Mira M-1

Ω **Metrohm**

Metrohm

Mira M-1

Manual

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1 Introduction

This manual gives you a comprehensive overview of the installation, functioning and operation of the Mira M-1 instrument.

> **ℹ NOTE**
>
> You can request application descriptions in the form of **Application Notes** and **Application Bulletins** from your Metrohm representative or download them from *http://www.metrohm.com*.

1.1 Instrument description

The **M**etrohm **I**nstant **R**aman **A**nalyzers (Mira) are handheld, high-power Raman spectrometers designed for the rapid, nondestructive identification of chemical and pharmaceutical samples, both liquid and solid. Barely larger than a smartphone, the Mira spectrometers are the only handheld Raman spectrometers currently on the market with Orbital Raster Scan (ORS) technology.

1.1.1 Model versions

Mira M-1 instruments are available in the following versions:

Table 1   Model versions

2.923.0010	Mira M-1 Basic	Laser class 1
	With vial holder	
2.923.0020	Mira M-1 Advanced	Laser class 3B
	With SWD and LWD attachment lenses	

> **ℹ NOTE**
>
> The accessories for a given model version can be created as a PDF list on the Internet at *http://partslists.metrohm.com*.

1.1.2 Power supply

The instrument is powered by exchangeable or rechargeable batteries of the AA / LR6 type or via the USB socket with a power supply unit or a connector to a PC.

1.1.3 Interfaces

A data connection to a PC can be established via the USB interface.

1.2 Intended use

This instrument is suitable for measuring in chemicals and flammable samples. Usage of the Mira M-1 therefore requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge with respect to the application of the fire prevention measures prescribed for laboratories or production plants is also mandatory.

The **Mira M-1 Advanced** model version with attachment lenses is specified with the laser class 3B, which requires appropriate protective measures to ensure personnel safety.

1.3 About the documentation

NOTE

Please read through this documentation carefully before putting the instrument into operation.

The documentation contains information and warnings which the user must follow in order to ensure safe operation of the instrument.

1.3.1 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**
	Carry out these steps in the sequence shown.
Method	**Dialog text**, **parameter** in the software
File ▸ New	Menu or menu item

[Next]	**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 laser radiation.
⚠️	**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.
❗	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.
ℹ️	**NOTE** This symbol highlights additional information and tips.

1.4   Safety instructions

1.4.1   General notes on safety

⚠️ **WARNING**

This instrument may only be operated in accordance with the specifications in this documentation.

This instrument has left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.4.2 Laser safety

NOTE

NOHD

The information below contain details of the NOHD calculation for the Mira M-1 instrument in accordance with the international standard IEC 60825-1, "Safety of laser products".

WARNING

Laser radiation

The **Mira M-1 Advanced** instrument is a class 3B laser instrument which emits laser light with a power of up to 100 mW and a wavelength of 785 nm (NIR) during data acquisition.

The laser radiation can cause serious eye injuries if the safety measures are not followed.

Uses, settings or procedures that are not described in this manual can lead to hazardous laser radiation exposure.

- This instrument is intended for use by trained personnel only.
- The provided protective glasses must be worn when using an attachment lens.
  The provided protective glasses is designed specific for laser wavelength and laser power of Mira M-1. The provided protective glasses may possibly not protect you from other laser sources.
- The nominal ocular hazard distance (NOHD) is 66 cm ± 5 cm.
- Instruments of the laser class 3B may only be used in protected and labeled rooms.
- Follow the provisions of the IEC 60825-1 standard "Safety of laser products" and the regulations for the use of laser systems in your country.

1.4.3 Warning stickers on the instrument

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

Figure 1   Instrument with warning sticker

1	Laser aperture	2	Type plate
3	Laser specification / serial number	4	Laser class

Laser aperture

The sticker marks the direction and position of the emerging laser beam when using attachment lenses.

Figure 2   Sticker - laser emergence

Laser specification / serial number

The sticker contains the laser data, the serial number and the applicable standards.

Figure 3   Sticker - laser data / serial number / standards

Laser class

The two stickers specify the laser class for the respective model version.

Figure 4   Sticker - Basic model version with vial holder

Figure 5   Sticker - Advanced model version with attachment lenses

1.4.4   Electrical safety

The electrical safety when working with the instrument is ensured as part of the international standard IEC 61010.

> ⚠ **WARNING**
>
> Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.

> ⚠ **WARNING**
>
> Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.
>
> There are no parts inside the housing which can be serviced or replaced by the user.

Supply voltage

> ⚠ **WARNING**
>
> An incorrect supply voltage can damage the instrument.
>
> Only operate this instrument with a supply voltage specified for it (see rear panel of the instrument).

Power supply unit

⚠️ **WARNING**

Use the power supply unit only for its intended purpose. Inappropriate use or use of non-approved or incompatible power supply units may cause fires or explosions and result in the revocation of the license or warranty.

If you think that the power supply unit has been damaged, have it checked by a service center. Do not use damaged power supply units.

Do not charge your instrument during thunderstorms.

Do not use the power supply unit outdoors.

### 1.4.5 Flammable solvents and chemicals

⚠️ **WARNING**

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. fume cupboard).
- Keep all sources of flame far from the workplace.
- Clean up spilled liquids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.

1.4.6 Recycling and disposal
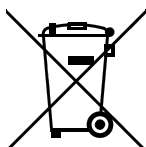
This product is covered by European Directive 2002/96/EC, WEEE – Waste from Electrical and Electronic Equipment.

The correct disposal of your old equipment will help to prevent negative effects on the environment and public health.

More details about the disposal of your old equipment can be obtained from your local authorities, from waste disposal companies or from your local dealer.

2　Overview of the instrument

2.1　Front

Figure 6　Mira M-1 - front

1	Vial holder	2	Touch screen
3	Battery compartment	4	Type B mini USB connector
5	On/off switch		

2.2 Rear

Figure 7   Mira M-1 - rear

1	**Accessories covering**	**2**	**SWD attachment lens (class 3B)**
3	**LWD attachment lens (class 3B)**		

3 Installation

3.1 Unpacking and inspecting the instrument

3.1.1 Packaging

The instrument is supplied in highly protective special packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

3.1.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

3.2 Power supply

3.2.1 Operation with exchangeable or rechargeable battery

The instrument is operated with exchangeable or rechargeable batteries of the AA / LR6 type.

i	**NOTE**

Battery type

We recommend using lithium-ion batteries.

i	**NOTE**

Power save mode

If used with batteries, the device will automatically shut-down after 10 minutes not in use.

Figure 8   Inserting the batteries

1	**Locking mechanism**	2	**Hinged cover**
	Rotary locking mechanism to open and close the battery compartment.		The polarity for the batteries is marked on the inside.

3.2.2   Operation via power supply unit or USB connection socket

For stationary use in the laboratory, the instrument can be operated via a power supply unit or the USB interface of a PC.

> **ℹ NOTE**
>
> **Battery charging function**
>
> The instrument has no charging function for rechargeable batteries.
>
> Used up batteries must be replaced.

3.3   Initial configuration

> **ℹ NOTE**
>
> **Configuration**
>
> Instrument settings and the installation of the spectral libraries are carried out with the **Mira Cal** software.
>
> You can find detailed information on the procedure in the tutorial for the **Mira Cal** software.

3.4 Inserting vial holder or attachment lenses

Samples may either be measured using the vial holder with the supplied vials or the attachment lenses. The use of attachment lenses allows measurement through packaging of different thicknesses (e.g. plastics or glass/amber glass).

3.4.1 Mira M-1 with vial holder (laser class 1)

The instrument is supplied with vials with the dimensions 12 x 32 mm.

Closing the covering prevents laser radiation from emerging.

The covering also contains a safety feature which stops the measurement and turns off the laser if it is opened.

Figure 9   Vial holder

1	**Vial holder**
	Attachable vial holder that can hold vials and the calibration standard.

Calibrating the instrument with the calibration standard
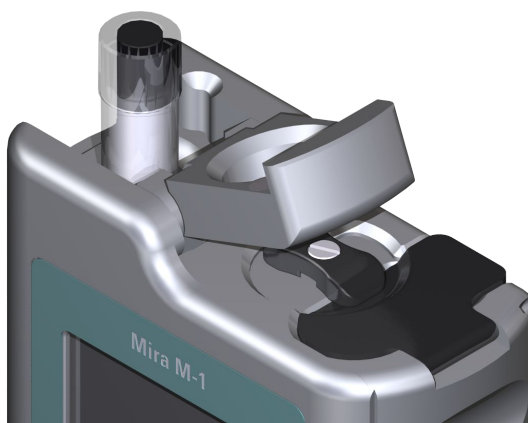
Figure 10   Vial holder with calibration standard

Measuring with vials
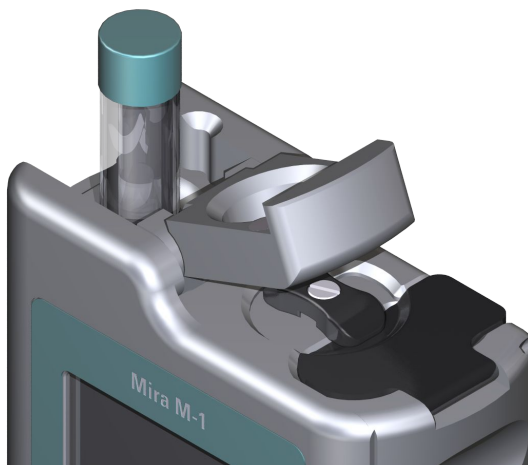
Figure 11   Vial holder with vial

3.4.2   Mira M-1 with SWD attachment lens (class 3B)

	WARNING
⚠	
	Laser radiation

The **Mira M-1 Advanced** instrument is a class 3B laser instrument which can emit laser light with a power of up to 100 mW and a wavelength of 785 nm (NIR) during data acquisition.

The laser radiation can cause serious eye injuries if the safety measures are not followed.

- The provided protective glasses must be worn when using an attachment lens.
- The safety regulations must be observed *(see Chapter 1.4.2, page 4)*.

The SWD attachment lens is used for samples with direct contact or in thin plastic bags.

The focal point is approximately **0.85 mm** from the end of the adapter.

Figure 12   SWD attachment lens

Figure 13   Example with direct measurement

3.4.3   Mira M-1 with LWD attachment lens (class 3B)

> ⚠️ **WARNING**
>
> **Laser radiation**
>
> The **Mira M-1 Advanced** instrument is a class 3B laser instrument which can emit laser light with a power of up to 100 mW and a wavelength of 785 nm (NIR) during data acquisition.
>
> The laser radiation can cause serious eye injuries if the safety measures are not followed.
>
> - The provided protective glasses must be worn when using an attachment lens.
> - The safety regulations must be observed *(see Chapter 1.4.2, page 4)*.

The LWD attachment lens is used for samples in thick-walled bottles.

The bottles can be clear or amber. The focal point is approximately **8 mm** from the top of the attachment lens.

Figure 14　LWD attachment lens

Figure 15　Example with measurement through a bottle
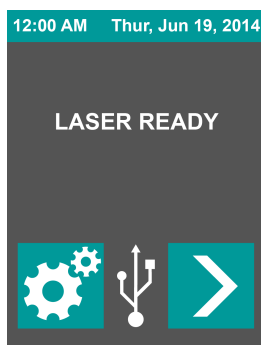
3.5   Installing firmware update

> **NOTE**
>
> **Firmware update**
>
> The installation of firmware updates is carried out via the **Mira Cal** software.
>
> You can find detailed information on the procedure in the tutorial for the **Mira Cal** software.

4 Operation

4.1 Autonomous operation

The following steps show how samples can be identified in autonomous operation without being connected to a PC.

1 **Switching on the instrument**

- Make sure the instrument is connected to the power supply.
- Switch on the instrument using the on/off switch.

2 **Entering the secret number**

- Enter the four-digit secret number (PIN).
  Default factory setting: **1234**

- Confirm the entry with the ✓ key.

3 **Preparing the sample measurement**

⚠️ **WARNING**

Laser radiation

The laser radiation can cause serious eye injuries if the safety measures are not followed.

- Wear the provided protective glasses when using an attachment lens.
- Observe the safety regulations *(see Chapter 1.4.2, page 4)*.

- Insert the sample vial or aim at the sample.

- Tap on the ▶ key in the main menu.
  The instrument is now ready for measuring.

12:00 AM Thur, Jun 19, 2014
LASER READY
⚙ ⌁ ▶

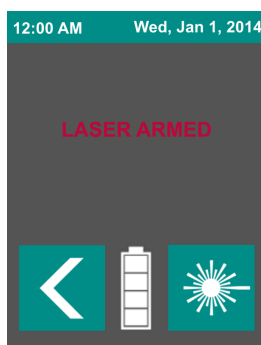### 4 Measuring the sample

> **NOTE**
>
> **Laser safety**
>
> The ☀ key of the **Mira M-1 Advanced** instrument must be pressed during measurement.

- Start the measurement with the ☀ key (and keep the key pressed down until the result is displayed).

12:00 AM Wed, Jan 1, 2014
LASER ARMED
◀ 🔋 ☀

- Wait for the end of the measurement and the result.
- Display during measurement:

5 **Displaying and saving the result**

- After the measurement, all activated spectral libraries are automatically searched and the result of the identification is displayed with:
  - Name of the identified substance
  - Sample spectrum
  - Library spectrum
  - Match rate

- Save the measurement with the 💾 key.
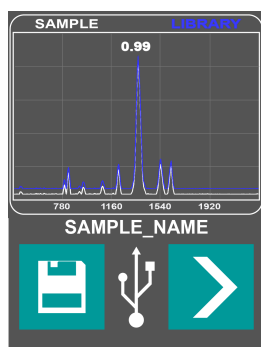
6 **Designating the sample**

ℹ️	**NOTE**

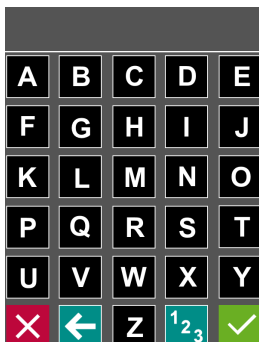**Key functions**

- 🅰️🅱️🅲️ : Switch editor over to alphabetic characters

- 1️⃣2️⃣3️⃣ : Switch editor over to numeric characters

- ⬅️ : Delete last character

- ❌ : Cancel the entry

- Enter a sample ID or a sample designation.

- Confirm the entry with the ✓ key.

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y
✕	←	Z	¹₂₃	✓

NOTE

Saved measured data

The saved measured data can be transferred into the **Mira Cal** software for further processing and evaluation.

You can find information on this procedure in the tutorial for the **Mira Cal** software.

4.2   Configuration

The following steps explain how the instrument is configured.

The following settings can be adjusted in the configuration menu of the running instrument:

- Change secret number (PIN)
  (see "Changing the secret number (PIN)", page 21)
- Activate/deactivate spectral libraries
  (see "Activating/deactivating spectral libraries", page 23)
- Calibrate the instrument
  (see "Calibrating the instrument", page 26)

Changing the secret number (PIN)

For the safety of your instrument, the secret number (PIN) can be changed.

> **i** **NOTE**
>
> **Storing the secret number**
>
> Store the secret number (PIN) in a safe place.

1 **Selecting the configuration menu**

▪ Select the configuration menu with the ⚙ key.

12:00 AM   Thur, Jun 19, 2014
LASER READY
⚙ ⑂ ❯
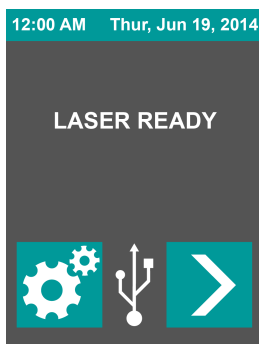
2 **Selecting the secret number menu**

▪ Select the secret number menu with the 🔒 key.

12:00 AM   Thur, Jun 19, 2014
⚖ 🔒
☰ *i*
❮ ⑂

3 **Entering the current secret number**

▪ Enter the current four-digit secret number.
Default factory setting: **1234**

ENTER OLD PINCODE
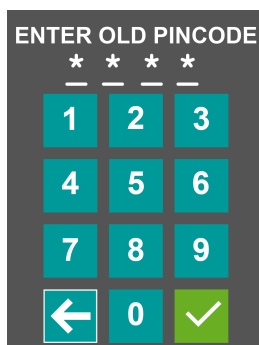
4 **Entering a new secret number**

- Enter the new four-digit secret number.

ENTER NEW PINCODE
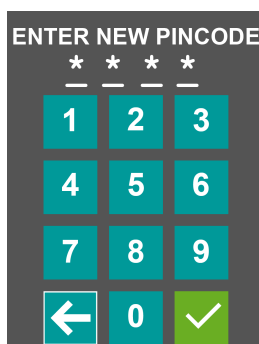
5 **Confirming the new secret number**

- Confirm the new secret number.

RE-ENTER PINCODE
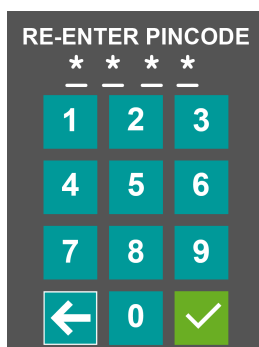
6 **Completing the entry**

- Complete the entry with the ✓ key.

Activating/deactivating spectral libraries

The libraries that were searched during the identification can be activated or deactivated in the Mira M-1 instrument.

> **NOTE**
>
> **Applying spectral library**
>
> - The fewer libraries are activated for the spectral comparison, the shorter the search.
> - If many libraries are activated, the sample may have a high match rate for several library substances and thus be difficult to identify.
>   It is advisable to incorporate previous knowledge of the sample into the identification.
>   For this reason, the libraries are arranged according to subjects. We recommend activating only those substance classes that fit the sample.
> - The settings chosen in this menu only determine whether a library is included in the search.
>   Newly purchased libraries first have to be unlocked in the **Mira Cal** software.

1 Selecting the configuration menu

- Select the configuration menu with the ⚙ key.

12:00 AM   Thur, Jun 19, 2014

LASER READY
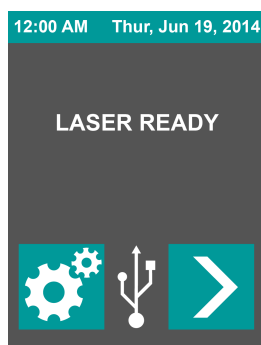
2 Selecting the library menu

- Select the library menu with the 📋 key.

3 Selecting the spectral library

- Tap twice on the desired spectral library.
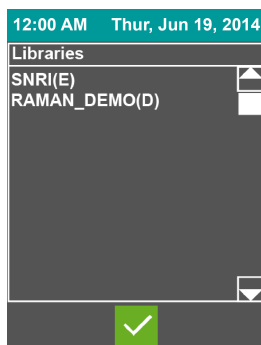
4 Activating/deactivating the spectral library

- Activate the spectral library with the **[ENABLE]** key or deactivate it with the **[DISABLE]** key.
- Activate or deactivate additional spectral libraries following the previous steps if needed.
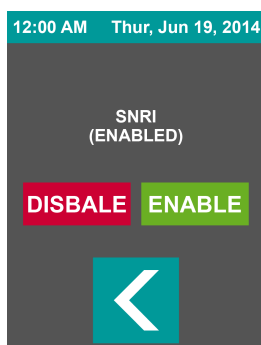
5 Exiting the library menu

- Exit the library menu with the ✓ key.

Calibrating the instrument

The Mira M-1 instrument is very robust and stable and does not necessarily require regular calibration. In certain cases, a recalibration should be carried out, e.g. after the instrument was dropped.

1 Selecting the configuration menu

- Select the configuration menu with the ⚙ key.

2 Selecting the calibration menu

- Select the calibration menu with the ⚖ key.

3 Inserting the calibration standard

- Open the cover of the vial holder.
- Insert the calibration standard.
- Close the cover of the vial holder.

```
12:00 AM    Thur, Jun 19, 2014
        INSERT CAL_STD




                          Press
                           &
                          Hold

    <                     ⚖
```

4   Starting the calibration

> ### NOTE
>
> **Laser safety**
>
> The ⚖ key of the **Mira M-1 Advanced** instrument must be pressed during calibration.

Start the calibration with the ⚖ key (and keep the key pressed down until the result is displayed).

5   Waiting for calibration

- ▪ Wait for the calibration to start, until the message is displayed.

```
12:00 AM    Thur, Jun 19, 2014
          CALIBRATING...

             ⚠

                          Press
                           &
                          Hold

    <                     ⚖
```

- ▪ The calibration is successful:

  – Exit the calibration menu with the ◁ key.
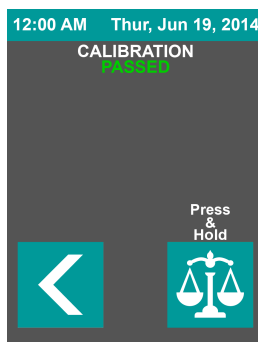
- ▪ The calibration is not successful:
  – Remove the calibration standard and check for contamination and damages.
  – Reinsert the calibration standard.

  – Restart the calibration with the ⚖ key.
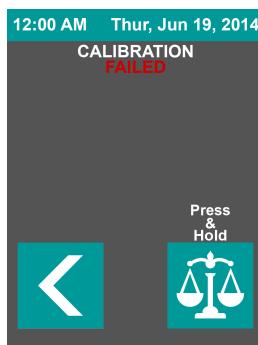
4.3 Operation with Mira Cal

> **NOTE**
>
> **Operation**
>
> The following functions are carried out with the **Mira Cal** software:
>
> - Configuration of the **Mira M-1** instrument.
> - Remote operation of the **Mira M-1** instrument.
> - Update and activation of the spectral libraries.
> - Automatic updating of date and time.
> - Installation of new instrument firmware.
> - Management and evaluation of results.
>
> You can find detailed information on the procedure in the tutorial for the **Mira Cal** software.

5 Operation and maintenance

5.1 General notes

5.1.1 Care

Mira M-1 instruments require appropriate care. Excess contamination of the instruments may result in functional disruptions and a reduction in the service life of the otherwise sturdy mechanics and electronics.

Spilled chemicals and solvents should be removed immediately. In particular, the plug connections should be protected from contamination.

> **! CAUTION**
>
> Although this is largely prevented by design measures, Metrohm Service should immediately be notified if aggressive media have found their way into the instrument.

5.1.2 Maintenance by Metrohm Service

Maintenance of the **Mira M-1** is best carried out as part of annual service, which is performed by specialist personnel from Metrohm. A shorter maintenance interval may be necessary if you frequently work with caustic and corrosive chemicals.

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

5.2 Quality management and qualification with Metrohm

Quality management

Metrohm offers you comprehensive support in implementing quality management measures for instruments and software.

Qualification

Please contact your local Metrohm representative for support in qualification of instruments and software. The **Installation Qualification** (IQ) and **Operational Qualification** (OQ) are offered by Metrohm representatives as a service. They are carried out by trained employees using standardized qualification documents and in accordance with the currently applicable requirements of the regulated industry.

Maintenance

The electronic and mechanical functional groups of Metrohm instruments can and should be checked by specialist personnel from Metrohm as part of a regular preventive maintenance schedule. Please ask your local Metrohm representative regarding the precise terms and conditions involved in concluding a corresponding maintenance agreement.

For detailed information on this topic, please visit *www.metrohm.com*.

6 Troubleshooting

6.1 Basic function

Problem	Cause	Remedy
The display flickers.	*The voltage of the batteries is too low.*	▪ Insert new or charged batteries into the instrument.
The instrument does not start.	*The batteries are dead.*	▪ Insert new or charged batteries into the instrument.
	The batteries are inserted incorrectly.	▪ Check the polarity of the batteries. ▪ Make sure the battery cover is closed correctly.

6.2 Measuring result

Problem	Cause	Remedy
The spectrum cannot find a match.	*No spectral library loaded in the instrument.*	▪ Update the library.
	The measuring signal is not clear due to a weak voltage.	▪ Insert new or charged batteries into the instrument.

The spectrum is noisy.	*The sample is out of focus.*	▪ Choose the correct attachment lens that corresponds with the sample.
		  – SWD attachment lens for direct measurement.
		  – LWD attachment lens for measurement through a bottle.

The spectrum is not created.	*The sample is missing.*	▪ Fill the sample into a vial and insert it into the instrument.
	The vial holder or the attachment lens is inserted incorrectly.	▪ Insert the accessory part correctly.
	The calibration is faulty.	▪ Carry out a calibration and repeat the measurement.

7 Appendix

7.1 Spectral libraries

Metrohm provides an extensive collection of Raman spectra for Mira spectrometers. These are suitable for not only identifying unknown Raman spectra, but also characterizing a whole range of different materials. The spectral library that is available comprises more than 9,000 Raman spectra which have been measured in the National Institute of Advanced Industrial Science and Technology (AIST) in Japan and by scientists at S.T. Japan, Inc. in Tokyo. This complete library is subdivided into 21 sub-libraries, which can be combined as required.

> **NOTE**
>
> **Subject to modifications**
>
> The spectral libraries and their scope are continuously updated.
>
> You can find the current offers for the spectral libraries under the optional accessories on the Metrohm website *(see Chapter 9, page 39)*.

Table 2   Spectral libraries

Article number	Designation	Number of spectra
6.6071.601	Complete Raman spectral library.	> 8,690
6.6071.602	Raman spectra of active substances and auxiliary materials that are relevant to the pharmaceutical industry and medical research.	> 1,170
6.6071.603	Raman spectra of solvents.	> 460
6.6071.604	Raman spectra of polymers, polymer additives, plastics, plasticizers and packaging materials.	> 920
6.6071.605	Raman spectra of aliphatic and aromatic aldehydes and ketones.	> 1,070
6.6071.606	Raman spectra of alcoholic and phenolic compounds.	> 890
6.6071.607	Raman spectra of esters, lactones and anhydrides.	> 2,930
6.6071.608	Raman spectra of hydrocarbons and halogenated hydrocarbons.	> 560
6.6071.609	Raman spectra of chemical substances that are used in the semiconductor industry.	> 370
6.6071.610	Raman spectra of selected hazardous substances that are listed in the "EPA Cameo Database for Chemical Emergencies and Responders" and the "USCG CHRIS Hazardous Chemicals Database".	> 1,360

Article number	Designation	Number of spectra
6.6071.611	Raman spectra of selected hazardous substances that are listed in the "EPA Cameo Database for Chemical Emergencies and Responders", "USCG CHRIS Hazardous Chemicals Database" and "NIOSH Guide to Chemical Hazards Databases", as well as chemicals that are regulated by the "Toxic Substances Control Act".	> 3,030
6.6071.612	Raman spectra of substances that are relevant to forensic analysis.	> 740
6.6071.613	Raman spectra of pesticides, insecticides, herbicides, fungicides, algicides and similar agricultural chemicals.	> 460
6.6071.614	Raman spectra of selected dyes, colorants, pigments and indicators.	> 300
6.6071.615	Raman spectra of sulfur and phosphorus compounds.	> 970
6.6071.616	Raman spectra of substances with a high production volume, as listed in the "HPV Challenge Program Chemical List".	> 690
6.6071.617	Raman spectra of minerals and inorganic materials *(not included in the complete library (6.6071.601))*.	> 1,410
6.6071.618	Raman spectra of minerals *(extracted from the 6.6071.617 library)*.	> 450
6.6071.619	Raman spectra of inorganic materials *(extracted from the 6.6071.617 library)*.	> 960
6.6071.620	Raman spectra of food additives, including FDA-controlled substances. Additionally, spectra of indirect food additives and substances that come into contact with foodstuffs, such as packaging materials and associated processing chemicals.	> 1,070
6.6071.621	Raman spectra of biochemicals, including vitamins, resins, starches, glycerins, fatty acids, sugars, carbohydrates, proteins, and peptides.	> 1,900
6.6071.622	Raman spectra of flavors, scents, and other substances that are used for manufacturing cosmetics.	> 1,030

8 Technical specifications

8.1 Operating specifications

Table 3   Specification of the measuring parameters

Aspect	Specification
Laser wavelength	785 nm
Laser output power	≤ 100 mW
Wavenumber range	400 - 2,300 cm^{-1}
Spectral resolution	12 - 14 cm^{-1} (FWHM) across the whole range
Collection optics	NA = 0.50, 1 mm and 7.6 mm working distance; 0.2 - 2.5 mm measuring spot size
Beam divergence	7.2 degrees
Detection technique	Orbital Raster Scan (ORS) to average over the sample
Laser class according to EN 60825-1	▪ Mira M-1 Basic Class 1 ▪ Mira M-1 Advanced Class 3B
Protection Level according to EN 207	D LB5 775 - 795 nm
NOHD - Nominal Ocular Hazard Distance	SWD attachment lens : 66 cm ± 5 cm
	LWD attachment lens : 64 cm ± 5 cm

8.2 Measured value memory

Memory size   8 GB (measured values and spectral library)

8.3 Screen

Display size	2.8 inch, resistive touch screen

8.4 Interfaces

USB connector	Type A/B mini USB connector (USB 2.0) with the following functions: ▪ Power supply ▪ Data transmission with USB cable (6.2151.110)

8.5 Power supply

Battery	2 x 1.5 V, size AA / LR6
Nominal input voltage	5 V DC
Power consumption	1,000 mA max.
Power supply unit	No. 6.2166.100
Nominal input voltage	100 - 240 V AC
Frequency	50 - 60 Hz
Output voltage	5 V DC
Nominal output current	1,500 mA max.

8.6 Runtime

	NOTE
i	**Runtimes** The runtimes may vary according to the configuration used and the usage habits. The following values are based on operation under reference conditions.

Uptime	Up to 11 hours with lithium-ion batteries.

8.7 Housing specification

Leak-tightness   Protected against dust and splash water.

8.8 Safety specifications

This instrument fulfills the following electrical safety requirements:

CE marking in accordance with the EU directives:
- 2006/95/EC (Low Voltage Directive, LVD)
- 2004/108/EC (EMC Directive, EMC)
- EN/IEC 60825-1 (Safety of laser products)

Safety instructions   This document contains safety instructions which have to be followed by the user in order to ensure safe operation of the instrument.
- EN 207 (Personal eye-protection equipment – Filters and eye-protectors against laser radiation (laser eye-protectors))

8.9 Electromagnetic compatibility (EMC)

Emission   Standards fulfilled:
- EN/IEC 61326-1
- EN/IEC 61000-6-3
- EN 55011 / CISPR 11

Immunity   Standards fulfilled:
- EN/IEC 61326-1
- EN/IEC 61000-6-2
- EN/IEC 61000-4-2
- EN/IEC 61000-4-3
- EN/IEC 61000-4-4
- EN/IEC 61000-4-5
- EN/IEC 61000-4-6
- EN/IEC 61000-4-11
- EN/IEC 61000-4-14
- EN/IEC 61000-4-28

8.10 Ambient temperature

Operation	−20 °C - +40 °C (at a max. of 93% humidity)
Storage/transport	−20 °C - +70 °C (at a max. of 93% humidity)

8.11 Reference conditions

Ambient temperature	+25 °C (±3 °C)
Relative humidity	≤ 60%
Instrument status	> 5 min in operation
Validity of the data	After adjustment

8.12 Dimensions and materials

Dimensions	
Length	131 mm
Width	85 mm
Height	39 mm
Weight	650 g (net incl. batteries)
Material	
Housing	Aluminum anodized
Accessories covering	Thermoplastic elastomers (TPE-E)

9 Accessories

Up-to-date information on the scope of delivery and optional accessories for your instrument can be found on the Internet. You can download this information using the article number as follows:

Downloading the accessories list

1 Type *http://partslists.metrohm.com* into your Internet browser.

The **Partslists** webpage will be displayed.

2 Select the desired output language.

3 Enter the article number (e.g. **2.884.0010**) and click on the **Generate PDF** command.

The PDF file with the accessories data will be created in the language selected.

> **NOTE**
>
> When you receive your new instrument, we recommend downloading the accessories list from the Internet, printing it out and keeping it together with the manual for reference purposes.

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