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FEL1400 - July 6, 2023

Item # FEL1400 was discontinued on July 6, 2023. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

SOFT-COATED NIR LONGPASS FILTERS

- **Longpass Filters for the NIR**
- **Ø21 mm Clear Aperture**
- **0.01% Max Transmission in Rejection Region**

FEL1500
Ø1" Longpass Filter,
Cut-On Wavelength: 1500 nm

Engraving Indicates
Recommended
Transmission Direction

FEL1350
Ø1" Longpass Filter,
Cut-On Wavelength: 1350 nm

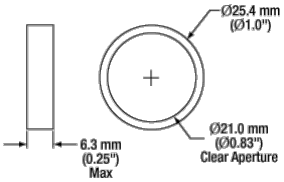
FEL1050
Ø1" Longpass Filter,
Cut-On Wavelength: 1050 nm

OVERVIEW

Features

- 1" Outer Diameter (Ø21.0 mm Clear Aperture)
- Order Sorting Filters for Photometry
- Stray Light or Trim Filters to Eliminate any Unwanted Near-Band Radiation
- Raman Spectroscopy Filters
- Astronomy Applications

Click to Enlarge
FEL1500 Filter
Mounted in a TRF90
Flip Mount Using a
Retaining Ring



Thorlabs' longpass filters are very useful for isolating regions of a spectrum. These longpass filters feature durable dielectric coatings that withstand the normal cleaning and handling necessary when using any high-quality optical component. Their film construction is essentially a modified quarter-wave stack, using interference effects rather than absorption, to isolate their spectral bands (see the *Specs* tab for transmission information).

	Longpass Filters
Transmission Region	Cut-on λ to 2200 nm (Min)
Rejection Region	200 nm to Cut-on λ

Unlike colored filter glass, the cut-on wavelength of these filters will shift to a shorter wavelength as the angle of incidence is increased. As a rule of thumb, when the angle of incidence goes from 0° to 45°, the central wavlength shifts down by about 10%. This feature can be useful in applications where it is desirable to fine tune the location of the cut-on wavelength. In addition, our edgepass filters are hermetically sealed to provide maximum humidity protection.

Our Soft-Coated NIR Longpass Filters will be retired without replacement when stock is depleted. If you require this part for line production, please contact our OEM Team.

Please note: The edgepass filters on this page are not tested or recommended for fluorescence applications or applications with demanding wavefront requirements, such as imaging. Please see our full selection of hard-coated edgepass filters for use in fluorescence and imaging applications.

Webpage Feature	
◆	Clicking on this symbol in the tables below will open a window showing transmission and optical density data for the corresponding filter.

Each filter is housed in a black anodized aluminum ring that is labeled with an arrow indicating the design propagation direction. The ring makes handling easier and enhances the blocking OD by limiting scattering. These filters can be mounted in our extensive line of filter mounts and wheels. As the mounts are not threaded, Ø1" retaining rings will be required to mount the filters in one of our internally-threaded SM1 lens tubes. We do not recommend removing the filter from its mount, as the filter consists of several layers of glass that are held together with epoxy and the mounting ring. These glass layers are necessary to protect the dielectric coating from the atmosphere; exposure would significantly reduce the filter's transmission efficiency over time.

SPECS

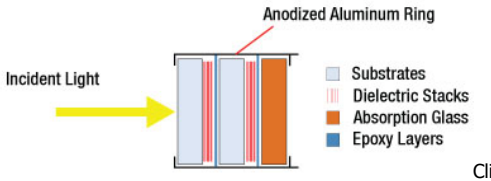
Specifications	
Transmission Region	Cut-on λ to 2200 nm Minimum
Transmission at Peak	900-1000 nm, 75% >1000 nm, 70%
Cut-On or Cut-Off Tolerance (Δλ @ 50% of Peak)	±15 nm (900 to 1500 nm)
Rejection Region	200 nm to Cut-On
Transmission in Rejection Region	0.01% abs. (OD > 4.0)
Cut-off Slope	3%, OD = 0.3 to OD = 4
Construction	Immersed Dielectric
Surface Quality (Scratch-Dig)	80-50 per Mil-0-13830A
Substrate Material	Soda Lime or Equivalent
Clear Aperture	Ø21.0 mm
Diameter	1" (25.4 mm)

Optical Density Equation:

$$OD = \log_{10}\left(\frac{1}{T}\right)$$

Bandpass/Edgepass Filter Structure

A bandpass or edgepass filter is created by depositing layers of material on the surface of the substrate. Typically, there are several dielectric stacks separated by spacer layers. The dielectric stack is composed of a large number of alternating layers of low-index and high-index dielectric material. The thickness of each layer in the dielectric stack is λ/4, where λ is the central wavelength of the bandpass filter (i.e. the wavelength with the highest transmittance through the filter). The spacer layers are placed in between the dielectric stacks and have a thickness of (nλ)/2, where n is an integer. The spacer layers can be formed from colored glass, epoxy, dyes, metallic, or dielectric layers. A Fabry-Perot cavity is formed by each spacer layer sandwiched between dielectric stacks. The filter is mounted in an engraved metal ring for protection and ease of handling.



Click to Enlarge

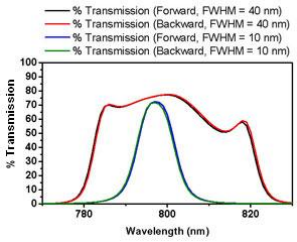
The number of layers shown in this schematic is not indicative of the number of layers in an actual bandpass filter. Also the drawing is not to scale.

Filter Operation Overview

The constructive interference conditions of a Fabry-Perot cavity allow light at the central wavelength, and a small band of wavelengths to either side, to be transmitted efficiently, while destructive interference prevents the light outside the passband from being transmitted. However, the band of blocked wavelengths on either side of the central wavelength is small. In order increase the blocking range of the filter, materials with broad blocking ranges are used for or coated onto the spacer layers and the substrate. Although these materials effectively block out of band transmission of incident radiation they also decrease the transmission through the filter in the passband.

Filter Orientation

An engraved arrow on the edge of the filter is used to indicate the recommended direction for the transmission of light through the filter. Although the filter will function with either side facing the source, it is better to place the coated side toward the source. This will minimize any thermal effects or possible thermal damage that blocking intense out-of-band radiation might cause due to the absorption of the out-of-band radiation by the substrate or colored glass filter layers. The plot to the right was made by illuminating the filter with a low intensity broadband light and measuring the transmission as a function of wavelength. The plot shows that the transmission direction through the filter has very little effect on the intensity and the spectrum of the light transmitted through the filter. The minimal variation between the forward and backward traces is most likely due to a small shift in the incident angle of the light on the filter introduced when the filter was removed, flipped over, and replaced in the jig.



Previous-generation FB800-10 and FB800-40 filters were used to make the measurement that resulted in the plot above.

The filter is intended to be used with collimated light normally incident on the surface of the filter. For uncollimated light or light striking the surface and an angle not normally incident to the surface the central wavelength (wavelength corresponding to peak transmission) will shift toward lower wavelengths and the shape of the transmission region (passband) will change. As a rule of thumb, when the angle of incidence goes from 0° to 45°, the central wavlength shifts down by about 10%. This feature can be useful in applications where it is desirable to fine tune the location of the cut-on, or cut-off wavelength.

Filter Temperature

The central wavelength of the bandpass filter can be tuned slightly (~1 nm over the operating range of the filter) by changing the temperature of the filter. This is primarily due to the slight thermal expansion or contraction of the layers.

Soft-Coated Longpass Filters

Item #	Cut-On Wavelength (nm)	Transmission Data[a]
FEL1000	1000	
FEL1050	1050	
FEL1350	1350	

Item #	Cut-On Wavelength (nm)	Transmission Data[a]
FEL1400	1400	
FEL1500	1500	

a. The shaded regions in these graphs denote the spectral ranges over which we recommend using these filters. Please keep in mind that the data given is typical, and performance may vary from lot to lot, particularly outside of the shaded regions.

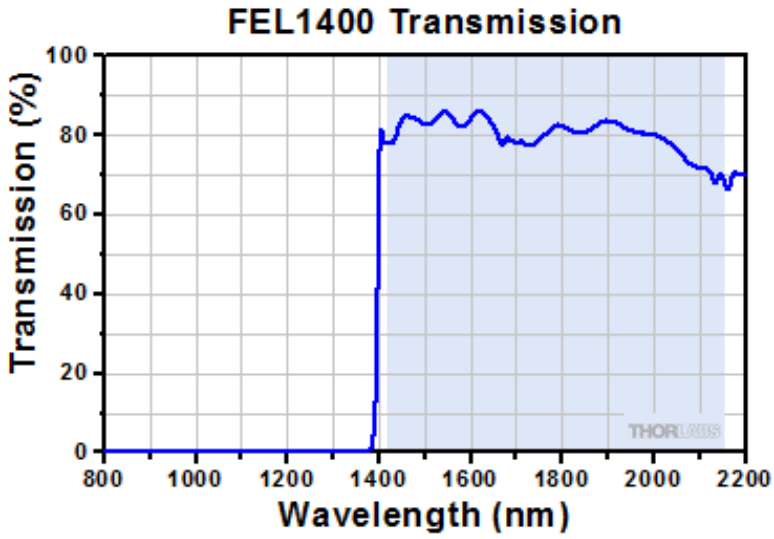
Part Number	Description	Price	Availability
FEL1000	**Ø1" Soft-Coated Longpass Filter, Cut-On Wavelength: 1000 nm**	**$120.75**	**Today**
FEL1050	**Ø1" Soft-Coated Longpass Filter, Cut-On Wavelength: 1050 nm**	**$120.75**	**Today**
FEL1350	**Ø1" Soft-Coated Longpass Filter, Cut-On Wavelength: 1350 nm**	**$120.75**	**Today**
FEL1400	**Ø1" Soft-Coated Longpass Filter, Cut-On Wavelength: 1400 nm**	**$120.75**	**Today**
FEL1500	**Ø1" Soft-Coated Longpass Filter, Cut-On Wavelength: 1500 nm**	**$120.75**	**7-10 Days**

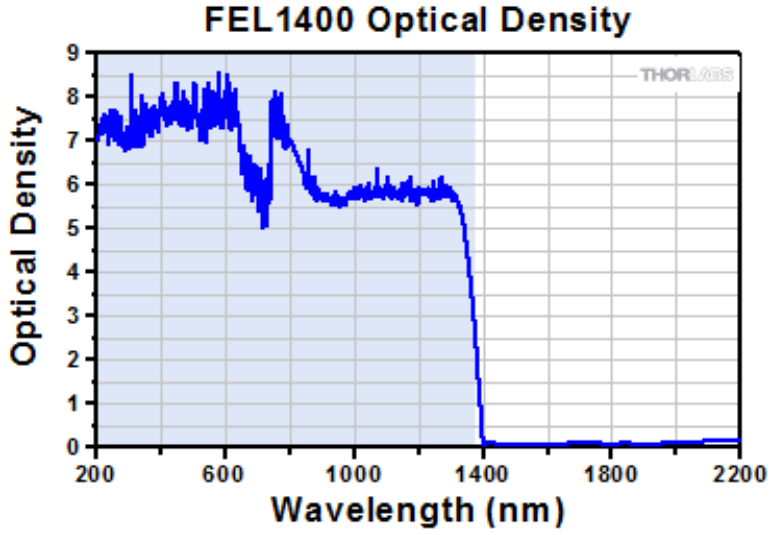
Storage Box for Mounted Filters

- Designed to Hold Ø25 mm and Ø50 mm Mounted ND Filters
- Protects Optics from Dust and Scratches
- Foam Inserts Separate Optics

The KT01 and KT02 are designed to hold filters that are housed in SM1-and SM2-threaded mounts respectively.

Part Number	Description	Price	Availability
KT01	**Storage Box for Mounted Ø1" (25 mm) Round Optics (Max. Capacity: 10)**	**$103.07**	**Today**
KT06	**Storage Box for Mounted Ø2" Round Optics (Max. Capacity: 10)**	**$103.07**	**Today**


FEL1400 Transmission
Transmission (%)
100
80
60
40
20
0
800
1000
1200
1400
1600
1800
2000
2200
Wavelength (nm)
THORLABS


FEL1400 Optical Density
Optical Density
9
8
7
6
5
4
3
2
1
0
200
600
1000
1400
1800
2200
Wavelength (nm)
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FEL1400