micropower gas sensing

MGS TECHNOLOGY

## DATA SHEET

# ULTRA-LOW POWER INFRARED GAS SENSOR MIPEX-05-B-RX-3.1

### Ex version

## Features

- ☑ Ultra-low power consumption. Average current consumption at constant measurement of concentration is less than 60 µA.
- ☑ Smart sensor with embedded microcontroller returns linearized, temperature-compensated output data.
- ☑ LED based dual wavelength technology.
- ☑ Response time (T90) without dust filter 15 sec for methane, ethane and 25 sec for propane.
- ☑ Measurement range:
  - up to 100% vol. for methane ($CH_4$)
  - up to 20% vol. for propane ($C_3H_8$)
- ☑ Provides intrinsically safe explosion protection level “ia”.
- ☑ Industry standard size (⌀20.1×16.6 mm).

## Description

MIPEX-05 is intended for automatic continuous measurement of the concentration of hydrocarbons in atmosphere of hazardous areas.

Sensor operating principle is based on NDIR technology, i.e. on selective absorption of infrared radiation by gas molecules.

Differential dual wavelength method allows eliminating of water vapor, optical elements contamination and other non-selective hindrances influence.

Communication interface – UART.

## Application

MIPEX-05 sensor is intended for using in a hazardous areas. Sensor is used as a OEM component for portable and fixed gas detectors for industrial safety.

# Available part numbers

| Part number | Calibration gas | Measurement range, % vol. | Temperature range, °C | RX-code |
|---|---|---|---|---|
| MIPEX-05-1-10-3.1 | $CH_4$ | 0…5 | -10…+40 | 10 |
| MIPEX-05-1-20-3.1 | | 0…100 | | 20 |
| MIPEX-05-1-11-3.1 | | 0…5 | -40…+60 | 11 |
| MIPEX-05-1-21-3.1 | | 0…100 | | 21 |
| MIPEX-05-1-12-3.1 | | 0…5 | -20…+50 | 12 |
| MIPEX-05-1-22-3.1 | | 0…100 | | 22 |
| MIPEX-05-1-13-3.1 | | 0…5 | -60…+60 | 13 |
| MIPEX-05-1-23-3.1 | | 0…100 | | 23 |
| MIPEX-05-2-71-3.1 | $C_3H_8$ | 0…2.5 | -40…+60 | 71 |
| MIPEX-05-2-81-3.1 | | 0…20 | | 81 |
| MIPEX-05-2-72-3.1 | | 0…2.5 | -20…+50 | 72 |
| MIPEX-05-2-82-3.1 | | 0…20 | | 82 |
| MIPEX-05-2-73-3.1 | | 0…2.5 | -60…+60 | 73 |
| MIPEX-05-2-83-3.1 | | 0…20 | | 83 |
| MIPEX-05-4-10-3.1 | $CH_4$* | 0…5 | -10…+40 | 10 |
| MIPEX-05-4-20-3.1 | | 0…100 | | 20 |
| MIPEX-05-4-11-3.1 | | 0…5 | -40…+60 | 11 |
| MIPEX-05-4-21-3.1 | | 0…100 | | 21 |
| MIPEX-05-4-12-3.1 | | 0…5 | -20…+50 | 12 |
| MIPEX-05-4-22-3.1 | | 0…100 | | 22 |
| MIPEX-05-4-13-3.1 | | 0…5 | -60…+60 | 13 |
| MIPEX-05-4-23-3.1 | | 0…100 | | 23 |

***** The atmosphere of objects of group I in accordance with IEC 60079-29-1 section 5.4.24.2.


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# Technical specification

| General specification | | |
|---|---|---|
| **Gas sampling method:** | | Diffusion |
| **Operating principle:** | | Non-Dispersive Infra-Red (NDIR) |
| **Target gas** | | $CH_4$ |
| | | $C_3H_8$ |
| **Operating, storage and transportation conditions:** | **Relative humidity, %** | up to 98 |
| | **Atmospheric pressure, kPa** | 80…120 |
| | **Temperature*, °C** | -60...+60 |
| **Warm-up time, sec** | | ≤ 120 |
| **Lifetime, years** | | >10 |
| **Level IP** | | without filter<br>20 |
| | | with dust filter<br>54 |
| **Housing material** | | Polycarbonate Lexan™ |
| **Overall dimensions, mm** | | ⌀20.1×16.6 (w/o pins) |
| **Max weight, g** | | 7.5 |

| Measurement specification | |
|---|---|
| **Measurement range, % Vol **** | 0…2.5 ($C_3H_8$) |
| | 0…5 ($CH_4$) |
| | 0…20 ($C_3H_8$) |
| | 0…100 ($CH_4$) |
| **Accuracy (+20…+25 °C)***** | ± 0.1% vol. or ± 5% of readings (whichever is greater) for $CH_4$ |
| | ± 0.05% vol. or ± 5% of readings (whichever is greater) for $C_3H_8$ |
| **Response time (T90), sec** | without dust filter<br>15 - $CH_4$, 25 - $C_3H_8$ |
| | with dust filter attached<br>25 - $CH_4$, 30 - $C_3H_8$ |

| Electrical specification | |
|---|---|
| **Operating supply voltage, VDC** | +3.0…+5.0 |
| **Maximum supply voltage, VDC** | +5.4 |
| **Communication interface** | UART |
| **Average current, µA** | 60**** |
| **Peak current, mA** | 4 max |

***** Term operating temperature refers to ambient temperature at which sensor operates and its intrinsic safety is ensured, but sensor accuracy is provided only in specified temperature range determined by RX-code (see Ordering info).

****** Variability in whole operating measurement range for any sensor modification is presented below.

******* Variability in whole operating temperature range for any sensor modification is presented below.

******** Average current consumption at constant measurement of concentration is less than 60 µA, when sending the command <@> no more than 1.32 ± 0.04 seconds.


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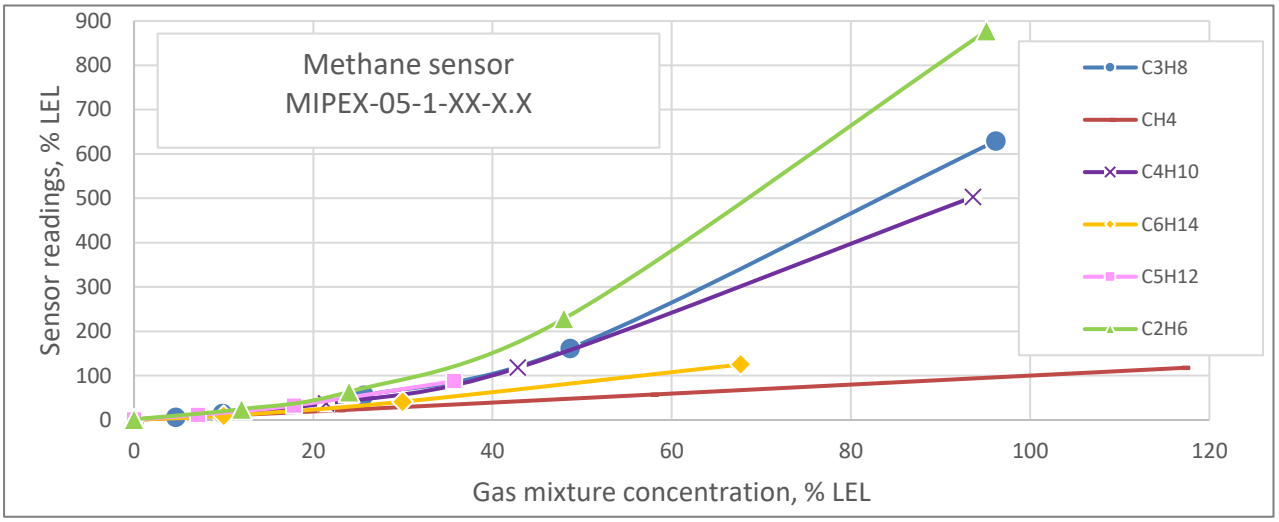
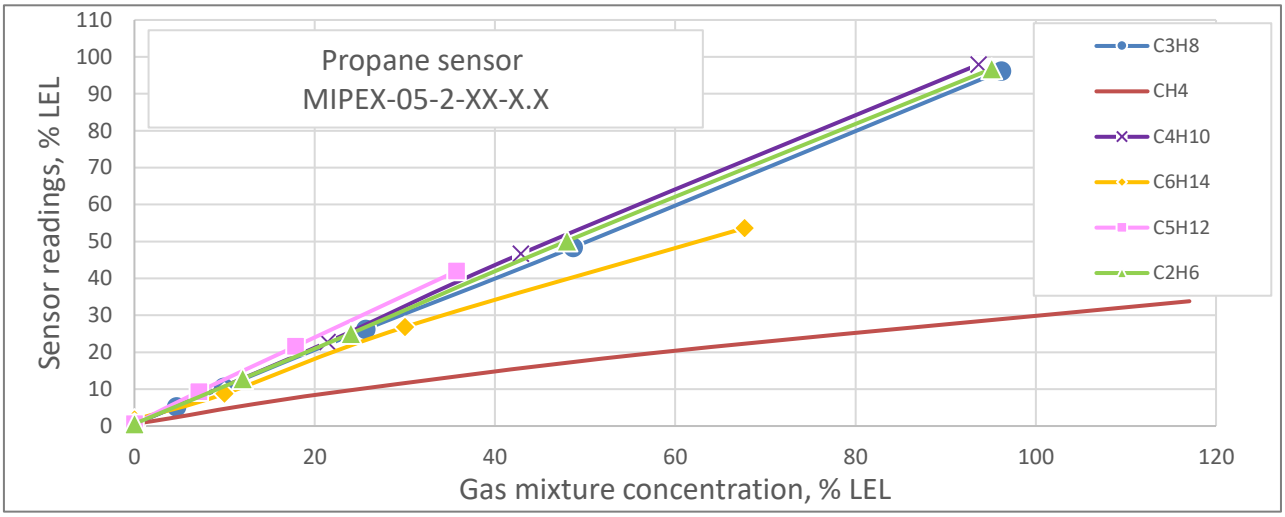
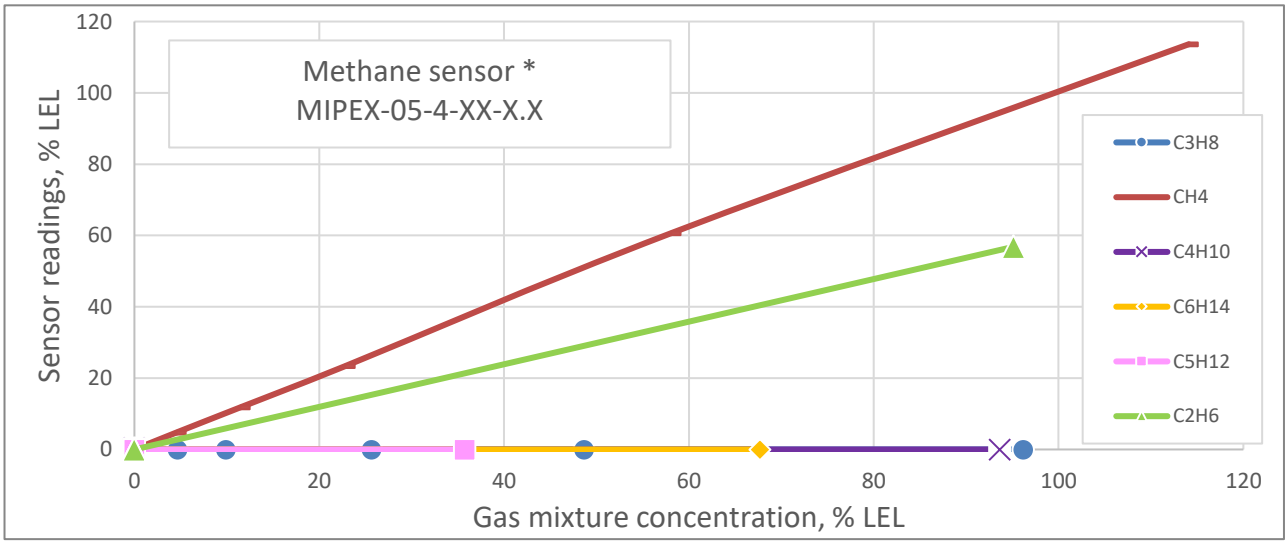
# Typical sensor cross-sensitivity to hydrocarbons and accuracy





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# Readings variability

| Gas | Readings variability within a temperature range | Additional variability due to pressure | Additional variability due to humidity |
|---|---|---|---|
| $CH_4$ | ± 0.1% vol. or ± 5% of readings (whichever is greater) within the range of +20…+25 °C; | ± 0.2% vol. or ± 30% of readings (whichever is greater) at 100 kPa (test: 80 kPa, 100 kPa, 120 kPa) | ± 0.2% vol. or ± 15% of readings (whichever is greater) at 40 °C (test: 20% RH, 50% RH, 90% RH) |
| | ± 0.15% vol. or ± 10% of readings (whichever is greater) within the range of -10…+20 °C and +25…+40 °C; | | |
| | ± 0.3% vol. or ± 20% of readings (whichever is greater) within the range of -40…-10 °C and +40…+60 °C. | | |
| | ± 0.4% vol. or ± 30% of readings (whichever is greater) within the range of -60…-40 °C | | |
| $C_3H_8$ | ± 0.05% vol. or ± 5% of readings (whichever is greater) within the range of +20…+25 °C; | ± 0.1% vol. or ± 30% of readings (whichever is greater) at 100 kPa (test: 80 kPa, 100 kPa, 120 kPa) | ± 0.1% vol. or ± 15% of readings (whichever is greater) at 40 °C (test: 20% RH, 50% RH, 90% RH) |
| | ± 0.075% vol. or ± 10% of readings (whichever is greater) within the range of -10…+20 °C and +25…+40 °C; | | |
| | ± 0.15% vol. or ± 20% of readings (whichever is greater) within the range of -40…-10°C and +40…+60 °C. | | |
| | ± 0.2% vol. or ± 30% of readings (whichever is greater) within the range of -60…-40°C | | |


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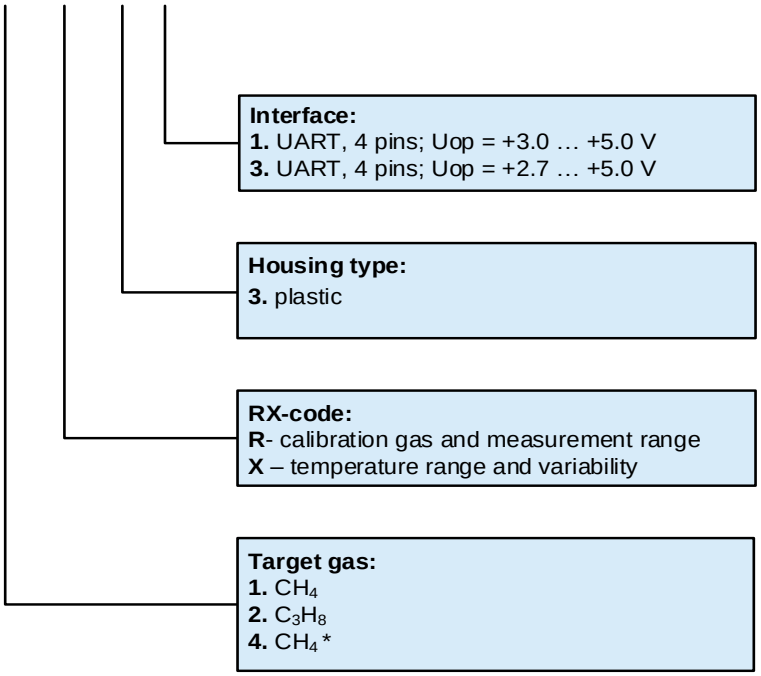
# Ordering info

Part number structure:

**MIPEX-05-B-RX-D.E**




Term “sensor type” refers to emitter and photodiode spectral range which is adjusted for best detection of a certain gas, while term “calibration gas” refers to gas mixture used for sensor calibration.

***** The atmosphere of objects of group I in accordance with IEC 60079-29-1 section 5.4.24.2.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## Intrinsic safety

Sensor is designed in accordance with standards:
**IEC/EN IEC 60079-0** and **IEC/EN 60079-11:**

- Explosion protection level – "ia";
- Hazardous area class (Electrical equipment group) – "I" and "IIC";
- Intrinsic safety parameters: $P_i$ = 0.25 W, $U_i$ = 5.4 V, $I_i$ = 450 mA, $C_i$ = 60.1 µF, $L_i$ = 0 mH.

**UL913, UL 60079-0, UL 60079-11, CSA C22.2 No. 60079-0, CSA C22.2 No. 60079-11:**

- Class I, Division 1, Group A, B, C, D.
- Intrinsic safety parameters: $P_{max}$ = 0.25 W, $U_{max}$ = 5.4 V, $I_{max}$ = 450 mA, $C_i$ = 60.1 µF, $L_i$ = 0 mH.

**IEC/EN 60079-28:**

- MIPEX-05's optical radiation power is less than 7 mW.

## Certificates / Declarations of conformity

Scheduled to be received:

- IEC / EN IEC 60079-0
- IEC / EN 60079-11
- IEC / EN 60079-28
- UL 913
- UL 60079-0
- UL 60079-11
- UL 60079-28
- CSA C22.2 No. 60079-0
- CSA C22.2 No. 60079-11
- RoHS 2 Compliant – Directive 2011/65/EU;
- RoHS 3 Compliant – EU Directive 2015/863.

## Handling precautions

Maximum allowable pressure on the central part of sensor reflecting cover and on side surface sensor – 4N.

Sensor is not intended to measure carbon dioxide contained in fluids.

Keep sensor out of contact with aggressive substances e.g. acidic environments, which can react with metals, as well as solvents, which may affect polymeric materials.

Diffusion holes of sensor should be protected against ingress of dust and sprayed materials.

Covering diffusion holes of sensor increases its response time.

Sensor must be mounted using sockets only, as soldering the pins may damage sensor.

There is no risk of pollution and negative impact on human health. Sensor does not contain any harmful substances that may be released during its normal operation.


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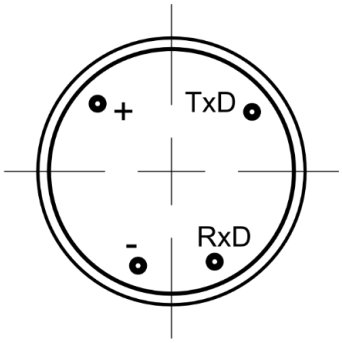
## Sensor pinout (bottom side)



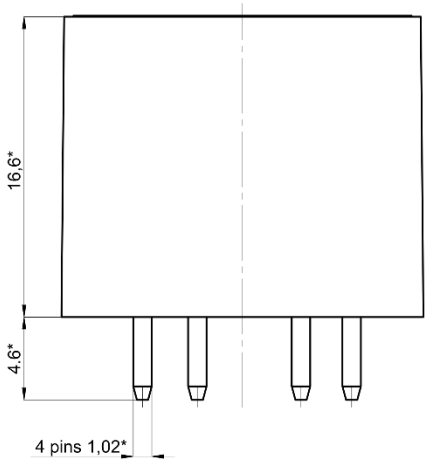

| Pin | Purpose |
|---|---|
| **TxD** | UART, TxD output |
| **RxD** | UART, RxD input |
| **+** | $V_{dd}$ |
| **–** | GND |

- $V_{dd}$ – +3.0 … 5.0 VDC;
- High logic level for transmitting line TxD and receiving line RxD corresponds to $V_{dd}$.

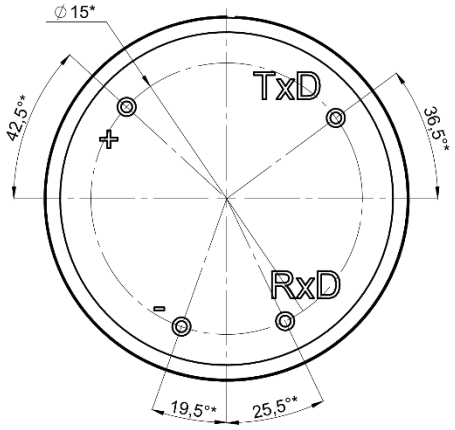
## Outline

All dimensions are in millimeters.

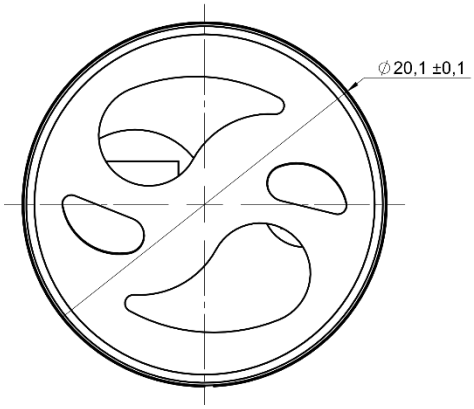
**Side view**

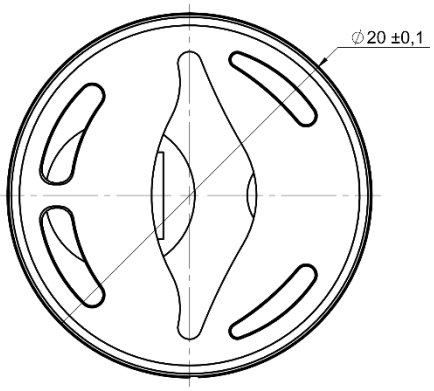



**Bottom view**




**Upper view**





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# Contacts

**MGS TECHNOLOGY DOO BEOGRAD**

Bulevar Patrijarha Germana 91, Beli Potok, Beograd,

Republic of Serbia

Tel/fax: +381 695 526 116

**web**: www.mgs-technology.com

**e-mail**: info@mgs-technology.com


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