THORLABS

QEPAS-CH4

Quartz-Enhanced Photoacoustic Sensor for Methane

User Guide



2024

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Chapter 1 Safety

Attention

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly as it was designed for.

The QEPAS-CH4 must not be operated in explosion endangered-environments!

Do not obstruct the air ventilation slots in the housing!

Do not remove covers! There are no user-serviceable parts inside!

The QEPAS-CH4 sensor is rated as Laser Class 1 instrument.

This precision device is only serviceable if returned and properly packed into the complete original packaging including the cardboard inserts. If necessary, ask for replacement packaging.

Refer servicing to qualified personnel!

Changes to this device cannot be made nor may components not supplied by Thorlabs be used without written consent from Thorlabs**.**

Attention

Prior to applying power to the QEPAS-CH4 sensor, make sure that the protective conductor of the 3 conductor mains power cord is correctly connected to the protective earth ground contact of the socket outlet! Improper grounding can cause electric shock resulting in damage to your health or even death!

Before connecting the power supply cord to the mains, make sure that the line voltage range marked on the QEPAS-CH4 sensor agrees with your local supply.

Attention

Mobile telephones, cellular phones or other radio transmitters are not to be used within the range of three meters of this unit since the electromagnetic field intensity may then exceed the maximum allowed disturbance values according to IEC 61326-1.

This product has been tested and found to comply with the limits according to IEC 61326-1 for using connection cables shorter than 3 meters (9.8 feet).

Attention

Do not stick anything into the gas inlet or outlet! You may damage the elements installed behind.

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Chapter 2 Introduction

The QEPAS-CH4 is a compact and complete bench top system based on Quartz-Enhanced Photoacoustic Spectroscopy (QEPAS) designed to measure methane (CH_4) in either air or nitrogen (N_2) gas matrices. The QEPAS-CH4 can measure methane concentrations ranging from 0.5 ppm to 10 000 ppm, and allows for the presence of varying non-condensing water. It will simultaneously measure CH_4 and H_2O in order to compensate for the influence of H_2O on the QEPAS-signal of CH_4. The QEPAS-CH4 includes an easy to use software that displays the current CH_4 value measured as well as gas conditions within the sensor cell. The all-in-a box design is optimized for ruggedness and stable alignment.

Details on the sensors performance can be found in the Specifications section. Below is a description for Set-up, installation, and use of the sensors GUI Software.

Attention

Please find all safety information and warnings concerning this product in the first chapter Safety.

2.1 Intended Use

The QEPAS-CH4 sensor is intended to measure a wide range of methane concentrations in either air or nitrogen gas matrices and allows for varying humidity levels.

The QEPAS-CH4 is designed for indoor use only.

Thorlabs, Inc. Life Support and Military Use Application Policy is stated below:

THORLABS' PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS OR IN ANY MILITARY APPLICATION WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF THORLABS, INC. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

2. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

3. The Thorlabs products described in this document are not intended nor warranted for usage in Military Applications.

2.2 Ordering Codes and Accessories

QEPAS-CH4	Quartz-Enhanced Photoacoustic Sensor, Methane Measurement Range 0.5 ppm to 10 000 ppm, Air or Nitrogen Gas Matrices, Non-Condensing Water Range 1000 ppm to 32 000 ppm.

2.3 Requirements

These are the requirements for the PC intended to be used for remote operation of the QEPAS-CH4.

Note

Hardware Requirements

Processor (CPU):	1 GHz or higher
Memory (RAM):	2 GB
Graphics Card Resolution:	1024 x 768 (Minimum)
Hard Drive:	2 GB of (Minimum) of Available Disk Space, 64 bit
Interface:	Free USB 2.0 Port, USB cable according to the USB 2.0 specification alternatively: Ethernet Port, RJ45 Cat 7 Cable

The QEPAS-CH4 software is compatible with the following operating system:

Windows® 10 (64-bit)

For operation of the QEPAS-CH4, the Microsoft .NET Framework V 4.6.2 or later is required. This software (V 4.6.2) is included within the Thorlabs QEPAS-CH4 installation package.

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Chapter 3 Getting Started

3.1 Parts List

Please inspect the shipping container for damage. Please do not cut through the cardboard, as the box might be needed for storage or returns.

If the shipping container appears to be damaged, keep it until you have inspected the contents for completeness and tested the QEPAS-CH4 mechanically and electrically.

Verify that you have received the following items within the package:

1. QEPAS-CH4 sensor with 19'' rack brackets
2. 2x Swagelok Closing Cap 6mm
3. 2x Swagelok Fitting 6mm (1x Nut, 1x Front and 1x Back Ferrule)
4. Region specific power cord, 1.5 m
5. USB 2.0 Cable, 2 m
6. RJ45 CAT 7 LAN Cable for Ethernet connection, 2 m
7. Quick Reference
8. Sensor specifications sheet

3.2 Operating Elements

FRONT VIEW



The QEPAS-CH4 only has to be connected to a PC with either the USB or Ethernet cable, powered with the powercord, and then the sensor can be turned ON by pressing the round ON/OFF button on the front.

Gas INLET and OUTLET should be connected to the test gas line and vent, respectively, making sure the vent is not blocked.

The sensor is designed to be started and work with the GUI-software described below.

3.3 Set-up

Place the QEPAS-CH4 on a stable, dry surface and make sure the ventilator outlet is not blocked.

1. Download the QEPAS Software from the Thorlabs QEPAS-CH4 sensors website and install it on the PC used to operate the system as described in the manuals Software Installation.

Note

Do not connect the QEPAS-CH4 to the PC prior to software installation!

Attention

Exit all running applications on your PC as the installer may require a reboot during installation!

2. Connect the QEPAS-CH4 to a PC using either the provided USB 2.0 or LAN cable.
If using the LAN cable, make sure the port is in the same IP address room as the QEPAS-CH4 (192.168.1.XXX, you will find the exact used IP on the accompanied specifications sheet).

3. Connect the QEPAS-CH4 to a 220 V or 120 V outlet using the power cable.

4. Remove the 6 mm Swagelok closing-cap at the inlet and outlet ports on the front of the system.

5. Connect your test gas line to the inlet (6 mm OD).

NOTE

The usage of a 2 µm line-filter before the INLET is recommended.

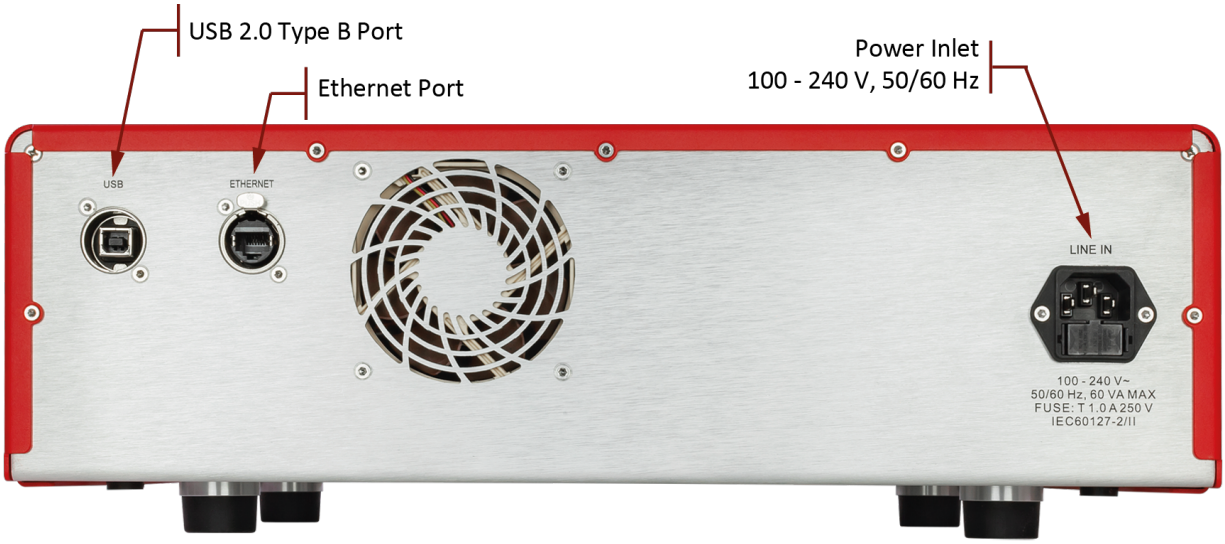
Warning

Make sure the input pressure does not exceed 1.050 bar absolute pressure.

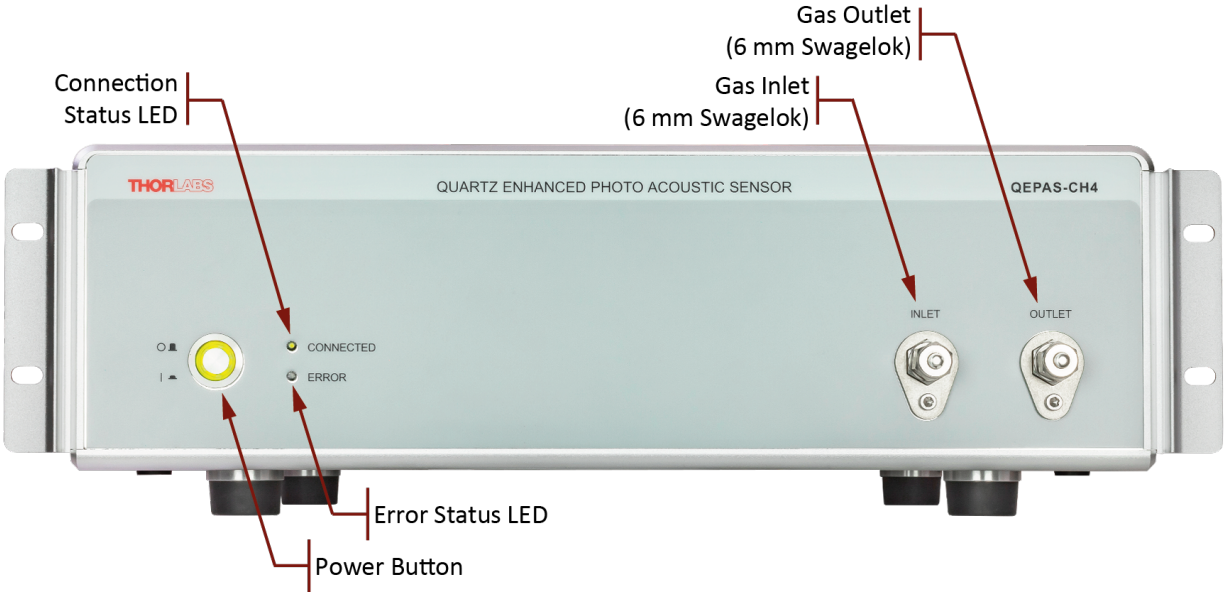
6. Connect the outlet to a vent-line, if necessary.

7. Turn the sensor ON by pressing the ON button on the front panel.

8. Start the QEPAS Software.



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Gas Outlet
(6 mm Swagelok)
Connection
Status LED
Gas Inlet
(6 mm Swagelok)
THORLABS
QUARTZ ENHANCED PHOTO ACOUSTIC SENSOR
QEPAS-CH4
CONNECTED
ERROR
INLET
OUTLET
Error Status LED
Power Button

Chapter 4 Operating Instructions

4.1 Operation

After the sensor is set up, connected with a gasline using a 6 mm OD Swagelok, and started via the GUI-software (see Establish Connection in the manual), the laser is turned ON at the start of the software. After a laser warm-up time of 30 minutes, the sensor is ready to start measuring (see QEPAS Measurement in the manual).

Note
The pump will turn on once the software is in Measurement Mode. The test gas passes through the pressure and flow controller and is taken into the sensors acoustic detection module (ADM) at a fixed flow of 20 sccm.

Note
The QEPAS signal is highly influenced by the presence of water in the gas matrix. This system continuously measures the water concentration in the gas matrix and compensates the QEPAS signal accordingly (absolute humidities from 1000 ppm to 32 000 ppm).

This allows for an accurate measurement of methane concentration over a wide range of relative humidities (see Specifications in the manual for details).

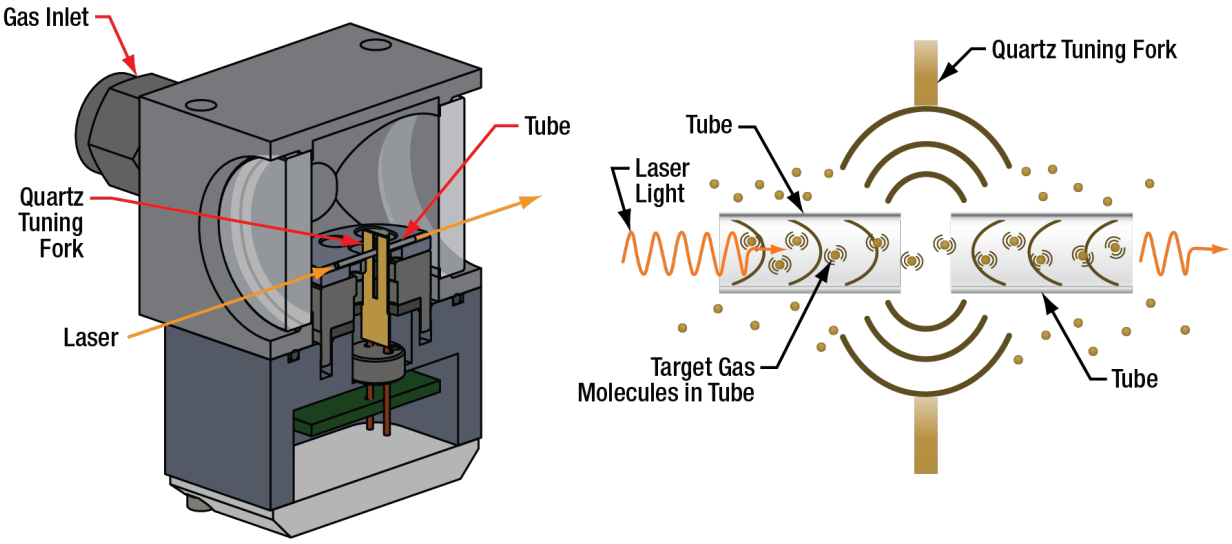
Note
The valves of the pressure controller are closed before sensor software measurement mode is started.

Note
Every 30 minutes while the software is running, the QEPAS-CH4 system will take a 40 second scan to ensure the laser line is still measuring on the correct peak.

4.2 Operating Principle

The QEPAS-CH4 is based on Quartz-Enhanced Photoacoustic Spectroscopy (QEPAS) in order to measure small amounts of methane.

In this section, the basic principles of QEPAS are explained.

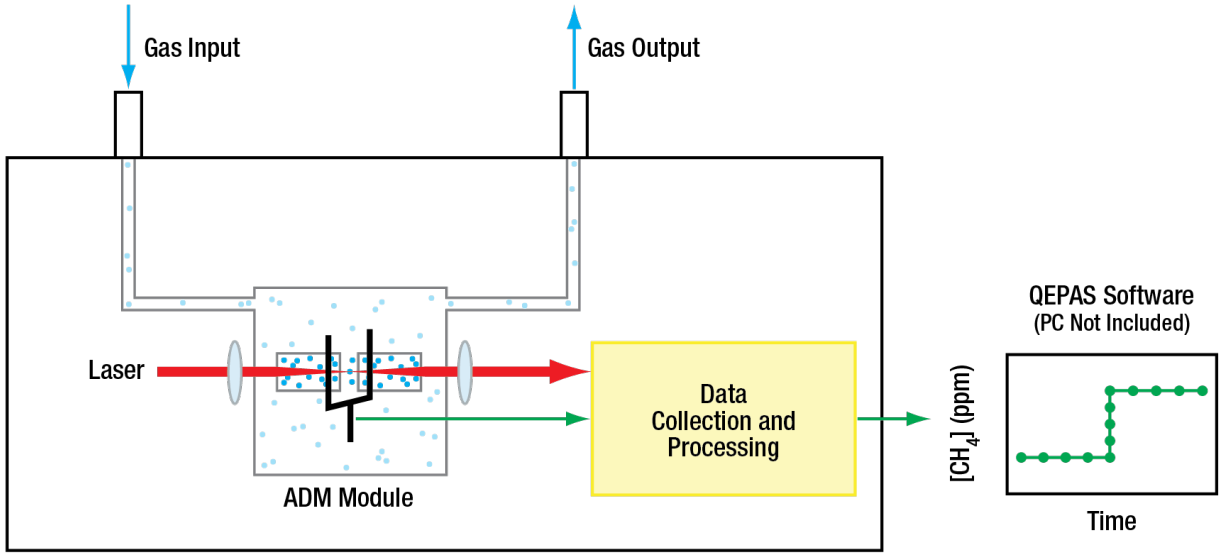


Photoacoustic spectroscopy is a technique based on the photoacoustic effect that is able to accurately

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detect trace gas concentrations for a wide variety of applications. Similar to laser absorption spectroscopy, a laser beam is sent through a gastight chamber, called the acoustic detection module (ADM), to excite the target gas molecules. However, instead of detecting the absorption lines with an optical detector, the pressure waves generated by the relaxation of those molecules is detected by a transducer. In the case of QEPAS, the transducer is a sharply resonant quartz tuning fork (QTF). The high-Q acoustic resonance enables the detection of weak excitation within small volumes, bypassing the acoustic resonance restrictions of conventional methods. When the laser source is modulated with a sine wave, the induced pressure (sound) wave will have double the frequency as that of the light modulation; therefore, the laser source modulation must be at half of the resonance frequency of the QTF. The resulting amplitude from the QTF is directly proportional to the concentration of trace gas in the sample.

The QTF also has good environmental noise immunity due to its being an acoustic quadrupole, since the primary vibrational modes require the prongs to move away from each other to be piezoelectrically active. Sound from external sources has a longer wavelength than the prong separation and will cause the prongs to move in the same direction, resulting in no piezoelectric response.



The QEPAS-CH4 has a robust connection of the ADM and laser, resulting in highly stable alignment. The system includes all other necessary components for control of electronics and gas-flow, such as laser controller, DAQ-card, pressure controller, flow controller, and vacuum pump.

Chapter 5 QEPAS Software

In the following chapter, the installation and use of the QEPAS Software and its graphical user interface (GUI) are explained in detail.

5.1 Software Installation

Note

Do not connect the QEPAS-CH4 to the PC prior to software installation!

Attention

Exit all running applications on your PC as the installer may require a reboot of your PC during installation!

The QEPAS-CH4 software package can be downloaded through the Software tab on the QEPAS-CH4 product page or go directly to the QEPAS Software page.

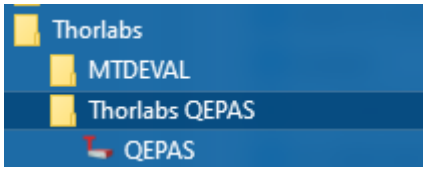
Please check for updates to the QEPAS-CH4 Software regularly and always use the latest software version.

After the Installer is downloaded, doubleclick on the file and follow the instructions. It will copy the software package to a folder of your choice, standard is "C:\Program Files\Thorlabs\QEPAS".

To start the GUI, find the "QEPAS.exe" in the installation subfolder "Bin". Double-click on the "QEPAS.exe" and the start screen of the **QEPAS-CH4 software** GUI will appear.

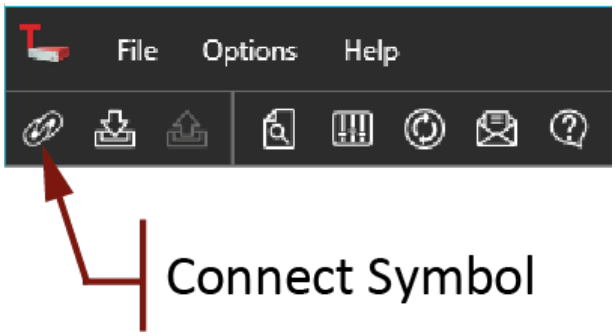


Click the Desktop Icon



Via the Microsoft Windows START Menu

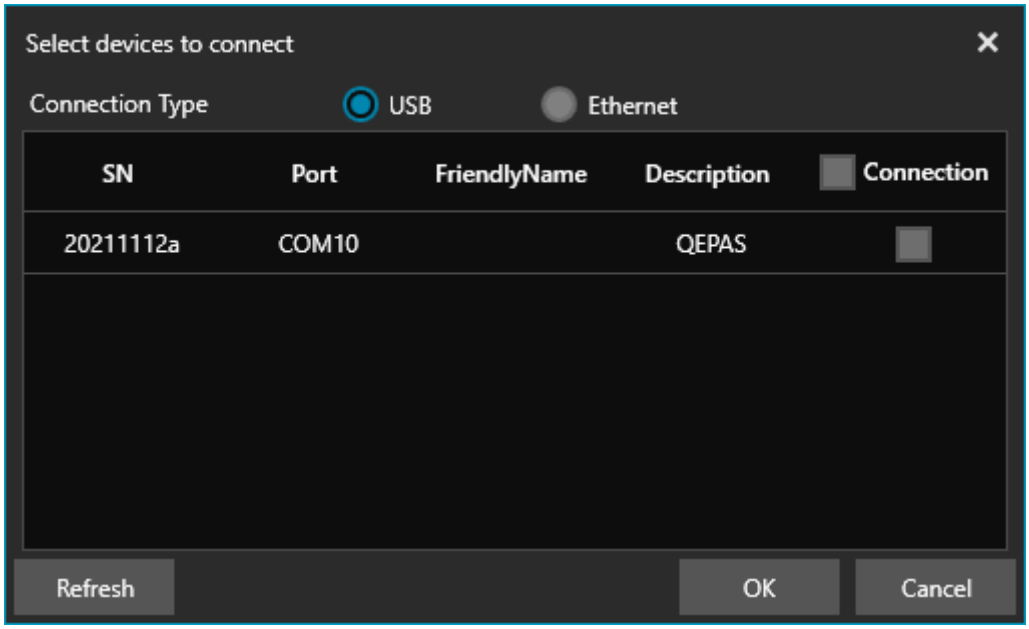
5.2 Establish Connection



After opening the software, click on the "Connect" symbol. A pop-up will appear with the available QEPAS-CH4 sensors and the option to connect by either USB or Ethernet. It might take a few seconds to display

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the QEPAS-CH4 sensors. If they do not appear, "Refresh" the software and check the cable connection. Select either USB or Ethernet, and select the desired sensor under "Connection".



Note

The preset IP address of the QEPAS-CH4 is 192.168.1.XXX. If using an Ethernet connection, check the spec sheet of your system for the actual IP address. To change the IP address of the QEPAS-CH4 sensor, first establish a USB connection before proceeding with the changes described in Information and DHCP.

Note

If a USB connection is chosen, the Ethernet settings can be changed in the GUI at a later time.

Click "OK" to establish and secure the connection. The GUI will then display the "Gas Conditions" tab and the internal laser of the QEPAS-CH4 will turn on. A warm-up timer will display in the lower left corner of the GUI. After a laser warm-up time of 30 minutes, the GUI and sensor show a "Ready" symbol and the QEPAS-CH4 is ready for operation.



5.3 Information and DHCP

Next to the Device Settings, there is an overview tabulary named "Information":



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In the upper part, there is information on the sensor itself displayed: the type of gas to be measured (CH_4), name of the sensor (QEPAS-CH4), the user-changeable Friendly Name, its serial number, firmware version, calibration date, and current connection type.

In the lower part, there is information about the DHCP-settings stored, which can be altered with a click on the pen-graphics. Typically the sensors DHCP settings are in "Auto" mode.

It is possible to turn the automatic retrieval of a DHCP IP address OFF and manually set a fixed IP address.

In order to get the fixed IP address working, the following settings must match the users network settings:

a) The IP address of the gateway-server

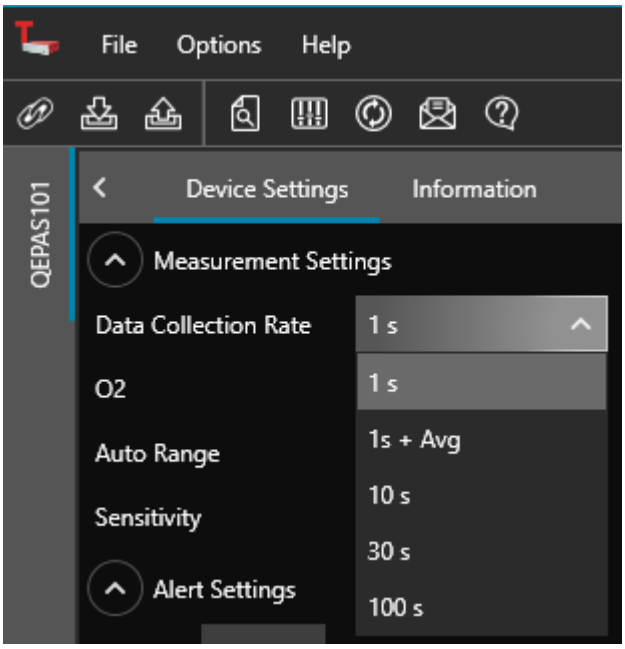
b) The DNS-server

c) The sensors manually set IP address requires an extension for the IP address-room:
e.g. xx.xxx.xxx.xxx**/20**

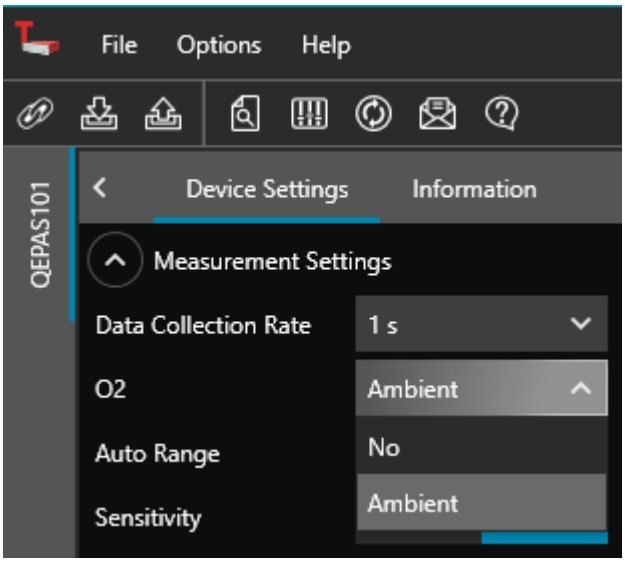
5.4 Measurement Settings

Before a QEPAS measurement can begin, the following Measurement Settings must be configured:

1. Data Collection Rate: The data collection rate can be set to 1 s, 10 s, 30 s, or 100 s. An additional option of 1 s + Avg and all longer data collection rates have a simple exponential smoothing filter implemented.



2. Oxygen (O_2): This setting is used to indicate the presence or absence of ambient oxygen in the gas matrix for the software to compensate for. A selection of "Ambient" expects the presence of oxygen in similar concentration to normal air and a selection of "No" indicates the use of a nitrogen gas matrix with no oxygen.



3. Auto Range: Because the QEPAS-CH4 can measure methane concentrations from <0.5 ppm to 10 000 ppm, it is necessary to switch between high and low sensitivity. The default setting is "Auto Range" mode where the firmware automatically changes the sensitivity range based off the detected methane concentration. The "Auto Range" can be turned off and the sensitivity range selected directly if the range of methane concentration is known or if, for example, a gas flush in the line is performed.

Note

Depending on the selected sensitivity range and the concentration of methane being measured, saturation of the sensor may occur. Saturation is indicated by an "Out of Range" warning in the lower left corner of the QEPAS Software. To avoid saturation of the sensor, the Low Sensitivity Range should be used for CH_4 concentrations greater than ~300 ppm. To avoid noisy and inaccurate measurements, the High Sensitivity Range should be used for methane concentrations less than ~300 ppm.

Note

Measurements performed using the High Sensitivity Range will be less noisy compared to those performed using the Low Sensitivity Range. Please refer to the Specifications for details.

5.5 QEPAS Measurement

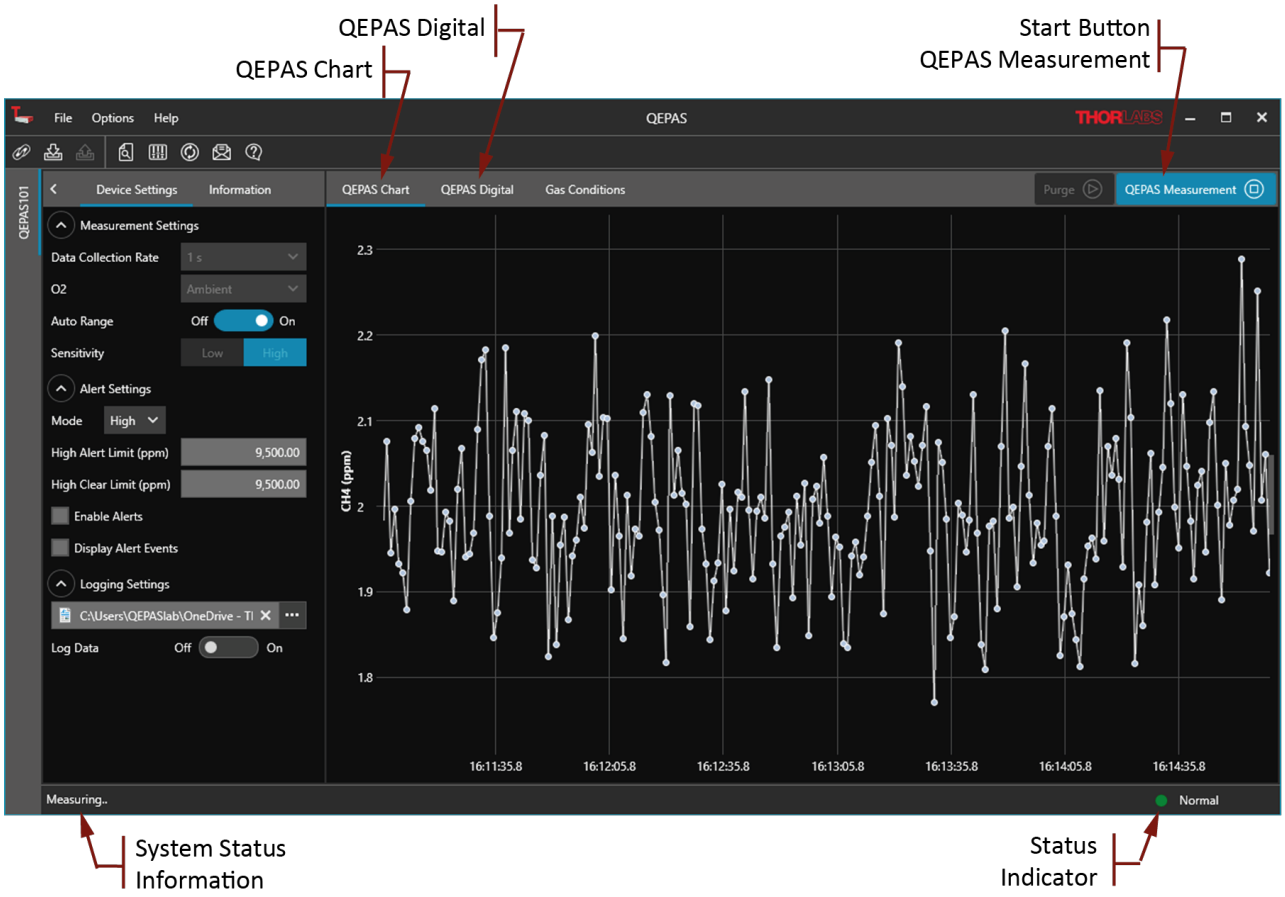
After the appropriate Measurement Settings have been selected, the QEPAS-CH4 can be put into measurement mode by clicking "QEPAS Measurement".

Once the QEPAS Measurement has been initiated, the pump is automatically turned on. The flow and pressure of the input gas are controlled and set to 20 sccm and 400 Torr, respectively. The flow and pressure can be monitored using the Gas Conditions tab and depending on the conditions of the input gas matrix, it could take a few minutes for the them to stabilize. The GUI will display "Error" with a red LED at the lower right corner until the flow and pressure stabilize. Once stabilized, the GUI will read "Normal" with a green LED.

A "peak-tracker" is automatically initiated upon starting the "QEPAS Measurement". Every 30 minutes, the QEPAS-CH4 system will take a 40 second scan to ensure the correct peak is being measured for CH_4 detection. If this routine fails, an error message is displayed - at first try restarting the system. If it still fails, please contact Thorlabs tech-support.

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A continuous measurement of the methane concentration (ppm) as a function of current time is displayed in the QEPAS Chart tab. Please see Graph Options for how to change the display to concentration as a function of absolute time.



Alternatively, the current methane concentration value can be displayed using the QEPAS Digital tab.

5.6 Optional Features

The QEPAS-CH4 has several optional features that the user can utilize: Purge the sensor, high/low Alarms, data Logging Settings, several Graph Options, File saving the data, and a separate Data Viewer.

5.6.1 Purge

Before or in between measurements, the user might want to purge the sensors gas-handling.

With a click on "Purge", located at the upper right of the GUI, the pump power is set higher, creating a strong underpressure, while the pressure controller and the flow-controller is set to open.

To purge the system, a cleaning gas such as pure nitrogen or pure synthetic air can be connected to the gas input to flush the sensor. Alternatively, a vacuum can be created inside the gas line by closing the input with the 6 mm Swagelok close cap, causing a decrease in pressure down to 50 Torr.

5.6.2 Alarms

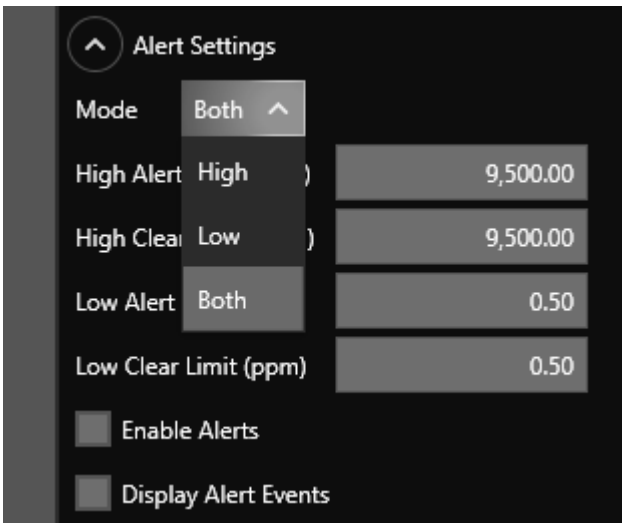
The user can set high and low alerts to indicate when the measured methane concentration is above or below the specified concentration, respectively. Additionally, the user can provide clear limits to specify below which concentration the alert will be removed.

These limits can be set through the "Alert Settings" in the Device Settings tab either before or during the QEPAS-CH4 is in Measurement Mode. The Mode can be set to High, Low, or Both:

High: The measured methane concentration is higher than the specified value (i.e. setting an upper limit)

Low: The measured methane concentration is lower than the specified value (i.e. setting a lower limit)

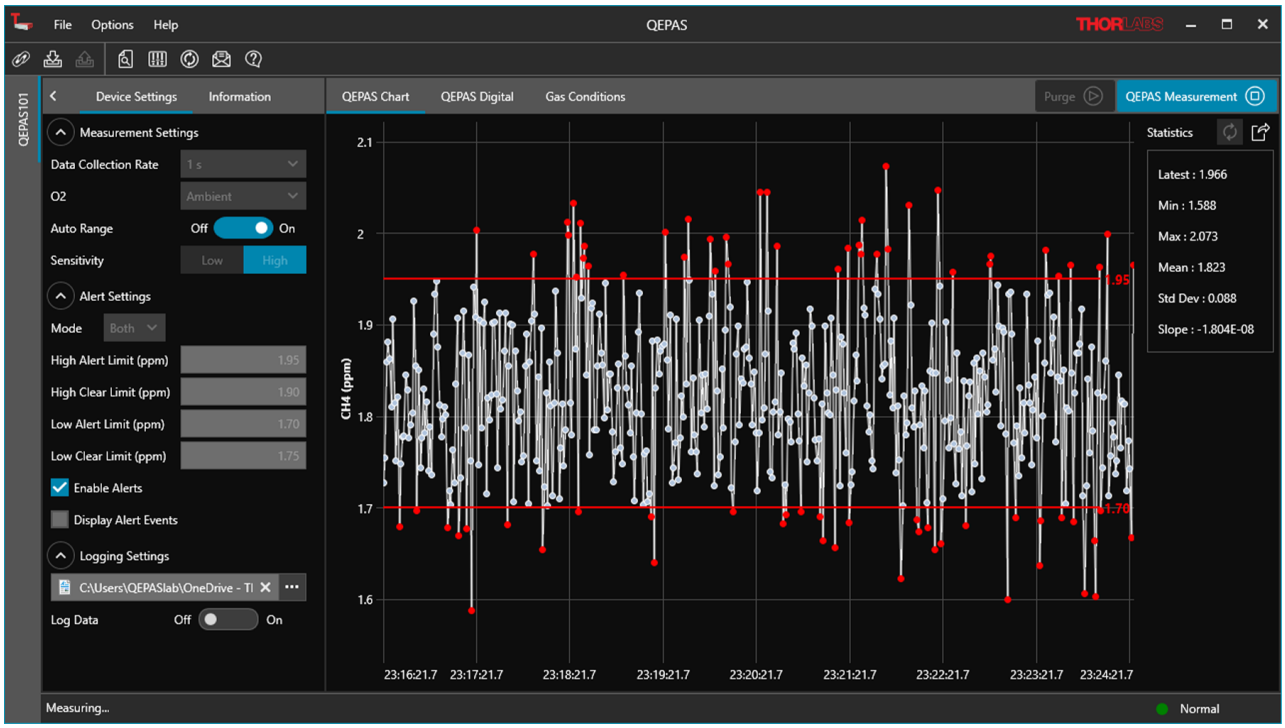
Both: The high and low limits are both specified to provide a range of concentrations



When the mode "Both" is used, an "Alert Limit" for triggering the high (CH_4-value measured is higher than here specified) or low (CH_4-value measured is lower than here specified) alert can be set.

The "Clear Limit" can be set differently from the alert limit: for clearing a triggered high alert, the measured CH_4-value has to drop below the clear limit; for a triggered low limit, the measured value has to be higher than the "Low Clear Limit" chosen.

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File
Options
Help
QEPAS
THORLABS
QEPAS101
Device Settings
Information
QEPAS Chart
QEPAS Digital
Gas Conditions
Purge
QEPAS Measurement
Measurement Settings
Data Collection Rate
1 s
O2
Ambient
Auto Range
Off
On
Sensitivity
Low
High
Alert Settings
Mode
Both
High Alert Limit (ppm)
1.95
High Clear Limit (ppm)
1.90
Low Alert Limit (ppm)
1.70
Low Clear Limit (ppm)
1.75
Enable Alerts
Display Alert Events
Logging Settings
C:\Users\QEPASlab\OneDrive - TI
Log Data
Off
On
CH4 (ppm)
2.1
2
1.9
1.8
1.7
1.6
23:16:21.7
23:17:21.7
23:18:21.7
23:19:21.7
23:20:21.7
23:21:21.7
23:22:21.7
23:23:21.7
23:24:21.7
Statistics
Latest : 1.966
Min : 1.588
Max : 2.073
Mean : 1.823
Std Dev : 0.088
Slope : -1.804E-08
Measuring...
Normal

5.6.3 Graph Options

On the middle right of the QEPAS chart is a toolbar that is only visible when hovering over the area with the mouse. This toolbar gives access to statistics calculations, chart display settings of the time axis, and the option to directly export the currently displayed data into a Microsoft Excel file.



- **Statistics:** The following statistics parameters for currently plotted data are calculated and displayed:

  Latest: Last measured CH_4 value

  Min: Lowest CH_4 value measured

  Max: Highest CH_4 value measured

  Mean: Calculated mean of the displayed values

  Std Dev: Calculated standard deviation of the displayed values

  Slope: Calculated slope of a trendline of the displayed values

  These values are for the measured data that is currently plotted in the chart and will be recalculated accordingly if the Time Axis is changed, as described below.

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- **Time Axis:** The Minimum and Maximum value of the X = time axis can be set. Possible input values are:
  Time point: Format YYYY-MM-DD hh:mm:ss
  Min: Write "first" and the graph will start at the first measured data point
  Max: Write "latest" and the graph will continuously be updated with the latest measured data point

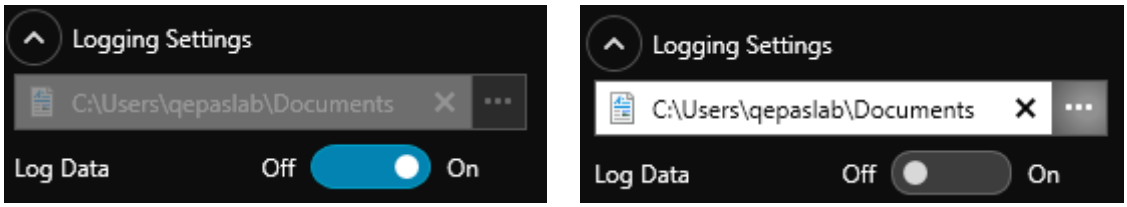
  To zoom into or out of the displayed data, click on the X axis. A double sided arrow will appear and the axis can be moved to show more or less data. Furthermore, the data can also be zoomed into by highlighting the desired region with the mouse.
  The Y-axis is set automatically to display the taken data best.
  Double left-click the mouse within the chart to reset both axes to the minimum and maximum values.

- **Save Data** A click on the "Save Data" symbol will open a dialog, where the currently displayed data (plus the accompanying Gas Conditions data) will be saved into a .csv file.

5.6.4 Logging Settings

The user can choose to store the measured data in a log file with a destination folder specified in Logging Settings. Note that this folder can only be changed when the system is not in Measurement Mode.

Once the desired destination folder is selected or created in Logging Settings, turn the Log Data switch to the On position. When this is in On position and the system in Measurement Mode, data logging is activated.
Also, when the Log Data is in the Off position but the system is in Measurement Mode, the sensor will continue to measure the methane concentration and not log any data. The user can then activate data logging On, but the data will be only be stored from that point on.



Click on the three dots next to the path to display an overview of the PC file system. Choose or create a folder and click OK. The data logging is activated once the Off / On Switch next to Log Data is in the On position.

The output format is a comma separated file (.csv) and the following data is continuously saved:

Time, CH4 (ppm), Pressure (Torr), Flow (sccm), Humidity (ppm), H2O_Range_State, CH4_Range_State, Sensitivity_Range, State, ADM_Temperature_Range_State

The "_State" data is stored as 0 and 1, indicating the following:

H2O_Range_State:
0 = out of range, CH4-value will be "-999" 1 = within range, OK
CH4_Range_State
0 = out of range 1 = within range
Sensitivity_Range_State
0 = high sensitivity 1 = low sensitivity

ADM_Temperature_Range_State

0 = within range, OK 1 = out of range

5.6.5 File

The "File"-dropdown menu has the following options:



Connection: Opens the Connection window as described in the Establish Connection section.

Save: Opens a dialog to specify where to store the current QEPAS-CH4 sensor settings into a settings file.

Load: Loads a previously saved settings file.

Load Data: Loads a previously saved QEPAS-CH4 sensor data file and opens the Data Viewer (this can be done in parallel to an ongoing measurement).

Close: Will stop any measurement and turn off the laser, pump, and pressure and flow controllers, as well as close the GUI.

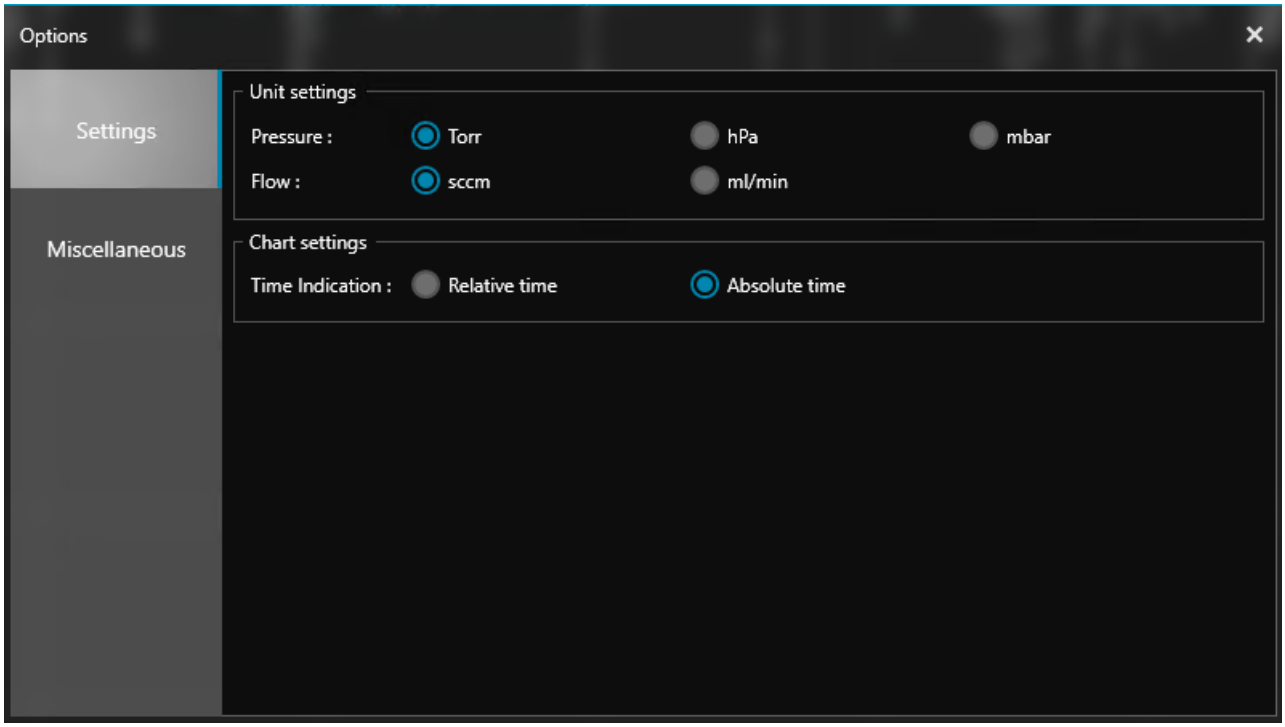
5.6.6 Options

The "Options" drop down menu has the following options:

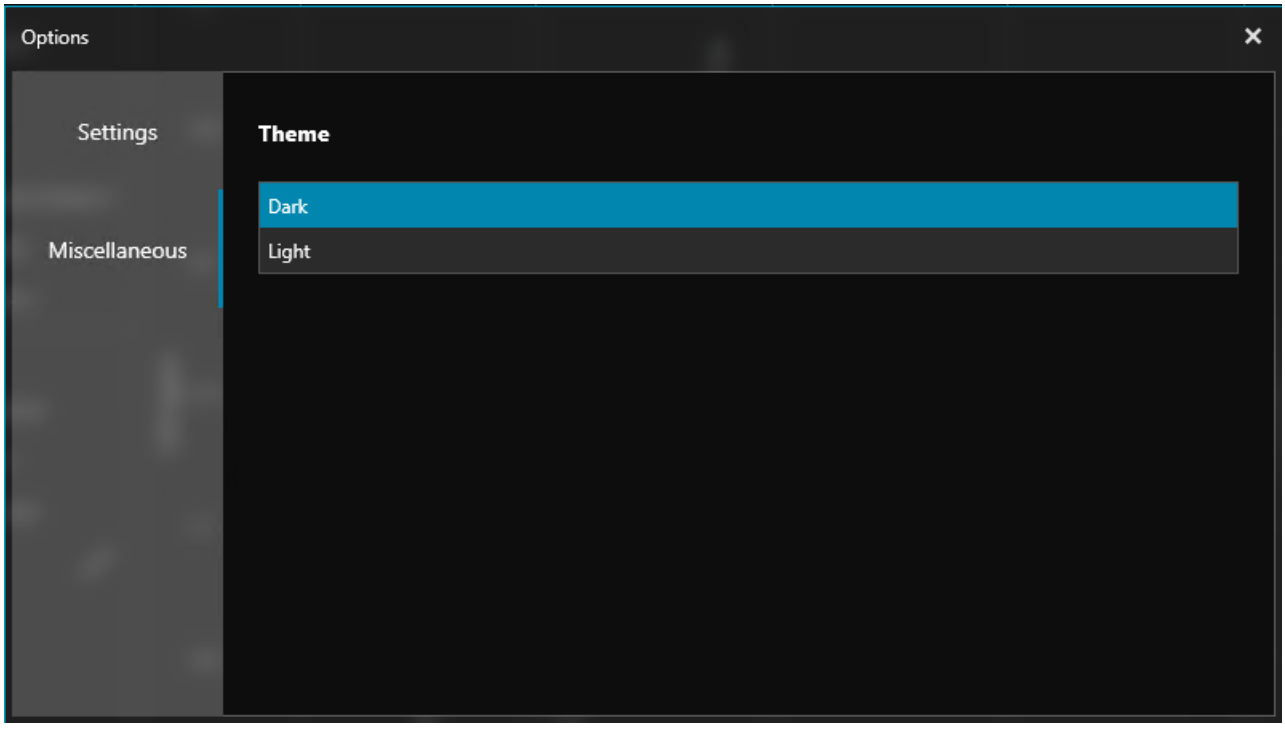
- **Settings:** The preferred units for pressure and flow can be changed using the Unit Settings. The displayed time can be changed under Chart Settings.
  - Absolute time is given in hh:mm:ss.ms.
  - Relative time displays the time since the QEPAS-CH4 measurement was started in hh:mm:ss.

Changes will take effect immediately.

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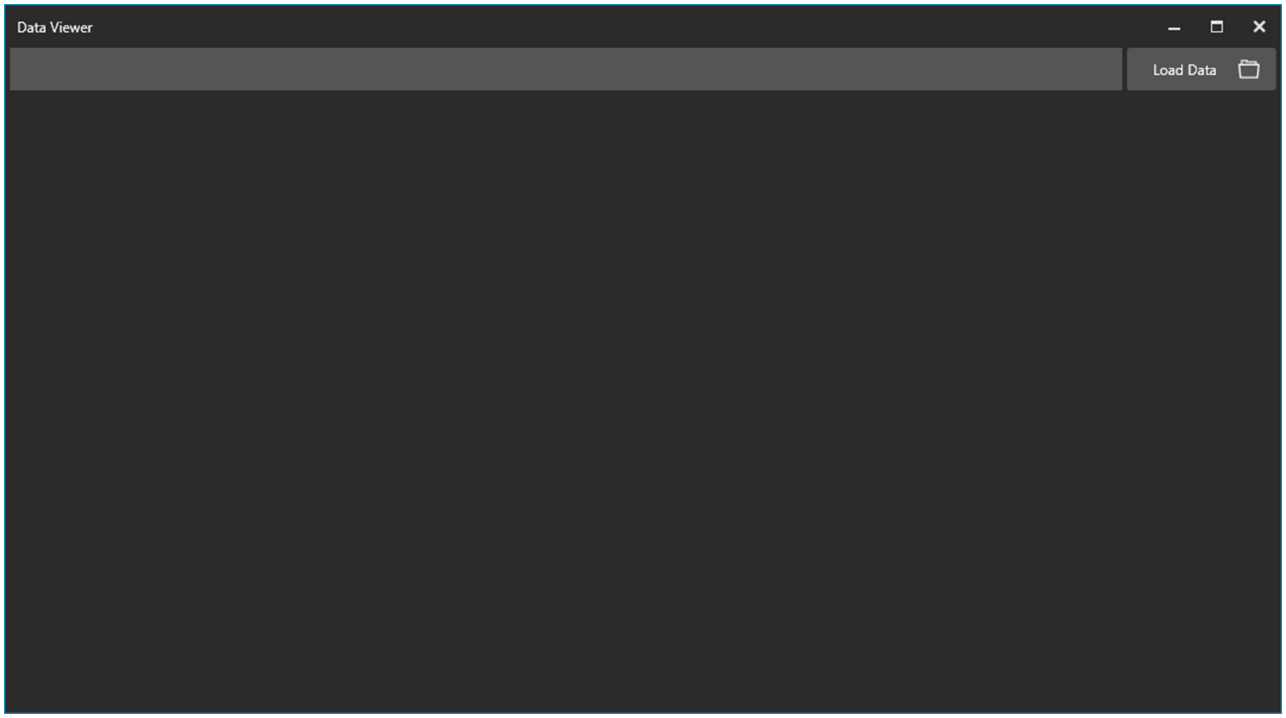


- **Miscellaneous:** Within the "Miscellaneous" section, the theme of the GUI can be altered from Dark to Light.

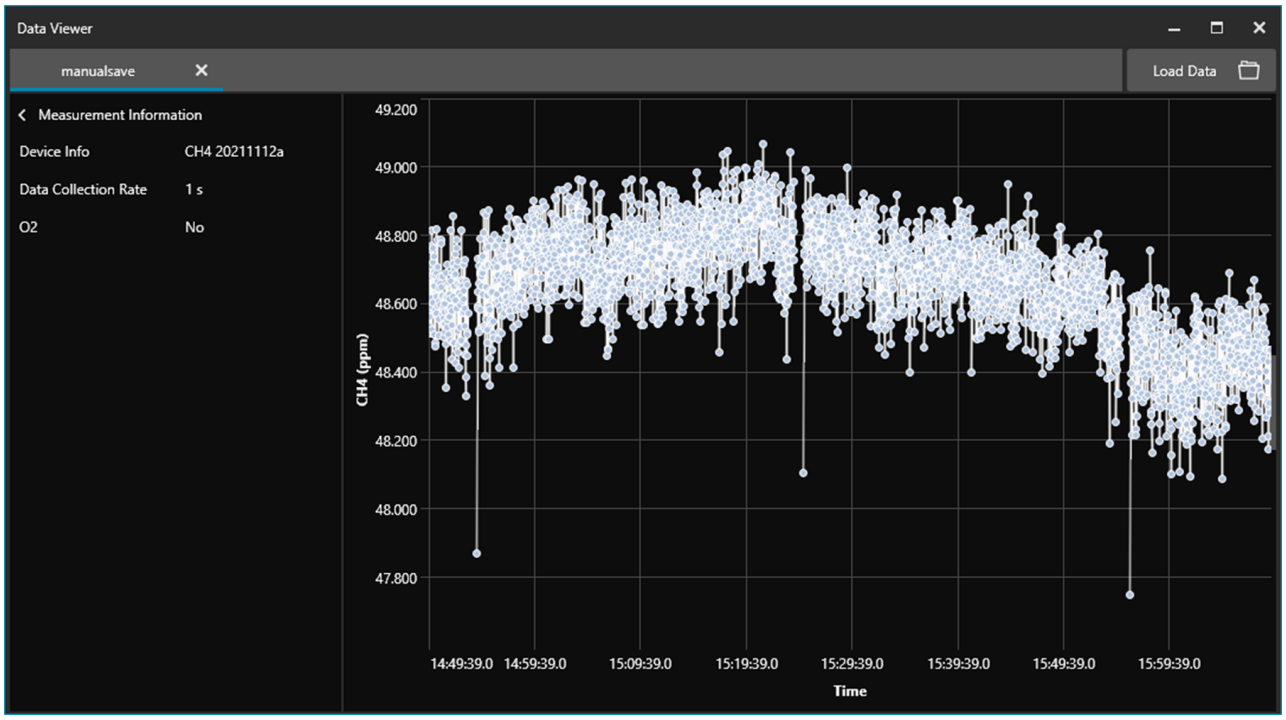


5.6.7 Data Viewer

By selecting "Load Data" in the "File"-dropdown menu, a Data Viewer will be opened:



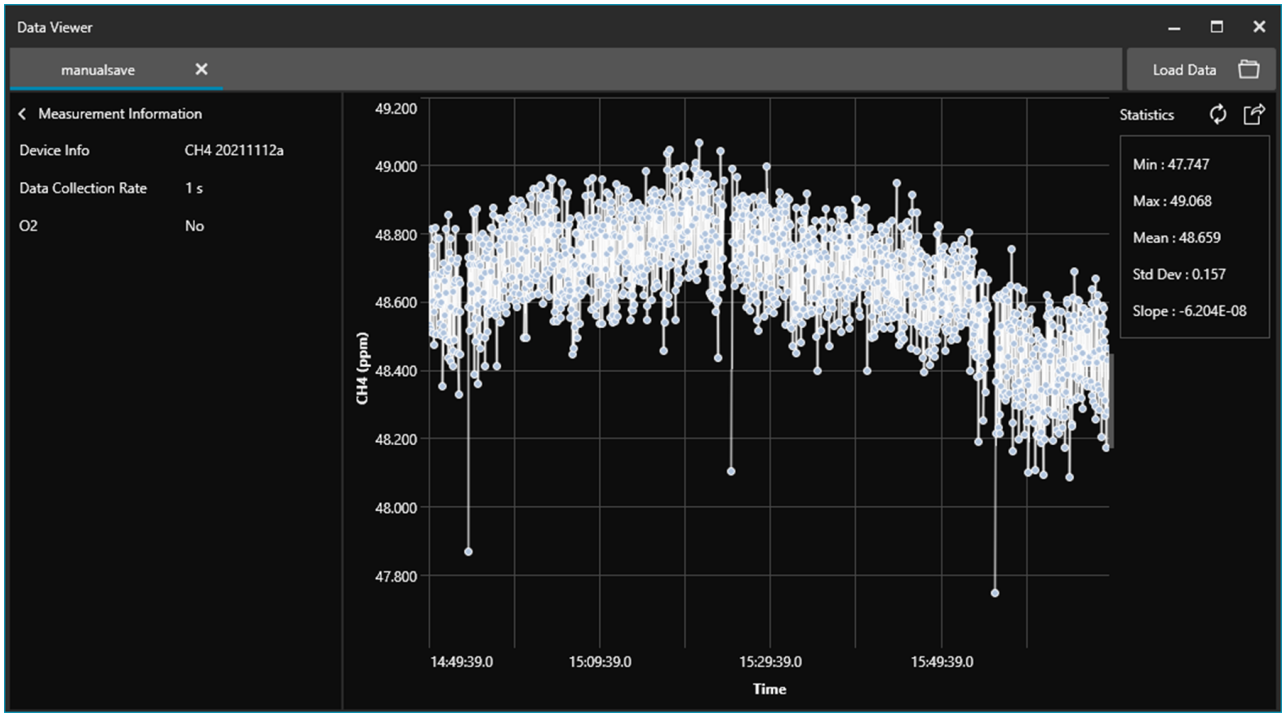
Click on "Load Data" in the upper right corner of the Data Viewer to open a previously saved QEPAS-CH4 measurement:



The used device ID, data collection rate, and chosen setting for oxygen (ambient or none) will be shown on the top left.

Statistics for the currently displayed data can be accessed by hovering over the right side of the QEPAS Chart, as described in Graph Options.

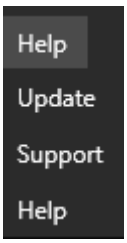
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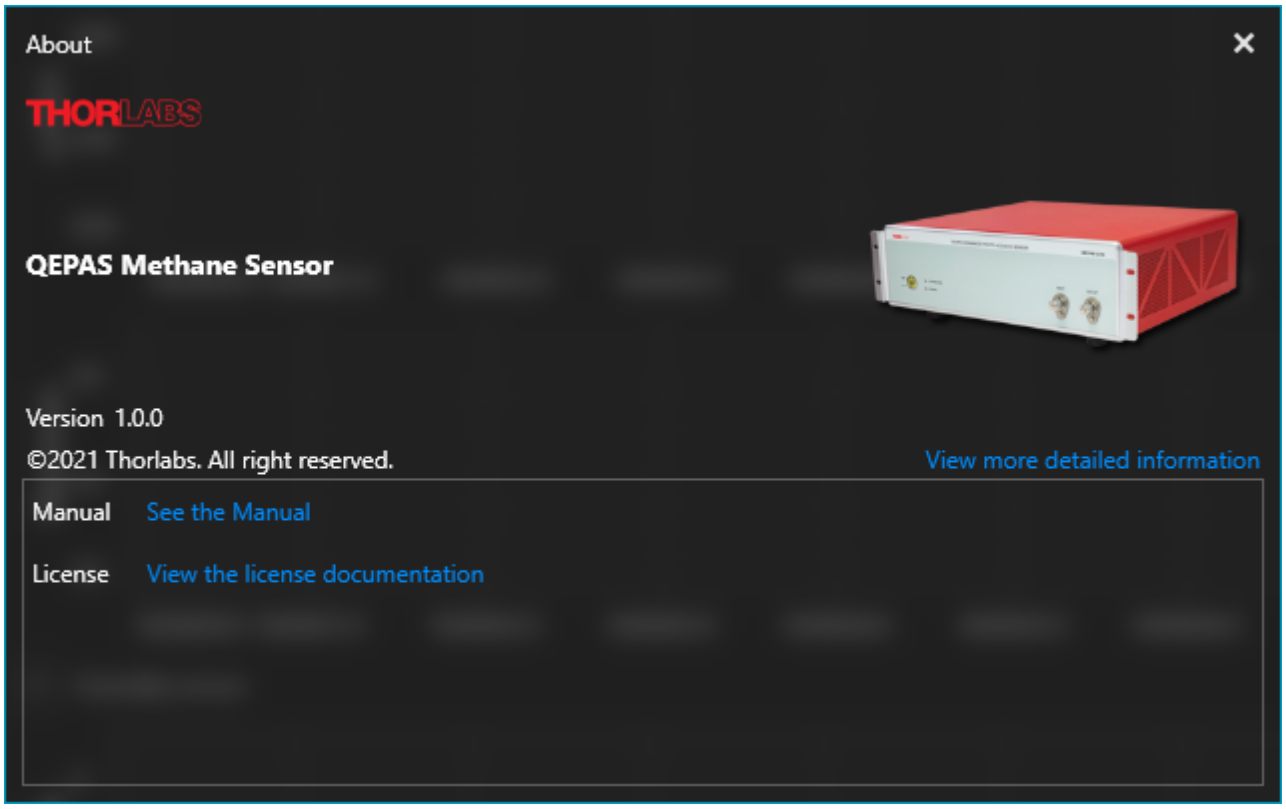
The data can also be zoomed into by highlighting the desired region with the mouse. The statistics for this updated data region can be calculated by clicking the refresh button next to "Statistics".

5.7 Help

The "Help"-dropdown menu has the following options:



- **Update:** Allows the user to check on the latest software. More information on the software can be found by following the link to the Thorlabs QEPAS-CH4 sensors software page.
- **Support**: Shows the description of the QEPAS-CH4 sensor in use and lists recent important firmware-GUI communications.This information can be copied to the Clipboard or saved in a text-file to the PC.
- **Help:** Provides information on the QEPAS-CH4 sensor and software version in use. Links to the manual, License as well as the Thorlabs QEPAS-CH4 webpage are provided.



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Chapter 6 Specifications

6.1 General Specifications

Item #	QEPAS-CH4
Sensor Connection	
USB	Type B, 2.0
LAN	RJ45 Cat 7
Sensor	
CH_4 Measurement Range[a]	<0.5 ppm to 10 000 ppm
H_2O Range	1000 ppm to 32 000 ppm 3.5% to 99% Relative Humidity[b]
Input Pressure Range	750 mbar to 1050 mbar (562 Torr to 787 Torr)
Gas Flow in Measurement Mode	20 sccm
Maximum Gas Flow for Purging	500 sccm
Downtime[c]	25 sec
CH_4 Response Time[d]	30 sec
H_2O Response Time[e]	60 sec
Sample Volume	20 cm^3
General	
Gasline Input[f]	6 mm Swagelok Tube Fitting
Supply Voltage	100 to 240 VAC, 50/60 Hz
Operating Temperature Range (Device)	15 °C to 35 °C
Operating Temperature Range (Sample)	15 °C to 35 °C
Transport and Storage Temperature Range	-20 °C to 70 °C
Environmental Humidity	Max. 80 % up to 31°C, Decreasing to 50 % at 40 °C
Operation Altitude	<2000 m
Dimensions (W x D x H)	482.6 mm x 395.7 mm x 149.8 mm (19.00" x 15.58" x 5.90")
Weight	10 kg

a. The minimum detection limit is for a 1 second integration time. The exact value is available with the sensor specificaction sheet.

b. The relative humidity range is for non-condensing water and is calculated at 760 Torr and 23 °C

c. Downtime is defined as the time it takes for the input gas to reach the ADM for detection.

d. CH_4 Response Time is defined as the time it takes for the intensity to decrease from 90% to 10% of the initial signal when the ADM is flushed with a neutral nitrogen or synthetic air gas.

e. H_2O Response Time is defined as the time it takes for the humidity level to increase from ~1000 ppm water to 25 000 ppm water when water vapor is introduced at the input.

f. The QEPAS-CH4 accepts gaseous samples without particles. A 2 µm particle filter is recommended (not included).

6.2 Key Performance Indicators

Below is a short description of the various key indicators used to measure the performance of each QEPAS-CH4 sensor.

Accuracy:	Mean deviation between measured and actual values
Precision (1σ, typ):	Standard deviation of the accuracy
Precision (3σ):	Three times the 1σ precision
Noise-on-Peak (1σ):	Typical measured noise of a specific measured concentration range (given here for <5 ppm)
Limit of Detection (LoD):	Lowest measurable value (LoD = 3* Noise-on-Peak (1σ))

The general key indicators for the two gas matrices are given in the tabulary below; however, each sensor comes with its own performance sheet that includes the measured values for the specific QEPAS-CH4 sensor.

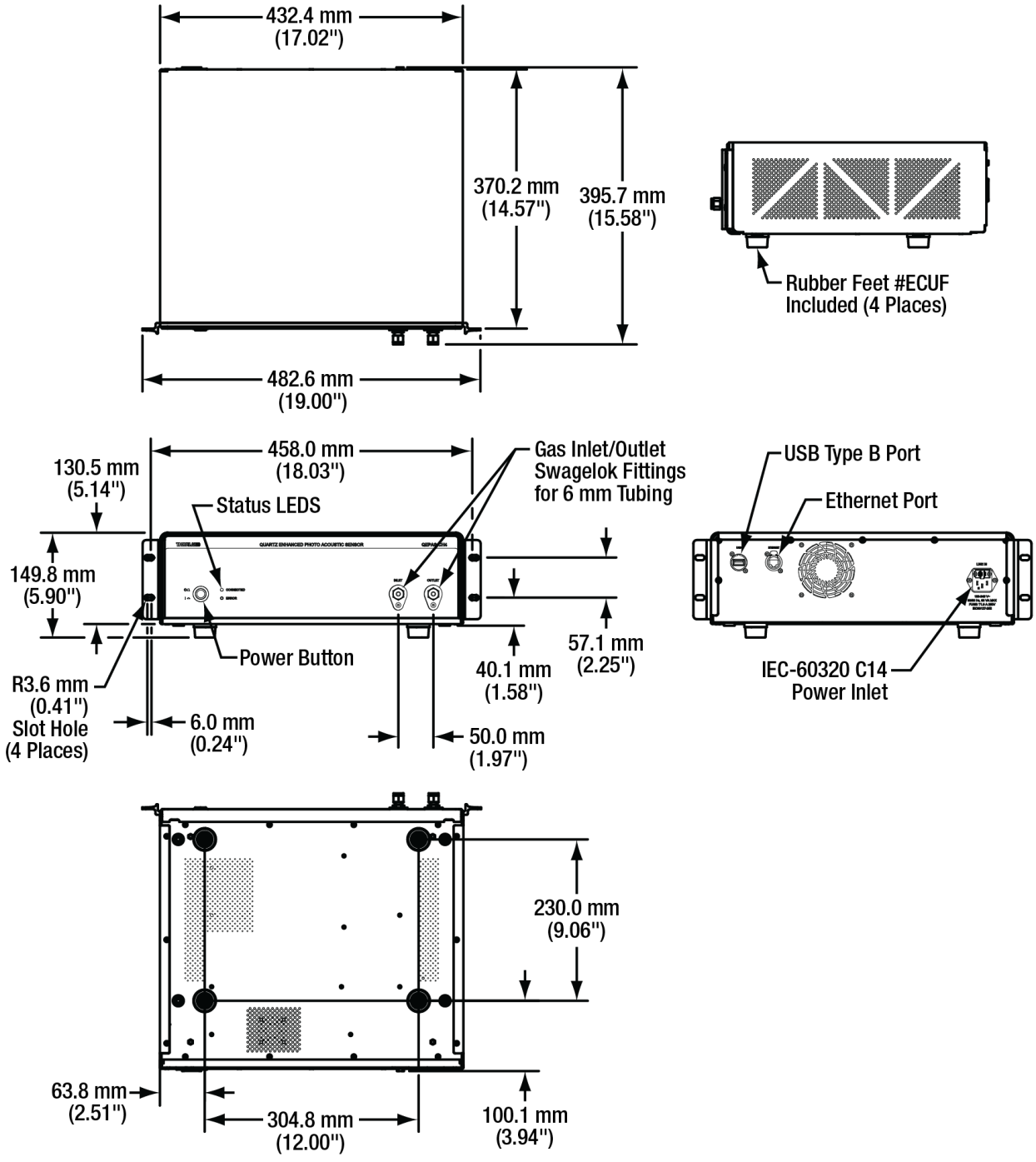
Key Indicator	CH_4 in Nitrogen	CH_4 in Synthetic Air
Accuracy	-5 % to 5 %	-5% to 5 %
Precision (3σ)	15 %	15 %
Noise-on-Peak (1σ)	<0.17 ppm	<0.17 ppm
LoD (3σ)	<0.5 ppm	<0.5 ppm

NOTE

The inaccuracy of the gas mixer set-up used for alignment, which includes the inaccuracy of the gas bottles with fixed CH_4 gas mixes, is 2.5% (1σ) and 7.5% (3σ).

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6.3 Dimensions



Chapter 7 Maintenance and Service

Protect the QEPAS-CH4 sensor from adverse weather conditions. The QEPAS-CH4 sensor is not water resistant.

Attention

A particle filter allowing maximum particles of 2 µm size before the inlet is recommenend.

Attention

To avoid damage to the instrument, do not expose it to spray, liquids or solvents!

The unit does not need regular maintenance by the user. It does not contain any modules and/or components that could be repaired by the user himself. If a malfunction occurs, please see the Return of Devices section and contact Thorlabs for return instructions.

Do not remove covers!

To clean the QEPAS-CH4 series housing, use a mild detergent and damp cloth. Do not soak the unit in water or use solvent based cleaners.

7.1 Troubleshooting

If you experience any trouble with the sensor, please contact the Thorlabs Tech Support, see Thorlabs Worldwide Contacts. There are no servicable parts within the sensor.

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Chapter 8 Certifications and Compliances



EU Declaration of Conformity

Manufacturer: Thorlabs GmbH

Address: Münchner Weg 1, D-85232 Bergkirchen

We hereby declare under our sole responsibility that:

Product: **QEPAS-CH4**

Product description: **Quartz-Enhanced Photoacoustic Sensor for Methane**

is/are in conformity with the following directive(s):

2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2014/35/EU	Low Voltage Directive (LVD)
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS), including 2015/863

and (harmonized) standards / technical specifications :

EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2021
EN 61010-1	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use.	2010 + A1:2019 + AC:2019
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	2018
EN 60825-1	Safety of laser products	2014+A11:2021

I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications and complies with all applicable Essential Requirements of the Directives.

Signed:

Name: Julien Vigroux *On:* 22.11.2023

Position: General Manager

CE

Chapter 9 Warranty

Thorlabs warrants material and production of the QEPAS-CH4 for a period of 24 months starting with the date of shipment in accordance with and subject to the terms and conditions set forth in Thorlabs' General Terms and Conditions of Sale which can be found at:

General Terms and Conditions:

https://www.thorlabs.com/Images/PDF/LG-PO-001_Thorlabs_terms_and_%20agreements.pdf

and

https://www.thorlabs.com/images/PDF/Terms%20and%20Conditions%20of%20Sales_Thorlabs-GmbH_English.pdf

9.1 Return of Devices

This precision device is only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

9.2 WEEE Policy

Thorlabs 'End of Life' Policy (WEEE)



Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return "end of life" Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out "wheelie bin" logo (see right), were sold to and are currently owned by a company or institute within the EC, and are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. "End of life" units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the users responsibility to delete all private data stored on the device prior to disposal.

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Chapter 10 Manufacturer Address

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Email: europe@thorlabs.com

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Fax: +44 (0)1353-654444
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Email:
techsupport.uk@thorlabs.com

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Please refer to the general terms and conditions linked under Warranty.

Chapter 12 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.



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