

TeX₄

*TEMPERATURE EXTENSION MODULE
WITH 4 CHANNELS*

USER MANUAL



The *TeX4* is manufactured by

PyroScience GmbH

Kackertstr. 11

52072 Aachen

Germany

Phone +49 (0)241 5183 2210

Fax +49 (0)241 5183 2299

Email info@pyroscience.com

Internet www.pyroscience.com

Registered: Aachen HRB 17329, Germany

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1 Overview

The temperature extension module *TeX₄* is intended for usage in combination with the fiber-optic oxygen meter *FireStingO₂*. The *FireStingO₂* provides up to 4 oxygen channels together with a single temperature port. Therefore, an automatic temperature compensation of the oxygen channels is only possible with one common temperature sensor. The *TeX₄* has been developed to enable individual temperature compensation for each oxygen channel by offering additional temperature ports. The temperature ports can be used in combination with the standard temperature sensors available from *PyroScience*.

The *TeX₄* has been designed for a tight mechanical coupling with the oxygen meter *FireStingO₂*, as it fits smoothly to the bottom of the *FireStingO₂*, where it can be fixed by integrated screws. Both the *TeX₄* and the *FireStingO₂* are connected via USB cables to a windows PC. The coupled modules are operated by the *Pyro Oxygen Logger* software.

2 Safety Guidelines

The *TeX4* is a laboratory instrument intended for combined usage with the fiber-optic oxygen meter *FireStingO2*. In order to guarantee an optimal performance of the *TeX4* please follow these operation instructions and safety guidelines. Before starting the measurements please ensure for

- a proper installation of the *Pyro Oxygen Logger* software before connecting the *TeX4* for the first time to the USB-port of your PC,
- appropriate operation temperature (0-50°C) and humidity (non-condensing conditions).

If any problems or damage evolve, please disconnect the instrument immediately, mark it to prevent any further use and consult *PyroScience* for repair or maintenance service. The *TeX4* should not be manipulated or opened by unauthorized persons, only by *PyroScience* or persons advised directly from *PyroScience*.

Please note that opening the housing will void the warranty. There are no serviceable parts inside the device.

The *TeX4* and the sensors should be kept and stored outside the reach of children in a secure place under dry and clean conditions at room temperature, avoiding moisture, dust, corrosive conditions and heating of the instrument. This device is not intended for medical, military or other safety relevant areas. It should be used in the laboratory by qualified personal only following the operation instructions and safety guidelines of this manual.

Please follow the appropriate laws and guidelines for safety like EEC directives for protective labor legislation, national protective labor legislation, safety regulations for accident prevention and safety data-sheets from manufacturer of chemicals used during measurements.

When used in the field, the environmental conditions (like high humidity, dust, exposure to direct solar radiation) may cause damage or interference of the *TeX₄*, which is on the user's authority.

Before using the *TeX₄* 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 *TeX₄* 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).

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

The sensors and the temperature extension box *TeX₄* are not intended for medical or military purposes or any 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 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 temperature extension box *TeX₄* out of reach of children!

3 Mounting

Place *the FireStingO2* on top of the *TeX4* as indicated on the following image:



Carefully turn the complete assembly upside down. Introduce the included hexagon socket wrench (Allen key, Inbus) into the four holes 1-4 and tighten the internal "coupling screws" by turning the wrench clockwise (about 10 rotations) as shown here:



4 Software Installation

The temperature extension module *TeX4* is operated by the logger software *Pyro Oxygen Logger* used for operating the oxygen meter *FireStingO2*. If you have installed this software already, you can skip this chapter. But ensure that you have installed a software version of 3.0 or higher. Older software versions of the *Pyro Oxygen Logger* software do not support the *TeX4*.

System requirements: PC with Windows 7/8/10 (but not "Windows 7 Starter Edition") and min. 700 MB free disk space.

IMPORTANT: Do not connect the *TeX4* to your PC before the *Pyro Oxygen Logger* software has been installed. The software will install automatically the appropriate USB-drivers.

Installation steps:

- Download the installer package for the newest version of the *Pyro Oxygen Logger* software from the *PyroScience* homepage: www.pyro-science.com/downloads.html
- Unzip and start the installer and follow the instructions.

After the successful installation a new program group "Pyro Oxygen Logger" is added to the start menu, and a short-cut named "Oxygen Logger" can be found on the desktop.

5 Operation

5.1 Connectors

The front of the *TeX4* provides four connectors T1-T4 for temperature sensors from *PyroScience*. The red status LED shows a short flashing when connecting the USB port to the PC, and it lights up constantly during normal operation.



The back of the *TeX4* provides the USB port (micro USB), an analog output (see chapter 6) and an extension port (see chapter 7).



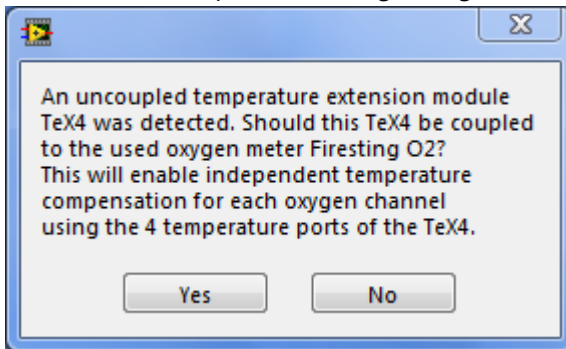
5.2 Coupling the TeX₄ with the FireStingO₂

When using a specific *TeX₄* for the first time, it must be "coupled" by the *Oxygen Logger* software to a specific *FireStingO₂* device. This is done by the following steps:

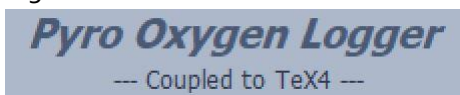
- Connect the *TeX₄* with the USB cable to your PC. A short flashing of the status LED indicates a proper connection.
- Connect the *FireStingO₂* with the USB cable to your PC. A short flashing of the logo indicates a proper connection.

IMPORTANT: No other *TeX₄* or *FireStingO₂* must be connected to the PC. Otherwise the coupling procedure will not work!

- Start the *Oxygen Logger* software. The software should show immediately the following dialog window:



- Click "Yes". Now the *TeX₄* is programmatically coupled to the specific *FireStingO₂* indicated by the message "Coupled to TeX₄" visible below the "Pyro Oxygen Logger" logo in the main window



The coupling information is stored within the flash memory of the *TeX₄*. Therefore, at the next startup of the *Oxygen Logger* software, the coupling is automatically detected by the software.

5.3 Using the Oxygen Logger software

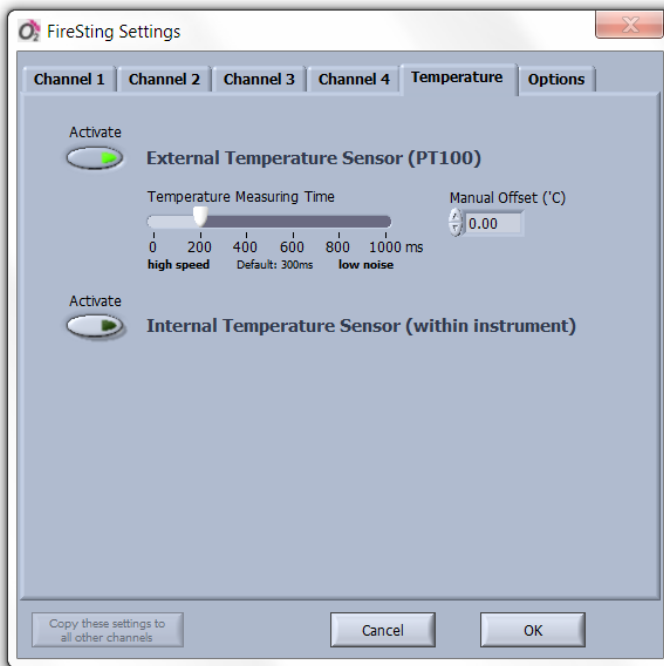
The operation of a *FireSting-TeX₄* couple with the *Oxygen Logger* software is widely unchanged compared to the operation of a sole *FireSting* device. Please refer to the manual of the *FireSting* for general operation instructions.



The temperature channels of the *TeX₄* are automatically activated, if "Temperature Sensor" is chosen in the settings of a specific oxygen channel (Settings → Environmental Conditions in the Sample → Temperature Sensor). For example, if the user selects "Temperature Sensor" for the oxygen channel 3, then the temperature reading for this channel is not taken from the single temperature port T at the *FireSting* device. Instead it is taken from the temperature sensor connected to the temperature port T₃ of the *TeX₄*.

The temperature port T at the *FireSting* device is actually not used anymore for any temperature compensation. However, the data of a connected temperature sensor can be still logged by the software, and hence can be used for an additional independent temperature measurement.

The settings of the *TeX4* can be adjusted within the **FireSting Settings** in the **Temperature** tab by clicking the **Settings** button:



For more details please refer to the manual of the *FireStingO2*.

5.4 Several FireSting-TeX₄-couples at a single PC

Several *FireSting-TeX₄* couples can be operated at a single PC. The coupling between a *FireSting* device and a *TeX₄* device is specifically related to the serial numbers of the devices. The coupling procedure is performed for each individual pair of *FireSting* and *TeX₄* devices as described in the previous sections. During the coupling it is important, that only a single *FireSting* and a single *TeX₄* is connected to the PC.

After all *FireSting* and *TeX₄* devices have been coupled properly by this procedure, all couples can be connected to a single PC. The *Oxygen Logger* software should then be started repeatedly for each couple, which opens a separate logging window for each couple. The **Flash Logo** button in the main window can be used to identify the *FireSting-TeX₄* couple connected to a specific logger window. Clicking this button will cause a short flashing of the *FireSting* logo followed by a short flashing of the status LED of the *TeX₄*.

The coupling information is stored within the flash memory of the *TeX₄*. Therefore, once the coupling has been performed, it will be valid even if the coupled devices are connected to a different PC.

5.5 Uncoupling a FireSting from a TeX₄

If a formerly coupled *FireSting* device should be operated without the coupled *TeX₄* device, you just have to start the *FireSting Logger* software **without** having the *TeX₄* device connected to the PC.

6 Analog Output

The *TeX4* provides at the backside of the housing analog outputs at the connector with 5 pins:



This connector provides 4 independent analog outputs with a range of 0-2.5V DC at a resolution of 14 bits. The 4 analog outputs can be configured very flexible within the *TeX4* settings window.

Pin	Name	Function	Description
1	GND		Ground
2	AO_A	Analog Output (0 – 2.5 V DC) (14 bit resolution)	Analog Output Port A
3	AO_B	Analog Output (0 – 2.5 V DC) (14 bit resolution)	Analog Output Port B
4	AO_C	Analog Output (0 – 2.5 V DC) (14 bit resolution)	Analog Output Port C
5	AO_D	Analog Output (0 – 2.5 V DC) (14 bit resolution)	Analog Output Port D

7 Extension Port

For OEM-applications the *TeX4* provides at the backside of the housing an extension port (connector with 7 pins):



Pins 1-2 are for the power supply of the module. The transmit and receive pins of the UART-interface are given at pins 4+5. The additional pins 6+7 are only needed if the module should be operated in auto-mode (see following chapter). In standard operation mode both pins 6+7 should be left unconnected.

Pin	Name	Function	Description
1	GND	Power	Ground
2	VCC	Power	Power supply min. 3.5V max. 5.0V DC max. 50 mA (typical 30 mA)
3	/USB_DISABLE	Disbale USB-port	Connect to GND for disabling the USB-port
4	TXD	Digital Output (0V or 3.3V)	Data transmission pin of the UART interface
5	RXD	Digital Input (0V or 3.3V) (5V tolerant)	Data receive pin of the UART interface
6	/AUTO	Digital Input	Not supported yet
7	/TRIG	Digital Input	Not supported yet

The UART interface operates at 3.3V levels (5V tolerant) consisting merely of a receive and a transmit line (pins 4+5). The configuration of the UART-interface is as follows:

19200 baud, 8 data bit, 1 stop bit, no parity, no handshake

The baud rate can be changed by a special command of the communication protocol (refer to the communication protocol for further information). However, after power cycling the module always reverts to the standard baud rate of 19200.

In the following different operation modes of the extension port are described.

7.1 Full-Control Mode

The standard operation mode of the module is the full-control mode. The necessary electrical connections are shown in Fig. 5.

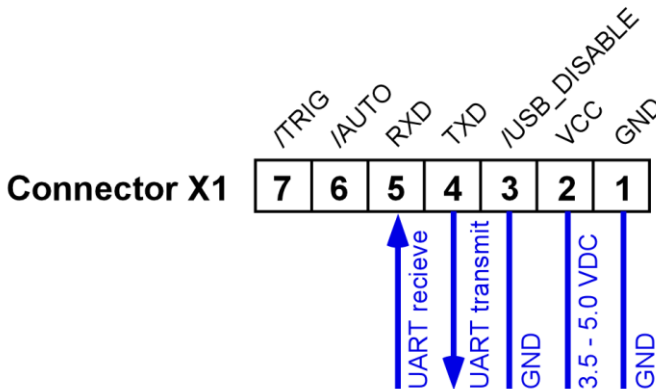


Fig. 1 Pin assignment in full-control mode

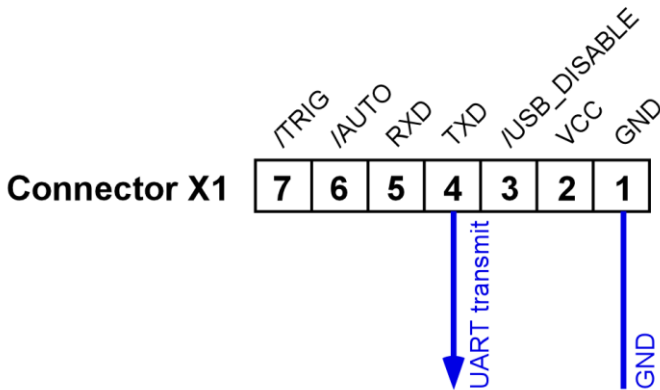
The full-control mode allows exploiting the full functionality of the module. Each action of the module is triggered by transmitting a text-command via the UART interface. The measurement results

can be either read out via the same UART interface. Alternatively, measurement results can be also read from the analog output.

For further details please refer to the separately available communication protocol.

7.2 Listening Mode

In this mode the *FirestingO2* is powered and controlled via the USB-interface together with the versatile logging software *Oxygen Logger*. However, the "UART transmit"-pin of the extension port can be used to listen to the data stream by third-party software. In this mode only the pins 1 and 4 are used:



The data stream contains all sampled temperature data in a simple ASCII-format. The communication protocol is available on request.

8 Specifications of the *TeX4*

Dimensions	68 x 120 x 30 mm
Weight	300 g
Interface	Micro USB
Power Supply	USB-powered (max 60mA at 5V)
Supported operating systems	Windows 7, 8, 10 (but not "Windows 7 Starter Edition")
Operating temperature of the electronics	0 to 50°C
Max. relative humidity	Non-condensing conditions
Temperature channels	4
Temp. measuring principle	4-wire PT100
Resolution	0.02 °C
Accuracy	+/-0.2 °C
Measuring range	-30 to 150 °C
Extension port	UART interface (contact us for details)