pyroscience
sensor technology

FireSting pro

Fiber-optic Multi-Analyte Meter

User Manual

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The ***FireSting pro*** is manufactured by

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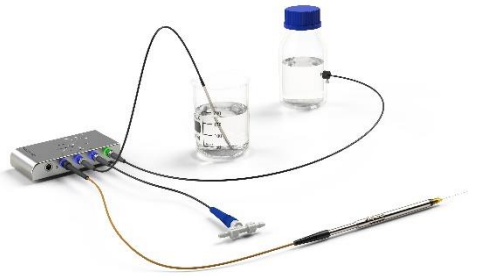
1 Overview

The compact USB-powered fiber-optic meter ***FireSting pro*** with 1, 2, or 4 channels for multiple analytes and sensor heads features:

- freely configurable channels for O2, pH and temperature
- broad optical sensor portfolio (multiple fiber-based and contactless sensor heads for several ranges)
- with (ultra-)high speed sampling
- zero-noise and zero-latency temperature compensation
- improved ambient light suppression and
- smart measuring modes for prolonged sensor lifetime
- pH, oxygen and temperature determination simultaneously in one sample



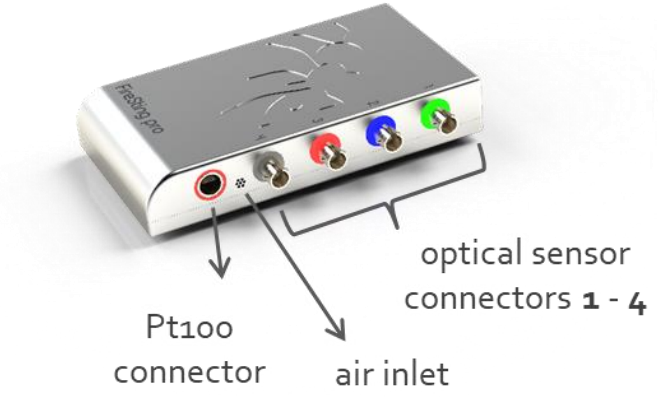
This single-device solution for multi-analyte measurements has integrated atmospheric pressure and humidity sensors for precise and easy oxygen sensor calibration, but also for automatic pressure compensation of the oxygen measurements. Furthermore, the ***FireSting pro*** offers 4 analog outputs and a broadcast-mode.

The new innovative and user-friendly ***Pyro Workbench*** allows operation of several ***FireSting pro*** meters in parallel as a scalable multi-channel system.

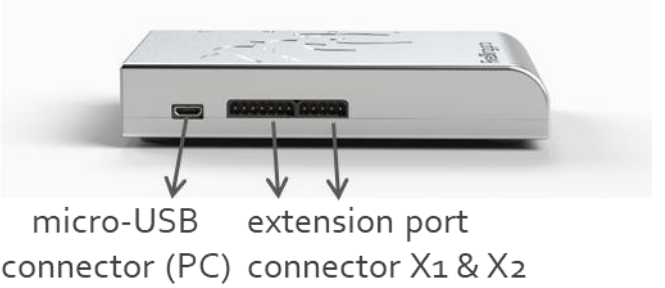
More information concerning our products can be found at www.pyroscience.com or contact us at info@pyroscience.com.

2 Introduction to the *FireSting pro* Meter

The ***FireSting pro*** comes with 1, 2, or 4 channels (optical sensor ST-connectors **1** to **4**) for up to 4 fiber-optic sensors and one connector (**T**) for an external Pt100 temperature probe. The optical channel connectors are color coded, indicating the analyte (**oxygen**, **pH** or **temperature**), which is currently measured and can be changed for each channel. The air inlet equilibrates the internal temperature, pressure and humidity sensors with the surrounding. Avoid covering these holes to ensure free air circulation towards the internal sensors.



The micro-USB connector on the left side panel provides energy supply and data exchange with the PC. Right-hand side of it, a connector X1 for power and digital interface (7-pins) and a connector X2 for analog output (5 pins) is located.



3 Quick Start

Step 1: Download the installer package and the manual of the logger software ***Pyro Workbench*** from the ***PyroScience*** website: https://www.pyroscience.com/downloads.html Unzip and start the installer, and follow the instructions.

Step 2: Connect the ***FireSting pro*** meter with the micro-USB cable to the Windows PC/laptop (Windows 7, 8, 10).

Step 3: Connect appropriate ***PyroScience*** sensor(s) to the optical sensor connectors **1** to **4** at the device (see 4).

Step 4: Connect an external temperature sensor (item no. ***TDIP15*** or ***TSUB21***) to the Pt100 connector or, alternatively, an optical temperature sensor (see 5) to one of the optical sensor connectors **1** to **4** for automatic temperature compensation.

Step 5: Prepare appropriate calibration standards, as described in the respective sensor manuals (see 7).

Step 6: Start the logger software by clicking on the short-cut "Pyro Workbench" on your desktop.

Step 7: Open the **Settings Wizard** by clicking on the ***FireSting pro*** picture. Select the respective analyte and enter all sensor settings for each sensor, including an appropriate mode of temperature compensation.

Step 8: Open the **Calibration Wizard** and follow the calibration instructions for each sensor. Measurements with the respective sensors will start automatically after all required sensor calibrations have been performed.

Step 9: Configure the **Graphs** according to your preferences.

Step 10: Activate **Data Logging**.

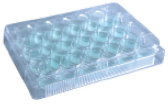
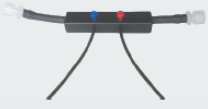
4 Connecting Sensors

The fiber-optic oxygen, pH and temperature sensors, as well as optical fibers needed for read-out of contactless sensors are connected to the ST-connectors of the ***FireSting pro*** (**1** to **4**) with a male fiber plug.

- Remove the black caps from the plug of the sensor / fiber.
- Remove the red caps from the sensor ports at the ***FireSting pro*** (the red caps should be put on again if it is not in use anymore to protect the optics).
- Insert the male fiber plug of the sensor cable into the ST-port (female fiber connector) of the ***FireSting pro*** and turn the bayonet coupling gently clockwise until the plug is locked firmly.

5 Optical sensors

The *FireSting pro* is compatible with a broad range of optical oxygen, pH and temperature sensors from *PyroScience*. For an overview of available optical sensor types, please see the *PyroScience* website: https://www.pyroscience.com/products.html

Sensor	Item	Analyte	Application
Robust Probes	OXROB...	O_2	stirred water & gas
	PHROB ...	pH (different ranges)	water, seawater, media
Retractable Needle-Type* 	OXR...	O_2	water, gas & semi-solid samples
	TPR...	T	
Fixed Needle-Type* 	OXF....	O_2	gas & water
	TPF....	T	
	OXF...-PT	O_2	gas
Bare Fiber Sensors*	OXB...	O_2	water, gas & custom
	TPB...	T	
Solvent-Resistant Probes 	OXSOLV...	O_2	approved polar & non-polar solvents
Nanoprobes 	OXNANO	O_2	aqueous solutions & microfluidics
Sensor Spots 	OXSP5	O_2	water & gas
	TPSP5	T	
	PHSP5 ...	pH	water, seawater, media
Respiration Vials / Combined Vials 	OXVIAL...	O_2	water & gas
	TOVIAL...	T · O_2	
	PHVIAL..	pH	water, seawater, media
	PHTVIAL..	T · pH	
	PHTOVIAL ...	T · pH · O_2	
Flow-Through Cells 	OXFTC..	O_2	water & gas
	OXFTCR	O_2	
	TPFTC2	T	
	TOFTC2	T · O_2	
	PHFTCR...	pH	water, seawater, media

* Micro- & Minisensors

6 Specifications of the *FireSting pro*

Dimensions	68 x 120 x 22 mm (housing) 78 x 120 x 24 (total)
Weight	ca. 290 g
Interface	USB 2.0
Power supply	USB-powered (max 50mA at 5V)
Supported operating systems	Windows 7, 8, 10
Operating temperature	0 to 50°C
Max. relative humidity	non-condensing conditions
Optical sensor port	1, 2, or 4 (dependent on model)
Optical sensors	complete ***PyroScience*** sensor portfolio for O2, pH and T
Optical sensor connector	fiber-optic ST-plug
Max. sample rate	ca. 10 samples per second (depending on the settings)
External temperature port Range, Resolution, Accuracy *	1 channel for 4-wire Pt100 -30°C to 150°C, 0.02°C, ±0.5°C
Internal temperature sensor Range, Resolution, Accuracy *	-40 to 125°C, 0.01°C, ±0.3°C
Internal pressure sensor Range, Resolution, Accuracy	300 to 1100 mbar, 0.1 mbar, typ. ±3 mbar
Internal humidity sensor Range, Resolution, Accuracy	0 to 100% rel. humidity (RH), 0.04% RH, typ. ±0.2% RH
Digital interface at extension port X1 (7 pins)	UART with 3.3V levels (5V tolerant), 115 200 baud, 8 data bit, 1 stop bit, no parity, no handshake
Connector plug port X1	Phoenix Contact, item no. 1778887
Analog output (4 channels) at extension port X2 (5 pins)	0 to 2.5 VDC 14 bit resolution
Connector plug port X2	Phoenix Contact, item no. 1778861

* Please note, that the optical sensors have a different temperature range.

7 Related documents

Detailed instructions for using the ***Pyro Workbench*** and application of optical oxygen, pH and temperature sensors.

- Manual for logger software "***Pyro Workbench***" (Windows)
- manuals for optical sensors from ***PyroScience*** (oxygen, pH, temperature)

8 Warnings and Safety Guidelines

Before using the *FireSting pro* and its sensors, read carefully the instructions and user manuals.

In case of problems or damage, disconnect the instrument and mark it to prevent any further use! Consult *PyroScience* for advice! There are no serviceable parts inside the device. Please note that opening the housing will void the warranty!

The *FireSting pro* is not watertight, is sensitive to corrosive conditions and to changes in temperature causing condensation. Avoid any condition (e.g. direct sun light) causing a heating of the device above 50°C (122°F) or below 0°C (32°F). Avoid any elevated humidity causing condensing conditions.

Handle the sensors with care especially after removal of the protective cap! Prevent mechanical stress to the fragile sensing tip! Prevent injuries with needle-type sensors!

Calibration and application of the sensors is on the user's authority, as well as data acquisition, treatment & publication!

The optical sensors and meter *FireSting pro* are not intended for medical, diagnostic, therapeutic, or military purposes or any other safety-critical applications. The sensors must not be used for applications in humans and must not be brought in direct contact with foods intended for consumption by humans.

The *FireSting pro* and optical sensors should be used in the laboratory by qualified personnel only, following the user instructions and the safety guidelines of the manual, as well as the appropriate laws and guidelines for safety in the laboratory!

Keep the sensors and the fiber-optic meter *FireSting pro* out of reach of children!