Anton Paar

Measure
what is measurable
and make measurable
that which is not.

Galileo Galilei (1564-1642)

Instruction Manual and Safety Information

Modular Circular Polarimeter

MCP 100, MCP 150

Instrument Software Version: 1.50

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Address of the instrument producer:
Anton Paar OptoTec GmbH
Lise-Meitner-Str. 6
30926 Seelze-Letter / Germany – Europe
Tel: +49 (0) 511 400950
Fax: +49 (0) 511 4009534
E-Mail: info.optotec@anton-paar.com
Web: www.anton-paar.com

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Contents

1 About the Instruction Manual

This instruction manual informs you about the installation and the safe handling and use of the product. Pay special attention to the safety instructions and warnings in the manual and on the product.

The manual is a part of the product. Keep this manual for the complete working life of the product and make sure it is easily accessible to all people involved with the product. If you receive any additions or revisions to this manual from Anton Paar GmbH, these must be treated as part of the manual.

Conventions for safety messages

The following conventions for safety messages are used in this instruction manual:

WARNING
Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE *Notice indicates a situation which, if not avoided, could result in damage to property.*

TIP *Tip gives extra information about the situation at hand.*

Typographical conventions

The following typographical conventions are used in this instruction manual:

Table 1.1: Typographical conventions

Convention	Description
<key>	The names of keys and buttons are written inside angle brackets.
"Menu Level 1 > Menu Level 2"	Menu paths are written in bold, inside straight quotation marks. The menu levels are connected using a closing angle bracket.

2 Safety Instructions

- Read the instruction manual before using the instrument.
- Follow all hints and instructions contained in this instruction manual to ensure the correct use and safe functioning of the instrument.
- Make sure that this instruction manual is easily accessible to all personnel involved with the instrument.

Liability

- This manual does not claim to address all safety issues associated with the use of the instrument. It is your responsibility to establish health and safety practices and determine the applicability of regulatory limitations.
- Anton Paar GmbH only warrants the proper functioning of its instruments if no modifications have been made to the mechanics, electronics, firmware and instrument software.
- Only use MCP 100/150 for the purpose described in this instruction manual. Anton Paar GmbH is not liable for damages caused by incorrect use of MCP 100/150.
- The results delivered by MCP 100/150 not only depend on the correct functioning of the instrument, but also on various other factors. We therefore recommend you have the results checked (e.g. plausibility tested) by skilled personnel before consequential actions are taken based on the results.

Installation and use

- The installation and operation of the instrument has to be done according to the instructions in the instrument manual, otherwise the accuracy and the safety is endangered.
- MCP 100/150 is **not** an explosion-proof instrument and therefore must not be operated in areas with risk of explosion.
- The installation procedure should only be carried out by authorized personnel who is familiar with the installation instructions.
- Do not use any accessories or wearing parts other than those supplied or approved by Anton Paar GmbH.
- Make sure all operators are trained to use the instrument safely and correctly before starting any applicable operations.
- In case of damage or malfunction, do not continue operating MCP 100/150. Do not operate the instrument under conditions which could result in damage to goods and/or injuries and loss of life.

Moving the instrument

- Before you move or lift the MCP 100/150 make sure that all hoses and the sample cell are empty.

Handling of chemicals

- Observe all safety regulations regarding the handling of the samples, cleaning, rinsing and waste liquids (e.g. use and disposal of lead-clarified samples).
- Check the chemical resistance of all materials which come into contact with the sample or cleaning liquid before starting the measurement.
- Make sure that different liquids (samples and cleaning liquids) that come into contact with each other are chemically compatible. They should not react exothermically or produce any solid particles that might stick to the inner wall of the sample cell.
- Prior to starting a measurement or cleaning procedure, make sure that all parts that come into contact with fluids, especially the measuring cell, hoses and waste container, are properly connected and in good condition.

Precautions for highly inflammable samples and cleaning agents

- Only store the minimum required amount of sample, cleaning agents and other inflammable materials near the MCP 100/150.
- Do not spill sample/cleaning agents or leave their containers uncovered. Immediately remove spilled sample/cleaning agents.
- Make sure that the setup location is sufficiently ventilated. Ensure the sufficient supervision of MCP 100/150 during operation.

Service and repairs

- Service and repair procedures may only be carried out by authorized personnel or by Anton Paar GmbH.

Returns

- For repairs send the cleaned instrument to your Anton Paar representative. Only return the instrument together with the filled out RMA (Return Material Authorization) and the form "Safety Declaration for Instrument Repairs". Please download the Safety Declaration form from our website www.anton-paar.com.
- Prior to sending the instrument to your representative or Anton Paar for repair or service, make sure that all liquids and solvents are completely drained out of the instrument.
  Do not return instruments which are contaminated by radioactive materials, infectious agents or other harmful substances that cause health hazards.

Disposal

- Concerning the disposal of MCP 100/150, observe the legal requirements in your country.

3 Checking the Supplied Parts

Your MCP was tested and packed carefully before shipment. However, damage may occur during transport.

TIP *An instrument stored at low temperatures can cause condensation of moisture on sensitive parts. To prevent malfunctions allow the transport package and its contents to come to thermal equilibrium prior to opening. Therefore the unopened package should first be stored in a dry room at normal temperature for a few hours.*

1. Keep the packaging material (box, foam piece, transport protection) for possible returns.
2. Check the delivery note and compare it with the supplied parts.
3. If a part is missing, contact your Anton Paar representative immediately.
4. If a part is damaged, contact the transport company and your Anton Paar representative.

Table 3.1: Supplied Parts

Symbol	Pcs.	Article Description	Mat. No.
	1	MCP 100 MCP 150	143911 160796
	1	Instruction manual	146926
	1	External Power Supply	99780
	1	Power cord USA or Power cord UK or Power cord Europe	52656 61865 65146
	1	Drying cartridge (spare part)	96950
	1	CANopen male termination plug	83999
	1	CANopen female termination plug	94732

3.1 Sample Cells and Accessories

Anton Paar offers a wide range of polarimeter cells for different sample volumes and properties suitable for single-, mass-, and continuous screening of your samples. Whatever the application, we aim to provide the right cell. For further information please refer to the brochure "Sample Cells and Accessories", available from your Anton Paar representative.

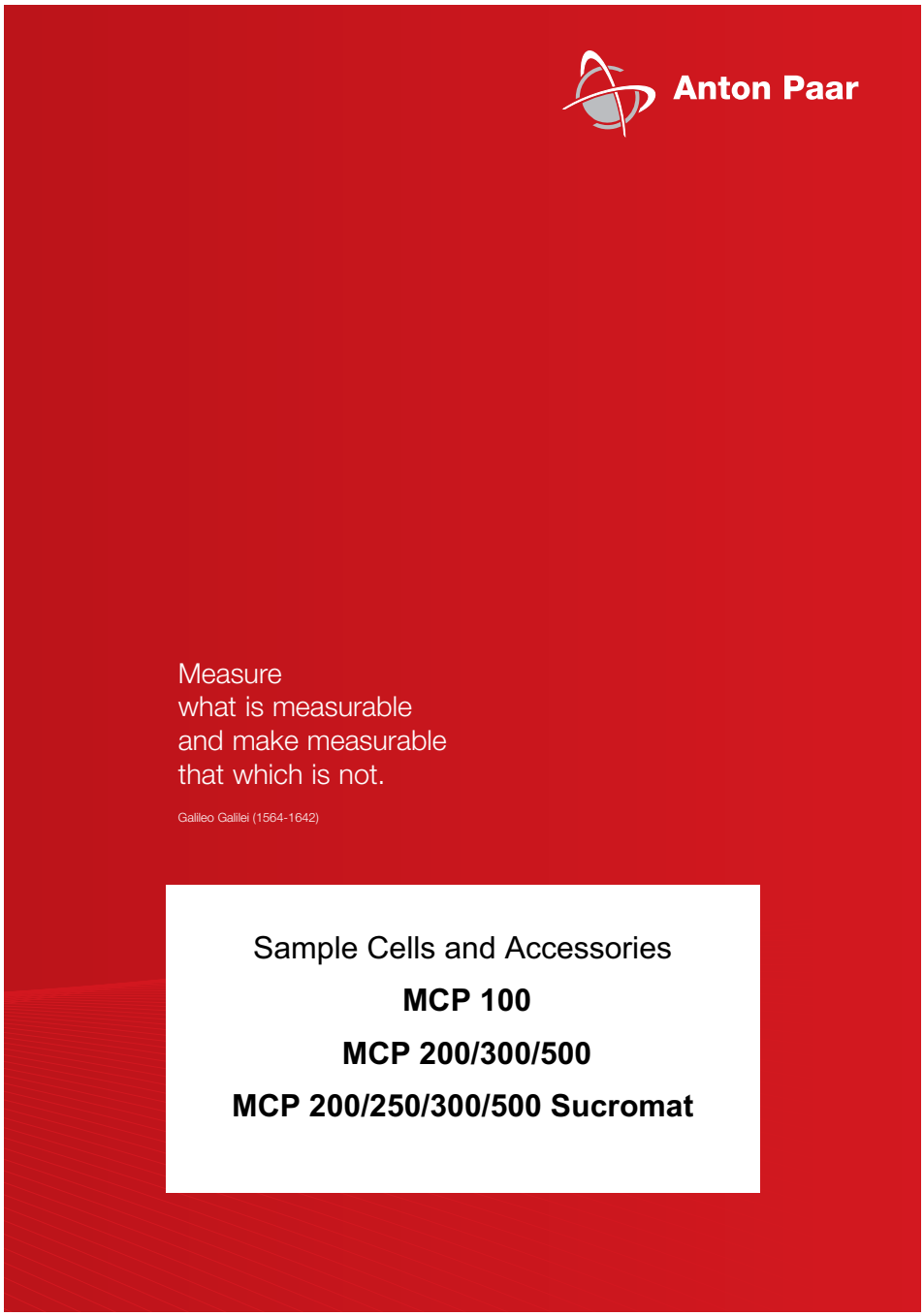


Fig. 3 - 1 Brochure Sample Cells and Accessories

4 The Measuring Principle

4.1 Definition of Optical Rotation (Biot's Formula)

The optical rotation α is the basic measurement of a polarimeter. Optical rotation is defined in angular degrees. It can be calculated with the specific rotation $[\alpha]_\lambda^T$ multiplied by optical pathway *l* [dm] multiplied by the concentration *c* [g/100 ml]:

$$\alpha = \frac{[\alpha]_\lambda^T \cdot l \cdot c}{100}$$

The specific rotation $[\alpha]_\lambda^T$ depends on the temperature *T* and the wavelength λ. Standard temperature is typically 20 °C. Literature sometimes states 25 °C. For historical reasons, only a few wavelengths are in use. The standard wavelength is 589 nm, which is the yellow emission wavelength of the element sodium.

4.2 Optical Rotation Measurement

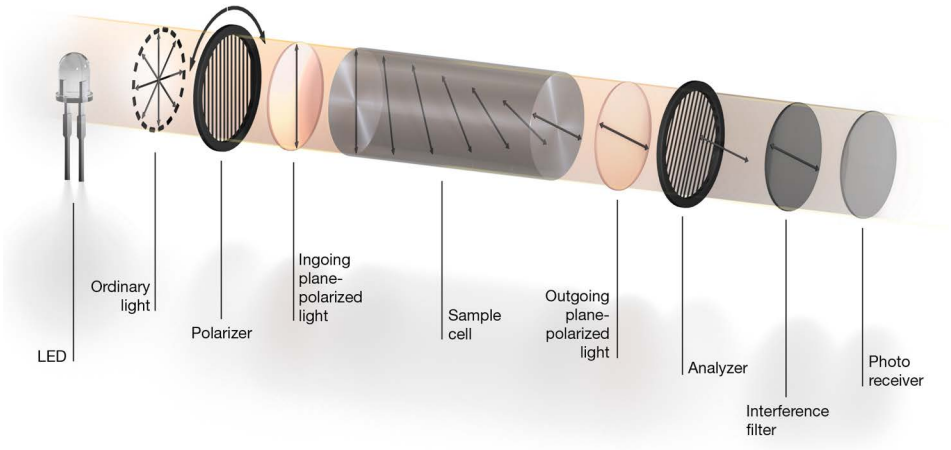


Fig. 4 - 1 Principle of the optical rotation measurement

To measure optical rotation, a Light Emitting Diode (**LED**) produces a beam of **ordinary light**. This light first passes through a **polarizer** (polarization filter) in order to obtain a defined orientation of the plane of polarization. The **polarized light** then passes through the **sample cell**. If the sample is optically active, the plane of polarization becomes rotated.

The light with the rotated plane of polarization passes through an **analyzer**, which is a second polarization filter. Now the MCP 100/150 rotates the first **polarizer**, until the **photo receiver** measures a minimum of light transmission. If the sample is optically inactive, **polarizer** and **analyzer** are now oriented perpendicular to another.

If the sample is optically active, the MCP 100/150 rotates the **polarizer** until the plane of polarization behind the **sample cell** is perpendicular to the polarization plane of the **analyzer** again. The resulting degree of rotation is a direct measure of the optical rotation of the sample. The correct wavelength for the measurement is precisely selected by an **interference filter** positioned in the beam in front of the **photo receiver**.

5 MCP 100/150 - An Overview

The MCP 100/150 is a **M**odular **C**ircular **P**olarimeter and concentration meter that was developed to combine high accuracy with ease of operation and a robust design.

5.1 Features and Benefits

Convenient

- With its compact design, the MCP 100/150 requires next to no space and fits into any laboratory.
- The instrument is easy to operate – simply switch it on, measure your sample and get correct results within seconds.
- An internal data memory ensures that no data is lost. The measured data can be automatically exported to a connected printer or to a server, via Ethernet.

Reliable

- The MCP 100/150 complies with all national and international pharmacopoeias, so you can be sure of a solution that is fit for the future.
- Defined user hierarchies ensure that only authorized personnel operate the instrument.
- The Audit Trail function clearly and irrevocably documents every instrument interaction as required by e.g. 21 CFR Part 11, GLP or GMP.
- Automatic Peltier temperature control entirely eliminates the risk of measurement errors due to inaccurate sample temperature.

Safe

- The MCP 100/150 can be automatically adjusted and calibrated with Toolmaster quartz control plates. The instrument guides you safely and easily through the required process.
- With the MCP 100/150 there are no data input errors. The MCP 100/150 provides seamless documentation and full traceability.
- The MCP 100/150 is equipped with a Peltier module providing a fast and precise automatic temperature control of the sample cell.

6 Functional Components

6.1 Front View

Fig. 6 - 1 Front view of MCP 100/150

1 ... LCD color touchscreen
2 ... Sample cell compartment

6.2 Interfaces on the Left Side

Fig. 6 - 2 Three USB ports on the left side

1 ... USB ports for memory, mouse, keyboard, bar code reader or printer

6.3 Rear View

Fig. 6 - 3 Rear view of MCP 100/150

1 ... Drying Cartridge
2 ... CAN out interface
3 ... CAN in interface
4 ... USB service interface
5 ... Power inlet
6 ... Power switch
7 ... Ventilation grill
8 ... Ethernet interface
9 ... RS-232 interface

6.4 View into the Cell Compartment

Fig. 6 - 4 MCP 100/150 cell compartment

1 ... Temperature-controlled sample cell holder
2 ... Wireless interface for Toolmaster sample cells
3 ... Cell compartment windows

7 Installing the Instrument

7.1 The Right Place

The MCP 100/150 is designed for operation under typical laboratory conditions. Put the instrument on a bench and connect it to the mains. To reach the highest possible precision for your measurements, do not place the instrument:

- near a heater
- near an air conditioner
- on a vibrating surface or close to vibrating equipment
- in direct sunlight

WARNING

- Ensure that the power plug is always easily accessible so that the instrument can easily be disconnected from the mains at any time.
- Ensure that the ventilation through the rear and bottom of the MCP is not blocked by any obstacles.

7.2 Terminating the CAN Bus

If no other instruments are connected to the CAN bus, plug the provided terminators into the CAN in and out connectors and fasten the coupling nuts.

7.3 Switching the Instrument On/Off

WARNING

- Before switching on the instrument, make sure that the line voltage is 100 V AC to 240 V AC, 50/60 Hz. If large voltage fluctuations are to be expected, a constant voltage source (UPS) is recommended.
- The non-fused earth conductor of the power cord (or power inlet) has to be connected to protective earth.

1. Connect the power inlet of the MCP 100/150 with the plug of the external power supply.
2. Connect the external power supply to the mains using the power cord.
3. To switch the instrument on or off, use the power switch at the back.

After turning on the power, allow approximately 15 minutes for temperature equilibration and internal temperature adjustments.

7.4 Assembling the Sample Cell

The polarimeter tubes are closed with cell windows at both ends. The windows are made of optical glass free of strain. Exposing them to high mechanical pressure results in birefringence and inaccurate measurements. Therefore damaged or stressed windows have to be replaced.

The polished plane surfaces surrounding the apertures of the polarimeter tube assure the sealing between cell and windows. The windows as well as the opposing contact surfaces of the tube have to be kept clean thoroughly to avoid leakage or pressure peaks on the windows.

The rubber washers do **not** function as a gasket. They distribute the pressure of the screw cap evenly onto the cell windows to avoid mechanical stress. Therefore place the rubber washers between screw cap and cell window only. Replace the washers before they loose their original shape or elasticity.

TIP

- *Clean the cell **and** windows thoroughly before assembly, see Chapter 19.2.*
- *Place the rubber washers between screw cap and cell window.*
- *The screw caps have to be tightened very gently (hand-tight), just enough as required to seal the cell windows.*
- *Replace the washers before they loose their original shape or elasticity.*
- *Replace damaged or stressed cell windows.*

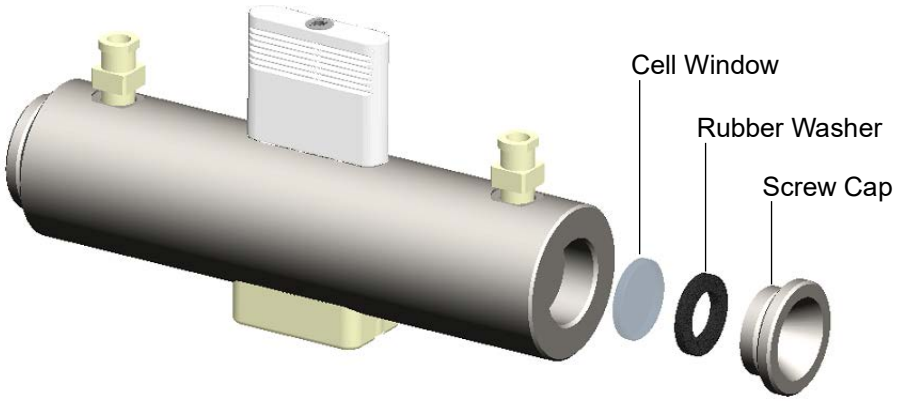


*Fig. 7 - 1 Assembly of cell windows: The rubber washer is **not** a gasket.*

7.5 Inserting the Sample Cell

Sample cells with Toolmaster function are automatically identified by the instrument. To achieve highly accurate measuring results, sample cells without Toolmaster function do not work with the MCP 100/150.

For installation of a sample cell, simply place it into the sample cell holder. After the detection of a sample cell an icon appears in the header of the main screen. The sample cell transfers its optical length and the temperature of the sample into the instrument automatically.

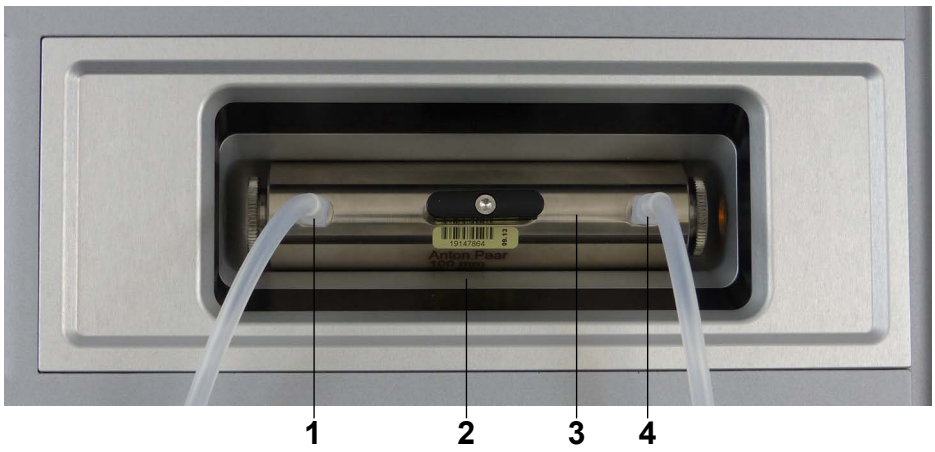


Fig. 7 - 2 A 100 mm sample cell placed in the sample cell holder

1 ... Sample inlet
2 ... Sample cell holder (Peltier temperature-controlled)
3 ... Stainless steel Toolmaster sample cell with Luer-Lock connectors
4 ... Sample outlet

7.6 Mounting the Tubes

To connect the sample cell to a waste container or drain:

1. Cut a piece of sufficient length of tubing made of a material that is resistant to the sample (e.g. silicone or polyvinyl chloride).
2. Attach the tube to the outlet of the sample cell.
3. Insert the other end of the tube into the waste container.

Fig. 7 - 3 Filling the cell with a syringe

8 Operating the Instrument

8.1 Input Options

To operate the Instrument you can:

- Tap the elements on the touchscreen.
- Use the touchscreen functions with a computer mouse.
- Use an external keyboard to enter characters.
- Use a bar code reader.

NOTICE

- *Operate the touchscreen with clean and dry fingers only.*
- *Never use any sharp objects.*
- *Operate the touchscreen with gentle fingertip pressure only.*

8.2 Operating Elements of the Main Screen

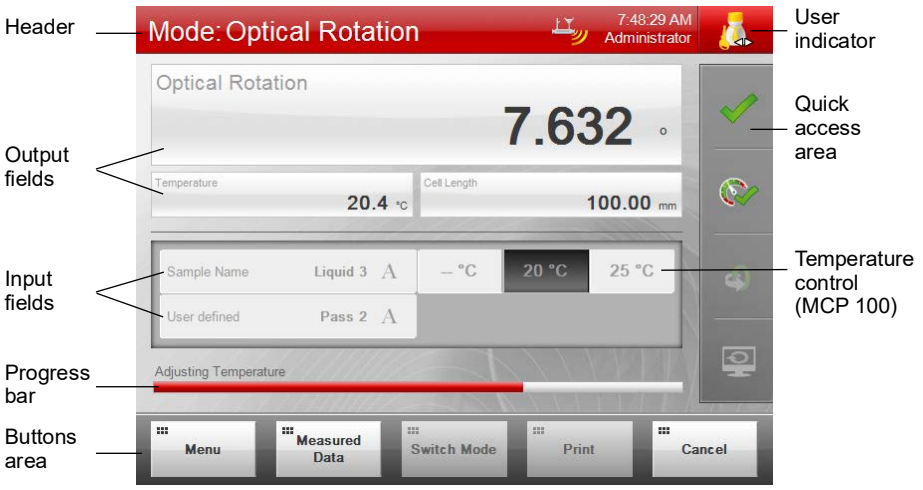


Fig. 8 - 1 Main screen example (MCP 100)

In the left part of the **header** you find the currently active measurement mode: Optical Rotation, Specific Rotation or Concentration. On the right side of the **header** you find a clock and the **user indicator** with the user name. The user indicator displays the type of user that is currently logged on (see Chapter 11.1). When a Toolmaster sample cell is inserted, a sample cell icon appears to the left of the clock.

The **output fields** show the measuring value, temperature and cell length of the sample cell. The **input fields** can be used to enter a sample name or a user-defined data field to assign additional information to your samples. Typical examples for the user-defined data field are a filling line number, tank number or batch identification.

The Peltier **temperature control** mode of the MCP 100 is selected with the radio buttons <20 °C/68 °F> or <25 °C/77 °F>. Disable the temperature control with the button <-- °C/°F>. The MCP 150 displays a checkbox in the same place. Activate the temperature control mode using this check box. Tap on the button <Set Temperature> to enter the required set temperature. See Chapter 13.6 for details.

A red **progress bar** indicates if the instrument is currently measuring. It turns green when a measurement is finished.

Buttons area

Use the buttons on the screen by directly tapping on them. If an external keyboard is connected, you can use the function keys <F1> to <F5> to operate the five buttons within the buttons area. <F1> corresponds to the leftmost button, <F5> corresponds to the rightmost button.

Table 8.1: Functions in the buttons area

<F1> or <Menu>	To open the main menu.
<F2> or <Meas. Data>	To view the measured data.
<F3> or <Switch Mode>	Choose the measurement mode: Optical Rotation, Specific Rotation or Concentration
<F4> or <Export>	To export or print the measured data.
<F5> or <Start>	To start a measurement. See Chapter 13.
<F5> or <Cancel>	To abort a measurement.

Quick access area

Table 8.2: Button functions in the quick access area

Button	Function
	**Open the message list**: The general instrument status as well as all measuring errors that have occurred during the measurement are described in this list. The button changes its appearance depending on the current error status.
	**Green OK sign:** The general instrument status is free of errors.
	**Yellow warning sign:** The instrument has a minor problem, for instance if a check is overdue or if there is a printer problem.
	**Red error sign:** • The instrument has a major problem that needs to be fixed before you continue with measurements. • A sample could not be measured. To reset the message list button to the green OK sign, confirm all error messages by tapping on the <X> button on the right side of the message. To confirm all messages in the list in one step, tap on the button <Remove all> at the end of the list.
	**Checks:** Execute a quartz check or a custom check. Refer to Chapter 12.2.
	**Set Zero:** Set the optical zero reference. Refer to Chapter 13.7.
	Activate the **monitor mode:** If you have started a measurement by tapping <Start>, the instrument displays continuous measuring values until the measurement is finished. The final values are frozen until the next measurement is started. Use this button to switch back to monitor mode.
	**Monitor mode** is active: Until a measurement is started (or after a measurement is terminated by tapping <Cancel>), the instrument is in the monitor mode and shows the current measuring values.

8.3 Using the Touchscreen

NOTICE

- Only use clean and dry fingers to operate the touchscreen.
- Never use any sharp objects.
- Operate the touchscreen with gentle fingertip pressure only.

To select items

To select an item in a table or list, directly tap on it. If you hold your finger on a data item for a prolonged time, a context menu will pop up (a long mouse click accesses the same context menu). Depending on the item you can now choose to export, print, delete or see details.

To use drop-down menus

Tap on the drop-down box. Then select an item from the list.

To use check boxes

Tap on a check box to activate or deactivate the required function.

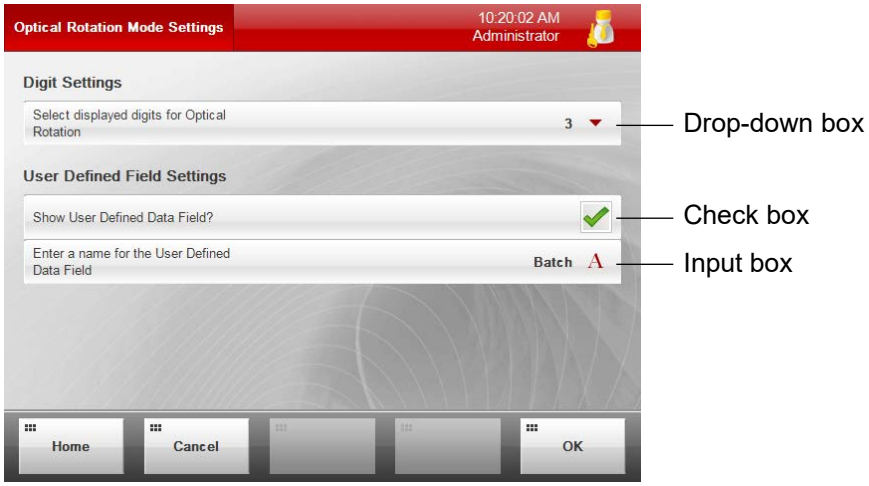


Fig. 8 - 2 Examples for drop-down box, check box and input box

To enter characters into an input box

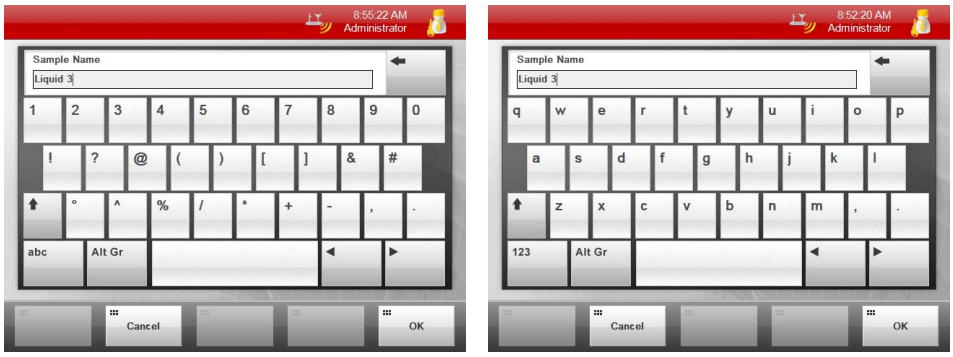


Fig. 8 - 3 On-screen keyboard numerical (left) and alpha (right)

1. Tap on an input box to open the on-screen keyboard.
2. Enter characters, numbers or special characters by tapping the buttons on the screen and then tap <OK>.

Table 8.3: Functions of the special buttons in the *on-screen keyboard*

←	Deletes the character on the left side of the cursor position.
◄ / ►	Moves the cursor position to the left/to the right.
↑	Changes to upper case in alphabetic character mode and to special characters in number mode.
123	Changes to the numeric character mode.
abc	Changes to alphabetic character mode.
Alt Gr	Changes to additional special characters.
^	To display exponential numbers, e.g. to enter 0.025 as 2.5 ^-2 (only in number mode).

To exit dialog windows with or without saving

You have three options to exit a dialog window:

- To get directly to the main screen, tap <Home> and decide whether you want to save or discard changes in the following pop-up window.
- To get one menu level higher and save changes, tap <OK>.
- To get one menu level higher without saving changes, tap <Cancel>.

TIP *When a measurement is currently in progress, you cannot save any changes to the instrument settings. The <OK> button is deactivated and tapping <Home> quits the dialog without saving the changes.*

9 Installing Optional Input/Output Devices

In this chapter, you find information about the installation of optional input/output devices. For detailed information on the devices, see the respective manual.

If you use accessories that are not supplied by Anton Paar, we do not guarantee the functionality and safety.

9.1 External Keyboard, Bar Code Reader, Mouse

To connect an external keyboard, bar code reader or mouse

Connect the external keyboard, bar code reader or mouse (not supplied by Anton Paar) to one of the three USB interfaces that are located on the left side of the instrument.

To use a bar code reader

A bar code reader can be used to fill in input boxes, for instance the sample name or the user-defined data field. Tested bar code readers are Symbol DS6707 or Datalogic Firescan D131.

To generate a printable bar code, you can use any bar code generator, e.g. http://barcode.tec-it.com.

9.2 USB Memory Device

Insert a USB memory device into one of the three USB interfaces that are located on the left of the instrument.

TIP *Format the memory devices using FAT, FAT32 or exFAT.*

9.3 Printer

You can use an RS-232 printer via RS-232 interface or an office printer (PCL compatible) via USB interface or via local network. Besides these hardware printers you can configure a virtual printer type named "PDF File Printer". This printer is used to export PDF files to USB memory devices or to FTP servers.

9.3.1 Connecting a Printer

This section describes how to connect the different printer types with your MCP 100/150. After connecting a printer to the instrument, you have to install this printer (see Chapter 9.3.3).

To connect an RS-232 printer

1. Connect the printer (e.g. Anton Paar Mat. No. 44737 or 93362) to the RS-232 interface (COM) of the instrument using the cable that is supplied together with the printer.
2. If you use an RS-232 printer which is not supplied by Anton Paar, set the communication settings on the printer accordingly (see Chapter 18.4).

To connect an office printer (not supplied by Anton Paar) via USB interface

Connect the printer to a USB interface on the left of the instrument.

To connect an office printer (not supplied by Anton Paar) via local network

You can connect your instrument and a PCL compatible printer (or an Epson Stylus D120) via Ethernet to your local network.

1. Connect the instrument via Ethernet interface to your local network.
2. Configure the network settings according to Chapter 18.1.
3. Connect the printer to your local network. For details, see the printer instruction manual.

9.3.2 PDF File Printer

The virtual printer type "PDF File Printer" is used to export PDF reports to USB memory devices or to FTP servers. The FTP server connection needs to be configured first (see Chapter 18.2).

9.3.3 Installing, Editing, Deleting a Printer

To install a new printer or edit an existing printer

1. Tap <Menu> and select **"Setup > Export Settings > Exporter Management"** to open the printer list.

2. Tap <More> and <New> to install a new printer or tap on a printer in the list to edit.

3. For RS-232 printers, enter the following settings:

   - Select the printer "Type" RS-232 Printer.
   - Activate/deactivate the check box "Use as default printer".
   - Enter a "Name" for the printer.
   - Activate/deactivate the check box "Color print".

4. For USB and network printers, enter the following settings:

   - Select the required printer "Type".
   - Activate/deactivate the check box "Use as default printer".
   - Enter a "Name" for the printer.
   - Select the paper "Format".
   - Select the "Port" USB or network.
   - Activate/deactivate the check box "Color Print".
   - For network printers only: Enter the IP address and IP port.

5. For a virtual PDF file printer, enter the following settings:

   - Select the printer "Type" PDF file printer.
   - Activate/deactivate the check box "Use as default printer".
   - Enter a "Name" for the printer.
   - Select the paper "Format".
   - Select the Printer USB or FTP.

Tip *When adding a new PDF file printer, this printer only works with the USB memory device that was connected during the creation of this printer. If you want to save on any USB memory please use the default PDF file printer.*

6. Tap <OK>.

You can install up to five printers.

To delete a printer

1. Tap <Menu> and select **"Setup > Export Settings > Exporter Management"** to open the printer list.

2. Tap <More> and <Delete>.

3. Select the printer to delete.

4. Tap <Delete> and <Yes>.

10 General Instrument Settings

10.1 Units

To change the displayed units and the input units of concentration or temperature tap <Menu> and select **"Setup > Measuring System Settings > Unit Settings"**.

To change the concentration unit

1. Tap <Select Concentration Unit>.
2. Select the concentration unit: g/100 cm³, g/100 ml, g/l, g/ml or kg/m³.
3. Tap <OK> to save the new settings.

To change the temperature unit

1. Tap <Select Temperature Unit>.
2. Select the temperature unit: Celsius [°C], Fahrenheit [°F] or Kelvin [K].
3. Tap <OK> to save the new settings.

To change the specific rotation unit

1. Tap <Select Specific Rotation Unit>.
2. Select the specific rotation unit: ° (degree) or "No Unit".
3. Tap <OK> to save the new settings.

10.2 Algebraic Signs

The instrument displays levorotatory values of the optical rotation with a minus sign. By default dextrorotatory values show no algebraic sign at all. You can set the instrument to explicitly show a plus sign ahead of all values.

To change the plus sign setting

1. Tap <Menu> and select **"Setup > Measuring System Settings > Formatting Settings"**.
2. Select to display a plus sign: Never, always or for RS232 print only.
3. Tap <OK> to save the new setting.

10.3 Date and Time

1. Tap <Menu> and select **"Setup > Control Panel > Date and Time"**.
2. Enter the current date and time. The date and time format depends on the regional settings.
3. Tap <OK>.

10.4 Regional Settings

1. Tap <Menu> and select **"Setup > Control Panel > Regional Settings"**.
2. Select the "Language", the "Data Format" (for numbers, date and time format, etc.), and the "Keyboard Layout".
3. Tap <OK>.
4. The instrument displays "Are you sure you want to change the regional settings? The instrument will reboot to complete this action".
5. Tap <Yes> to implement the new settings. The instrument reboots.

To set the instrument to a language that you know

If the instrument is operated in a language or font you do not understand, proceed as follows:

- To reset the language to English, press <Ctrl>, <Alt> and <E> simultaneously on the external keyboard and then switch the instrument off and on again.
- To reset the language to a language other than English, proceed as follows:

1. Tap the leftmost button in the main screen (<Menu>).
2. Select the menu item with the  symbol (menu **"Setup"**).
3. Select the second menu item (menu **"Setup > Control Panel"**)
4. Select again the second menu item (menu **"Setup > Control Panel > Regional Settings"**).
5. Use the submenus to set the required language, data format and keyboard layout.
6. Confirm each change with the rightmost button (<OK>) in the buttons area.
7. In the following dialog, tap the button with the green check icon (<Yes>) to reboot the instrument.

10.5 Instrument Name and Location

If you have more than one MCP and want to differentiate between them, you can define instrument names and locations.

1. Tap <Menu> and select **"Setup > Control Panel > Instrument Name and Location"**.
2. Enter the "Instrument Name" and "Instrument Location" and tap <OK>.

10.6 Setting Display Brightness

To improve the visibility of results on the touchscreen within your measuring environment:

1. Tap <Menu> and select **"Setup > Control Panel > Display Brightness"**.
2. Enter the preferred setting (from 30% to 100%) and tap <OK>.

10.7 Sound Settings

The instrument can provide an acoustic signal upon every successful touchscreen or softkey action, mouse click or bar code reader input as well as after the completion of a measurement.

1. Tap <Menu> and select **"Setup > Control Panel > Sound Settings"**.
2. Activate/deactivate the input beep.
3. Activate/deactivate the measurement beep.
4. Tap <OK>.

10.8 Setting Screen Saver and Standby Mode

The MCP 100/150 features a screen saver and a standby mode to save energy and to extend the lifetime of the instrument.

The screen saver is active by default and switches off the display backlight after 30 minutes of inactivity. It does not start during measurements, checks or adjustments. Mouse, keyboard, touch or Toolmaster activities end the screen saver.

The standby mode starts together with the screen saver. It powers down the measuring light and stops the rotary encoder. While in operation the rotary encoder is slightly audible in silent environments. The standby mode quiets down the measuring system automatically.

To set the screen saver

1. Tap <Menu> and select **"Setup > Control Panel > Screen Saver"** to open the settings for the screen saver.
2. Use the check box to activate/deactivate the screen saver.
3. Enter a time between 1 minute and 300 minutes.
4. Tap <OK> to save the changes.

To set the standby mode

1. Tap <Menu> and select **"Setup > Control Panel > Screen Saver"** to open the settings for the standby mode.
2. Use the check box to activate/deactivate the standby mode.
3. Tap <OK> to save the changes.

11 User Accounts and Passwords

11.1 User Groups, Auto Logon, Naming and Password Rules

User groups

There are three user groups which have different levels of user rights (see the menu tree in Appendix C):

	**Operator** This user group may perform measurements.
	**Manager** This user group has the rights of the "operator" user group and may additionally modify settings and perform adjustments.
	**Administrator** This user group has the rights of the "manager" user group and additionally may access menu entries at a high security level: Create and change all user accounts, change the general setup of the instrument, activate/deactivate the audit trail function and back up or restore the instrument settings.

TIP *Three **user accounts** are factory preset: "Administrator", "Manager" and "Operator". They belong to the corresponding **user group**.*
*The **default passwords** for these users are accordingly "administrator", "manager" and "operator" (all in lower case letters).*
When delivered, the instrument is freely accessible without password protection, because the auto logon function for the user "Administrator" is active by default.

Custom User Groups

If the standard user rights of MCP 150 do not fit your needs, you can create a new user group (not available for MCP 100, see Chapter 11.4). Within this group you can limit or grant access to the functions of the instrument. This allows you to assign individual rights to a user with the help of a custom-made menu.

Auto logon function

You can assign the auto logon function to a single user. If you switch off the instrument and restart, there is no logon procedure. All instrument functions according to user rights of the auto logon user are freely accessible.

NOTICE *If 21 CFR Part 11 or increased security is activated, auto logon will be disabled. Be sure to know your user name and password before switching off the instrument.*

Example: The user “Smith” belongs to the user group “operators” and the auto logon function is activated for him. If he switches off the instrument, anyone can switch the instrument on and start measuring without a need to log on. Only operator level functions are available.

Naming rules

If you operate the instrument in the increased security mode, user names must have at least six characters.

NOTICE *If* 21 CFR Part 11 or *increased security is activated, user accounts that do not comply with the naming rules or password rules will be deactivated.*

Password rules

With low security levels, giving a password is not mandatory. If you do not set a password, users can log on by just selecting their user name from the user list only.

Passwords must be at least one character long. All ASCII characters are allowed, including letters, numbers and most special characters. Passwords are case-sensitive, meaning "Anton Paar" or "anton paar" are treated as different.

With high security levels (21 CFR Part 11 and "Increased Security"), giving a password is mandatory. Passwords must have at least six characters. When setting new passwords, the last five passwords must not be used.

11.2 Logging On/Off

When delivered, the instrument is freely accessible without password. Three user accounts are factory preset. For the "administrator" user, the auto logon function is activated.

If user accounts are installed and passwords are set, you may have to pass a logon procedure after switching on the instrument.

Table 11.4: Factory default passwords

User type	Factory default password
Operator	operator
Manager	manager
Administrator	administrator

TIP *It is recommended to replace these default passwords when first setting the instrument into operation.*

NOTICE *If the instrument is used in the increased security mode or with 21 CFR Part 11, your user account will be deactivated after three failed logon attempts.*

To log on

1. Tap on the user indicator on the right side of the header of the main screen to open the "Logon" dialog.
2. Select or type in your "User name", enter your "Password" and tap <OK>.

To log off

1. Tap on the user indicator on the right side of the header of the main screen to open the "Logon" dialog.
2. Tap <Log off>.

- If no user with auto logon right exists, the user indicator changes its appearance to: 

  The instrument finishes the current measurement or measurement series but does not accept any input until someone successfully logs on.

- If a user with auto logon right exists, this user is automatically logged on.

To retrieve a forgotten password

1. Tap the button <Forgot Password> in the "Logon" dialog.
2. Follow the instructions on the screen.

11.3 Creating, Editing and Deleting User Accounts

You need administrator rights to create, edit or delete user accounts.Up to 50 user accounts can be created.

TIP

- *A user with a deactivated account cannot log on until he/she is activated again.*
- *A user who has no administrator rights can only change his/her own password.*

To create or edit a user account

1. MCP 100: Tap <Menu> and select **"Setup > User Management"**.
   MCP 150: Tap <Menu> and select **"Setup > User Management > User Management"**.

2. Tap <More> then <New> to create a new user account or tap on a user name in the list to edit a user account.

   The Edit User dialog opens.

3. Enter the following settings:

   - Enter a "User Name".
   - Activate/deactivate the user account with the check box.
   - Activate/deactivate the "Auto logon" using the second check box.
   - Select the "User Group".
   - Set a Password

4. MCP 150 only: Select the "Role for the Electronic Signature". This is only possible if electronic signing is activated (Chapter 15.6).

5. Tap <OK>.

To delete a user account

1. MCP 100: Tap <Menu> and select **"Setup > User Management"**.
   MCP 150: Tap <Menu> and select **"Setup > User Management > User Management"**.

2. Highlight a user name on the user list and tap <More> and <Delete>.

3. Set the check box in front of the user you want to delete.

4. Tap <Delete> and <Yes>.

To change a password

If the instrument is operated in increased security mode or in 21 CFR Part 11, you may not use the last five passwords a second time.

1. MCP 100: Tap <Menu> and select **"Setup > User Management"**.
   MCP 150: Tap <Menu> and select **"Setup > User Management > User Management"**.
2. Select a user from the list.
3. Tap <Set Password>.
4. Enter the new password twice and tap <OK>.

11.4 User Group Administration

The following function is available for MCP 150 only.

If the standard user rights of your instrument do not fit your needs, you can create a new user group. In this group you can limit or grant access to the functions of the instrument. This allows you to assign individual rights to the users with the help of a custom-made menu.

You may only modify the copy of a standard group. The menus of the original groups cannot be changed.

To create a new user group

1. Tap <Menu> and select **"Setup > User Management > User Group Administration".**
2. Tap <More> and <Copy>.
3. Select a user group to copy and tap <Copy>.

To choose an icon for the user group

A selection of seven different icons is available to represent the users of a new group. The icons of the standard groups Manager and Operator cannot be changed.

1. Tap <Menu> and select **"Setup > User Management > User Group Administration".**
2. Tap the drop box in the left column named "Icon"
3. Choose an icon from the list and tap <OK>

To edit the name of the new group

1. Tap <Menu> and select **"Setup > User Management > User Group Administration".**
2. Tap the text box in the column "Name".
3. Change the name and tap <OK>.

To edit the rights of the new user group

1. Tap <Menu> and select **"Setup > User Management > User Group Administration".**
2. Tap < ... > in the right column.
3. Edit the rights as needed. A green check means this function is available in the menu. An empty check box makes the menu function unavailable for this user group.
4. Tap <OK>

To export a menu tree of a user group

You can export a menu tree of a user group in Excel format for documentation purposes. The spreadsheet generated contains the menu structure with the functions that are available for the selected user group.

1. Insert a USB flash drive into a USB interface.
2. Tap <Menu> and select **"Setup > User Management > User Group Administration".**
3. Tap < ... > in the right column.
4. Tap the button <Export>.

Use the submenu to define the "Storage Location" and enter the "File name", then tap <OK>.

12 Checking and Adjusting the Instrument

12.1 Definitions

Checking

Checking the correct state of operation of an instrument by measuring a sample of exactly known measurement properties and comparing the result with the expected values.

Adjusting

Enabling correct measurements in the future by measuring a reference standard of exactly known measurement properties and adjusting the instrument's constants in a way that the correct results are found by the instrument.

Calibrating

Calibrations are checking procedures which are carried out using certified standards. By comparing the measured result with the standard reference value, you can evaluate the quality of your measurements.

12.2 Checks

Two different types of checks can be performed:

- A **quartz check** uses a quartz plate, which functions as a certified optical rotation reference standard. MCP 100/150 can be automatically adjusted and calibrated with Toolmaster quartz control plates featuring a safe, quick and user-friendly wireless data transfer of the certified optical rotation and the quartz temperature (no external temperature sensor required). The instrument guides you safely and easily through the required process. For checks with quartz plates lacking a Toolmaster function please refer to Chapter 17.8.
- A **custom check** requires a substance with known measurement properties as a reference standard. The custom check is performed with a Toolmaster sample cell.

12.2.1 Quartz Check

To edit the quartz check settings

1. Tap <> to open the checks window.
2. Tap <> (next to quartz check) to edit the check settings.
3. Enter the following settings:

- Enter a set temperature or switch off the temperature control.

TIP *Quartz checks may be performed without temperature control. Deviations of the optical rotation caused by different quartz temperatures are compensated precisely by calculation, because the temperature coefficient of the quartz is known. A quartz check without temperature control offers the same accuracy, but is faster.*

- Activate/deactivate a reminder. Set the number of days to remind after.
- Activate/deactivate the GxP relevance of the check. Date, user and result of the last check can be added to a detailed report if active.

4. Tap <OK>.

To perform a Quartz Check

1. Tap <> to open the checks window.
2. Tap <> (next to quartz check) and follow the instructions on the screen.
3. After the check is finished, tap <Export> if you want to print or export the check results.

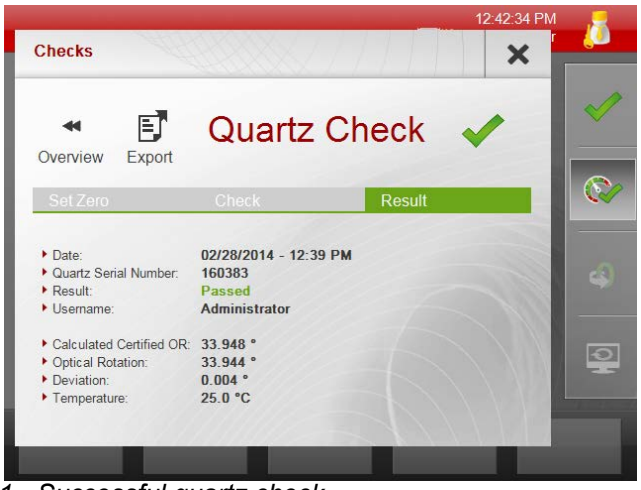


Fig. 12 - 1 Successful quartz check

A quartz check passes if the deviation of the measured value from certified value is smaller than 0.008° with an MCP 100 or 0.006° with an MCP 150.

TIP *If a check failed, it is recommended to perform a quartz adjustment.*

12.2.2 Custom Check

A custom check requires a substance with known measurement properties as a reference standard. The custom check is performed with a Toolmaster sample cell.

To edit the custom check settings

1. Tap <  > to open the check window.
2. Tap <  > (next to custom check) to edit the check settings.
3. Edit the following settings:

- Quantity of check: Optical rotation, specific rotation or concentration.
- Check name: Enter a name for the identification of the check. It is recommended to use the name of the reference substance.
- Enter a set temperature or switch off the temperature control.

TIP *It is recommended to always perform custom checks with automatic temperature control, because the sample temperature is one of the major external influencing parameters in optical rotation measurements.*

- Reference value of the standard.
- Check tolerance (allowed deviation of result).
- Activate/deactivate a reminder. Set the number of days to remind after.
- Activate/deactivate the GxP relevance of the check. Date, user and result of the last check can be added to a detailed report if active.

4. Tap <OK>.

To perform a custom check

1. Tap <  > to open the check window.
2. Tap <  > (next to custom check).
3. When asked to insert a cell for zero setting use a cell according to Chapter 13.7.
4. Follow the instructions on the screen.
5. After the check is finished, tap <Export> if you want to print or export the check results.

TIP *If a check failed, it is recommended to perform a quartz adjustment.*

12.2.3 Viewing, Printing or Exporting Check Results

1. Tap <Menu> and select **"Data Memory > Check Data"** to open the check data list (not available in Non Storage Mode, see Chapter 15.7).
2. Tap on an item to see more detailed information.
3. Tap <More> and then <Export> to perform a printout on paper or to a PDF file or to export the data as an MS Excel file.
4. Follow the instructions on the screen.

12.3 Adjustments

A high-precision polarimeter like the MCP 100/150 requires an adequately precise adjustment. Checking the accuracy is performed with a Toolmaster quartz control plate (see Chapter 12.2). If the result of this check differs substantially from the used quartz plate or the custom standard an adjustment is required.

12.3.1 Performing an Adjustment

1. Remove the quartz plate or the sample cell from the instrument.
2. Tap <Menu> and select **"Adjustments > Quartz Adjustment"**.
3. Choose the temperature for the adjustment and tap <Next>.

TIP *It is recommended to always perform adjustments with temperature control.*

4. Insert a quartz after the instrument has set its zero point.
5. When the instrument finished measuring the quartz you can check the results and the recommendation on the screen. Select one of the options, <Reject> or <Accept>.

Fig. 12 - 2 Successful quartz adjustment

12.3.2 Viewing, Printing or Exporting Adjustment Results

1. Tap <Menu> and select **"Data Memory > Adjustment Data"** to open the adjustment data list (not available in Non Storage Mode, see Chapter 15.7).
2. Tap on an item to see more detailed information.
3. Tap <More> and then <Export> to perform a printout on paper or to a PDF file or to export the data as an MS Excel file.
4. Follow the instructions on the screen.

12.3.3 Restoring the Factory Adjustment

You can restore the factory adjustment:

1. Tap <Menu> and select **"Adjustments > Reset to Factory Adjustment"**.
2. Tap <Yes>.

13 Measuring

This chapter describes the configuration of the measurement system, the filling of samples and the measurement procedure.

13.1 Selecting the Measurement Mode

The MCP 100 offers three different standard measuring modes: Optical Rotation, Specific Rotation or Concentration (see Chapter 4.1).

1. Tap <Switch Mode> to open the mode selection window.

Fig. 13 - 1 Mode selection window MCP 100

2. Select the mode **"Optical Rotation"**, **"Specific Rotation"** or **"Concentration"**.

- If mode "**Specific Rotation"** was selected, you have to enter the concentration value of the sample prior to a measurement.
- If mode "**Concentration"** was selected, you have to enter the specific rotation value of the sample prior to a measurement.

13.2 User Functions

The MCP 150 additionally offers user defined functions, see Chapter 16.

13.3 Configuration of the Measurement Mode

1. Tap <Switch Mode> to open the mode selection window.

2. Tap the settings icon <> located next to the measurement mode to:

- Change the number of displayed digits.
- Add a user-defined data field to every measurement. With a user-defined data field you can assign additional information to your samples. Typical examples for the user-defined data field are a filling line number, tank number or batch identification.
- Define mandatory fields for sample name, user defined fields, concentration and specific rotation (depending on measurement mode). Choose between <Not Mandatory>, <Mandatory - Keep Value> and <Mandatory - Clear Value>.

With the option <Clear value> the input field is cleared every time when opened. The option <Keep Value> preserves the last input value. Mandatory fields are marked with a red border on the main screen and have to be completed before a measurement is performed.

3. Tap <OK> to close the settings window.

13.4 Specific Rotation Table

The concentration mode settings offer to create a table with often used Specific Rotation values for different substances. Prior to a concentration measurement you can choose the specific rotation by the name of the substance instead of entering the specific rotation value for every measurement again.

1. Tap <Switch Mode> to open the mode selection window.
2. Tap the settings icon <  > located right to the measurement mode.
3. Activate the check box to use the Specific Rotation table.
4. Tap the field below to edit the Specific Rotation table.
5. Enter name and Specific Rotation value of your substances.
6. Tap <OK> twice to close the settings window.

When measuring in concentration mode tap on the input field for the Specific Rotation prior to a measurement. Select a substance by name and the corresponding value from the table will be used for the calculation of the measurement result.

13.5 Monitor Mode

If you have not started a measurement yet or if you have terminated a measurement by tapping <Cancel>, the instrument is in the monitor mode and shows a continuous reading of the current measuring values.

If you have started a measurement by tapping <Start>, the continuous measuring values are shown until the measurement is finished. The final values are frozen until the next measurement is started. To unfreeze the screen and to return to the monitor mode, tap <  > in the quick access area.

13.6 Automatic Peltier Temperature Control

The MCP 100/150 is equipped with a Peltier module providing a fast and precise automatic temperature control of the sample cell.

Table 13.1: Temperatures of Peltier module

	MCP 100	MCP 150
Working temperatures	20 °C, 25 °C and disabled	From 15 °C to 35 °C * and disabled
Safety temperature deactivation in case of technical error	+72 °C	

* At standard laboratory conditions (ambient temperature of 23 °C)

TIP *It is recommended to always perform measurements with automatic temperature control, because the sample temperature is one of the major external influencing parameters in optical rotation measurements.*

The temperature control mode of the MCP 100 is selected with the radio buttons <20 °C/68 °F> or <25 °C/77 °F>. Disable the temperature control with the button <-- °C/°F>:

Activate the temperature control mode of the MCP 150 by using the check box. Tap on the button <Set Temperature> to enter the required set temperature:

13.7 Setting the Optical Zero Reference

The zero reference has to be set before a measurement is performed. Insert a Toolmaster cell and set the optical zero point by pressing <  >.

TIP

- *Optical zero must be set with the sample cell in measuring position. A potential strain in the cell windows may cause a small zero offset that has to be compensated.*
- *Make sure that the sample cell is thoroughly flushed. Traces of optically active substance must not be present. Fill the cell bubble-free with an optically inactive liquid (usually the solvent of the sample).*
- *For consecutive measurements insert the sample cell into the cell holder always in the same orientation.*

13.8 Preparing a Measurement

Before starting a measurement, check that:

- The glass windows of the sample cell are installed
- The tubing is connected correctly.
- The tubing connections are tight.
- The waste tube leads into the waste container.
- The waste containers volume is sufficient for all samples.
- Suitable cleaning liquids are available.

For installation and tubing of sample cells see Chapter 7.4. to Chapter 7.6.

13.9 Filling Samples

WARNING
Before applying any cleaning liquid onto your instrument or before filling any sample or cleaning liquid into your sample cell make sure that:

- All safety instructions concerning the use of chemicals and the use of inflammable chemicals are met (see Chapter 2).
- The fire point of the liquid in use is higher than 97 °C (25 °C above the maximum temperature of the Peltier module which is 72 °C).
- No source of ignition exists close to the instrument.
- Sufficient ventilation is guaranteed.
- All wetted parts are resistant to the substances in use (see Appendix A).

TIP The consistency of a sample may influence the measuring light beam. Solid particles or air bubbles may cause faulty measurements.*To achieve highly accurate measuring results, fill the samples into the sample cell homogeneously and without solid particles or air bubbles.*

Sample amount

If the measuring cell is clean and dry, you need 200 µL to 10 mL of sample (depending on the type of cell you are using). If you are measuring without cleaning and drying between the samples (flow-through cells), you need a higher amount of sample because you have to flush residues of the previous sample out of the sample cell to avoid cross-contamination. For the cleaning of sample cells (after or in between use) refer to Chapter 19.2.

13.10 Performing a Measurement

1. Select the measurement mode (see Chapter 13.1).
2. Set the temperature control mode (see Chapter 13.6).
3. Set the optical zero reference (see Chapter 13.7).
4. Enter a sample name if required.
5. Enter a text into the user-defined data field if required.
6. Fill the sample cell with your sample (see Chapter 13.9).
7. Tap <Start> and wait until the measurement is finished.

- The progress bar shows the progress of the measurement with a growing red bar and the message "Measuring".
- If the temperature control is activated the sample must hold the temperature within a tolerance for a certain time to receive a valid measurement.
- The optical rotation is checked for stability within the measurement accuracy of the instrument. If the optical rotation is already stable before tapping <Start>, the instruments will calculate the result from buffered values and display it instantly.
- When the measurement is finished, the progress bar turns green, the message "Finished" is displayed. An acoustic signal is given if the feedback beep function is activated.
- The result display is frozen and the values are saved in the data memory and can be viewed, printed, exported or deleted.

8. Measure the next sample or clean and dry the sample cell. For cleaning of sample cells refer to Chapter 19.2.

14 Handling the Measurement Data

14.1 Data Memory

Your instrument can store 2500 result records. After 1000 measurements, the instrument issues a reminder for clearing the memory. If the memory is full, no measurements are possible and in that case no more measuring results will be saved, so make sure to free memory space in time.

14.2 Viewing Results

Your instrument supports two forms of result visualization:

- In the multiple sample view you can see a number of results listed in a table.
- In the single sample view you can see a more detailed view of one result at a time.

Activating the multiple sample view

1. Tap <Meas. Data> to open the multiple sample view.
2. Use the scrollbar to scroll through the list.

Activating the single sample view

1. Tap <Meas. Data> to open the multiple sample view.
2. Tap on a sample result to open the single sample view.
3. Use the <up> or <down> button to see the previous or next result.

14.3 Print and Export Options

Following data types are available for printout and export:

- Measurement data
- Check data
- Adjustment data
- Audit trails

The instrument supports three kinds of printouts:

- Simple continuous printouts using an RS-232 printer with paper roll.
- Report printouts using an office printer (USB or local network).
- Report printouts to PDF files (USB flash drive, FTP server).

Finally data can be exported in three different formats:

- MS Excel spreadsheet (.xls)
- Text (tabulator separated values)
- PDF (portable document format)

Three different report types are available for printout and export:

- Compact: The most important data of a single measurement.
- Detail: All available data of a single result on a single page. This export with additional information about the last quartz check is GxP compliant.
- Table: Multiple measurements in table form.

Table 14.1: Report types for printout and export

Data	Compact	Detail	Table
Unique sample ID*	X	X	X
Sample name	X	X	X
Date and time of measurement	X	X	X
User name	X	X	X
User defined field	X	X	X
Sample state	X	X	X
Measurement mode	X	X	X
Measured value	X	X	X
Set temperature	X	X	X
Sample temperature	X	X	X
Wavelength in air		X	
Wavelength in vacuum		X	
Cell length		X	
Last quartz check date/user/result**		X	

* Not available in Non-Storage Mode
** If the check was marked GxP relevant (see Chapter 12.2.1 and 12.2.2)

14.4 Printing or Exporting Results

You can use an RS-232 printer via RS-232 interface or an office printer (PCL compatible) via USB interface or via local network to print the measuring results. Besides these hardware printers you can configure a virtual printer type named "PDF File Printer". This printer is used to export PDF files to USB memory devices or to FTP servers (see Chapter 9.3 and Chapter 18.2).

1. Tap <Meas. Data> to open the multiple sample view.
2. Tap <More> and then tap <Export>.
3. Select the items you wish to print or export and then tap <Export>.
4. Use the drop-down boxes “Output Target”, “Reports”, “Storage Location” and “File Name” to define the export settings.
5. Tap <OK>.

   The generated PDF files are not editable to safeguard the data against subsequent modification.

14.5 Setting Automatic Export

1. Tap <Menu> and select **"Setup > Export Settings > Automatic Export"**.
2. Tap on <Output target> and select one of the following:

- <PDF Export>
- A printer or FTP server that has been configured according to Chapter 9.3.
- <None> to deactivate the automatic export

3. If the "Non Storage Mode" (Chapter 15.7) is activated, an additional check box is available. Use the check box to confirm the selected export method.
4. Tap <OK> to save the changes.

After each measurement a file with the measurement data will be sent to the FTP server or printer.

14.6 Defining Export and Print Settings

14.6.1 Defining the Header and Background of the Report

You can import logos via USB memory device and use them as header or background logo in the printer report. You can also define an address which will be printed in the header of the printer report.

To be recognized by the instrument and fit into the document layout, the logo graphic files have to:

- have the file format .jpg or .bmp,
- be located in the main directory of the USB memory device,
- have a maximum size of 1536 x 1024 pixel.

To import logos into the internal memory

1. Tap <Menu> and select **"Setup > Export Settings > Import Logos"**.
2. Select the "storage location" (USB memory device).
3. Select the <File Name> of the image file.
4. Tap <Place> to define the position of the image in the internal memory.
5. Tap <OK> to load the file into the instrument.

To select logos for the report

You can select a logo for the report header and a second logo for the report background.

1. Tap <Menu> and select **"Setup > Export Settings > Select Logos"**.
2. Use the two drop-down boxes to select a logo for the header and a second logo for the background.
3. Tap <OK> to save the changes.

14.6.2 Defining the Name and Address of the Report

To enter name and address for the header

1. Tap <Menu> and select **"Setup > Export Settings > Name and Address"**.
2. Enter the name and address and tap <OK>.

14.7 Deleting Results

We recommend deleting your result data regularly after a successful data export or printout.

Your instrument can store 2500 result data files. After 1000 measurements, the instrument issues a reminder for clearing the memory. If the memory is full, no more measuring results will be saved, so make sure to free memory space in time.

To delete results

1. Tap <Menu> and select **"Data Memory > Measurement Data > Delete Measured Data"** to open the multiple sample view (delete).
2. Tap <More> and <Delete>.
3. Select the items to delete or tap <Select all>.
4. Tap <Delete>.

15 System Security

You can enable different system security settings to ensure data security and to protect your measuring system from unauthorized access.

15.1 Security Level

Depending on your needs you can set different security levels: low or 21 CFR Part 11 compliant. The "Low" security level is set by default.

TIP

- *Please note that you need to set an additional password for the service account to fulfill the security standards of 21 CFR Part 11, see Chapter 15.4.*
- *If selecting "21 CFR Part 11" security level, user-defined values that correspond to a tighter security standard will not be changed.*
- *If any changes are applied to one of the standard security level settings, the security level is switched to a user-defined security level.*

Table 15.1: Comparison of security level settings

Security Level	Low	21 CFR part 11
Audit trail	Off	On
Audit trail backup reminder	Off	Default: 60 days
Electronic Signature (MCP 150)	Off	On/Off
E-Sign req. password (MCP 150)	-	On if activated
Auto logoff	Off	On
Auto logoff time	Off	Default: 60 min
Min. password length active	Off	On
Min. password length	Off	Default: 6 characters
Password expires	Off	On
Password expiry time	Off	Default: 60 days
Increased security	Off	On

To view the security settings

1. Tap <Menu> and select **"Setup > System Security > Security Level"**.
2. To check your current settings, tap <Details>.

To set the security level

NOTICE

- *Your current sample list will be reset by changing the security level.*
- *By switching to "21 CFR Part 11", increased security is activated automatically (see Chapter 15.3).*

1. Tap <Menu> and select **"Setup > System Security > Security Level"**.
2. Use the drop-down box to select a security level.

3. If you want to compare your current settings to the new settings tap <Details>.

   The settings affected by changing the security level will be highlighted with red letters.

4. Tap <OK> to set the security level.

TIP *If any changes are applied to one of the standard security level settings, the security level is switched to a user-defined security level.*

15.2 Auto Logoff and Password Expiry

To set the auto log off time

The instrument can automatically log off the current user after a defined duration of inactivity.

1. Tap <Menu> and select **"Setup > System Security > Logon Settings"**.
2. Use the check box to activate or deactivate the auto log off function.
3. Set the auto log off time to a duration between 1 and 60 minutes.
4. Tap <OK>.

To set the password expiry time

You can define the expiration time period of passwords. The setting applies to all passwords. If a password expires, the corresponding user account is deactivated.

1. Tap <Menu> and select **"Setup > System Security > Logon Settings"**.
2. Use the check box to activate the password expiry function.
3. Set the password expiry time to a duration between 1 and 365 days.
4. Tap <OK>.

To set the password length

You can define the required minimum length of passwords. The setting applies to all passwords.

1. Tap <Menu> and select **"Setup > System Security > Logon Settings"**.
2. Use the check box to activate the password length function.
3. Set the password length (from 6 to 30 characters).
4. Tap <OK>.

15.3 Increased Security

In addition to different security levels, you can tighten your security settings by activating increased security settings.

NOTICE *If the increased security is activated, all user accounts that do not comply with the naming rules or password rules will be deactivated. The auto logon function will be deactivated if set.*

Table 15.2: Increased security settings

On	Off
No endless data storage allowed	Endless data storage allowed
Only user-defined sample list mode allowed	All sample list types allowed
Lock user account after three failed logon attempts	User account is not locked after three failed logon attempts
Auto Logon is not allowed	Auto Logon allowed
User name must have at least 6 characters	User name can be shorter than 6 characters
User name must be entered instead of selected from list	User name can be selected from list
Password must have at least 6 characters	Passwords can have any length
Last 5 passwords must not be used	Same passwords can be used
Only exported data can be deleted	Data can be deleted without having to export before

To activate or deactivate increased security

1. Tap <Menu> and select **"Setup > System Security > Increased Security"**.
2. If you want to view your current settings, tap <Details>.
3. Use the "Increased Security" check box to activate or deactivate increased security.
4. If you want to view the settings that will be affected by activating increased security, tap <Details>.
5. Tap <OK> to save the setting.

15.4 Advanced Security

In addition to the security levels in the previous chapters, you can further tighten your security settings by disabling data transfer from and to USB memory devices (e.g. measurement data export or backup of the instrument settings).

You can also assign an additional password for the service account of the instrument. With this function you are able to prevent unauthorized access to the instrument by service personnel.

To activate or deactivate advanced security

1. Tap <Menu> and select **"Setup > System Security > Advanced Security"**.
2. Use the "Disable USB memory devices" check box to activate or deactivate the data transfer to or from USB memory devices.
3. Use the "Service log on requires customer password" check box to activate or deactivate an individual password for service personnel.
   - If activated, the instrument prompts you to enter and confirm a customer password.
   - To log on, service personnel has to enter the general service password first followed by the customer password. Be sure to have the customer password available in case of a service event.
4. Tap <OK> to save the setting.

TIP *To fulfill 21 CFR Part 11 security standards, activate this setting as well as the security level "21 CFR Part 11", see Chapter 15.1.*

15.5 Audit Trail

Using the audit trail function, you get all operating steps that directly or indirectly lead to changes in measuring results documented in a log file. Additionally all changes which are relevant for data integrity, manipulation or access control are documented in this log file as well. The audit trail is not available in Non Storage Mode (see Chapter 15.7).

The following operations, including the respective warnings which appear in the diagnosis window, are documented in the audit trail:

- Measurements with result and settings
- Toolmaster connect and disconnect
- Successful or rejected adjustments and passed or failed checks.
- Resetting of current adjustment to factory adjustment.
- Exceeding of adjustment intervals and check intervals.

- User logon and logoff
- Changes of user accounts (creating, editing, activating, deactivating, deleting, changing a password).
- Saving and restoring of parameter settings and configurations.
- Deletion of measured data (number of deleted measuring data and corresponding unique sample ID).
- Changes in the instrument software, module firmware and operating system.
- Activation or deactivation of the audit trail function and exporting/deletion of audit trail entries.
- Changes to the instrument date and time.

If you are working under quality management (QM) regulations like GLP/GMP or 21 CFR part 11, we recommend you to set your security level to 21 CFR part 11 or a user-defined security level where audit trail is active. Export the audit trail data in regular intervals and store the data in a safe place.

To activate/deactivate the audit trail function

There are two ways to activate the audit trail function:

- You can set the security level to "21 CFR Part 11" (see Chapter 15.1) and the audit trail will be activated automatically.
- You can activate the audit trail function within your user-defined security mode.

1. Tap <Menu> and select **"Setup > System Security > Audit Trail"** to open the "Audit Trail Settings" dialog.
2. Activate/deactivate the audit trail using the check box "Audit Trail active".
3. Activate/deactivate the "Audit Trail Backup Reminder", define the time span and tap <OK>.

TIP *When the audit trail is activated, any auto logon that was assigned to a user is automatically deactivated and the function is no longer accessible.*

To view, print or export the audit trail

The audit trail list can store up to 999 entries. Make sure to regularly export and delete the audit trail data.

1. Tap <Menu> and select **"Data Memory > Audit Trail Data"** to open the audit trail list.
2. Tap on a list item to see more detailed information.

3. To perform a printout on paper or to a PDF file or to export the data as an MS Excel or text file tap <More> and <Export>. Then follow the instructions on the screen.

To delete the audit trail entries

1. Tap <Menu> and select **"Data Memory > Audit Trail Data"**.

2. Tap <More>, <Delete> and <OK>.

Only the audit trail entries, that have already been exported are deleted. For data safety reasons, it is not possible to delete audit trail entries that have not been exported before.

15.6 Electronic Signature

Electronic signatures can be classified as ordinary manual signatures helping to verify the authenticity of electronic data in regulated process environments. This feature is available for MCP 150 only.

TIP *The export of data to a LIMS (see Chapter 18.3) does not work with electronic signature activated.*

Roles for the electronic signature

Depending on importance or impact, different signing roles can be assigned to a user. According to common regulations, you can choose between three different roles: submitter, reviewer or approver.

Once the electronic signature function has been activated, a sample can be signed as positive or negative by the submitter, followed by the reviewer and ultimately by the approver. If a user of a higher level signs first, the signing statuses of the lower levels are set accordingly to the evaluation of this higher level user.

Example: If a sample is signed as positive by the approver prior to a submitter or reviewer, the signing states of submitter and reviewer are also set as positive consequently.

Signing status

With the electronic signature activated, three boxes appear in the first column of the data table in the multiple sample view next to the sample error state icon. The boxes illustrate the signing states of submitter (bottom box), reviewer (middle box) and approver (top box):

- gray box: not signed yet
- green box: signed as positive
- red box: signed as negative

To set the electronic signature

1. Tap <Menu> and select **"Menu > Setup > System Security > Electronic Signature"**.
2. Use the "Electronic Signature" check box to activate or deactivate the electronic signature.
3. If a password is required during the signing process, use the second check box to activate a password inquiry.
4. Tap <OK>.

To assign the role for the electronic signature

1. Tap <Menu> and select **"Setup > User Management > User Management"**.
2. Select the user to whom an electronic signature role shall be assigned to.
3. Use the submenu to specify the "Role for Electronic Signature".
4. If required enter a name for the user who executes the electronic signature.
5. Tap <OK>.

To execute the electronic signature for a sample

Only the user who carried out the measurement is allowed to sign the corresponding sample as the submitter.

NOTICE *Once you have executed an electronic signature, you can no longer change the signing state of the respective sample.*

1. Tap <Menu> and select **"Data Memory > Measurement Data > Measured Data"**.
2. Select the sample to be signed.
3. Tap on the corresponding signing role button.
4. If needed, add a comment using the input field.
5. Enter your password if requested.
6. Assess the sample by tapping <Sign negative> or <Sign positive>.
7. If you want to print or export your results including signing state and respective comments, tap <Print or Export>.

15.7 Non Storage Mode

To reduce efforts for instrument validation and qualification in lab environments your instrument offers a "Non Storage Mode", that conforms to the United States Pharmacopoeia 1058 CAT-B. In this mode the data memory is not available. The instrument does not store any measurements, checks or adjustments. Also an audit trail is not generated.

As consequence the results have to be either written down manually or exported directly after every single measurement, check or adjustment. The export of results can be automatized (see Chapter 14.5).

After restart in Non Storage Mode a message in the quick access bar reminds you to confirm an export method (see Chapter 14.5). To avoid measurement data loss the error message only disappears after confirmation of the export method.

Non Storage Mode features

- Operation without data memory.
- Reduced menu tree (see footnotes in Appendix C). Users belonging to the group "Operator" don’t see a menu tree at all. A popup window allows them to set the display brightness and their own password.
- Simplified system security.

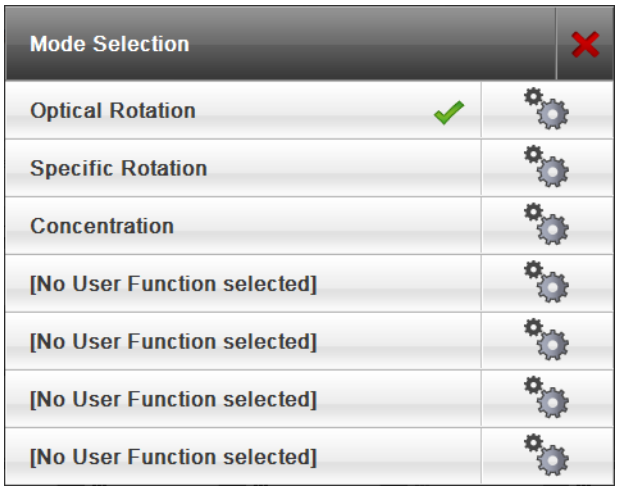
To activate or deactivate the Non Storage Mode

1. Tap <Menu> and select **"Setup > System Security > Non Storage Mode"**.
2. Use the check box to activate or deactivate the Non Storage Mode.
3. Tap <OK> and follow the instructions on the screen.
4. The instrument reboots.

16 User Functions

Additionally to the three MCP 100 standard measuring modes Optical Rotation, Specific Rotation and Concentration the MCP 150 offers four slots in the mode selection window for programmable user functions. With these user functions you can automatically calculate quantities of your interest from the output values of your instrument.

Fig. 16 - 1 Mode selection window MCP 150



16.1 Linear Functions, Polynomials and Formulas

The MCP 150 offers three types of user functions: linear functions, polynomials and formulas. For the calculated quantities, you have the same options for display, printout and export as for standard measurement results.

Examples:

- Calculate the concentration of binary mixtures.
- Convert your results into a unit which is not supported in the standard instrument configuration.

Cascading user functions

You can freely use the output value of one user function as the input variable for another user function independently of the types of user functions involved. The instrument software automatically checks for circularity of the formula system.

16.1.1 Programming Linear Functions

The general formula for a linear function is:

$$f(x) = factor \cdot x + offset$$

x selected input quantity
f(x)calculated output quantity

1. Tap <Switch Mode> to open the mode selection window.
2. Tap the settings icon <  > located next to the user function.
3. Tap <Manage User Functions>.
4. Tap <New> to enter a new function or select an existing function. Perform the following settings:

   - Enter a "Name" for the linear function (up to 50 characters long).
   - Enter the "Unit" to be displayed.
   - Use the menu "Function Type" to select "Linear Function".
   - Use the menu "Inputs" to define the input quantity.
   - Use the menu "Outputs" to enter "Offset" and "Factor" of your linear function.
   - Enter a comment to describe this user function. This comment will not be printed, exported or displayed anywhere but is only an internal description of your user function.
   - Activate/deactivate the check box "Protect function against changes by other users".

5. Tap <Apply> to close the function settings window.

16.1.2 Programming Formulas

1. Tap <Switch Mode> to open the mode selection window.

2. Tap the settings icon <  > located next to the user function.

3. Tap <Manage User Functions>.

4. Tap <New> to enter a new function or select an existing function. Perform the following settings:

   - Enter a "Name" for the formula (up to 50 characters long).
   - Enter the "Unit" to be displayed.
   - Use the menu "Function Type" to select "Formula".
   - Use the menu "Inputs" to define the input quantity.
   - Use the menu "Outputs" to enter your formula. The following formula elements are allowed:
     - Brackets: ()
     - Operators: + - / * ^
     - Functions: log(), ln(), sqrt(), sin(), cos(), tan(), asin(), acos(), atan()
     - Constants
   - Enter a comment to describe this user function. This comment will not be printed, exported or displayed anywhere but is only an internal description of your user function.
   - Activate/deactivate the check box "Protect function against changes by other users".

5. Tap <Apply> to close the function settings window.

16.1.3 Programming Polynomials

The general formula for a polynomial is:

$$f(x) = Coeff.0 + Coeff.1 \cdot x + Coeff.2 \cdot x^2 + Coeff.3 \cdot x^3 + Coeff.4 \cdot x^4 + Coeff.5 \cdot x^5 + Coeff.6 \cdot x^6$$

x ..... selected input quantity
f(x) ... calculated output quantity

1. Tap <Switch Mode> to open the mode selection window.
2. Tap the settings icon <  > located next to the user function.
3. Tap <Manage User Functions>.
4. Tap <New> to enter a new function or select an existing function. Perform the following settings:
   - Enter a "Name" for the polynomial (up to 50 characters long).
   - Enter the "Unit" to be displayed.
   - Use the menu "Function Type" to select "Polynomial".
   - Use the menu "Inputs" to define the input quantity.
   - Use the menu "Outputs" to enter the polynomial coefficients. If you do not enter a value for a coefficient, the coefficient will be set to zero.
   - Enter a comment to describe this user function. This comment will not be printed, exported or displayed anywhere but is only an internal description of your user function.
   - Activate/deactivate the check box "Protect function against changes by other users".
5. Tap <Apply> to close the function settings window.

16.1.4 Copying, Exporting and Deleting User Functions

1. Tap <Switch Mode> to open the mode selection window.
2. Tap the settings icon <  > located next to the user function.
3. Tap <Manage User Functions>
4. Tap <more> and copy, export (print) or delete.
5. Follow the instructions on the screen.

16.1.5 Assigning and Selecting User Functions

After defining a user function (see previous chapters) you can assign it to a slot in the mode selection window.

1. Tap <Switch Mode> to open the mode selection window.
2. Tap the settings icon <  > located next to the user function.
3. Perform the following settings:

   - Select a user function.
   - Select the number of displayed digits.
   - Activate a user-defined data field to assign additional information to your samples. Typical examples are a filling line number, tank number or batch identification.
   - Define whether it is mandatory to enter a sample name or content for user-defined data field for each measurement. If active a measurement can only be started after filling in the mandatory data fields.

4. Tap <OK>.

Now you can simply select the function from the main menu after tapping <Switch Mode>.

17 Updates and System Information

In this chapter, you can find information about service software features such as performing an instrument software upgrade, getting details about the system and viewing the live raw data as well as information about how to check the status of the drying cartridge.

17.1 Updating the instrument software

Perform a system update to set up the instrument with the new features of the latest instrument software version containing the module firmware.

NOTICE

- *Before updating the software, contact your Anton Paar representative as an update can possibly affect settings concerning data transfer and interfaces.*
- *To update the system, you need administrator rights with activated auto logon function, see Chapter 11, or the administrator must log on and perform the update. It is not possible to downgrade the system to an older version.*

TIP *Before starting the system update, export or print relevant measurement data, see Chapter 14, and create a backup file of the instrument settings, see Chapter 17.4.*

To update the instrument software

1. Load the latest software (file name extension ".aup") onto your USB memory device.
2. Insert the memory device into a USB port on the left side of your instrument.
3. Tap <Menu> and select **"Service > Update > System Update"**.
4. Select the "storage location" (USB memory device) and the "file name" of the new firmware (file name extension ".aup").
5. Tap <OK>.
6. Follow the instructions on the screen.

17.2 System Information

In this menu, you find information about the configuration of the hardware and the firmware. The instrument type, serial number and firmware versions are shown in a table.

In this menu, you can also save an instrument log file to a USB memory device. This file contains the last operating steps and may help during trouble shooting.

To view the system information

1. Tap <Menu> and select **"Service > System Information"** to open the configuration overview table.
2. Use the vertical scrollbar to scroll through the table.

17.3 Saving the Instrument Log File

A log file contains important activities of the instrument software. In case of a malfunction this log file can help the software engineers to solve a problem.

To save an instrument log file

1. Tap <Menu> and select **"Service > System Information"** to open the configuration overview table.
2. Tap <Save Logfile> and select a storage location.
3. Accept the automatically generated file name or enter a new one and tap <OK>.

If you use a USB flash drive, the instrument log file will be saved to the root directory.

17.4 Backup of Instrument Settings

You can use the backup and restore function for:

- Saving the current instrument status in case settings are changed accidentally.
- Saving the current settings for safety reasons before performing a software upgrade.
- Copying the instrument settings to other MCP 100/150 polarimeters.

A backup file contains all instrument settings, measurement and check data except audit trail data.

To make a backup of the instrument settings

1. Tap <Menu> and select **"Service > Backup"**.
2. Select the "storage location" (USB flash memory or FTP server) and enter a file name or accept the automatic file name.
3. Tap <OK>. The backup file is stored in the root directory of your USB flash drive or onto the FTP server.

17.5 Restore the Instrument Settings

NOTICE

- *When restoring the instrument settings, make sure that the backup file corresponds with the instrument type.*
- *The audit trail is not restored*
- *A restore in the "Non Storage Mode" (see Chapter 15.7) recovers all instrument settings, but no measurement data, check data and audit trail data. A backup file saved in "Non Storage Mode" doesn't contain any data either.*

1. Tap <Menu> and select **"Service > Restore"** to open the "Restore" dialog.
2. Select the "storage location" (USB flash memory) and the "file name". The backup file must be stored in the root directory of your USB flash drive.
3. Tap <OK > to restore the settings.

17.6 Live Raw Data

In this menu, you get a live view of sensor signals including raw data.

1. Tap <Menu> and select **"Service > Live Raw Data"**.

17.7 Download Documents

In this menu, you can save the manual and release notes to USB flash memory.

1. Connect a USB flash memory to one of the USB ports.
2. Tap <Menu> and select **"Service > Download Documents"**.
3. Tap <OK>.

17.8 Non-Toolmaster Quartz Check

The non-Toolmaster quartz check allows you to test the instrument with quartz plates lacking a Toolmaster function (see Chapter 12.2). As consequence the instrument has no information about the current temperature of the quartz plate. The temperature control of the instrument is disabled and the current quartz temperature has to be entered manually during the check.

Performing a non-Toolmaster quartz check

1. Tap <Menu> and select **"Service > Non-Toolmaster Quartz Check"**.
2. Remove the quartz plate or the sample cell from the instrument.

3. After the set zero process enter:

   - Name or ID of the quartz plate
   - Certified optical rotation
   - Certified temperature
   - Current temperature of the quartz plate

4. Insert the quartz plate.

5. When the instrument finished measuring you can check the results.

18 Communication with External PC

18.1 Connecting to an External PC via LAN

If you connect the instrument to your local network, you can use a network printer for printouts or request the instrument system information and instruction manual via any PC in the network.

To configure a network connection

1. Tap <Menu> and select **"Setup > Control Panel > Network"**.
2. If your network server has DHCP functionality, activate "Obtain an IP address automatically (DHCP)".
3. If your network server has no DHCP functionality, deactivate "Obtain an IP address automatically (DHCP)" and enter "IP Address", "Subnet Mask", "Default Gateway", "Primary DNS" and "Secondary DNS".
4. Tap <OK>.

To request the instruments system information via LAN

1. Open an internet browser on a PC that is connected to your local network.
2. Enter the IP address of your instrument in the address field of the browser and press the Enter.
3. Now the system information of your instrument is displayed together with a download link for the PDF file of the instruction manual.

18.2 Connecting to FTP Servers

The MCP 100/150 allows you to export your measuring data directly to a connected PC or server via file transfer protocol FTP. Also an automatic export to the FTP server is possible.

To configure an FTP connection

1. Install an FTP-server of your choice (for example Filezilla) on your PC or your server.
2. Tap <Menu> and select **"Setup > Export Settings > FTP Locations"**.
3. Tap <More> and <New> to create a new FTP connection.
4. Enter a name of your choice in the field "Name".
5. Enter the IP address or the URL of the server in the field "FTP Server Path".

6. Enter the user name you created earlier on the FTP server into the field "Username" (case-sensitive).
7. Enter the password of the FTP user, if one was defined on the FTP server.
8. Tap <OK>.

To export measured data to an FTP server see Chapter 14.

18.3 Connecting to LIMS

The MCP 150 can be connected to a Laboratory Information Management System (LIMS) using the Anton Paar software LIMS Bridge. This function is not available for MCP 100. LIMS Bridge can be used to send remote measurement commands from the LIMS to the instrument and to forward result files from the instrument to the LIMS.

The activation of the LIMS mode also allows you to use the Anton Paar SignApp available in the iOS and Android app stores.

To set the LIMS mode

1. Tap <Menu> and select **"Setup > Measuring System Settings > LIMS Settings"**.
2. Activate/deactivate the check box"Run LIMS Server on Startup".
3. Select the "LIMS Measurement Report Format" in compact or detail.
4. Tap <OK> twice. The instrument will reboot.

TIP *The export of data to a LIMS does not work with electronic signature activated. To deactivate the electronic signature see Chapter 15.6.*

For more details, see the LIMS Bridge instruction manual.

18.4 Connecting via RS-232

If you want to connect MCP 100/150 via RS-232 to a PC you have to use a suitable RS-232 null modem cable (e.g. Anton Paar Mat. No. 70429).

Table 18.1: Simple RS-232 null modem cable for MCP 100/150

Connector D-sub, 9 pins, female	Connector D-sub, 9 pins, female
2	3
3	2
5	5

Connecting the RS-232 cable

1. Connect the RS-232 cable to the RS-232 connector at the rear of MCP 100/150.
2. Connect the other end of the RS-232 cable to your PC.

   If you have no RS-232 connector at your PC, it is also possible to use a USB/RS-232 converter.

TIP *If you have defined an RS-232 printer, make sure that you do not print anything (manually or automatically) while using the RS-232 interface for data transfer to a PC. Otherwise, there will be a conflict with the RS-232 printer and both the printout and data transfer will fail.*

Required RS-232 settings

- Baud rate: 9600
- Data bits: 8
- Parity: none
- Stop bits: 1
- Handshaking:none

Output format

- Language:always English
- Decimal separator:(dot)
- Column separator:(semicolon)
- Line end:CR

18.5 RS-232 Interface Commands

Commands can be written with or without blanks between the words, for example both "getdata" and "get data" are valid commands.

The encoding is according to the 8-bit ANSI code page 850. This means that strings with special characters can only be converted with a loss of information. A "?" (question mark) will be used for characters which cannot be encoded.

TIP *If mandatory fields are active, they are ignored by the RS-232 commands. A measurement can be started without filling out the mandatory fields.*

The following interface commands are available to operate the instrument:

Table 18.2: List of RS-232 interface commands

Command	Description
start	Starts a measurement.
abort	Aborts a measurement.
finished	Returns the status of the measurement.
set zero	Starts set zero.
status set zero	Returns the set zero status.
get raw data	Returns the current raw data values for optical rotation, sample temperature and set temperature.The start of a measurement is not required.
get data	Returns the result values of the last finished measurement (if the instrument is not in monitor mode again).
get data head	Gets meta data of the last measured sample. The meta data contains the names of the output quantities.
get data unit	Gets unit data of the output quantities of the last measured sample. For each output quantity the unit is returned.
set temperature xx	Sets the temperature to the given value (xx in [°C]). This command is only allowed, if no measurement is in progress.
set concentration xxx.xxx	Sets the concentration value used for the specific rotation mode.
set specific rotation xxxx	Sets the specific rotation value used for the concentration mode.
set sample name x	Sets the sample name for the next measurement.
set user defined field x	Sets the user defined field for the next measurement.
get user defined field name	Gets the name (not the content!) of the user defined field.
set mode x	Sets the measuring mode
get mode	Gets the selected measuring mode
help	Returns a list of the available RS-232 interface commands.

The following table lists the responses of the instrument to commands given via RS-232 interface.

Table 18.3: RS-232 commands and responses

Command	Response	Description
start	measurement started	The measurement was started.
	no toolmaster connected	No sample cell was inserted.
abort	measurement aborted	The measurement was aborted.
	measurement not started	No measurement was started.
	already aborting	Measurement already being aborted.
finished	measurement not started	No measurement has yet been started.
	measurement not finished	The measurement is in progress.
	measurement finished	The measurement was finished.
set zero	set zero started	Command set zero accepted.
	set zero already started	Set zero was already started before
status set zero	set zero is running	Status response
	set zero is finished	
get raw data	6.876;19.8;20.0	Current raw data values for optical rotation, sample temperature and set temperature (no measurement required).
get data	05/27/2014 - 11:56 AM; Operator; Liquid34a;Ok; Optical Rotation; 6.876;---; 22.3; 100.00	Result values of the last measurement, example response. Only if the instrument is not in monitor mode again.
	measurement not started	No measurement has been started. Instrument is in monitor mode.
	measurement not finished	The measurement is in progress.
get data head	Date;Username;Sample Name; Sample State;Measurement Mode; Measured Value;Set Temperature; Temperature;Cell Length	Data head: names of output quantities, example response.
get data unit	;;;;;°;°C;°C;mm	Data unit, example response.
set temperature xx	accepted	Sets the temperature control: • "20" or "25" for °C • "68" or "77" for °F • "293" or "298" for Kelvin • "--", "off" or "none" to switch the temperature control off.
	invalid parameter	The given value was not accepted

Command	Response	Description
set concentration xxxx,xxx	accepted	Sets Concentration value to xxx.xxx
	Concentration must be between 0.001 g/100ml and 100 g/100ml	Value xxxx.xxx is out of limits (depends on chosen unit for).
set specific rotation xxxx.xxx	accepted	Sets Specific Rotation to xxxx.xxx
	Specific Rotation must be between -1000 and 1000	Value xxxx.xxx is out of limits.
set sample name x	accepted	Sets the sample name for the next measurement.
	parameter may not be longer than 50 characters	The sample name x was too long.
set user defined field x	accepted	Sets the User Defined Field content for the next measurement to x.
	User Defined Field not active	The User Defined Field is inactive.
get user defined field name	Batch No.	Example response. Gets the name of the user defined field, not its content.
	User Defined Field not active	The User Defined Field is inactive.
set mode x	accepted	Sets the measuring mode: • "0" or "Optical Rotation" • "1" or "Specific Rotation" • "2" or "Concentration"
	invalid parameter	Unknown measuring mode.
get mode	Specific Rotation	Returns the active measuring mode.
	Optical Rotation	
	Concentration	
help	start - Starts a measurememt abort - Aborts a measurememt finished - Indicates if ...	Lists available commands.

19 Upkeep and Cleaning

To assure a constant and high accuracy of your measurements, establish a regular and effective cleaning routine and store the instrument under the recommended conditions.

WARNING
Before applying any cleaning liquid onto your instrument or before filling any sample or cleaning liquid into your sample cell make sure that:

- All safety instructions concerning the use of chemicals and the use of inflammable chemicals are met (see Chapter 2).
- The fire point of the liquid in use is higher than 97 °C (25 °C above the maximum temperature of the Peltier module which is 72 °C).
- No source of ignition exists close to the instrument.
- Sufficient ventilation is guaranteed.
- All wetted parts are resistant to the substances in use (see Appendix A).

NOTICE *To protect the surface of your instrument never use:*

- *highly nonpolar solvents (e.g. toluene, hexane, solvent naphta)*
- *strong acids or bases (e.g. nitric acid, sulfuric acid, hydrochloric acid, caustic soda)*
- *strong mechanical action (steel brush).*

19.1 Cleaning the Instrument Housing

To clean the instrument housing or the touchscreen, use a soft tissue that can be moistened with an ethanol water mix or warm water, if necessary with some mild cleaning agent added (pH < 10).

Cleaning frequency for ventilation openings

All ventilation openings must be cleaned at least once a year with a vacuum cleaner. Reduce the vacuum power to avoid high fan speeds. Avoid touching the fan blades in order to protect the fan bearing and blades.

19.2 Cleaning and Drying Sample Cells

Cleaning frequency

Clean and dry the measuring cell at least after each working day or working shift. Cleaning more frequently can become necessary when:

- You perform adjustments.
- You measure a sample that is not miscible with the previous sample (e.g. water after a petrochemical sample).
- You want to measure using a minimum sample amount.
- You measure a sample that could chemically react with the previous sample.
- The cell windows are dirty.

Cleaning liquids

For cleaning and drying, employ two cleaning liquids:

- Cleaning liquid 1 dissolves and removes sample residues in the measuring cell. It has to be a good solvent for all sample components.
- Cleaning liquid 2 removes cleaning liquid 1 and is easily evaporated by a stream of dry air in order to accelerate drying of the cell. Cleaning liquid 2 has to be a good solvent for cleaning liquid 1.

Recommended for aqueous samples: Water (cleaning liquid 1) and ethanol (cleaning liquid 2).

Recommended for chemical samples: Ethanol (cleaning liquid 1) and acetone (cleaning liquid 2).

If you are not sure if a cleaning liquid is suitable for your sample, perform a preliminary test in a test tube to see if any phase separation, precipitate or opalescence can be observed.

To perform a cleaning and drying procedure

1. Rinse the sample cell with cleaning liquid 1 (minimum 50 mL). If your sample is viscous or contains particles, use a cleaning brush.
2. Empty the sample cell.
3. Rinse the sample cell with cleaning liquid 2 (minimum 20 mL).
4. Empty the sample cell.
5. Dry the sample cell with clean and oil free compressed air.
6. Check if the windows are clean.

To clean the sample cell windows

1. Remove the screw caps.
2. Remove the rubber washers.
3. Remove the windows (and exchange them if necessary).
4. Clean the windows by using cleaning liquid 1 first and then cleaning liquid 2.
5. Clean the sample cell using a brush.
6. Reassemble the sample cell.

TIP *The rubber washers have no gasket function! The windows are in direct contact to the sample cell in order to guarantee the proper optical length, e.g. 100.0 mm. The rubber washer's only function is to equally distribute the contact pressure from the screw cap to the window.*

19.3 Cleaning the Sample Cell Compartment

Cleaning frequency

How often the device should be cleaned depends on the usage and the environment. Residues in the cell holder and the Toolmaster base station may reduce the contact with the sample cell. As a consequence temperature control of the sample may be impaired. With extreme build up of residues even the path of light through the sample could be affected.

To ensure that the inserted sample cell or quartz control plate contacts the entire surface, take care that the cell holder is clean and free of any residues. Cleaning of the sample cell compartment is usually only necessary when:

- Sample is spilled.
- The sample hose slips off the hose connector of a filled cell.
- Liquids crystallize in the sample cell compartment.

Cleaning liquids

To clean the sample cell compartment use cleaning liquid 1 and cleaning liquid 2 (see Chapter 19.2).

TIP *Don't touch or contaminate the windows when cleaning the sample cell compartment.*

19.4 Cleaning the Cell Compartment Windows

Contaminants on the cell compartment windows like dust, skin oils or sample residues scatter the light and can therefore impair the measuring result. The path of the measuring beam has to be kept clean in any circumstance. Dust and loose contaminants should be blown off first, before you use other cleaning methods. Air from a can with inert dusting gas or a bulb blower is recommended.

NOTICE *To protect the* cell compartment windows*:*

- *Never clean if not contaminated.*
- *Never use dry or abrasive wipes.*
- *Never use abrasive cleaning agents.*
- *Never use strong mechanical action.*

If blowing off the surfaces of the glasses is not sufficient, they have to be cleaned with a wipe. Acceptable wipes are cotton swabs or lens cleaning tissues. Never use a dry wipe. Moisten it moderately with a solvent, preferably isopropyl alcohol or acetone of optical grade. Clean from the center of the glass to the outside in a spiral movement.

Fig. 19 - 1 Clean the compartment windows beginning from the center in a spiral movement outwards

19.5 Drying Cartridge

A drying cartridge in the rear of the instrument protects the optical system from moisture. The cartridge is equipped with a humidity indicator behind the window in the center. This allows you to check the status of the cartridge without the need to remove it.

NOTICE

- *Check the status of the drying cartridge at least once a year.*
- *Don't exchange the cartridge unless it needs exchanging.*
- *Always install a drying cartridge. An unsealed optical system might result in damage to the instrument.*

When the desiccant in the cartridge saturates with moisture, the indicator changes its color from blue to pale pink. If the blue color disappears and the indicator begins to show a tinge of pink, the cartridge must be replaced:

Fig. 19 - 1 Humidity indicator of drying cartridge

1. Dry, new cartridge
2. Replace
3. Saturated, replace immediately

To replace a drying cartridge

1. Unscrew the old cartridge counterclockwise using the transparent, protective cap of the new cartridge as a screwdriver.
2. Remove any residue around the threaded hole of the housing.
3. Check the correct position of the gasket of the fresh cartridge.
4. Screw the cartridge into the hole.

20 Maintenance and Repair

20.1 Warranty

To keep the warranty[1] on the instrument valid, observe the instructions given in section 19, "Upkeep and Cleaning".

The instrument does not require any periodic maintenance by Anton Paar service engineers to retain the warranty.

The following wear and tear parts are generally excluded from the warranty:

- Drying cartridge
- Fuses
- Hoses in direct contact with sample (if applicable, depending on sample cell type)
- Glasses (sample cell windows)
- Rubber washers (between sample cell windows and screw cap)
- O-rings in direct contact with sample (if applicable, i.e. in sample cells)
- Fluid connectors in direct contact with sample (if applicable, i.e. UNC or Luer connectors for sample cells)
- Button cell (real-time clock)

The real-time clock of the device is powered by an internal lithium button cell while the device is switched off. When the button cell is depleted, the real-time clock sets the date of the instrument to January 1, 2000 on start-up. If date and time are not set manually, incorrect time stamps will be written to reports.

To ensure continuous operation, it is recommended to replace the button cell every five years as a preventive measure. Contact your local Anton Paar representative for a replacement of the button cell.

20.2 Repair Performed by an Authorized Anton Paar Representative

In case your instrument needs repair, contact your local Anton Paar representative, who will take care of the necessary steps. If your instrument needs to be returned, request an RMA (Return Material Authorization Number). It must not be sent without the RMA and the filled “Safety Declaration for Instrument Repairs”. Please make sure it is cleaned before return.

TIP *Find the contact data of your local Anton Paar representative on the Anton Paar website (http://www.anton-paar.com) under “Contact”.*

1. *For detailed information please see the general terms of delivery (GTD) on the Anton Paar website (http://www.anton-paar.com).*

Appendix A: Technical Data

Table A.1: General Technical Data of MCP 100/150

Dimensions (L x W x H)	370 mm x 320 mm x 130 mm
Weight	8.6 kg (19 lbs) incl. power supply
Mains voltage	From 100 VAC to 240 VAC, 50/60 Hz
Power consumption	Typical 70 VA, max. 120 VA
Power inlet	According to IEC/EN 60320-1/C14, protection class I
AC adapter output	DC 24 V, max. 5 A
Housing material	
Front, top and side cover	Styrene/Butadiene
Back, bottom	Stainless Steel
Environmental conditions (EN 61010)	Indoor use only
Operating altitude	Up to 2.000 m above sea level
Ambient temperature	From 15 °C to 35 °C (from 59 °F to 95 °F)
Air humidity	Operation: 20 % to 80 % RH, non-condensing Storage: 10 % to 90 % RH, non-condensing
Pollution degree	2
Over-voltage category	II
Light source	LED, average lifetime of 100 000 h
Wavelength	589 nm
Touchscreen display	145 mm (5.7"), 640 x 480 pixel
Memory	• 2500 measuring values
Interfaces	• 3 x USB 2.0 • 1 x USB Type B for service • 1 x Ethernet (100 Mbit) • 1 x RS-232 • 1 x CAN out • 1 x CAN in

NOTICE

- *Only connect devices to the interfaces that comply with PELV (protective extra-low voltage) according to EN 61140 or with SELV (safety extra-low voltage) according to EN 60950.*
- *Connect only Anton Paar equipment or equipment with a maximum power consumption of 250 mA to the CAN interface.*
- *Only connect USB devices with a maximum current load of 250 mA to the USB ports.*

Measuring Performance

Table A.2: Measuring Performance of MCP 100/150

	MCP 100	MCP 150
Measuring range	±89.9 °OR (Optical Rotation)	
Resolution	0.001 °OR	
Accuracy	±0.01 °OR	±0.004 °OR
Repeatability	±0.01 °OR	±0.004 °OR
Sample cell volume	From 200 µL to10 mL	
Optical cell length	From 2.5 mm to 100 mm	
Peltier temperature control	20 °C, 25 °C and disabled	From 15 °C to 35 °C * and disabled
Temperature accuracy	±0.2 °C	±0.1 °C
Optical wavelength	589 nm	
Transmission, optical density	Up to 2.0 OD	

* At standard laboratory conditions (ambient temperature of 23 °C)

Wetted Parts

The following parts are in contact with samples and cleaning liquids during normal operation.

Table A.3: Wetted parts of sample cells

Sample cell parts	Material
Sample cell	Stainless steel or Ni-Alloy
Sample cell windows	Borosilicate glass
Luer adpater	Ethylene tetrafluoroethylene (ETFE)

The following parts of the instrument may come in contact with samples and cleaning liquids if the sample/liquid is spilled or if the sample cell is leaking.

Table A.4: Wetted parts of MCP 100/150

MCP 100/150 parts	Material
Toolmaster base station	Polychlorotrifluoroethene (PCTFE)
Gasket of Toolmaster base station	Perfluoroelastomer (FFKM)
Sample cell holder	Aluminum anodized
Sample cell compartment windows	Borosilicate glass
Window gaskets	Perfluoroelastomer (FFKM)
Sample cell compartment mid-frame	Polyoxymethylene black (POM)
Gasket between sample cell holder and mid-frame	Fluoroelastomer (FKM)
Sample cell compartment top-frame	Aluminum anodized
Gasket between mid-frame and top-frame	Fluoroelastomer (FKM)

Appendix B: Software versions

Instrument software *	Date of release	Document number
V1.00 (MCP 100)	25.03.2014	D02IB011EN-A
V1.10 (MCP 100)	06.06.2014	D02IB011EN-B
V1.50 (MCP 100/150)	29.05.2015	D02IB011EN-G

* Please refer to the corresponding release notes

Appendix C: Menu Tree

The menu tree shows which parts of the menu are accessible for users with administrator, manager or operator rights using the following colors:

Operator, Manager and Administrator
Administrator and Manager
Administrator only

Table C.1: Menu Tree of MCP 100/150

Level 1	Level 2	Level 3
Adjustments	Quartz Adjustment	
	Reset to Factory Adjustment	
Data Memory[a)]	Measurement Data	
	Check Data	
	Adjustment Data	
	Audit Trail Data	
Setup	Measuring System Settings	LIMS Settings[b)]
		Unit Settings
		Formatting Settings
	Control Panel	Date and Time
		Regional Settings
		Network
		Instrument Name and Location
		Display Brightness
		Sound Settings
		Screen Saver
	System Security	Security Level[a)]
		Audit Trail[a)]
		Electronic Signature[b)]
		Logon Settings
		Increased Security
		Advanced Security[a)]
		Non Storage Mode
	User Management	User Management[b)]
		User Group Administration[b)]
	Export Settings	Exporter Management
		FTP Locations
		Automatic Export
		Name and Address
		Select Logos
		Import Logos
Service	Update	System Update
	System Information	Save Logfile
	Backup	
	Restore	
	Live Raw Data	
	Download Documents	
	Non-Toolmaster Quartz Check	

a) Disabled in Non Storage Mode, see Chapter 15.7
b) MCP 150 only

Table C.2: Main Screen Options

Level 1	Level 2	Level 3
Menu (see Table C.1)		
Measurement Data[a)]		
Switch Mode	Optical Rotation	Settings
	Specific Rotation	Settings
	Concentration	Settings
	User Functions[b)]	Settings
Export[a)]		
Start / Cancel Measurement		
Quick Access Bar	Message List	Delete Messages
	Checks	Execute Quartz Check
		Execute Custom Check
	Set Zero	
	Monitor Mode	
Input Fields	Set Temperature	
	Edit Sample Name	
	Edit User Defined Field	
	Edit Concentration	
	Edit Specific Rotation	

a) Disabled in Non Storage Mode, see Chapter 15.7
b) MCP 150 only

Appendix D: CE Declaration

EU DECLARATION OF CONFORMITY

Anton Paar

1. Radio equipment (type number): MCP 100 (143911)
   MCP 150 (160796)

2. Name and address of the manufacturer: Anton Paar OptoTec GmbH
   Lise-Meitner-Str. 6
   30926 Seelze-Letter
   Germany

3. This declaration of conformity is issued under the sole responsibility of the manufacturer.

4. Object of the declaration: Modular Compact Circular Polarimeter

5. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

   2014/53/EU (RED) (OJ L 153, 22.05.2014, p. 62 - 106)

   Other Union harmonisation legislation:

   2014/30/EU (EMC) (OJ L 96, 29.03.2014, p. 79 - 106)
   2014/35/EU (LVD) (OJ L 96, 29.03.2014, p. 357 - 374)
   2011/65/EU (RoHS) (OJ L 174, 01.07.2011, p. 88 - 110)

6. References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:

   EN 300 330 V2.1.1
   EN 61326-1:2013
   EN 61010-1:2010+A1:2019+A1:2019/AC:2019
   EN IEC 61010-2-010:2020

7. Notified body / EU-type examination: Not applicable.

8. Description of accessories and components, including software, which allow the radio equipment to operate as intended and covered by the EU declaration of conformity:
   Sample cells and quartz control plates (reference standards), which are automatically recognized when inserted into the instrument and transmit data via RFID technology.

9. Signed for and on behalf of: Anton Paar OptoTec GmbH

Seelze-Letter, 07-May-2024

DocuSigned by:
N. Bertram
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Dr. Nils Bertram
General Manager

DocuSigned by:
Volker Baumann
5062C8BE440A436...

Volker Baumann
Head of Research and Dvelopment

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