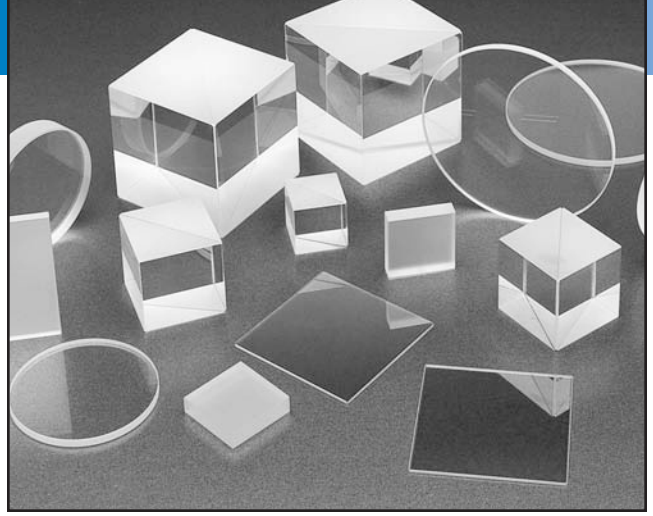


# Beamsplitters

Beamsplitters separate an incoming beam of light into two separate beams — a transmitted beam and a reflected beam. The relative intensity and polarization of the separated beams are determined by the characteristics of the beamsplitter coating and the nature of the incoming beam.

Beamsplitters are broadly classified as cube, plate, or pellicle. Subclassifications include non-polarizing, polarizing, laser line, broadband, and ultrafast beamsplitters.

In all of the beamsplitters mentioned above, the beamsplitting surface is mounted at a 45-degree angle to the incoming beam. Consequently, the transmitted beam is parallel to the incoming beam and the reflected beam is orthogonal to it. In a plate beamsplitter, a partially reflecting coating is deposited on one side of a flat substrate, and an antireflection coating is deposited on the opposite side. For a cube beamsplitter, the partially reflecting coating is deposited on the hypotenuse of an isosceles right-angle prism, and an identical, uncoated prism is bonded to the first prism to form a cube. Antireflection coatings are then deposited on the entry and exit faces of the cube. A pellicle beamsplitter consists of a thin, elastic membrane stretched like a drumhead over a flat metal frame. Depending on the desired characteristics, the membrane may or may not be coated.

Plate beamsplitters are available with a wide variety of coatings, many of which can be used with high-energy lasers. Disadvantages include a lateral displacement of the transmitted beam (approximately 0.3 times the thickness of the substrate), satellite beams (ghost reflections) from the antireflection coated surface, and extreme polarization sensitivity. Cube beamsplitters eliminate the offset problem and the beamsplitting coating is encased in glass. Power-handling capability can be limited due to the bonded interface, and ghost reflection can occur at the entrance and exit faces. Pellicle beamsplitters virtually eliminate the offset and ghost reflection problems, but coating availability is limited, and their power-handling capability is less than that of cube beamsplitters.

## COATING CHOICES

Choosing the right coating is the most critical aspect of selecting a beamsplitter. CVI Melles Griot offers several different coating types.

### Polarizing Coatings

These dielectric coatings are designed to separate non-polarized or circularly polarized light into two linearly polarized orthogonal beams: one $s$, one $p$. These coatings can be either broadband or laser line polarizing coatings and will transmit $p$-polarized light and reflect $s$-polarized light.

### Laser Line Non-polarizing Coatings

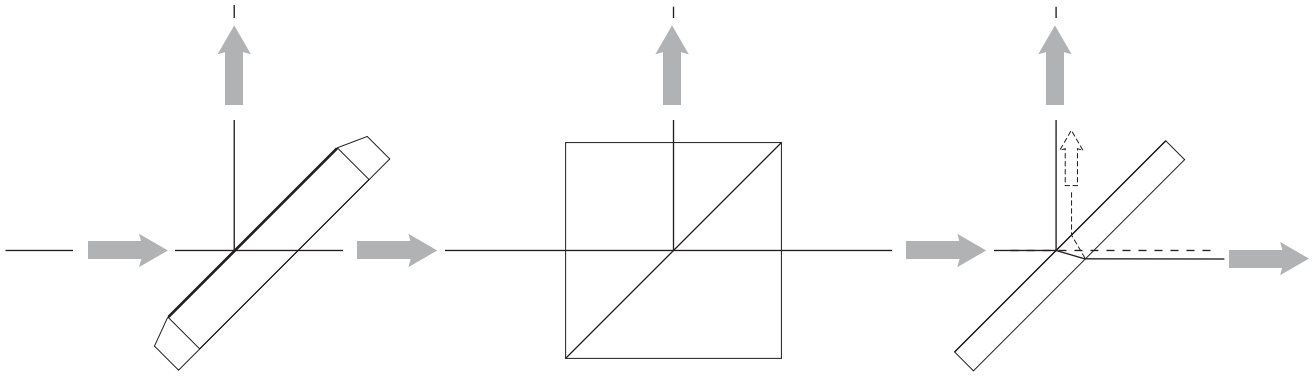
These dielectric coatings are designed so that, at a specific laser wavelength, transmission and reflection characteristics are the same for both $s$- and $p$-polarization. At any other wavelength, the characteristics may vary dramatically.

### Broadband Dielectric Coatings

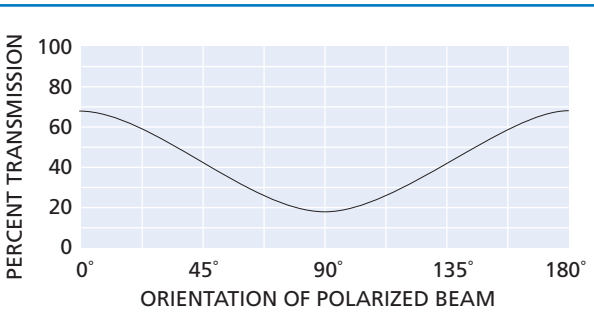
These durable coatings exhibit extremely low absorption. They are polarization sensitive and are ideal for unpolarized and circularly polarized light sources. With a linearly polarized source, transmission (and reflection) can vary by as much as 80 percent, depending upon the orientation.

### Broadband Hybrid Coatings

These coatings, which combine a dielectric coating with a metallic coating, are relatively insensitive to changes in polarization. Because these coatings are relatively susceptible to damage, however, they are offered only on cube prisms, where they are completely protected.




**Beam offset of pellicle, cube, and plate beamsplitters**




**Transmission through a 50/50 broadband non-polarizing beamsplitter as a function of polarization angle**

**CVI Melles Griot depostion system**

## Custom Beamsplitters

In addition to the standard beamsplitters listed in this chapter, CVI Melles Griot can produce custom beamsplitters with different dimensions, optimized for different wavelengths, and with different split ratios. Standard beamsplitter coatings also can be applied to almost any right-angle prism. Contact your nearest CVI Melles Griot sales office for information about our custom capabilities.