Thermo Scientific Orion COD165 Thermoreactor

User Guide

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Chapter 1   Introduction

⚠️ **Important Note:** Read the information in this user guide completely before using the COD165 thermoreactor. The manufacturer does not acknowledge any responsibility for improper use of the equipment.

⚠️ **Important Note:** The labels on to the COD165 thermoreactor warn users of the dangers to which they are exposed to during use or maintenance. The labels must not be removed from the COD165 thermoreactor.

⚠️ **Warning:** The COD165 thermoreactor operates at high temperatures and special care is required during use.

Safety Rules

The heating plate may reach temperatures of 165 °C during the heating and cooling phases.

Only glass containers that can withstand a temperature greater than 165 °C should be used with the COD165 thermoreactor.

Cleaning

Always unplug the COD165 thermoreactor before cleaning it. The heating plate must be cool before the instrument is cleaned. Use a damp cloth with nonflammable, non-abrasive detergents.

Personal Protection Equipment (PPE)

The COD165 thermoreactor operates at high temperatures and is designed for use with glass vials containing concentrated acid. Appropriate PPE should be worn at all times during operation.

Repair and Maintenance

For repair and maintenance, contact Technical Support. Within the United States call 1.800.225.1480 and outside the United States call 978.232.6000 or fax 978.232.6031. In Europe, the Middle East and Africa, contact your local authorized dealer. For the most current contact information, visit www.thermo.com/contactwater.

General Information

The COD165 thermoreactor will hold 25 round glass vials with 16 mm external diameter. It is designed for sample preparation in determining COD, total phosphorus, total nitrogen, total chromium and other parameters in water and sludge analysis. The COD165 thermoreactor, paired with the Thermo Scientific Orion COD reagents and the Thermo Scientific Orion AQUAfast AQ4000 advanced colorimeter or Thermo Scientific Orion AQUAfast AQ2040 colorimeter, provide the user with a complete analytical setup for COD analysis. The Thermo Scientific Orion AQUAfast AQ3700 colorimeter also performs COD analysis, as well as nitrogen and phosphate digestion methods.

The COD165 thermoreactor is designed to be highly resistant to chemical and mechanical corrosion. The heating block that holds the COD vials allows for very good thermal homogeneity at the selected temperatures. The temperature of the heating block is microprocessor controlled. The Pt100 temperature probe does not require any calibration, because when the instrument is turned on, a self test is performed.

The COD165 thermoreactor is equipped with a voltage selector for either 115 V or 230 V. It is accessible on the rear panel of the instrument. Always check the voltage setting before plugging the instrument into a power outlet.

The COD165 thermoreactor has five preset work temperatures of 100 °C, 120 °C, 150 °C, 160 °C and 165 °C and four preset run times of 30 minutes, 60 minutes, 120 minutes or continuous time.

The heating block is equipped with over-temperature protection by a thermostat, which turns off heating when the temperature exceeds 180 °C.

Note: The COD165 thermoreactor is delivered complete with three power cords; one for 110 to 120 V standard US outlets, one for 220 to 240 V European outlets and one for 230 V Chinese outlets.

Assembly and Installation

The instrument is equipped with a voltage selector, which allows the connection to either 115 V or 230 V outlets.

Connecting the Power Supply

After unpacking the unit, position it correctly on the laboratory bench. Before connecting it to the power supply, check that the power switch is turned to "0" and check that the data on the unit's plate corresponds to that supplied by the electric socket. The unit works at voltages between 90 and 260 V with a frequency of 50 or 60 Hz.

Note: The power switch means that the unit can be completely disconnected from the power supply when it is not in use, thus reducing energy consumption.

Start Up

Use the power switch on the front of the unit to turn the unit on (turned to "–"). When it is switched on, all the LEDs on the unit blink for few seconds. When the LEDs are off, the unit is ready to be programmed at different work temperatures and times.

Operation Controls

Control	Description
Power Switch	The switch lights up when the instrument is turned on.
Start/Temp Key	When the Start/Temp key is pressed, the work cycle is started with the selected temperature and time values, which are indicated by their corresponding LEDs.
	To change the temperature, press the Start/Temp key and select desired temperature. The temperature setting will scroll down through the four temperatures and the corresponding LED will light.
	Note: It is possible to select different temperatures if the programmed temperature has not been reached and the timer is not started. Once timer has started this key is not operative.
	If the selected temperature is lower than the actual temperature of the heating block when the Start/Temp key is pressed, the cycle will not start and all the LEDs will turn on intermittently, indicating an error.
	To correct this error, select a higher temperature setting or allow the block to cool to a temp below the set point temperature.
Time Key	The timer starts when the block reaches the selected temperature. While the timer is running, the LED will blink and the Time key is not operative.
Temperature LED	When the instrument is turned on the temperature LEDs are not lit. Once the Start/Temp key is pressed, the selected temperature LED will light.
	All four LEDs will blink if the selected temperature is lower than the current block temperature.
Time LED	When the instrument is turned on the time LEDs are not lit. Select the desired run time by pressing the Time key. A blinking time LED indicates that the timer has started.

When the unit is switched on, press the **Start/Temp** key to start the work cycle. The default option is set at 160 °C and 30 minutes, as shown by the corresponding LED. To select a different temperature, press the **Start/Temp** key until the corresponding LED is lit. To select a different time, press the **Time** key until the corresponding LED is lit.

Note: It is possible to modify both temperature and time until the temperature of the heating block reaches the selected temperature and the run time starts.

When the selected temperature is reached, a beeper will sound intermittently for 5 seconds. At this time the LED corresponding to the selected time will start to blink, signalling that the countdown has started.

The end of the countdown will be signaled by a beeper that will sound continuously for 5 seconds; at the same time the heating element and the corresponding time and temperature LED will turn off. The instrument is now ready for a new work cycle.

Power Interruptions

The instrument will register a black out or a lack of power supply as a manual stop of the cycle. The work cycle will have to be restarted.

Auto Shutoff Feature

The COD165 thermoreactor will shut down once the timer cycle is complete. If the power to the instrument is interrupted, the instrument will automatically end the program that is running and a manual restart is required.

Safety Features

The COD165 thermoreactor is equipped with an internal thermostat that will not allow the temperature of the block to exceed 180 °C. If this temperature is reached the unit will automatically shutdown. The COD165 thermoreactor continuously monitors the block of temperature and if inconsistent or anomalous readings are observed, the instrument will go into an alarm mode in which all eight LEDs blink and a beeper sounds.

Chapter 2 Operation

Running a Cycle

To initiate a cycle on the COD165 thermoreactor, power on the instrument and press the **Start/Temp** key.

The default settings are a temperature of 165 °C and a run time of 30 minutes, which will be indicated with the temperature and time LEDs. Use the **Temp** or **Time** key to change the temperature or time setting.

The selected temperature and time settings are shown by the temperature and time LEDs. It is possible to change both the temperature and time if the selected temperature has not been reached yet and the timer has not started. Once the selected temperature has been reached, a beep will sound intermittently for five seconds. After the beep, the LED corresponding to the selected time will start to blink, indicating that the timer has started. The end of the cycle will be indicated when the beeper sounds continuously for five seconds. At the completion of the cycle, the heater is turned off and the temperature and time LEDs turn off.

A new cycle can be run if the temperature of the heating block is not greater than the new selected temperature. If this occurs, the instrument will enter an alarm mode and all of the temperature LEDs will illuminate.

Maintenance

All the maintenance operations should be performed only after the instrument has been disconnected from the power supply.

The COD165 thermoreactor is designed to be maintenance-free and only occasional cleaning needs to be performed with a damp cloth and non-flammable, non-abrasive detergent.

Replacing the Fuses

The heating block is equipped with two fuses connected to the socket, located on the rear panel. If a fuse replacement is required, the power supply should be removed and then the fuse panel can be opened with a screwdriver. See the **Electrical Schematic** section for the fuse type.

Disposing of the Instrument

Disposal of this unit should comply with all local, state, and federal regulations.

Verification of the Heating Block Temperature

The electronic temperature controls within the COD165 thermoreactor are designed to provide excellent stability and eliminate temperature overruns or oscillations. The temperature sensor does not require calibration, as a self-calibration is performed upon power up of the instrument.

The temperature may be monitored using a standard NIST traceable thermometer with a range of 0 to 250 °C. Place the thermometer in a hole within the heating block and monitor the temperature.

Chapter 3 **Customer Services**

Specifications

Description	COD165
Power Supply	90 to 260 V / 50 to 60 Hz, detected automatically
Power	400 W
Weight	3.6 kg
Dimensions (W x H x D)	155 mm x 95 mm x 275 mm
Selectable Temperatures	100 °C, 120 °C, 150 °C, 160 °C or 165 °C
Selectable Times	30 minutes, 60 minutes, 120 minutes or continuous
Diameter of Holes	16 mm x 25 mm
Thermoregulator	PID microprocessor
Precision	± 0.2 % end of scale
Temperature Probe	Pt100 class A
Temperature Probe Calibration	Automatic by software
Heating Block Temperature Stability	±0.5 °C
Heating Block Temperature Homogeneity	±0.5 °C
Heating Block Temperature Precision	±1 °C
Over-temperature Protection	On the block
Performance from 20 °C to 150 °C	12 minutes
Reaching of Set Temperature Signal	Acoustic
During Time Count Signal	Visual
End of Cycle Signal	Acoustic
Set Temperature less than Block Temperature Error Signals	Visual and acoustic
Broken Temperature Probe Alarm Signals	Visual and acoustic

Electrical Schematic

1. 5 x 20 mm slow blow fuse, 5 A

2. General switch

3. Voltage changer electronic card

4. Safety thermostat

5. Electrical resistance

6. Pt100 temperature probe
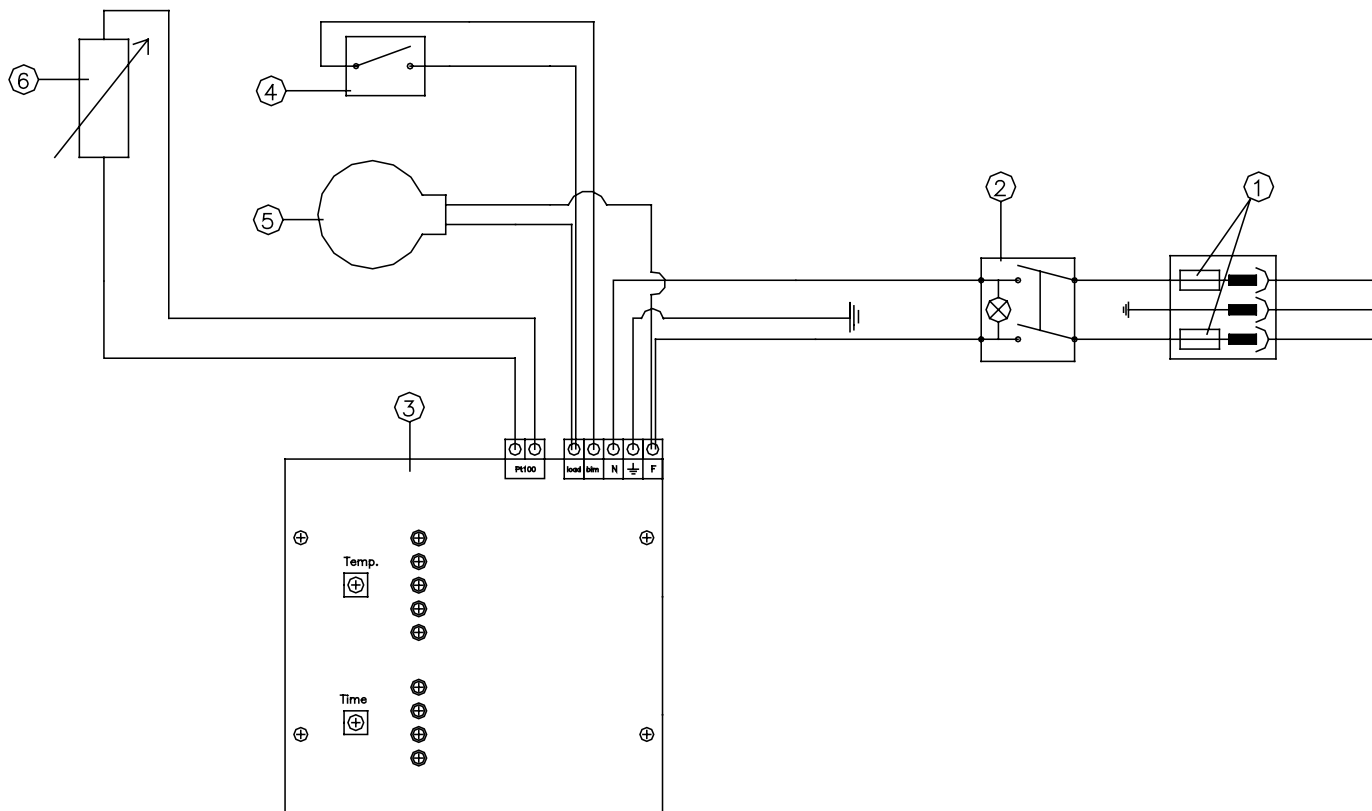
Notice of Compliance

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

"The digital apparatus does not exceed Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications."

"Le present appareil numerque n'emetpas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class A prescites dans le Reglement sur le brouillage radioelectrique edite par le ministere des Communications du Canada."

Assistance

After troubleshooting all components of your measurement system, contact Technical Support. Within the United States call 1.800.225.1480 and outside the United States call 978.232.6000 or fax 978.232.6031. In Europe, the Middle East and Africa, contact your local authorized dealer. For the most current contact information, visit www.thermo.com/contactwater.

For the latest application and technical resources for Thermo Scientific Orion products, visit www.thermo.com/waterapps.

Warranty

For the most current warranty information, visit www.thermo.com/water.

Ordering Information

Cat. No.	Description
COD165	COD165 thermoreactor, holds up to 25 vials, 110 V / 220 V
CODS01	COD standard, 1000 mg/L, 475 mL bottle
CODS10	COD standard, 10000 mg/L, 475 mL bottle
CODL00	COD test kit, 0 to 150 ppm, 25 tests, EPA approved
CODH00	COD test kit, 0 to 1500 ppm, 25 tests, EPA approved
CODHP0	COD test kit, 0 to 15000 ppm, 25 tests
AC2V16	16 mm vials, 10 pack
AQ4000	AQUAfast IV advanced colorimeter
AQ2040	AQUAfast II COD colorimeter
AQ3700	AQUAfast III colorimeter with nitrogen, phosphate and COD digestion capabilities
CODTMP	Pt100 probe for temperature measurements

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