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# FB19M10 - February 07, 2018

Item # FB19M10 was discontinued on February 07, 2018. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

# THZ BANDPASS FILTERS: 10 MM - 590 MM CENTER WAVELENGTH

- Bandpass Filters Fabricated from Gold-Mesh Frequency-Selective Surfaces
- **Center Wavelengths Available from 10 to 590 μm (30.0 THz to 510 GHz)**
- Custom Filters Available



25.0 mm Outer Diameter



Cross-Absent Pattern of the Frequency-Selective Surface

## O V E R V I E W

#### Features

- Mesh Made from Gold Film for Temperature Stability
- Designed for Use in Cryostats and Other Cooled Environments
- >70% Transmission at Center Wavelength
- Stacking Filters Reduces Out-of-Band Transmission
  25.0 mm Outer Diameter for Compatibility with Our Ø1"
- Lens Tubes, Filter Mounts, and Optic Mounts
- Customizable Options Include:
  - Wavelengths from 10 to 600 μm (30.0 THz to 500 GHz)
  - Outer Diameters up to 3" (76.2 mm)
  - Mounting Options for Single and Stacked Filters

Thorlabs' Far-Infrared and Terahertz Bandpass Filters provide high-spectral-resolution filtering with center wavelengths (CWLs) from 10 to 590  $\mu$ m (30.0 THz to 510 GHz). With more than 70% transmission at the CWL, these filters are fabricated from gold-mesh frequency-selective surfaces designed to reject out-of-band radiation primarily by reflection and destructive interference.

General Specifications <sup>a</sup>					
Peak Transmission	>70% at CWL <sup>b</sup>				
Bandwidth (FWHM) <sup>a</sup>	7% to 25% of CWL <sup>b</sup>				
Out-of-Band Transmission, Single Filter	≤4.6% (OD ≥ 1.3)				
Out-of-Band Transmission, Two Stacked Filters	<1% (OD > 2)				
Clear Aperture	Ø19 mm (0.75")				
Mounting Ring Outer Diameter	25.0 mm (0.98")				
Mounting Ring Inner Diameter	19.7 mm (0.78")				
Tolerances of Inner and Outer Diameters	±0.2 mm (±0.008")				
Ring Thickness	1.02 mm (0.04")				
Ring Material	Nickel				
Gold Film Thickness	1 µm				
Temperature Range	4 K to 363 K (-269 °C to 90 °C)				

 While all units will meet these specifications, the transmission of individual units will vary from production run to production run. For unit-specific information, please see the serialized item's specification sheet, found by clicking on the red

The cross-absent pattern of these filters (shown in detail above)

is a continuous mesh with a pattern of crosses etched away from the gold using photolithography. While a simple wire-grid mesh acts as a shortpass filter, blocking radiation with wavelengths

- documents icon next to the serialized Item #.
- Center Wavelength

larger than the grid size, the cross-absent mesh selects a specific band of wavelengths. For more information, please refer to *Frequency Selective Surfaces: Theory and Design* by Ben A. Munk.<sup>a</sup>

Unlike similar bandpass filters, these gold filters do not require a polymer support layer, which eliminates issues of darkening due to gamma radiation, delamination due to thermal cycling, and unwanted vibronic bands associated with polymers. Due to the construction from gold mesh and a nickel ring, these filters are compatible with temperatures down to 4 K (-269 °C). The filter also maintains performance over wide temperature cycles, making it ideal for use in astronomy and materials research.

To further decrease out-of-band transmission, two or more filters of similar center wavelength can be stacked together. With only two filters in series, the outof-band transmission will fall from 4.6% or less to below 1%, as shown by the graph to the right for the 30 µm CWL filter.

#### Handling Precautions and Mounting

The 1 µm thick gold mesh on these filters is exceptionally fragile and will break easily if bumped or touched. We do not recommend using canned air on these filters or otherwise attempting to clean them. Quick changes in pressure should be avoided. For more reliable handling outside of a cryogenic environment, we strongly recommend mounting these filters in our Ø1" Lens Tubes, non-motorized Filter Mounts, or Optic Mounts. If the mount requires a retaining ring to be threaded against the optic, the SPW602 Spanner Wrench and SM1LTRR Stress-Free Retaining Ring should be used, and care should be taken to avoid overtightening the ring against the filter. Excessive pressure from the retaining ring may cause rippling in the mesh. Pre-mounted versions are available as a custom option.



#### **Custom Options**

While we offer a selection of filters from stock, Thorlabs is also able to provide custom filters with alternative center wavelengths, diameters, and mounts. Filters with center wavelengths between 10 and 600 µm can be produced. Options for outer diameters include, but are not limited to, 19.1 mm and 33.1 mm. Custom outer diameters can be made as large as 3" (76.2 mm). We can also provide single or stacked filters pre-mounted in our Ø1" Lens Tubes or other mounts; up to four filters can be stacked together in one lens tube. Please contact Tech Support for more information.

a. Munk, Ben A., Frequency Selective Surfaces: Theory and Design, John Wiley & Sons, Inc. (2000).

	Webpage Features							
	Clicking this icon allows you to download our standard support documentation.							
	Choose Item Clicking the words "Choose Item" opens a drop-down list containing all of the in-stock filters around the desired center wavelength. The red icon next to the serial number then allows you to download spectral measurements for that serial-numbered filter.							
Additional Bandpass Filters								
V/Vis 340	Visible Bandpass FiltersNIR Bandpass FiltersMIR Bandpass FiltersLWIR, FIR, and THz FiltersPremium I340 - 694.3 nm CWLs700 - 1650 nm CWLs1750 - 8500 nm CWLs10 - 590 µm CWLs355 - 15					Bandpass Filters 50 nm CWLs	Bandpass Filter Kit	
	We also offer custom bandpass filters with other central wavelengths or FWHM. To request a quote, contact Tech Support.							port.

### THz Bandpass Filters: 10 - 590 µm Center Wavelength

Item #	Center Wavelength <sup>a</sup>	CWL Tolerance	Transmission <sup>b</sup>
FB19M10	10 µm (30.0 THz)		
FB19M12.5	12.5 µm (24.0 THz)	±1 μm	
FB19M15	15 µm (20.0 THz)		
FB19M20	20 µm (15.0 THz)	±1.2 μm	
FB19M30	30 µm (10.0 THz)		
FB19M50	50 µm (6.0 THz)	±5%	

Item #	Center Wavelength <sup>a</sup>	CWL Tolerance	Transmission <sup>b</sup>
FB19M100	100 µm (3.0 THz)		
FB19M120	120 µm (2.5 THz)		
FB19M150	150 µm (2.0 THz)		
FB19M200	200 µm (1.5 THz)	±5%	
FB19M300	300 µm (1.0 THz)		
FB19M500	500 µm (600 GHz)		

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FB19M80	80 µm (3.8 THz)		FB19M590	590 µm (510 GHz)	

• Nominal center wavelength. Click "Choose Item" below, followed by the red Docs icon next to a serial number to view a document with the unit-specific center wavelength, as well as the bandwidth based on the unit-specific center wavelength.

• Click on the graphs icon (IIII) for a sample transmission curve.

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