

High Performance InfraRed Notch Filter Design with OD 6 Blocking for Industrial CO₂ Lasers 10.6 μm

Driven by applications from the automobile industry, the prices for thermal imaging cameras have fallen dramatically in recent years. The industry also benefits from this development in the monitoring of welding processes with CO₂ lasers. The advantage is obvious: errors such as welding spatter or hairline cracks are detected more quickly.

Today's thermal imaging cameras are based on bolometer arrays that detect radiation in the range of 8 –12 μm. CO₂ lasers emit at 10.6 μm. Their wavelength is therefore perfectly seen by these cameras, and the intense laser light overshadows the processes actually observed. The infrared eye is blinded.

A so-called notch filter that "hides" specific wavelengths, provides a remedy. To date, such filters have been widespread in the VIS and NIR range and are mainly used in Raman laser spectroscopy or confocal microscopy. For wavelengths in the medium and long infrared range only a very small product range has been available thus far.

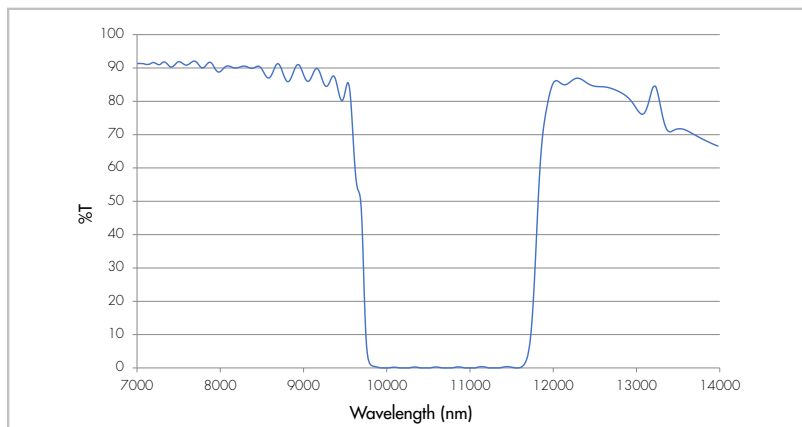
This 10.6 μm notch filter is a leap forward in IR coating technology. It features hundreds of layers to achieve blocking of OD6 at the laser wavelength.

The innovative, high-layer-count IR optical coating is produced by the deposition capabilities that now deliver groundbreaking optical coating performance in the 8 to 12 μm spectral range.

The filter is designed as an accessory for professional thermal imaging cameras.



Measurement with FTIR Spectrometer



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We aren't capable of doing a broadband spectrum measurement for this wavelength range, but instead verified OD6 blocking performance at 10.6 μm with both CW with a CO₂ laser and pulsed using a CO₂ TEA laser and a HgCdTe detector with around ±0.05 OD in this range and a noise floor >OD 6 at an external professional partner to confirm design.

We use that in conjunction with the above FTIR data as our basis for certifying the performance of this product. Our specs will continue to be by-design, but we can provide FTIR data to any customers who may need it.

Specification

AOI	0° collimated
Polarization	Random
Notch center wavelength	10.60 μm nominal
Transmission	>80% avg @7.0 – 14.0 μm out of band
Blocking	>OD 6 abs @10.59 – 10.61 μm, >OD 6 avg @10.0 – 11.0 μm by design
Substrate	Germanium
Thickness	1 mm or 2 mm ±0.1 mm
Size	on request i.e., ½" to 3" diameter

Germany and Other Countries

Laser Components Germany GmbH
Tel: +49 8142 2864-0
Fax: +49 8142 2864-11
info@lasercomponents.com
www.lasercomponents.com

France

Laser Components S.A.S.
Tel: +33 1 39 59 52 25
Fax: +33 1 39 59 53 50
info@lasercomponents.fr
www.lasercomponents.fr

United Kingdom

Laser Components (UK) Ltd.
Tel: +44 1245 491 499
Fax: +44 1245 491 801
info@lasercomponents.co.uk
www.lasercomponents.co.uk

Nordic Countries

Laser Components Nordic AB
Tel: +46 31 703 71 73
Fax: +46 31 703 71 01
info@lasercomponents.se
www.lasercomponents.se