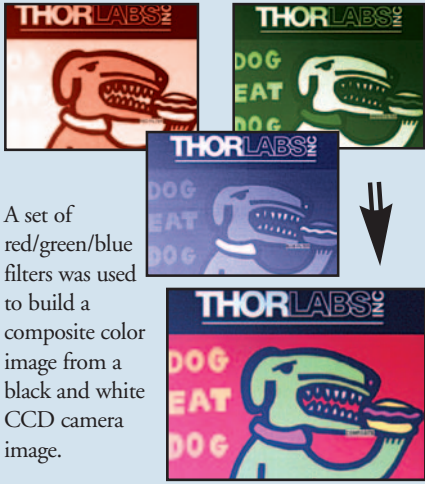


## Optics

### Dichroic Color Filters

Additive and subtractive dichroic color filters are used to separate color in CCD imaging, digital projection, machine vision, and printing. Each filter is designed so that it only transmits a small portion of the visible spectrum.

#### 3-Color Composite Image



A set of red/green/blue filters was used to build a composite color image from a black and white CCD camera image.

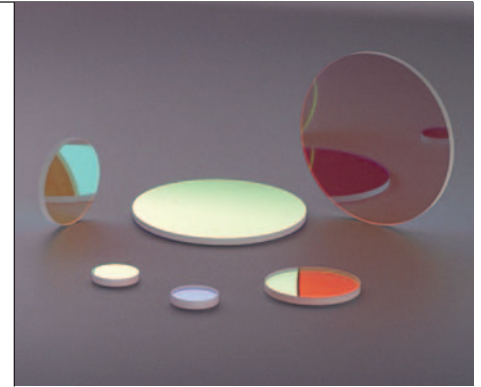
In the simplest case (as shown below) the red, green, and blue additive filters can be used in succession to produce a high-contrast color image from a black and white CCD image. Unlike traditional color CCD cameras, which make use of repetitive groups consisting of three spatially separated pixels, these color filters allow one to achieve the same effect without sacrificing resolution.

Dichroic color filters have many applications. For example, additive filters are commonly used in digital projection to enhance contrast. These kinds of filters also have benefits to machine

vision; a single filter can be placed in front of the CCD camera to increase contrast, thus making it easier to sort items. Copy machines and print preprocessing centers make use of subtractive filters to create images that will later be printed in ink.

- Will Not Fade Like Gels or Plastic Filters
- Variety of Sizes
- Multilayer Thin Film Coatings on Glass Substrates
- Also Available in Kits

In contrast to plastic filters or gels, these coatings can withstand high temperatures, provide unparalleled durability, and will not fade with time. Each filter in the filter set is mounted in an SM1 lens tube. The filter part number and filter color are engraved on the lens tube.

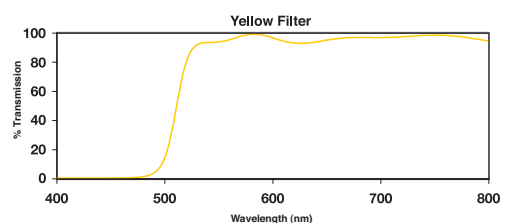
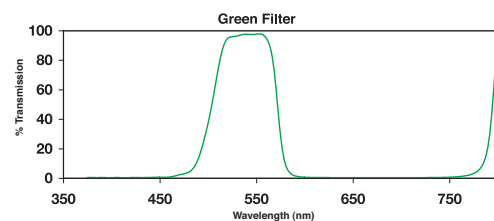
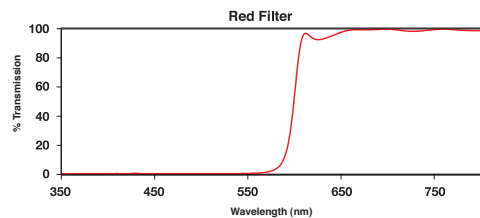
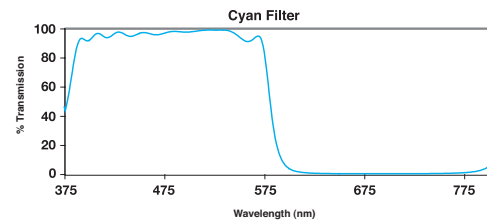
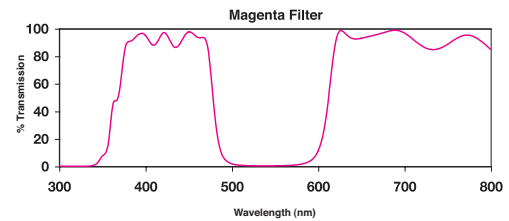
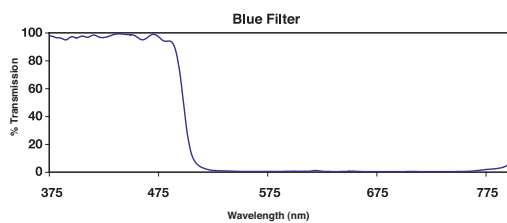


#### Preloaded Dichroic Color Filter Wheel

FW1ADF is a Filter Wheel that Comes Preloaded With All Six Ø1" Dichroic Color Filters

ITEM #	\$	£	€	RMB
FW1ADF	\$ 231.00	£ 145.50	€ 214.80	¥ 2,206.10

**Added Savings Over Buying The Pieces Individually**



Optical Systems

Free Space Isolators

E-O Devices

Spherical Singlets

Multi-Element Lenses

Cylindrical Lenses

Aspheric Lenses

Mirrors

Diffusers & Lens Arrays

Windows

Prisms

Gratings

Polarization Optics

Beamsplitters

Filters & Attenuators

Gas Cells

## Dichroic Color Filters (continued)

### Specifications

- **Angle of Incidence:** 0°
- **Scratch/Dig:** 80/50 MIL-0-13830A
- **Clear Aperture:** >90% Diameter
- **Temperature Range:** -50 to +80°C
- **Dimensional Tolerance:**
  - A) Ø12.7mm +0/-0.25mm
  - B) Ø25.4mm +0/-0.25mm
  - C) Ø50.8mm +0/-0.5mm
- **Thickness:** 2mm (Nominal)
- **Material:** Borofloat Glass

Individual Filter Specifications Appear to the Right

### Additive Filters:

- **RED**  
T: >75% Avg., 615-730nm  
T: <1% Avg., 380-550nm  
Cut-On: 585 ± 15nm
- **GREEN**  
T: >70% @ Peak  
T: <1% Avg., 400-460nm  
Low Edge: 505nm ± 15nm  
High Edge: 575 ± 15nm
- **BLUE**  
T: >85% Avg., 390-480nm  
T: <1% Avg., 540-750nm  
Cut-Off: 505 ± 15nm

### Subtractive Filters:

- **CYAN**  
T: >85% Avg., 390-530nm  
T: <1% Avg., 585-710nm  
Cut-Off: 555 ± 15nm
- **MAGENTA**  
T: >75% Avg., 395-440nm  
and 645-750nm  
T: <1% Avg., 500-590nm
- **YELLOW**  
T: >85% Avg., 550-750nm  
T: <1% Avg., 410-475nm  
Cut-On: 515 ± 15nm

### Ø1/2" Dichroic Color Filters

ITEM#	\$	£	€	RMB	DIAMETER	COLOR	DESCRIPTION
FD05R	\$ 18.30	£ 11.50	€ 17.00	¥ 174.80	Ø1/2"	Red	Unmounted Additive Dichroic Color Filter
FD05G	\$ 18.30	£ 11.50	€ 17.00	¥ 174.80	Ø1/2"	Green	Unmounted Additive Dichroic Color Filter
FD05B	\$ 18.30	£ 11.50	€ 17.00	¥ 174.80	Ø1/2"	Blue	Unmounted Additive Dichroic Color Filter
FD05C	\$ 18.30	£ 11.50	€ 17.00	¥ 174.80	Ø1/2"	Cyan	Unmounted Subtractive Dichroic Color Filter
FD05M	\$ 18.30	£ 11.50	€ 17.00	¥ 174.80	Ø1/2"	Magenta	Unmounted Subtractive Dichroic Color Filter
FD05Y	\$ 18.30	£ 11.50	€ 17.00	¥ 174.80	Ø1/2"	Yellow	Unmounted Subtractive Dichroic Color Filter

### Ø1" Dichroic Color Filters

ITEM#	\$	£	€	RMB	DIAMETER	COLOR	DESCRIPTION
FD1R	\$ 22.70	£ 14.30	€ 21.10	¥ 216.80	Ø1"	Red	Unmounted Additive Dichroic Color Filter
FD1G	\$ 22.70	£ 14.30	€ 21.10	¥ 216.80	Ø1"	Green	Unmounted Additive Dichroic Color Filter
FD1B	\$ 22.70	£ 14.30	€ 21.10	¥ 216.80	Ø1"	Blue	Unmounted Additive Dichroic Color Filter
FD1C	\$ 22.70	£ 14.30	€ 21.10	¥ 216.80	Ø1"	Cyan	Unmounted Subtractive Dichroic Color Filter
FD1M	\$ 22.70	£ 14.30	€ 21.10	¥ 216.80	Ø1"	Magenta	Unmounted Subtractive Dichroic Color Filter
FD1Y	\$ 22.70	£ 14.30	€ 21.10	¥ 216.80	Ø1"	Yellow	Unmounted Subtractive Dichroic Color Filter



### Ø2" Dichroic Color Filters

ITEM#	\$	£	€	RMB	DIAMETER	COLOR	DESCRIPTION
FD2R	\$ 31.30	£ 19.70	€ 29.10	¥ 298.90	Ø2"	Red	Unmounted Additive Dichroic Color Filter
FD2G	\$ 31.30	£ 19.70	€ 29.10	¥ 298.90	Ø2"	Green	Unmounted Additive Dichroic Color Filter
FD2B	\$ 31.30	£ 19.70	€ 29.10	¥ 298.90	Ø2"	Blue	Unmounted Additive Dichroic Color Filter
FD2C	\$ 31.30	£ 19.70	€ 29.10	¥ 298.90	Ø2"	Cyan	Unmounted Subtractive Dichroic Color Filter
FD2M	\$ 31.30	£ 19.70	€ 29.10	¥ 298.90	Ø2"	Magenta	Unmounted Subtractive Dichroic Color Filter
FD2Y	\$ 31.30	£ 19.70	€ 29.10	¥ 298.90	Ø2"	Yellow	Unmounted Subtractive Dichroic Color Filter



### Ø1" Dichroic Color Filter Kits

ITEM#	\$	£	€	RMB	DIAMETER	COLOR	DESCRIPTION
FD1S	\$ 95.60	£ 60.20	€ 88.90	¥ 913.00	Ø1"	CMY Set	Set of Three Ø1" SM1 Mounted Subtractive Filters
FD1A	\$ 95.60	£ 60.20	€ 88.90	¥ 913.00	Ø1"	RGB Set	Set of Three Ø1" SM1 Mounted Additive Filters
FD1D	\$ 191.10	£ 120.40	€ 177.70	¥ 1,825.00	Ø1"	CMYRGB	Set of All Six Ø1" SM1 Mounted Dichroic Filters


High-Resolution CCD Cameras, Sensitive Detectors, and Photomultiplier Tubes

Motor- and Piezo-Driven Stages and Controllers

Mounts and Accessories

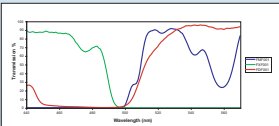


## Putting It All Together

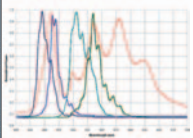
### Microscopy Accessories


Pages 623-646

Fluorescence and Extinction Filters and Filter Wheels



High-Power LEDs Designed to Mount Into Popular Microscopes





- Optical Systems
- Free Space Isolators
- E-O Devices
- Spherical Singlets
- Multi-Element Lenses
- Cylindrical Lenses
- Aspheric Lenses
- Mirrors
- Diffusers & Lens Arrays
- Windows
- Prisms
- Gratings
- Polarization Optics
- Beamsplitters
- Filters & Attenuators
- Gas Cells