

# Sensor News

More than 30 Years of Focus on Innovation and Quality Leadership



# PyriQ

Digital **Infrared** Sensor Intelligence

Gas Analysis  
Investigation  
of Plants

Environmental Gas  
Against Global  
Warming

Go Digital  
Digital Pyroelectric  
Detectors



Dear readers,

In our current Sensor News, we take a journey into the past of InfraTec and present our latest innovation, the digital detector. Moreover, you will get some insights into the fields of application of our pyroelectric detectors.

**InfraTec – International and Reliable**

Together with our business and project partners, we look back on a challenging and exciting year. Our flexible pandemic management and our well-stocked warehouse of raw materials and semi-finished products

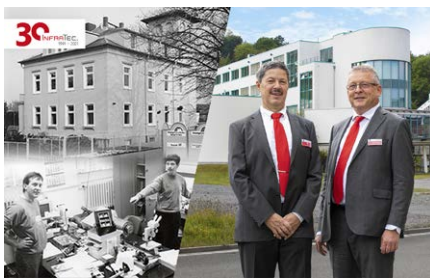
have enabled us to meet our customers' needs at all times, even under the current circumstances of worldwide supply shortages. To meet the increasing demand for detectors, we have expanded our workforce in almost all areas, and not only at our headquarters in Dresden, Germany. This year, we are also strengthened our sales presence in our Shanghai office.

The next few years will also see the challenge of generational change: "We, the owners of InfraTec, are getting older and

will now be judged not only by what we achieve every day, but how we manage to make the next generation of owners and managers work optimally at InfraTec," says managing director Dr. Matthias Heinze on the subject of corporate succession.

We hope you will find many interesting insights and findings while reading the latest Sensor News.

30 Years of Infrared Technology at the Highest Level



On the left: The InfraTec branch at the time and the two managing directors Dr. Matthias Krauß and Dr. Matthias Heinze in 1991 / On the right: The managing directors Dr. Matthias Heinze and Dr. Matthias Krauß at the inauguration ceremony of the new clean room in 2020.

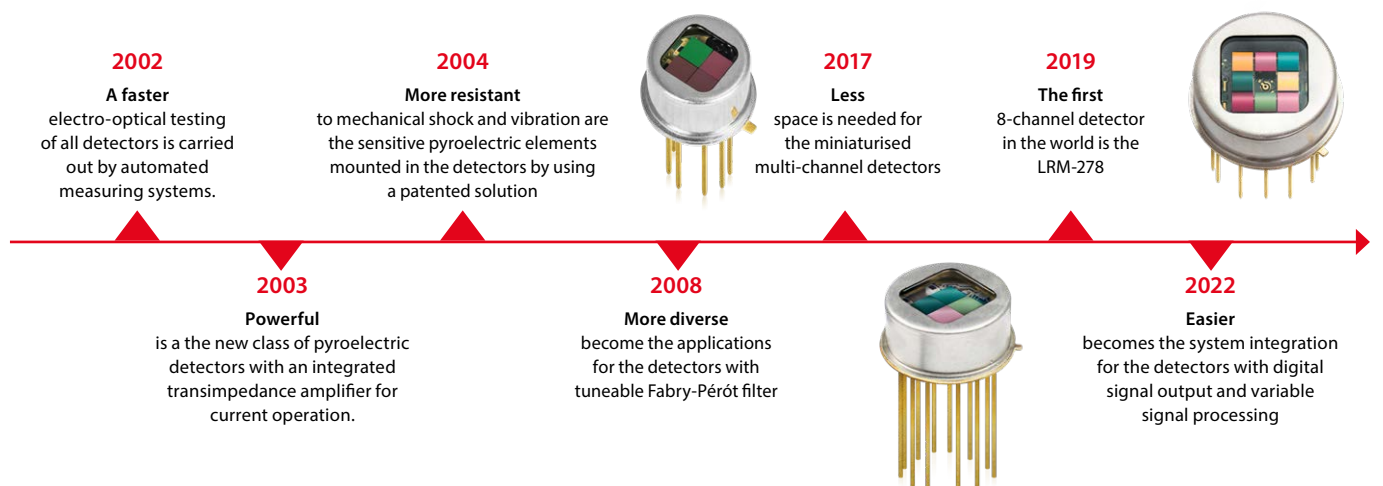
More than three decades ago, ambitious graduates of the Technical University (TU) of Dresden founded the company InfraTec. Unknown as a start-up, they faced numerous challenges, as there were no products ready for series production, manufacturing and testing technologies, or even customers.

Nevertheless, they mastered every hurdle with solid expertise, commitment, as well as patience and led InfraTec onto the international market. Today, 30 years after its founding, InfraTec is a globally respected producer in the field of infrared technology, with subsidiaries in the UK, the USA and China.

This success story began in the basement of the former kindergarten of the TU Dresden, where the first detectors were developed and produced. Shortly afterwards, the young company moved to the premises of the TechnologieZentrumDresden and began developing and producing compact multi-channel detectors with 2 to 4 channels for gas analysis. With the relocation of the TechnologieZentrum, InfraTec finally also came to the site on Gostritzer Straße and set up the first complete production line for pyroelectric detectors here.

This was the beginning of an almost completely manual production for pyroelectric detectors. In the years that followed, numerous innovative and award-winning technologies from InfraTec were developed. Today, the sensor clean room covers 1,500 m<sup>2</sup> and houses the laboratories of the development department as well as state-of-the-art machinery for automated series production. This provides the necessary capacity and accuracy to meet the strictly specified, customer-specific requirements. In the laboratories, InfraTec's developers and their partners conduct research on novel technologies and pyroelectric materials.

InfraTec will continue to be the strongly customer-oriented company with a focus on technology and quality leadership: Because we live research and technology!





# Go Digital – Reach Your Goal Faster with Less Effort

Last year, InfraTec introduced its first pyroelectric detector of the PyrIQ family with a digital interface – the 4-channel detector LRD-3824. Like all of InfraTec’s detectors, this one is based on single-crystal lithium tantalate (LiTaO<sub>3</sub>). This material offers high sensitivity and a good signal-to-noise ratio without additional cooling or temperature stabilisation.

Compared to detectors with an analogue output signal, the digital option already includes the entire pre-processing of the sensor signals. Thus, the sensitivity, the time constants and the dynamic range of each channel can be individually adapted to the requirements of the respective application. The detector’s core, a 16-bit A/D converter, then translates the signal into a digital data stream. There is also a digital filter already integrated into the detector. The LRD-3824 communicates with a connected microcontroller via an I<sup>2</sup>C interface. Complex amplifier and filter stages, as are necessary for detectors with an analogue output signal, are now not required. All this saves development time, reduces the space requirement of the entire system and simplifies system integration.

### Special Features of the Digital Detector

The variable signal processing allows the detector behaviour to be changed even during operation. This offers the user the possibility to adapt the performance of sensitivity and stability to the requirements of the application in the best possible way in every situation.

There is a further optimisation in electromagnetic compatibility (EMC). The digital output signal is less affected by interference radiation than analogue signals. In

addition, the entire signal conversion of the detector is spatially concentrated and shielded by the detector housing.

For high-precision measurement, especially in gas analysis, synchronisation of the emitter and detector clock is necessary. For digital pyroelectric detectors of the PyrIQ family, a separate clock input is available for this purpose, via which the system clock or the exact sampling time is specified. This allows a time signal with a highly precise sampling rate to be generated.

Another special feature compared to analogue technology is the “Fast Recovery after Saturation” function. Here, a logic integrated in the detector will detect whether the input signal of the A/D converter is overdriven. This can be caused by a faulty operating condition – for example, by extreme temperature fluctuations or mechanical influences. In this case, the analogue input stage will automatically be reset in order to be available for measurements again within a very short time.

### Small but Mighty – The Digital 2-Channel Detector

The LID-2322 combines two spectral channels with a digital output signal in a TO39 housing. It is ideally suited for the use in

mobile devices due to its compactness. Together with its low power consumption and thermal compensation, it is the ideal choice when it comes to applications in harsh environments.

To operate the detector, only two other connections are necessary in addition to the connections to the supply voltage. In this way, it can be both parameterised and read out. The external hardware effort is thus reduced to a minimum and the integration of the detector into the application is significantly simplified. A fifth pin, which can be used to specify an external clock, also enables this detector to read out the measurement data at the exact time and to synchronise it with a radiation source.



Digital 2-channel detector LID-2322

**Various Fields of Application for PyrlQ Detectors**

Digital detectors are just as suitable for the use in gas analysis and flame sensing as detectors with analogue signal output. But especially if the environmental conditions require a compact and easy-to-integrate detector, a detector with integrated digitisation will be a good choice.

Thus, among other things, the digital version is suitable for the field of air-conditioning and building technology when it comes to measuring air quality. Since this correlates well with the carbon dioxide concentration in the air, the CO<sub>2</sub> content of the room air is used for demand-controlled ventilation control in buildings and rooms. The CO<sub>2</sub> concentration is measured according to the principle of non-dispersive infrared measurement technology. For this purpose, suitable IR filters are integrated into the detector in order to be able to make an accurate and reproducible measurement.

This ensures good air quality at all times. In this context, the compactness of the detector, which results from the integration of the entire signal pre-processing, is an advantage. Another benefit is the low sensitivity of the digital output signal to interference caused by mobile phone networks, Bluetooth or wi-fi.



In flame sensor technology, pyroelectric detectors capture spectral ranges that are characteristic for burning organic substances such as wood, natural gas, petrol and various plastics. Flame sensors are used in the fields of industrial fire protection and early fire detection and withstand even the most adverse environmental conditions.

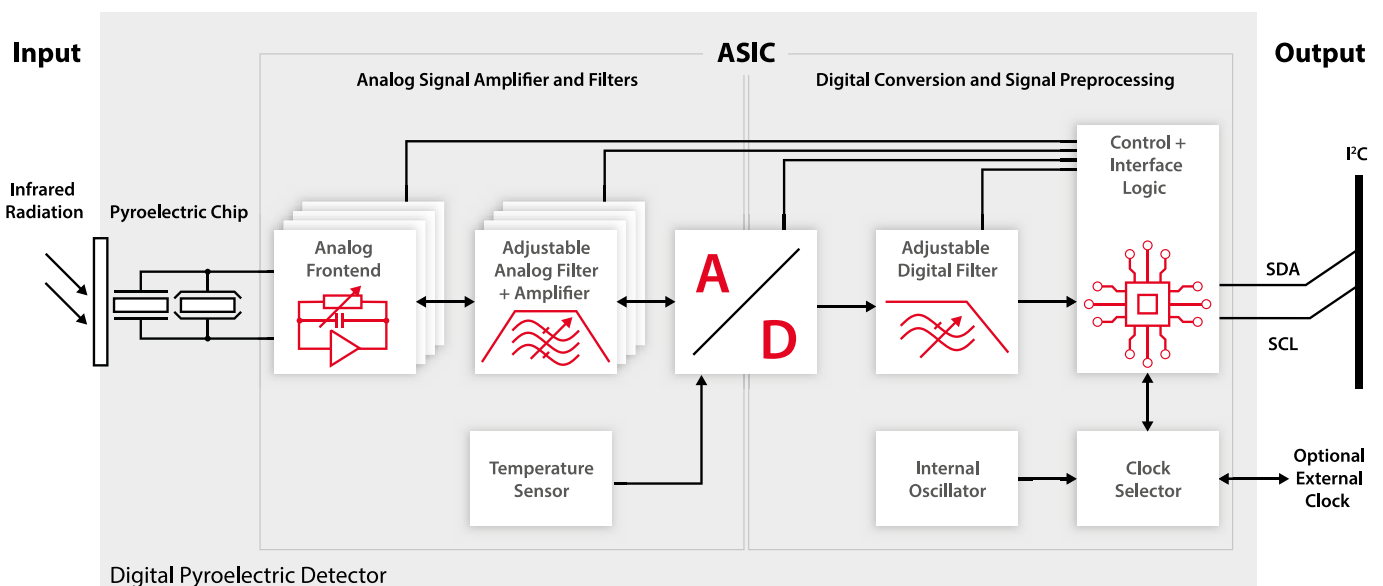
Due to the low interference sensitivity of the digital detector, the risk of false alarms caused by electromagnetic interference sources is significantly reduced.

**Further Possible Applications for the Digital Detector:**

- Agricultural industry, for example for monitoring the atmosphere in greenhouses and in research projects on plants
- Gas detectors for explosive gases, for example for mining or drilling platforms
- Process gas analysis, for example for measuring exhaust gases in industrial plants



More information at: <https://bit.ly/3rLBOoV>





## Feeding the World

Studying plants to improve crop performance and yield. The global population is growing and current crop yield is not keeping up with this pace of growth.



Measurement of photosynthesis in the field

Today, researchers are very interested in studying and better understanding the photosynthetic process to find ways to make crops more efficient under changing ambient conditions and to improve crop yield. Climate change and increasing ambient CO<sub>2</sub> levels have had a major impact on

the photosynthetic process in plants. All plants use sunlight, CO<sub>2</sub> and water to make photosynthesis.

Researchers of PP Systems are using instrumentation like the CIRAS-3 Portable Photosynthesis System to study how plants photosynthesize under various environmental conditions (CO<sub>2</sub>, H<sub>2</sub>O, temperature and light) in-situ. For high level research, it is imperative that researchers can both measure and control CO<sub>2</sub> and H<sub>2</sub>O quickly and accurately. Pyroelectric detectors from InfraTec allow our CIRAS-3 Portable Photosynthesis System to do both. The CIRAS-3 is considered a "true differential" analyser featuring four independent, non-dispersive infrared gas analysers for both CO<sub>2</sub> and H<sub>2</sub>O. This allows researchers to precisely

control the reference supply of CO<sub>2</sub> and H<sub>2</sub>O gas concentrations provided to the leaf and measure the sample CO<sub>2</sub> and H<sub>2</sub>O gas concentrations coming from the leaf.

*"We've been using InfraTec detectors for 10+ years and have been quite pleased with the performance. They are accurate, robust and extremely reliable which is critical in our business and with our gas analysis range of products."*

Instruments like this are being used by universities, government research institutes and private research companies all around the world and data is published regularly in many premier scientific publications. Ultimately, this important research results in educating farmers and providing them with the tools and resources necessary to improve crop performance and yield under these challenging times and rapidly evolving changes to our planet.



Close-up of temperature-controlled leaf cuvette and artificial light source



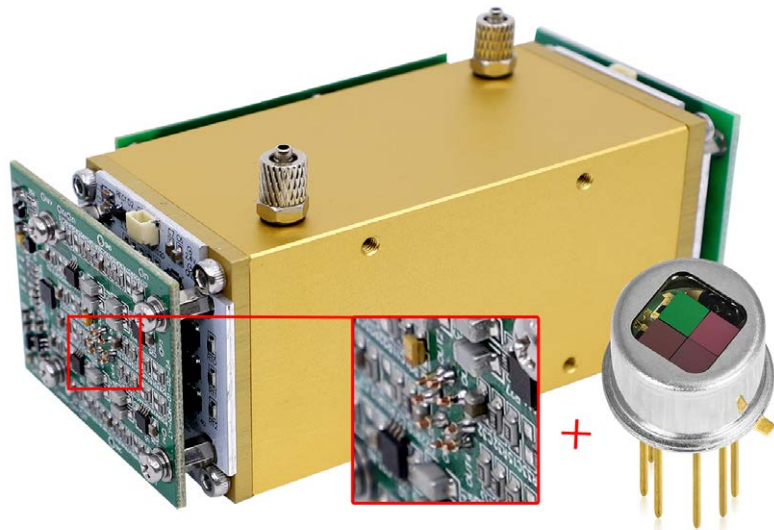
More information at:  
<https://bit.ly/3u90J7l>

# InfraTec Detectors against Global Warming

**Qingdao Laoying Haina Group uses infrared detectors to equip its self-developed devices for environmental gas analysis.**

Global warming is one of the most serious environmental problems mankind facing at present. In this context, greenhouse gases are the main cause of global warming. CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O are the three most important greenhouse gases, which account for more than 95% total amount of greenhouse gases in the atmosphere. The monitoring of greenhouse gas content is a prerequisite for greenhouse gas governance.

The spectroscopy technology team of Qingdao Laoying Haina Opto-Electronic Environmental Protection Group Co., Ltd. from China uses InfraTec's pyroelectric detectors LIM-272 and LRM-284 combined with infrared multi-pass gas cells. The company developed CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O gas sensors based on NDIR technology, including single-gas



Gas sensor LY-NDIR by Haina based on NDIR technology (gas cuvette) with single-gas sensors and multi-gas sensors and InfraTec detector LRM-284



Gas sensors for environmental gas analysis of the Laoying Haina Group

sensors and multi-gas sensors, to meet the requirements of ambient air CO<sub>2</sub> monitoring and pollution source CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O emission monitoring.

They can be used to monitor greenhouse gas emissions in many industries such as thermal power, steel, oil and gas mining, coal mining and waste treatment, to provide technical support for greenhouse gas emission control.

Since its inception, Qingdao Laoying Haina Group has – after years of development – become a diversified group company integrating environmental monitoring equipment, optical sensing, intelligent data and other industrial fields.



More information at: <https://bit.ly/3DE7gKs>

## Stay Informed

Knowledge creates the basis for progress and further development. It enables us to gain new perspectives and to master tasks and challenges more successfully.

For this reason, we are offering you the opportunity to expand, refresh or consolidate your knowledge in a lively way at our online events. Last year, for example, our **online event "Detector Talks"** was carried out for the first time. Over the course of two days, a total of 154 participants from 25 countries gained profound insights into the world of infrared detectors and had the opportunity to exchange ideas with the speakers. Our speakers included external partners who

reported on their own experiences as well as our technical experts who come into contact with the most diverse applications of our customers on a daily basis.

Additionally to these events, we will be available to answer questions from all interested parties at **(online) trade shows** and look forward to a lively exchange of ideas and thoughts with you. We are also happy to present our latest developments in the field of sensor technology and pyroelectric detectors.

Stay curious at all times.



Dates for upcoming events can be found here: <https://bit.ly/3DI7KPJ>



You will find us at these trade shows: <https://bit.ly/37eGQ5N>



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