Quick Start Guide

QG000121

miniLiquid

Measurement in Liquids

AS734x Application

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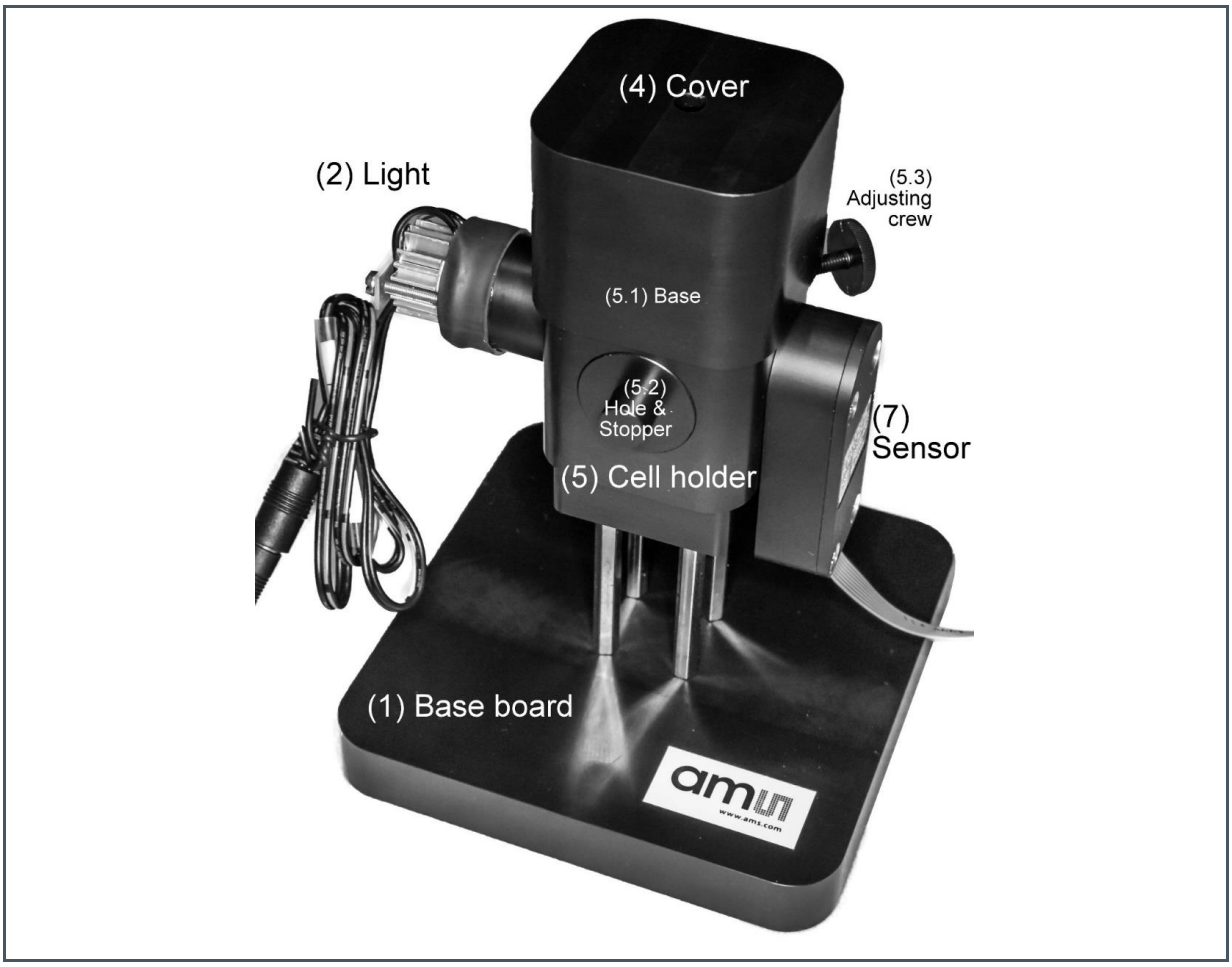
Content Guide

1 Basics

The miniLiquid Development Kit (DK) is a mechanical mounting system for AS7xxx compatible Evaluation Kits (EVKs) for liquid measurements using inserted cuvettes. It realizes the mounting of the parts, the shielding of the probe, and the optical path between light sources and the sensor through the liquid samples in the cuvette.

The sensor board (7) is not a part of the miniLiquid and must be ordered separately. The sensor board must be mechanically compatible with the ¼" mounting on the holder (5) and its openings (5.2) or allows the mounting of such an adapter into the openings. The sensor must be centered on the optical path on the sensor board. An overview of the **ams** compatible sensor boards is included in this document. The included ¼" adapter can be interchanged with the adapter on the sensor board, if it is not compatible.

Figure 1 :
Complete miniLiquid with Sensor and LED Based Luminary



Two ¼" mechanically compatible light sources (2 - VIS and NIR) are included in the scope of delivery of the miniLiquid. The spectra are described later in the document. Other LEDs or light sources can be used after own modification if the interfaces for the openings in the holder and the optical path are observed. Light sources are also mounted in the holder openings using the ¼" standard. Different optical paths (180° transmission or 90° reflection) can be realized via different openings in the holder (alternatively on each side of the holder). Unused openings in the holder should be closed with the plugs (5.2) to avoid light interference during measurements.

Sample cuvettes are included in the DK. However, it is very important to match the cuvettes and the entire optical path to the application - as this determines the accuracy of the measurements and their results. In the case of liquid measurements, the results are:

1. From the spectral overlap of the spectra of the light source, with the spectrum of the liquid on the sensor channels in transmission (180°).
2. From the reflection of the light with the liquid and contained particles on the sensor channels in (90°).

In both modes, it is necessary to take into account the influences of the cuvette when passing through its walls twice - as well as its various reflections and refractions. Therefore, cuvettes with a surface prepared for optical measurements are recommended. Note that only two sides of a cuvette may be pretreated. Take this into account for measurements with the cuvette inserted. The influences of the cuvette and the optical path should be eliminated using differential measurement. To do this, first measure the empty cuvette in the setup. Then substitute these sensor values from the sensor results after measuring the samples in the same setup.

All parts of the DK must be mounted. The light source and the sensor should be prepared to have an operating temperature, and the assembly should be free from interference. After inserting a cuvette, the holder should be closed with the cap (4) - to avoid light influences from the environment. Then proceed with the measurements.

The next chapters further elaborate on some important technical details.

2 Ordering Information

Ordering Code	Description
JCDK_MINI-LIQUID-TEST-SETUP	Mechanical EVK for Liquid Measurement

Attention

Please order Sensor Boards and EVKs separately. However, check the optical and mechanical interfaces of the sensor board and the light sources in the miniLiquid for suitability or their replacement with suitable alternatives before placing an order.

Information

It is also possible to print or modify the customized adapters. See the document path of the USB Stick for the 3D models.

3 Out of Box

The main components of the miniLiquid box as standard delivery are:

Figure 2:
LED and Cell Holder Parts

1	Base board	**6**	Spacer
2	LED Light Source(s) VIS (+NIR) in ¼” housing	**7**	¼” Adapter for Sensor boards
3	Power supply for (2)	**8**	Cuvettes – examples
4	Cover and cup for (5)	**9**	Specific Sensor Board, not figured
5	Cell holder		

The sensor board and/or test system must be ordered separately (see chapter 4).

4 Sensor Board

The type of sensor board is defined by the measurement task. **ams** offers a series of multi-channel sensors that are available as Evaluation Kits (EVKs) for testing. The sensors are centered on the sensor board to a mounted adapter and thus fulfill the mechanical requirements of the miniLiquid.

Figure 3:
AS7341 EVK with Optical Adapter, Diffuser and Connected FTDI Adapter in Holder

The following sensor boards (EVKs) can be used with the miniLiquid. It may be necessary to replace the adapter with a standard 1/4” adapter (scope of delivery) before use.

Figure 4:
miniLiquid Compatible ams Test System

Type	Response
AS73211-AB5 SET DK	(3 Channels VIS) True Color XYZ plus Temperature on Chip
AS73211 EVK	(3 Channels VIS) True Color XYZ plus Temperature on Chip
AS7331 EVK	(3 Channels UV) UVA, UVB, UVC plus Temperature on Chip
AS7341 EVK	(10 Channel VIS + NIR) 8 x Spectral VIS, Clear, Flicker; NIR
AS7341 EVK Fast Demo	(10 Channel VIS + NIR) 8 x Spectral VIS, Clear, Flicker; NIR Fast Measurement
AS7342 EVK	(10 Channel VIS + NIR) 8 x Spectral VIS, Clear, Flicker; NIR
AS7343 EVK	(13 Channel VIS + NIR) 8 x Spectral VIS, Clear, Flicker; NIR

Ask our FAE team for new **ams** compatible sensor boards and EVKs.

Please see the corresponding datasheets and manuals for more technical details of the sensor test systems.

5 Optical Adapters

The sensor test system and illumination must be mounted on the miniLiquid mechanical system in the prepared mechanical interface (1/4") firmly, stably, and in the correct beam path.

Figure 5:
Alternative ¼" Adapters

The optical adapters fix the sensor electronics exactly in the optical path to the light source. Some sensor boards are already equipped with adapters compatible with the miniLiquid. Non-compatible adapters can be exchanged with the adapter included with the miniLiquid. After inserting the adapters, they can be fixed with the screws in the holder before the measurement.

Figure 6:
Fixing the Parts During Measurement is Important to Get a Stable Setup

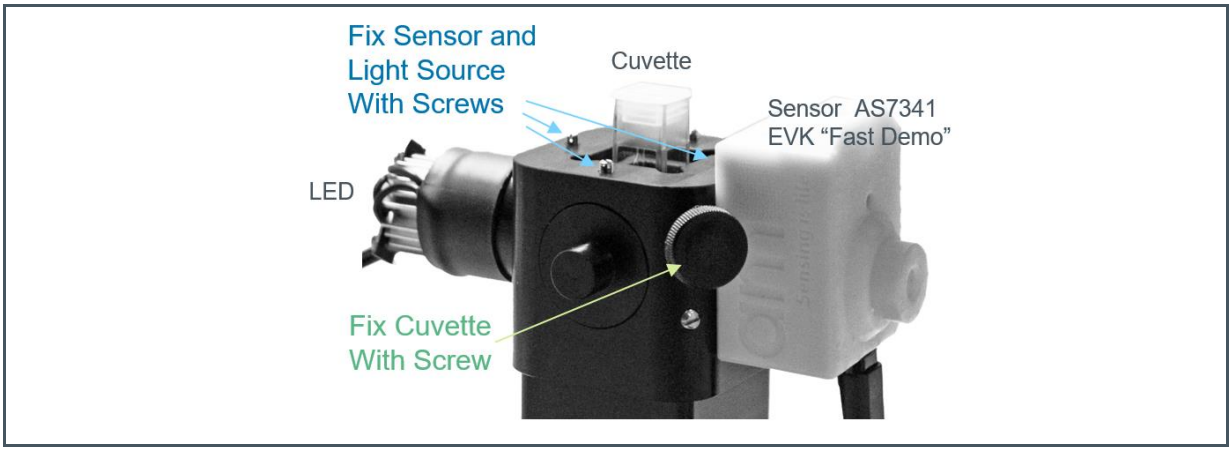
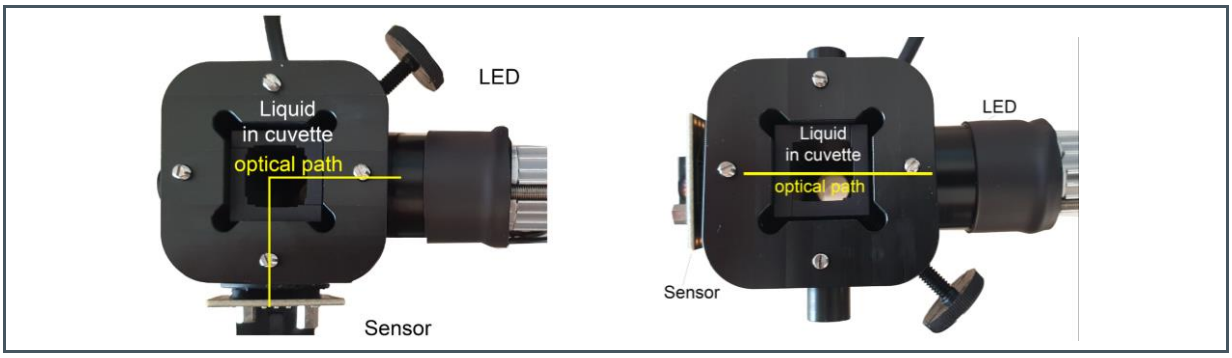


Figure 7:
Standard LED Luminary in Holder and Alternative Optical Paths (Left 90°, Right 180°)



If a custom adapter is required, then the optical path and mechanical fixation must be adhered to. The following figure shows the dimensions of a typical adapter. 3D models of a typical adapter can be supplied by **ams**.

Figure 8:
Sizes of a Typical Adapter for miniLiquid

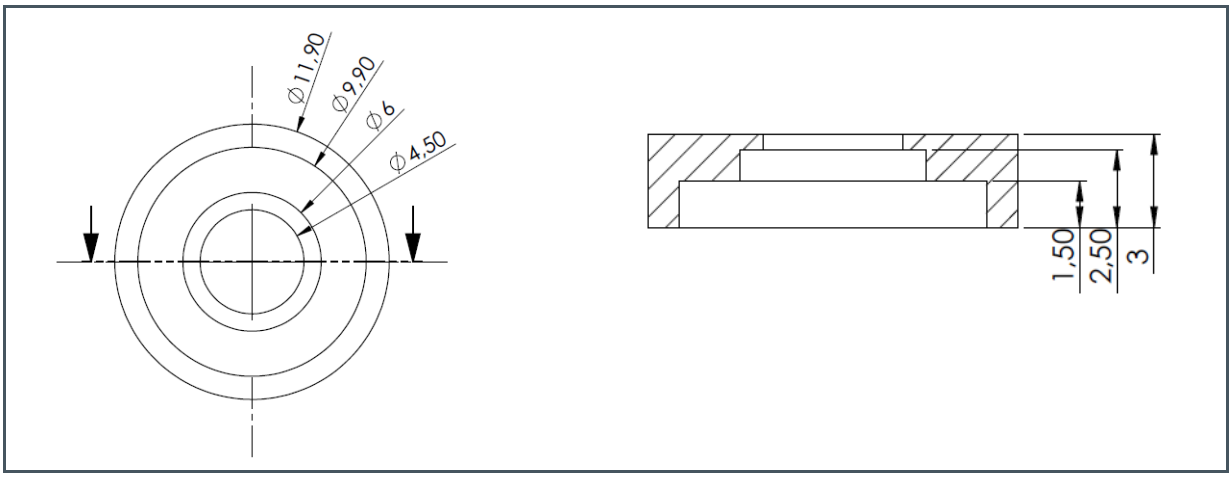
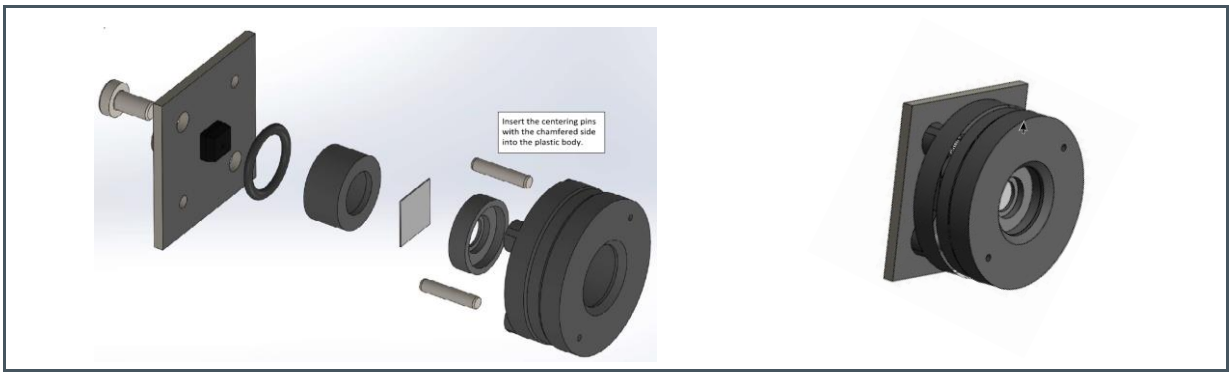


Figure 9:
Typical ¼” Adapter with Diffuser or Filter Inside



If an optical diffuser is required because the application is not diffuse then see the sensor’s manual for more information.

6 LED Light Sources

Two standard LED-based luminaires are prepared to be used as a White Light Source (VIS - Cree® XLamp® XM-L2 LEDs 4k CCT) and NIR LED source (SFH 4715AS). The LEDs are mounted in a mechanical housing, which can be fixed in the miniLiquid cell holder. In principle, it is possible to change the LED type in the housing if the new LED is pin and foot-print compatible (Star Platine).

Figure 10:
Spectral Curves of the Standard LEDs (XM-L2, SFH 4715AS)

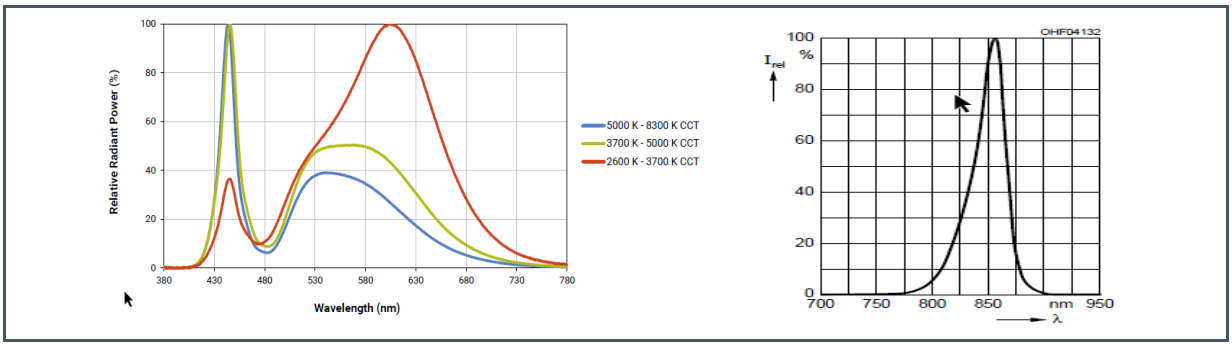
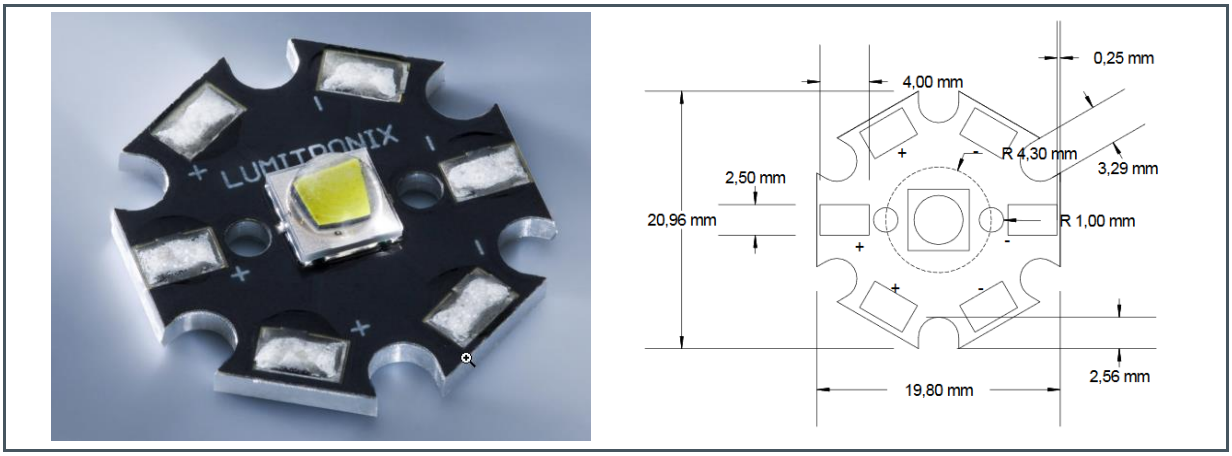


Figure 11:
miniLiquid Uses Star Platine Format in the LED Modules (1)



(1) Source: https://lumstatic.com/X8/ZC/ICVRecE2rt-BpnedFA.pdf

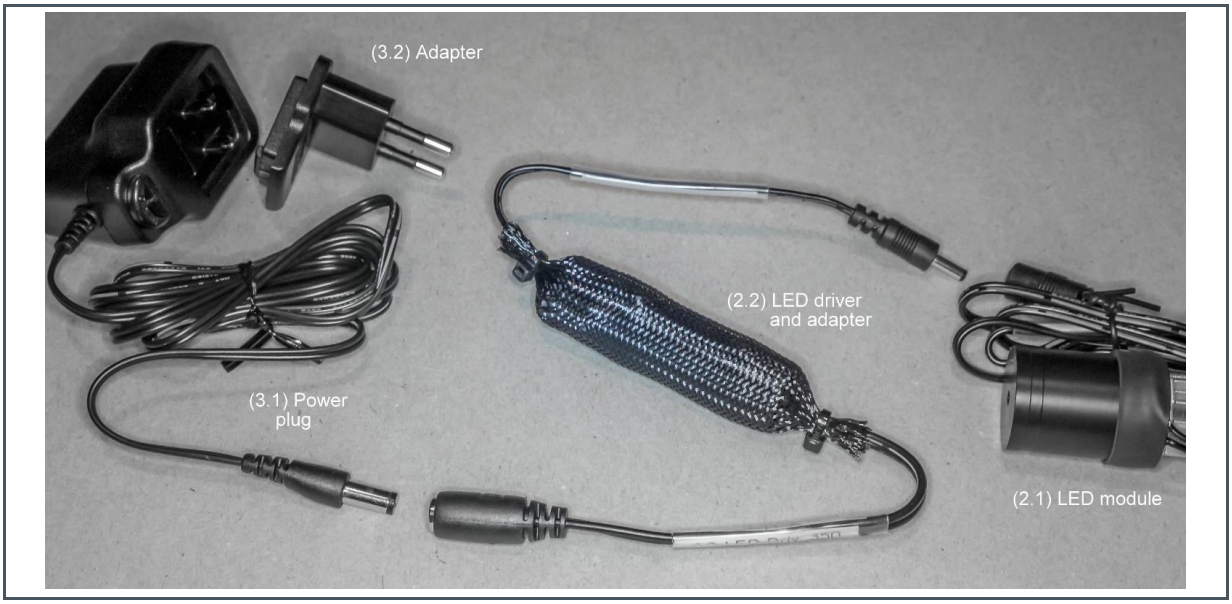
7 How to Build the Setup

To build the miniLiquid setup, the follow the steps below:

7.1 Standard Light Source with Power Supply

- Complete the power plug (3.1) with the country-specific adapter (3.2) (for example).
- Connect the power plug with the LED driver and adapter (2.2) to the LED module (2.1).
- Mount the complete light source into one free opening of the cell holder and fix it.

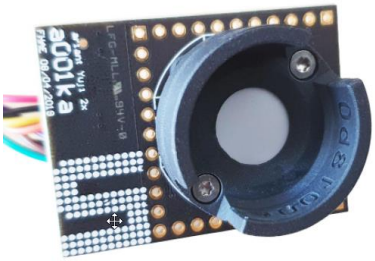
Figure 12 :
Power Supply



7.2 Sensor

- Check if the onboard optical adapter is compatible with the ¼° openings of the holder, or, in case of the test, needs a diffusor in front of the sensor and the adapter on board does not have it. If necessary, change the adapter on boards against the miniLiquid ¼" adapter (7)[1].
- Mount the Optical adapter and diffuser on top of the Sensor and tighten them with two screws.
- Check the optical adapter on the board to see if it is compatible with the ¼° openings of the holder or if the test requires a diffuser in front of the sensor, and the adapter on the board does not have it. If necessary, replace the adapter on the board with the miniLiquid ¼" adapter.

Figure 13:
Diffuser is Mounted Top of the Sensor and Connected FTDI Cable



7.3 Assemble the miniLiquid

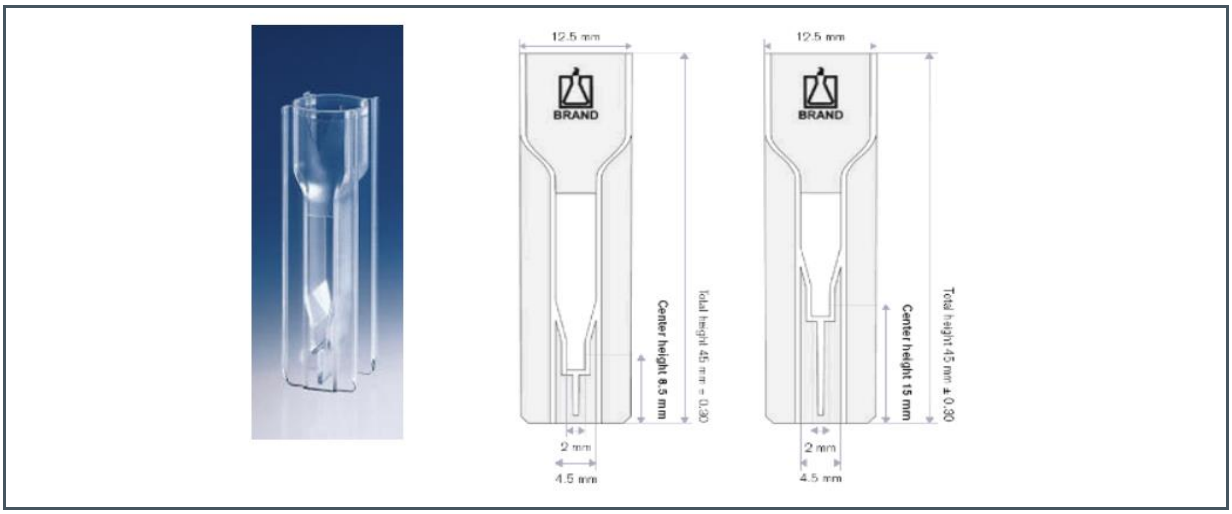
- Plug the cell holder (5) with the mounted spacer (6) in the base board (1) and screw it on the back side of the base board.
- Install the assembled light source (2) into the cell holder (5) by using one of the free openings (5.2) in the holder. If necessary, remove the plugs beforehand. It is important to fix the plugs, the illuminator and the sensors. They can be fixed with a screw on the top of the holder.
- Install the sensor (9) in the second free opening, depending on the required optical path. It is important to note that the optical path selection is dependent on the required method (180° or 90°).

[1] The miniLiquid ¼" adapter exists for an upper and lower scale to insert a diffuser between both scales.

7.4 Cuvettes

- Use the delivered (Macro/Semi-Micro) cuvettes (8) or similar. In case of sensor sensitivity, problems in combination with dark liquids, use the semi-micro cuvettes to increase the light energy on the sensor by a smaller optical path through the liquid.
- Insert the cuvette into the holder (opening on the top side). If necessary, fix the holding part inside the holder with the white screw on the vertical side of the holder. This will fix the cuvette in the holder. Check the optical path. If the cuvette contains liquids, the liquid must be filled almost to the top.
- Cover the cuvette in the holder to prevent ambient lighting.

Figure 14:
UV-Cuvettes Micro from Brand (1)



(1) Source: https://shop.brand.de/en/all-products-for-search/uv-cuvettes-macro-p7191.html

7.5 Software Installation

- The software and drivers of the ordered sensor test system must be installed on the PC after the mechanical SETUP realization is completed. Please check the sensor manuals for more details.

7.6 Start-Up miniLiquid

- Check the assembly of all the mechanical parts, the light source, and the sensor. Plug in the cuvette with the probe. Seal the holder with the cover. Afterward, connect the light source to a power supply and the sensor via USB to the PC. Switch them on and wait 30 minutes to get the working temperature.
- To get a stable test system, use one sample from the test series for the next partial step. Select the parameters in the test software (select gain and integration time), and start the measurement to achieve stable values for the sensor result to be greater than 10,000 digits or more. Measure over a period, and optimize the test system by excluding interfering sources until stable values are established without noise.
- Check the dynamic of the selected parameters with the darkest (e.g. 100% concentration) and lightest (0% concentration) probe. If the selected parameters are not able to measure the full target, use a dynamic gain. In this case, check the linearity of the sensor conversion parameters beforehand and work with calculated results not depending on these parameters (e.g. basic counts). Also, check the non-linearity and drifts over temperature to be able to correct the measured counts.

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