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# Description

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## The detector window has to fulfill two functions:

- Define the spectral sensitiveness of the pyroelectric chip according to the purpose of the application (between UV and far IR)
- Reliable hermetic seal of the optical interface between detector and environment (leakage rate <  $5 \cdot 10^{-9}$  Pa·l/s Helium)

## InfraTec detectors are available with the following window versions:

- Standard single crystal windows
- Windows on silicon
- Standard narrow band pass filters (NBP)
- Custom-designed filters or filters provided by the customer

Not every window/filter can be built in every detector. Environment resistance and dimension play a decisive role. For example potassium bromide is very water-soluble and can only be utilized in an environment with low relative humidity. Please confirm your filter choice with InfraTec before ordering.

The following pages will provide an overview of our standard filters and their typical spectral scans.

## 1 Standard Crystal Windows

Name	Code	Description	Transmission range	Environment resistance	Plot Page
CaF <sub>2</sub> 0.4 mm thick	60	Calcium fluoride	(UV ... 9) μm	o	1
CaF <sub>2</sub> 0.7 mm thick	61	Calcium fluoride	(UV ... 8) μm	o	1
CaF <sub>2</sub> 1.0 mm thick	62	Calcium fluoride	(UV ... 8) μm	o	1
BaF <sub>2</sub> 0.4 mm thick	63	Barium fluoride	(UV ... 12) μm	o	1
BaF <sub>2</sub> 1.0 mm thick	64	Barium fluoride	(UV ... 12) μm	o	1
CsI 0.8 mm thick	65	Cesium iodide, protected	(UV ... 50) μm	-*	2
KBr 0.8 mm thick	66	Potassium bromide, protected	(UV ... 30) μm	-*	2
KBr 1.0 mm thick	67	Potassium bromide, protected	(UV ... 30) μm	-*	2
Sapphire 0.4 mm thick	68	Sapphire uncoated	(UV ... 5) μm	+	2
Sapphire 0.6 mm thick	69	Sapphire uncoated	(UV ... 5) μm	+	2
Si uncoated 0.5 mm thick	70	Silicon uncoated	(1.1 ... 50) μm	+	2

\* water-soluble

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## 2 Standard Silicon Windows

Name	Code	Description	Transmission type	Environment resistance	Plot Page
Si ARC 2 – 5 µm	10	Coated silicon	Antireflection	+	3
Si ARC 3 – 6 µm	11	Coated silicon	Antireflection	+	3
Si ARC 3 – 10 µm	12	Coated silicon	Antireflection	+	3
Si WBP (3.0 - 5.0) µm	13	Silicon WBP	Bandpass	+	3
Si WBP (8.0 - 14.0) µm	14	Silicon WBP	Bandpass	+	3
Si LWP 5.3 µm	15	Silicon LWP	Long wave pass	+	4
Si LWP 6.5 µm	16	Silicon LWP	Long wave pass	+	4
Si LWP 7.3 µm	17	Silicon LWP	Long wave pass	+	4

Durability: Adhesion MIL-F-48616/section 4.6.8.1.  
 Humidity MIL-F-48616/section 4.6.8.2.  
 Abrasion resistance MIL-F-48616/section 4.6.8.3.

## 3 Standard Narrow Band Pass Filters (NBP)

NBP Filters are made by default from silicon or germanium substrate. These filters feature an excellent blocking in the short-wave (UV to NIR). Please note that an out-of-band transmission in the range > 10 µm (long wave IR) is an always existing undesirable side effect and not shown in scans of this catalogue.

Name [CWL/FWHM]	Code	Tolerance of CWL [nm]	Tolerance of HPBW [nm]	Plot Page
NBP 4.66 µm / 180 nm CO centered	I	±40	±20	5
NBP 4.74 µm / 140 nm CO flank	K	±20	±20	5
NBP 4.27 µm / 170 nm CO <sub>2</sub> high AOI	Z	±30	±20	5
NBP 4.45 µm / 60 nm CO <sub>2</sub> long path	E	±20	±20	5
NBP 4.26 µm / 90 nm CO <sub>2</sub> narrow	T	±20	±20	5
NBP 4.26 µm / 180 nm CO <sub>2</sub> standard	D	±20	±20	5
NBP 4.30 µm / 600 nm Flame	F	±30	±30	6
NBP 3.40 µm / 120 nm HC	G	±30	±20	6
NBP 3.33 µm / 160 nm Methane	C	±20	±20	6
NBP 5.30 µm / 180 nm NO <sub>x</sub>	L	±40	±20	6
NBP 3.95 µm / 90 nm Ref	H	±30	±20	6
NBP 7.30 µm / 200 nm SO <sub>2</sub>	U	±40	±30	6

Durability: Adhesion MIL-F-48616/section 4.6.8.1.  
 Humidity MIL-F-48616/section 4.6.8.2.  
 Abrasion resistance MIL-F-48616/section 4.6.8.3.

Temperature shift of CWL: (0.1 ... 0.9) nm/K  
 AOI shift of CWL: -30 nm at 15° AOI  
 (-40 ... -100) nm at 30° AOI  
 (100 ... -180) nm at 45° AOI

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## 4 Name Generation for InfraTec Standard Detectors

The detector name will be determined by the detector type and the filter code according to the extended table code. The filters will be arranged in ascending order of the Center Wavelength (CWL). In dual channel detectors Reference will always be placed in channel 2, in quad channel detectors Reference will always be placed in channel 1. The additional aperture window in detectors with beamsplitter follows the filtercode with a dash.

### Scheme of standard detector name:

[Detector description]-[Channel 1]...[Channel x]-[Aperture]

Customized detectors can consist of modified bodies and/or customized filters. The necessary dimensions of these filters are listed at the detector datasheet under the line 'Filter sizes'.

### Scheme of customized detector name:

[Detector description]-[X###]

Please confirm description with InfraTec before ordering.

	Filter channels				Aperture
	ch1	ch2	ch3	ch4	
Single channel (LIE, LME)	x				
Examples:					LIE-316-10; LME-341-F
Dual channel without Beamsplitter (LIM, LMM)	x	x			
Examples:					LIM-222-DI; LMM-242-ZH
Dual channel with Beamsplitter (LIM)	x	x			X
Examples:					LIM-032-ZI-11; LIM-052-TH-11
Quad channel without Beamsplitter (LIM, LMM)	x	x	x	x	
Examples:					LIM-214-GDIL ; LMM-244-HDIL
Quad channel with Beamsplitter (LIM)	x	x	x	x	X
Examples:					LIM-011-HGDL-11 ; LIM-054-HGEI-11

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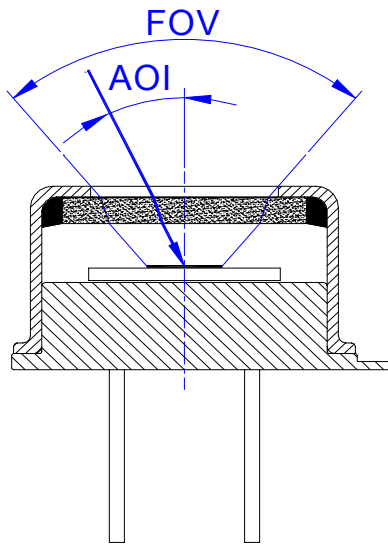
# Description

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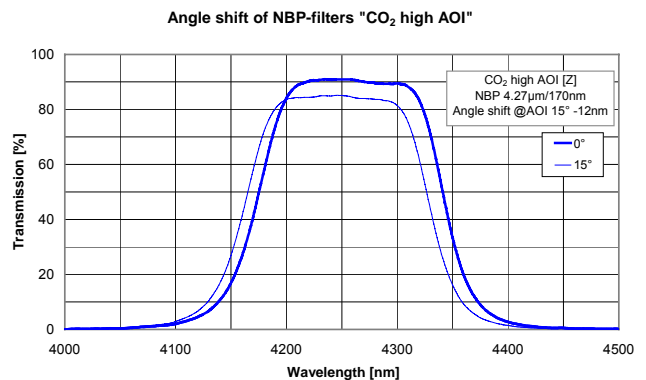
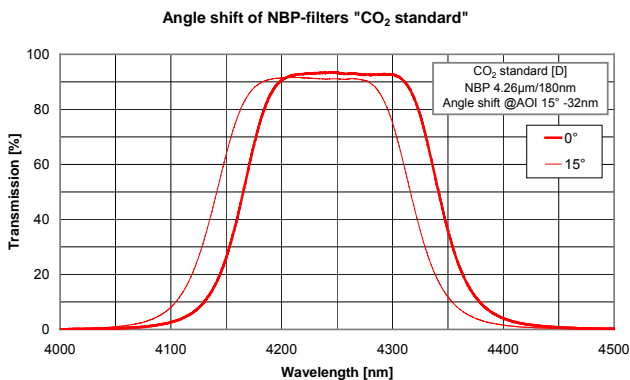
## 5 Field of View (FOV)

A detector's Field of View (FOV) should be optimally chosen and specified in order to maximize useful incident radiation but also to minimize background or unwanted radiation. In other words, the FOV of a detector should be specified as large as necessary only to admit the maximum amount of useful radiation based on specific system characteristics and requirements.

A wide Angle of Incidence (AOI) shall be avoided for applications with narrow-band IR filters (typical for NDIR gas analysis). In this case the physical conditioned shift of cut-on and cut-off of the narrow-band IR filter will move towards shorter wavelengths and will modify the desired spectral characteristics of the detector.



Therefore InfraTec offers special IR filter types with extreme low angle shift of approximately -15 nm at 15° AOI ('CO' [I], 'CO<sub>2</sub> high AOI' [Z], 'CO<sub>2</sub> narrow' [T], 'Flame' [F], 'Methane' [C] and 'SO<sub>2</sub>' [U]). A higher temperature drift of the CWL (approx. +0.5 nm/K) will arise as a matter of principle for these six filters. Furthermore please note that multi channel detectors with AOI larger than ±15 degrees might cause interference problems between channels (cross over).



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In the following table FOV's for some of our standard detectors are listed. Additionally this information is given under the line 'Field of View' in every detector datasheet:

Group	Type	FOV for different window substrates		
		Minimum value for every point of the sensitive element		
		Calcium or Barium fluoride 0.4 mm thick	Silicon substrate 0.5 mm thick	Silicon substrate 1.0 mm thick
Standard Products	LIE-216	40°	45°	55°
	LIE-235	95°	100°	125°
	LIE-316	65°	70°	80°
	LME-345	80°	90°	110°
	LME-541	60°	65°	85°
Extended Products	LIE-312	95°	-	-
	LIE-332	90°	-	-
Multi Color Products	LIM-011	not applicable	Maximum angle of incidence shall be $\pm 7^\circ$ otherwise internal reflexions may modify the channel ratio!	
	LIM-032	not applicable		
	LIM-054	not applicable		
	LIM-212	not applicable	45°	60°
	LIM-214	not applicable	40°	50°
	LIM-222	not applicable	20°	25°
	LIM-262	not applicable	30°	35°
	LMM-244	not applicable	50°	65°

## 6 Requirements for Customer Furnished Filters for use in InfraTec Detectors

- Filters already cut to size are preferred. The correct size and tolerances for each detector type can be found in the datasheets ('Filter sizes'). Standard thickness for all filters is 0.50+0.20/-0.10 mm. **The thickness range of (0.70 ... 1.10) mm can be used for most of our detectors on request. Please confirm with InfraTec before ordering.**
- Filter quantity required
  - Production orders: Desired quantity +10 %
  - Sample orders under 10 pcs: 2-3 additional filters
- Preferred packaging for the filters
  - Waffle tray
  - Wafer tape (blue tape foil)
- Filters provided must be clean without any ink point or other marking. Cleanliness is required for good adhesion and sealing of the filters to the pyroelectric detector package.

InfraTec offers the option to assemble customer furnished filters supplied uncut in wafer format for production orders. Wafers can be cut for an additional charge. InfraTec cannot assume liability for peeling or chipping of filter layers or other problems that might occur during cutting. Please note that filters coated on germanium or hard substrates such as sapphire and quartz have an increased risk of damage during the cutting process.

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**Please note:**

InfraTec limits the incoming inspection of customer furnished filters to a visual check and the identification of the Center Wavelength (CWL) and the Half Power Bandwidth (HPBW). The customer together with his filter supplier shall supervise the compliance of the filter specification.

InfraTec has extensive experience in filter treatment. InfraTec cannot assume liability for any filter damage that may occur during processing.

Please contact us if you have any questions.