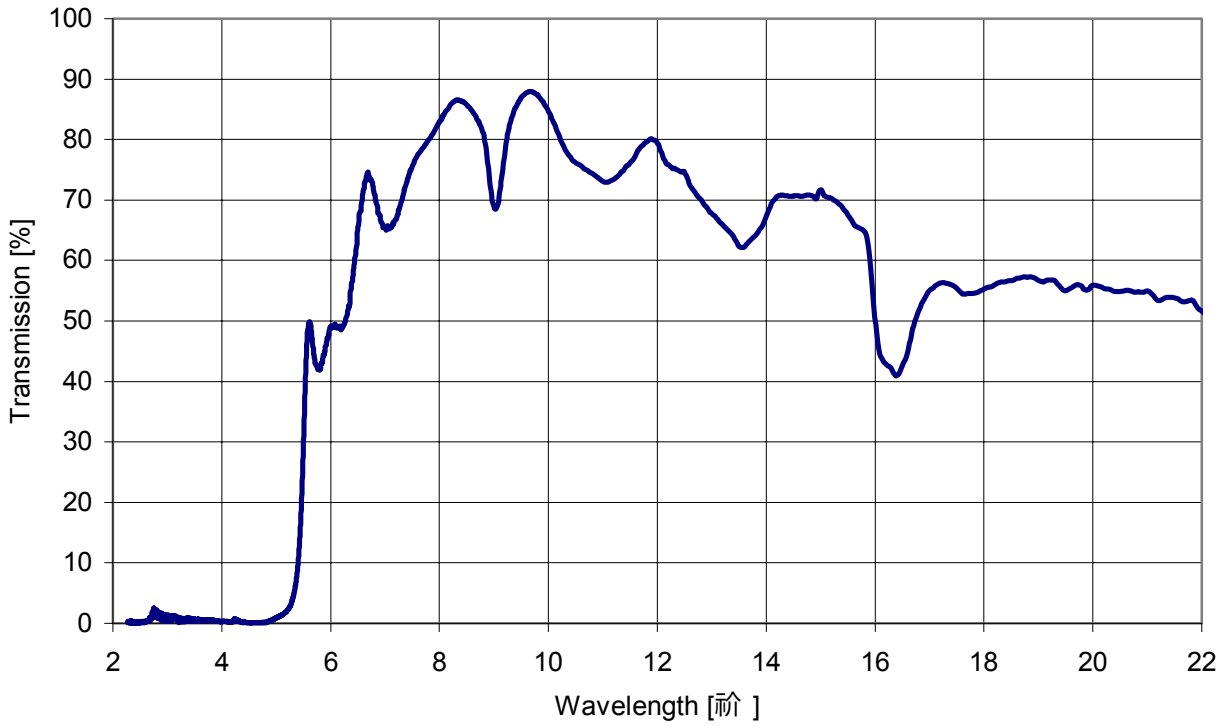
PerkinElmer™ optoelectronics.

technical data optical filters

Filter Type : STANDARD

Specification	
CUT ON Wavelength	**5.5µm**
CUT ON Tolerance Range	**±0.3µm**
Average Transmission from 7.5µm to 13.5µm	**≥70%**
Average Transmission from Visual to 5µm	**<0.5%**
Typical Filter Thickness	**0.525mm**
Base Material	**Silicon**

Sample Curve



(modifications reserved; 13-Jan-2000, J. Schilz)

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technical data optical filters

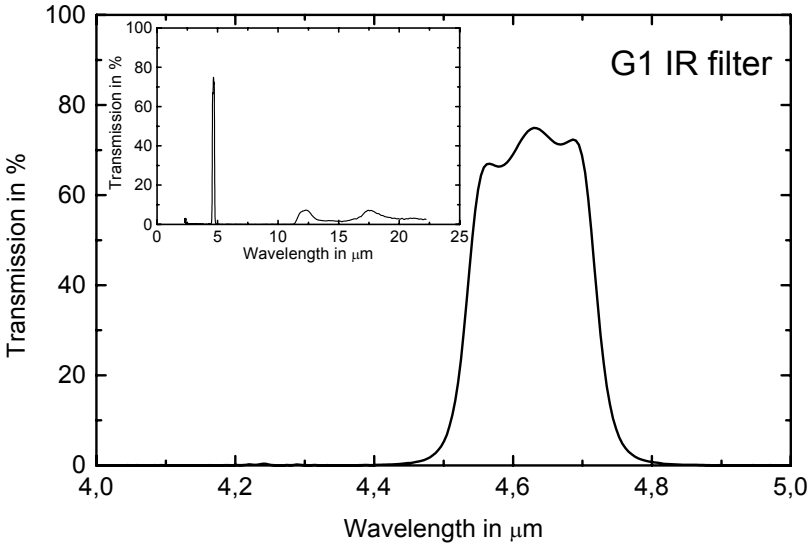
G1: 4% grade infrared bandpass filter for 4.64 μm (CO)

Filter Identifier	**G 1**
Matched to gas	**CO**

Specifications:

Center wavelength (CWL)	4.64 μm
CWL tolerance	±1%
Half power bandwidth (HPB)	180 nm
HPB tolerance	±20 nm
HPB / CWL	4%
Peak transmittance	>73%
Average transmittance from visual to bandpass region	≤0.1%
Peak transmission value from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 8 μm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

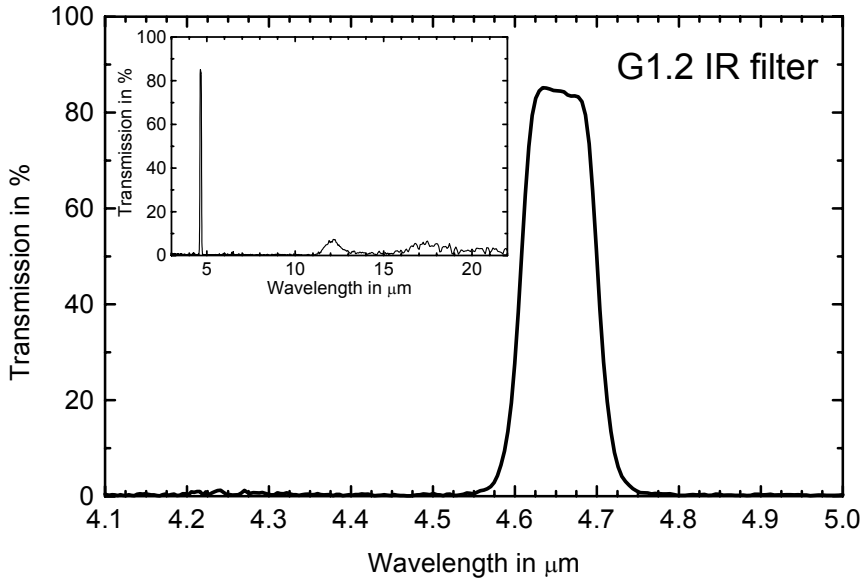
G1.2: 2% grade infrared bandpass filter for 4.66 μm (CO)

Filter Identifier	**G 1.2**
Matched to gas	**CO**

Specifications:

Center wavelength (CWL)	4.66 μm
CWL tolerance	±0.015 μm
Half power bandwidth (HPB)	90 nm
HPB tolerance	±10 nm
HPB / CWL	1.9%
Peak transmittance	>70%
Blocking out of band; average transmission up to 11 μm	≤0.1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

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technical data optical filters

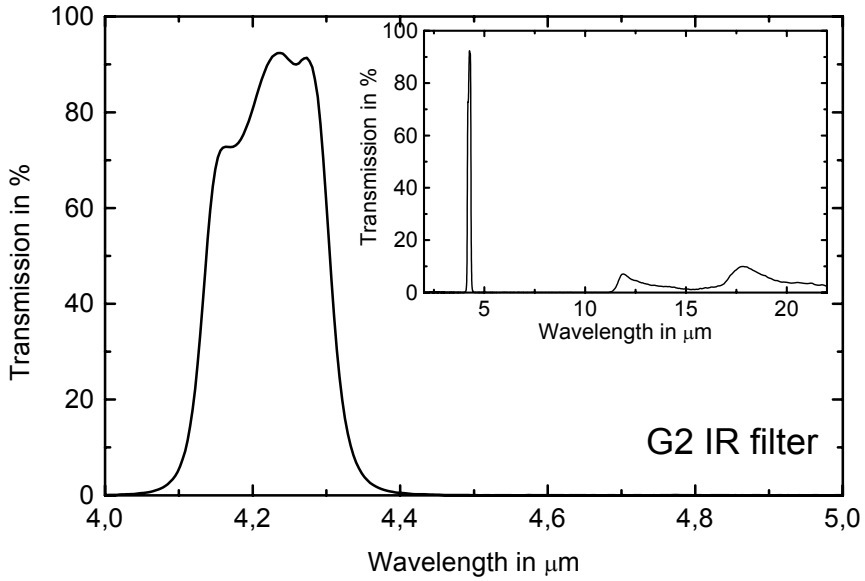
G2: 4% grade infrared bandpass filter for 4.26 µm (CO_2)

Filter Identifier	**G 2**
Matched to gas	**CO_2**

Specifications:

Center wavelength (CWL)	4.26 µm
CWL tolerance	±1%
Half power bandwidth (HPB)	180 nm
HPB tolerance	±20 nm
HPB / CWL	4.2%
Peak transmittance	>73%
Average transmittance from visual to bandpass region	≤0.1%
Peak transmission value from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 8 µm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

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technical data optical filters

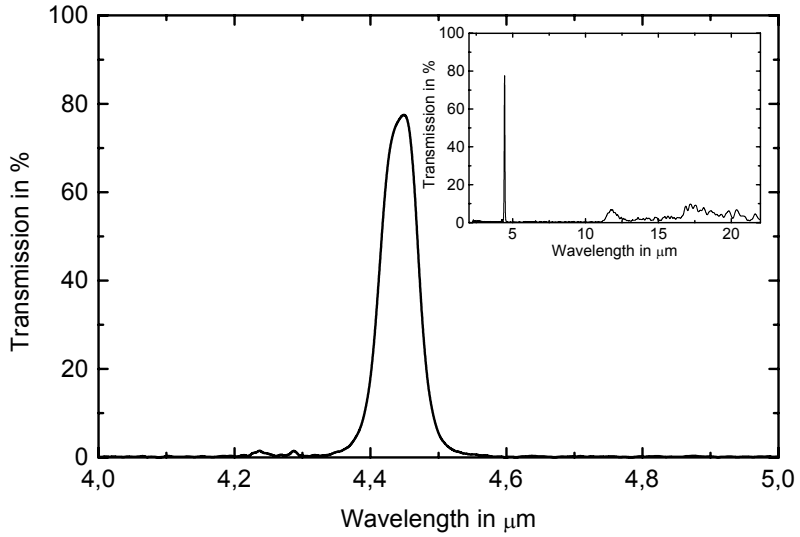
G2.2: 1.5% grade infrared bandpass filter for 4.43 μm (CO_2)

Filter Identifier	**G2.2 (this filter replaces G2.1!)**
Matched to gas	**CO_2**

Specifications:

Center wavelength (CWL)	4.43 μm
CWL tolerance	+40 nm / –0 nm
Half power bandwidth (HPB)	60 nm
HPB tolerance	±5 nm
HPB / CWL	1.4%
Peak transmittance	>70%
Average transmittance from visual to bandpass region	≤0.1%
Average transmittance from bandpass region to 10.5 μm	<0.1%
Peak transmittance from bandpass region to 10.5 μm	≤1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

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technical data optical filters

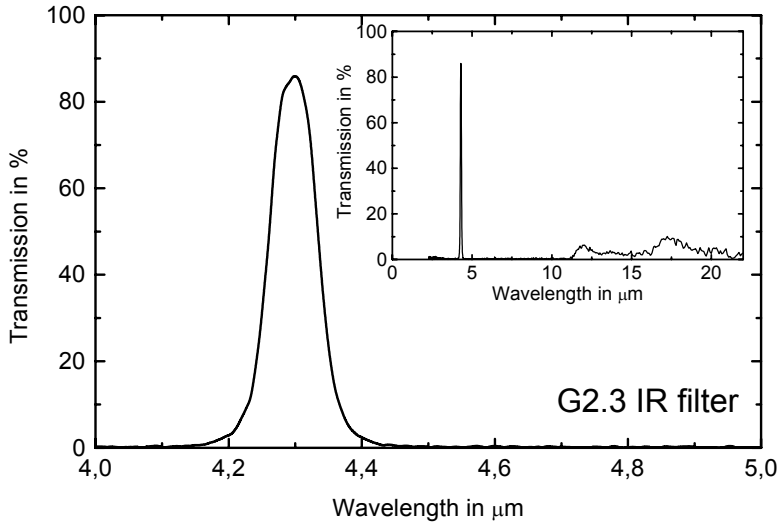
G2. 3: 2% grade infrared bandpass filter for 4.3 μm (CO_2)

Filter Identifier	**G2.3**
Matched to gas	**CO_2**

Specifications:

Center wavelength (CWL)	4.30 μm
CWL tolerance	±0.75%
Temperature coefficient of CWL	<0.01 %/K
Half power bandwidth (HPB)	85 nm
HPB tolerance	±10 nm
HPB / CWL	2%
Peak transmittance	>70%
Average transmittance from visual to bandpass region	≤0.1%
Average transmittance from bandpass region to 8 μm	<0.1%
Peak transmittance from bandpass region to 8 μm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

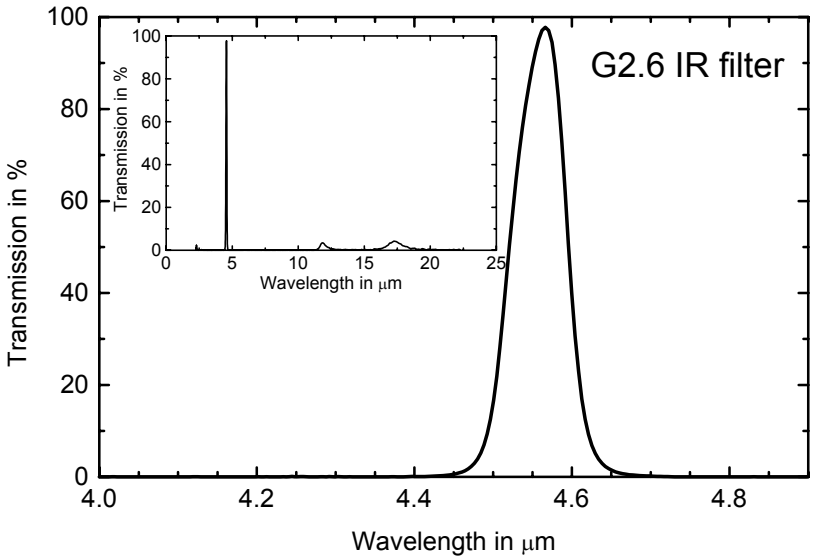
G2.6: 2% grade infrared bandpass filter for 4.66 μm (N_2O)

Filter Identifier	**G 2.6**
Matched to gas	**N_2O**

Specifications:

Center wavelength (CWL)	4.53 μm
CWL tolerance	±0.75%
Half power bandwidth (HPB)	85 nm
HPB tolerance	±10 nm
HPB / CWL	1.8%
Peak transmittance	>70%
Average transmittance from visual to bandpass region	<0.1%
Peak transmittance from bandpass region to 8 μm	<1%
Average transmission between 8 to 12 μm	<5%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

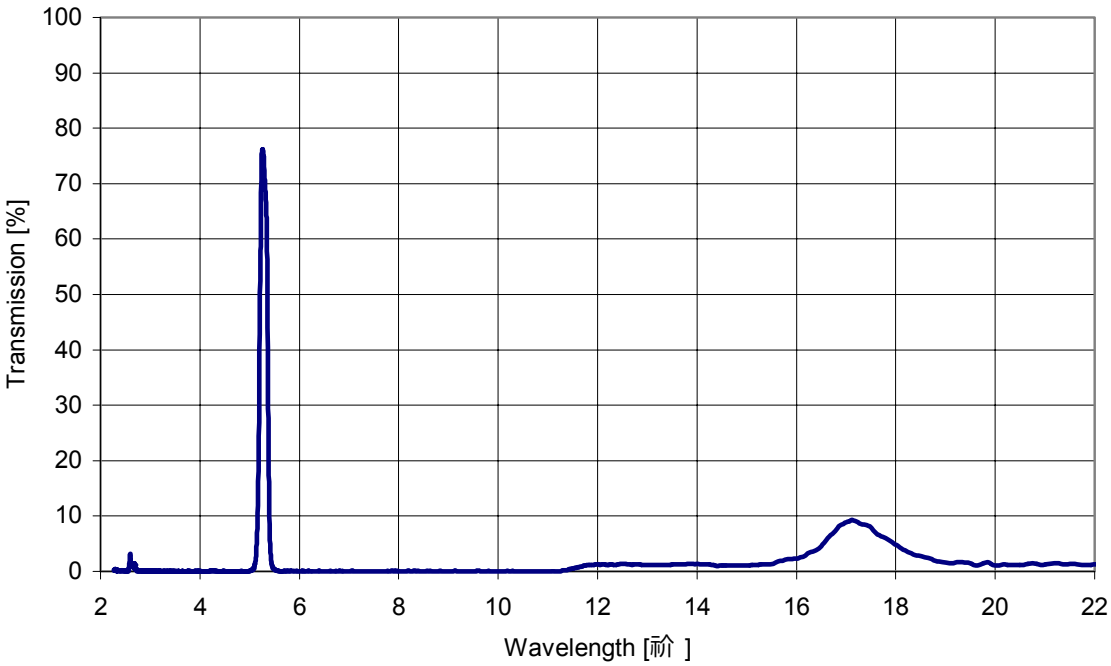
technical data optical filters

Filter Identifier	**G 4**
Gas Reference	**NO**

Specifications:

Center wavelength (CWL)	5,3 µm
CWL tolerance	±1%
Half power bandwidth (HPB)	180 nm
HPB tolerance	±20 nm
Peak transmittance	>73%
Average transmittance from visual to bandpass region	≤0.1%
Peak transmission value from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 8 µm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

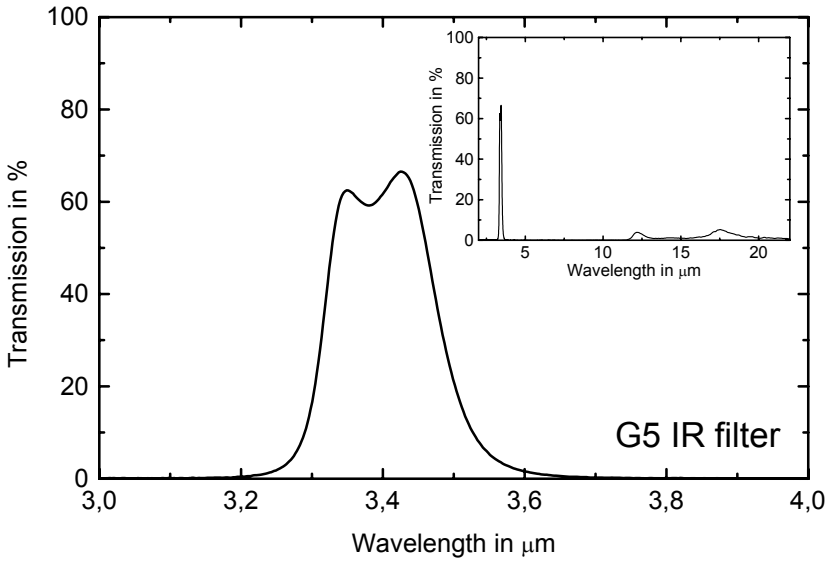
G5: 5% grade infrared bandpass filter for 3.4 µm (HC)

Filter Identifier	**G 5**
Matched to gas	**HC (ethane, propane)**

Specifications:

Center wavelength (CWL)	3.4 µm
CWL tolerance	±2%
Half power bandwidth (HPB)	180 nm
HPB tolerance	±20 nm
HPB / CWL	5.3%
Peak transmittance	>76%
Average transmittance from visual to bandpass region	≤0.1%
Peak transmission value from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 8 µm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

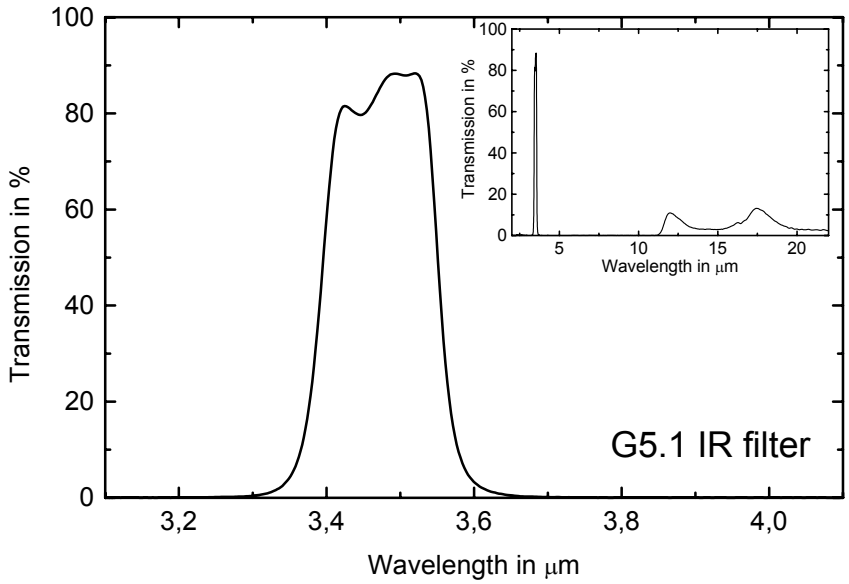
G5.1: 5% grade infrared bandpass filter for 3.46 µm (HC)

Filter Identifier	**G 5.1**
Matched to gas	**HC**

Specifications:

Center wavelength (CWL)	3.46 µm
CWL tolerance	±50nm
Half power bandwidth (HPB)	163 nm
HPB tolerance	±10 nm
HPB / CWL	4.7%
Peak transmittance	>70%
Average transmittance from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 8 µm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

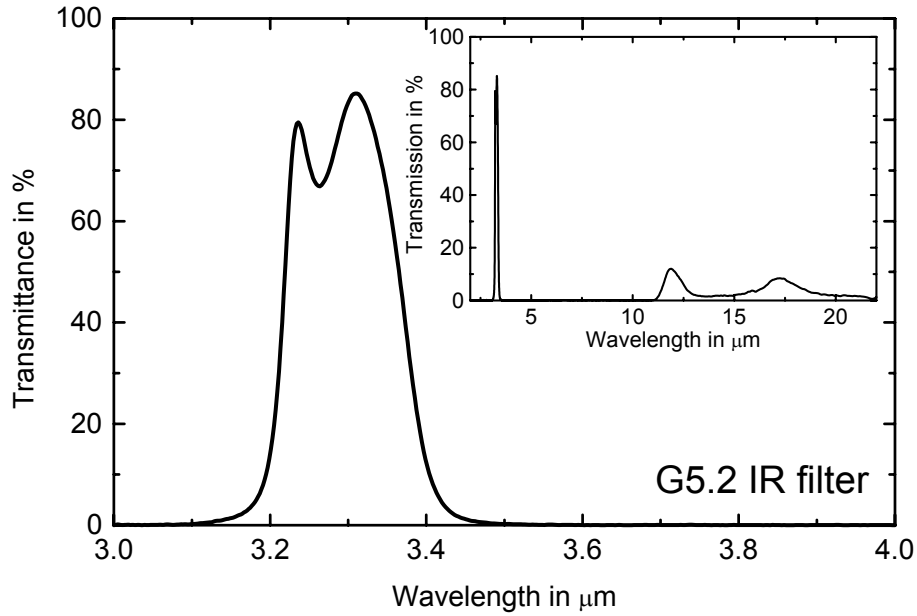
G5.2: 5% grade infrared bandpass filter for 3.3 μm (HC)

Filter Identifier	**G 5.1**
Matched to gas	**HC (methane)**

Specifications:

Center wavelength (CWL)	3.30 μm
CWL tolerance	±33nm
Half power bandwidth (HPB)	160 nm
HPB tolerance	±20 nm
HPB / CWL	4.8%
Peak transmittance	>70%
Average transmittance from visual to bandpass region	<0.1%
Peak transmittance from bandpass region to 8 μm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

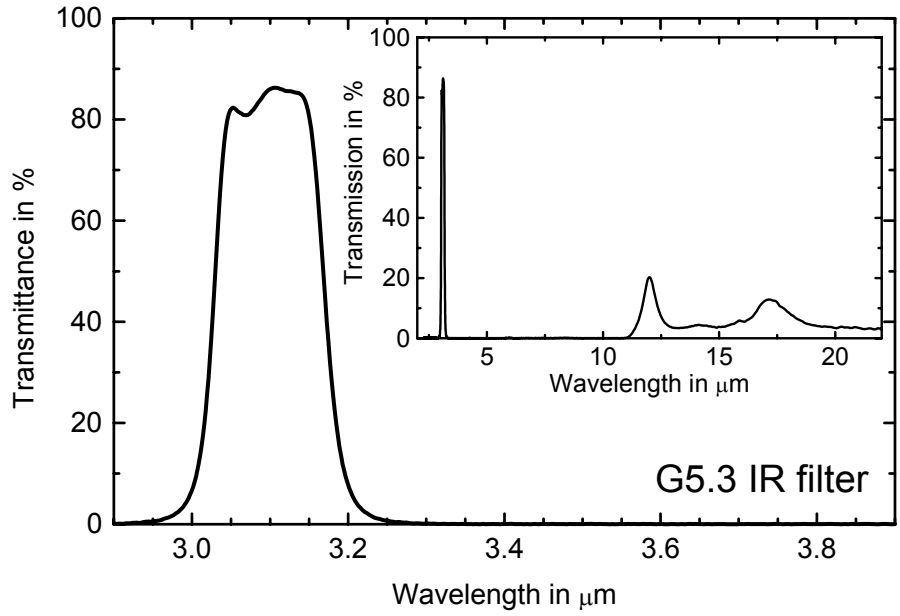
G5.3: 5% grade infrared bandpass filter for 3.09 μm (HC)

Filter Identifier	**G 5.3**
Matched to gas	**HC (reference)**

Specifications:

Center wavelength (CWL)	3.09 μm
CWL tolerance	±30nm
Half power bandwidth (HPB)	160 nm
HPB tolerance	±20 nm
HPB / CWL	5.2%
Peak transmittance	>70%
Average transmittance from visual to bandpass region	<0.1%
Peak transmittance from bandpass region to 8 μm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

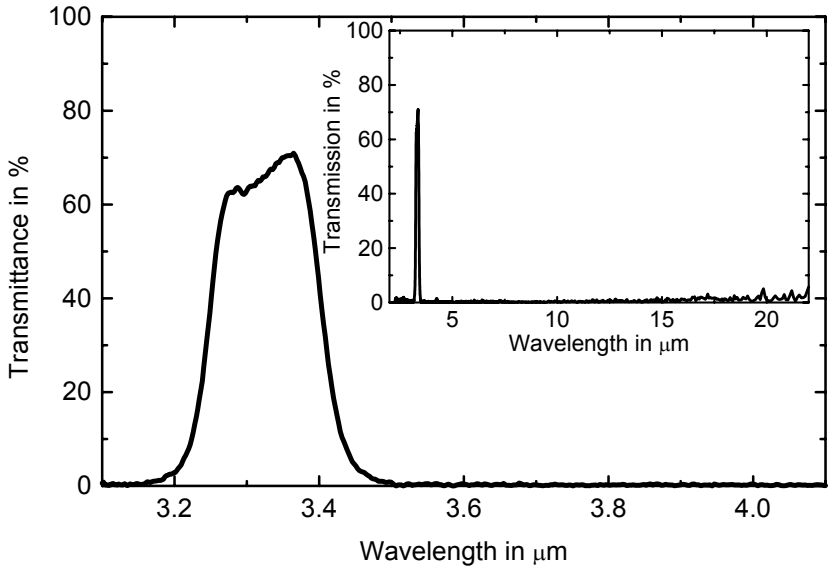
G5.5: 5% grade infrared bandpass filter for 3.33 μm (HC)

Filter Identifier	**G 5.5**
Matched to gas	**HC**

Specifications:

Center wavelength (CWL)	3.325 μm
CWL tolerance	±15 nm
Half power bandwidth (HPB)	160 nm
HPB tolerance	±20 nm
HPB / CWL	4.8%
Peak transmittance	>70%
Average transmittance from visual to bandpass region	<0.1%
Peak transmittance from bandpass region to 8 μm	<1%
Average transmittance from 8 to 12 μm	<5%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

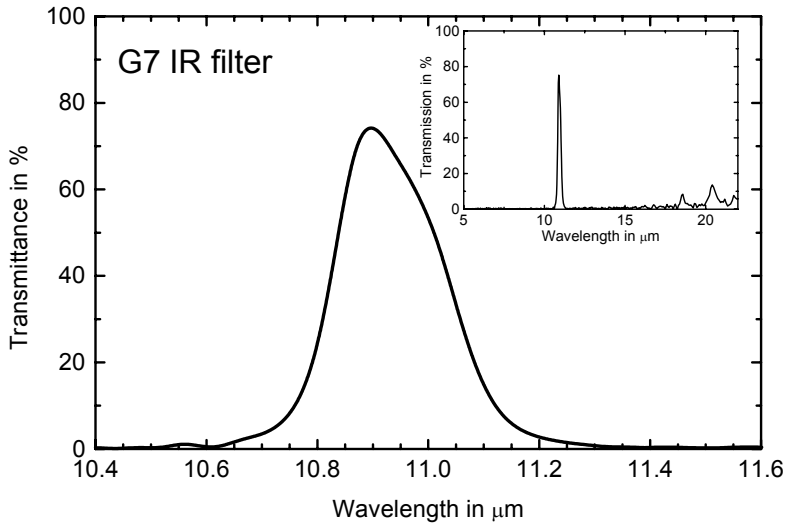
G7: 2.2% grade infrared bandpass filter for 10.9 μm

Filter Identifier	**G 7**
Matched to gas	**Freon**

Specifications:

Center wavelength (CWL)	10.9 μm
CWL tolerance	±0.5%
Half power bandwidth (HPB)	240 nm
HPB tolerance	±30 nm
HPB / CWL	2.2%
Peak transmittance	>65%
Average transmittance from visual to bandpass region	≤0.1%
Peak transmission value from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 17.5 μm	≤1%
Typical filter thickness	0.525 mm
Substrate material	germanium

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

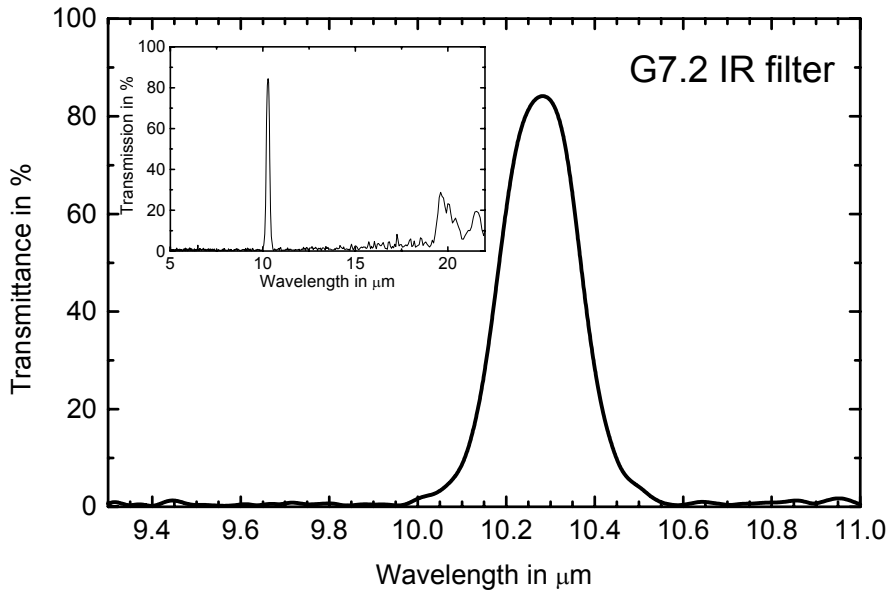
G7.2: 2% grade infrared bandpass filter for 10.27 μm (Freon R134a)

Filter Identifier	**G 7.2**
Matched to gas	**Freon R134a**

Specifications:

Center wavelength (CWL)	10.27 μm
CWL tolerance	±1%
Half power bandwidth (HPB)	210 nm
HPB tolerance	±20 nm
HPB / CWL	2%
Peak transmittance	>65%
Average transmittance from visual to bandpass region	≤0.1%
Peak transmission value from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 17.5 μm	≤1%
Substrate material	germanium

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

G9 infrared filter for pyrometry

Wide bandpass for 8 to 14 µm

• **Large transparency in the 2nd atmospheric window 8...14 µm, which makes transmission almost independent of air humidity.** • **Infrared filter for thermopile or pyroelectric sensors.**	• **Infrared filter especially suited for:** **thermopile-based remote temperature measurement devices,** **pyrometry.** • **Filter is applied in e.g. the following PerkinElmer thermopile sensors:** **TPS 334 G9** **TPS 434 G9**

Contents

General product description

The PerkinElmer infrared (IR) filters are passive devices consisting of multiple layers of thin dielectric films on both sides of a substrate. The layer materials, the thickness of the different film, their order and their number on each side determine the transmission characteristics of the filter.
Every PerkinElmer thermopile and every PerkinElmer pyroelectric detector is equipped with an infrared filter which not only protects the respective sensor but also plays a major role in determining the response of the detector to an IR source.

Technical data

The G9 filter is a wide bandpass with the transmission window of 8 to about 14 µm. This region is the so-called second atmospheric window – a wavelength region not disturbed by water absorption. Pyrometers with its spectral response confined to this region are therefore applicable for long distance temperature measurements. The figure shows a sample curve of the transmission characteristics.

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technical data optical filters

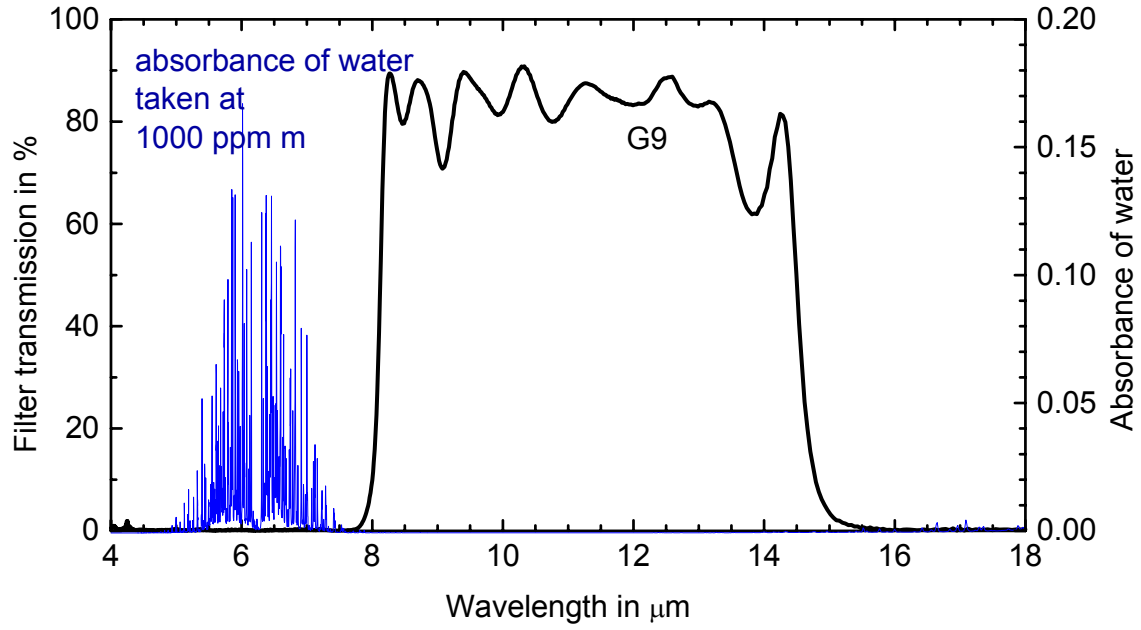

Figure 1: Transmittance of the PerkinElmer IR filter G9 together with the absorption spectrum of water in the wavelength region 4 to 18 µm. The absorbance is defined as $k \cdot c \cdot l$, with k the absorption coefficient and $c \cdot l$ the concentration – absorption-length product, which is 1000 ppm·m in the current data.

For thermopile sensors as e.g. TPS 334 or TPS 434, this window is directly sealed into the sensor cap. This leads to the devices TPS 334 G9 or TPS 434 G9.
For the lens equipped thermopile sensor TPS 334-L10.6 the window will be additionally inserted *into* the housing.
The optical specifications are listed in the following table.

Filter Identifier	**G 9**
Device number	**25500633**
Application	pyrometry
Cuton wavelength defined at half power point	8 µm
Tolerance of cuton wavelength	±0.2 µm
Cutoff wavelength defined at half power point	14 µm
Tolerance of cuton wavelength	±0.5 µm
Average transmittance from 9 to 13 µm	≥75%
Average transmittance from visual to bandpass	≤1%
Average transmittance from bandpass region to 20 µm	≤1%
Typical filter thickness	0.525 mm
Substrate material	Silicon

(modifications reserved; 13-Jan-2000, J. Schilz)

Application hints

If you design a device for remote temperature measurements for distances larger – let's say –10 cm, the application of the G9 filter may already be recommended. It is especially recommended if the measurement of the pyrometer takes place under varying humidity conditions.
For short measurement distances – here especially to mention the ear thermometer or the application in a microwave oven – or for industrial applications, where the conditions do not vary considerably, the employment of the G9 filter is not an essential requirement. Please check in your application. PerkinElmer is happy to assist you.

Quality statement

PerkinElmer Optoelectronics is an ISO 9001 certified manufacturer with established SPC and TQM. All materials are checked according to specifications and final goods meet the specified tests.

Contact PerkinElmer Optoelectronics

Please visit our website: http://www.perkinelmer.com
For thermopile sensors please contact PerkinElmer Optoelectronics GmbH directly in Wiesbaden, Germany:

- PerkinElmer Optoelectronics GmbH
  Wenzel-Jaksch-Str. 31, D-65199 Wiesbaden, Germany
  Phone: +49 (611) 492-493 Fax: +49 (611) 492-228

USA customers please contact:

PerkinElmer Optoelectronics Inc.
Santa Clara, CA, 2175 Mission College Blvd., Santa Clara, CA 95054
Phone: +1 (408) 565-0830, Fax: +1 (408) 565-0703
Toll Free within USA: 800-775-OPTO (6786)
E-mail: opto@perkinelmer.com

For Asia:

PerkinElmer Optoelectronics
47 Ayer Rajah Crescent #06-12, Singapore 139947
Phone: +65 775-2022 Fax: +65 777-2196

The contents of this document are subject to change without notice. Customers are advised to consult with PerkinElmer Optoelectronics sales representatives before ordering.

Customers considering the use of PerkinElmer Optoelectronics thermopile or pyroelectric devices in special applications where failure or abnormal operation may directly affect human lives or cause physical injury or property damage, or where extremely high levels of reliability are demanded, are requested to consult with PerkinElmer Optoelectronics sales representatives before such use. The company will not be responsible for damage arising from such use without prior approval.

As any semiconductor device, thermopile or pyroelectric sensors or modules have inherently a certain rate of failure. It is therefore necessary to protect against injury, damage or loss from such failures by incorporating safety design measures into the equipment.

(modifications reserved; 13-Jan-2000, J. Schilz)

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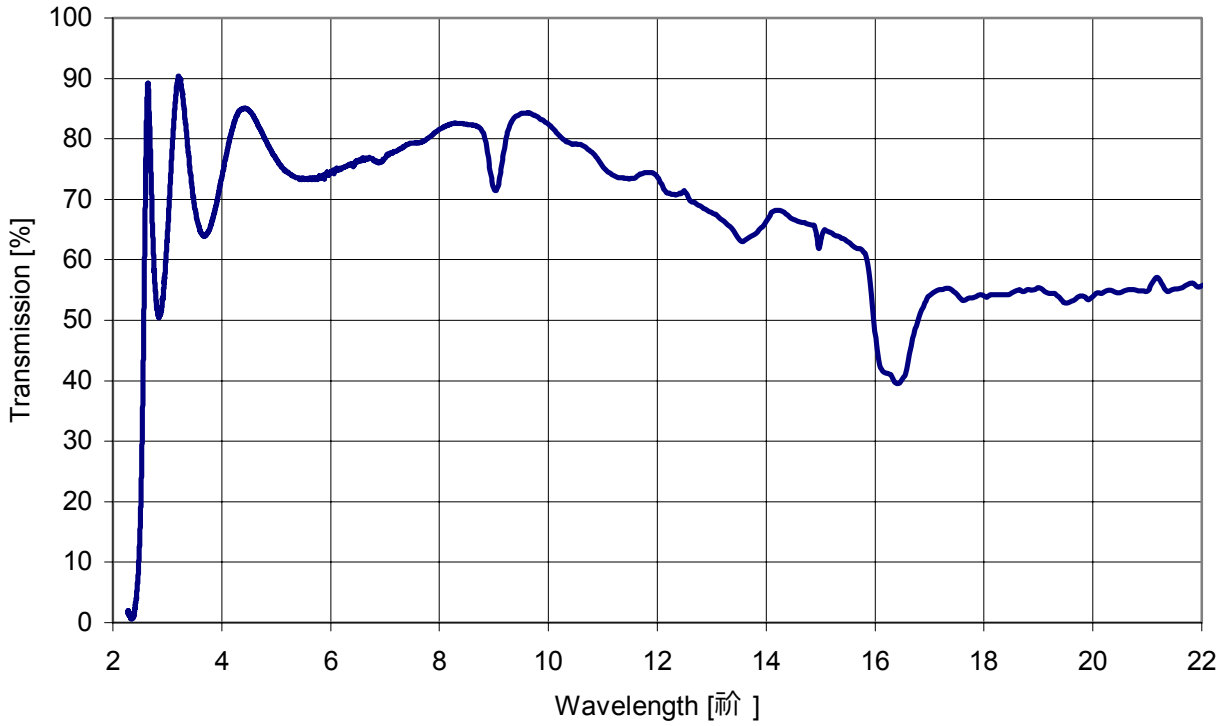
technical data optical filters

Filter Type : G10

Specification

Average Transmission from 3µm to 13.5µm	**≥70%**
Typical Filter Thickness	**0.525mm**
Base Material	**Silicon**

Sample Curve



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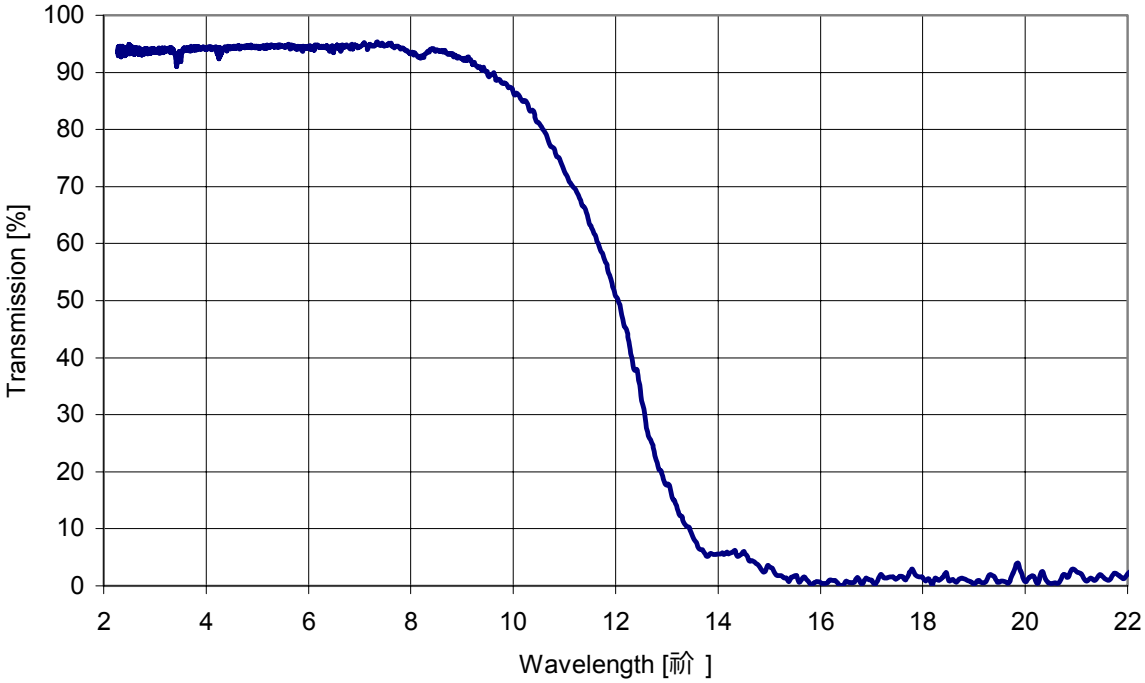
technical data optical filters

Filter Type G11

Filter Identifier	**G 11**
Specifications:	
Substrate material	Calcium Fluoride

Sample curve



(modifications reserved; 13-Jan-2000, J. Schilz)

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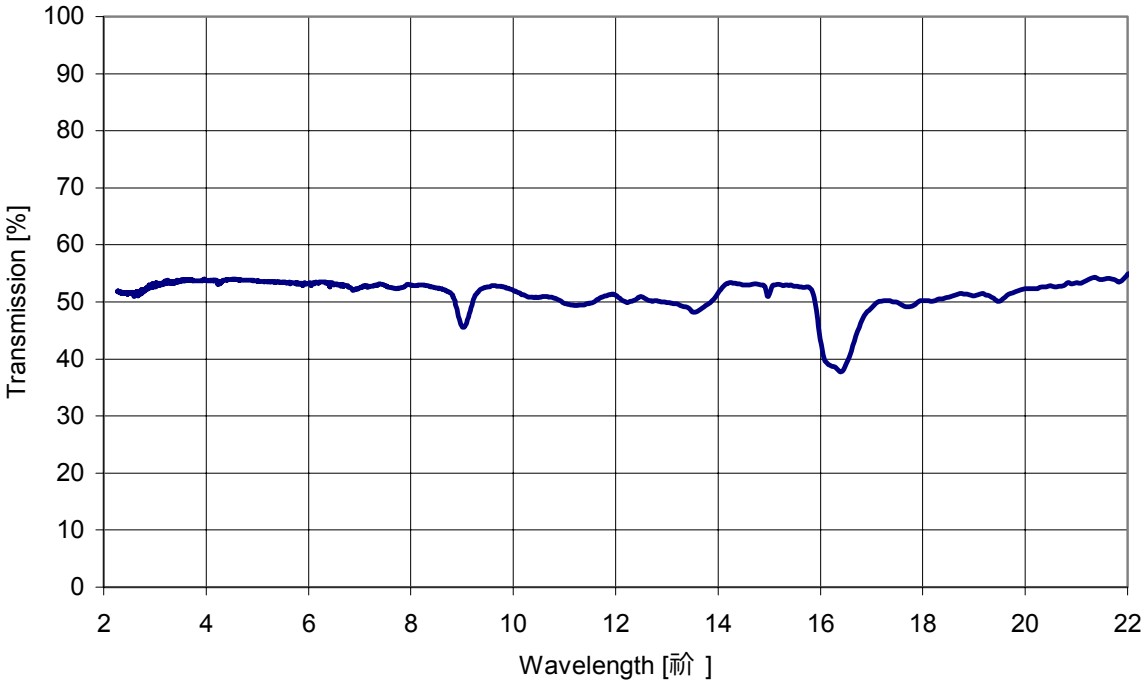
Filter Type : G12

Specification

Typical Filter Thickness	**0.525mm**
Base Material	**Silicon**

Uncoated !

Sample Curve



(modifications reserved; 13-Jan-2000, J. Schilz)

PerkinElmer™ optoelectronics.

technical data optical filters

G14 infrared filter

Enhanced transmission in the 3 to 5 µm range

• **Infrared filter for thermopile or pyroelectric sensors.** • **Enhanced transparency in the wavelength range 3...5 µm, i.e. the 1st atmospheric window. This is the operating region for infrared absorption gas detectors.**	• **especially suited as additional protection filter for infrared gas detectors working in the 3...5 µm range,** • **limited use as pyrometer filter for the first atmospheric window 3..5 µm.**

Contents

General product description

The PerkinElmer infrared (IR) filters are passive devices consisting of multiple layers of thin dielectric films on both sides of a substrate. The layer materials, the thickness of the different film, their order and their number on each side determine the transmission characteristics of the filter.
Every PerkinElmer thermopile and every PerkinElmer pyroelectric detector is equipped with an infrared filter which not only protects the respective sensor but also plays a major role in determining the response of the detector to an IR source.

Technical data

The G14 infrared filter has an enhanced transmission in the 3 to 5 µm IR region. This is the wavelength range, where many IR-based gas detectors operate. (E.g. the CO_2 absorption band is found around 4.25 µm.) Therefore the filter is suited as additional protection filter in spectroscopic applications.
The wavelength range 3..5 µm is the so-called first atmospheric window. Since the transmission of the G14 filter is very high in this range, it can also be applied as pyrometer optics for target temperatures higher than about 300 °C. There is a limited applicability, however, since there is still high transmittance in regions where water absorption is significant.
The figure shows a sample curve of the transmission characteristics.

(modifications reserved; 13-Jan-2000, J. Schilz)

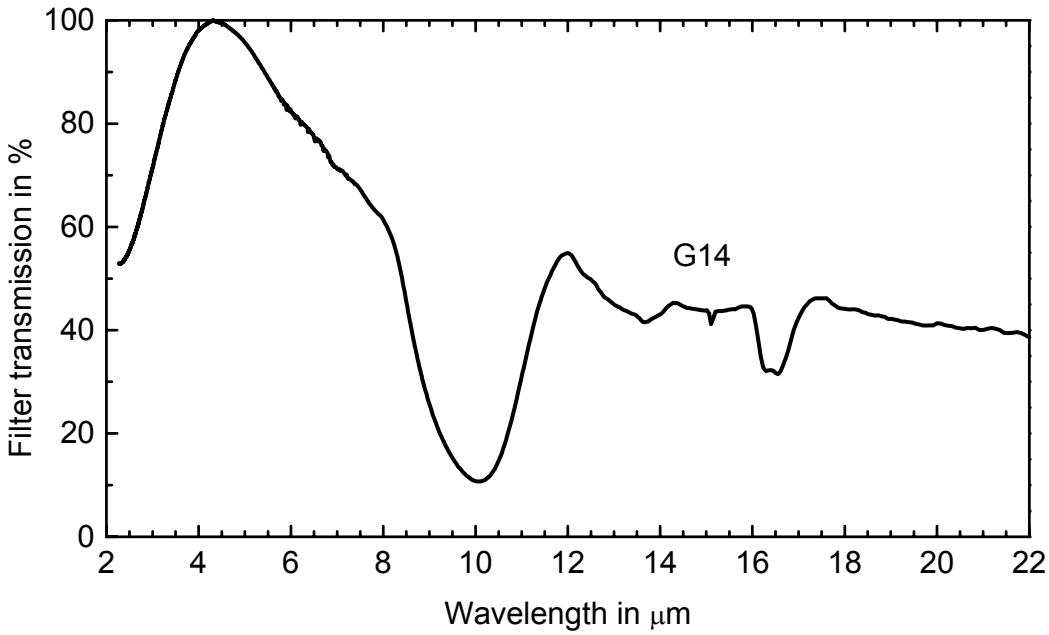


Figure 2: Transmittance of the PerkinElmer IR filter G14 in the wavelength region 2 to 22 µm.

The optical specifications are listed in the following table.

Filter Identifier	**G 14**
Device number	**26500540**
Application	protection filter
Average transmittance from 3 to 5 µm	≥70%
Typical filter thickness	0.525 mm
Substrate material	silicon

Quality statement

PerkinElmer Optoelectronics is an ISO 9001 certified manufacturer with established SPC and TQM. All materials are checked according to specifications and final goods meet the specified tests.

Contact PerkinElmer Optoelectronics

Please visit our website: http://www.perkinelmer.com
For thermopile sensors please contact PerkinElmer Optoelectronics GmbH directly in Wiesbaden, Germany:

- PerkinElmer Optoelectronics GmbH
  Wenzel-Jaksch-Str. 31, D-65199 Wiesbaden, Germany

(modifications reserved; 13-Jan-2000, J. Schilz)

Phone: +49 (611) 492-493 Fax: +49 (611) 492-228

USA customers please contact:

- PerkinElmer Optoelectronics Inc.
  Santa Clara, CA, 2175 Mission College Blvd., Santa Clara, CA 95054
  Phone: +1 (408) 565-0830, Fax: +1 (408) 565-0703
  Toll Free within USA: 800-775-OPTO (6786)
  E-mail: opto@perkinelmer.com

For Asia:

- PerkinElmer Optoelectronics
  47 Ayer Rajah Crescent #06-12, Singapore 139947
  Phone: +65 775-2022 Fax: +65 777-2196

The contents of this document are subject to change without notice. Customers are advised to consult with PerkinElmer Optoelectronics sales representatives before ordering.

Customers considering the use of PerkinElmer Optoelectronics thermopile or pyroelectric devices in special applications where failure or abnormal operation may directly affect human lives or cause physical injury or property damage, or where extremely high levels of reliability are demanded, are requested to consult with PerkinElmer Optoelectronics sales representatives before such use. The company will not be responsible for damage arising from such use without prior approval.

As any semiconductor device, thermopile or pyroelectric sensors or modules have inherently a certain rate of failure. It is therefore necessary to protect against injury, damage or loss from such failures by incorporating safety design measures into the equipment.

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PerkinElmer™ optoelectronics.

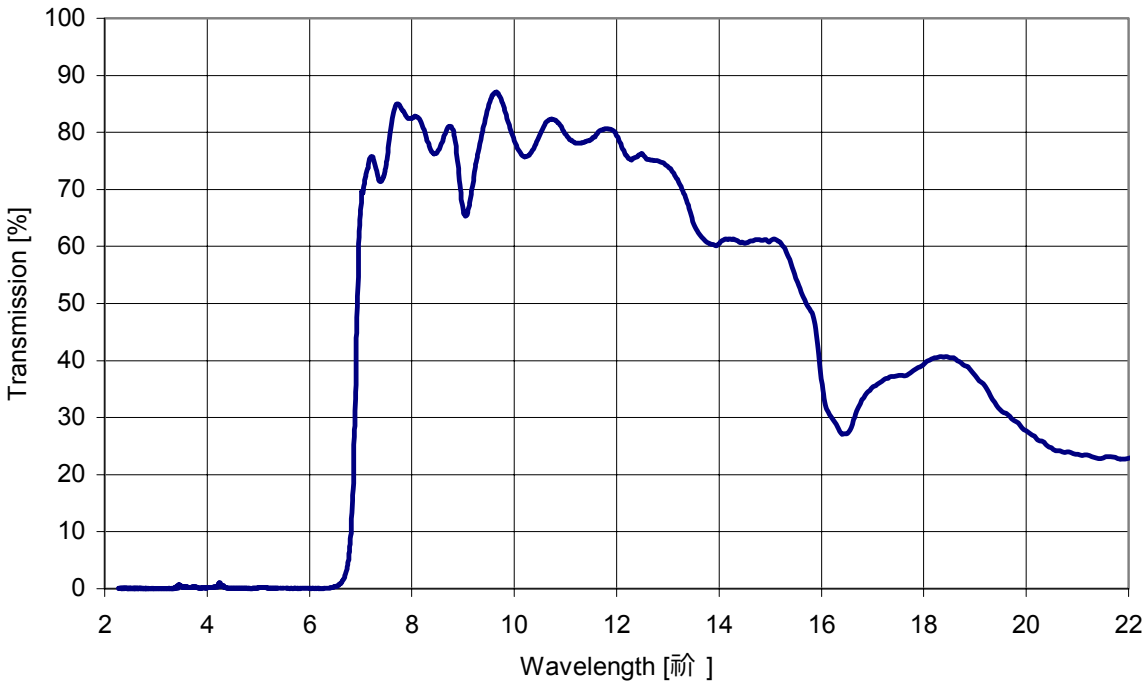
technical data optical filters

Filter Type : G15

Specification

CUT ON Wavelength	**6.613µm**
CUT ON Tolerance Range	**±0.3µm**
Average Transmission from 7.5µm to 14µm	**≥70%**
Average Transmission from Visual to Passband	**<0.5%**
Typical Filter Thickness	**0.525mm**
Base Material	**Silicon**

Sample Curve



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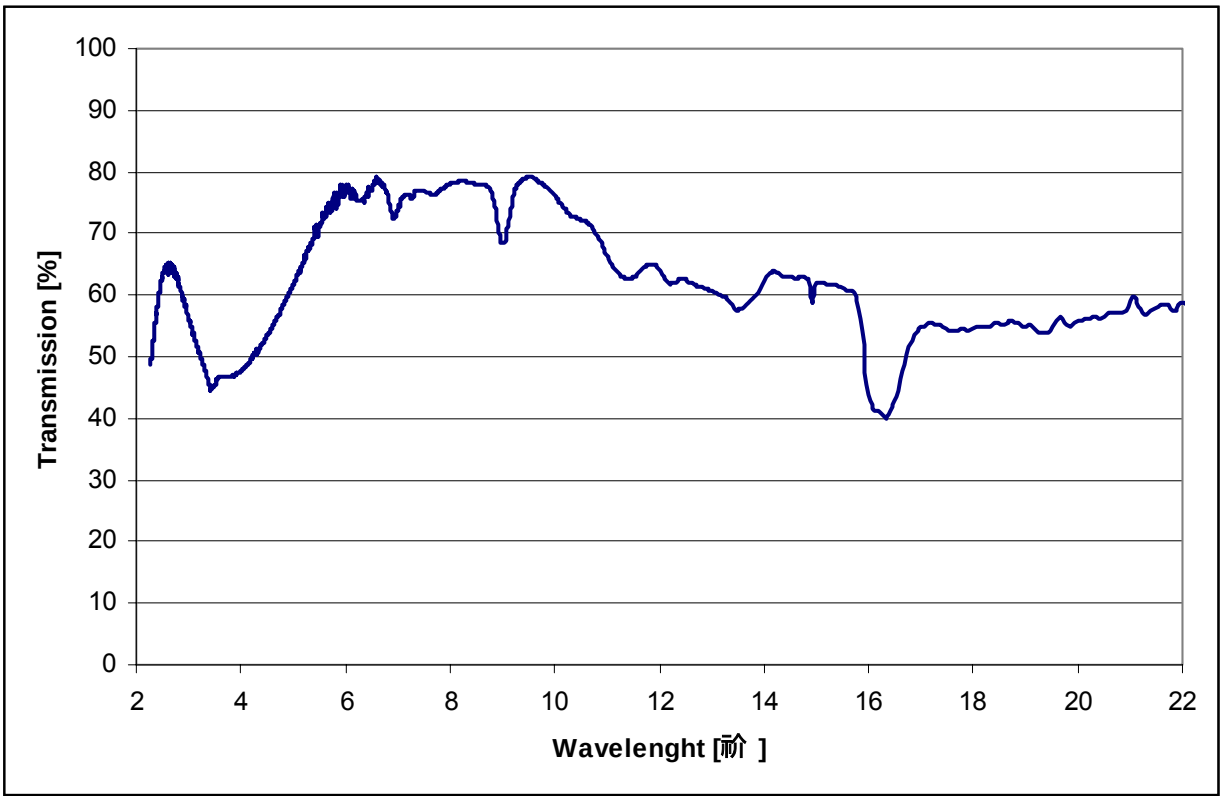
technical data optical filters

Filter Type : G16

Specification

Average Transmission from 6µm to 10µm	**≥70%**
Typical Filter Thickness	**0.525mm**
Base Material	**Silicon**
Coating	**Hardcarbon**

Sample Curve



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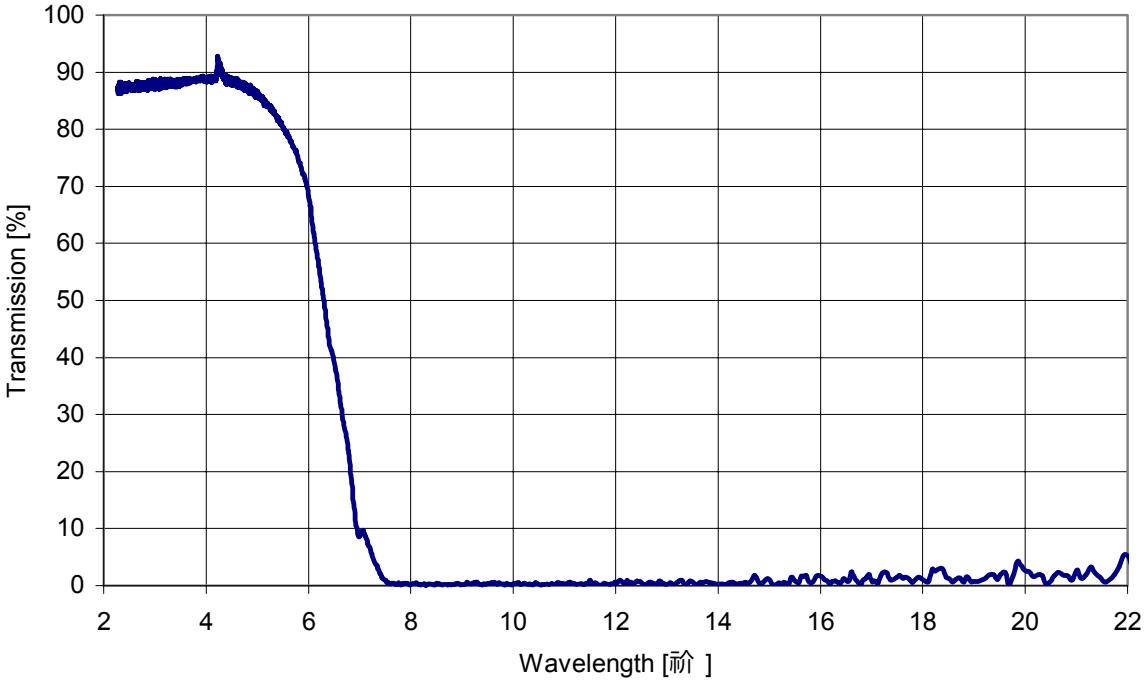
PerkinElmer™ optoelectronics.

technical data optical filters

Filter Type : Sapphire (G17)

Sample Curve



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technical data optical filters

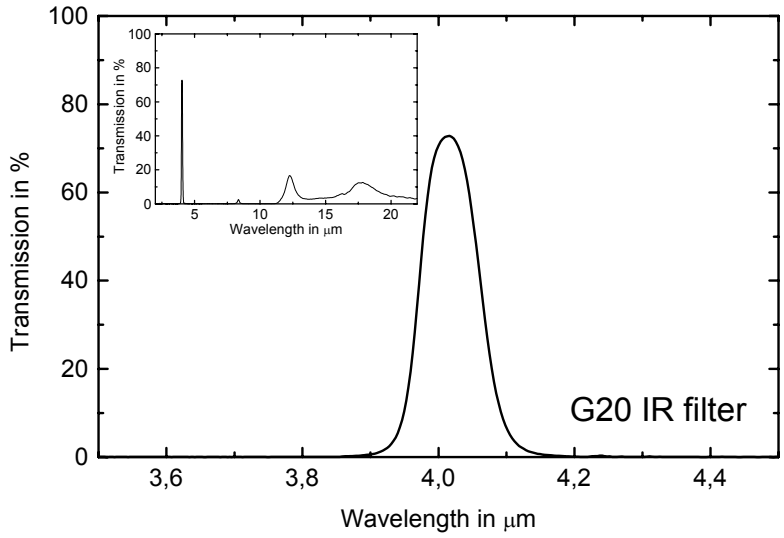
G20: 2% grade infrared bandpass filter for 4.0 µm

Filter Identifier	**G 20**
Matched to gas	**none – reference channel**

Specifications:

Center wavelength (CWL)	4.0 µm
CWL tolerance	±2%
Half power bandwidth (HPB)	90 nm
HPB tolerance	±20 nm
HPB / CWL	2.3%
Peak transmittance	>76%
Average transmittance from visual to bandpass region	≤0.1%
Peak transmission value from visual to bandpass region	≤1%
Peak transmittance from bandpass region to 8 µm	<1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



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PerkinElmer™ optoelectronics.

technical data optical filters

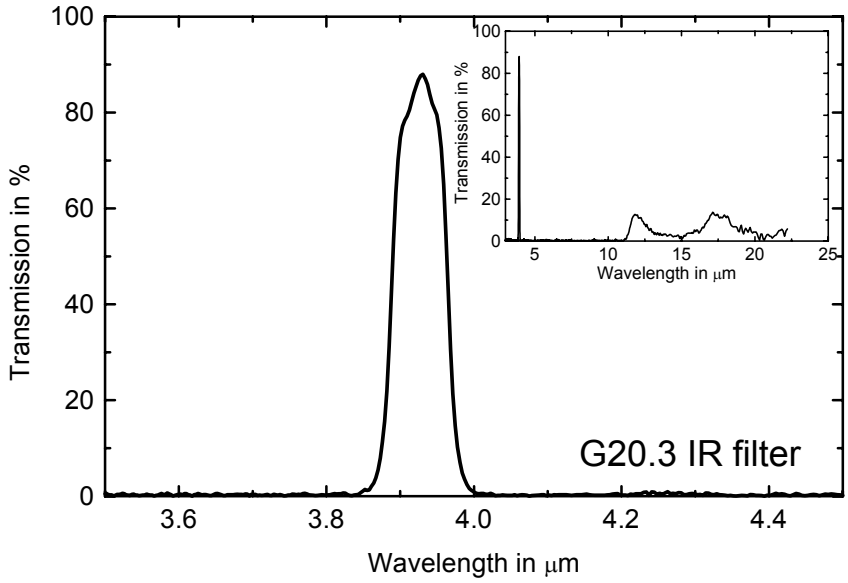
G20.3: 2% grade infrared bandpass filter for 3.93 µm

Filter Identifier	**G 20.3**
Matched to gas	**none – reference channel**

Specifications:

Center wavelength (CWL)	3.93 µm
CWL tolerance	±0.02 µm
Half power bandwidth (HPB)	75 nm
HPB tolerance	±10 nm
HPB / CWL	1.9%
Peak transmittance	>65%
Blocking out of band; average transmission up to 11 µm	≤0.1%
Typical filter thickness	0.525 mm
Substrate material	silicon

Sample curve



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