Anton Paar

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

Galileo Galilei (1564-1642)

Sample Cells and Accessories

MCP 100

MCP 150/5100/5300/5500

MCP 5300/5500 Sucromat

Sample Cells and Accessories

MCP 100

MCP 150/5100/5300/5500

MCP 5300/5500 Sucromat

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1 MCP 100/150 Feature Matrix

The Modular Compact Polarimeter MCP 100/150 is the low entry level device. It differs from the MCP 5100/5300/5500 and Sucromat versions in regard to the following technical aspects.

General hardware differences to MCP 5100/5300/5500 + Sucromat:

1. Only one wavelength available, 589 nm
2. Max. sample cell length 100 mm
3. Upgrade with FillingCheck not possible
4. Toolmaster function, only temperature and sample path length data transfer

Differentiation

	MCP 100	MCP 150	MCP 5100	MCP 5300	MCP 5500
Methods / Modes	3 fix : optical rotation, specific rotation, concentration	Optical rotation, specific rotation, concentration, and user defined methods	Optical rotation, specific rotation, concentration, ISS, user defined methods	Optical rotation, specific rotation, concentration, ISS, user defined methods	Optical rotation, specific rotation, concentration, ISS, user defined methods
Wavelength (nm)	589 only	589	589 + optional	589 + optional	589 + optional
Max sample cell length (mm)	100	100	200	200	200
Modularity	no	no	yes	yes	yes
Toolmaster™	only wireless temperature	only wireless temperature	standard wireless	standard wireless	standard wireless
FillingCheck™	no	no	optional	optional	standard
User group administration	no	yes	yes	yes	yes
Electronic signature	no	yes	yes	yes	yes

2 MCP 5100/5300/5500 Feature Matrix

Depending on the model these MCPs are equipped with different standard features and options, such as, multiple wavelengths, FillingCheck or air pump (see below).



	MCP 5100	MCP 5300	MCP 5500 (MW 325)
MW option	(○)	(○)	(○)
Wireless Toolmaster	•	•	•
FillingCheck	(○)	(○)	•
Air pump	(○)	(○)	•
VNC connectivity module	(○)	•	•

• > Standard
(○) > Option

Peltier temperature control:
Fast and precise automatic temperature control without external water bath.

Toolmaster™:
Automatic identification of sample cells (check whether cell is suitable for selected measuring method) and quartz control plates for instrument check or adjustment, wireless transfer of reference data to the instrument.

FillingCheck™:
Live video of filling and sample condition inside cell for maximal security and data traceability and to avoid errors caused by bubbles or impurities.

Built - in air pump:
Air pump to discharge the sample from the cell, clean and dry the inside of the connected sample cell.

Multiple wavelengths option: (up to 8 wavelengths from 325 nm to 880 nm) can be added to the instrument according to the application requirements.

3 MCP Sucromat Feature Matrix

Differences between Sucromat and MCP:

MCP Sucromats do **not have a standard Peltier temperature control**, because sugar is generally measured with **temperature compensated scales**. That means, the temperature is only measured, not controlled, and the measured value is automatically corrected for the temperature difference to the standard temperature of 20 °C.

MCP 5300/5500 Sucromats are equipped with 589 nm, the upgrade with the second official ICUMSA wavelength of 880 nm is optionally available. The 880 nm in the **near-infrared** range is important for the measurement of dark samples, e.g. after lead-free clarification.

		
	MCP 5300 Sucromat	MCP 5500 Sucromat
MW option (880 nm)	(○)	(○)
Wireless Toolmaster	●	●
Peltier temperature control	(○)	(○)
FillingCheck	(○)	(○)
VNC connectivity	(○)	●

● > Standard
(○) > Option

4 Sample Cells for Your Application

Anton Paar offers a wide range of polarimeter sample cells for different sample volumes and properties as well as single-, mass-, and continuous screening of samples. Whatever the application, Anton Paar aims to provide the suitable cell.

MCP sample cells are equipped with wireless technology supporting the Toolmaster function. Cell identification and master data are automatically transferred into the instrument. The MCP automatically checks if the cell meets the selected measuring method settings. Live temperature data is also transmitted to the instrument. The cell is a passive and sealed component. It does not require any electrical power.

The sample cells are available in different path length, material and filling options for the different needs and recommendations.

Every Toolmaster sample cell is compliant to the recommendations of ICUMSA and standards of OIML as well as the Australian standard K157. For every sample cell a detailed protocol will be available which contains all information regarding the mechanical tolerances after the final production step and the cell material.

4.1 Sample Cell Types

Sample cells for the automatic Peltier temperature control

The temperature is the most influencing external parameter for the optical rotation measurement. For precise polarimetric measurements a stabilized sample temperature is important, especially if the sample has a high temperature coefficient in its optical rotation.

Therefore the automatic Peltier temperature control (standard for MCP 5100/5300/5500) in combination with a suitable sample cell provides maximum accuracy for the application. Only with sample cells designed for the use in the automatic Peltier temperature control the maximum temperature performance can be obtained.

Water jacketed sample cells

These sample cells are equipped with a water jacket for the connection to an external water bath (circulator). These sample cells provide an alternative if the instrument is not equipped with an automatic Peltier temperature control, as with the standard MCP Sucromat.

Temperature insulated sample cells

These sample cells with plastic coat are insulated to minimize influences of the ambient temperature. The insulated cells are used only in the sugar industry, were the polarimeter is working with the temperature compensated sugar scale (ISS TC). The built in temperature sensor transfers the measured sample temperature into the instrument and the software calculates the measured °Z value corrected to the reference value of 20 °C.

4.2 Sample Cell Properties

Sample volumes for all applications

Anton Paar sample cells come in different volumes. Depending on the length and inner diameter of the sample cell, the volumes range from 0,5 mL to 20 mL

In-/Outlet ports and flow-through mode for convenient use

Depending on the sample quantity, Anton Paar sample cells can be equipped with different filling ports: For small sample volumes, syringe inlet ports are available for most convenient filling. Larger sample volumes may easily be inserted through a filling funnel. In- and outlet ports can easily be fitted with tubes for a flow-through set-up and connection to a waste container or with a central drain. Flow-through operation depends on the sample properties (e.g. sufficiently low viscosity and adhesion to cell walls to avoid carryover).

Cell lengths for all sample properties and standards

The cell length has a linear influence on the measured optical rotation value: the longer the cell, the larger the measured value. At the same time, the reading should be within the measuring range of -89.9° to + 89.9° (i.e. all angles, for which an unambiguous result can be obtained by a polarimeter). Anton Paar offers a variety of different cell lengths between 2,5 mm and 200 mm, so that the optimal length can be chosen to make best possible use of the measuring range.

The maximal cell length may be limited by:

- the available sample volume (the shorter the cell, the smaller the volume)
- the darkness of the sample (the shorter the cell, the more transmission)
- a high specific rotation (optical rotation value outside measuring range)

In addition the cell length may be prescribed by a standard operating procedure (SOP), industry standard, or pharmacopoeia. In order to avoid errors, Anton Paar sample cells are manufactured to the corresponding accuracy according to OIML (Organisation Internationale de Metrologie Legale) class 0.01.

Intelligent sample cells with Toolmaster function have the nominal cell length, the actually measured cell length (nominal length +/-x µm) plus their thermal expansion coefficient stored in an internal chip. The instrument can thus correct for thermal expansion effects at temperatures other than 20 °C.

Inner diameters for optimal transmission and sample volume

The inner diameter determines both the light transmission (the larger, the better the signal) and the sample volume (the smaller, the smaller the volume). Different diameters are available for the optimal configuration for each sample, ranging from 1.2 mm to 8 mm.

4.3 Sample Cell Selection Criteria

When selecting a polarimeter cell, it should be as long as possible, but as short as necessary. Before selecting a sample cell, some general considerations should be taken into account:

- Longer polarimeter cells yield smaller errors: Sample residues or inhomogeneities will have less effect on the measurement than in shorter cells.
- The measured optical rotation is directly proportional to the optical path length (= polarimeter cell length). Therefore the longer the sample cell, the higher the measured optical rotation will be.
- Longer sample cells require more sample volume and more time for the temperature equilibration. If no temperature control is used, the temperature of large sample volumes is more stable than with small volumes.
- With increasing optical path length the transmission of the sample is reduced exponentially. Therefore it could be required to use a sample cell with shorter optical path length, e.g. when measuring dark colored samples with high light absorption.

4.4 Sample Cell Selection Table

<table>
<tr><td colspan="3">Choose the optical path length. Depending on your application: Is there an
• SOP (Standard Operating Procedure) or
• Official recommendation or standard?</td></tr>
<tr><td>Yes</td><td colspan="2">No</td></tr>
<tr><td rowspan="2">Optical path length according to standard:
• 2.5 mm to 200 mm available,
(max. 100 mm for MCP 100)</td><td colspan="2">Consider the Specific Rotation of the sample</td></tr>
<tr><td>Low Specific Rotation:
• Long optical path
(to maximize the measuring signal)</td><td>High Specific Rotation:
• Short optical path
(to keep the Optical Rotation within the measuring range)</td></tr>
<tr><td colspan="3">Consider the sample viscosity</td></tr>
<tr><td colspan="2">Viscous sample:
• Sample cell with filling funnel</td><td>Highly viscous sample:
• Sample cell with Luer connectors and large internal diameter</td></tr>
<tr><td colspan="3">Consider the available sample volume</td></tr>
<tr><td colspan="2">Small sample volume:
• Sample cell with Luer connectors
(0.5 ml to 2 ml cell volume)</td><td>Enough sample volume:
• Sample cell with filling funnel
(10 ml to 20 ml cell volume)</td></tr>
<tr><td colspan="3">Consider the optical density (sample color)</td></tr>
<tr><td colspan="3">Dark sample:
• Large internal diameter for sufficient light (if enough sample available)</td></tr>
<tr><td colspan="3">Consider the sample aggressiveness and choose a cell material*</td></tr>
<tr><td colspan="2">Non- or less corrosive sample:
• Standard Stainless Steel</td><td>Highly corrosive sample:
• Hastelloy C-276
• Hastelloy B-3</td></tr>
<tr><td colspan="3">Result: A suitable sample cell</td></tr>
</table>

* It is recommended to check the resistance of the sample cell material against all substances and solvents that are to be used in the application.

5 Assembling Sample Cells

The polarimeter tubes are closed at both ends with cell windows, which 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 surface around the aperture of the polarimeter tube assures the sealing between cell and window. The windows as well as the opposing contact surface of the tube have to be kept clean carefully to avoid leakage or pressure peaks on the windows.

The rubber washer does not function as a gasket, but is only used to distribute the pressure of the screw cap evenly on the cell window to avoid mechanical stress. Always place the rubber washer between screw cap and cell window. Replace the washers before they loose their original shape or elasticity.

TIP *The screw caps have to be fixed very gently (hand-tight), just enough as required for sealing the cell windows.*

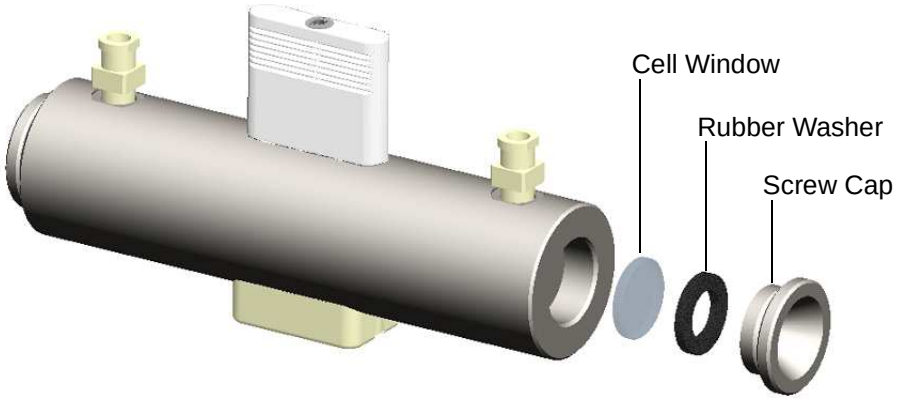


*Fig. 5 - 1 Assembly of cell windows: The rubber washer is **not** a gasket.*

6 Sample Cells for MCP 100

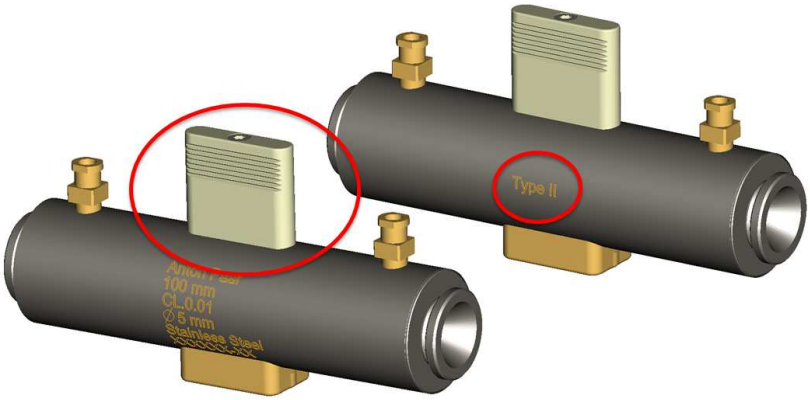
The Modular Compact Polarimeter **MCP 100 only allows the use of wireless Toolmaster™ sample cells**. Sample cells without Toolmaster™ will **not** be recognized by the instrument and the measurement can not be started. **The maximum path length of sample cells for MCP 100 is 100 mm.**

5 different sample cells are available. The sample cells for the MCP 100 can easily be identified by the **description on the cell body and the handle**.

All MCP 100 cells are inscribed with **"Type II"** and the **handle is colored white** instead of black for the MCP 5100/5300 and 5500 and Sucromat.

The use of MCP 100 sample cells in the MCP 5100/5300 and 5500 and Sucromat is **not** possible. The cell will **not** be recognized and a **measurement is impossible.**

However, the sample **cells for the MCP 5100/5300/500 and Sucromat can be used in the MCP 100**, so the cells are **downward, but not upward compatible**.



MCP 100 wireless Toolmaster

The wireless Toolmaster^{TM} function offers a transfer of cell relevant parameters (path length, sample temperature) into the instrument software to allow the maximum traceability and a comfortable handling.

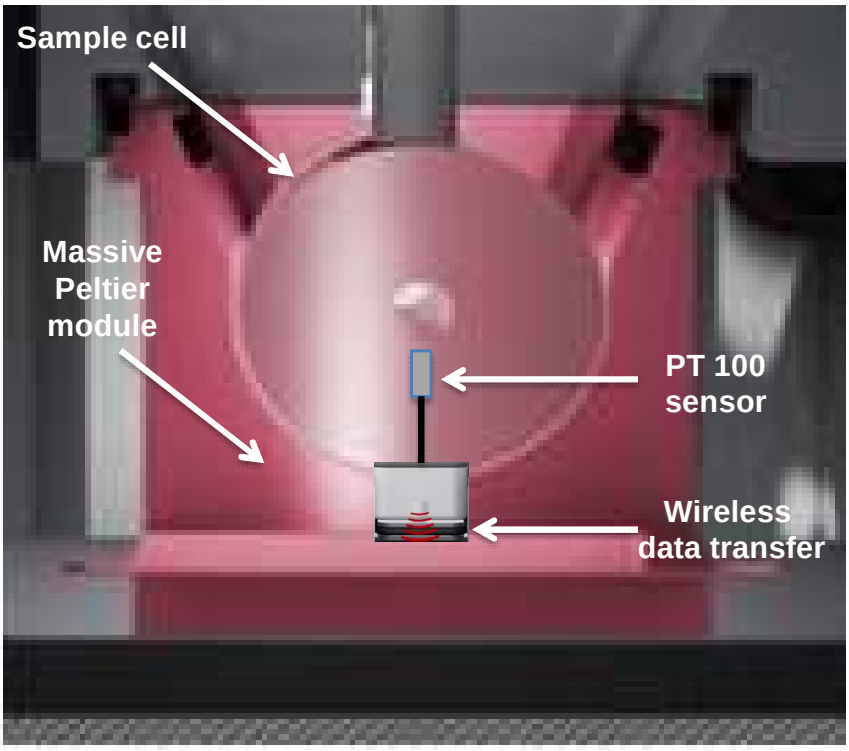


Fig. 6 - 2 Positioning of a sample cell inside Peltier block with a PT 100 sensor and wireless data transfer unit

- **No handling of external temperature sensor required**
- **No cross-contamination from external temperature sensor**
- **Does work with connected tubes**
- **Safe, quick and user-friendly wireless data transmission**

- **Heat transfer to / from several directions**
- **Optimal thermal contact**
- **Quick thermal equilibration, no errors due to temperature gradients**
- **Fast heating-/cooling rates**
- **High accuracy by design (even temperature distribution)**

6.1 Path Length 100mm

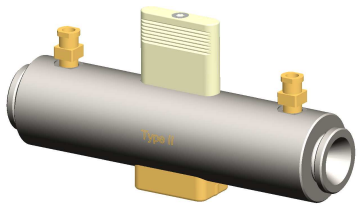
6.1.1 Cells with Luer Filling Ports

All Luer type sample cells will be delivered with 2 m tubing, 2 Luer adaptors and 1 waste beaker.

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

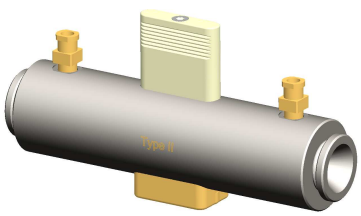
6.1.1.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with Luer filling ports, wireless Toolmaster 	100	5	2.0	143946

6.1.1.2 Nickel Alloy (Hastelloy C-276)

This item is manufactured of high class stainless steel. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Nickel alloy Hastelloy C-276, Luer filling ports, wireless Toolmaster 	100	3	0.7	143947

6.1.2 Cells with Filling Funnel

The use of flow-through cells is recommended for routine analysis, i.e. when a large number of similar samples have to be measured consecutively.

These cells can be filled manually through a filling funnel. If the cell is filled manually, the sample will enter the cell and finally reach the level of the hose outlet. With the next sample being poured into the filling funnel, the previous sample will be replaced and flushed out of the hose outlet. This procedure allows a fast sample replacement without cleaning the sample cell in between.

6.1.2.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel, wireless Toolmaster 	100	8	5	143950

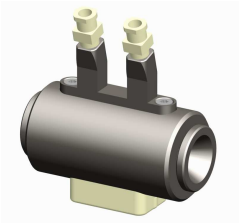
6.2 Path Length 10 mm

6.2.1 Cells with Luer Filling Ports

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

6.2.1.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with Luer filling ports, wireless Toolmaster 	10	5	0.2	143948

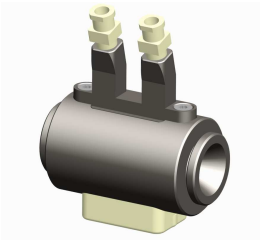
6.3 Path Length 2.5 mm

6.3.1 Cells with Luer Filling Ports

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

6.3.1.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with Luer filling ports, wireless Toolmaster 	2.5	5	0.05	143949

6.4 Expendable Material for Sample Cells

Item	Description	Cat.-No.
	Glass window, ø15.5 mm	49703
	Rubber washer, ø15.5 mm, material NBR	49384
	Cleaning brush for sample cells with inner diameter of 8 mm	49586
	Cleaning brush set for sample cells with inner diameter less then 8 mm	156597

7 Quartz Control Plates for MCP 100

Quartz control plates are used for checking and adjusting the polarimeter scale. Optically pure and plane quartz plates are polished down to a thickness of approx. 0.4 mm to 1.6 mm vertically to its axes. The plates are fixed in a holder designed similar to a sample cell for convenient handling.

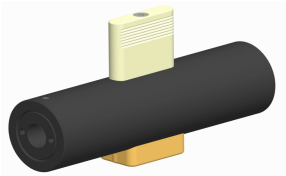
For producing quartz control plates of low optical rotation values, plates of levorotatory and dextrorotatory quartzes are combined (double plate). The optical rotation values of each single quartz plate add to the required optical rotation value.

The quartz control plates are supplied in a case together with manufacturer certificate and temperature correction table. All quartz control plates comply with international standards (ICUMSA and OIML). The optical rotation values of the quartz control plates are determined by comparison with an officially certified quartz control plate of the Physikalisch Technische Bundesanstalt (PTB), Braunschweig, the German National Institute of Standards. The accuracy of the optical rotation OR value is ± 0.005° OR. On request quartz control plates can be supplied with an official certificate issued from the PTB. Besides below listed quartz control plates, it is possible to supply quartz control plates with customer specified optical rotation values, too.

The MCP 100 requires the use of **wireless Toolmaster** quartz control plates. Quartz control plates without **Toolmaster** will **not** be recognized by the instrument.

Two different quartz plates are available. The quartz plates for the MCP 100 can easily be identified: All **MCP 100 quartz plates** are inscribed with **"Type II"** and the **handle is colored white** instead of black for the MCP 5100/5300/5500 and Sucromat.

The use of **MCP 100 quartz control plates** in the MCP 5100/5300/5500 and Sucromat is **not possible** - the cell will not be recognized. However, the quartz control plates for the MCP MCP 5100/5300/5500 and Sucromat can be used in the MCP 100, so they are **downward** compatible, but **not upward** compatible.

Item	Quartz Control Plates with certified Optical Rotation at 589nm	Cat.-No.
	50 °Z / 17 °OR	143960
	100 °Z / 34 °OR	143961

8 Sample Cells for MCP 150/5100/5300/5500

Please note that the MCP 150 is not able to operate 200 mm sample cells, its mechanical design is able to support a maximum path length of 100mm.

The wireless Toolmaster function is standard for MCP 5100/5300/5500. The MCP 150 has a limitted Toolmaster function, "only" the temperature of the sample cell and the path length is transferred wirelessly into the instrument. The full wireless Toolmaster function offers a transfer of all cell relevant parameters (path length, sample temperature, material type, serial number, last service date) into the instrument software to allow a maximum of traceability and a comfortable handling.

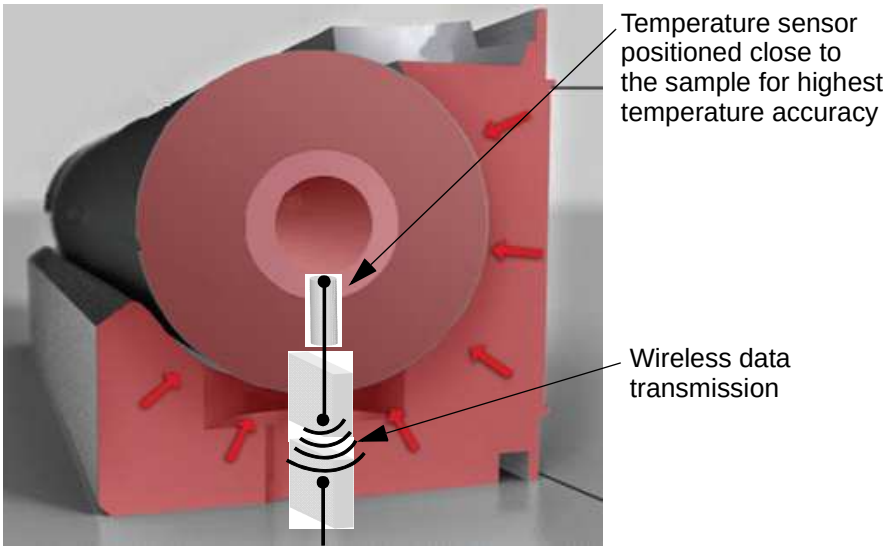


Fig. 8 - 3 PT 100 temperature sensor and wireless data transfer

- **No handling of external temperature sensor required**
- **No cross-contamination from external temperature sensor**
- **Does work with connected tubes**
- **Safe, quick and user-friendly wireless data transmission**

For the use of a sample cell in the Peltier module the cell material has to have a good heat conductivity and a good thermal contact to the Peltier surface, **any kind of glass cells or plastic insulated cells are not recommended**.

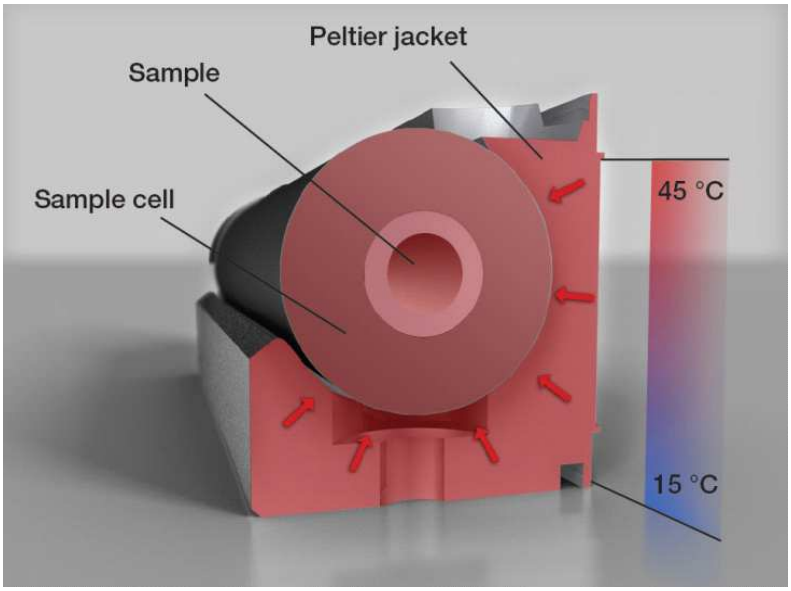


Fig. 8 - 4 Sample cell in an automatic Peltier temperature control module

- **Heat transfer to / from many directions**
- **Optimal thermal contact**
- **Quick thermal equilibration, no errors due to temperature gradients**
- **Fast heating-/cooling rates**
- **High accuracy by design (even temperature distribution)**

8.1 PathLength 200 mm

8.1.1 Cells with Luer Filling Ports

All Luer type sample cells will be delivered with 2 m tubing, 2 Luer adapters and 1 waste beaker.

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

8.1.1.1 Nickel Alloy (Hastelloy B-3)

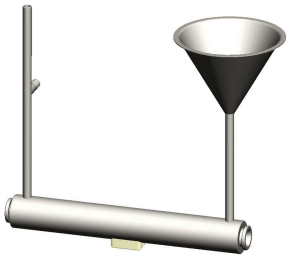
This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Hastelloy B-3 cell with Luer filling ports, **wireless** Toolmaster 	200	5	4.0	131424

8.1.2 Cells with Filling Funnel

The use of flow-through cells is recommended for routine analysis, i.e. when a large number of similar samples have to be measured consecutively.

These cells can be filled manually through a filling funnel. If the cell is filled manually, the sample will enter the cell and finally reach the level of the hose outlet. With the next sample being poured into the filling funnel, the previous sample will be replaced and flushed out of the hose outlet. This procedure allows a fast sample replacement without cleaning the sample cell in between.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel **wireless** Toolmaster 	200	8	10.0	104124

8.2 Path Length 100 mm

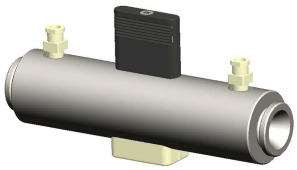
8.2.1 Cells with Luer Filling Ports

All Luer type sample cells will be delivered with 2 m tubing, 2 Luer adapters and 1 waste beaker.

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

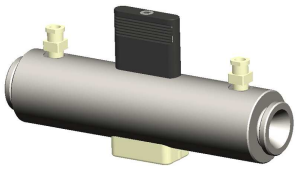
8.2.1.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with Luer filling ports, **wireless** Toolmaster 	100	5	2.0	104135

8.2.1.2 Nickel Alloy (Hastelloy C-276)

This sample cell is manufactured of an alloy with excellent chemical resistance. Please check the material resistance before use or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Nickel alloy C-276 cell with Luer filling ports, **wireless** Toolmaster 	100	3	0.7	104139
	100	5	2.0	104137

8.2.1.3 Nickel Alloy (Hastelloy B-3)

This sample cell is manufactured of an alloy with excellent chemical resistance. It can be used in applications with highly aggressive substances, e.g. HCL concentrations up to 40 %. Please check the material resistance before use or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Nickel alloy B-3 cell with Luer filling ports, **wireless** Toolmaster 	100	3	0.7	109915
	100	5	2.0	109920

8.2.2 Cells with Filling Funnel

The use of flow-through cells is recommended for routine analysis, i.e. when a large number of similar samples have to be measured consecutively.

These cells can be filled manually through a filling funnel. If the cell is filled manually, the sample will enter the cell and finally reach the level of the hose outlet. With the next sample being poured into the filling funnel, the previous sample will be replaced and flushed out of the hose outlet. This procedure allows a fast sample replacement without cleaning the sample cell in between.

8.2.2.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel, **wireless** Toolmaster 	100	8	5	104119

8.2.2.2 Nickel Alloy (Hastelloy C-276)

This item is manufactured of high class stainless steel and PTFE. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Nickel alloy C-276 cell with PTFE filling funnel, **wireless** Toolmaster 	100	8	5	109946

8.2.2.3 Nickel Alloy (Hastelloy B-3)

This item is manufactured of high class stainless steel and PTFE for applications with highly aggressive substances, e.g. HCl concentrations up to 40%. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Nickel alloy B-3 cell with PTFE filling funnel, **wireless** Toolmaster 	100	8	5	109945

8.3 Path Length 50 mm

8.3.1 Cells with Luer Filling Ports

All Luer type sample cells will be delivered with 2 m tubing, 2 Luer adapters and 1 waste beaker.

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

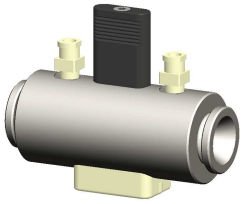
8.3.1.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with Luer filling ports, **wireless** Toolmaster 	50	5	1.0	104133

8.3.1.2 Nickel Alloy (Hastelloy C-276)

This item is manufactured of high class stainless steel. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Nickel alloy C-276 cell with Luer filling ports, **wireless** Toolmaster 	50	3	0,35	108248

8.3.2 Cells with Filling Funnel

The use of flow-through cells is recommended for routine analysis, i.e. when a large number of similar samples have to be measured consecutively.

These cells can be filled manually through a filling funnel. If the cell is filled manually, the sample will enter the cell and finally reach the level of the hose outlet. With the next sample being poured into the filling funnel, the previous sample will be replaced and flushed out of the hose outlet. This procedure allows a fast sample replacement without cleaning the sample cell in between.

8.3.2.1 Stainless steel

This item is manufactured of standard stainless steel and may not be used for highly aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel, wireless Toolmaster 	50	8	2.5	104103

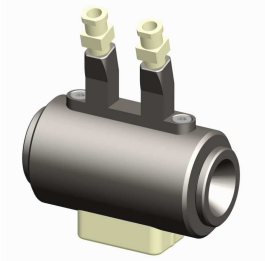
8.4 Path Length 10 mm

8.4.1 Cells with Luer Filling Ports

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

8.4.1.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for high agressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with Luer filling ports, **wireless** Toolmaster 	10	5	0.2	108852

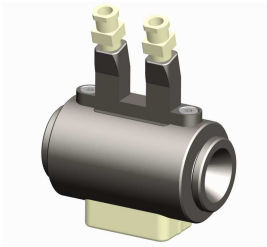
8.5 Path length 2.5 mm

8.5.1 Cells with Luer Filling Ports,

The sample cell is filled and emptied with a syringe through the Luer filling ports. Slightly turn the cell to release air bubbles from the cell through the second filling port. Cleaning/washing with a suitable solvent is mostly sufficient. Occasionally, the cell must be dismantled for proper cleaning.

8.5.1.1 Stainless steel 1.4571

This item is manufactured of standard stainless steel and may not be used for very aggressive samples / cleaning agents. Please check the material resistance before use, or contact the manufacturer for more information.

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with Luer filling ports, **wireless** Toolmaster 	2,5	5	0.05	109524

8.6 Expendable Material for Sample Cells

Item	Description	Cat.-No.
	Glass window, ø15.5 mm	49703
	Rubber washer, ø15.5 mm, material NBR	49384
	Cleaning brush for sample cells with inner diameter of 8 mm	49586
	Cleaning brush set for sample cells with inner diameter less then 8 mm	156597

9 Sample Cells for MCP Sucromat in Sugar Payment Laboratory and Quality Control

The MCP Sucromat does not feature a Peltier temperature control as standard, because sugar is generally measured with temperature compensated scales. The temperature is only measured, but not controlled. The measured rotation is automatically corrected for the temperature difference to the standard temperature of 20 °C.

Temperature insulated sample cells are recommended to reduce the influence of the ambient temperature on the sample. This provides a fast temperature stabilization for a fast and stable measurement of the sample.

9.1 Application: Sugar Payment Laboratory

The use of flow-through cells is recommended for routine analysis, i.e. when a large number of similar samples have to be measured consecutively.

These cells can be filled manually through a filling funnel. If the cell is filled manually, the sample will enter the cell and finally reach the level of the hose outlet. With the next sample being poured into the filling funnel, the previous sample will be replaced and flushed out of the hose outlet. This procedure allows a fast sample replacement without cleaning the sample cell in between.

9.1.1 Temperature Insulated Cells, Wireless Toolmaster

Wireless Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with plastic jacket, filling funnel, **wireless** Toolmaster 	200	8	10	104130

Wireless Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with plastic jacket, filling funnel, **wireless** Toolmaster, **for Betalyser** 	200	8	10	104131

9.2 Application: Sugar Quality Control / Laboratory

Different to the application in the payment laboratory, in the QC lab a variety of different sugar analysis methods are required.

Due to the different substances that are analyzed with a polarimeter, the samples are not measured with a temperature compensated sugar scale. Thus the temperature must be controlled with an external water bath or the polarimeter must be equipped with the automatic Peltier temperature control (PN 188427).

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9.2.1 Cells for MCP with Temperature Control, Wireless Toolm.

Cells for MCP Sucromat :

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel, **wireless** Toolmaster 	200	8	10	104124

9.2.2 Cells for External Temperature Control, Wireless Toolm.

Water jacket cell for external temperature control with laboratory circulators:

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel, **water jacket** and **wireless** Toolm. 	200	8	10	104127

9.3 Additional Cells for MCP Sucromat with Water Jacket and Wireless Toolmaster

The use of flow-through cells is recommended for routine analysis, i.e. when a large number of similar samples have to be measured consecutively.

These cells can be filled manually through a filling funnel. If the cell is filled manually, the sample will enter the cell and finally reach the level of the hose outlet. With the next sample being poured into the filling funnel, the previous sample will be replaced and flushed out of the hose outlet. This procedure allows a fast sample replacement without cleaning the sample cell in between.

9.3.1 Path Length 100 mm

Water jacket cell for external temperature control with laboratory circulators:

Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel, **waterjacket** and **wireless** Toolmaster 	100	8	5	104122

9.3.2 Path Length 50 mm

Water jacket cell for external temperature control with laboratory circulators:

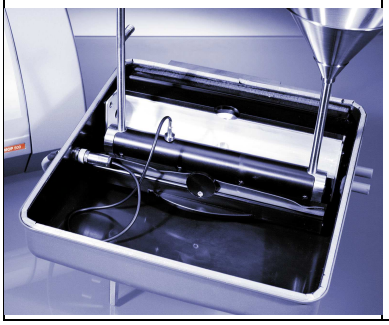
Model	Path length (mm)	Int. diam. (mm)	Vol (ml)	Cat.-No.
Stainless steel cell with filling funnel, **waterjacket** and **wireless** Toolmaster 	50	8	2,5	104117

9.4 Expendable Material for Sample Cells

Item	Description	Cat.-No.
	Glass window, ø15.5 mm	49703
	Rubber washer, ø15.5 mm, material NBR	49384
	Cleaning brush for sample cells with inner diameter of 8 mm	49586

10 Optional Modules

10.1 Automatic Peltier Temperature Control

Item	Description	Cat. No.
Peltier module 	Automatic temperature control with temperature range from 10 °C to 45 °C	188427

10.2 Multi-Wavelength Option Kits

MCP 5100,5300 and 5500 can be optionally equipped with the MW option. The 589 nm filter is standard in all MCP's, additional wavelength for the specific kit can be selected, the maximum number of wavelengths is 8, (7 additional + 589 nm as standard).

The requirement for additional wavelengths has to be carefully negotiated before creating the quotation, as the different possible wavelengths require the corresponding LED light source, different wavelength kits are available. Please identify together with the customer the required wavelengths and select the corresponding kit.

- The optional wavelength's **(○)** mentioned inside the kit, can be ordered together with the instrument, or retrofitted later on at customer site by an authorised Anton Paar sercive technician.
- The optional wavelength's **(○)** mentioned inside the kit, can only be ordered during the instrument purchase. Upgrades with this specific wavelength's can only be done at manufacturer site.

Wavelength (nm)	MW kit "1"	MW kit "2 UV/VIS"	MW kit "2 UV/NIR"	MW kit "3UV/VIS/NIR"	MW kit "3 UV/VIS"
589	●	●	●	●	●
880	/	/	●	(○)	/
633	/	(○)	(○)	(○)	(○)
578	(○)	(○)	(○)	(○)	(○)
546	(○)	(○)	(○)	(○)	(○)
436	(○)	(○)	(○)	(○)	(○)
405	/	/	/	(○)	(○)
365	/	●	/	(○)	(○)
325	/	/	/	/	●

● > Standard
(○) > Option
(○) > Only during instrument purchase or later at manufacturer site

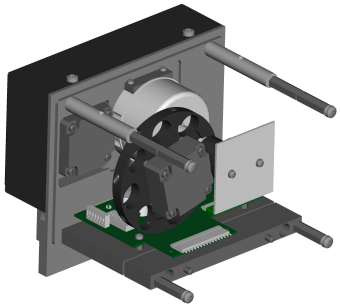
10.2.1 Multi-wavelength kit “1”:

The use case:

Customer application does not need any additional wavelenth yet, but feel the need to have the flexibility in the future. With this instrument combination, the AP service can easily adapt the required interference filter into the already existing MW option on site.

589 nm is installed, all other filters need to be ordered additionally.

The instrument is equipped with 1 LED light source, able to cover the selectable range of wavelengths below

Item	Description	Cat. No.
Multi-wavelength option 	Built in wavelength: 589	183323
Additional possible wavelength for "MW Kit 1"		
Interference filter	436 nm	187610
Interference filter	546 nm	187611
Interference filter	578 nm	187612

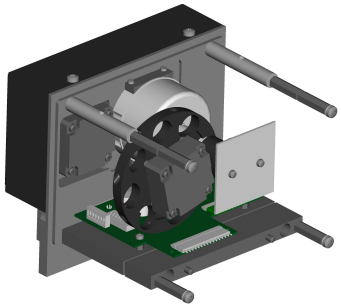
10.2.2 Multi-wavelength kit “2 UV/VIS”:

The use case:

Customer application does not need any additional wavelength yet, but feel the need to have the flexibility in the future. With this instrument combination, the AP service can easily adapt the required interference filter into the already existing MW option on site.

589 and 365 nm are installed, all other filters need to be ordered additionally.

The instrument is equipped with 2 LED light sources, able to cover the selectable range of wavelengths below

Item	Description	Cat. No.
Multi-wavelength option 	Built in wavelength: 589 + 365 nm	183326
Additional possible wavelength for "MW Kit 1"		
Interference filter	436 nm	187610
Interference filter	546 nm	187611
Interference filter	578 nm	187612
Interference filter	633 nm	187613

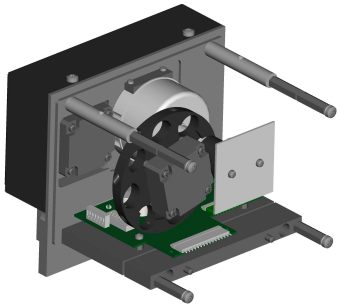
10.2.3 Multi-wavelength kit “2 UV/NIR”:

The use case:

Customer application does not need any additional wavelength yet, but feel the need to have the flexibility in the future. With this instrument combination, the AP service can easily adapt the required interference filter into the already existing MW option on site.

589 and 880 nm are installed, all other filters need to be ordered additionally.

The instrument is equipped with 2 LED light sources, able to cover the selectable range of wavelengths below

Item	Description	Cat. No.
Multi-wavelength option 	Built in wavelength: 589 + 880 nm	184723
Additional possible wavelength for "MW Kit 1"		
Interference filter	436 nm	187610
Interference filter	546 nm	187611
Interference filter	578 nm	187612
Interference filter	633 nm	187613

10.2.4 Multi-wavelength kit “3” (UV/VIS/NIR):

The use case:

Customer application does not need any additional wavelength yet, but feel the need to have the flexibility in the future. With this instrument combination, the AP service can easily adapt the required interference filter into the already existing MW option on site.

589 nm built-in, additional wavelength need to be ordered additionally.

The instrument is equipped with 1 LED light sources, able to cover the range from 436 to 633nm, the additional available wavelengths (365,405,880 nm) including the corresponding LED light source.

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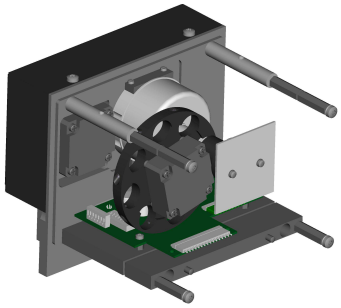
Item	Description	Cat. No.
Multi-wavelength option 	Built in wavelength: 589	183325
Additional possible wavelength for "MW Kit 1"		
Interference filter	436 nm	187610
Interference filter	546 nm	187611
Interference filter	578 nm	187612
Interference filter	633 nm	187613
Interference filter + LED kit > installation / upgrade only at manufacturer site	365 nm	186164
Interference filter + LED kit> installation / upgrade only at manufacturer site	405nm	186167
Interference filter + LED kit> installation / upgrade only at manufacturer site	880 nm	186166

10.2.5 Multi-wavelength kit “3” (UV/VIS):

The use case:

Customer application does not need any additional wavelength yet, but feel the need to have the flexibility in the future. With this instrument combination, the AP service can easily adapt the required interference filter into the already existing MW option on site.

589 + 325 nm built-in, additional wavelength need to be ordered additionally.

The instrument is equipped with 2 LED light sources, able to cover 325, 436,546,578,589,and 633 nm. The additional available wavelengths (365 and 405 nm) including the corresponding LED light source.

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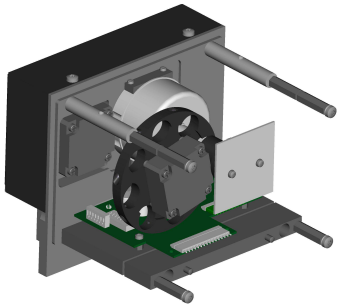
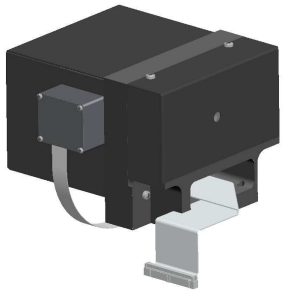
Item	Description	Cat. No.
Multi-wavelength option 	Built in wavelength: 589 * 325 nm	183399
Additional possible wavelength for "MW Kit 1"		
Interference filter	436 nm	187610
Interference filter	546 nm	187611
Interference filter	578 nm	187612
Interference filter	633 nm	187613
Interference filter + LED kit > installation / upgrade only at manufacturer site	365 nm	186164
Interference filter + LED kit> installation / upgrade only at manufacturer site	405nm	186167

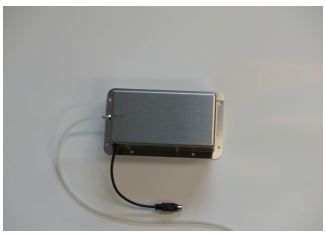
10.3 FillingCheck

The FillingCheck is already standard for the MCP 5500, but can be upgraded in the remaining instruments (MCP 5100/5300 and Sucromat), during the purchase, or later on..

Item	Description	Cat. No.
FillingCheck 	Built in camera for	187476

10.4 Air pump kit

All MCP polarimeters (MCP 5100/5300) can be purchased with the air pump or upgraded later on in the field. For the **MCP 5500** the air pump is standard. The pump is used to discharge the sample from the cell and to clean / dry the sample cell inside. The connection between air outlet and inlet of sample cell is easily done with silicone tubing. Please check the material resistance of the tube before use.

Item	Description	Cat. No.
Air pump kit 	Air pump in stainless steel housing for the assembling on the back panel of the MCP. The kit contains 2 meter of silicone tubing.	159058

11 Quartz Control Plates for MCP 150/5100/ 5300/5500 + Sucromat

Quartz control plates are used for checking and adjusting the polarimeter scale. Optically pure and plane quartz plates are polished down to a thickness of approx. 0.4 mm to 1.6 mm vertically to its axes. The plates are fixed in a holder designed similar to a sample cell for convenient handling.

For producing quartz control plates of low optical rotation values, plates of levorotatory and dextrorotatory quartzes are combined (double plate). The optical rotation values of each single quartz plate add to the required optical rotation value.

The quartz control plates are supplied in a case together with manufacturer certificate and temperature correction table. All quartz control plates comply with international standards (ICUMSA and OIML). The optical rotation values of the quartz control plates are determined by comparison with an officially certified quartz control plate of the Physikalisch Technische Bundesanstalt (PTB), Braunschweig, the German National Institute of Standards. The accuracy of the optical rotation OR value is ± 0.005° OR. On request quartz control plates can be supplied with an official certificate issued from the PTB. Besides below listed quartz control plates, it is possible to supply quartz control plates with customer specified optical rotation values, too.

Item	**Quartz Control Plates Certified in Optical Roation and International Sugar Scale (ISS, °Z), for the standard wavelengths 365, 405, 436, 546, 578, 880 and 589nm**	**Cat.-No.**
Quartz control plate **wireless** 	3 °Z, / 1 °OR	110288
	8 °Z, / 3 °OR	104457
	15 °Z / 5 °OR	104458
	25 °Z / 9 °OR	104460
	50 °Z / 17 °OR	104461
	75 °Z / 25 °OR	104462
	100 °Z / 34 °OR	104463
	-35 °Z / -12 °OR	104456
	-3 °Z / -1 °OR	110298

12 Temperature Validation of Sample Cells and Quartz Control Plates

For the validation of the temperature measurement of a Toolmaster sample cell, the following accessories are required.

12.1 Temperature Validation Accessories

Item	Description	Cat. No.
Temperature validation needle 	For 50mm sample cell	108253
	For 100mm sample cell	108252
	For 200mm sample cell	99900
MKT 50 	Millikelvin thermometer	26878
Temperature sensor 	Temperature sensor, 0 °C to 100 °C, accuracy 1 mK	74557

12.2 Validation Process

A temperature validation needle matching the path length of the sample cell is needed for the temperature validation of sample cells. For the temperature measurement a Millikelvin Thermometer MKT 50 from Anton Paar is recommended.

After unscrewing one screw cap of the sample cell, the needle is screwed in into the cell. Then an MKT temperature sensor is inserted into the needle as deep as possible.

NOTICE *Temperature sensors are extremely delicate equipment:*

- *Handle the sensor and its cable very careful*
- *Insert the sensor gently into the validation needle*
- *Do not bend the cable*
- *Do not drop the sensor*

Now the sample cell has to be filled with water. Place it into the automatic Peltier temperature control of the instrument. Select the temperature within the polarimeter software and correlate the displayed temperature with the value measured by the MKT 50.

If the temperature measurement is within the specifications, the validation passed. In case that the validation measurement failed, please contact the Anton Paar OptoTec service for further information.

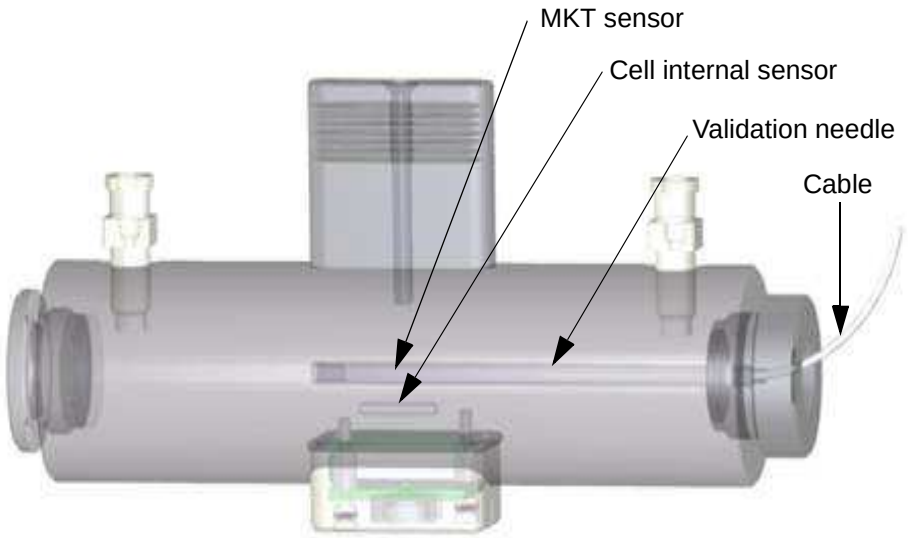


Fig. 12 - 1 Temperature validation: Due to design and size of the needle the sensor is measuring the temperature almost in the same position as the built in temperature sensor of the sample cell.

Quartz Control Plates for MCP 150/5100/5300/5500 + Sucromat

Quartz control plates are used for checking and adjusting the polarimeter scale. Optically pure and plane quartz plates are polished down to a thickness of approx. 0.4 mm to 1.6 mm vertically to its axes. The plates are fixed in a holder designed similar to a sample cell for convenient handling.