

# **INSTRUCTION MANUAL**

# OXY MICRO

Fiber Optic Oxygen Measurement System for Oxygen Microsensorst

Serial No.\_\_\_\_\_

PC-controlled one-channel fiber optic oxygen meter for oxygen microsensors; excitation wavelength of 505 nm; quartz-quartz glass fibers of less than 150 µm diameter connected by ST-fiber connectors. Also available with two 12-bit analog outputs and external trigger input.

**www.wpiinc.com** 121323

# **OXY MICRO**

Specification:

# Micro fiber optic oxygen transmitter for use with oxygen microsensors

Software version: OxyMicro (Version 7.0.0)

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## World Precision Instruments, Inc.

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# **1** Preface

You have chosen a new, innovative technology for measuring oxygen. The OXY MICRO is a compact, easy to transport and completely PC-controlled micro fiber optic oxygen transmitter. The data evaluation is PC supported as well.

The OXY MICRO was developed especially for fiber optic oxygen microsensors. It is based on a novel technology, which creates very stable, internally referenced measured values. This allows a more flexible use of oxygen microsensors in various fields of interest.

Chemical optical oxygen microsensors (also called optrodes) have several important features:

- They are small.
- Their signal does not depend on the flow rate of the sample.
- They allow measurements with high spatial resolution whenever this is required.

Therefore, they are ideally suited for the examination of small sample volumes. A set of different oxygen microsensors is available to make sure you have the sensor which matches your application.

Please feel free to contact our service team to find the best solution for your application.

Your WPI Team

# PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE WORKING WITH THIS DEVICE.

# 2 Description of the OXY MICRO Transmitter

The OXY MICRO is a precise single channel micro fiber optic oxygen transmitter with temperature compensation. It is designed for very small fiber optic oxygen microsensors (tip diameter < 50  $\mu$ m) with sensor coating type PSt1 (limit of detection 0.05 % oxygen, 20 ppb dissolved oxygen). The small outer dimensions and low power consumption make it suitable for portable use. For operation, a PC / notebook is required. The OXY MICRO is controlled using a comfortable software, which also saves and visualizes the measured values.



Fig. 1 OXY MICRO, micro fiber optic oxygen transmitter for use with oxygen microsensors

The OXY MICRO has a dual 12 bit analog output, and an external trigger input to be connected to a data logger.

The analog outputs are programmable to deliver oxygen, temperature or the raw values (phase or amplitude). The data are retrieved via PC / notebook and USB (alternatively RS232) (digital) or using the external trigger input (analog).

#### Features:

- High precision
- Portable (battery power optional)
- Analog / Digital data output (on request)
- Temperature compensation

#### 2.1 Scope of Delivery



Fig. 2 Case with all delivered equipment

- OXY MICRO, micro fiber optic oxygen transmitter
- Software OxyMicro V7.0.0 (CD)
- USB serial driver (CD)
- USB cable
- RS232 cable
- Power supply (100 240 VAC, 18 VDC)
- Temperature sensor PT 1000

#### Additionally required equipment (not supplied):

- Oxygen-sensitive chemical optical microsensor
   You can find microsensors mounted into different types of housings on www.wpiinc.com
- PC / Notebook for comfortable data recording and configuration System requirements: Microsoft<sup>®</sup> Windows<sup>®</sup> XP / Vista<sup>TM</sup> or Microsoft<sup>®</sup> Windows<sup>®</sup> 7; Processor power according to minimum requirements of the respective operating system

#### 2.2 Front Panel

The front panel is equipped with a connector for the fiber optic microsensor, a connector for the temperature sensor, a control LED and an ON / OFF switch.



Fig. 3 Transmitter front panel

ELEMENT	DESCRIPTION	FUNCTION
POWER	ON / OFF switch	Switches the device ON and OFF.
	Control LED	red: device off green: device on orange: standby
OXYGEN SENSOR	ST fiber connector	Connect the fiber optic microsensor here.
ТЕМР	Connector for PT 1000 temperature sensor	Connect the PT 1000 temperature sensor for temperature compensated measurements here.

## 2.3 Rear Panel

Two standard BNC connectors are added for analog output channels 1 and 2, another one for external trigger input. The electrical specifications of all rear panel connectors are given in chapter 5 "Technical Data". Please follow these notes to avoid mistakes.



Fig. 4 Transmitter rear panel

ELEMENT	DESCRIPTION	FUNCTION
12 VDC	Line adapter for power supply	Connect the power supply cable. Use the provided parts only.
RS232	USB / RS232 interface (male)	Connect the device with a USB or RS232 data cable to your PC / notebook. Use the provided parts only.
CH 1	Analog out (channel 1)	Connect the device with external devices, e.g. a data logger.
CH 2	Analog out (channel 2)	Connect the device with external devices, e.g. a data logger.
EXT TRIG	External trigger input	Connect the device with external devices, e.g. a data logger with a trigger output, pulse generator.

# **3** Installation

#### 3.1 Set-up



Fig. 5 Set-up for OXY MICRO

A typical set-up is shown in Fig. 5. An oxygen microsensor is connected via an optical fiber to the transmitter which is connected via a serial COM port to a PC.

The OxyMicro - V7.0.0 software is compatible with  $Microsoft^{\ensuremath{\mathbb{R}}}$  Windows<sup>®</sup> XP / Vista<sup>TM</sup> and Microsoft<sup>®</sup> Windows<sup>®</sup> 7

Remove the rubber cap from the optical sensor connector (ST connector) and keep the cap. After measurements or for storing the transmitter the rubber cap should be put back on to keep the optical sensor connector clean.

It is recommended to clean the ST connector with a dust free cleaning wipe or a cleaning implement for ST connectors before the measurement. Make sure to insert the cleaning implement into the inner part of the connector; then turn it three or four times.

Remove the protective cap from the male plug on the optical fiber and insert it in the ST connector of the OXY MICRO. The ST plug has to be inserted and slightly turned clockwise to fasten it. Be careful not to snap off the optical fiber; best hold the fiber between forefinger and thumb at the bayonet lock of the male plug (see Fig. 6).



Fig. 6 Attaching the oxygen microsensor to the connector on the transmitter

There is a red mark on the temperature sensor connector of the OXY MICRO. The temperature sensor plug also has a red mark. Match those two marks before inserting the temperature sensor plug into the connector on the transmitter front panel; else the plug might get damaged.

#### 3.2 Software Installation

The software is working with English and German regional settings. Please change your setting to one of these settings before installing the software.

- 1. Please close all other applications as they may interfere with the software.
- 2. Insert the supplied CD-ROM into the respective drive.
- 3. If no dialog opens automatically, use the explorer to open the file menu on the CD. Copy the file "OxyMicro\_v7.0.0.exe" to a folder on your PC (e.g. C:/OXY MICRO/...) and create a shortcut to your desktop so you are able to start the software quickly.
- 4. Start the software by double clicking the symbol for the "OxyMicro\_v7.0.0.exe" file.

## 3.3 USB Serial Driver Installation

The USB-RS232-RJ 4/4 requires

- At least one available USB port
- Windows XP / Vista / 7

Connect the USB cable to the PC / notebook and insert the delivered driver CD.

The Found New Hardware Wizard will launch automatically. Select No, not this time from the options and click Next.



Fig. 7 Found New Hardware Wizard

Select Install from a list or specific location (Advanced); then click Next.



Fig. 8 Found New Hardware Wizard

Select Search for the best driver in these locations and go to Search for removable media (floppy, CD-ROM...). Click Next to proceed.



Fig. 9 Found New Hardware Wizard

Then Windows will copy the required driver files. Windows should then display a message indicating that the installation was successful. Click **Finish** to complete the installation.

# **4** Operation

# 4.1 Adjustment of Regional Settings of the Operating System

The software is working with English and German regional settings.

To change the regional settings on your PC press **Start** and go to the **Control Panel**. Choose **Regional and Language Options**.



Fig. 10 Control Panel - Classic View

Select the Regional Options tab (e.g. English (United States)) and click Customize.

egional Options	Languages Advanced		
Standards and	l formats		
This option al dates, and tin	ifects how some programs format numbers, currencies, ne.		
Select an iter your own forn	n to match its preferences, or click Customize to choose nats:		
English (Unit	ed States) Customize		
Samples			
Number:	123,456,789.00		
Currency:	\$123,456,789.00		
Time:	2:28:37 PM		
Short date:	6/29/2010		
Long date:	Tuesday, June 29, 2010		
Location			
To help servi weather, sele	ces provide you with local information, such as news and ct your present location:		
United State	s		

Fig. 11 Regional and Language Options window

A window opens; select the **Numbers** tab and choose the dot `.' in the **Decimal Symbol** drop down menu. In the drop down menu **Digit grouping symbol** you have to choose space ` '. Then press **Apply** and **OK**.

Positive: 123,456,789.00	Negative: -123,456,	789.00
Decimal symbol:		*
No. of digits after decimal:	2	*
Digit grouping symbol: 🧲		~
Digit grouping:	123,456,789	~
Negative sign symbol:	•	~
Negative number format:	-1.1	~
Display leading zeros:	0.7	~
List separator:		~
Measurement system:	U.S.	~

Fig. 12 Customize Regional Options window - Numbers tab

Click **Customize** again and go to the **Date** tab now. In the drop down menu **Short date** format you have to select `dd.MM.yy' and choose the dot `.' in **Date separator**. Again press **Apply** and **OK**.

Customize Regional Options
Numbers Currency Time Date
Calendar When a two-digit year is entered, interpret it as a year between:
Short date Short date sample: 29.06.10
Short date format.
Date separator:
Long date Long date sample: 29 June 2010
Long date format: dd MMMM yyyy
OK Cancel Apply

Fig. 13 Customize Regional Options window - Date tab

Press **OK** in the **Regional and Language Options** window, and you have finished adjusting the regional settings.

#### 4.2 Configuration of COM Port

To check which COM port is assigned to the USB cable press **Start** and go to the **Control Panel**. Select **System**.

Select the Hardware tab in the System Properties window and click Device Manager.

System He	store Autom	atic Updates	Remote
General	Computer Name	Hardware	Advanced
Device Man	ager		
Section 1 and 1 an	e Device Manager lists a your computer. Use the [ operties of any device.	ll the hardware device Device Manager to ch	es installed hange the
		Device Ma	anager
Drivers			
Dri co ho	iver Signing lets you make mpatible with Windows. V w Windows connects to V	e sure that installed dr Vindows Update lets <u>:</u> Windows Update for o	ivers are you set up drivers.
	Driver Signing	Windows L	lpdate
Hardware Pr	Driver Signing	Windows L	lpdate
Hardware Pri	Driver Signing ofiles ardware profiles provide a ferent hardware configura	Windows L way for you to set up tions.	Ipdate
Hardware Pr	Driver Signing ofiles ardware profiles provide a ferent hardware configura	Windows L way for you to set up tions. Hardware f	and store

Fig. 14 System Properties window

You can find the USB serial Port under **Ports (COM & LPT)** (in the figure below this would be COM port 6 for example).



Fig. 15 Device Manager - USB Serial Port selected

l

OXY MICRO only accepts COM port numbers that are < 10. In case the COM port number is 10 or higher please change it to a port number < 10.

To change the COM port number you open the **Device Manager** activate **Port (COM & LPT)** and double-click the USB-Serial Port. A window opens; select the **Port Settings** tab and click on **Advanced**.

Communications Port (COM1) Properties
General Port Settings Driver Details Resources
Bits per second: 9600 V Data bits: 8 V Parity: None V Stop bits: 1 V Flow control: None V
Advanced Restore Defaults
OK Cancel

Fig. 16 USB Serial Port Properties - Port Settings tab

Change the COM Port Number to a free port number < 10 and click OK.

Advanced Settings for COM4		? 🛛			
COM Port Number: COM4		OK			
USB Transfer Sizes		Cancel			
Select lower settings to correct performance problems at low baud rates. Select higher settings for faster performance.					
Receive (Bytes): 409	6 🖌				
Transmit (Bytes): 409	6				
BM Options	Miscellaneous Option	18			
Select lower settings to correct respons	e problems. Serial Enumerator				

Fig. 17 Advanced Settings for COM Port window

You have to confirm the new port number by clicking **OK**; then you can close the device manager.

#### 4.3 Starting the Device

- Connect the OXY MICRO via the supplied USB cable to a serial COM port of your PC / notebook. (Alternatively, You can connect the OXY MICRO via the RS232 cable to a serial COM port of your PC / notebook. Tighten the cable with the screws on your PC / notebook.)
- 2. Connect the power supply.
- 3. Please close all other applications as they may interfere with the software. Start the software OxyMicro V7.0.0.

UAT	GEN	Measurement	Calibration		
0.0	% airsatur. 💌	Quick Start	Advanced Start	Stop	amplitude
TEMPER	ATURE	Sampling Rate			phase     ambient light
•••• °C	off - line	Log Data	no logging		Display Raw Values
	waiting .	the right com p	ort.		

Fig. 18 Initial Window - Software is scanning to detect the connected OXY MICRO device

The software is scanning all COM ports available to detect and configure the connected OXY MICRO device.

If the software is unable to detect the correct COM port, a message is displayed asking you to choose the right COM port.

Connect the instrument to the PC .		
Search for device		
And choose the right com port.		

Fig. 19 Information dialog - choose the right COM port

With a right mouse click onto **Com Port** the dialog **Select COM Port** opens. Select the correct COM port in the drop-down menu and click the **OK** button.

Select COM Port	
Com 1	•
<u> </u>	X Cancel

Fig. 20 Select COM Port dialog

If no device is detected, please check all connections and proper installation of serial COM ports.

The window shown below is displayed after the connected transmitter got detected:

WPI OxyMicro - V7.0.0		
File Charts Display Print Settings		
OXYGEN	Measurement Calibration	
0.0 % airsatur. 💌	Quick Start Advanced Start Stop	amplitude
TEMPERATURE	Sampling Rate :	phase
erre <sup>°C</sup> off - line	Log Data no logging	Display Raw Values
MEASURE CHART INFO		
start time: 00:00:00	- → % airsaturation - × - temperature	
	0 measurement time	
		Þ
Com3 No file selected!	start: 00:00:00 1	4:53:42

Fig. 21 Initial display of OxyMicro - V7.0.0

Now connect the oxygen microsensor and temperature sensor to the respective connectors on the transmitter front panel.

#### 4.4 Calibration

Prior to measurements you have to calibrate the oxygen microsensor. Click the **Calibration** tab in the upper middle screen.

Charts Display Print Settings		
OXYGEN	Measurement Calibration	
0.0 % airsatur. 👻	Quick Start Advanced Start Stop	amplitude
TEMPERATURE	Sampling Rate :	phase     ambient light

Fig. 22 Calibration tab

There are three different calibration modes:

- With the setting calibrate with temperature sensor the current raw phase values of the oxygen microsensor are measured and stored. Temperature during calibration is measured with the PT 1000 temperature sensor and saved. The temperature sensor has to be in close vicinity to the oxygen microsensor or make sure that the temperature at both oxygen and temperature sensor is the same.
- With the setting **calibrate without temp. sensor** the current raw phase values of the oxygen microsensor are measured and stored. The temperature value during calibration is set manually in the software and stored. This option can be used, if the temperature at the location of the oxygen microsensor is known.
- With the setting calibrate manually the raw phase values of the oxygen microsensor as well as the temperature values are set manually in the software. This option can be used, if previously measured calibration values for the currently used oxygen microsensor are available. You can find calibration data on the Final Inspection Protocol delivered with your oxygen microsensor (see Fig. 32).

Please read the instruction manual of the respective oxygen sensor for more detailed information about calibration standards and sensor specifications.

#### 4.4.1 Calibration with Temperature Sensor

Clicking the **cal.** button next to **calibrate with temperature sensor** opens the respective **Calibration Menu** dialog:

Calibration Menu						
2 Point calibration - with temperature sensor						
atm. pressure	1013 👤 mbar					
1st point : 0 %air.sat.	phase         temperature           58         64         ∘         20         0         ∘c         ✓ Store current value					
2nd point : 100 %air.sat.	phase temperature 20,0 °C Store current value					
amplitude 24681	phase temperature 57.28 ° 25.4 °C					
	✓ <u>F</u> inish <u>X</u> <u>C</u> ancel					

Fig. 23 Dialog for calibration with temperature sensor

- 1. Insert the current atmospheric pressure value.
- 2. Set the first calibration point (0 % air sat.).

Place the oxygen microsensor and temperature sensor in the medium for the first calibration point. At the bottom of the dialog the currently measured amplitude and phase value of the oxygen microsensor and the temperature are displayed. Watch the displayed phase value; wait for about 3 minutes until the phase angle is constant (the variation of the phase angle should be smaller than  $\pm$  0.1° and the variation of temperature smaller than  $\pm$  0.1°C) and click the **Store current value** button to the right of the **1st point** value. The transmitter stores amplitude, phase and temperature values.

	Calibrat	ion Menu
2 Point ca	ibration - with	n temperature sensor
atm. pressure	1013 🌲 mbar	
1st point : 0 %air.sat.	phase	temperature 20_0
2nd point : 100 %air.sat.	phase	temperature 20_0
amplitude 24681	phase 57.28	temperature 25.4 °C
	✓ <u>F</u> inish	X Cancel

Fig. 24 Dialog for calibration with temperature sensor – storing the first calibration value

A warning message is displayed saying this will overwrite the existing calibration values; hit **Continue** and the 1st point values will be updated.

Calibration Message	X
This action will overwrite the exsisting calibration values.	
Continue X Cancel	

Fig. 25 Calibration message window

3. Set the second calibration point (100 % air sat.).

Place the oxygen microsensor and temperature sensor in the medium for the second calibration point. At the bottom of the dialog the currently measured amplitude and phase value of the oxygen microsensor and the temperature are displayed. Watch the displayed phase value; wait for about 3 minutes until the phase angle is constant (the variation of the phase angle should be smaller than  $\pm 0.1^{\circ}$  and the variation of temperature smaller than  $\pm 0.1^{\circ}$ C) and click the **Store current value** button to the right of the **2nd point** value. The transmitter stores amplitude, phase and temperature values.

	Calibrati	ion Menu
2 Point calif	oration - with	temperature sensor
atm. pressure	1013 糞 mbar	
1st point : 0 %air.sat.	phase	temperature 20_0 ℃ ✓ Store current value
2nd point : 100 %air.sat.	phase 28 82 °	temperature
amplitude 24681	phase 57.28	° <mark>25.4</mark> °C
	✓ <u>F</u> inish	X Cancel

Fig. 26 Dialog for calibration with temperature sensor – storing the second calibration value

A warning message is displayed saying this will overwrite the existing calibration values (see Fig. 25); hit **Continue** and the 2nd point values will be updated.

End the calibration process by clicking the **Finish** button. The calibration data are stored to the transmitter and the display in the **INFO** tab will be updated.

#### 4.4.2 Calibration without Temperature Sensor

Clicking the **cal.** button next to **calibrate without temperature** sensor opens the respective Calibration Menu dialog:

2 Point calibration - without temperature sensor					
atm. pressure	1013 👤 mbar				
1st point : 0 %air.sat.	phase temperature 58 ,64 ∘ <u>↓</u> 20 ,0 <u>↓</u> ℃ ✓ Store current value				
2nd point : 100 %air.sat.	phase temperature 28 .82 ° ★ 20 .0 ★ ℃ ✓ Store current value				
amplitude 27852	phase 27.67 °				
	Einish X Cancel				

Fig. 27 Dialog for calibration without temperature sensor

- 1. Insert the current atmospheric pressure value.
- 2. Set the first calibration point (0 % air sat.).

Place the oxygen microsensor in the medium for the first calibration point. At the bottom of the dialog the currently measured amplitude and phase value of the oxygen microsensor are displayed. Set the current temperature at the oxygen microsensor by using the up and down arrows or typing in the temperature value. Watch the displayed phase value; wait for about 3 minutes until the phase angle is constant (the variation of the phase angle should be smaller than  $\pm$  0.1°) and click the **Store current value** button to the right of the **1st point** value. The transmitter stores amplitude, phase and temperature values.

	Calibration Menu
2 Point ca	libration - without temperature sensor
atm. pressure	1013 🔶 mbar
1st point : O %air.sat.	phase temperature 58 .64 • $\pm$ 20 .0 $\pm$ C Vore current value
2nd point : 100 %air.sat.	phase     temperature       28     .82     °     ▲ 20     .0     ▲ °c     ✓ Store current value
amplitude 2468	phase 57.28 °
	✓ <u>Finish</u> X <u>C</u> ancel

Fig. 28 Dialog for calibration without temperature sensor – storing the first calibration value

A warning message is displayed saying this will overwrite the existing calibration values; hit **Continue** and the 1st point values will be updated.

Calibration Message 🛛 🛛 🔀
This action will overwrite the exsisting calibration values.
Continue X Cancel

Fig. 29 Calibration message window

3. Set the second calibration point (100 % air sat.).

Place the oxygen microsensor in the medium for the second calibration point. At the bottom of the dialog the currently measured amplitude and phase value of the oxygen microsensor are displayed. Set the current temperature at the oxygen microsensor by using the up and down arrows or typing in the temperature value. Watch the displayed phase value; wait for about 3 minutes until the phase angle is constant (the variation of the phase angle should be smaller than  $\pm 0.1^{\circ}$ ) and click the **Store current value** button to the right of the **2nd point** value. The transmitter stores amplitude, phase and temperature values.

1	Calibration Menu							
	2 Point calibration - without temperature sensor							
	atm. pressure 1013 🌒 mbar							
	1st point :     phase     temperature       □ %air.sat.     58     54     °     ▲ 200     0     ▲ 300							
<	Znd point :     phase     temperature       100 %air.sat.     28 .82     • 20 .0 ÷ Store current value							
	amplitude phase 24681 - ••• •••							
	Einish Cancel							

Fig. 30 Dialog for calibration without temperature sensor – storing the second calibration value

A warning message is displayed saying this will overwrite the existing calibration values (see Fig. 29); hit **Continue** and the 2nd point values will be updated.

End the calibration process by clicking the **Finish** button. The calibration data are stored to the transmitter and the display in the **INFO** tab will be updated.

#### 4.4.3 Manual Calibration\*

Clicking on manual will open the respective Calibration Menu dialog:

	Calibration Menu	
2 Point c	alibration - user defined	
atm. pressure	970 🚔 mbar	
<b>1st point :</b> O %air.sat.	phase temperature 59 47 * 20 0 * °C	
2nd point : 100 %air.sat.	phase temperature 29.27 * 20.0 * °C	
	✓ <u>F</u> inish X <u>C</u> ancel	

Fig. 31 Dialog for user defined calibration

You can find calibration data on the Final Inspection Protocol delivered with your oxygen microsensor (see Fig. 32). Use the values in the grey highlighted boxes to fill in the **Calibration Menu**. If previously measured calibration values for the used oxygen sensor are available you can also use these values for the manual calibration.

- 1. Insert the atmospheric pressure at which the calibration data you are using were measured. (In case you are using the FIP data use the pressure value in the grey highlighted box.)
- 2. Select phase and temperature value for the first calibration point.
- 3. Select phase and temperature value for the second calibration point.

\*Technical data relate to sensor specific calibration.

Data					
Atmospheric pressure:	970	hPa			
	Phase signal	Valid range	Temperature	Valid range	Amplitude
	[°]	[°]	[C°]	[C°]	[r.U.]
cal 0 0% air sat	59.47	58.00 - 61.00	20.0	18.0 - 22.0	46450
cal 2nd 100 % air sat	29.27	27.00 - 30.00	20.0	18.0 - 22.0	22710
Response time [t90]:	< 60 s		Valid range:	< 60 s	
	Please type in these values into the software for "manual calibration"				

Fig. 32 Example for a Final Inspection Protocol

End the calibration process by clicking the **Finish** button. A warning message is displayed saying this will overwrite the existing calibration values. Hit **Continue**. The calibration data is stored to the transmitter and the display in the **INFO** tab will be updated. Abort the calibration by clicking the **CANCEL** button.

#### 4.5 Measurement

Press the Quick Start button to open the Measurement Assistant.

	Measurement Calibration							
0	Quick Start	Stop						
	Sampling Rate :							
	Log Data	no logging						

Fig. 33 Quick Start button

If no calibration has been performed or the software has been closed after calibration the following message showing the date of the last calibration is displayed:

ĺ	Measurement Assistent
	You did not calibrate the sensor after program start.
	Date of last calibration : 30/05/11
	Last calibration was made 29 day(s) ago.
	🔪 <u>N</u> ew Calibration
	Continue X Cancel

Fig. 34 Measurement Assistant dialog showing the date of the last calibration

Click **Continue** to go on with the measurement assistant or press **New Calibration**, which will get you back to the calibration menu.

1 sec	Dynamic Averaging           4         \$           samples	
Femperature Co	mpensation	
C off	Enter the temp	perature during the measurement:
• on	20.0	°C
ogging setup		
• Measure		C Measure & Log
• Measure	file name	C Measure & Log
• Measure	file name	C Measure & Log

Fig. 35 Measurement Assistant dialog

#### **Sampling Rate**

Measurement frequencies from "fast sampling" up to 60 minutes can be selected. The speed in "fast sampling" mode is about 250 ms when no temperature sensor is connected and decreases to about 350 ms when connecting the temperature sensor or activating the analog output channels.

The sensor shelf-life can be increased using a slower measuring mode; the effect of photobleaching is reduced as the illumination light is switched off between sampling. Moreover a huge amount of data for long-time measurements can be avoided using a slower measuring mode.

#### **Dynamic Averaging**

When choosing a sampling rate of 1 sec. **Dynamic Averaging** can be selected. This defines the number of averaged measured values. The higher the running average, the longer the time (sampling time) used for averaging. With a higher running average value set (maximum 25 samples) a smoother measurement signal can be achieved. The default setting is 4.

#### **Temperature Compensation**

Select the temperature measurement mode for temperature compensated oxygen measurement. The following options can be selected:

- Selecting off you have to set a constant temperature value. This option can be used, if the temperature at the location of the oxygen microsensor is known and stays constant throughout the measurement.
- Selecting on the temperature value for temperature compensation of the oxygen microsensor is measured with the supplied PT1000 temperature sensor. Make sure the temperature sensor is connected to the transmitter properly.

#### **Logging Setup**

Measurements can be done with or without data logging.

Subsequent data storage is not possible, if you do your measurements without data logging.

If you select **Measure & Log**, click the **file location** button to choose a location for the measurement file and name it. In the **File Description** area you can add a small note to the measurement file which is going to be saved with the file header. The measurement file is saved as txt-file in ASCII format.

When all pre-settings are done start the measurement by clicking the **Start** button. The **Calibration** and **Data Logging** tab are hidden now and the selected **Sampling Rate** and **Logging Status** are displayed in the **Measurement** tab.

Measurement						
Quick Start Adv	anced Start	Stop				
Sampling Rate :	1 sec					
Logging Status:	logging					

Fig. 36 Measurement tab showing sampling rate and logging status

Press the Stop button to end the measurement. This will also stop the data logging process.

To close the software select File / Exit.

#### 4.5.1 Control Bar



Fig. 37 Software display - Control Bar

The control bar contains a numerical display for oxygen and temperature as well as warning lights. The control buttons for **Calibration**, and **Measurement** are described in chapters 4.4, and 4.5.



Fig. 38 Numerical Display

The temperature for temperature compensated measurement is displayed either "on-line", if the temperature sensor is connected, or "off-line", if the temperature sensor is not connected.

In the upper right corner warning lights are displayed showing possible errors of the raw data (amplitude, phase, ambient light).

0	amplitude:	green:	The amplitude is correct.
		yellow:	The amplitude is critically low; replacement of the sensor is
			recommended.
		red:	The amplitude is too low; the sensor tip may be damaged or
			the sensor cable may not be connected.
0	phase:	green:	The phase angle is within the normal range.
		red:	The phase angle is out of limits.
0	ambient light:	green:	The ratio of sensor signal to ambient light is acceptable.
		red:	The level of background light (e. g. direct sunlight, lamps) is too
			high. Reduction of ambient light is recommended.



Fig. 39 Control Bar - warning lights

Clicking on Hide Raw Values / Display Raw Values will hide or show the raw data values for amplitude and phase.



Fig. 40 Control Bar – warning lights, the raw values are displayed

1 mile: 30:00:00	- % aireaturation	temperature		
	 - % airsaturation	temperature	,	
	1			
	1			
	1			
	1			

## 4.5.2 Graphical Display

Fig. 41 Software display - Graphical display

Different graphs (oxygen, phase, amplitude and temperature) can be displayed by activating them in the **Charts** menu. The respective graph will be shown in the graphical display.

Zooming is possible by a left mouse click and movement from the upper left corner to the lower right corner of the area of interest. Zooming out is done vice versa or by using the submenu **Display / Zoom / Undo Zoom**.

Choosing **Display** / **AutoScaleY** the y-axis is scaled automatically. It is activated by default setting.

Selecting the submenu **Display** / **Dimensions** opens the dialog for **Dimension Settings**.

P Dimension Settings	
Choose the dimensions	for the chart:
X-axis (ticks)	1000 🚖
Y-axis (minimum)	-5 🔹
Y-axis (maximum)	150 🚖
	Cancel

Fig. 42 Dimension Settings dialog

l

You can adjust the number of measurement points on the x-axis shown in the display (maximum number of points is 5000). Furthermore, you can adjust the minimum and maximum of the y-axis. Making adjustments will turn off the **AutoScaleY** function.

Use the submenu **Display** / **Clear Charts** to clear the graphs on the display.

Selecting Print / Charts will print all the graphs shown on the display.

Opening the **INFO** tab will show information about the software version and some important transmitter settings. You can also use the submenu **Settings** / **Instrument Info** to get to this display.

If you have any questions concerning your OXY MICRO oxygen transmitter, please contact our service team and have the software and transmitter information ready.

III OxyMicro - V7.0.0				
File Charts Display Print Settings	Measurement	Calibration		
102.4 % airsatur. 💌	Quick Start	Advanced Start	Stop	amplitude
TEMPERATURE	Sampling Rate :	1 sec		phase
23.7 °C on - line	Log Data			Display Raw Values
MEASURE CHART INFO				
IDENTIFICATION PHIboard number : v1231757 PM number : 20122876 Serial number : S DUA 0001 00001 MUX channel : OFF - 00 PARAMETERS Signal LED current 100 Ref LED current : 066 Ref LED amplitude : 99495 Frequency : 006 Sending interval : 0001 Averaging : 2 Internal temp : 27.4 C SYSTEM SETTINGS APL function : ON Temp compensation : ON - ch a Analog out : chAt chB t RS232 echo : ON Oxygen unit : %a.s.	08		E	OxyMicro - V7.0.0 01/2013 World Precision Instruments, Inc. International Trade Center 175 Sarasota Center Blvd. Sarasota, FL 34240-9258 Phone 941-371-1003 Fax 941-377-5428 eMail - sales@wpiinc.com Internet - www.wpiinc.com
	Print Info	info bar	2	
Com3 No record file selected!			start: 15:12:10	15:14:03

Fig. 43 INFO tab display and info bar

The info bar located at the bottom of the screen provides information about the connected serial COM port, start time of the running measurement, current time and information about file name and location. If you did not select a location or file name, the message "No file selected!" is displayed in this area.

## 4.6 Subsequent Data Handling

Open Excel on your PC. Go to File / Open and choose Files of type / Text files.

Look in:	🧼 System (	C:) 🕑 🎯	• 🔰 🔍	× 🖆 💷	• Tools •	
My Recent Documents Desktop My Documents	C781f4276 dell Document: Inst Program F WINDOWS	4e3bdef5390d96f31Dec515				
My Computer						
My Computer	File <u>n</u> ame:			×	(	open
My Computer My Network Places	File name: Files of type:	All Microsoft Office Excel Files		~		2pen ancel
My Computer My Network Places	File pame: Files of type:	All Microsoft Office Excel Files All Files All Microsoft Office Excel Files Microsoft Office Excel Files All Web Pages Wull Files		>	c	open ancel

Fig. 44 Selecting file type

Choose the measurement file you want to process. The **Text Import Wizard** opens; choose **Delimited** and click **Next**.

Text Import Wizard - Step 1 of 3 🛛 🔹 💽					
The Text Wizard has determined that your data is Fixed Width. If this is correct, choose Next, or choose the data type that best describes your data.					
Original data type           Choose the file type that best describes your data:           ② Delmitted]         - Characters such as commas or tabs separate each field.           ○ Leed width         - Fields are aligned in columns with spaces between each field.					
Start import at row: 1 🗢 File grigin: Windows (ANSI)	~				
Preview of file C:\PET4.txt.					
<pre>1 ***** DESCRIPTION ********; 2 [enter the description here];</pre>	^				
3 4 ***** INSTRUMENT INFO ******; § IDENTIFICATION; ✓					
	>				
Cancel < Back Next >	ish				

Fig. 45 Text Import Wizard - Step 1

Then choose semicolon, click Next, and then Finish.

This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below. Delimiters Text gualifier: Text gualifier: Data greview Text the description here] Text Instrument INFO ******** Lenter the description here] Text Instrument INFO ******* The Instrument INFO ************************************	Text Import Wizard - Step 2 of 3	?×
***** DESCRIPTION ******** [enter the description here] ***** INSTRUMENT INFO ******* IDENTIFICATION	This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below. Delimiters Text gualifier: " Data greview	e
	<pre>***** DESCRIPTION ******** [enter the description here] ***** INSTRUMENT INFO ******* IDENTIFICATION </pre>	

Fig. 46 Text Import Wizard - Step 2

Your measurement data are displayed and can be processed now.

In the head of the ASCII file (see Fig. 47), you find the **Description** of your measurement which you have entered when storing the file.

Below, you find the **Instrument Info** containing the data of the complete calibration routine and some more important settings of the instrument and firmware.

The **Software Info** below contains the version number of the software, date and time of the performed measurement.

Below, you find the **Measure Mode Settings** containing the *dynamic averaging*, and the *measuring mode*.

The following rows, separated by semicolons, list the measuring data. The first two rows contain the **date** and **time**, the third the **log-time** in minutes, the fourth the **oxygen content** in the chosen unit. The raw data - **phase angle** in [°] and the **amplitude** in [r.U.] - are stored in the fifth and sixth row, respectively. The seventh row contains the **temperature** in °C measured by PT1000 temperature sensor.

The last row shows an **Error Message** for any error that might occur during measurement. E### is the byte error code:

- Bit 0 ADC overflow
- Bit 1 DC light overflow
- Bit 2 Amplitude too low
- Bit 3 No temperature sensor detected
- Bit 4 Overheat
- Bit 5 No oxygen calculation
- Bit 6 Reserved
- Bit 7 Reserved

#### **Examples:**

E0 = No error

E1 = Error : DC light overflow to much ambient light

E12 = Error : no temp sensor & amplitude too low

***** DESCRIPTION *********		
Sample File		
***** INSTRUMENT INFO *******		
IDENTIFICATION		
PHIboard number : v1231757		
PM number : 20122876		
Serial number : S DUA 0001 000008		
MUX channel : OFF - 00		
PARAMETERS		
Signal LED current: 100		
Ref LED current : 066		
Ref LED amplitude : 99495		
Frequency : 006		
Sending interval : 0001		
Averaging : 2		
Internal temp : 27.4 C		
SYSTEM SETTINGS		
APL function : ON		
Temp compensation : ON - ch a		
Analog out : chA t chB t		
RS232 echo : ON		
Oxygen unit : %a.s.		
CALIBRATION		
Sensor type : 1		
0%a.s.phase 1 : 58.31 at 020.0°C amp 045900		
100.00%a.s.phase 2: 29.24 at 020.0°C amp 030100		
Date (ddmmyy) : 151013		
Pressure (mBar) : 1013		
FIRMWARE		
Code 3.016 (IAP) : 08/20/04, 09:50:56		
Xilinx built : 01/05/04 (MM/DD/YY)		
Reset condition : SLEEP		
***** SOFTWARE INFO ********		
OxyMicro - V7.0.0 01/2013		
© by WPI Inc.		
15.10.2013		
15:12:17		
******MEASURE MODE SETTINGS**		
Dynamic Ave: 4		
measure mod 1 sec		
start time 15:11:22		
date(DD/MM/) time/hh:mm:s logtime/min oxygen/% air phase/°	amp	temp/°C

Fig. 47 Example for a text file recorded with OxyMicro - V7.0.0 software

#### 4.7 Analog Output

Selecting the submenu **Settings / Analog Output** opens the dialog for selecting which data should be exported. There are two analog output channels available. You can choose one of the following parameters:

- o None
- Oxygen
- Phase
- Amplitude
- Temperature
- If you have adjusted the desired settings of the analog outputs and want to connect the transmitter to a data logger, please close the software to store the settings before you disconnect the OXY MICRO from the computer.

analog channel 1:	analog channel 2:
C - none	• Fnone
🖲 - oxygen (airsat.)	C - oxygen (airsat.)
C - phase	C - phase
C - amplitude	C - amplitude
C - temperature	C - temperature

Fig. 48 Analog Choice dialog

For more detailed information about analog output specifications please refer to chapter 5.2 "Analog Output and External Trigger".

#### 4.8 LED Intensity

This function is for more experienced users to change the illumination level of the device. With a higher illumination level the signal-to-noise ratio can be improved, with a lower illumination level sensor bleaching can be avoided and its measurement stability prolonged.

After changing LED-intensity the measurement parameters of the transmitter will change and the sensor has to be recalibrated. A warning message is displayed.

LED Adjust - Warning				
The calibration values are no longer valid.				
Please recalibrate the sensor.				
Collection				
Calibration	X I will recalibrate later.			

Fig. 49 LED Adjust - Warning message

There are two options: In **Auto Adjust** mode the transmitter will adjust the illumination level automatically. Manual adjustment is possible in the **Advanced** mode.

LED Intensity Adjust
Auto Adjust Advanced
🖌 Start Auto Adjust
Status :

Fig. 50 LED Intensity Adjust – Auto Adjust tab

:	LED Intensity Adjust					
•	Auto Adjust Advanced					
•	LED Intensity 50 🛓 % 🗸 Confirm					
•						
ł	amplitude 4704					
•						

Fig. 51 LED Intensity Adjust - Advanced tab

# 4.9 Software Menu Structure

Main	Submenu 1	Submenu 2
File		
FIIC	closes the program	
Charts	→ Oxygen	
displays or hides	→ Phase	
the respective	→ Amplitude	
measurement	→ Temperature	
graphs.		
<b>.</b>		
Display	→ Zoom	→ AutoScaleY
		automatically scales the y-axis.
		→ Undo Zoom
		restores the original display.
	→ Clear Charts	
	clears the graphs on the display	
	→ Dimensions	
	opens a dialog to choose the	
	dimensions for the charts.	
Print	→ Charts	
	prints the charts shown on the display.	
Settings	→ COM port	
	allows choosing the serial COM port	
	for the serial interface.	
	→ Instrument Info	
	opens the INFO tap in the graphical	
	display.	
	→ Analog Ouput	
	opens a dialog to configure the analog	
	out of the device.	
	→ LED Intensity	
	allows adjusting the illumination level	
	of the sensor.	

# **5** Technical Data

# 5.1 Specifications

OPTICAL SENSOR	
Oxygen sensor	PSt1
Optical connector	ST compatible, Core / Center 100 / 140
Channels	1
LED peak wavelength	505 nm

TEMPERATURE SENSOR			
Potentiometric temperature sensor (Pt 1000)	Range Resolution	0 – 50 °C ± 0.1 °C	
Temperature sensor plug	Plug type	Lemo FGG.00.30	4.CLAD35 1 PT1000-1 2 n.c. 3 n.c. 4 PT1000-2

#### DC INPUT

#### DC-Supply: 18 V / 0.83 A / type TR15RA180

Use the provided parts only.



DIGITAL INTERFACE			
Serial communication	<ul> <li>a) RS232 serial interface</li> <li>19200 Baud (Databits 8, Stoppbits 1, Parity none, Handshake none)</li> <li>b) USB interface</li> </ul>		
Transmitter port	RJ11 4/4 socket 1 TXD 2 RXD 3 n.c. 4 GND		
Serial interface cable to PC	RJ11 4/4 to DSub9		
	PINOUT CONFIGURATION D89/F RJ11/4P4C 1 3 2 2 3 1 5 4 SHELL BRAID		
USB interface cable to PC	RJ11 4/4 to USB type A (transmitter adapted cable)		

ENVIRONMENTAL CONDITIONS	
Operating temperature	0 °C to 50 °C
Storage temperature	- 10 °C to 60 °C
Relative humidity	0% to 80 % (non-condensing)

OPERATION CONTROL			
LED at the front panel	Red Green Orange	Device off Device on Standby	
DIMENSIONS / WEIGHT			
	185 mm x 110 mm x 45 mm		
	630 g		

## 5.2 Analog Output and External Trigger

The OXY MICRO is supplied with a dual programmable 12 bit analog output with galvanic isolation and an external trigger input.

ANALOG OUTPUT		
Channels	Dual voltage outputs	
Output range	0 – 4095 mV	
Socket type	BNC connectors	
Resolution	12 bit	
Accuracy error	± 10 mV	
Galvanic isolation	500 V rms	
Shortcut protection	Yes	
Output parameters	O <sub>2</sub>	
(PC software allows to	Temperature	
choose the parameter.)	Phase	
	Amplitude	
0 – 4095 V Voltage Output:		

Voltage	0	1000 (e. g.)	4095	V
Oxygen	0	100	409.5	% air sat.
Ampl.	0	20000	81900	r.U.
Phase	0	25	102.375	0
Temperatur	0	100	409.5	°C

Examples

Formula – Oxygen:	Oxygen [% air sat.] = Voltage [V] x 409.5 / 4.095 (e. g. 0.750 V = 75 % air sat.)
Formula – Amplitude:	Ampl [r.U.] = Voltage [V] x 81.900 / 4.095 (e. g. 2.500 V = 50000 r.U.)
Formula – Phase:	Phase [°] = Voltage [V] x 102.375 / 4.095 (e. g. 2.500 V = 62.50 °)
Formula – Temperature:	Temperature [°C] = Voltage [V] x 409.5 / 4.095 (e. g. 0.500 V = 50 °C)
Update rate	Dependent on the sampling rate of the software. If an external trigger is used, the update rate is equivalent to the trigger pulse rate (min. 3 sec.).

EXTERNAL TRIGGER INPUT		
Channels	Single input	
Socket type	BNC connectors	
Input voltage range	TTL-compatible, up to 24 V	
Trigger mode	Low-High-Low	
	(Input must be kept Low for at lease	st 50 µs)
Normal state	No current	
Galvanic isolation	500 V rms	
Timing Specifications	Min. rise & fall time for trigger	15 ns
	Max. rise & fall time for trigger	2 ms
	Min. pulse length	3 ms
	Min. pause length	10 ms
	Min. periode length	13 ms
	(TTL-compatible)	

# **6 Operational Notes**

## 6.1 Optical Output

The ST connector is a high precision optical component. Please keep it clean and dry. Always use the rubber cap to close the output when not in use.

## 6.2 Temperature Compensation

Use only the temperature sensor supplied. The use of any other temperature sensor may damage the device.

## 6.3 Warm-Up Time

The warm-up time of the electronic and opto-electronic components of the OXY MICRO is 5 minutes. After 5 min. stable measuring values will be obtained.

## 6.4 Power Adapter

OXY MICRO always has to be used with the original power adapter (100 - 240 VAC; 47 - 63 Hz; 18 V / 0.83 A; type TR15RA180) which is supplied.

As an alternative power source a battery can be used that meets the DC input voltage given in chapter 5 "Technical Data". The battery adapter cable is available as an additional accessory.

## 6.5 Analog Outputs

WARNING: The analog outputs are not protected against any input voltage. Any voltage applied to the analog outputs can cause irreversible damage to the transmitter.

## 6.6 RS232 Interface / USB Interface

The transmitter uses a special interface cable. A different cable can cause malfunction. Use the provided parts only.

## 6.7 Maintenance

The transmitter is maintenance-free.

The housing should be cleaned with a cloth only. Avoid any moisture entering the housing. Never use benzine, acetone, alcohol or any other organic solvents.

The ST fiber connector of the sensor can be cleaned only with lint-free cloth or a cleaning implement for ST connectors.

#### 6.8 Service

Alignment, rework or repair work may only be carried out by a suitable qualified technician, trained by us. The safety of the user may be endangered, e. g., if the device

- Is visibly damaged;
- No longer operates as specified;
- Has been stored under adverse conditions for a lengthy period of time;
- Has been damaged in transport

If you are in doubt, the instrument should be sent back to the manufacturer for repair and maintenance.

#### World Precision Instruments, Inc.

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Please contact our service team in case of any question. We look forward to helping you and are open for any proposition or criticism.

# 7 CE and FCC Conformity

#### **CE Conformity**

The equipment is confirmed to comply with the requirements set out in the Council Directive relating to Electromagnetic Compatibility (2004/108/EEC) and for Low Voltage (2006/95/EEC). For the evaluation of above mentioned Council Directives following harmonized standards were consulted: EMC: EN 61326-1: 2006 LVD: EN 61010-1: 2010

#### Verification of FCC Rules

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

# **8 Concluding Remarks**

Dear Customer,

With this manual, we hope to provide you with an introduction to work with the OXY MICRO fiber optic oxygen transmitter.

This manual does not claim to be complete. We are endeavored to improve and supplement this version.

We are looking forward to your critical review and to any suggestions you may have.

You can find the latest version at www.wpiinc.com.

With best regards,

Your WPI Team

### WARRANTY

WPI (World Precision Instruments) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year\* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

#### **Claims and Returns**

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

#### Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

\* Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.

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