MICRO-HYBRID

Product guide for infrared measurement applications

Measure smarter not harder.

Editorial

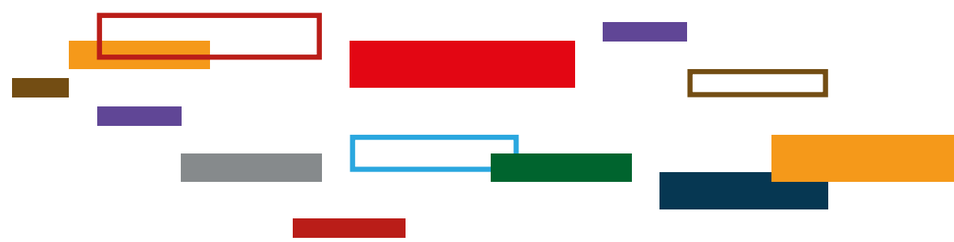
Your guide to mastering successful IR measurement technology applications

Whether it's NDIR gas analysis, flame detection, or temperature measurement, choosing the right IR components is essential to your application's performance.

As the world's only manufacturer of all IR components, we offer you a perfectly matched portfolio of emitters and detectors. This guide provides everything you need for optimal selection and integration: technical details, application insights, and our unique USPs for maximum precision and efficiency.

Learn how to evaluate IR emitters and detectors efficiently - and what really matters when integrating IR components into your system.

We are passionate about infrared. Join our IR community and start measuring smarter, not harder.



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MICRO-HYBRID › Product guide › Infrared measurement applications

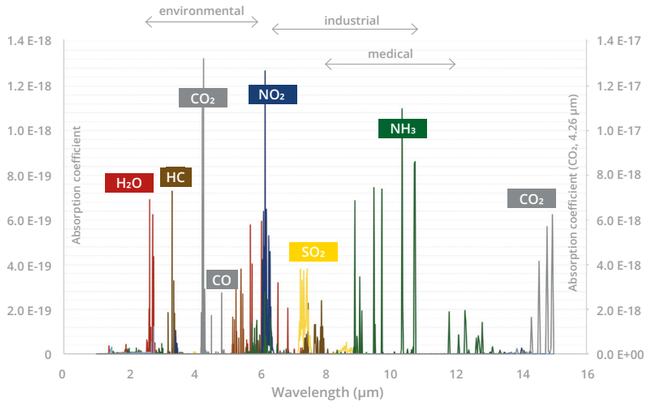
NDIR gas analysis

Ready for the NDIR gas measurement challenge?

Accurate gas measurement starts with the right setup - and we've got everything you need to make it work. Whether you're analyzing CO_2, CH_4, CO, or countless other gases, the key to precise detection lies in selecting the right emitter, detector, and optical path length for your target gas.

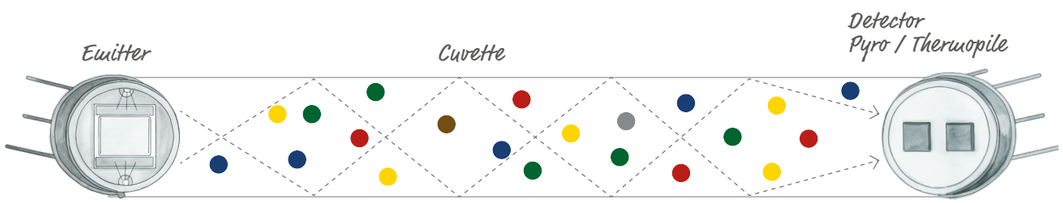
With our infrared components, you can build a powerful NDIR measurement system tailored to your application. And to make development even easier, our **Eval kit** provides a ready-to-use platform to test and optimize your setup.

Precision matters: matching IR emitters and detectors to gas spectra



Every gas has a unique absorption spectrum, as shown in the figure. This means that for accurate NDIR gas measurement, your IR emitter and detector must be precisely tuned to the relevant wavelength range of your target gas.

By using carefully selected components, you can maximize sensitivity and selectivity, ensuring reliable measurement results.



How does this work?

- **IR emitters** should provide strong radiation in the relevant spectral range.
- **IR detectors** must be sensitive to the specific absorption wavelength of the gas.
- **Optical filters** for precision play a crucial role by isolating the exact wavelength needed for precise gas detection. Filters ensure that only the relevant wavelengths reach the detector. Select narrow band filters tailored to your gas spectrum for higher accuracy.

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Infrared filters for IR components

Centre wavelength (CWL) [nm]	Centre wavelength tolerance [nm]	Half band-width [nm]	Half bandwidth tolerance [nm]	Transmission	Code	Application
3400	± 20	140	± 20	T_{max} > 80 %	G2	HC
3910	± 28	70	± 10	T_{max} > 70 %	D2	Reference
4265	± 25	120	± 10	T_{max} > 70 %	E1	CO_2 main band
4415	± 30	60	± 10	T_{max} > 70 %	E2	CO_2 side band
4525	± 20	83	± 6	T_{max} > 70 %	K1	N_2O
4650	± 40	180	± 20	T_{max} > 70 %	F1	CO
5060	± 25	100	± 15	T_{max} > 70 %	D5	Reference
5300	± 30	200	± 20	T_{max} > 70 %	L1	NO
6580	± 40	200	± 35	T_{max} > 70 %	I1	H_2O
7300	± 50	180	± 20	T_{max} > 80 %	H1	SO_2
7665	± 77	242	± 40	T_{max} > 70 %	U1	Halothane
8224	± 40	240	± 24	T_{max} > 70 %	V1	Desflurane
8550	± 40	180	± 18	T_{max} > 70 %	W1	Isoflurane
8620	± 45	540	± 45	T_{max} > 70 %	X1	xFluranes
9663	± 80	240	± 40	T_{max} > 70 %	M1	OH
10540	± 100	690	± 100	T_{max} > 70 %	J1	SF_6

Micro-Hybrid IR components for measuring one or more gases

JSIR Emitters

JSIR 340-4 CMOSI chip in TO39 housing

JSIR 340-5 CMOSI chip in TO46 housing

JSIR 350-4 NAC chip in TO39 housing

JSIR 350-5 NAC chip in TO46 housing

JSIR 355-4 NAC chip in TO39 housing

Infrared detectors

Pyroelectric		Thermopile	
2 channel	**4 channel**	**2 channel**	**4 channel**
MPS 2 SENS pyro detector	MPS 4 SENS pyro detector	MTS 2 SENS 200	MTS 4 SENS 200

Checklist: How to successfully evaluate IR components for NDIR gas measurement

Before building your NDIR gas measurement system, you need to evaluate the right components for your application.
Here's what to consider:

☐ **1. Define the parameters of your target gas**

- Identify the absorption spectra of the gas you want to measure (e.g., CO_2, CH_4, CO, NO_2, NH_3).
- Determine the concentration range and required sensitivity.

☐ **2. Choose a suitable IR emitter**

- Ensure the emitter covers the specific absorption wavelength of your target gas.
- Consider power, modulation capability, and lifetime for long-term reliability.

⚠ Make sure to choose an emitter with a suitable optical window, if needed.

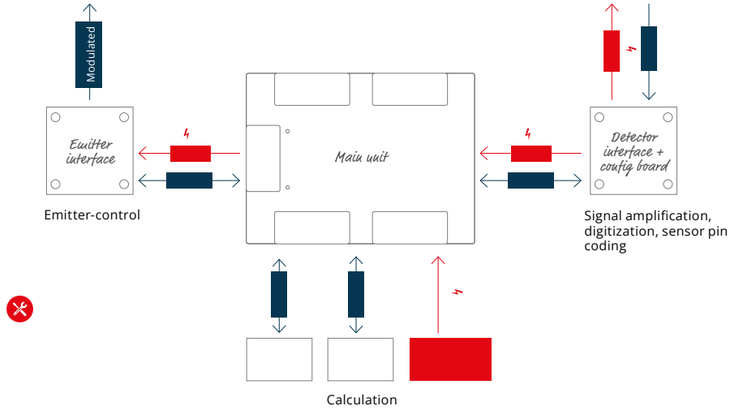
☐ **3. Select the right IR detector**

- The detector should be optimized for the relevant wavelength range.
- Look for high signal-to-noise ratio and stability in your measurement conditions.

⚠ A well-evaluated component selection leads to higher measurement accuracy and long-term stability in your application.

☐ **4. Evaluate**

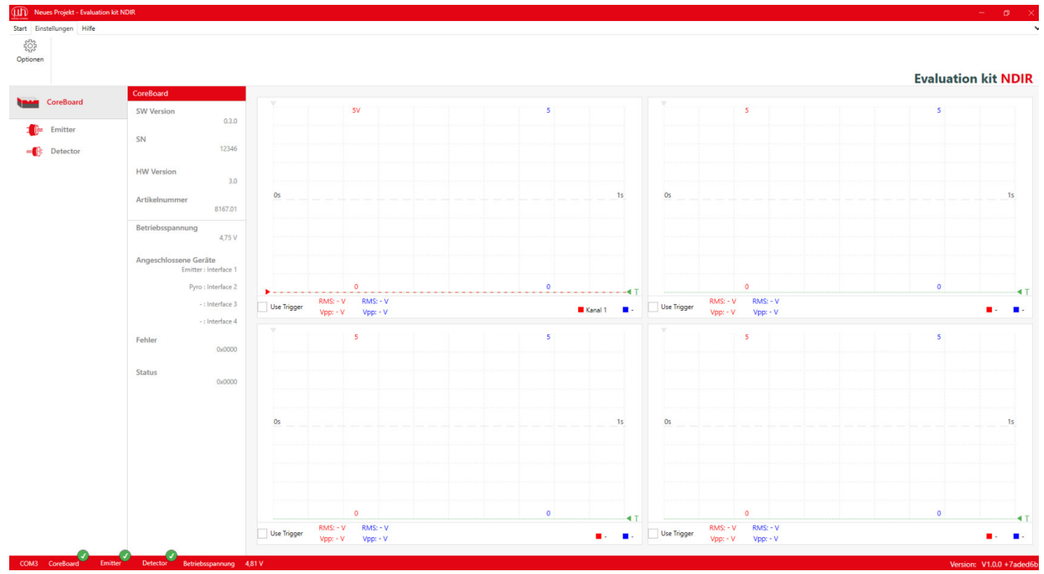
- The eNDIRi² evaluation kit is the perfect tool for component testing and system evaluation.
- It allows quick and flexible testing of IR emitters and detectors in real application conditions.



MICRO-HYBRID › Product guide › Infrared measurement applications

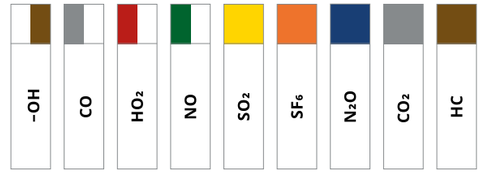
Checklist: How to successfully evaluate IR components for NDIR gas measurement

Testing the parameters of IR components is easy with the eNDIRi² software



☐ **5. Start right away with the preconfigured NDIR bundles**

- To simplify the process, use our NDIR bundles, where we've already matched emitters and detectors for specific gases. Available in pyro or thermopile edition.



eNDIRi² evaluation kit / NDIR evaluation kit 2.0 / 7206.04-5.51

All-in-one test kit for the evaluation of IR emitters and IR detectors

- Ready to measure: quick evaluation of IR emitters and detectors
- Complete set with coordinated hardware, software and IR components
- Free eNDIRi² app software for analysis and visualization
- Versatile for applications in industry, prototyping, research and teaching
- Quick start: including instructions and preconfigured components for CO_2

Start measuring

Micro-Hybrid JSIR emitter
High performance for precise gas sensing

Our infrared emitters set new standards in efficiency and reliability. Designed for demanding applications, they deliver **high modulation frequencies**, **strong radiant power** and **long-term stability** - ensuring precise and consistent measurement results.

Key advantages of Micro-Hybrid IR emitters

- **High modulation frequency** - fast response time with a time constant of just **12.5 ms**, enabling dynamic gas measurements
- **High radiant power & temperature - membrane temperatures up to 850 °C** for optimal IR emission and signal strength
- **Long-term stability** - robust **chip architecture** ensures durability and consistent performance over time

HermeSEAL JSIR 350-4 emitter, TO39 with reflector and Si ARC-

HermeSEAL JSIR 350-4 emitter, TO39 with reflector and Sapphire

JSIR 350-5 emitter, TO46 with reflector

JSIR 350-4 emitter,

Quad JSIR 350-4 emitter, TO8 with reflector,

Technical information - Overview

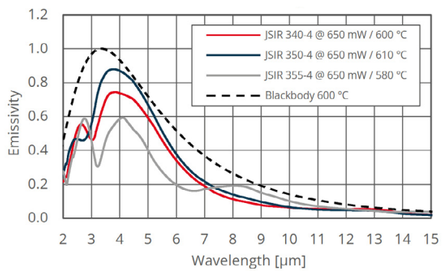
- High modulation frequency
- Low input power
- Long-term stability of radiant performance
- Optional hermetic sealing
- Perfect in combination with our detectors
- Fail-safe chip architecture
- Use in mobile or battery-operated devices

JSIR emitters are available in standard TO housings with cap, reflectors, open or with window to protect the chip membrane in certain environments:

JSIR 350 - MEMS-based emitter chip NAC technology
JSIR 340 - MEMS-based emitter chip CMOS technology

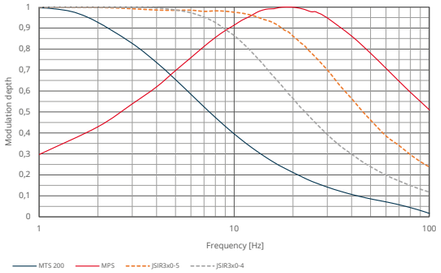
Typical operating characteristics of JSIR emitters

Typical operating characteristics of JSIR



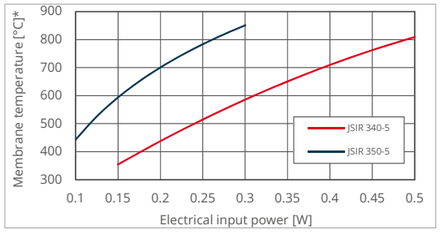
Optimal part selection: Selecting the right emitter is about more than specifications alone. It means finding a solution that combines the performance your application demands with the cost efficiency your project requires.

Frequency response



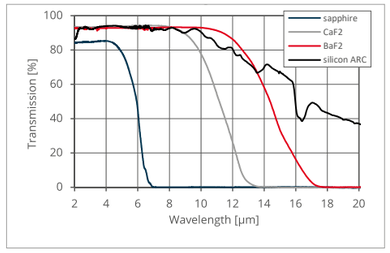
Measurement speed matching: Find the emitter that best aligns with your detector's response time to ensure the right balance of fast signal generation, dependable measurement performance, and the speed demands of your specific application.

Temperature distribution



Efficient heat generation: The high membrane temperature of up to 850 °C ensures strong IR emission. The influence of filling gases (e.g., Krypton) can optimize the temperature distribution and thus improve radiation efficiency.

Transmission range of different filter/windows



Refined calibration: The choice of the right window material is crucial for the efficiency of the IR emitter. Materials such as sapphire, BaF_2, and CaF_2 influence transmittance at different IR wavelengths and must be selected to suit the application.

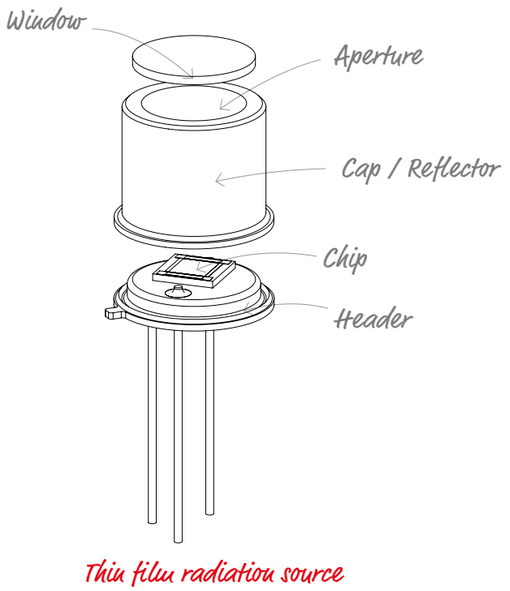
Customization codes for JSIR emitters

With this numerical code you can easily choose the right combination of emitter parts according to your application demands.

JSIRAAA-B-CC-D-EEE-F-GG-III

example

JSIR350-4-AL-C-D3.7-N2-A7-I-AO



JSIRAAA-B

JSIR350-4-AL-C-D3.7-N2-A7-I-AO
Thin film radiation source with chip type
JSIR 340-4 – CMOSI active area 2.2 x 2.2 mm²
JSIR 340-5 – CMOSI active area 1.0 x 1.0 mm²
JSIR 350-4 – NAC active area 2.2 x 2.2 mm²
JSIR 350-5 – NAC active area 0.65 x 0.65 mm²
4 x JSIR 350-4 – NAC active area 4 x 2.2 x 2.2 mm²
JSIR 355-4 – NAC active area 2.2 x 2.2 mm²

CC-

JSIR350-4-AL-C-D3.7-N2-A7-I-AO
Header
AL – TO39 (symmetric pinout)
AI – TO39 (asymmetric pinout)
BL – TO46 (for chip type -5)
CB – SMD housing
DL – TO 8
XX – Customized housing or packaging

D-

JSIR350-4-AL-C-D3.7-N2-A7-I-AO
Header
C – Cap
R – Reflector

EEE-

JSIR350-4-AL-C-D3.7-N2-A7-I-AO
Aperture
S5.0 – Square 5 x 5 mm² (SMD)
D3.6 – Diameter 3.6 mm (TO46, reflector)
D3.7 – Diameter 3.7 mm (TO39, cap)
D5.8 – Diameter 5.8 mm (TO39, cap)
D6.0 – Diameter 6 mm (TO39, reflector)
XX – Customized type

F-

JSIR350-4-AL-C-D3.7-N2-A7-I-AO
Filling gas
N_2 – Nitrogen (N_2)
XX – Customized filling gas
0 – Open

GG-

JSIR350-4-AL-C-D3.7-N2-A7-I-AO
Window
A1 – Sapphire (Al_2O_3)
A2 – Calcium fluoride (CaF_2)
A4 – Barium fluoride (BaF_2)
A7 – Silicon ARC 2.5-15.5
XX – Customized window
0 – Without

III

JSIR350-4-AL-C-D3.7-2-A7-I-AO
Options
I – HermeSEAL® (only with window A1 or A7)
A0 - Add-on reflector

Micro-Hybrid IR detectors
Featuring top parameters in sensitivity and detectivity

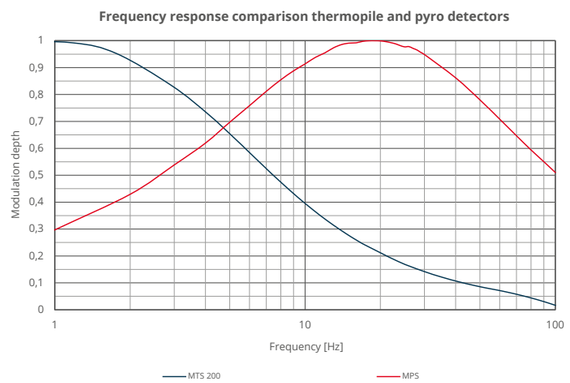
Within Micro-Hybrid's portfolio you can find both thermopile and pyroelectric detectors for NDIR gas measurement. Thermopile detectors offer high stability and long-term signal consistency, while pyroelectric detectors enable fast response times and high sensitivity. This allows precise adaptation of the detection technology to the specific requirements of each application.

Key advantages of Micro-Hybrid IR detectors

- High sensitivity & long-term stability
- High detectivity up to 4.0 x 10^8 cm√Hz/W
- High sensitivity: up to 200,000 V/W
- Low microphone effect
- Temperature dependence
- Current mode operation

Thermopile vs. pyroelectric detectors

Parameter	Thermopile	Pyroelectric
Voltage supply	Not required	Required
Measurement	Continuous, no emitter modulation, up to 5 Hz	Modulated, interval measurement, from 5 Hz
Temperature stability	Sensitive to ambient fluctuations	Less sensitive to temperature changes
Vibration sensitivity	No response to vibrations	Some sensitivity, minimized in MEMS detectors



Pyroelectric detectors for NDIR gas analysis

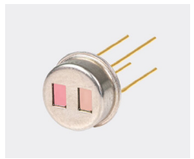
Best performance for high-frequency applications

For **precise and stable NDIR gas measurement**, our **2-channel and 4-channel pyroelectric detectors** offer a high signal-to-noise ratio (D* = 4.0 × 10^8 cm·√Hz/W), fast response times, and optimized temperature compensation. With **internal signal amplification** and **low thermal mass**, they ensure **reduced susceptibility to external interference and high measurement reliability.**

Key advantages of Micro-Hybrid Pyro detectors

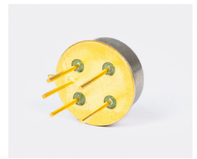
- High sensitivity and long-term stability
- High detectivity up to 4.0 x 10^8 cm·√Hz/W
- High sensitivity up to 200,000 V/W
- Low microphone effect
- Temperature dependence
- Current-mode operation

Find the ideal pyro sensor for demanding analytical applications.
MPS SENS - two-channel pyro sensors for gas analysis in medical and industrial applications:



MPS 2 SENS LiTAO3 lithium tantalate pyro detectors

MPS 2 SENS premium pyro detectors



MPS 4 SENS

Technical information – Overview

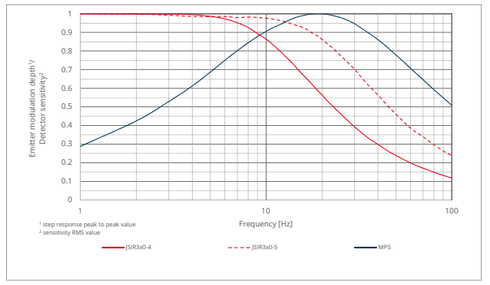
Parameter	MPS SENS	MPS SENS LITAO₃
Pyro chip	2 Chips with MEMS-based CPM membrane	2 chips with ferroelectric lithium tantalate ($LiTaO_3$)
Detectivity	High detectivity up to 4.0x10⁸ cm√Hz/W	Up to 2.0x10⁸ cm√Hz/W
Sensitivity	High sensitivity up to 200.000 V/W	Sensitivity up to 120.000 V/W
Spectral sensitivity	Broad 2 - 15 µm, optimized from 3 - 5 µm	Wide spectral sensitivity from UV to LWIR
Modulation frequency	Optimized for 10 – 100 Hz	Optimized for 3 - 25 Hz

Both pyroelectric chip variants feature an **amplified signal in current mode** for enhanced sensitivity and stability. The **integrated reference channel** ensures reliable baseline correction, improving measurement accuracy. Housed in a **robust TO39 package**, these detectors offer durability and easy integration into NDIR gas analysis systems.

Typical operating characteristics of MPS pyro detectors

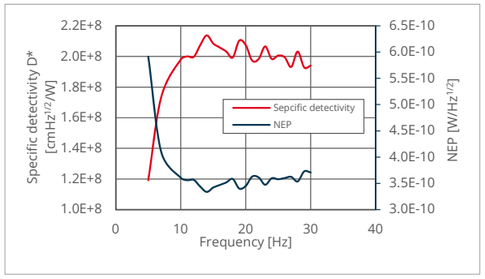
High precision, signal strength, and interference immunity of the Micro-Hybrid pyroelectric detectors - ideal for demanding gas detection **applications!**

Frequency response of the pyro detectors:



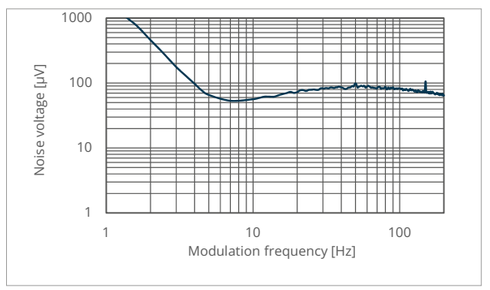
Optimum signal processing: The detectors show a high sensitivity in the relevant frequency range. The amplified signal processing in current mode enables stable and precise measurement.

Frequency dependence of the detector sensitivity:



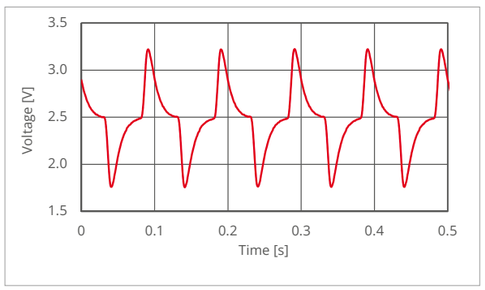
Constant sensitivity: The specific detectivity (D*) remains stable over a wide frequency range, which ensures consistently high measurement accuracy. The low equivalent noise signal (NEP) ensures high signal quality.

Noise voltage as a function of the modulation frequency:



Low noise for precise signals: The noise voltage decreases at low frequencies and remains stable, enabling precise signal acquisition with a high signal-to-noise ratio.

Waveform of the output signal at 10 Hz:



Clean signal processing: The voltage waveform shows a clear and reproducible signal output, allowing the pyroelectric detectors to provide reliable and precise readings.

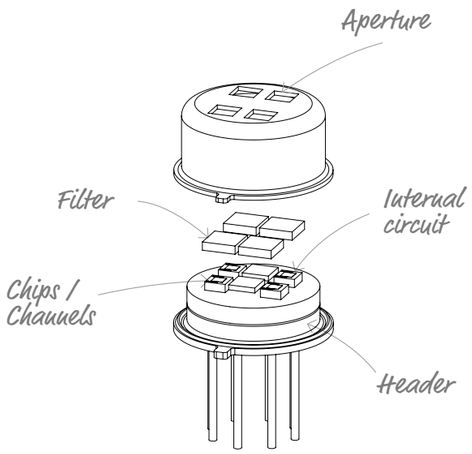
Customization code for pyroelectric detectors for NDIR gas analysis

With this numerical code you can easily choose the right combination of pyro detector parts according to your application demands.

PSAxBCD-E-F-G.GG-H-I/I

↓

PS2x4C2-A-U-S1.5-Kr-E1/D2



PSA

PS2x4C2-A-U-S1.5-Kr-E1/D2
Channels
1 – One channel (on request)
2 – Two channel
3 – Four channel

B

PS2x4C2-A-U-S1.5-Kr-E1/D2
Pyro chip type
4 – CPM 0.7 x 0.7 mm²
5 – CPM 1.0 x 1.0 mm²
9 – $LiTaO_3$ 1.8 x 1.0 mm²

C

PS2x4C2-A-U-S1.5-Kr-E1/D2
Amplification mode
C – Current mode

D-

PS2x4C2-A-U-S1.5-Kr-E1/D2
Feedback resistor
2 – 10 GΩ
3 – 100 GΩ

E

PS2x4C2-A-U-S1.5-Kr-E1/D2
Package
A – T039

F-

PS2x4C2-A-U-S1.5-Kr-E1/D2
Signal polarity
U – Unipolar (+0 ... +5 V)

G.GG-

PS2x4C2-A-U-S1.5-Kr-E1/D2
Aperture
S 1.5 – Squared 1.5 x 1.5 mm²
R 2.7 – 2.7 x 1.8 mm² (only with $LiTaO_3$)

H

PS2x4C2-A-U-S1.5-Kr-E1/D2
Filling gas
Kr – Krypton
N2 – Nitrogen (only with $LiTaO_3$)

II/II

PS2x4C2-A-U-S1.5-Kr-E1/D2
Filter

D2 – Reference 3910 nm (with CPM & $LiTaO_3$)
D5 – Reference 5060 nm (only with CPM)
E1 – CO_2 carbon dioxide 4265 nm (with CPM & $LiTaO_3$)
E2 – CO_2 carbon dioxide 4415 nm (only with CPM)
F1 – CO carbon monoxide (only with CPM)
G2 – Hydrocarbons (with CPM & $LiTaO_3$)
H1 – SO_2 sulfur dioxide (only with CPM)
I1 – H_2O water (only with CPM)
J1 – SF_6 sulfur hexafluoride (only with CPM)

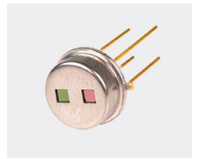
K1 – N_2O nitrous oxide (only with CPM)
L1 – NO nitric oxide (only with CPM)
M1 – alcohols (only with CPM)
U1 – Halothane (only with CPM)
X1 – xFluranes (only with CPM)
V1 – Desflurane (only with CPM)
W1 – Isoflurane (only with CPM)

Micro-Hybrid thermopiles for NDIR gas analysis
Reliable sensing when it matters

Micro-Hybrid thermopile detectors enable **continuous, modulation-free detection of infrared radiation** and are sensitive across a **broad spectral range**. Optimized for **low-frequency NDIR gas measurements** up to 5 Hz, they offer **high temperature resistance** up to 250 °C (CMOS technology) and are **immune to mechanical vibrations.** Their robust design ensures **stable, long-term operation in industrial** and environmental applications.

Key advantages of Micro-Hybrid thermopiles

- High sensitivity and long-term stability
- High detectivity: up to 6.27x108 cm√Hz/W with Krypton filling
- High sensitivity: up to 171 V/W



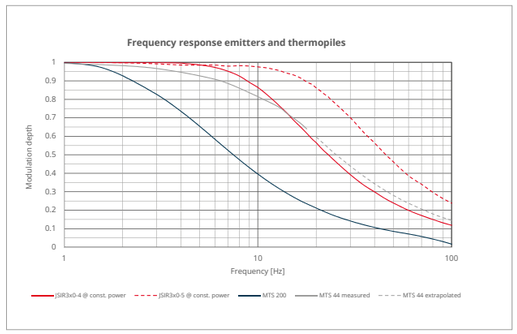
MTS 2 SENS two channel thermopiles

MTS 4 SENS 4 channel thermopiles for multi gas

Technical information – Overview

Parameter	MTS SENS 200	MTS SENS 44
Thermocouples	200	44
Detectivity	typ. 6.27x10⁸ cm√Hz/W	typ. 1.61x10⁸ cm√Hz/W
Sensitivity	171 V/W	39 V/W

Typical operating characteristics



The MTS 44 delivers significantly faster response times than standard thermopiles - without compromising signal stability. Optimized for frequencies up to 10 Hz, it supports fast measurement cycles in compact sensor designs for both mobile and fixed applications.

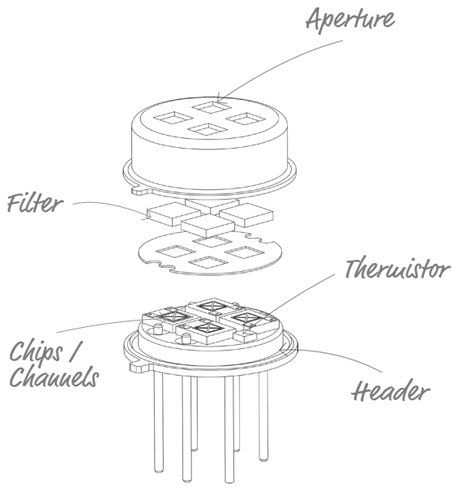
Customization codes for thermopiles for NDIR gas analysis

With this numerical code you can easily choose the right combination of thermopile parts according to your application

TSAxBBBB-C-DD.D-E-F-GG/GG

↓

TS2x200B-A-S1.5-1-Kr-E1/D2



Thermopile detector

TSAx

TS2x200B-A-S1.5-1-Kr-E1/D
Channels
1 – One channel (on request)
2 – Two channel
3 – Four channel

BBBB-

TS2x200B-A-S1.5-1-Kr-E1/D2
Thermopile chip type
200B – High end performance
44S - Industrial standard

C-

TS2x200B-A-S1.5-1-Kr-E1/D2
Package
A – T039

DD.D-

TS2x200B-A-S1.5-1-Kr-E1/D2
Aperture
S1.5 – Square 1.5 x 1.5 mm²

E-

TS2x200B-A-S1.5-1-Kr-E1/D2
Thermistor
1 – PTC Ni 1000
2 – NTC 30K (on request)
3 – NTC 100K (on request)

F-

TS2x200B-A-S1.5-1-Kr-E1/D2
Filling Gas
Kr – Krypton

GG/GG

PS2x4C2-A-U-S1.5-Kr-E1/D2
Filter

D2 – Reference 3910nm
D5 – Reference 5060nm
E1 – CO_2 carbon dioxide (main band)
E2 – CO_2 carbon dioxide (side band)
F1 – CO carbon monoxide
G2 – Hydrocarbons (CH_4; C_2H_6; ...)
H1 – SO_2 sulfur dioxide
I1 – H_2O water
J1 – SF_6 sulfur hexafluoride
K1 – N_2O nitrous oxide
L1 – NO nitric oxide
M1 – alcohol (CH_3-OH; C_2H_5-OH)
U1 – Halothane
X1 – xFluranes
V1 – Desflurane
W1 – Isoflurane

MICRO-HYBRID › Product guide › Infrared measurement applications

NDIR gas sensors
Ready-to-use gas sensor modules for your measurement

Developing an NDIR gas measurement system from scratch can be complex, but we've made it easier for you! In addition to our infrared components, we offer **ready-to-use gas sensor modules** for a wide range of gases and concentration ranges

Key advantages of Micro-Hybrid gas sensors

- **High precision & stability** - minimized pressure deviation and compensation of barometric changes (<0.1% / 10 hPa)
- **Low maintenance** - high-quality materials and easy-to-clean design
- **Battery-powered operation** - ideal for mobile and remote applications
- **Integrated gas temperature monitoring** - for enhanced measurement accuracy

Available gas sensor modules:

- CO_2, CO, CH_4, SF_6, N_2O, NO
- Covering ppm to Vol.-% ranges, tailored to your application
- Pre-calibrated for fast and reliable gas detection

With our sensor modules, you get a fully integrated solution, including optimized IR emitters, detectors, and optical filters, so you can start measuring immediately.

Individual solutions and measurement ranges on request

	CO_2	CO	CH_4	SF_6	N_2O	NO
100 Vol.-%	✓	✓	✓	✓	✓	
50 Vol.-%	✓	✓	✓	✓	✓	
30 Vol.-%	✓	✓	✓	✓	✓	
10 Vol.-%	✓	✓	✓		✓	
5 Vol.-%	✓	✓	✓		✓	
1 Vol.-%	✓	✓	✓		✓	✓
5000 ppm	✓	✓			✓	✓
2000 ppm	✓	✓			✓	
1000 ppm	✓	✓			✓	
500 ppm						
100 ppm						
50 ppm						

Micro-Hybrid microFLOW - inline gas sensors

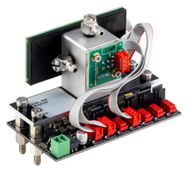
High performance gas sensor modules for industrial and environmental monitoring

Micro-Hybrid gas sensor modules are engineered for **precise and stable measurement** in continuous operation, offering **field-proven reliability** with minimal maintenance. They are used in **exhaust gas monitoring** for vehicles and industrial processes, **process gas analysis** in manufacturing environments, and **traffic and emission control systems.**

To ensure easy setup and fast commissioning, the specially developed **MARS light software** is available for free download. It enables straightforward configuration and makes your gas sensor module ready for **immediate use**.

Advanced features for seamless integration

- **Optimized measurement accuracy** - 10-point linearization, temperature, and pressure compensation
- **Robust & durable** - chemically resistant materials and modular design for flexible applications
- **Easy system integration** - RS232 / CAN-Bus digital interfaces for smooth communication



Technical information - Overview

- Minimized deviation due to pressure variations and barometric changes (< 0.1% per 10 hPa)
- Common industrial interfaces available
- Low maintenance due to high-quality materials
- Suitable for battery-powered devices
- Gas temperature in the measuring system can be monitored
- Maintenance and cleaning possible with little effort

Micro-Hybrid MicroSENS

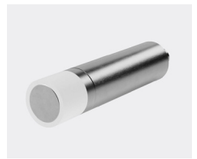
Reliable CO_2 monitoring for incubators

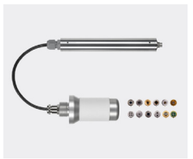
The **MicroSENS gas sensor** is specially developed for **high-precision CO_2 measurement** in medical and biological incubators to ensure stable CO_2 levels, which are critical for cell cultures, tissue engineering, and IVF applications. Designed for continuous operation under high humidity and elevated temperatures, the sensor offers long-term reliability and minimal drift.

The sensor is temperature and pressure compensated and also features humidity compensation for optimum measurement results. Thanks to the digital and analog interfaces, integration is easy and enables straightforward communication with other components in the incubator.

Key advantages of Micro-Hybrid MicroSENS gas sensors

- Accurate monitoring of 5 - 10 Vol.-% CO_2 for optimal incubation conditions
- High humidity resistance for consistent performance in incubator environments
- Advanced temperature and pressure compensation for reliable readings
- Fast response time for real-time adjustments
- Compact, robust design for easy system integration





Technical information - Overview

- IR dual-beam technology
- Temperature and pressure compensated
- Sterilizable at typ. 100, 140, and 180 °C
- Long service life

Typical operating characteristics

Product name	MicroSENS CO2 0-20% 180-HS-PFAS-free gas sensor	MicroSENS CO2 180-HS 0-20% Incubator Sensor	MicroSENS 100-VS
Measurement range	0 - 20 Vol.-%	0 - 20 Vol.-%	0 - 20 Vol.-%
Gas supply	Diffusion	Diffusion	Diffusion
Warm-up time	< 10 s	< 15 s	< 15 s
Time to full spec	< 5 min	< 5 min	< 5 min
IP protection	IP44	IP20	Sensor head IP54, connector IP30
Accuracy	± (2 % of reading + 0.2 Vol.-%)	± (2 % of reading + 0.2 Vol.-%)	± (2 % of reading + 0.2 Vol.-%)
Response time	< 100 s	< 35 s	< 25 s (with filter)
Digital resolution	0.001	0.001	0.001
Temp. influence	0.155 % FS / 10 K	0.125 % FS / 10 K	0.125 % FS / 10 K
Pressure influence	0.004 % FS / 10 hPa	0.004 % FS / 10 hPa	0.004 % FS / 10 hPa
Long-term stability	≤ ± 0.2 Vol.-% at 5 Vol.-% / year	≤ ± 0.2 Vol.-% at 5 Vol.-% / year	≤ ± 0.2 Vol.-% at 5 Vol.-% / year
Operating voltage (analog)	15 - 24 V DC	15 - 24 V DC	15 - 24 V DC
Operating voltage (digital)	12 - 24 V DC	12 - 24 V DC	12 - 24 V DC
Power consumption	< 2 W	< 2 W	< 2 W
Output signals	Digital: RS232 Analog: Current 4 - 20 mA	Digital: RS232	"Digital: RS485 Analog: Current 4 - 20 mA"
Output format	Micro-Hybrid industrial protocol	Micro-Hybrid industrial protocol	Micro-Hybrid industrial protocol
Operating temp.	0 - 60 °C	0 - 60 °C	0 - 60 °C
Storage temp.	-20 - 85 °C	-20 - 85 °C	-20 - 85 °C
Sterilization temp.	180 °C	190 °C (sensor head only)	100 °C (steam sterilizable)
Humidity	0 - 95 % RH, non-conden-sing	0 - 95 % RH, non-conden-sing	0 - 95 % RH, non-condensing

MICRO-HYBRID › Product guide › Infrared measurement applications

IR flame detection
Early fire recognition with pyroelectric sensors

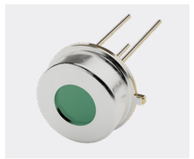
Infrared detectors identify the characteristic IR radiation of flames reliably and enable early fire warning even under harsh industrial conditions. The detectors are ideal for continuous monitoring in safety-critical environments like industrial plants, warehouses, and transportation systems.

Pyroelectric detectors for flame detection

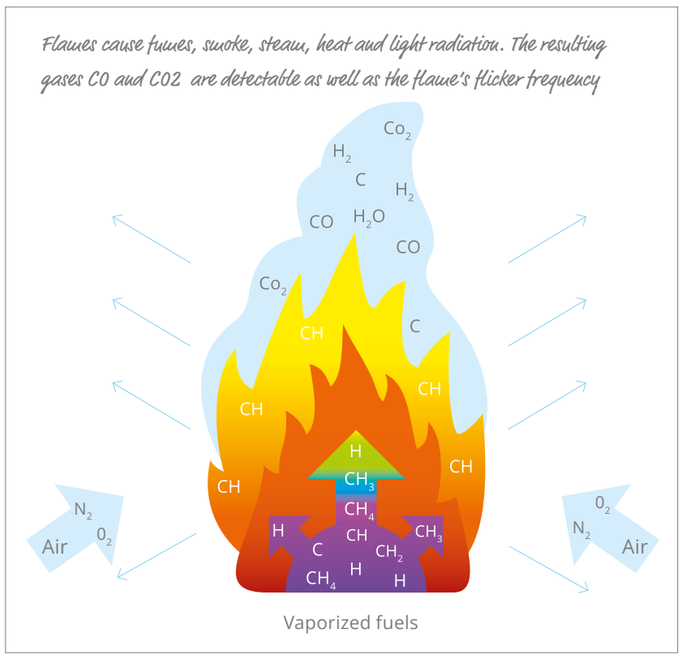
The MPS pyroelectric flame sensor detects **modulated infrared signals** by analyzing the **dynamic IR signature** produced by flame flicker and the specific absorption features of combustion gases.

Key advantages of pyroelectric detectors for flame detection

- High sensitivity and long-term stability
- High detectivity up to 3.5x10^8 cm√Hz/W
- Low microphone effect
- Temperature dependency
- Drive-mode current



PS1xPyro-Flame



Remote temperature measurement

Non-contact temperature measurement relies on detecting **infrared radiation** emitted by an object. **Thermopile detectors** are ideal for **pyrometers** because they provide **continuous, precise readings** without requiring modulation of an IR source.

In industrial applications, sensors must meet higher demands:

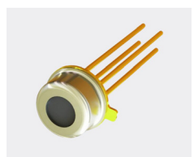
- Accurate measurements across wide temperature ranges
- Fast response times for dynamic processes
- Resistance to dust, vibration, and temperature fluctuations
- Long-term stability under harsh conditions

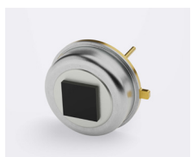
MTS thermopiles for non-contact temperature measurement

Micro-Hybrid thermopile detectors are designed for high precision, durability, and reliability, making them an ideal choice for industrial pyrometry.

Key advantages of MTS thermopiles for non-contact temperature measurement

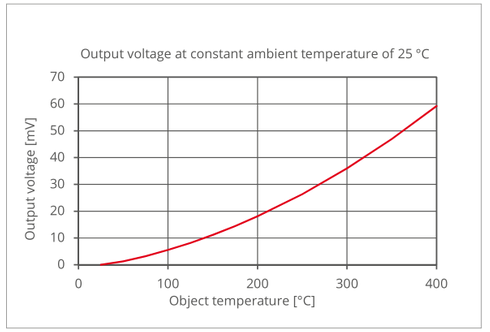
- High detectivity up to 12.2 × 10^8 cm·√Hz/W with Krypton filling
- High sensitivity up to 501 V/W
- Filters: 8-14 µm (optimized for industrial use) or 5.5 µm cut-on (optimized for high-volume applications)
- Operating ambient temperature range: -20 to 180 °C, depending on filter





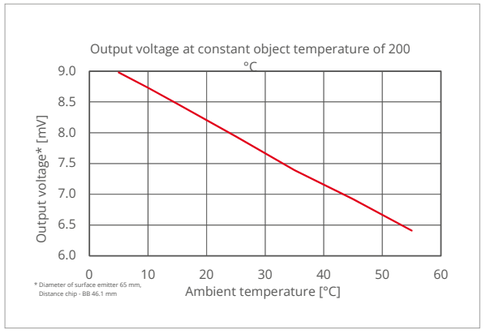
Typical operating characteristics of MTS Temp 80 thermopiles

Reliable signal output across a wide temperature range:



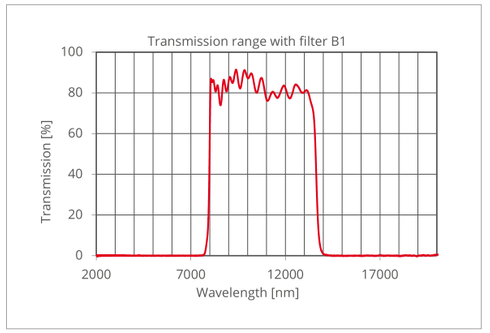
MTS Temp 80 delivers stable, predictable results even at target temperatures up to 400 °C - ideal for precise thermal monitoring in industrial environments.

Consistent performance under changing ambient conditions:



The sensor compensates for varying environmental temperatures, ensuring dependable output even in thermally dynamic applications.

Optimized for the mid-infrared:



The integrated B1 filter enables highly selective detection in the 8-14 µm range - the spectral sweet spot for accurate, non-contact temperature sensing based on Planck's law.

Technical information - Overview

Parameter	MTS Temp 44	MTS Temp 80	MTS Hightemp 80
Operating temperature	-20 ...+85	-20 ...+85	-20 ...+180
Thermocouples	44	80	80
Detectivity	typ. 1.61x10^8	typ. 12.2x10^8	typ. 12.2x10^8
Sensitivity	typ. 39 V/W	typ. 501 V/W	typ. 501 V/W

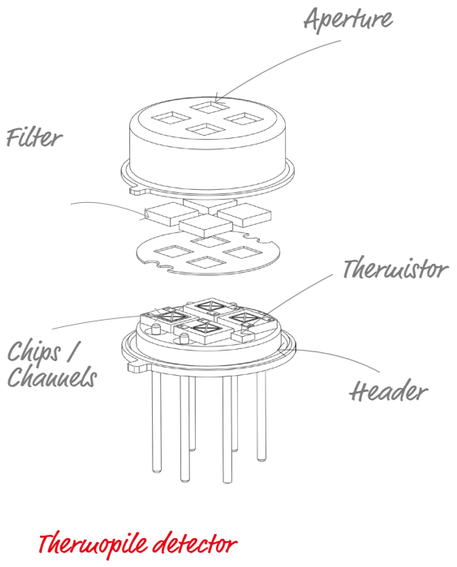
Customization options: thermopiles for remote temperature measurement

With this numerical code, you can easily choose the right combination of thermopile parts according to your application demands.

TSAxBBB-C-DD.DD-E-F-GG-H

↓

TS1x80B-A-D0.75-1-Kr-B1-180



TSAx

TS1x80B-A-D0.75-1-Kr-B1-180
Channels
1 - One channel (on request)

BBB-

TS1x80B-A-D0.75-1-Kr-B1-180
Thermopile chip type
44S - Industrial standard
56S - Consumer markets
80B - High end performance

C-

TS1x80B-A-D0.75-1-Kr-B1-180
Package
A - T039
B - To46 (only 56S)

DD.DD-

TS1x80B-A-D0.75-1-Kr-B1-180
Aperture
D2.55 - round D2.55 mm (only 56S)
D0.75 - round D0.75 mm

E-

TS1x80B-A-D0.75-1-Kr-B1-180
Thermistor
1 - PTC Ni 1000
5 - NTC 26K (only 56S)

F-

TS1x80B-A-D0.75-1-Kr-B1-180
Filling Gas
Kr - Krypton
N2 - Nitrogen (only 56S)

GG

TS1x80B-A-D0.75-1-Kr-B1-180
Filter
B1 - Silicon, 8-14 µm
B2 - Silicon, cut on 5.5 µm (only 56S) W1 – Isoflurane

H

TS1x80B-A-D0.75-1-Kr-B1-180
Option
180 - Up to 180 °C work temp (only 80B, B1 filter)

MICRO-HYBRID › Product guide › Infrared measurement applications

Technical information

JSIR emitter

Chiptype	340-4	340-5	350-4	350-5	355-4	Unit
Active area	2.2 x 2.2	1.0 x 1.0	2.2 x 2.2	0.65 x 0.65	2.2 x 2.2	mm^2
Hot resistance	18 ± 5	25 ± 5	40 ± 20	40 ± 20	35 ± 20	Ω
Temperature coefficient	1,100	1,200	500	500	480	ppm/K
Time constant	11	6	12.5	12.5	30	ms
Nominal power consumption	650	300	650	175	650	mW
Operating voltage	3.4	2.4	4.9	4.9	4.8	V
Operating current	190	110	132	132	140	mA
Operating mode	Constant power mode	Constant power mode	Constant power mode	Constant power mode	Constant power mode	
Temp. of active area	540 ± 30	585 ± 30	610 ± 30	610	580 ± 30	°C
Maximum power consumption	1200	400	1200	300	1200	mW
Maximum enclosure temperature	185	185	185	185	185	°C
Maximum temperature of active area	770	710	850	850	850	°C

MPS pyro detectors for gas analysis

Product type	MPS2SENS LiTaO$_3$	MPS2SENS	MPS4SENS	Unit
Active area	1.8 x 1.0	2 x (0.7 x 0.7)	4 x (0.7 x 0.7)	mm²
Aperture	2.7 x 1.8	2 x (1.5 x 1.5)	4 x (1.5 x 1.5)	mm²
Thermal time constant	57	16	16	ms
Electrical time constant	6	2	2	ms
AC sensitivity	120.000	200.000	200.000	V/W
Noise voltage density	90	50	50	µV/√Hz
Typical noise equivalent power (NEP)	typ. 7.0 x 10-10	typ. 4.0 x 10-10	typ. 4.0 x 10-10	W/√Hz
Specific detectivity	typ. 2 x 10^8	4.0*10^8	4.0*10^8	cm√Hz/W
Microphonic voltage	550	< 1000	< 1000	µV/g
Operating voltage (Vdd)	1.8 ... 5.5 (3 V recommended)	+5 ± 10 %	+5 ± 10 %	V DC
Operating temp. range	-20 to +85	-20 to +85	-20 to +85	°C

MTS thermopile detectors for gas analysis

Product type	MTS2SENS200 carbon dioxide	MTS2SENS44 carbon dioxide	MTS4SENS200 3C-1	MTS4SENS44 3C-1	Unit
Active area	2 x (1.2 x 1.2)	2 x (1.0 x 1.0)	4 x (1.2 x 1.2)	4 x (1.0 x 1.0)	mm²
Aperture	2 x (1.5 x 1.5)	2 x (1.5 x 1.5)	4 x (1.5 x 1.5)	4 x (1.5 x 1.5)	mm²
Thermopile elements	200	44	200	44	
Time constant	51	13	51	13	ms
DC output voltage	9.35	1.47	9.35	1.47	mV
DC responsivity	171	39	171	39	V/W
Noise voltage	33	24	33	24	nV/√Hz
NEP	0.19	0.62	0.19	0.62	nW/√Hz
Specific detectivity	6.27×10^8	1.61×10^8	6.27×10^8	1.61×10^8	cm√Hz/W
Resistance	65	35	65	35	kΩ
Thermistor	PTC Ni1000	PTC Ni1000	PTC Ni1000	PTC Ni1000	
Operating temp. range	-20 to +85	-20 to +85	-20 to +85	-20 to +85	°C
Socket	TO39	TO39	TO39	TO39	

MTS thermopiles for temp

Product name	MTS1HIGH TEMP80	MTS1TEMP80	MTS1TEMP44	MTS1TEMP56	Unit
Active area	Ø 0.5	Ø 0.5	1.0 x 1.0	0.82 x 0.82	mm²
Aperture	0.75	0.75	0.75	0.25	mm
Thermopile elements	80	80	44	56	
Time constant	51	51	13	11	ms
DC output voltage	3.74	3.74	1.74	0.8	mV
DC sensitivity	500	501	39	31	V/W
Noise voltage	18	18	24	38	nV/√Hz
NEP	0.04	0.04	0.62	1.23	nW/√Hz
Resistance	20	20	35	90	kΩ
Detector filter	From 8 to 14 µm / Filter B1	From 8 to 14 µm / Filter B1	From 8 to 14 µm / Filter B1	Cut-on 5.5 µm / Filter B2	
Operating temp. range	-20 to +180	-20 to +85	-20 to +85	-20 to +85	°C
Package	TO39	TO39	TO39	TO46	TO46

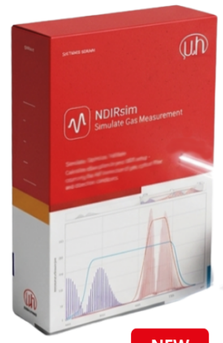
MicroFlow CO_2 sensors

Technical parameter		Unit
General		
Order number	VKM20029xx	
Measurement principle	NDIR	
Sample cell length	2 ...100	mm
Estimated lifetime of IR source	40 000	h
Gas flow rate	0.1 - 3	l/min
Dimensions	71 x 139 x 69.5 or 88 x 90 x 60	[mm]
Weight	160 - 170	g
Tube connection	6/4 mm tube	
Electrical connection type for power supply	2-pin, 3.5 mm	
Connection type for communication	3 pol. RS232 / 3 pol. CAN-Bus (2.54 mm)	
Measuring gas	Methane, carbon dioxide, carbon monoxide, sulfur hexafluoride	
Warm up time	< 10	min
Response time (t90)	< 5	s

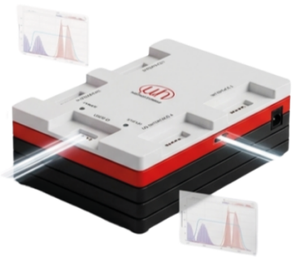
Technical parameter		Unit
Digital resolution	0.001	Vol.-%
Linearity error	< 0.6	% FS
Repeatability	< 0.25	% FS
Long term stability (zero)	< 0.7	% FS/ month
Long term stability (span)	< 1	% FS/ month
Temperature influence (zero)	< 0.05	% FS/ 10 K
Temperature influence (span)	< 0.7	% FS/ 10 K
Position influence	< 0.5	% FS/ 180 °
Pressure influence	< 0.15	% FS/ 10 hPa
Operating voltage	9 ... 30	V DC
Operating current max.	110 mA @ 9 V, 33 mA @ 30 V	
Inrush current	220	mA
Nominal power consumption	1	W
Digital output signal	RS232 or CAN-Bus	
Output format CAN	MARS/ CAN-Bus	
Output format RS232	ASCII	
Data rate CAN max.	10	ms
Data rate RS232 max.	100	ms
Operating environment		
Operating temperature	5 ... 45	°C
Storage temperature	-20 ... 60	°C
Air pressure	300 - 1200	hPa
Ambient humidity	0 ... 95 relative humidity (non condensing)	%

MICRO-HYBRID › Product guide › Infrared measurement applications

Micro-Hybrid Gas Sensor Development Solutions



NEW



NEW

NDIRsim App

- Browser-based simulation app
- No installation required
- Order in the Micro-Hybrid online shop, use securely via your Micro-Hybrid account

eNDIRi: Full IR Evaluation Kit

- Unique range of functions
- User-friendly software downloads, including the eNDIRi app
- Plug-and-play setup
- Evaluation of IR components for specific applications

Multipass Absorption Cell

- First Micro-Hybrid gas measurement cell for very low gas concentrations
- For use with Micro-Hybrid IR emitters and detectors

NDIR Bundles

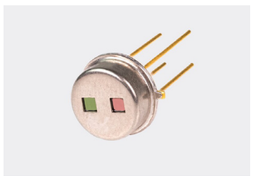
- Gas-specific emitters and detectors in practical test kits
- Thermopile sets, pyro sets & emitter Kits

NDIR bundles

It is easy to obtain measurement results quickly with our sets of matched IR emitters and detectors.

Each Micro-Hybrid NDIR bundle combines 5 IR emitters and 5 matching IR detectors for one target gas. They are available as thermopile or pyroelectric bundles.

Explore all NDIR bundles online



All pre-configured NDIR Bundles

HC	CO2	N2O	SF6	SO2
NO	H2O	CO	-OH	

Customized electronic solutions

At Micro-Hybrid, we offer more than high-performance IR components and sensors. We are also your ideal partner for **developing and manufacturing custom electronics** - tailored precisely to your application needs.

With our transparent and efficient **5-step MHbig5 model,** we guide you from the **initial project idea** to series production:

Creating your electronic solution in 5 steps:

01 **Request** › 02 **Examination** › 03 **Development** › 04 **Test and optimization** › 05 **Series production**

By combining **high-end sensor technology** with **customized electronics development**, we deliver complete, perfectly matched solutions - all from a **single source**. This shortens your time-to-market and gives you a technological edge in competitive industries. Discover how **Micro-Hybrid can turn your idea into a market-ready product.**

sales@microhybrid.com

Our manufacturing competencies at a glance

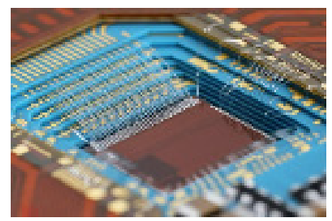
Thick-Film technology
- Production of robust, reliable multilayer circuits on ceramic substrates
- Ideal for high-temperature and chemically resistant applications

LTCC technology (Low temperature cofired ceramics)
- 3D multilayer ceramic circuits with integrated passive components
- Compact, highly stable circuits for harsh environments

SMD Assembly
- Automated placement and soldering of surface-mount components
- High precision and repeatability for complex electronic modules

Chip and Wire Bonding (Chip-on-board technologies)
- Direct connection of semiconductor chips to circuit boards
- Enables miniaturization and robust, high-frequency electronic assemblies

Circuit protection
- Design and integration of customized protection concepts
- Increases reliability and lifespan of electronic systems under extreme conditions



Global presence. Local expertise.

With our international sales and application centers, we are close to our customers - wherever they are.

From first contact to technical consultation and after-sales support, our local teams ensure fast response times, in-depth application know-how, and excellent service throughout the entire sales process.

MICRO-HYBRID

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