# Quick Start Guide

## OEM Gas Measurement Modules – From Unpacking to First Reading in 8 Steps

INFRA.sens® · ULTRA.sens® · KOMBI.sens® · HUMI.sens® · O2.sens · Thermobox V5

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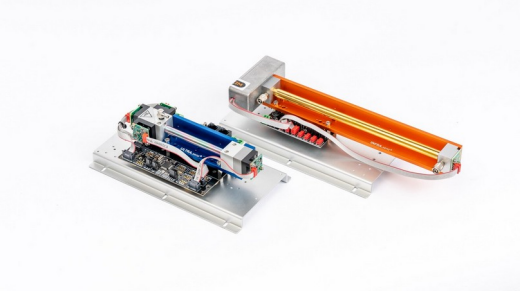


**INFORMATION**

**This quick start guide does not replace the operating manual**

It summarizes the key steps for initial commissioning. Before working with the gas measurement module, read the complete operating manual, in particular Section 1 “Safety.” Product-specific values (measuring range, channel assignment, power supply) are given in the data sheet or technical specification of your module; in case of discrepancies, the operating manual prevails.

**Download the complete operating manual (BA001-EN):**
www.witec-sensorik.de/en/downloads/manual-gasmodules/

## Safety at a Glance

**WARNING**

**Risk of explosion**

The gas measurement module is not an explosion-protected device.

- Never use in hazardous locations (Ex zones).
- Do not measure explosive gas mixtures.

**WARNING**

**Leakage of toxic or corrosive gases (e.g., CO, $H_2S$, $SO_2$, $NO_2$, $O_3$, $NH_3$, $Cl_2$)**

- Connect the gas outlet to an extraction system or exhaust line.
- Perform a leak test after connecting (Step 4).
- Before working on the gas path, purge it with ambient air or nitrogen for at least 10 minutes.
- Observe the safety data sheet (SDS) of the sample gas.

**⚠ WARNING**

**Ultraviolet radiation (ULTRA.sens, KOMBI.sens)**

UV LEDs and EDL sources: risk group 2 per DIN EN 62471. Hazard to eyes and skin.

- Do not look directly into the radiation source; switch off the radiation source before working on the beam path.

**! NOTICE**

**Incorrect voltage, reverse polarity, electrostatic discharge**

The base board can be destroyed.

- Check voltage and polarity before switching on.
- Connect the interfaces first, then switch on the power supply.
- Handle the electronics only with ESD protection.

## 1 What You Need

The scope of delivery is listed on the enclosed delivery note. Check the shipment for completeness and transport damage. Report visible damage to the carrier immediately and keep the packaging.

Software and documentation are available for **download**. Provide the following yourself or order it as an accessory:

| Item | Version / Item No. |
|---|---|
| 24 VDC power supply, galvanically isolated | 2003262 (base board V1.8.x, V1.9.x, Thermobox) · 2003137 (IR-compact V2.0.x) |
| RS232 data cable | 2002204 (IR-compact) · 2001207 (V1.9.x and Thermobox) · 2000592 (V1.8.x) |
| USB/RS232 adapter | 2001552 (alternatively CAN-USB adapter 2002089) |
| PC | Windows 10 or 11 with MARS® Tool light (Step 6) |
| Gas lines | Tubing 4 mm ID / 6 mm OD, Viton or PTFE (for $H_2O$ measurement, PTFE or stainless steel only) |
| Zero gas | Gas free of the measured component, e.g., nitrogen ($N_2$) 5.0 |
| Sample conditioning | Sample gas cooler or Nafion™ tubing, particle filter < 0.1 µm, pulsation-free pump, flow meter |

## 2 Unpack and Acclimatize

1. Remove the module from the packaging. Do not touch the electronics (ESD).
2. Allow the module to reach room temperature before switching it on so that no condensation forms.
3. Remove the dust caps from the gas connections only immediately before connecting the gas lines.

Storage: dry, dust-free, in the original packaging, −20 to 60 °C (O2.sens: ideally 15–25 °C).

## 3 Mounting

| Ambient Condition | Requirement |
|---|---|
| Temperature | 5–45 °C, as constant as possible |

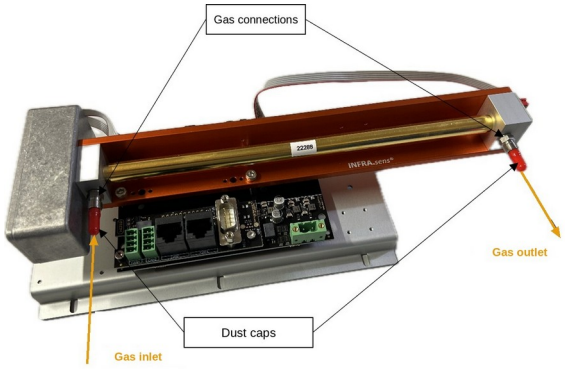
| Ambient Condition | Requirement |
|---|---|
| Relative humidity | < 95 %, non-condensing |
| Location | Dry, dust-free, no aggressive atmosphere, not outdoors without a protective enclosure, non-hazardous areas only |

1. Securely fasten the module with **6 M4 screws** through the holes in the mounting plate.
2. The optical bench (emitter, cell, detector) must not touch any other components except via the mounting plate (enclosure walls, cables, heat sources) and must not be exposed to vibration – otherwise the measured value will drift.
3. Define the mounting orientation and do not change it afterward.
4. With O2.sens: align the sensor vertically with the sensing surface facing down.

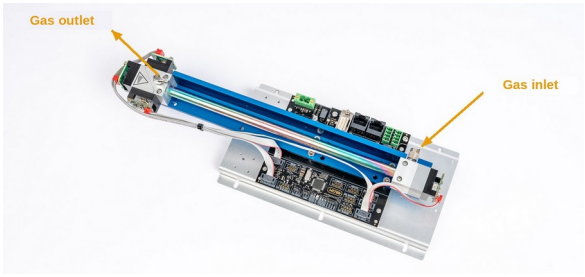
   ✔️ **Result:** The module is mechanically secured. The mounting orientation can shift the zero point – this is why the zero point is adjusted in Step 8.

## 4 Connect the Gas Lines and Perform a Leak Test

The **gas inlet is always on the detector side**, the gas outlet on the emitter side. The module was calibrated in this flow direction – maintain it during adjustment and test gas application as well.




*INFRA.sens: inlet on the left*




*ULTRA.sens: inlet on the right*

1. Remove the dust caps. Do not modify or replace the fittings.
2. Connect the sample gas line to the gas inlet and the exhaust line to the gas outlet. Keep lines short (each meter of tubing adds approx. 0.75 s of dead time at 1 l/min).
3. Install sample conditioning upstream: dry the sample gas (dew point < 5 °C), filter particles (< 0.1 µm), keep the pressure stable.
4. Set the flow rate and keep it constant (see table). Avoid fluctuating back pressure at the gas outlet.

| Flow Rate | Value |
|---|---|
| Permissible | 0.1–1.5 l/min |
| During factory calibration | 0.7–1 l/min |
| For adjustment | 1 l/min |

### Leak test (recommended after connecting)

1. Switch off the gas supply and seal the gas outlet tightly.
2. Connect nitrogen 5.0 to the gas inlet via pressure regulator, shut-off valve, and pressure gauge (alternatively, a hand pump with pressure gauge).
3. Pressurize the gas path to **250 mbar overpressure**, shut off the supply, and observe the pressure drop for 1 minute.
4. Remove the seals and reconnect the gas lines.

   ✔️ **Result:** Pressure drop < 1 mbar/min – the gas path is leak-tight. Otherwise, check the fittings and repeat the test.

## 5 Make the Electrical Connections

| Version | Supply Voltage | Current Consumption |
|---|---|---|
| ULTRA.sens (base board V1.9.x) | 24 VDC (15–30 V) | < 100 mA |
| INFRA.sens, base board V1.9.x / IR-compact V2.0.x | 24 VDC (15–30 V / 9–30 V) | < 300 mA |
| KOMBI.sens | 24 VDC (15–30 V) | < 400 mA |
| Thermobox V5 with heater | 24 VDC (15–30 V) | min. 2 A (35 W) |

| Connection | Base Board V1.9.x | IR-compact V2.0.x | Thermobox V5 |
|---|---|---|---|
| Power supply | X5: Pin 1 UB+, Pin 2 UB− | Power: Pin 1 UB+, Pin 2 UB− | 24 VDC: Pin 1 UB+, Pin 2 UB− |
| RS232 | CON3, D-sub 9 socket: Pin 2 TxD, 3 RxD, 5 GND | RS232, 3-pin: Pin 1 RxD, 2 TxD, 3 GND | RS232, D-sub 9 socket: Pin 2 TxD, 3 RxD, 5 GND |
| CAN bus (RJ45) | X1/X4: Pin 1 GND, 4 CAN-H, 5 CAN-L | – | – |
| CAN bus (terminal) | X2/X3, 4-pin, 3.5 mm: Pin 1 GND, 2 CAN-L, 3 CAN-H | CAN, 3-pin, 2.54 mm: Pin 1 CAN-L, 2 CAN-H, 3 GND | CAN, 4-pin, 3.5 mm: Pin 1 GND, 2 CAN-L, 3 CAN-H (pin 1 on the right) |

*Base board V1.8.x and Modbus versions: see operating manual, Section 7.3.*

### CAN bus wiring

- The two RJ45 sockets X1/X4 (V1.9.x) are connected in parallel – several modules can be daisy-chained with standard patch cables.
- A **120 Ω termination resistor** must be active at the **first and last node**. It is integrated on the base board: enabled via software on V1.9.x and IR-compact V2.0.x, via jumper JP2 on V1.8.x.
- Baud rate (125 kbaud, 250 kbaud, 500 kbaud, 1 Mbaud) and node ID or CAN IDs are configured via software (MARS® Tool via RS232). Protocol and commands: communication manual.

1. Connect the data cable to the RS232 port of the module and, via the USB/RS232 adapter, to the PC.
2. Connect the power supply – **do not switch it on yet**. Check voltage and polarity.

**NOTICE**

**Floating (potential-free) operation**

- Use only galvanically isolated power supplies.
- Do not connect the enclosure or metal parts to protective earth (PE).
- Wire the supply UB− and the GND of the communication interface separately – otherwise equalizing currents will flow.

## 6 Install the Software

**MARS® Tool light** is used to read measured values, log data, and perform adjustments on the PC. The latest version is available for download at

www.witec-sensorik.de/en/downloads/software/

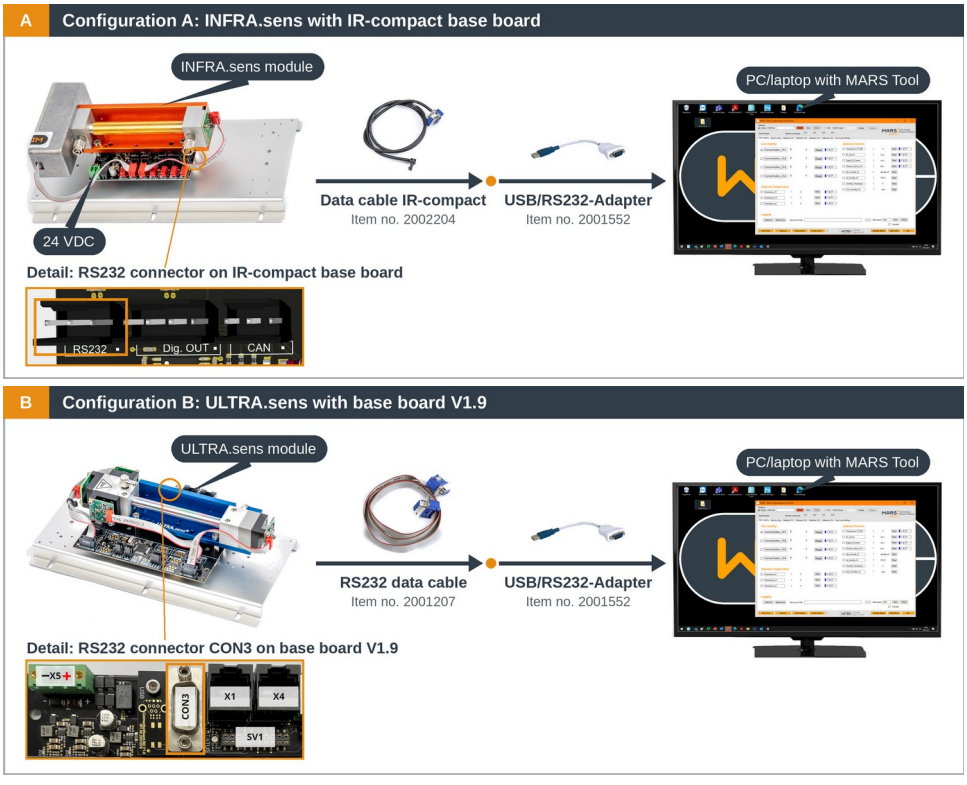
After completing the form, you will receive the download link by e-mail.

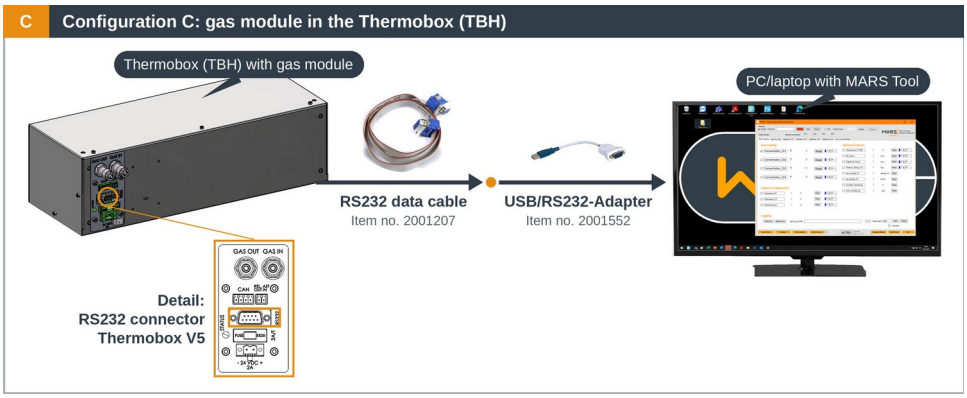
Download MARS® Tool light

1. Download the software package, run the setup file, and install MARS® Tool light (administrator rights recommended).
2. Install the driver of the USB/RS232 adapter and note the assigned COM port in the Windows Device Manager.

Without MARS® Tool, a terminal program (e.g., HTerm) is sufficient for simple queries: **115,200 baud, 8N1**. Commands: communication manual.

### Connecting the module to the PC






*Configuration A: INFRA.sens with IR-compact base board · B: ULTRA.sens with base board V1.9 · C: gas measurement module in the Thermobox V5*

## 7 Switch On and Connect

1. Switch on the 24 VDC supply.
2. Check that **LED2 flashes at 1 Hz** and **LED4 is green** (detector signal sufficient).
3. Start MARS® Tool light, select the COM port, and establish the connection to the module.
4. Check the measured values and the status byte.
   ✔ **Result:** The module is connected and delivers measured values.

## 8 Warm Up and Adjust the Zero Point

| Version | Wait Time Before Adjustment |
|---|---|
| Without heater | At least 30 min under stable conditions (warm-up time < 15 min) |
| Heated (Thermobox, temperature control) | Until the setpoint temperature is reached, approx. 30 min at 25 °C starting temperature, longer when cold |

1. Purge the entire measuring system with **zero gas** at a flow rate of 1 l/min.
2. Wait until the reading is stable (fluctuation < 1 % of full scale).
3. Set the zero point – in MARS® Tool light, by interface command, or via the external zero-point trigger (DIO1 to GND for at least 4 s).
4. Switch back to sample gas.
   ✔ **Result:** The reading shows 0.00 ppm. The module is ready for operation.

**INFORMATION**

**Suitable zero gas**

The zero gas must not contain the measured component. For $CO_2$ modules, ambient air is unsuitable (approx. 400–1,000 ppm $CO_2$) – use nitrogen ($N_2$) 2.8, preferably 5.0. Span-point adjustment with test gas, recommended check intervals, and automatic zero-point adjustment (AZF): operating manual, Section 10.

## ? Troubleshooting

| Fault | Possible Cause | Remedy |
|---|---|---|
| LED2 does not flash | No or incorrect power supply | Check voltage and polarity |
| No connection to the PC | Wrong COM port, wrong cable, RS232 line longer than 5 m, interface set to Modbus | Check COM port, use Wi.Tec data cable, check RS232/Modbus DIP switch |
| LED4 red | Detector signal below alarm level: cell contaminated or fogged, emitter aged | Check sample conditioning, contact Wi.Tec service |
| Measured value drifts | Temperature, pressure, or flow unstable; condensate | Stabilize conditions, adjust zero point |
| Measured value fluctuates | Pump pressure pulsation, fluctuating back pressure, grounding problems | Use a pulsation-free pump, check exhaust routing and grounding |
| Slow response | Long lines, insufficient flow, adsorbing gases ($SO_2$, $NO_2$) | Shorten lines, increase flow, use PTFE tubing |

## Further Information and Contact

- **Operating Manual (BA001-EN):** safety, connections of all base boards, adjustment, maintenance, accessories – www.witec-sensorik.de/en/downloads/manual-gasmodules/
- **Data sheet or technical specification of the module:** measuring range, technical data, channel assignment (included with the delivery)
- **Communication Manual:** www.witec-sensorik.de/en/downloads/communication-manual-gasmodules/
- **MARS® Tool light (software and manual):** www.witec-sensorik.de/en/downloads/software/
- **This Quick Start Guide:** www.witec-sensorik.de/en/downloads/quickstart-manual-gasmodules/

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