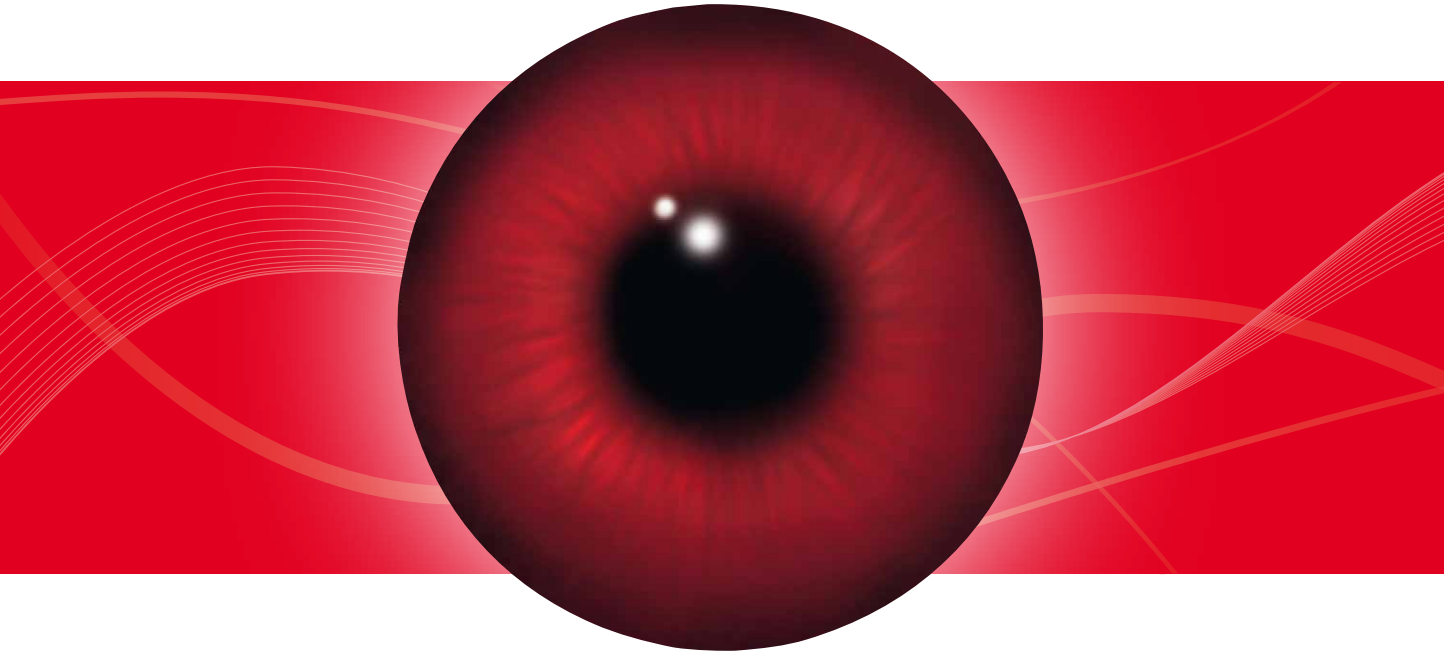
Fields of Application

Pyroelectric Detectors



Detection of radiation from deep UV to FIR (THz)
Single and multi-channel detectors
Infrared flame detection
NDIR gas analysis

InfraTec.

What are pyroelectric detectors used for?

A pyroelectric detector can be used precisely and with long term stability to measure infrared radiation. Since the pyroelectric element only reacts to a change of the infrared radiation the detector must always be used with a modulated (mechanically chopped or electrically pulsed) radiation source. Since pyroelectric detectors operate on a thermal phenomenon they have a very broad spectral response - between 100 nm to over 1,000 µm without any cooling like semiconductor detectors. The most common application is motion detection, realized with cheap pyroelectric ceramic material. NDIR gas analysis and flame detection are also very common applications. For both applications mostly high quality single crystalline $LiTaO_3$ material is used to obtain a large signal to noise ratio and very stable performance over time. The use for spectroscopy or radiometry is also possible. Pyroelectric detectors are thermal detectors and are able to measure signals up to some kHz with high performance. Short pulses can be detected down to some µs (microseconds).

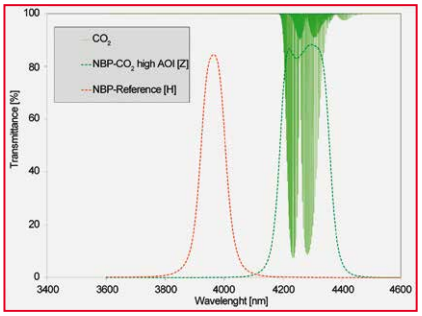
Examples of fields of application

- Gas detection for: human safety, industrial processes, anesthetic gases, leakage testing, breath alcohol testing, petroleum exploration,
- Plant health
- Flame detection
- Temperature sensor

NDIR gas analysis

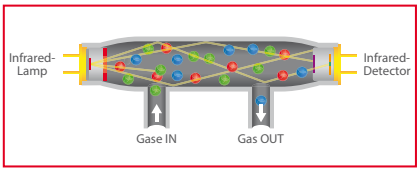
A large number of gases absorb infrared (IR) radiation due to intramolecular vibrations. For any specific material the strength of absorption varies with the wavelength of the infrared radiation. This principle is often used in gas analysis. An NDIR (Non Dispersive InfraRed) gas analyzer contains an electrically or mechanically modulated infrared source, a gas chamber with the gas of interest and a pyroelectric detector. A standard narrow bandpass filter (NBP) that matches the absorption wavelength of the target gas is integrated in the detector cap.

To measure CO_2 for example our standard filter with its center wavelength at 4.27 µm could be used. Recommended detectors are LME-335/LME-336 family (single channel, high performance, thermal compensation) or LIM-262/ LIM-272 (dual channel, thermal compensation).



Infrared flame detection

The pyroelectric detector of a flame sensor is detecting the typical spectral radiation of burning organic (hydrocarbon) materials (wood, natural gas, petrol, plastics). Two criteria are used to distinguish a flame from the sun or any other light source.



- A typical fire is „self-modulated“ around (1 … 5) Hz by flickering.
- A hydrocarbon flame produces the combustion gases of carbon CO and CO_2. The emission bands of CO_2 and CO in the infrared range are between 4.0 and 4.8 µm. A built-in IR bandpass passes only the emission bands of both CO_2 and CO to the pyroelectric element. Computing both flicker frequency and spectral information (4.0 ... 4.8) µm will suppress false alarms effectively.

Recommended detectors are LME-300 (high performance, large field of view), LME-352/LME-336 (single channel, low power consumption, high responsivity, large field of view) and LMM-244 (quad channel, high responsivity).

InfraTec GmbH
Infrarotsensorik und Messtechnik

Gostritzer Straße 61 – 63
01217 Dresden / GERMANY
Phone: +49 351 871-8625
Fax: +49 351 871-8727
E-mail: sensor@InfraTec.de