equivalent density" of less than 30 kg/m² and a total mass exceeding 2 kg;

a.4. Beam steering mirrors more than 100 mm in diameter or length of major axis, that maintain a flatness of $\lambda/2$ or better (λ is equal to 633 nm) having a control bandwidth exceeding 100 Hz.

b. Optical components made from zinc selenide (ZnSe) or zinc sulphide (ZnS) with transmission in the wavelength range exceeding 3,000 nm but not exceeding 25,000 nm and having any of the following:

b.1. Exceeding 100 cm³ in volume; *or*

b.2. Exceeding 80 mm in diameter or length of major axis and 20 mm in thickness (depth).

c. "Space-qualified" components for optical systems, as follows:

c.1. Lightweighted to less than 20% "equivalent density" compared with a solid blank of the same aperture and thickness;

c.2. Substrates, substrates having surface coatings (single-layer or multi-layer, metallic or dielectric, conducting, semiconducting or insulating) or having protective films;

c.3. Segments or assemblies of mirrors designed to be assembled in space into an optical system with a collecting aperture equivalent to or larger than a single optic 1 m in diameter;

c.4. Manufactured from "composite" materials having a coefficient of linear thermal expansion equal to or less than 5×10^{-6} in any coordinate direction.

d. Optical control equipment, as follows:

d.1. Specially designed to maintain the surface figure or orientation of the "space-qualified" components controlled by 6A004.c.1 or 6A004.c.3;

d.2. Having steering, tracking, stabilization or resonator alignment bandwidths equal to or more than 100 Hz and an accuracy of 10 μ rad (microradians) or less;

d.3. Gimbals having all of the following:

d.3.a. A maximum slew exceeding 5°;

d.3.b. A bandwidth of 100 Hz or more;

d.3.c. Angular pointing errors of 200 μ rad (microradians) or less; *and*

d.3.d. Having any of the following:

d.3.d.1. Exceeding 0.15 m but not exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 2 rad (radians)/s²; *or*

d.3.d.2. Exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 0.5 rad (radians)/s²;

d.4. Specially designed to maintain the alignment of phased array or phased segment mirror systems consisting of mirrors with a segment diameter or major axis length of 1 m or more.

e. Aspheric optical elements having all of the following characteristics:

e.1. The largest dimension of the optical-aperture is greater than 400 mm;

e.2. The surface roughness is less than 1 nm (rms) for sampling lengths equal to or greater than 1 mm; *and*

e.3. The coefficient of linear thermal expansion's absolute magnitude is less than 3×10^{-6} /K at 25° C;

Technical Notes:

1. An "aspheric optical element" is any element used in an optical system whose imaging surface or surfaces are designed to depart from the shape of an ideal sphere.

2. Manufacturers are not required to measure the surface roughness listed in 6A004.e.2 unless the optical element was designed or manufactured with the intent to meet, or exceed, the control parameter.

Note: 6A004.e does not control aspheric optical elements having any of the following:

a. A largest optical-aperture dimension less than 1 m and a focal length to aperture ratio equal to or greater than 4.5:1;

b. A largest optical-aperture dimension equal to or greater than 1 m and a focal length to aperture ratio equal to or greater than 7:1;

c. Being designed as Fresnel, flyeye, stripe, prism or diffractive optical elements;

d. Being fabricated from borosilicate glass having a coefficient of linear thermal expansion greater than 2.5×10^{-6} /K at 25° C; *or*

e. Being an x-ray optical element having inner mirror capabilities (e.g., tube-type mirrors).

N.B.: For aspheric optical elements specially designed for lithographic equipment, see 3B001.

■ 34. In Supplement No. 1 to part 774 (the Commerce Control List), Category 6—Sensors, Export Control Classification Number (ECCN) 6A008 is amended by revising the "items" paragraph in the List of Items Controlled section, to read as follows:

6A008 Radar systems, equipment and assemblies having any of the following characteristics (see List of Items