MIRA P C1D2

2.927.0050

Manual

8.0927.8008EN / v2 / 2025-07-28

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1 Overview

1.1 Instrument description

Metrohm Instant Raman Analyzers (MIRA) are handheld, high-power Raman spectrometers designed for rapid, nondestructive identification and verification of chemical and pharmaceutical samples, both liquid and solid. The MIRA spectrometers are the only handheld Raman spectrometers currently on the market with Orbital Raster Scan (ORS) technology.

The **MIRA P C1D2** is intended for operation in a **Class I Division 2** hazardous location.

1.2 MIRA P C1D2

MIRA P C1D2 instruments are available in the following versions:

Table 1 Product versions

Article number	Designation	Version feature
2.927.0050	**MIRA P C1D2**	Includes instrument, C1D2 enclosure, Calibrate/Verify Attachment (CVA) and USB Mini Cable. Without sampling attachments.

The article number and serial number for identification of the product can be found on the type label:

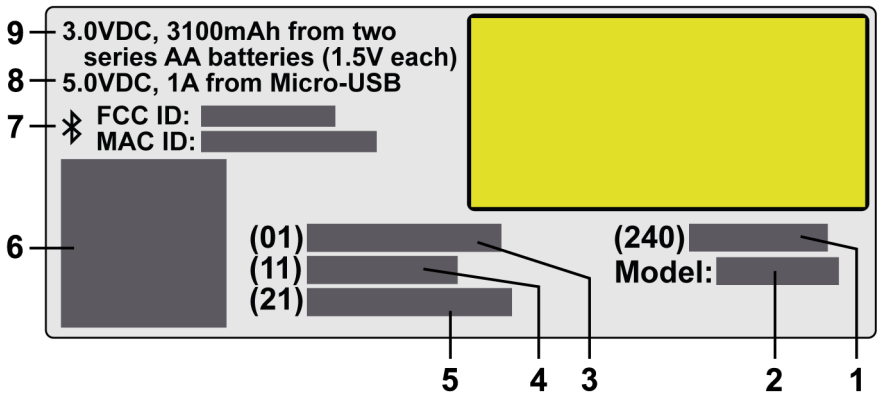

Figure 1 Instrument label at the bottom of the instrument

1 **(240) = Metrohm article number**

2 **Instrument model**

3	**(01) = Global Trade Item Number (GTIN) in accordance with GS1 standard**	**4**	**(11) = Manufacturing date: month, year**
5	**(21) = Serial number**	**6**	**QR code**
7	**Bluetooth logo; FCC ID number (Federal Communications Commission); MAC address of the instrument**	**8**	**USB input specifications (nominal voltage and minimum current): 5.0 V DC, 1 A from Micro-USB**
9	**Battery specifications: 3.0 V DC, 3,100 mAh from 2 Series AA batteries (1.5 V each)**		

1.2.1 C1D2 sampling attachments

Table 2 Sampling attachments for MIRA P C1D2

Article number	Designation	Version feature
6.07506.500	**Immersion Probe C1D2**	Designed for direct contact with liquids and solids. Shaft length 6" / 15.3 cm
6.07506.520	**LWD 5 cm C1D2 Attachment**	Long working distance (for samples in thick-walled bottles). Shaft length 2" / 5.1 cm.
6.07506.530	**LWD 15 cm C1D2 Attachment**	Long working distance (for samples in thick-walled bottles). Shaft length 6" / 15.3 cm
6.07506.510	**XLWD 5 cm C1D2 Attachment**	Extra long working distance (for samples in very thick containers / glass bottles) Shaft length 2" / 5.1 cm
6.07506.550	**XLWD 15 cm C1D2 Attachment**	Extra long working distance (for samples in very thick containers / glass bottles) Shaft length 6" / 15.3 cm
6.07506.540	**Manual Stand-off C1D2**	Manually adjustable working distance of 0.25 m to 1.5 m. Designed for use in low-light situations. Not meant to be used outdoors.

1.3 Software

1.3.1 MIRA Cal P Software

In order to configure a **MIRA P** instrument, the following software is needed:

6.06071.010	Mira Cal Pharma USB Stick

To download the latest version of **MIRA Cal P** software (including firmware), click on the following link: *https://go.metrohm.com/s/uZsT4*

1.3.2 Tutorial MIRA Cal P

Refer to the following MIRA Cal P software tutorial for more information:

8.0105.8004EN	Tutorial MIRA Cal P

Enter the product number (without the language code) in the search field on *https://www.metrohm.com* to search for the tutorial.

1.4 About the documentation

Please read through this documentation carefully before putting the product into operation.
The document contains important safety information and warnings which you must follow in order to ensure safe operation of the instrument. Metrohm is not responsible for damages and safety hazards that occur from using the instrument in a manner that is not specified in the user manual.

Symbols and conventions

Possible depictions in the documentation:

Depiction	Meaning
*(5-**12**)*	Cross-reference to figure legend (Figure number - ***Element in the figure***)
1	Instruction step
Method	Parameters, menu items, tabs, and dialogs
File ▶ New	Menu path
[Continue]	Button or key
	Supplementary information to the descriptive text

Note

In graphics, orange arrows or frames indicate the reference to the descriptive text. The relevant elements may also be colored orange.

Movement

In graphics, blue arrows indicate the movement direction. The elements to be moved may also be colored blue.

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1.5 Displaying accessories

Up-to-date information on the scope of delivery and on optional accessories can be found on the Metrohm website.

1 Searching for a product on the website

- Go to *https://www.metrohm.com*.
- Click on .
- Enter the article number of the product into the search field and press **[Enter]**.
  - Article number: see *MIRA P C1D2, chapter 1.2, page 1*
- In the result list, click on the desired product.

Detailed information regarding the product is displayed.

2 Displaying accessories

- Scroll down (accessories subject to availability):
  - Included parts
  - Optional parts

3 Download accessories list (included and optional parts)

- Click on to download the accessories list as a PDF.

Metrohm recommends keeping the downloaded PDF for reference purposes.

2 Safety

2.1 Intended use

The **MIRA P C1D2** is a portable Raman spectrometer. The instrument is suitable for indoor and outdoor use. It enables contactless, nondestructive determination and verification of different material types, such as pharmaceutical APIs and auxiliary materials.

Class I Division 2 hazardous location

The MIRA P C1D2 is intended for operation in a Class I Division 2 hazardous location.

A Class I Division 2 hazardous location.refers to the potential presence of flammable or explosive gases or vapors. Under normal operating conditions, the concentrations of the hazardous substances are not high enough to be ignitable. However, ignitable concentrations of gases or vapors might occasionally circulate.

C1D2 sampling attachments

Depending on the application, the instrument is equipped with a suitable C1D2 sampling attachment (Smart Tip). The nominal ocular hazard distance (NOHD) applicable to the respective Smart Tip must be taken into account at all times.

The **Manual Standoff C1D2** is not meant to be used outdoors. It may be operated only in a defined and monitored laser area.

2.2 Responsibility of the operator

The operator must ensure that the basic regulations on occupational safety and accident prevention are observed. The operator has the following responsibilities:

- Identify the hazards to the safety and health of its personnel and implement the necessary protective measures and precautions.
- Instruct personnel in the safe handling of the product.
- Train personnel in the use of the product according to the user documentation (e.g. install, operate, clean, eliminate faults).
- Train personnel on basic occupational safety and accident prevention regulations.
- Provide personal protective equipment (e.g. protective glasses, gloves).
- Provide suitable tools and equipment to carry out the work safely.
- Ensure compliance with applicable laws, regulations and standards.

The product may be used only when its status is perfect. The following measures are required to ensure the safe operation of the product:

- Check the status of the product before use.
- Remedy defects and malfunctions immediately.
- Maintain and clean the product regularly.

2.3 Requirements for operating personnel

Only qualified personnel may operate the product. Qualified personnel are persons who meet the following requirements:

- Basic regulations on occupational safety and accident prevention are known and complied with.
- Knowledge of handling hazardous chemicals is present. Personnel have the ability to recognize and avoid potential dangers.
- Knowledge regarding the application of fire prevention measures is present.
- Safety-relevant information is communicated and understood. The personnel can operate the product safely.
- The user documentation has been read and understood. Personnel operate the product according to the instructions in the user documentation.
  CAUTION – Operations, settings or procedures other than those specified in the user documentation may result in hazardous radiation exposure.

2.4 Safety instructions

2.4.1 Danger from hazardous conditions

The instrument is equipped with a C1D2 enclosure that must be mounted at all times when working in a hazardous location. USB access is intended solely for use in non-hazardous environments. Any attempt to access or use the USB port in a hazardous location may compromise intrinsic safety and violate regulatory compliance.

Explosion hazard

Risk of death or serious injury by fires and explosions

- The **MIRA P C1D2** is only allowed to be used in a **Class I**, **Division 2** hazardous location if it is equipped with a C1D2 sampling attachment and a properly mounted C1D2 enclosure.
- Do not operate if the C1D2 enclosure, the attachment or the instrument is cracked or damaged.
- Do not attempt to open the C1D2 enclosure or to connect to the USB port or to change batteries while in a hazardous location.
- Use only **AA Energizer® L91 Ultimate Lithium™** batteries.

- **Cleaning**
  Deposits on the surfaces can lead to electrostatic charging. Flames or sparks may occur during discharge.
  – Remove deposits from the surfaces of the C1D2 enclosure, the attachment and the instrument.
  – To avoid a build-up of electrostatic charge, the non-metallic parts may only be cleaned with a damp cloth.
- Observe the national explosion protection regulations.

Risque d'explosion

Mort ou blessures graves par incendie ou explosion

- Le **MIRA P C1D2** ne peut être utilisé dans une zone dangereuse de **Classe I**, **Division 2**, que s'il est équipé d'un accessoire de mesure C1D2 et d'un boîtier C1D2 correctement monté.
- Ne pas utiliser si le boîtier C1D2, l'accessoire ou l'instrument est fendu ou endommagé.
- Ne pas tenter d'ouvrir le boîtier C1D2, de le connecter au port USB ou de changer les piles dans une zone dangereuse.
- Utilisez uniquement des piles **AA Energizer® L91 Ultimate Lithium™**.
- **Nettoyage**
  Les dépôts sur les surfaces peuvent entraîner une charge électrostatique. Des flammes ou des étincelles peuvent survenir lors de la décharge.
  – Enlevez les dépôts des surfaces de l'enceinte C1D2, de l'attache et de l'instrument.
  – Pour éviter l'accumulation de charge électrostatique, les pièces non métalliques ne peuvent être nettoyées qu'avec un chiffon humide.
- Respectez la réglementation nationale sur la protection contre les explosions.

2.4.1.1 Hazardous location warning sticker

A warning sticker on the back of the C1D2 enclosure provides information on operation in hazardous locations.

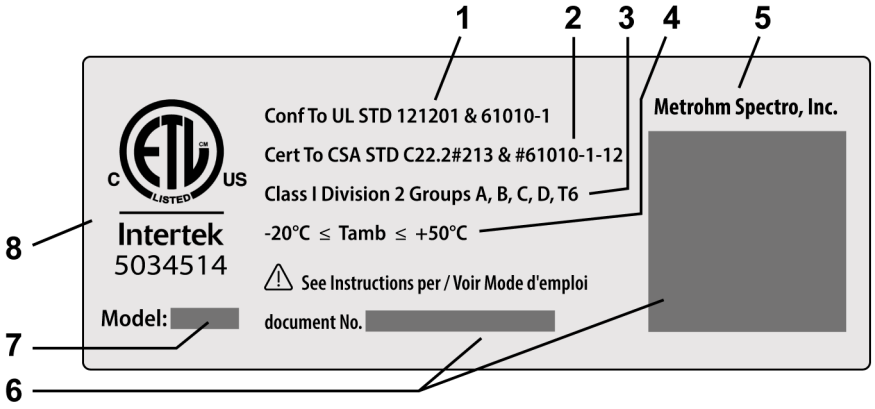


Figure 2 Warning sticker on the back of the C1D2 enclosure

1	**Conforms to UL STD 121201 & 61010-1**	**2**	**Certified to CSA STD C22.2#213 & #61010-1-12**
3	**Class I Division 2 Groups A, B, C, D, T6**	**4**	**Allowable ambient temperature**
5	**Manufacturer**	**6**	**See instructions per: Document number, revision number and QR code for downloading the document**
7	**Instrument model**	**8**	**ETL / Intertek Certification**

2.4.2 Laser safety

Nominal ocular hazard distance (NOHD)

The following information refers to the nominal ocular hazard distance (NOHD) for the instrument MIRA P C1D2 in accordance with EN 60825-1 (Safety of laser products), *(see page 46)*.

Risk of injury by laser radiation

Laser radiation can cause serious eye damages.

- Instruments must be used by trained personnel only. Follow the safety measures and instructions.
- Avoid exposure to laser radiation and specular reflections. Do not point the instrument at people.
- When working with open laser beams (3B laser classification of the complete device), **appropriate protective glasses** must be used, see Operating specifications chapter in the MIRA manuals.
- Observe the nominal ocular hazard distance (NOHD) for the Smart Tip used *page 46*. This distance defines the danger zone.
- Observe national laws.
  If there is no specific safety standard or safety regulation for the working area, observe the standard ANSI Z136.1 or supplement IEC 60825.14 for guidance on the safe use of lasers.

You can purchase protective laser glasses (6.7560.010) from Metrohm Raman *(see "Displaying accessories", chapter 1.5, page 5)*.

Laser classification of the MIRA P C1D2

The laser classification of the complete device depends on the Smart Tip used.

Attached Smart Tip	Complete device classification	
	Laser Class 1	Laser Class 3B
Immersion Probe C1D2		X
LWD 5 cm C1D2 Attachment		X
LWD 15 cm C1D2 Attachment		X
XLWD 5 cm C1D2 Attachment		X
XLWD 15 cm C1D2 Attachment		X
Manual Standoff C1D2		X
Calibrate/Verify Attachment (CVA)	X	

Interlock mechanism

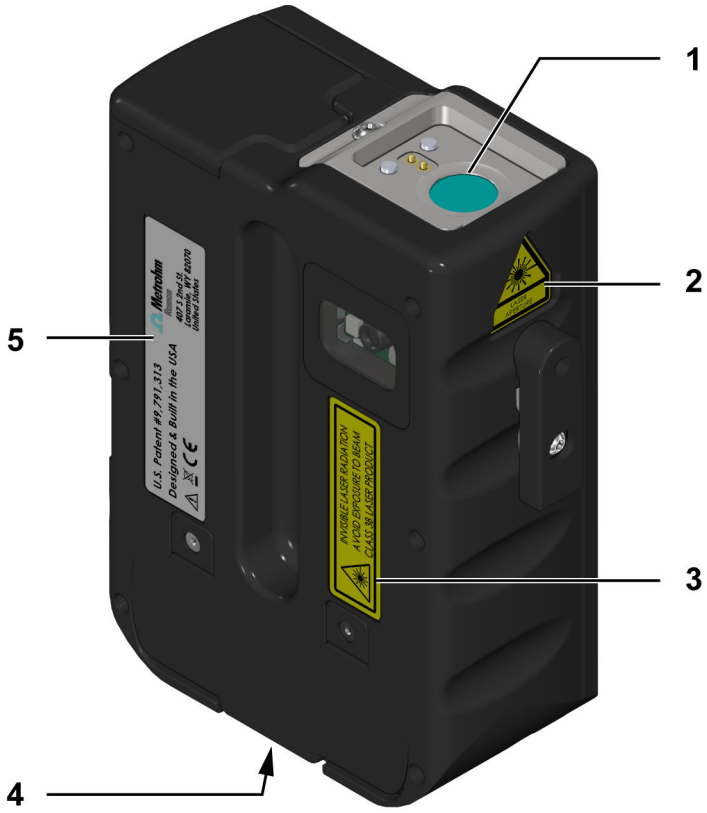
The Calibrate/Verify Attachment (CVA) has an interlock mechanism. This mechanism prevents laser radiation from emerging. The laser stops immediately if the attached Smart Tip is disconnected from the instrument.

Risk of injury when measuring thermally sensitive materials

Measuring a thermally sensitive sample that is in a tightly sealed vessel can lead to a pressure increase and subsequent explosion of the vessel.

2.4.2.1 Laser warning stickers on the instrument

The instrument is equipped with stickers that warn of potential hazards from laser radiation. These warning stickers are listed and explained below.



1	**Laser aperture**
2	**Laser aperture sticker**
3	**Laser class**
4	**Laser specification / serial number (bottom of instrument)**
5	**Type label**

Emergence of laser

Laser aperture

Laser specifications

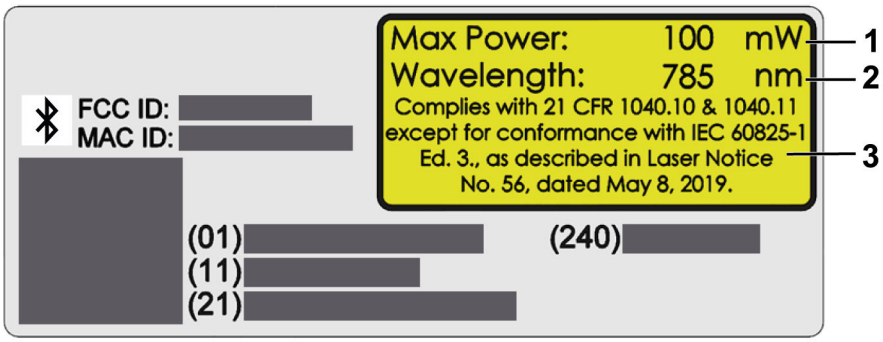


Figure 3 Sticker at the bottom of the instrument

1 **Max Power: 100 mW**	**2** **Wavelength: 785 nm**
3 **Compliance** Complies with 21 CFR 1040.10 & 1040.11 except for compliance with IEC 60825-1 Ed.3, as described in the Laser Notice No. 56, dated May 8, 2019.	

Laser class

The following laser classification is used for all MIRA instruments.

Invisible laser radiation

Avoid exposure to beam

Class 3B laser product

2.4.3 Danger from electrical potential

A considerable risk of injury exists in connection with touching live parts.

- Never open the housing of the instrument when the power cord is connected. You can not service or replace any parts inside the housing.
- Only personnel who have been issued Metrohm qualification may perform service and repair work on electric and electronic parts.
- The electrical safety of the instrument is ensured as part of the international standard IEC 61010.

2.5 Design of warning messages

The present documentation uses warning messages as follows.

Structure

1. Severity of the danger (signal word)
2. Type and source of danger
3. Consequences of disregarding the danger
4. Measures for averting the danger

Hazard levels

Signal color and signal word designate the hazard level.

DANGER

Indicates an immediate danger. It will result in serious injuries or death if not avoided.

WARNING

Indicates a potential danger. Failure to avoid the danger may result in death or serious injury.

CAUTION

Indicates a potential danger. If not avoided, it may result in light or minor injuries.

NOTICE

Indicates a potentially damaging situation. If not avoided, the product or something in the surrounding area could be damaged.

2.6 Meaning of warning signs

Warning signs on the product or in the documentation indicate potential dangers or draw attention to certain behaviors in order to avoid accidents or damage.

Depending on the application purpose, the operating company attaches additional warning signs to the product. The corresponding instructions of the operator must be followed.

Table 3 Warning signs according to ISO 7010 (examples)

Warning signs / meaning		Warning signs / meaning	
	General warning sign		Warning of hot surface
	Warning of sharp object (cut/ puncture)		Warning of hand injuries (crushing)
	Warning of electrical voltage		Warning of corrosive substances
	Warning of optical radiation		Warning of a laser beam
	Warning of flammable materials		Warning of biological hazard
	Warning of toxic materials		

3 Functional description

3.1 Overview of the instrument

Figure 4 MIRA P C1D2 – Front

1	**Magnetic Smart Tip fixture / laser aperture**	**2**	**Touch screen**
3	**C1D2 mounting adapter**		

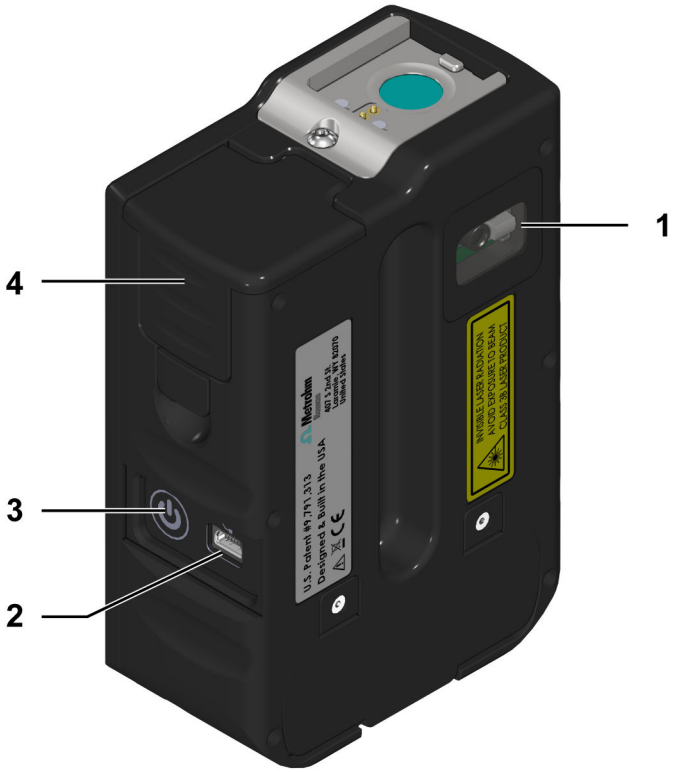


Figure 5 MIRA P C1D2 – Rear

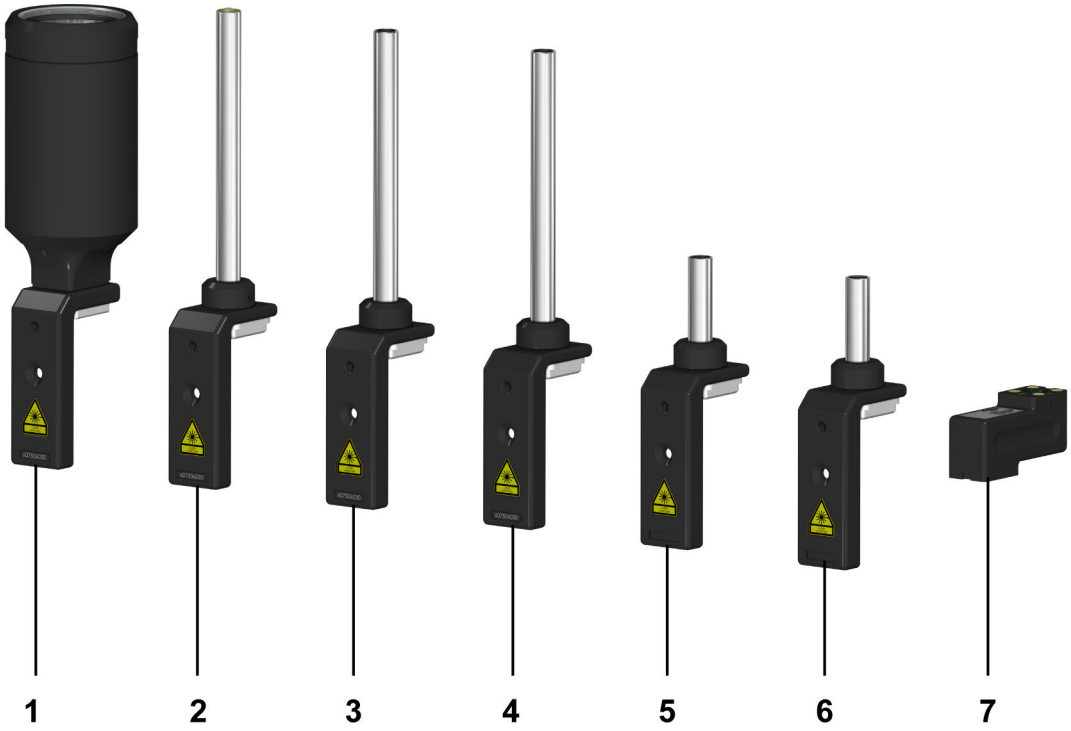
1	**Barcode reader**	**2**	**Type B mini USB connector**
3	**On/off switch**	**4**	**Battery compartment**

3.1.1 Smart Tips – Overview

Smart Tips are attached to the instrument with magnetic connectors. The Smart Tips contain a memory chip so that the instrument can identify them. By design, Smart Tips will not allow operation of the instrument when seated in an incorrect position.

The C1D2 Smart Tips are secured in place with a screw.

The following Smart Tips are available:



1	**Manual Stand-off C1D2 (6.07506.540)**	**2**	**Immersion Probe C1D2 (6.07506.500)**
3	**XLWD 15 cm C1D2 Attachment (6.07506.550)**	**4**	**LWD 15 cm C1D2 Attachment (6.07506.530)**
5	**XLWD 5 cm C1D2 Attachment (6.07506.510)**	**6**	**LWD 5 cm C1D2 Attachment (6.07506.520)**
7	**Calibrate/Verify Attachment (CVA) (6.06071.040)**		

Tip	Description
1	The **Manual Stand-off C1D2** enables data collection from a manually adjustable distance of **0.5 m** to **1.5 m**. The Manual Stand-off C1D2 can be used to determine the contents in a 55-gallon drum/ barrel or to scan a container from a distance. The Manual Stand-off C1D2 is not meant to be used outdoors. It is designed for use in low-light situations. Laser class 3B operation.

Tip	Description
2	The **Immersion Probe C1D2** allows data collection on a sample without focus adjustment. Simply contact the substance with the probe to acquire the data. The 6" (15.3 cm) length of the stainless steel construction allows for easy cleaning. The focal point on the probe is 400 microns from the tip of the lens. This means the probe will not perform well on substances through a bag. The probe is designed for direct contact with liquids and solids. Sleeves are available to prevent contamination of the probe. Laser class 3B operation.
3 *5*	The Extra Long Working Distance lenses **XLWD 15 cm C1D2 Attachment** (length 6" / 15.3 cm) and **XLWD 5 cm C1D2 Attachment** (length 2" / 5.1 cm) are used for extra long distance point and shoot measurements for samples in very thick containers such as glass bottles. The focal point is approximately **18 mm** from the top of the lens. Laser class 3B operation.
4 *6*	The Long Working Distance lenses **LWD 15 cm C1D2 Attachment** (length 6" / 15.3 cm) and **LWD 5 cm C1D2 Attachment** (length 2" / 5.1 cm) are used for point and shoot measurements at long distances, typically for samples in thick-walled bottles. The focal point is approximately **8 mm** from the top of the lens. Laser class 3B operation.
7	The **Calibrate/Verify Attachment (CVA)** is needed for the calibration of the instrument. The CVA contains a toluene-acetonitrile calibration standard and a polystyrene verification sample.

4 Delivery and storage

4.1 Delivery

Inspect the delivery immediately upon receipt:

- Check the delivery against the delivery note to ensure completeness.
- Check the product for damage.
- If the delivery is incomplete or damaged, contact your regional Metrohm representative.

4.2 Packaging

The product and accessories are supplied in protective special packaging. Keep this packaging to ensure safe transportation of the product. If a transport locking device is present, keep this as well for future reuse.

4.3 Storage

Always remove batteries if the instrument is not in use.

5 Installation

5.1 Start-up

WARNING

Explosion hazard

Death or serious injury by fires and explosions

- The **MIRA P C1D2** is only allowed to be used in a **Class I**, **Division 2** hazardous location if it is equipped with a C1D2 sampling attachment and a properly mounted C1D2 enclosure.
- Do not operate if the C1D2 enclosure, the attachment or the instrument is cracked or damaged.
- Do not attempt to open the C1D2 enclosure, or to connect to the USB port, or to change batteries while in a hazardous location.
- Use only **AA Energizer® L91 Ultimate Lithium™** batteries.
- **Cleaning**

  Deposits on the surfaces can lead to electrostatic charging. Flames or sparks may occur during discharge.
  - Remove deposits from the surfaces of the C1D2 enclosure, the attachment and the instrument.
  - To avoid a build-up of electrostatic charge, the non-metallic parts may only be cleaned with a damp cloth.
- Observe the national explosion protection regulations.

AVERTISSEMENT

Risque d'explosion

Mort ou blessures graves par incendie ou explosion

- Le **MIRA P C1D2** ne peut être utilisé dans une zone dangereuse de **Classe I**, **Division 2**, que s'il est équipé d'un accessoire de mesure C1D2 et d'un boîtier C1D2 correctement monté.
- Ne pas utiliser si le boîtier C1D2, l'accessoire ou l'instrument est fendu ou endommagé.
- Ne pas tenter d'ouvrir le boîtier C1D2, de le connecter au port USB ou de changer les piles dans une zone dangereuse.
- Utilisez uniquement des piles **AA Energizer® L91 Ultimate Lithium™**.
- **Nettoyage**

  Les dépôts sur les surfaces peuvent entraîner une charge électrostatique. Des flammes ou des étincelles peuvent survenir lors de la décharge.
  - Enlevez les dépôts des surfaces de l'enceinte C1D2, de l'attache et de l'instrument.
  - Pour éviter l'accumulation de charge électrostatique, les pièces non métalliques ne peuvent être nettoyées qu'avec un chiffon humide.
- Respectez la réglementation nationale sur la protection contre les explosions.

WARNING

Eye damage from laser radiation

Laser radiation can cause serious eye damages.

- Instruments must be used by trained personnel only. Follow the safety measures and instructions.
- Avoid exposure to laser radiation and specular reflections. Do not point the instrument at people.
- When working with open laser beams (3B laser classification of the complete device), **appropriate protective glasses** must be used, see Operating specifications chapter in the MIRA manuals.
- Observe the nominal ocular hazard distance (NOHD) for the Smart Tip used. This distance defines the danger zone.
- Observe national laws.

  If there is no specific safety standard or safety regulation for the working area, observe the standard ANSI Z136.1 or supplement IEC 60825.14 for guidance on the safe use of lasers.

Initial start-up

Prerequisite:

- The instrument is not in a hazardous location.
- The **MIRA Cal P** software is installed *(see "MIRA Cal P Software", chapter 1.3.1, page 3)*.
  Refer to the MIRA Cal P software tutorial for detailed information *(see "Tutorial MIRA Cal P", chapter 1.3.2, page 3)*.

Required accessories:

- 3 mm Allen key (6.2621.100)

1 Insert batteries *(see "Changing batteries", page 23)*.

2 Switch on the instrument using the on/off switch.

3 Carry out the following steps using the **MIRA Cal P** software:

- Configure the instrument settings.
- Install spectral libraries.
- Calibrate the instrument using the Calibrate/Verify Attachment (CVA):
  - Attaching the Calibration Standard *(see "Attaching the Calibrate/Verify Attachment (CVA)", page 25)*.
  - Calibrating the instrument *(see "Calibrate an instrument", chapter 6.3.1, page 40)*.

4 Attach a C1D2 sampling attachment *(see "Attaching Smart Tips", chapter 5.3, page 25)*.

5 Mount the C1D2 enclosure *(see "C1D2 enclosure assembly and disassembly", chapter 5.4, page 30)*.

5.2 Energy supply with batteries

Battery indicator	Charge status
	Full
	Almost full
	Half full
	Yellow battery warning Metrohm recommends replacing the batteries when the battery indicator changes color from yellow to red.

Battery indicator	Charge status
	Red battery warning The instrument will give a low battery warning and then shut down.

Automatic shutdown

You can configure an automatic shutdown to save battery life *(see "Automatic Shutdown", page 39)*.

Changing batteries

WARNING

Explosion hazard

Death or serious injury by fires and explosions

- Batteries must only be changed in an area free of ignitable concentrations.
- Use only **AA Energizer® L91 Ultimate Lithium™** batteries.

AVERTISSEMENT

Risque d'explosion

Mort ou blessures graves par incendie ou explosion

- Les piles ne doivent être changées que dans une zone exempte de concentrations inflammables.
- Utilisez uniquement des piles **AA Energizer® L91 Ultimate Lithium™**.

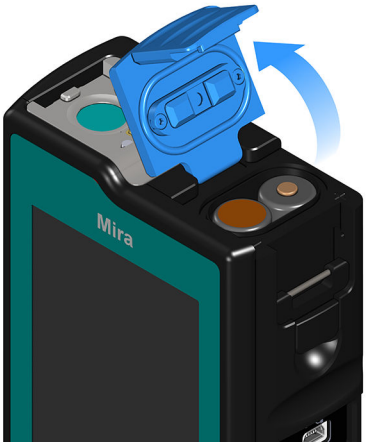
1 Preparations:

- Remove the instrument from the hazarous location.
- Dismount the C1D2 enclosure from the instrument *(see "C1D2 enclosure assembly and disassembly", chapter 5.4, page 30)*.
- Unscrew and detach the present Smart Tip.

2

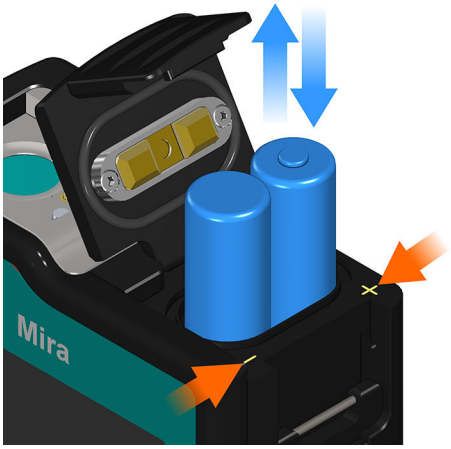
- Pull the lever.

3



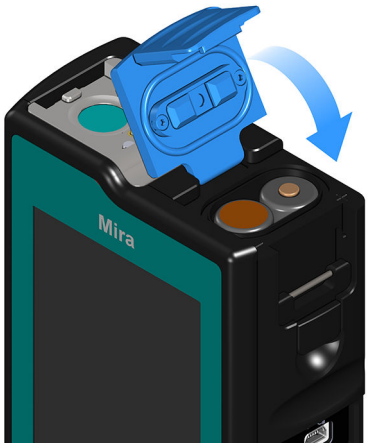
- Open the top lid.

4



- Replace the batteries. Refer to the plus and minus signs on the housing.

5



- Close the lid.

6

- Push the lid downwards until the lock release mechanism engages.

5.3 Attaching Smart Tips

Attaching the Calibrate/Verify Attachment (CVA)

The CVA has 2 positions. Attaching the Smart Tip works the same way for both positions.

1 Preparations:

- Remove the instrument from the hazarous location.
- Dismount the C1D2 enclosure from the instrument *(see "C1D2 enclosure assembly and disassembly", chapter 5.4, page 30)*.
- Unscrew and detach the present Smart Tip.

2

- Attach the Smart Tip by engaging the bottom left corner of the tip into the left edge of the mounting point. Rotate the tip into position.

Side **1** of the CVA contains a toluene-acetonitrile standard for **calibration**.

Side **2** of the CVA contains a polystyrene sample for **verification**.

Attaching C1D2 attachments

Only C1D2 attachments may be used *(see "C1D2 sampling attachments", chapter 1.2.1, page 2)*.

Required accessories:

- 3 mm hex key (6.2621.100)

WARNING

Explosion hazard

Death or serious injury by fires and explosions

- The **MIRA P C1D2** is only allowed to be used in a **Class I**, **Division 2** hazardous location if it is equipped with a C1D2 sampling attachment and a properly mounted C1D2 enclosure.
- Do not operate if the C1D2 enclosure, the attachment or the instrument is cracked or damaged.
- Do not attempt to open the C1D2 enclosure, or to connect to the USB port, or to change batteries while in a hazardous location.
- Use only **AA Energizer® L91 Ultimate Lithium™** batteries.
- **Cleaning**

  Deposits on the surfaces can lead to electrostatic charging. Flames or sparks may occur during discharge.
  - Remove deposits from the surfaces of the C1D2 enclosure, the attachment and the instrument.
  - To avoid a build-up of electrostatic charge, the non-metallic parts may only be cleaned with a damp cloth.
- Observe the national explosion protection regulations.

AVERTISSEMENT

Risque d'explosion

Mort ou blessures graves par incendie ou explosion

- Le **MIRA P C1D2** ne peut être utilisé dans une zone dangereuse de **Classe I**, **Division 2**, que s'il est équipé d'un accessoire de mesure C1D2 et d'un boîtier C1D2 correctement monté.
- Ne pas utiliser si le boîtier C1D2, l'accessoire ou l'instrument est fendu ou endommagé.
- Ne pas tenter d'ouvrir le boîtier C1D2, de le connecter au port USB ou de changer les piles dans une zone dangereuse.
- Utilisez uniquement des piles **AA Energizer® L91 Ultimate Lithium™**.
- **Nettoyage**

  Les dépôts sur les surfaces peuvent entraîner une charge électrostatique. Des flammes ou des étincelles peuvent survenir lors de la décharge.
  - Enlevez les dépôts des surfaces de l'enceinte C1D2, de l'attache et de l'instrument.
  - Pour éviter l'accumulation de charge électrostatique, les pièces non métalliques ne peuvent être nettoyées qu'avec un chiffon humide.
- Respectez la réglementation nationale sur la protection contre les explosions.

WARNING

Eye damage from laser radiation

Laser radiation can cause serious eye damages.

- Instruments must be used by trained personnel only. Follow the safety measures and instructions.
- Avoid exposure to laser radiation and specular reflections. Do not point the instrument at people.
- When working with open laser beams (3B laser classification of the complete device), **appropriate protective glasses** must be used, see Operating specifications chapter in the MIRA manuals.
- Observe the nominal ocular hazard distance (NOHD) for the Smart Tip used. This distance defines the danger zone.
- Observe national laws.

  If there is no specific safety standard or safety regulation for the working area, observe the standard ANSI Z136.1 or supplement IEC 60825.14 for guidance on the safe use of lasers.

1 Preparations:

- Remove the instrument from the hazarous location.

- Dismount the C1D2 enclosure from the instrument *(see "C1D2 enclosure assembly and disassembly", chapter 5.4, page 30)*.
- Unscrew and detach the present Smart Tip.

2 Slide the Smart Tip down and connect it to the mounting point.

3 Secure the Smart Tip to the C1D2 mounting adapter with a screw. Use the hex key.

4 Mount the C1D2 enclosure to the instrument *(see "C1D2 enclosure assembly and disassembly", chapter 5.4, page 30)*.

5.4 C1D2 enclosure assembly and disassembly

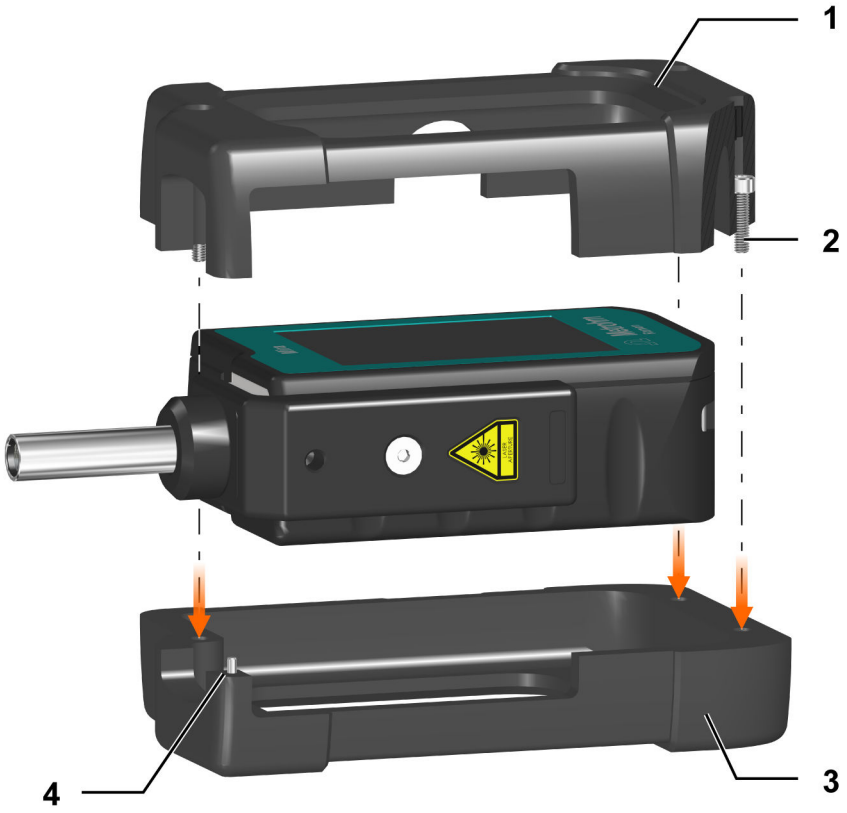


Figure 6 Instrument and C1D2 enclosure

1	**Front cover**	**2**	**Captive screw (within the front cover)**
3	**Rear cover**	**4**	**Pin**

Mounting the C1D2 enclosure

Prerequisite:

- The instrument is not in a hazardous location.

Required accessories:

- 3 mm hex key (6.2621.100)

1 Place the rear cover (**3**) on a table.

2 Place the instrument into the rear cover.

3 Place the front cover (**1**) over the instrument, joining it to the pin (**4**) and the rear cover.

4 Tighten the 3 captive screws (**2**) with the hex key to secure the front cover to the rear cover (see orange arrows).

Dismounting the C1D2 enclosure

Prerequisite:

- The instrument is not in a hazardous location.

Required accessories:

- 3 mm hex key (6.2621.100)

1 Place the instrument on a table.

2 Unscrew the 3 captive screws (**2**) with the hex key.

3 Detach the front cover (**1**) from the rear cover (**3**).

4 Remove the instrument from the rear cover.

5.5 USB connection

WARNING

Explosion hazard

Death or serious injury by fires and explosions

- The USB port must only be used in an area free of ignitable concentrations.

We do not recommend to use third party USB cables, only use the provided Metrohm USB Mini-B cable (order number 6.215.1110).

Energy supply

For stationary use in the laboratory, you can operate the instrument with the USB interface which is connected to a powered USB hub. The USB hub also allows data transfer.

Battery charging function

The instrument has no charging function for rechargeable batteries. You must replace drained batteries.

Synchronization

Connect the instrument to the Windows PC that uses the USB Mini-B cable.

If the instrument is off, connecting the USB cable to a Windows PC initiates an instrument start-up.

Refer to **Tutorial MIRA Cal P** for detailed information *(see "Tutorial MIRA Cal P", chapter 1.3.2, page 3)*.

6 Operation and control

6.1 Safe shutdown

To prevent unexpected behavior in the instrument, always perform a safe shutdown.

A **safe shutdown** is performed in the following cases:

- The on/off switch is pressed.
- The battery is low.
- A battery-powered instrument is not in use for the duration specified in the shutdown delay.

An **unsafe shutdown** is performed in the following cases:

- The on/off switch is pressed and held for 3 seconds or longer.
- The battery door is opened while running on batteries only.
- The USB is unplugged while running on USB only.

6.2 Data acquisition

The following steps show how to measure samples with the instrument.

Operating procedures and users have to be defined and synchronized beforehand in MIRA Cal P. Refer to MIRA Cal P software tutorial for more information *(see "Tutorial MIRA Cal P", chapter 1.3.2, page 3)*

WARNING

Explosion hazard

Death or serious injury by fires and explosions

- The **MIRA P C1D2** is only allowed to be used in a **Class I**, **Division 2** hazardous location if it is equipped with a C1D2 sampling attachment and a properly mounted C1D2 enclosure.
- Do not operate if the C1D2 enclosure, the attachment or the instrument is cracked or damaged.
- Do not attempt to open the C1D2 enclosure, or to connect to the USB port, or to change batteries while in a hazardous location.
- Use only **AA Energizer® L91 Ultimate Lithium™** batteries.
- **Cleaning**

  Deposits on the surfaces can lead to electrostatic charging. Flames or sparks may occur during discharge.
  - Remove deposits from the surfaces of the C1D2 enclosure, the attachment and the instrument.
  - To avoid a build-up of electrostatic charge, the non-metallic parts may only be cleaned with a damp cloth.
- Observe the national explosion protection regulations.

AVERTISSEMENT

Risque d'explosion

Mort ou blessures graves par incendie ou explosion

- Le **MIRA P C1D2** ne peut être utilisé dans une zone dangereuse de **Classe I**, **Division 2**, que s'il est équipé d'un accessoire de mesure C1D2 et d'un boîtier C1D2 correctement monté.
- Ne pas utiliser si le boîtier C1D2, l'accessoire ou l'instrument est fendu ou endommagé.
- Ne pas tenter d'ouvrir le boîtier C1D2, de le connecter au port USB ou de changer les piles dans une zone dangereuse.
- Utilisez uniquement des piles **AA Energizer® L91 Ultimate Lithium™**.
- **Nettoyage**

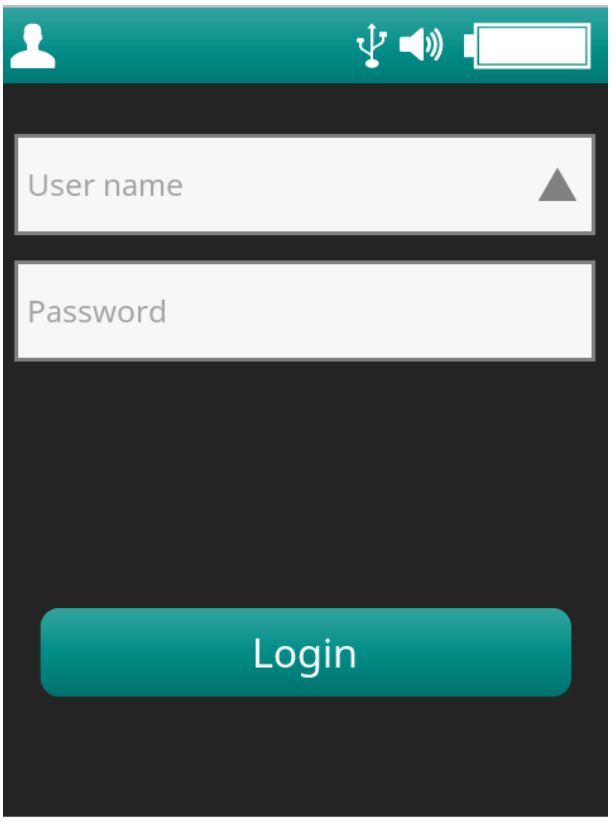
  Les dépôts sur les surfaces peuvent entraîner une charge électrostatique. Des flammes ou des étincelles peuvent survenir lors de la décharge.
  - Enlevez les dépôts des surfaces de l'enceinte C1D2, de l'attache et de l'instrument.
  - Pour éviter l'accumulation de charge électrostatique, les pièces non métalliques ne peuvent être nettoyées qu'avec un chiffon humide.
- Respectez la réglementation nationale sur la protection contre les explosions.

Make sure the instrument has battery power.

1 **Switching on the instrument**

Switch on the instrument using the on/off switch.

2 Login



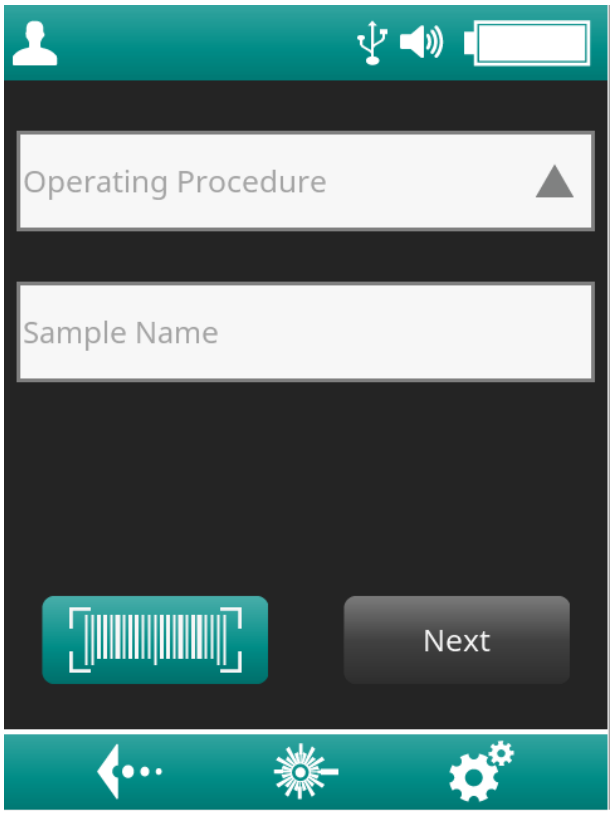
Select your user name from the dropdown list, enter your password and click on **[Login]**.

3 Attach Smart Tip

If not already done, attach the correct Smart Tip to the instrument *(see "Attaching C1D2 attachments", page 26)*.

Within an operating procedure a certain Smart Tip type may be required. A data acquisition will only be possible when the instrument recognizes the correct Smart Tip.

4 Selecting an operating procedure



Select an operating procedure from the dropdown list.

5 Read a barcode

Click on  to use the barcode reader instead of typing in by hand.

Barcode functionality and behavior is defined in the operating procedure.

Click on **[Next]**.

6 Enter Batch ID, Lot ID, Container

Enter the Batch ID, Lot ID and Container by hand or use the barcode reader.

Click on **[Next]**.

7 Arming the laser

WARNING

Eye damage from laser radiation

Laser radiation can cause serious eye damages.

- Instruments must be used by trained personnel only. Follow the safety measures and instructions.
- Avoid exposure to laser radiation and specular reflections. Do not point the instrument at people.
- When working with open laser beams (3B laser classification of the complete device), **appropriate protective glasses** must be used, see Operating specifications chapter in the MIRA manuals.
- Observe the nominal ocular hazard distance (NOHD) for the Smart Tip used. This distance defines the danger zone.
- Observe national laws.

  If there is no specific safety standard or safety regulation for the working area, observe the standard ANSI Z136.1 or supplement IEC 60825.14 for guidance on the safe use of lasers.

Click on **[Arm laser]**.

Laser armed display is displayed.

8 Measuring the sample

- Click on **[Acquire]** to start the measurement.

When the data is acquired, a spectrum is displayed with information according to the definitions in the operating procedure.

9 Measuring the next sample

Click on **[Next]** to start the next measurement.

6.3 Configuration

Open Settings

1 Click on  to go to the settings section.

Speaker

Enable or disable the internal speaker. This will activate an acoustic signal when the barcode reader is used.

Calibrate Instrument

Calibrate the instrument *(see "Calibration", page 40)*.

System Suitability Test

Conduct a system suitability test *(see "System suitability test (SST)", page 40)*.

Automatic Shutdown

By default, no automatic shutdown is configured.

To conserve battery charge, an automatic shutdown can be specified. A battery-powered instrument will automatically shut down after the specified time.

Example: With the automatic shutdown time **3**, a battery-powered instrument will automatically shut down after 3 minutes of being not in use.

The automatic shutdown will affect only battery-powered instruments. For an instrument connected to a power supply or to a PC, the automatic shutdown is disabled.

Battery Chemistry

WARNING

Explosion hazard

Death or serious injury by fires and explosions

- Batteries must only be changed in an area free of ignitable concentrations.
- Use only **AA Energizer® L91 Ultimate Lithium™** batteries.

⚠ AVERTISSEMENT

Risque d'explosion

Mort ou blessures graves par incendie ou explosion

- Les piles ne doivent être changées que dans une zone exempte de concentrations inflammables.
- Utilisez uniquement des piles **AA Energizer® L91 Ultimate Lithium™**.

For an accurate battery life indicator, it is important to choose the battery chemistry that is being used in the instrument.

Set the battery chemistry:

1 In the Settings section, click on **[Battery Chemistry]**.

2 Select the battery type:

- Lithium

The change will be reflected by the text in the battery indicator. This setting is persistent.

We recommend to change the batteries when the battery indicator changes color from white to yellow, orange or red.

6.3.1 Calibrate an instrument

Calibration

1 Attach the CVA.

2 Click on the instrument settings icon .

3 Click on **[Calibrate Instrument]**.

4 Click on **[Calibrate]**.

Instrument calibration can also be done in Mira Cal P with a connected instrument.

System suitability test (SST)

1 Attach the CVA.

2 Click on the instrument settings icon  .

3 Click on **System Suitability Test**.

4 Click on **Run SST**.

7 Maintenance

Deposits on the surfaces can lead to electrostatic charging. Flames or sparks may occur during discharge.

- Remove deposits from the surfaces of the C1D2 enclosure, the attachment and the instrument.
- To avoid a build-up of electrostatic charge, the non-metallic parts may only be cleaned with a damp cloth.
- Observe the national explosion protection regulations.

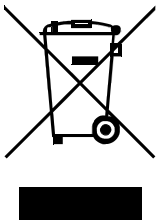
7.1 Maintenance agreement

Maintenance of the product is best carried out as part of an annual service performed by specialist personnel from Metrohm. Shorter maintenance intervals may be necessary if you frequently work with caustic and corrosive chemicals. Metrohm Service personnel are properly trained in procedures for safely repairing the instrument.

Routine cleaning of the instrument can be done using non-corrosive cleansers such as water, ethanol, or acetone.

Metrohm Service offers every form of technical advice for maintenance and service of all Metrohm products.

8 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.

9 Technical specifications

9.1 Ambient conditions

Nominal function range	–20 to +50 °C	at max. 93% relative humidity, non-condensing
Storage and Transport	–20 to +70 °C	at max. 93% relative humidity, non-condensing
NEMA Ratings	NEMA 3 Indoor/outdoor use	
Altitude / Pressure range	0…2,000 m.a.s.l. and 2,000…3,000 m.a.s.l. / min. 700 mbar	
Pollution degree	3 (industrial)	

9.2 Interfaces

USB connector	Type A/B mini USB connector (USB 3.0) with the following functions:	
		Power supply
		Data transmission
		with USB cable (6.2151.110)

9.3 Energy supply

Battery specifications	2 x 1.5 V, size AA	Use only AA Energizer® L91 Ultimate Lithium™ batteries
USB Mini-A/B Power specifications		Instrument connected to a powered USB hub
Nominal input voltage	5 V DC	
Minimum input current	1 A	
Nominal input current	1.3 A	
Maximum input current	1.5 A	

9.4 Measurements, weight and material

Measurements

With C1D2 enclosure	103 × 62 × 161 mm	Width × Depth × Height
Without C1D2 enclosure	88.2 × 45.3 × 125.5 mm	Width × Depth × Height
Display	3.7'' TFT LCD resistive touch display, glove-compatible	

Weight

With C1D2 enclosure	1050 g
Without C1D2 enclosure	705 g

Material

Housing	Aluminum anodized
C1D2 enclosure	Polyurethane

9.5 Ruggedization

(tested without C1D2 enclosure)	MIL-STD-810H Method 514.8 CAT 4	Common Carrier, Packaged
	MIL-STD-810H Method 514.8 CAT 4	Composite 2 Wheeled Trailer, Packaged
	MIL-STD-810H Method 514.8 CAT 4	Composite Wheeled Vehicle, Packaged
	MIL-STD-810H Method 516.8 Procedure IV	Packaged, Logistic Transit Drop Test (Transit Drop, 26 drops from 48 inches to wood backed by concrete)
	MIL-STD-810H Method 516.8 Procedure VI	Bench Handling

9.6 Operating specifications

Laser wavelength	785 nm ± 0.5 nm
Laser output power	100 mW, 50 mW for the sample, 5 adjustable laser powers down to 10 mW
Wavenumber range	400–2,300 cm^{-1}
Spectral resolution	8–10 cm^{-1} (FWHM)
Collection optics	NA = 0.50, 1 mm and 7.6 mm working distance; 0.042–2.5 mm measuring spot size
Beam divergence	2 degrees

Detection technique	Orbital Raster Scan (ORS) to average over the sample
Laser class according to EN 60825-1	Class 3B
Protection Level of protective glasses (according to EN 207)	D LB5 775–795 nm
NOHD – Nominal Ocular Hazard Distance	
Manual Stand-off C1D2 at 0.5 m setting	3 m
Manual Stand-off C1D2 at 1.5 m setting	25 m
Immersion Probe C1D2	<10 cm
XLWD 15 cm C1D2 Attachment	<23 cm
XLWD 5 cm C1D2 Attachment	<23 cm
LWD 15 cm C1D2 Attachment	<10 cm
LWD 5 cm C1D2 Attachment	<10 cm