Optrode M2

6.1125.000

Manual

8.109.8066EN / v1 / 2025-06-06

Metrohm

Metrohm AG
CH-9100 Herisau
Switzerland
+41 71 353 85 85
info@metrohm.com
www.metrohm.com

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Technical Communication
Metrohm AG
CH-9100 Herisau

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Disclaimer

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc., are expressly excluded from the warranty. Unauthorized modifications to the product (e.g., conversions or attachments) exclude any liability on the part of the manufacturer for resulting damage and its consequences. Instructions and notes in the Metrohm product documentation must be strictly followed. Otherwise, Metrohm's liability is excluded.

Table of contents

Table of figures

1 Introduction

1.1 Description

The **Optrode M2** is used as a photometric sensor for various titration methods that require the use of indicators. Its enclosed glass shaft enables it to be safely used in nonaqueous or corrosive media. It does not require any time-consuming care or conditioning.

Equipped with 8 LED light sources with different wavelength ranges, it can be used with a large variety of indicators. The sensor does not have a mechanical switch.

The LED light source can be selected either via the control software ***tiamo*** (version 2.5 and higher) or without the need for contact using the provided stirring bar.

The energy supply to the Optrode M2 is ensured via USB cable. Metrohm titrators are equipped with USB connectors for this purpose. In addition, a USB power adapter is available to power the Optrode M2 independently.

The Optrode M2 provides an analog measuring signal and can be connected reliably to any Metrohm titrator at the **Ind.** connector. This allows the Optrode M2 to be used for titration like other sensors.

1.2 Symbols and conventions

The following symbols and formatting may appear in this documentation:

*(5-**12**)*	**Cross-reference to figure legend** The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step** Perform the steps one after the other.
Method	**Dialog text**, **parameter** in the software
File ► New	Menu or menu item
[Continue]	**Button** or **key**
	**WARNING** This symbol draws attention to a possible life-threatening hazard or risk of injury.

	**WARNING** This symbol draws attention to a possible hazard due to electrical current.
	**WARNING** This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	**WARNING** This symbol draws attention to a possible biological hazard.
	**WARNING** Warning of optical radiation
	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.
	**NOTICE** This symbol highlights additional information and tips.

2 Safety

2.1 General notes on safety

WARNING

This sensor may be operated only in accordance with the information contained in this documentation.

2.2 Intended use

The Optrode M2 is designed for use in indoor environments (analytical laboratories). It is intended solely for use as an optical sensor for photometric titrations (together with a suitable titrator).

This sensor can be used in chemicals and flammable solvents. Usage of the Optrode M2 therefore requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge of the application of the fire prevention measures prescribed for laboratories or production operation is also mandatory.

2.3 Danger caused by breakage of glass

The Optrode M2 has a main body made of glass *(see chapter 8, page 15)*.

If this is damaged, then the function may become impaired and there is a danger of cut injuries.

WARNING

Risk of cuts from sharp edges

Cut injuries due to damaged glass parts and pieces of broken glass.

- Handle glass parts (e.g. electrodes, bottles) with care.
- Only use undamaged glass parts.
- Dispose of damaged glass parts immediately.
- In the event of uncertainties, contact the regional Metrohm service representative.

3 Overview

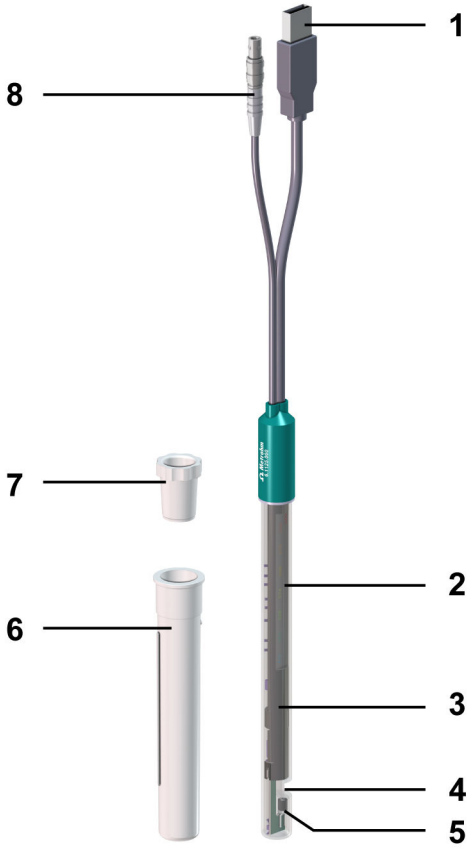


Figure 1 Optrode M2 – Overview

1 **USB plug** For energy supply of the sensor.	**2** **Optical circuit board** With wavelength display.
3 **Glass shaft**	**4** **Measuring gap** Light path = 10 mm.
5 **Photodiode** For measuring the light intensity.	**6** **Storage vessel (6.2008.040)**
7 **Ground-joint sleeve**	**8** **Sensor F plug** For connecting to a titrator (connector **Ind.**).

4 Installation

Also refer to the manual for the respective instrument to connect it.

The Optrode M2's USB cable is used for the energy supply to the electronics and to the sensor's light source. The actual sensor cable (measuring signal) has a conventional F plug for connecting to the indicator measuring input (**Ind.**) of a titrator on the.

4.1 Example of connecting to a device with a USB connector

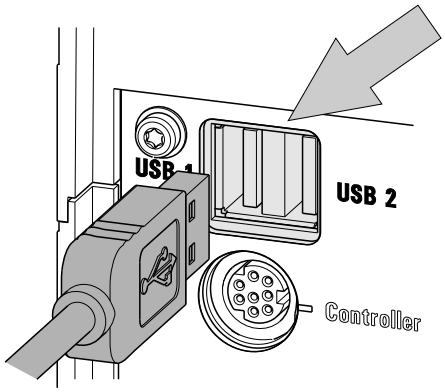


Figure 2 Energy supply on a device with USB connector

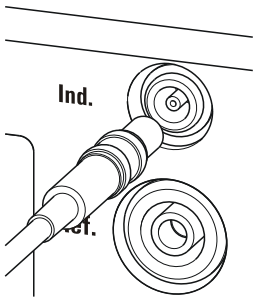


Figure 3 Connect Optrode M2 to the indicator measuring input

4.2 Example of connecting to a device with a USB Mini (OTG) connector

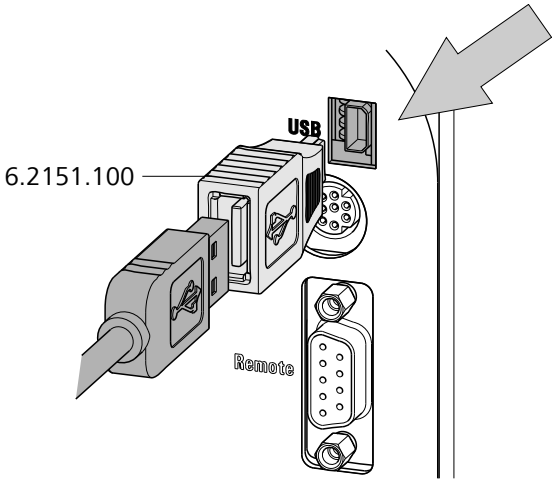


Figure 4 Energy supply on a device with USB Mini (OTG) connector

In order to connect the Optrode M2's USB cable, an adapter USB MINI (OTG) - USB A (6.2151.100) is required (see figure).

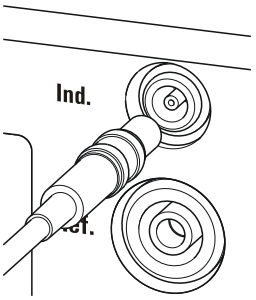


Figure 5 Connect Optrode M2 to the indicator measuring input

4.3 Energy supply with a USB power supply unit

A 6.02117.000 USB power supply unit is available if the power supply to the Optrode M2 cannot be provided via a titrator's USB port. This USB power supply unit can be connected to a power outlet directly.

The cable for energy supply to the Optrode M2 can be connected to the USB port on the USB power supply unit.

4.4 Installing the Optrode M2

NOTE

Ensure that the sensor is not exposed to direct sunlight and avoid disruptive light reflections.

Install the Optrode M2 as shown in the figure below.

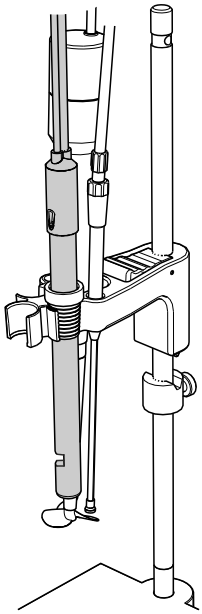


Figure 6 Install the Optrode M2

The sensor must be firmly installed on the titration head. Particularly when automation is involved, it is important to ensure that the cable has sufficient play.

During the titration, it is important that the solution is mixed well. Select a stirring rate high enough to form a small vortex. If the stirring rate is too high, then air bubbles will be aspirated. This results in incorrect measured values. If the stirring rate is too low, then the solution at the sensor will not yet be mixed correctly.

In order for the measurement to be taken in a well-mixed solution after the addition of the titrant, position the antidiffusion tip where turbulence is high. Furthermore, the distance between the addition of the titrant and the sensor should be as large as possible. Take into account the stirring direction (counterclockwise or clockwise) when positioning the electrode and antidiffusion tip.

The sensor's optical window is to be positioned facing the flow direction. This removes small air bubbles from the measuring gap.

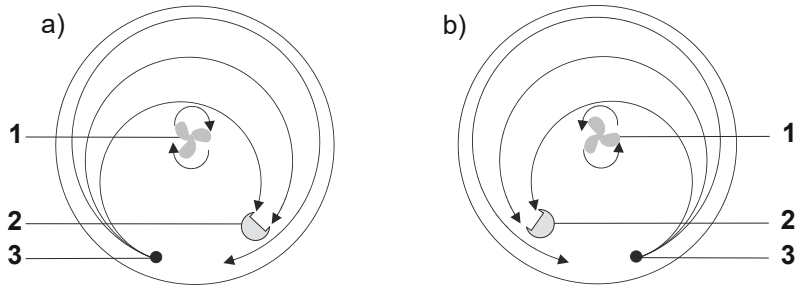


Figure 7 Diagrams showing propeller stirrer, sensor and titration tip during a titration. a) clockwise stirring direction, b) counter-clockwise stirring direction.

1 Propeller stirrer	**2 Sensor**
3 Antidiffusion tip	

5 Operation and maintenance

5.1 Setting the wavelength

The Optrode M2 has eight LEDs (LED = light-emitting diode) on its optical circuit board that serve as light sources. Each LED emits light in a different wavelength range. The LEDs are labeled with their primary wavelength on the optical circuit board. It is easy to recognize which LED is active and which wavelength is set by the fact that the label is lit in the corresponding color.

Figure 8 Wavelength display of the Optrode M2

Table 1 Wavelength ranges

LED	Color	Usable wavelength range / nm
470	blue	460–480
502	blue-green	485–520
520	green	505–535
574	yellow-green	560–585
590	yellow-orange	575–605
610	orange	595–625
640	light red	620–655
660	red	650–670

The magnetic switch in the sensor head is used to switch between LEDs or it is done automatically via ***tiamo*** (version 2.5 and higher).

Switching between LEDs with magnet

The wavelength is changed manually as follows:

1 Hold a magnet, e.g. a stirring bar, against the magnet symbol.

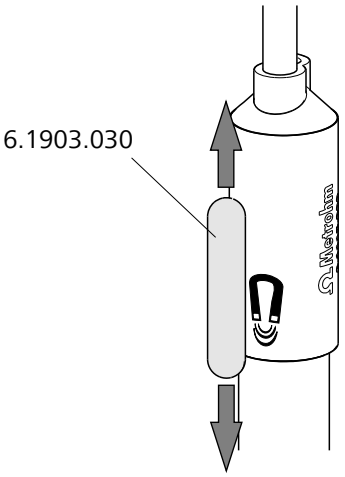


Figure 9 Switching the LED

2 Briefly move the magnet up and down again.

Moving the magnet switches to the next LED.

3 Move the magnet again until the desired wavelength is set.

Switching between LEDs via tiamo

The Optrode M2 is recognized automatically by the control software ***tiamo*** (version 2.5 and higher). However, this only works if the Optrode M2 is connected directly to the titrator or control instrument via USB.

The wavelength is changed as follows in ***tiamo***:

1 Double-click on the command in the method run.

2 Open the **General/Hardware** tab.

3 Under **Sensor**, select the option **Optrode type 2**.

4 Under **Wavelength**, select the desired wavelength.

(A wavelength of 610 nm is suggested by default, no matter what wavelength the Optrode M2 is currently set to.)

The selected wavelength can later be used in the formula editor as variable (**.WVL**).

NOTE

- The LED only switches to the selected wavelength once the determination starts.
- The wavelength cannot be changed during a running determination (neither with a magnet nor via ***tiamo***).

CAUTION

The light intensity of the LED must have stabilized sufficiently before use. Each time you switch on and each time you change the wavelength, wait at least ten minutes before starting the first determination.

NOTE

The wavelength remains set even if the Optrode M2 is switched off or its energy supply is interrupted (USB connection).

5.2 Sensor care

The Optrode M2 does not require any special care. Store the sensor dry in the storage vessel provided.

If it becomes dirty, the Optrode M2's glass shaft can be cleaned with warm water and a small amount of detergent or ethanol. Use a soft cloth for this.

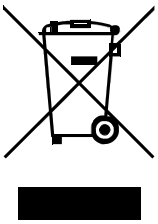
6 Troubleshooting

6.1 Possible problems and information on how to deal with them

Problem	Cause	Remedy
Signal jumps. No endpoint. Several endpoints. Erratic signal changes of the measuring curve.	*Air bubbles enter the measuring gap.*	▪ Decrease the stirring rate. ▪ Make sure you are using degassed (CO_2-free) water. ▪ Glass vessels facilitate visual checking. ▪ Position the sensor in the sample vessel *(see figure 7, page 8)*.
	Stirring is inadequate.	▪ Adjust the stirring rate (take the beaker size into account!). ▪ Position the sensor facing the stirrer stream *(see figure 7, page 8)*.
	The sample is not completely dissolved.	Make sure that salts are completely dissolved before adding indicator.
	The sensor is not stable in the titration head.	Avoid strain on the sensor cable (automation!).
	The stirring rate is too high or too low.	Adjust the stirring rate to the beaker size.
	The indicator solution is too old.	Check the stability (usable just for one day, in some cases). Prepare fresh solution, if necessary.
	Addition of the indicator solution.	▪ Do not add indicator before the sample has completely dissolved. ▪ After the addition of indicator, start with the titration right away. ▪ Adjust the amount of indicator to the sample amount / filling volume.
	The sensor is not immersed deep enough.	The entire measuring gap must be covered with sample solution even when stirring.
No light. None of the LEDs are lit up.	*The energy supply of the Optrode M2 is missing.*	▪ Connect the Optrode M2 to a USB port on a titrator or a USB power supply unit. ▪ Check the USB cable.

Problem	Cause	Remedy
	The Optrode M2 is defective.	Replace the Optrode M2.
No signal. The measured value is constant at approximately 0 mV.	*The solution is too dark.*	▪ Use less indicator. ▪ Dilute the solution.
	The Optrode M2 is dirty.	Clean the sensor, particularly the smooth surfaces in the measuring gap *(see chapter 5.2, page 11)*.
Signal is too high. Constant measured value at approximately 900 mV.	*The solution is too bright.*	Use more indicator.
	Too much ambient light present (e.g. direct sunlight).	Protect the measurement setup against light.
Optrode M2 is not recognized automatically in *tiamo* (version 2.5 and higher).	*The Optrode M2 firmware is outdated.*	Have the firmware updated by a regional Metrohm service representative.

7 Recycling and disposal



Properly dispose of chemicals and of the product to reduce negative effects on the environment and public health. Local authorities, waste disposal companies or dealers provide more detailed information on disposal. Observe the WEEE EU directive (WEEE = Waste Electrical and Electronic Equipment) for the proper disposal of waste electronic equipment within the European Union.

8 Technical specifications

8.1 Measuring mode

Measured quantity	Absorption (For titration only)

8.2 Measuring interval

Measuring cycle	3 ms

8.3 Resolution

Voltage	0.1 mV

8.4 Ambient conditions

Nominal function range	0–40 °C at max. 80% relative humidity, non-condensing
Altitude	max. 3,000 m. above sea level
pH range	0–14

8.5 Energy supply

Voltage	4.75–5.25 VDC
Power consumption	max. 85 mA

8.6 Reference conditions

Ambient temperature	+25 °C (±3 °C)
Device status	At operating temperature, LED used operating for at least 10 minutes

8.7 Light sources (LEDs)

Typical wavelengths	470 nm 502 nm 520 nm 574 nm 590 nm 610 nm 640 nm 660 nm

8.8 Dimensions

Shaft diameter	12 mm
Sleeve diameter	14.2 mm
Height	177 mm
Installation length	135 mm
Cable length	1.2 m fixed cable (plug F and USB)

8.9 Material

Glass tube	Borosilicate glass
Sleeve	PBT

Index