LASER COMPONENTS®

Pyroelectric Detectors
Filter and Window Selection

The pyroelectric detector configuration is concluded with the 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 pyroelectric 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.

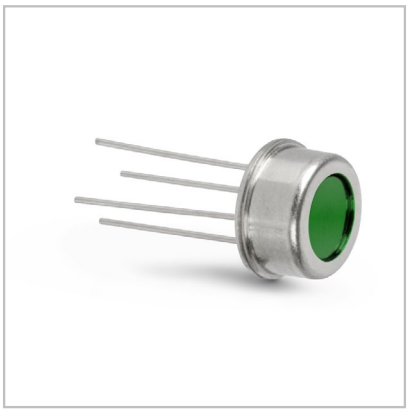
Apertures:

Numbers are used for filters (see Table 1, page 3) for applications that require a large aperture /field of view e.g. flame detection. Here the detector aperture is normally 5 x 5 mm² for single channel $LiTaO_3$ detectors.

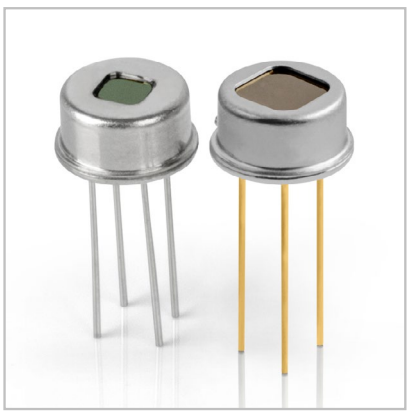
Letters are used for filters in applications where a small aperture is sufficient. Here the aperture is 3.5 x 3.5 mm² for single channel detectors.

For windows (see Table 2, page 5) the aperture is, in general, 5 x 5 mm² for single channel detectors. However other apertures are available on request.

For DLaTGS pyroelectric detectors the aperture is in general round with 5.3 mm.



TO-39 housing with dia. 5.3 mm aperture (e.g. DLaTGS detectors)



TO-39 housing with small and large aperture

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Multi Channel:

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

Dual channel: Reference placed on channel 2.

Example:

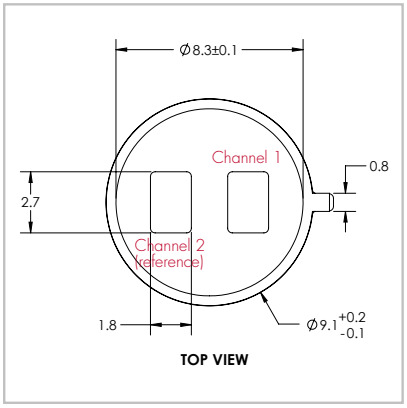
LT.....-AH:	channel 1:	filter NBP4.265–110nm
	channel 2:	filter NBP3.95–90nm (reference)

Quad channel: Reference placed on channel 1.

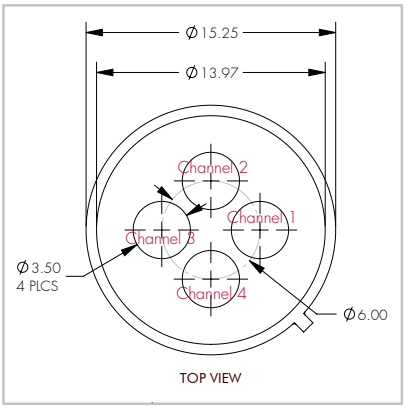
The other filters are arranged in ascending order of the center wavelength.

Example:

LT.....-HGEK:	channel 1:	filter NBP3.95–90nm (reference)
	channel 2:	filter NBP3.40–120nm (HC)
	channel 3:	filter NBP4.45–60nm (CO_2 long path)
	channel 4:	filter NBP4.74–140nm (CO flank)



TO-39 dual channel



TO-8 quad channel

Standard Gas Sensor Filters

The choice of IR filter including center wavelength (CWL), half power bandwidth (HPBW: 50% of peak transmittance), minimum transmission and blocking are very dependent on the gas to be detected, optical system in which the detectors will be used and the performance required over temperature.

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

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

Standard Narrow Bandpass (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. 13 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)

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Table 1: Standard Gas Sensor Filter List

Code		Application	CWL [µm]	HPBW [nm]	Spectral Shift @ AOI 15° [nm]	Temperature Shift [nm/K]	
small aperture (standard)	large aperture						
J	49	Hydrogen flame	2.95 ± 50 nm	500 ± 100	≤ –35	< +0.25	BP2.95-500nm
W	53	Reference CH_4	3.09 ± 30nm	160 ± 20	≤ –15	< +0.50	NBP3.09-160nm
C	35	CH_4	3.33 ± 20 nm	160 ± 20	≤ –20	< +0.50	NBP3.33-160nm
G	40	HC	3.40 ± 30 nm	120 ± 20	≤ –25	< +0.25	NBP3.40-120nm
P	48	Reference for medical CO_2	3.70 ± 35 nm	110 ± 30	≤ –30	< +0.50	NBP3.70-110nm
B	41	Reference for SO_2 mixtures	3.86 ± 30 nm	90 ± 20	≤ –20	< +0.50	NBP3.86-90nm
H	34	Reference	3.95 ± 35 nm	90 ± 10	≤ –15	< +0.50	NBP3.95-90nm
T	32	CO_2 narrow	4.26 ± 20 nm	90 ± 20	≤ –20	< +0.50	NBP4.26-90nm
A	42	CO_2 balanced	4.265 ± 20 nm	110 ± 20	≤ –20	< +0.50	NBP4.265-110nm
D	33	CO_2	4.26 ± 20 nm	180 ± 20	≤ –40	< +0.25	NBP4.26-180nm
Z	43	CO_2 standard	4.27 ± 30 nm	170 ± 20	≤ –20	< +0.50	NBP4.27-170nm
F	30	Flame wide	4.30 ± 50 nm	600 ± 50	≤ –20	< +0.50	BP4.30-600nm
E	44	CO_2 long path	4.45 ± 20 nm	60 ± 20	≤ –20	< +0.50	NBP4.45-60nm
N	50	N_2O / Flame narrow	4.50 ± 25 nm	60 ± 20	≤ –20	< +0.50	NBP4.50-60nm
I	39	CO centered	4.66 ± 30 nm	180 ± 20	≤ –20	< +0.50	NBP4.66-180nm
K	37	CO flank	4.74 ± 20 nm	140 ± 20	≤ –20	< +0.50	NBP4.74-140nm
L	31	NO / Flame long reference	5.3 ± 40 nm	180 ± 20	≤ –25	< +0.60	NBP5.3-180nm
M	38	H_2O in gas mixtures	5.78 ± 40 nm	180 ±20	≤ –30	< +0.60	NBP5.78-180nm
V	47	NO_2	6.22 ± 30 nm	110 ±20	≤ –20	< +0.80	NBP6.22-110nm
U	45	SO_2	7.3 ± 40 nm	200 ± 30	≤ -40	< +0.80	NBP7.3-200nm
S	46	Methane in gas mixtures	7.91 ± 50 nm	160 ± 30	≤ -40	< +0.80	NBP7.91-160nm
Q	52	Anesthesia	8.91 ± 50 nm	300 ± 50	≤ -35	< +1.00	NBP8.91-300nm
O	36	Alcohol, SiF_4 Tetraflourosilane	9.50 ± 60 nm	450 ± 60	≤ -60	< +1.00	BP9.50-450nm
R	51	SF_6, NH_3 (ammonia)	10.60 ± 80 nm	240 ± 48	≤ -40	< +1.00	NBP10.6-240nm

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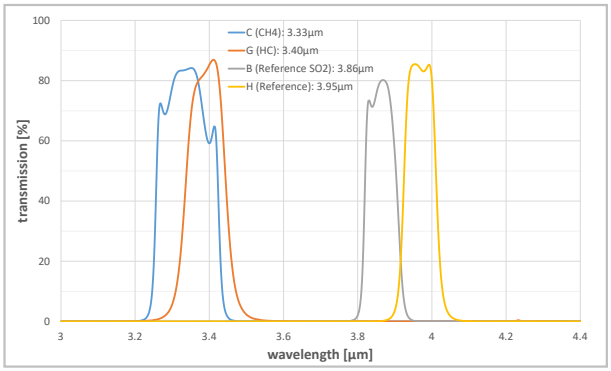
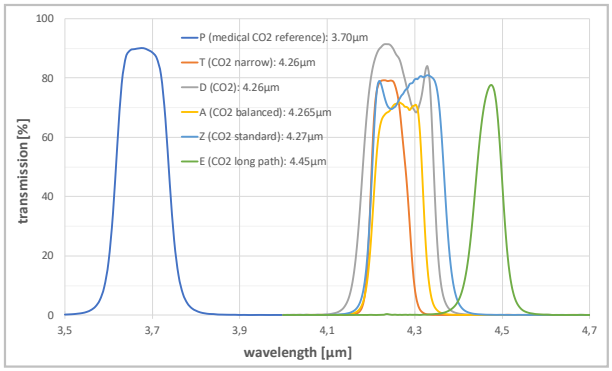
Filter Transmission Curves

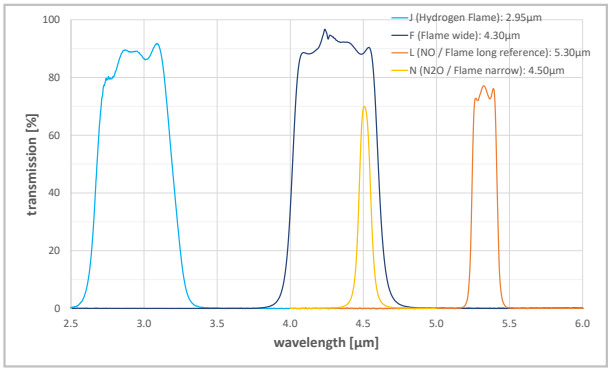
Bandpass Filters for Detection of Methane, HC and References



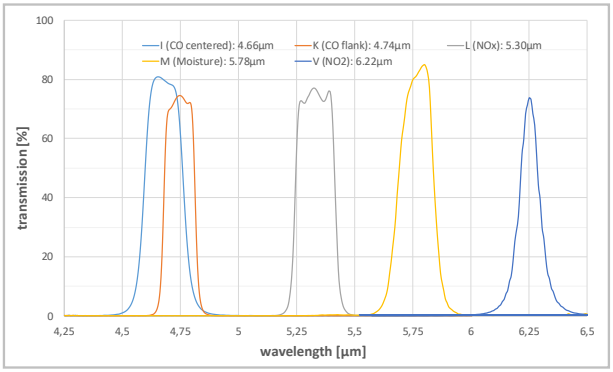
Bandpass Filters for Detection of CO_2



Bandpass Filter for Flame Detection



Bandpass Filters for Detection of CO, NO, H_2O and NO_2



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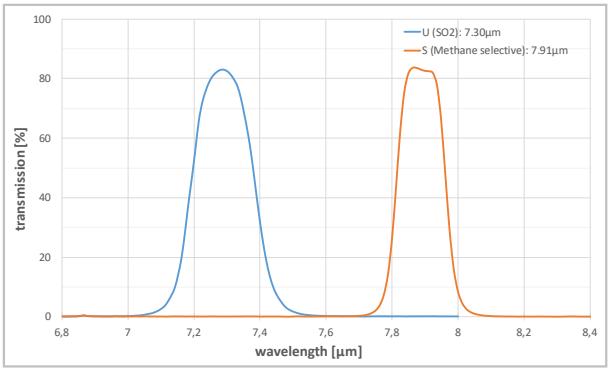
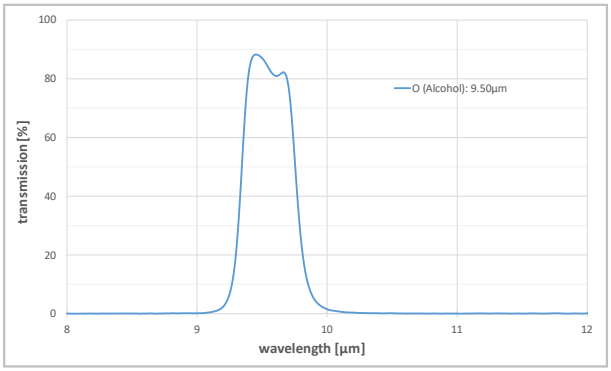
Filter Transmission Curves

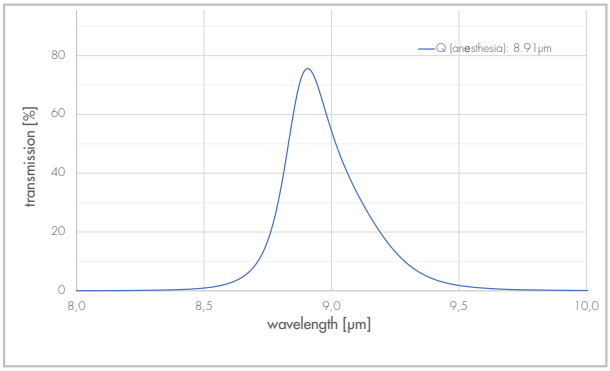
Bandpass Filters for Detection of SO_2 and Methane in Gas Mixtures



Bandpass Filter for Alcohol Detection



Bandpass Filters for Anesthetic Gases



Bandpass Filter for Detection of SF_6

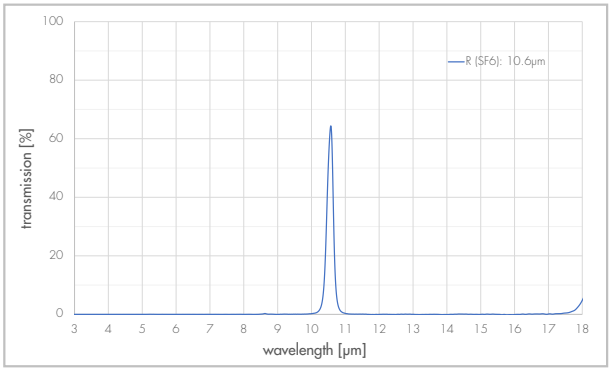


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Table 2: Silicon / Crystal Window List

Standard Windows

Code	Transmission Range / Coating Range [µm]	Description	Thickness [mm]	Notes
b1	UV –15	BaF_2 – Barium Fluoride	0.4	
c1	UV – 12	CaF_2 – Calcium Fluoride	0.4	
k1	UV – 25	KBr – Potassium Bromide, protected	1.0	
k2	UV –25	KBr – Potassium Bromide, uncoated	1.0	Water-soluble
l1	7.5 - 15	Si LWP – Silicon longwave-pass filter	0.55	Cut on (5 %) ~ 7.22 µm 50% point ~ 7.5 µm
s1	2 – 56	Silicon uncoated	0.5	for far IR (THz) applications
s2	3 – 5	Silicon AR-coated	0.5	
s3	3 - 6	Silicon AR-coated	0.5	T (4.7 + 5.3 µm) > 99%
s4	2 - 12	Silicon Broadband AR-coated	0.5	T avg (2.0 – 12 µm) > 87%
s5	1.5 - 5	Silicon AR-coated	0.525	T avg (1.5 – 5 µm) > 86%
w1	8 – 14	Silicon bandpass filter	0.55	T avg (9 – 13 µm) > 75 %
z1	2 – 14	Zinc Selenide AR-coated, wedged	0.5	
z2	0.6 – 21	Zinc Selenide wedged	0.5	

Available Options

Code	Transmission Range [µm]	Description	Thickness [mm]	Notes
a1	UV – 5	Sapphire uncoated	0.4	
d1	UV – 100	CVD Diamond	0.15	
i1	UV – 50	CsI – Caesium iodide	1.0	Water-soluble
p1		HDPE: High density polyethylene	0.8	for far IR (THz) application
Y		without window		Vaccuum operation (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.

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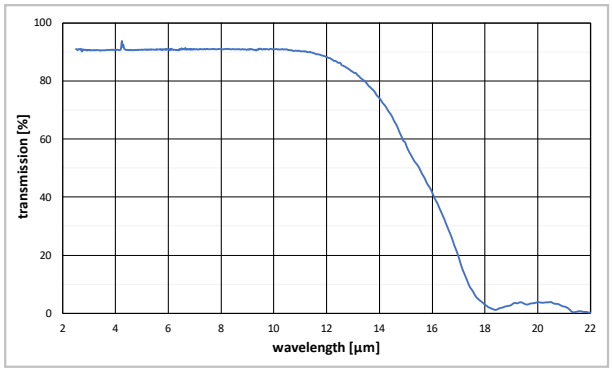
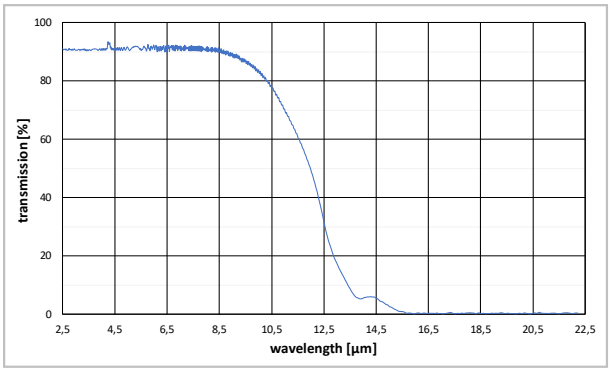
Window Transmission Curves

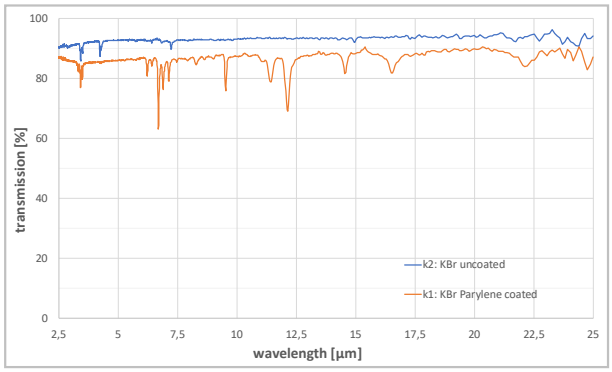
b1: BaF_2



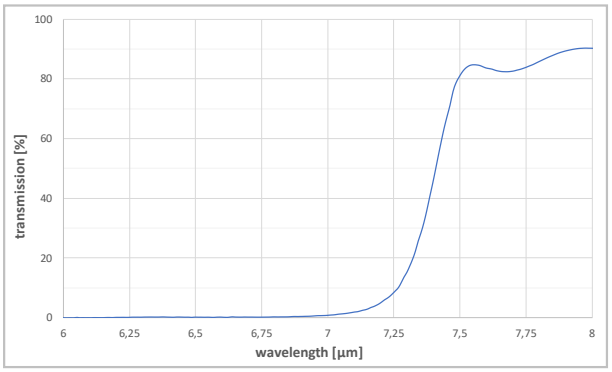
c1: CaF_2



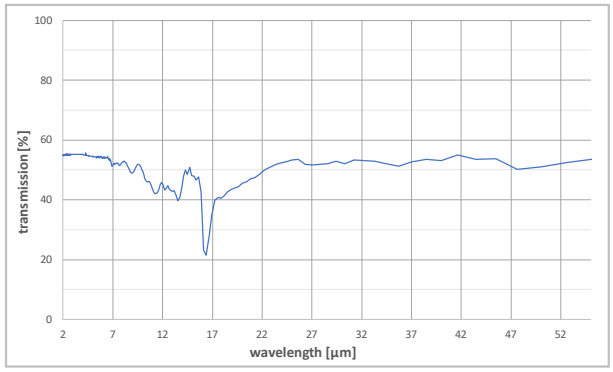
k1: KBr Parylene coated / k2: KBr uncoated



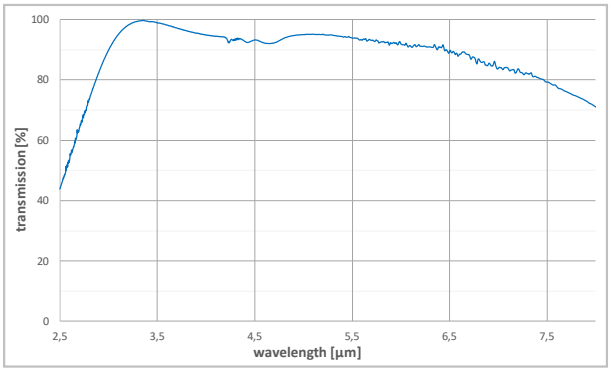
l1: Si LWP-Filter



s1: Si uncoated



s2: Si AR-coated 3 – 5 µm



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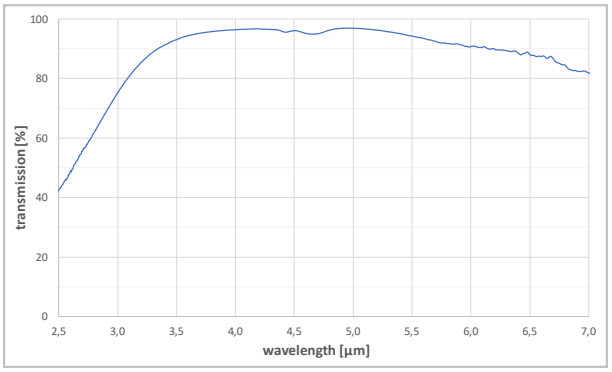
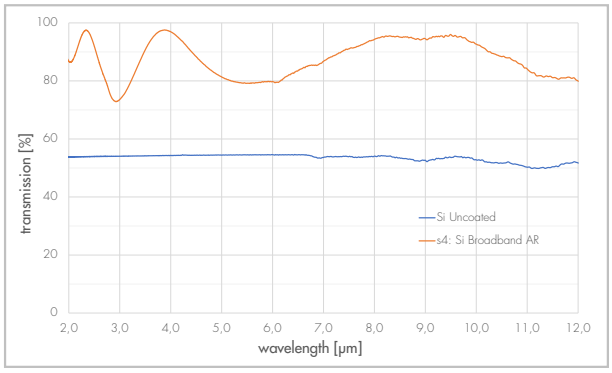
Window Transmission Curves

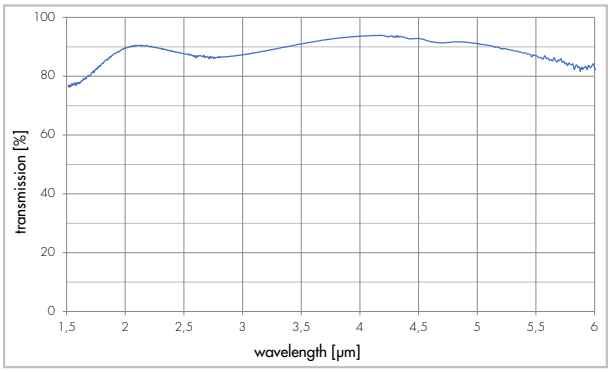
s3: Si AR-coated 4.7 – 5.3 µm



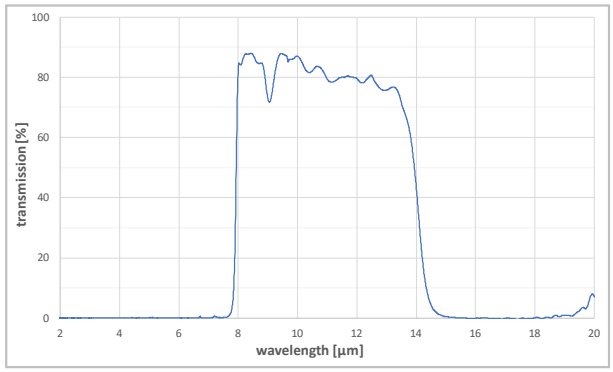
s4: Si broadband AR-coated 2 – 12 µm



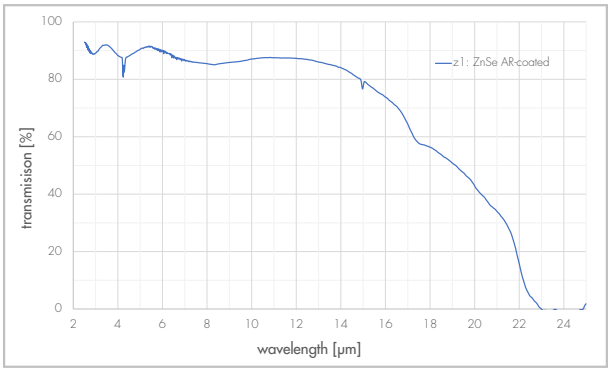
s5: Si AR-coated 1.5 – 5 µm



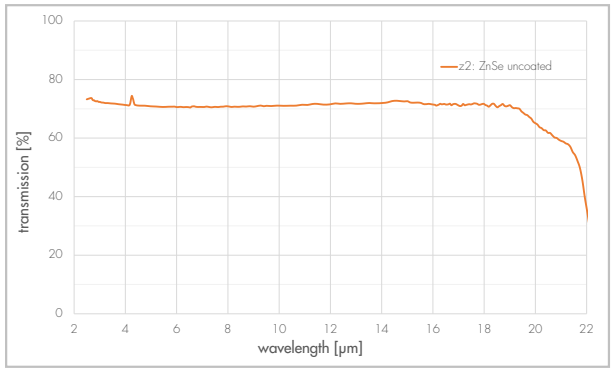
w1: Si WBP-Filter



z1: ZnSe AR-coated



z2: ZnSe uncoated



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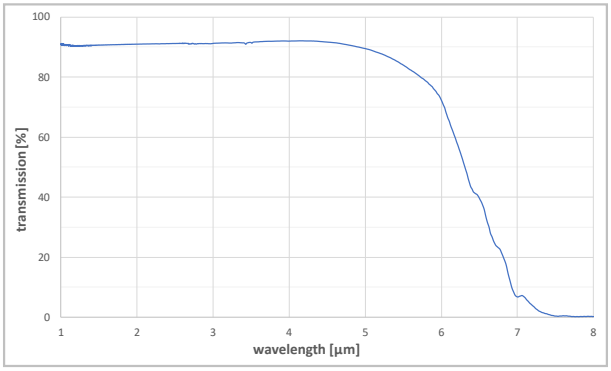
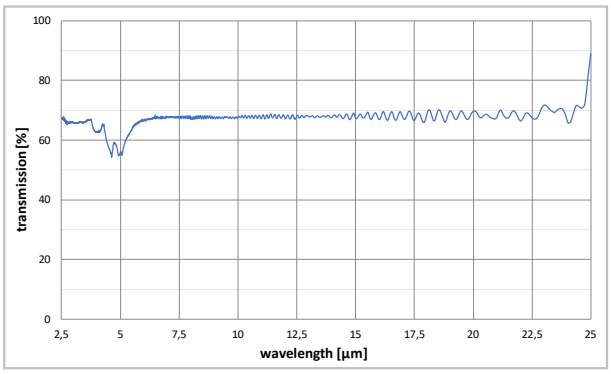
Window Transmission Curves

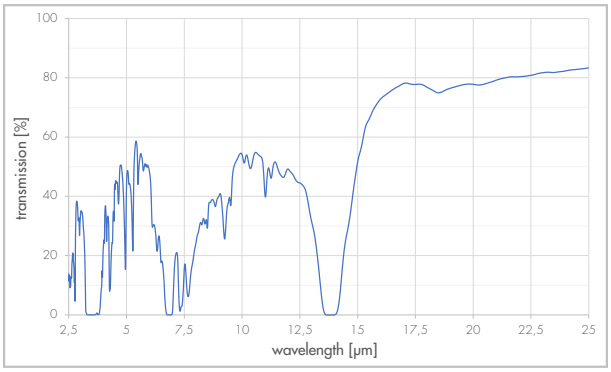
a1: Sapphire



d1: CVD Diamond



p1: HDPE



Product Changes

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