

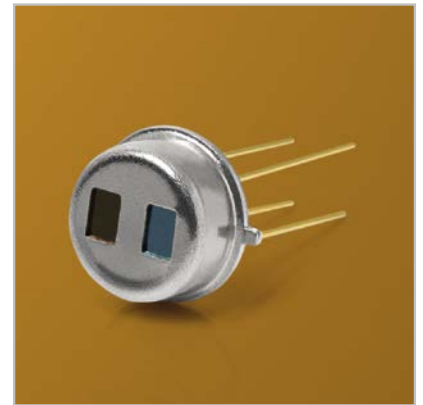
Pyroelectric Detectors Filter and Window Selection

The pyroelectric detector configuration is concluded with an appropriate window or filter specification.

Depending on the application, the filter / window defines the spectral sensitivity of the pyroelectric element, also providing a reliable hermetic sealing of the optical interface between the detector and its environment.

Please note that if pyro electric detectors are required without any filter or window, we cannot offer any warranty on the functionality of the device.

The detector designation includes the filter / window description via codes according to the following tables.



Apertures:

Numbers are used for filters (see table 1) for applications that require a large aperture / field of view e.g. flame detection. Here the detector aperture is normally $5 \times 5 \text{ mm}^2$ for single channel detectors.

Letters are used for filters in applications where a small aperture is sufficient. Here the aperture is $3.5 \times 3.5 \text{ mm}^2$ for single channel detectors.

For the windows (see table 2) in general the aperture is $5 \times 5 \text{ mm}^2$ for single channel detectors. However other apertures are available on request.

Multi Channels:

If the detector has more than one channel, filters are arranged in the following order:

Dual channel: The reference is placed on channel 2.

Example:

LT.....-AH: channel 1: filter NBP4.265-110nm
channel 2: filter NBP3.95-90nm (reference)

Triple / Quad channel: The reference is placed on channel 1.

The other filters are arranged in ascending order of the center wavelength.

Example:

LT.....-HGEK: channel 1: filter NBP3.95-90nm (reference)
channel 2: filter NBP3.40-120nm (HC)
channel 3: filter NBP4.45-60nm (CO₂ long path)
channel 4: filter NBP4.74-140nm (CO flank)

Standard Gas Sensor Filters

The choice of IR filter including the center wavelength (CWL), the optical bandwidth (HPBW), the minimum transmission and the blocking are very dependent on the gas to be detected, the optical system in which the detectors will be used and the performance over the required temperature range.

In particular the filters's band shape, the filter's substrate material, and the HPBW are performance drivers that must be considered in any gas sensor design.

After many years of experiences in the field of gas sensing, we have selected a range of filters that cover the main applications.

Standard NBP filters are coated on silicon substrates, 0.4 - 0.7 mm thick. Blocking is guaranteed up to 10 µm for all filters up to 6 µm (CWL). For above 6 µm CWL-filters, blocking is guaranteed up to min. 1.3 µm.

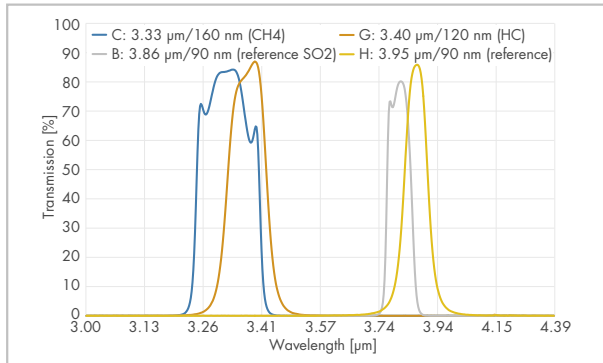
General quality specification:

Surface quality: F-F or better per MIL-F-48616
Environment durability: acc. to MIL-F-48616
(Temperature §4.6.9.1, Humidity §4.6.8.2, Moderate abrasion §4.6.8.3, Adhesion §4.6.8.1, Solubility and Cleanability §4.6.9)

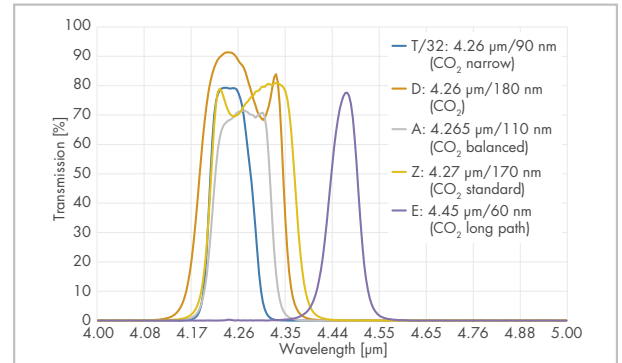
	Code* <small>* Letter for small aperture (standard) / Number for large aperture</small>	Application	Comments	CWL [μm]	HPBW [nm]	Angle shift @ AOI 15° [nm]	Temperature shift [nm/K]
NBP3.33-160nm	C	CH ₄ - Methane		3.33 ± 20 nm	160 ± 20 nm	≤ -20	< +0.50
	35						
NBP3.40-120nm	G	HC		3.40 ± 30 nm	120 ± 20 nm	≤ -25	< +0.25
	40						
NBP3.86-90nm	B	Reference for SO ₂ mixtures	NEW	3.86 ± 30 nm	90 ± 20 nm	≤ -20	< +0.50
	41						
NBP3.95-90nm	H	Reference		3.95 ± 35 nm	90 ± 10 nm	≤ -15	< +0.50
	34						
NBP4.26-90nm	T	CO ₂ narrow		4.26 ± 20 nm	90 ± 20 nm	≤ -20	< +0.50
	32						
NBP4.265-110nm	A	CO ₂ balanced	NEW	4.265 ± 20 nm	110 ± 20 nm	≤ -20	< +0.50
	42						
NBP4.26-180nm	D	CO ₂		4.26 ± 20 nm	180 ± 20 nm	≤ -40	< +0.25
	33						
NBP4.27-170nm	Z	CO ₂ standard		4.27 ± 30 nm	170 ± 20 nm	≤ -20	< +0.50
	43						
BP4.30-600nm	F	flame		4.30 ± 50 nm	600 ± 50 nm	≤ -20	< +0.50
	30						
NBP4.45-60nm	E	CO ₂ long path		4.45 ± 20 nm	60 ± 20 nm	≤ -20	< +0.50
	44						
NBP4.66-180nm	I	CO centered		4.66 ± 30 nm	180 ± 20 nm	≤ -20	< +0.50
	39						
NBPF4.74-140nm	K	CO flank		4.74 ± 20 nm	140 ± 20 nm	≤ -20	< +0.50
	37						
NBP5.3-180nm	L	NO		5.3 ± 40 nm	180 ± 20 nm	≤ -25	< +0.60
	31						
NBP5.78-180nm	M	H ₂ O in gas mixtures	NEW	5.78 ± 40 nm	180 ± 20 nm	≤ -30	< +0.60
	38						
NBP6.22-110nm	V	NO ₂	NEW	6.22 ± 30 nm	110 ± 20 nm	≤ -20	< +0.80
	47						

	Code* * Letter for small aperture (standard) / Number for large aperture	Application	Comments	CWL [μm]	HPBW [nm]	Angle shift @ AOI 15° [nm]	Tempera- ture shift [nm/K]
NBP7.3-200nm	U	SO ₂		7.3 ± 40 nm	200 ± 30 nm	≤ -40	< +0.80
	45						
NBP7.91-160nm	S	Methane in gas mixtures	NEW	7.91 ± 50 nm	160 ± 30 nm	≤ -40	< +0.80
	46						
BP9.50-450nm	O	Alcohol	NEW	9.50 ± 60 nm	450 ± 60 nm	≤ -60	< +1.00
	36						

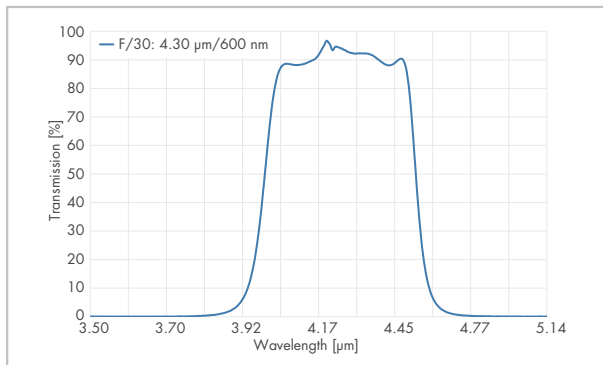
Bandpass Filters for Detection of Methane, HC and References



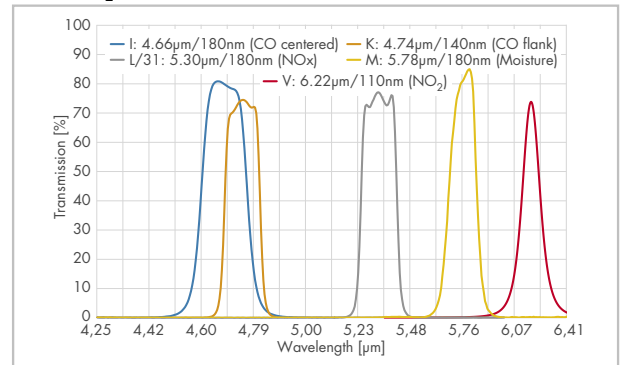
Bandpass Filters for Detection of CO₂



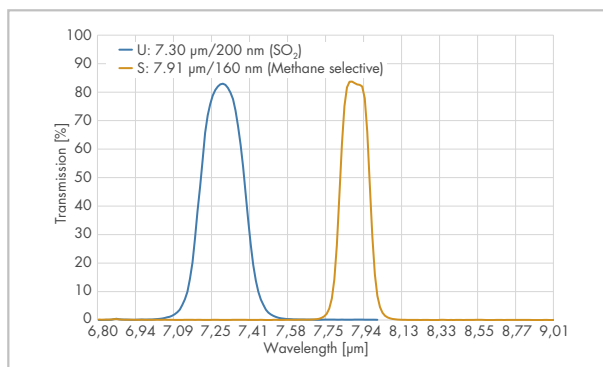
Bandpass Filter for Flame Detection



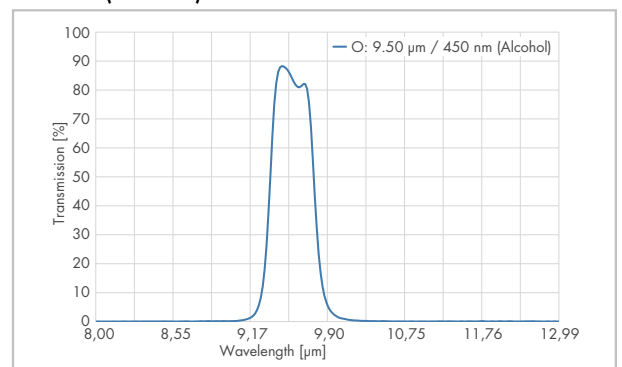
Bandpass Filters for Detection of CO, NO, H₂O and NO₂



Bandpass Filters for Detection of SO₂ and Methane in Gas Mixtures



Bandpass Filter for Detection of 9.50 μm / 450 nm (Alcohol)



Standard Silicon / Crystal Windows

Standard Windows

Code	Name	Thickness [mm]	Description	Transmission Range / Coating Range	Notes
b1	BaF ₂	0.4	Barium Fluoride	UV – 12 µm	
c1	CaF ₂	0.4	Calcium Fluoride	UV – 9 µm	
k1	KBr protected	1.0	Potassium Bromide, protected	UV – 25 µm	
k2	KBr uncoated	1.0	Potassium Bromide, uncoated	UV – 25 µm	Water-soluble
l1	Si LWP 7.5 µm	0.55	Silicon longwave-pass filter	7.5 – 15 µm	Cut on (5 %) ~ 7.22 µm 50% point ~ 7.5 µm
s1	Si uncoated	0.5	Silicon uncoated	2 – 56 µm	for far IR (THz) applications
s2	Si A/R (3 – 5 µm)	0.5	Silicon A/R-coated	3 – 5 µm	
w1	Si WBP (8 – 14 µm)	0.55	Silicon bandpass filter	8 – 14 µm	T ave (9 – 13 µm) > 75 %
z1	ZnSe A/R (2 – 14 µm)	1.0	Zinc Selenide AR-coated, wedged	2 – 14 µm	
z2	ZnSe wedged	1.0	Zinc Selenide wedged	0.6 – 16 µm	

Available Options

Code	Name	Thickness [mm]	Description	Transmission Range	Notes
a1	Sapphire	0.4	Sapphire uncoated	UV – 5 µm	
d1	CVD Diamond	0.15		UV – 100 µm	
i1	CsI	1.0	Caesiumiodid	UV – 50 µm	Water-soluble
p1	HDPE	0.8	High density polyethylene		
Y			without window		No warranty!!

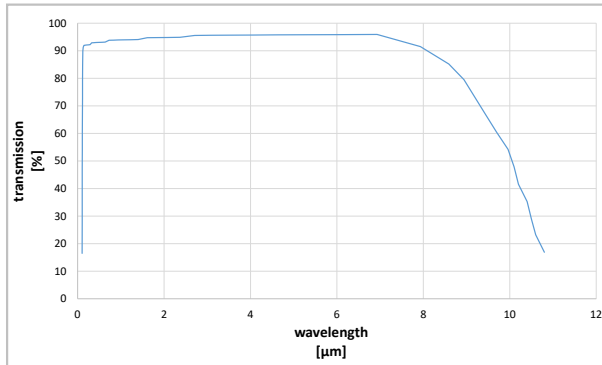
Example:

LT.....b1: Detector with Barium Fluoride window, 0.4 mm thick.

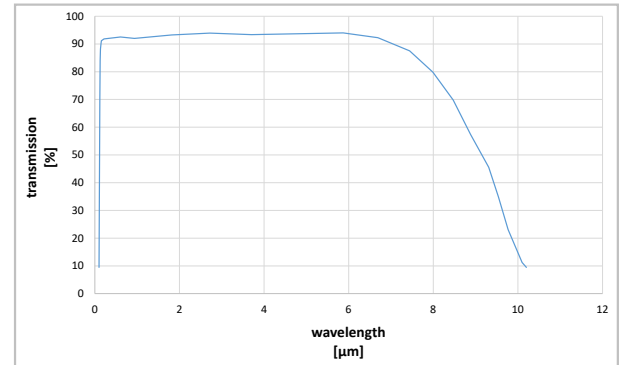
Notes:

Transmission ranges are typical values and are not specified as this is a material property.

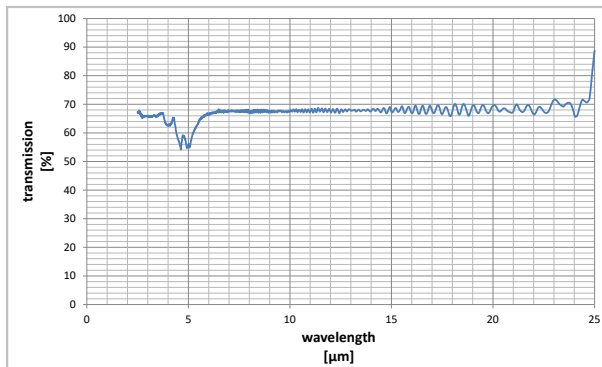
BaF₂ (-b1)



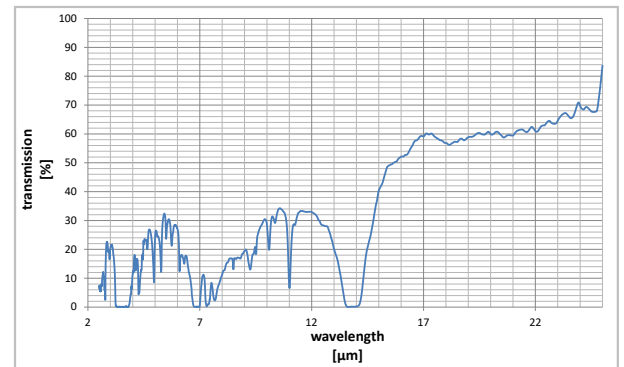
CaF₂ (-c1)



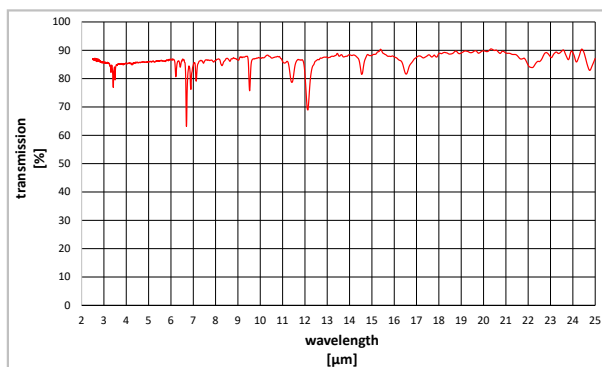
CVD Diamond 0.15 mm (-d1)



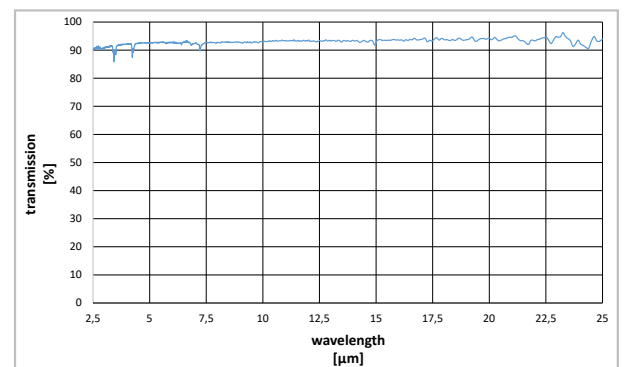
HDPE 0.8 mm (-p1)



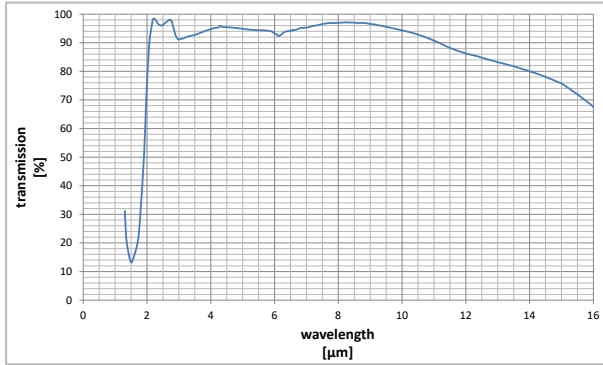
KBr Parlyene Coated (-k1)



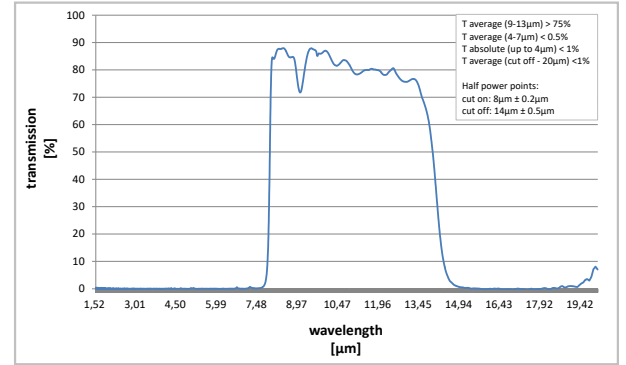
KBr Uncoated (-k2)



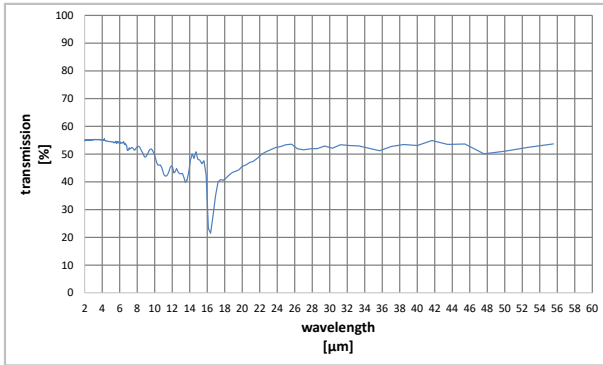
ZnSe AR Coated 2-14 μm (-z1)



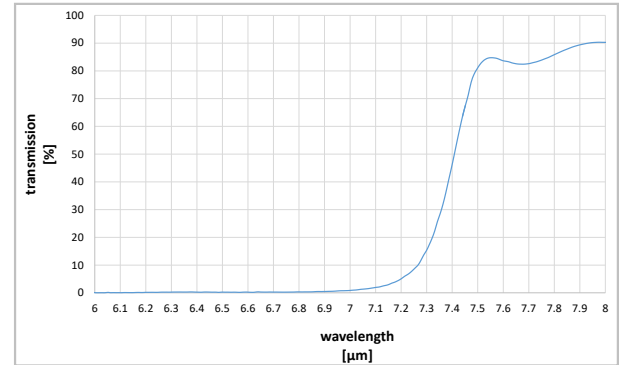
Si WBP Filter 8-14 μm (-w1)



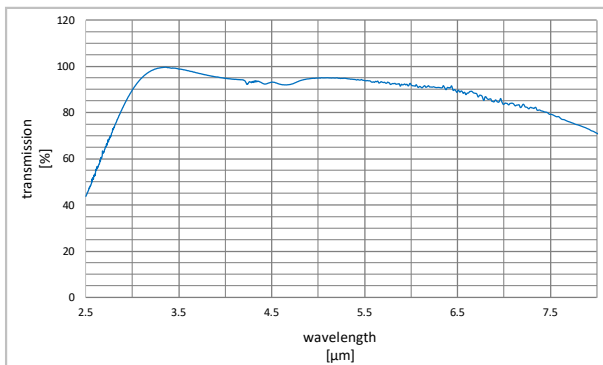
Si uncoated (-s1)



Si LWP 7.5 μm (-l1)



Si AR coated 3-5 μm (-s2)



Filter Set

For development purposes our filters are also available mounted in round holders that fit over standard TO-39 caps (single elements). This way different filters can be easily tested in order to determine the best filter suitable for your application.

We offer a whole filter set (17 pieces) as optical gas and flame filter kit:

C, G, B, H, T, A, D, Z, F, E, I, K, L, U, M, S, O



TO39 Round Window Holder

