HAMILTON

Microlab STAR Line

FLUOREYE

User's Guide

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Hamilton Bonaduz AG
Via Crusch 8
CH-7402 Bonaduz
Switzerland

www.hamiltoncompany.com

Contents

1 General Information

These instructions are to help users to operate the FLUOREYE for Microlab STAR Line correctly and safely.

Disclaimer

All efforts have been made to ensure the accuracy of the contents of these instructions. Note that the product adaptions after the date of issue have not been included, which means that certain illustrations, images, and descriptions may be incomplete or differ from the actual product delivered.

Hamilton Bonaduz AG can assume no responsibility for any errors in these instructions or their consequences. If any errors are found, please contact Hamilton Bonaduz AG.

Throughout these instructions, protected product names may be used without being specifically marked as such.

Copyright

1.1 Additional Manuals

- Microlab STAR Line Operator's Manual
- Microlab STAR Line Software Programmer's Manual

1.2 Messages and Notes

Warnings and Notes are included in these instructions to emphasize important instructions and critical situations. The following designation is used:

⚠ CAUTION	**Caution** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	**Notice** Indicates the possibility of damaging the instrument or compromising the results of a method.
i	**Note** Indicates useful, additional information for the operator.

1.3 Version History

Version	Release Date	Description
00	12/2022	First Release

2 Safety

2.1 Safety Symbols

Mandatory Actions

A human head (front view) wearing opaque eye protection signifies that opaque eye protection must be worn.

Two protective gloves, one shown in front and the other shown behind (outlined) signify that protective gloves must be worn.

Overalls (front view) signify that protective clothing must be worn.

2.2 Chemical Hazards

If FLUOREYE is used for toxic or irritant chemicals, the user is responsible to take appropriate actions for protection. This is especially important when toxic chemicals can evaporate while the module is activated.

Only use the minimum required quantities of hazardous liquids for a single application.

Evaporation of hazardous liquids can cause corrosion. Handle with care, use a lid, or use an extractor hood to protect the user.

If the module becomes contaminated with biohazardous or chemical materials, it should be cleaned and decontaminated. Use appropriate protective clothing, goggles and gloves when handling a contaminated module. Any surfaces on which liquid is spilled must be decontaminated.

Do not use disinfecting materials which contain hypochlorite (e.g. Javel water, Chlorox) or bleaching fluids.

Associated Hazards

Chemical, biological and radioactive hazards can be associated with the substances used on the module. The handling of substances may be subject to local, state or federal law or regulations with regard to health, environment or safety.

- Always be aware of possible hazards associated with these substances.
- Use appropriate protective clothing, goggles and gloves.
- Strictly observe the corresponding provisions.

Caustic Substances

Caustic substances can cause burns and eye injuries.

- Always be aware of possible hazards associated with these substances.

- Avoid exposure to caustic substances.
- Use appropriate protective clothing, goggles and gloves.

2.3 Electrical Hazards

Before connecting or disconnecting the module from or to an Instrument, make sure that the instrument is switched off.

Only when the instrument is switched off is it safe to connect or disconnect the module. Not obeying this instruction may result in damage to the module and/or the instrument.

Radio Interference

This device contains lLicense-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s License-exempt RSS(s) and complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation of the device.

Changes or modifications made to this equipment not expressly approved by HAMILTON Bonaduz AG may void the FCC authorization to operate this equipment.

2.4 Radiofrequency Radiation Exposure Hazard

Radiofrequency radiation exposure Information:

This equipment complies with FCC and ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

2.5 Fire Hazard

FLUOREYE is not protected from explosions; nor is it for use in Ex zones.

- Use caution when using flammable materials.

2.6 Hazards due to UV Light

UV light exposure may cause severe eye or skin injury.

Do not remain in front of openings/gaps as UV radiation may permeate there.

Wear opaque eye protection, gloves, and protective clothing.

2.7 Safety Measures During Installation

Installation and verification of the FLUOREYE must be performed by Hamilton-trained Service Engineers.

i	Handle FLUOREYE with care.

⚠ CAUTION	**Sharp Edges of Instrument** The instrument may have sharp edges that may cause injuries. • Handle with care.

In order to provide a safe operation of FLUOREYE, the deck layout/workspace must respect the platform regulation regarding safe travel height of channels, heads and tools.

Furthermore, make sure the plate to be measured is not lower than the neighboring plates/modules. This would lead to collisions and therefore damage FLUOREYE. The center carrier in the picture below is not a good location to place the measure plate, as both the left and right carrier are higher and could cause a collision.

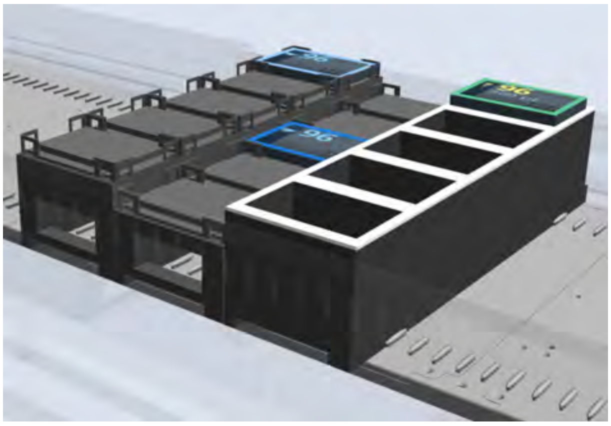


Fig. 1: Bad Location for a Plate to be Measured

Allow the following safety distances whenever you plan to read a full plate or wells near the plates' borders:

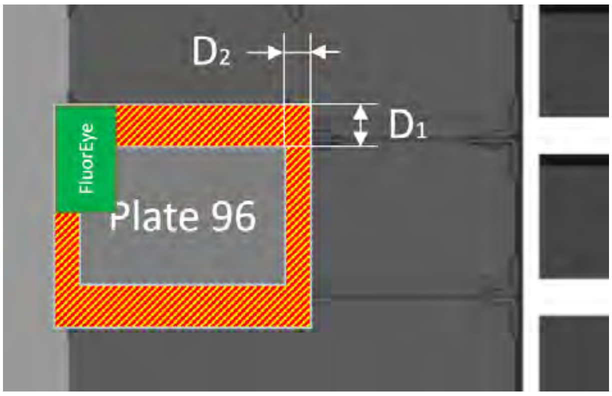


Fig. 2: Distances

D1 = 28 mm D2 = 14 mm

Refer to the Service Manual or contact your Hamilton representative.

NOTICE	**LEDs Interfering with FLUOREYE** The LEDs of the Pipetting Arm use the same wavelength as FLUOREYE. • Switch off the LEDs permanently.

2.8 Safety Measures During Operation

FLUOREYE is often used in combination with measuring kits (labware & reagents) from third-party vendors. Only use the kits according to their specifications, check the expiry date and apply general laboratory rules (SOP) in order to achieve valid results.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

NOTICE	**Risk of Damage to the Module** • Do not drop the module. • Do not flood the module with liquids. • Do not use flammable liquids. • Handle with care.

2.9 Safety Measures Outside Operation

Cleaning and Disinfection

NOTICE	**Risk of Damage to the Module** • Only use recommended cleaning agents. • Do not autoclave the module.

Storage

When FLUOREYE is not in use and removed from the deck or workspace, protect it from dust in a dry place, not exposed to sun, not near flammable materials.

Keep in mind that the battery may be discharged after a long storage period. A full charge cycle is recommended.

Repair and Shipment

For repair and shipment, the module must be decontaminated if it was used in laboratory environment with infectious or hazardous materials.

2.10 Disposal

2.10.1 Americas/Pacific Rim

After the life cycle of the FLUOREYE has ended, disposal must be considered. The customer is responsible for proper disposal of electronic devices per local regulations.

2.10.2 European

WEEE Declaration

The recycling of a module is in accordance with EC directive WEEE.

The European Community requires from manufacturers to organize the disposal and Waste of Electrical and Electronic Equipment (WEEE). For this reason, Hamilton Bonaduz AG took part in an initiative to organize the disposal of its products through a European disposal network called RENE. RENE is the largest recycling network for the disposal of electronic equipment in Europe.

The mission of RENE is a European-wide, WEEE-compliant, high-quality recycling for electrical and electronic equipment through a dense network with both innovative and SMB-sized partner companies. As a consequence, Hamilton Bonaduz AG receives a turn-key solution that includes all processes from treatment of incoming orders over collection, logistics, and recycling down to reporting and the according management of material flows.

Hamilton offers a WEEE process in collaboration with Toolpoint and RENE AG:

- Request for the collection of the Hamilton instrument via Toolpoint home page (www.toolpoint.ch)
- Completion of the decontamination confirmation form
- Preparation for transport: packing
- Activation of the recycling order
- Archiving of the decontamination confirmation
- Disposal of the product

Responsibilities

Ordering Party	Decontamination Preparation for Transport Note: The cost for decontamination and preparation for shipment is paid by the ordering party. On request, Hamilton offers to take care of that part of the recycling process.
RENE	Transport Disposal
Toolpoint	Registration Invoice the disposal to Hamilton
Hamilton Bonaduz AG	Organize the disposal in accordance with the WEEE directive

Recycling Process

1. Request the disposal of the instrument.

   Access to the order registration is given by the Toolpoint homepage (www.toolpoint.ch).

   ⊠ Recycling ⊠ Order registration form
2. Complete the decontamination form.

   Once the form has been completed, the request for disposal is automatically activated and transferred to Toolpoint. The confirmation of the order will be sent to the registered contact person.
3. Decontaminate the instrument and its components.

   The ordering party is responsible for decontamination. It is mandatory to sign the decontamination form and send an electronic copy to Toolpoint. Toolpoint forwards the documentation to RENE, which is in charge with the disposal of the instrument.
4. Pack and prepare the instrument for shipping.

   Instruments with a weight of over 30 kg need to be fixed on a euro pallet. Instruments below 30 kg can be packed in a cardboard or plastic box. A signed copy of the decontamination form needs to be added to the outer part of the shipping box or instrument.

2.10.3 Battery Disposal

Lithium-ion batteries and devices containing these batteries should not be disposed of in laboratory waste or recycling bins. Lithium-ion batteries must be taken to separate recycling or industrial hazardous waste collection points.

⚠ CAUTION

Fire Hazard

- To prevent fire, it is recommended to tape battery terminals and/or place lithium-ion batteries in separate plastic bags.

3 Module Overview

3.1 Intended Use

FLUOREYE is an on-deck fluorescence reader module used for automated measurement of fluorescence samples, intended to be used as an accessory for a Hamilton Automatic Liquid Handling Workstation in Research Use Only or in-vitro diagnostic (IVD) laboratories. It is not suitable as a standalone product. The module consists of a Base Station and a mobile device. The mobile device is transported by the instrument above the samples.

FLUOREYE is classified as a laboratory equipment, in accordance with the Low Voltage Directive.

i	If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

3.2 Hardware

Overview

FLUOREYE consists of a Base Station and a mobile device. This combination is placed on and powered by an Active Base Plate (offering 4 + 5 positions) or an MFX Single Active Position that delivers power and CAN control. This combination uses one SBS footprint and is therefore easy to integrate and is space-saving.

Fig. 3: FLUOREYE Components

FLUOREYE comes with two excitation and detection wavelengths that make FLUOREYE suitable for a wide range of test kits in RNA and DNA quantification, as well as for other applications. As the Mobile Device is picked up by a 1000 µl Pipetting Channel, the fluorescence reading functionality is brought to the plate (not vice versa as known from larger systems).

This allows for the hosting of the plate to be measured directly on the deck. If needed, the plate can stay on a cooled or heated position, or on a Hamilton Heater Shaker. The measurement is fast (less than 3 minutes for a 96 well plate in standard mode) and the FLUOREYE library/demo methods offer a large selection of settings to customize for special cases.

3.2.1 Mobile Device

The mobile device is equipped with two UV sensors (detection wavelength 520 nm / 680 nm) and two excitation light sources (470nm / 625nm) to excite the measurement. The mobile device is picked up by a 1000ul channel from the hosting platform and moved the mobile device over the labware containing the sample. At reading distance, the mobile device triggers the measurement. After a dark measurement and a definable number of excitated measurements, the values are transferred via Bluetooth Low Energy (BLE) to the Base Station (and from there into the instrument software via CAN).

The positions to read are simply defined in a sequence (Microlab STAR) or a Transfer Pattern (Microlab VANTAGE).

The mobile device is equipped with an RFID tag that pairs the mobile device with the Base Station. This guarantees a clear connection between the two units and allows for the use of multiple FLUOREYEs in the same laboratory or even on the same instrument. Note that the current library does not support the synchronous measurement with two or more units at a time on the same instrument.

Table with Excitation/Detection Wavelengths

	Excitation	Detection
System 1	470 nm	520 nm
System 2	625 nm	680 nm

Fig. 4: Mobile Device

3.2.2 Base Station

The FLUOREYE Base Station is placed on an Active Base Carrier or on a Multiflex Carrier using a Single Active Position.

These Base plates provide multiple locations to place active and passive modules and provides both power- and communication connections. The Base Station hosts the battery-charging electronics, the Bluetooth receiver, and an RFID Antenna used for the identification of the mobile device. The two units are paired in order to make sure only valid data is accepted. The data received from the mobile device is sent to the software using the CAN bus.

Fig. 5: Base Station

Function Check

The Base Station is equipped with an optical reference in order to allow a quick check of the proper function of the device. The mobile device, sitting in the park position, can measure a built-in reference "crystal" and delivers a value back. If this value lies within the specified tolerance, the proper function of the measuring system and the Bluetooth transmission is considered as proven. If this functionality delivers an error, the proper functionality is not executed, and a Hamilton representative must be contacted. (See also chapter " Demo Method" [▶ 46].)

Offset Teaching

A second marker allows for the checking of the X and Y offset of the device.

The offset teaching is performed by the user manually and needs to be executed individually per channel (see chapter " Demo Method" [▶ 42]).

Fig. 6: Teaching Marker

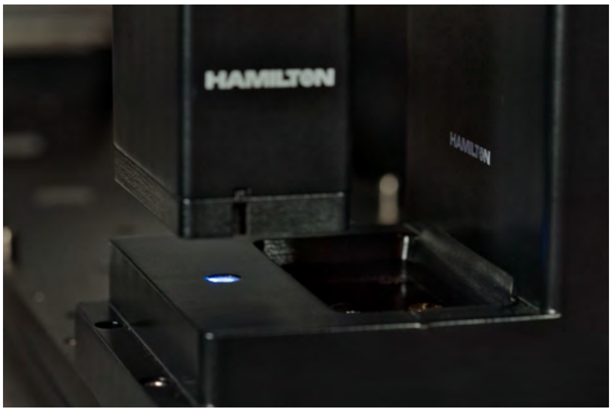


Fig. 7: Mobile Device Moved Above Teaching Marker

3.3 Operating Principle

3.3.1 Basic Description

In the Base Station, the mobile device is charged whenever parked. The Base Station sits on the Active Carrier that provides power and communication to the Module. An RFID tag in the mobile device and an RFID antenna in the Base Station pairs the two devices and makes sure that the Bluetooth communication is only established between paired devices. This is helpful if more than one device is used on one platform or multiple platforms in the same lab use FLUOREYE.

A 1000ul Pipetting channel picks up the mobile device and moves it above the plate positions to be measured. The definition of such a position is done with the Sequence Editor (VENUS). Before starting the measurement, the number of measurements as well as the measurement settings are used to calculate the maximum number of possible readouts.

Fig. 8: 1000ul Pipetting Channel Picking Up the Mobile Device

i	Make sure the needed space for FLUOREYE is allowed for when reading on a full deck. Especially, avoid "valleys" in your deck layout where the plate to be measured is located on a lower carrier than the surrounding.

Fig. 9: Mobile Device Measuring the Fluorescence

The mobile device measures the fluorescence within the well and delivers the value back to the Base Station. The transfer is done using a Bluetooth low energy protocol to extend the number of possible reads. It is possible to use combinations of the two excitation wavelengths and the two detection wavelengths.

3.3.2 Calculation Using a Standard Curve

FLUOREYE does not deliver an absolute concentration value. The value needs to be calculated based on a dedicated reference curve with two or multiple standard solutions of known concentrations. When using DNA or RNA Kits, these standards are part of the kit and can be used. FLUOREYE then measures the known standards and allows the precise calculation of all values in between the bottom and top standard concentration.

To calculate the concentration measured by FLUOREYE, the following formula is used:

$$Conc_{Sample} = \frac{[(RFU_{Sample} - RFU_{Dark}) - (RFU_{BottomStd} - RFU_{Dark})] \times Conc_{TopStd}}{(RFU_{TopStd} - RFU_{Dark}) - (RFU_{BottomStd} - RFU_{Dark})}$$

with

Conc	Fluorescence Concentration
RFU	Relative Fluorescence Unit

Indices

Sample	Sample
Dark	Dark Value
BottomStd	Standard Bottom Value
TopStd	Standard Top Value

Keep in mind that the dark value can either be used or not used in this formula.

If the dilution of the sample and the standard are not identical, they are also included in the calculation.

Dark Value

Dark value represents the value of the ambient, measured by the sensor when there is no excitation. Dark value compensation is used whenever the ambient light might have an influence on the measurement. If the dark value and the signal value are close to each other, this might be an indication of a very low fluorescence concentration or a very high ambient light in the given wavelength spectrum.

Standard Values

The mobile device itself delivers a value that is relative to a sample with a defined concentration (RFU, Relative Fluorescence Unit). Therefore, at least two standards must be present on the labware to be measured. Usually, there is a dark value (spot 1), as well as a bottom (or blank) standard (Spot 2) defining the lower end of the straight line. The top standard with a known concentration is found at the upper end of the line (spot 3). Now, it is possible to calculate the concentration of every sample value in-between (spot 4).

Calculation Example

In a simplified way, this would look as shown below:

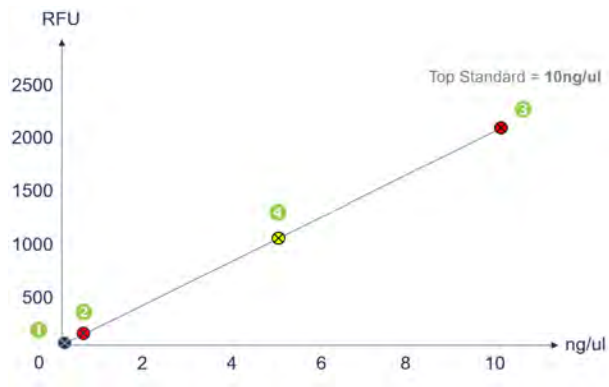


Fig. 10: Simplified Example

Calculation Example for the above graphic:

Measured Dark Value:	11 RFU
Measured Bottom Standard:	21 RFU
Top Standard 10.0 ng/µl:	2115 RFU
Measured Sample:	1019 RFU
Sample Concentration:	4.93083 ng/µl

Keep in mind that FLUOREYE is able to perform a dark value measurement. This means that the ambient light is compensated. The sensor values are read out without excitation, delivering the ambient light that can be subtracted from the measured excitated values.

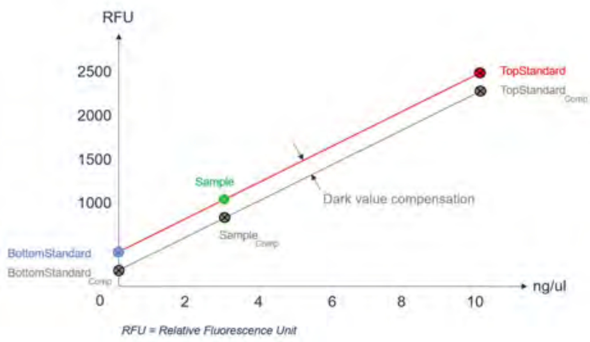


Fig. 11: Measurement with Dark Value Compensation

3.3.3 Library Parameter Overview

Quick Overview of Possible Settings

Parameter Name	Description	Range
ModuleID	Used to identify the mobile device if more than one FLUOREYE is connected to the instrument.	1 to 4
Cycle Number	The cycle number defines if one measurement per well will be taken, or if a series of measurements will be taken and the average of the values is passed back to the Base Station.	1 to 100
Cycle Time	The Cycle time defines the Interval in seconds between two measurements within a cycle.	1 to 100 seconds

Parameter Name	Description	Range
Method Type	The method type defines the combination of detection- and excitation wavelengths. Possible settings are: • E1D1: Excitation 1 (470nm) + Detection 1 (520nm) • E1D2: Excitation 1 (470nm) + Detection 2 (680nm) • E2D2: Excitation 2 (625nm) + Detection 2 (680nm) • E1D1_E1D2: Excitation 1 (470nm) + Detection 1 (520nm) + Detection 2 (680nm) • E1D1_E2D2: Excitation 1 (470nm) + Detection 1 (520nm) + Excitation 2 (625nm) + Detection 2 (680nm) • E1D2_E2D2: Excitation 2 (625nm) + Detection 2 (680nm) + Excitation 2 (625nm) + Detection 2 (680nm) • E1D1_E1D2_E2D2: Excitation 1 (470nm) + Detection 1 (520nm) + Excitation 1 (470nm) + Detection 2 (680nm) + Excitation 2 (625nm) + Detection 2 (680nm)	1 to 10 seconds
Dark Mode	To reduce/eliminate the effect of ambient light, the dark value indicates the amount of light without excitation and is subtracted to get the signal strength. It can be measured before each well is measured, or once in the beginning of the measurement	• none • once • Every Time
PowerLed1	This setting defines the measurement gain for the sensor. It can be varied for every measurement, if necessary	0 to 255
PowerLed2	This setting defines the measurement gain for the sensor. It can be varied for every measurement, if necessary	0 to 255
NumberOfPositions	Minimum number of positions measurable based on worst-case scenarios	Output parameter
BatteryLevel	Delivers the battery level in %	0 to 100
FullChargeNeeded	This value indicates that a full charge is needed	true / false
Temperature	Delivers the temperature of the internal sensor (not the liquid temperature!)	

i In order to gain more insight, review the library details.

3.3.4 Positioning the Mobile Device

Positioning the mobile device is crucial for obtaining correct data. Therefore, it is important to know that the optimal measuring distance of the Fluorescence Sensor is 16 mm (measured from the base of the mobile device to the liquid Surface). Having this distance maintained between the device border and the liquid surface, an optimal measurement is performed.

Fig. 12: Mobile Device Above the Sample Plate

Fig. 13: Measuring Distance Between Liquid Surface and Lower Border

i	Maintain a measuring position of 16 mm between the lower border of the case and the liquid surface. This provides the strongest signal as the value drops with more (higher) or less (lower) measuring positions.

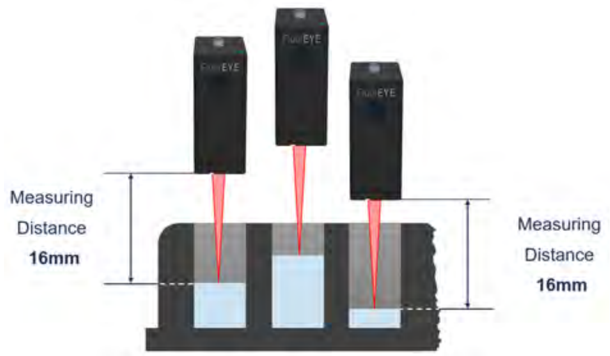


Fig. 14: Measuring Distance

To maintain this optimal reading position, two possibilities have been implemented.

3.3.4.1 Using 'Get Last Liquid Level'

The software allows for the measurement of the last liquid level of a well during an Aspirate or surface Dispense step. These values are returned as absolute coordinates (based on the instrument's zero position). In the 'Absolute' mode, this height is taken, recalculated, and then used to position the mobile device accordingly.

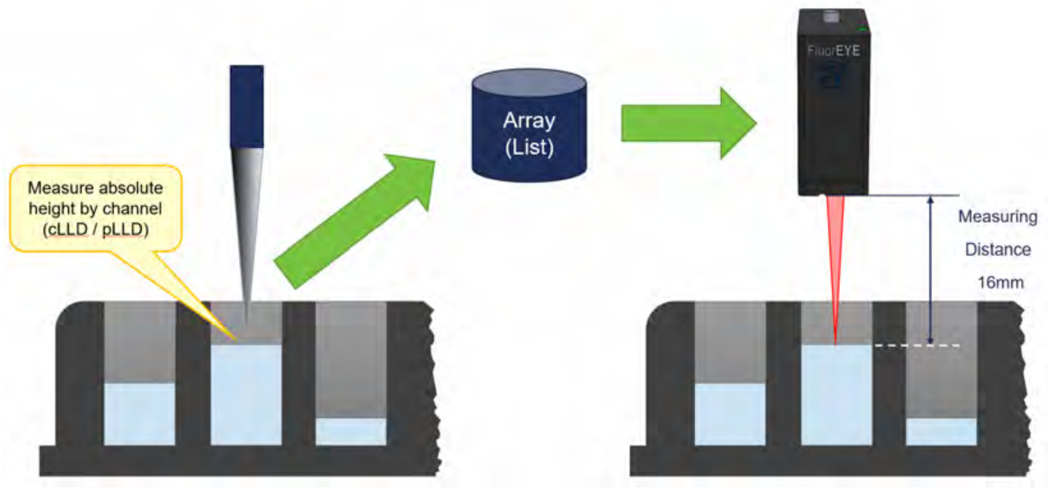


Fig. 15: Get Last Liquid Level

3.3.4.2 Using a Fixed Height

A second option to position the mobile device is the Relative mode. Here, the container bottom is taken, and a definable distance is used to indicate the liquid surface. Keep in mind that the given distance is the space between the lower border of the Mobile Device and the container bottom. Depending on the labware itself and the liquid level in the well, this distance must be chosen wisely to maintain an optimal measuring point.

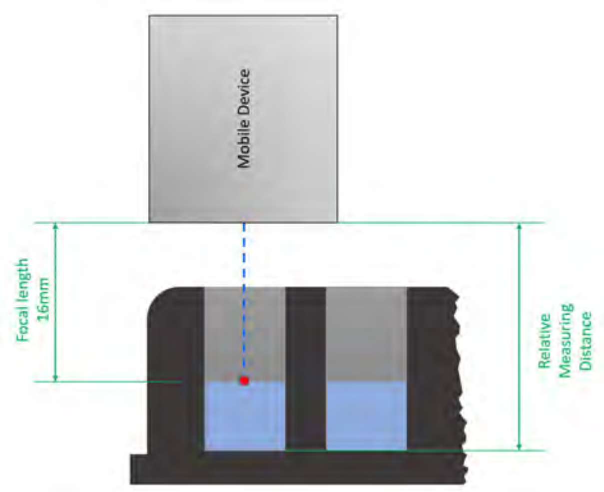


Fig. 16: Positioning by Fixed Height

Note that the definition of the measuring height uses an array (list) of values. This allows for the definition of an individual measurement height for each well, if desired. Keep in mind that the order of your measurement sequence and the order of the height values in the array must fit. Passing a single value only in the array, the Mobile Device will use this height for all measurements.

3.3.5 Return Values

The result for each well is returned in millivolt, but as you can see in the following chapter for calculation, the unit itself is not relevant. It is up to the programmer to define a relationship between these values in millivolt and the fluorescence concentration. The return values are provided in two formats.

To directly use the results in the method/assay, the following arrays are provided by the library:

Parameter Name	Meaning
LabwareIDs	The name(s) of the plate(s) for each measurement
PositionIDs	The names of the wells for each measurement
Sensor Temperatures	The internal sensor temperature (not the liquid!) for each measurement
Measured Values E1D1	Well signal measured with excitation = 470 nm and detection = 520 nm
Measured Values E1D2	Well signal measured with excitation = 470 nm and detection = 680 nm
Measured Values E2D2	Well signal measured with excitation = 625 nm and detection = 680 nm
Dark Signal Values E1D1	Ambient light measured at 520 nm, no excitation
Dark Signal Values E1D2	Ambient light measured at 680 nm, no excitation
Dark Signal Values E2D2	Ambient light measured at 680 nm, no excitation

In addition, a *.csv file is generated, holding the "raw" values.

As it is not possible to have optional parameters, the library always returns the values of all measurement types – measurements that are not taken return the last measured values. It is up to the programmer to just use the results that have just been measured.

3.4 Software

Hamilton FLUOREYE Library

Refer to the Help file in the FLUOREYE library. Every function is properly explained. Use the yellow question mark in the top-right corner of each command:

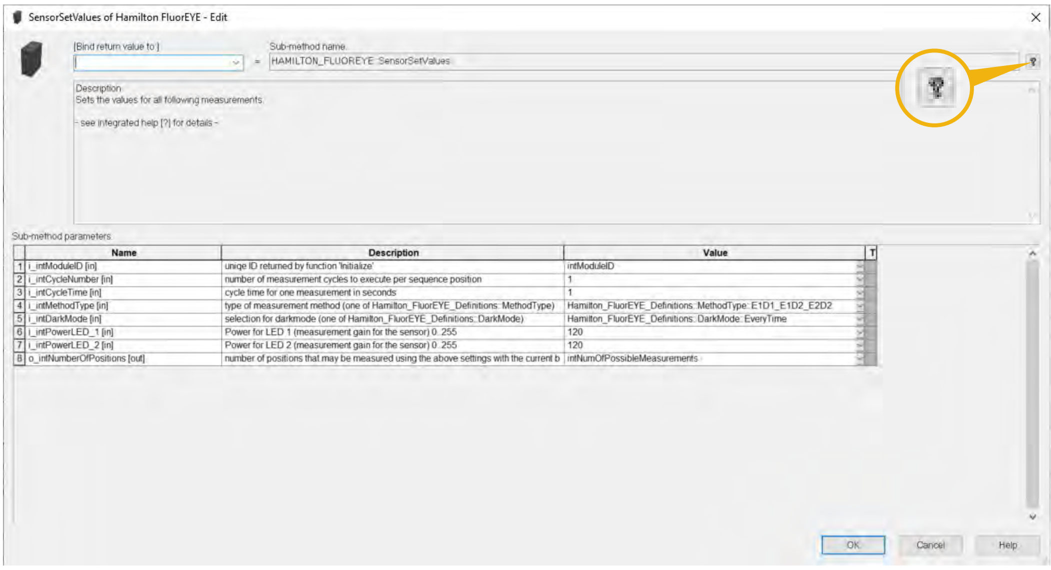


Fig. 17: Calling Help File

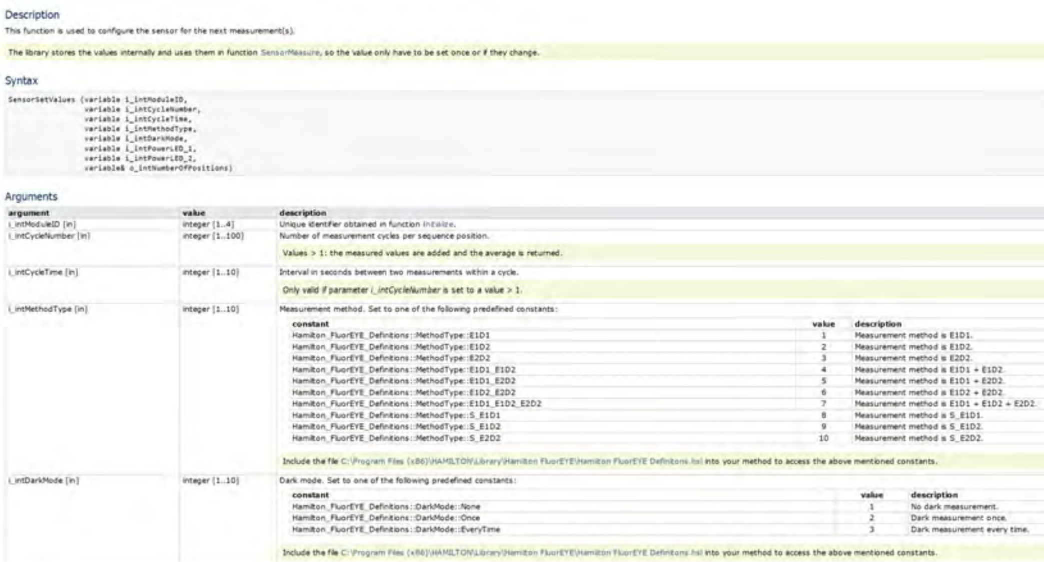


Fig. 18: Library Help (Example)

4 Installation

The following installation description is for user information only. The installation of the module must be performed by a trained Service Engineer.

i	Keep in mind that the blue LEDs on the STAR pipettor Arm will be disconnected during and after the installation of FLUOREYE. As they use the same wavelength as FLUOREYE, they may affect the results and are therefore permanently switched off.

i	When using FLUOREYE on a Microlab VANTAGE liquid handling system, please make sure the blue LEDs of the internal Status Light are programmatically switched off during the use of FLUOREYE and/or whenever sensitive samples are in the workspace. As the LEDs use the same wavelength as FLUOREYE, they may affect the results and are therefore permanently switched off.

4.1 Mechanical Connection

Step 1: Assemble the MFX Active Base Plate, the Base Station, and the mobile device outside the instrument; pins of MFX Active Carrier Base to connector of FLUOREYE must match (visual inspection).

Step 2: Make sure the centering bolts are mounted at the correct position. These will later fix the Base Station to the Active Carrier.

Step 3: Remove the silicone caps from the Active Carrier.

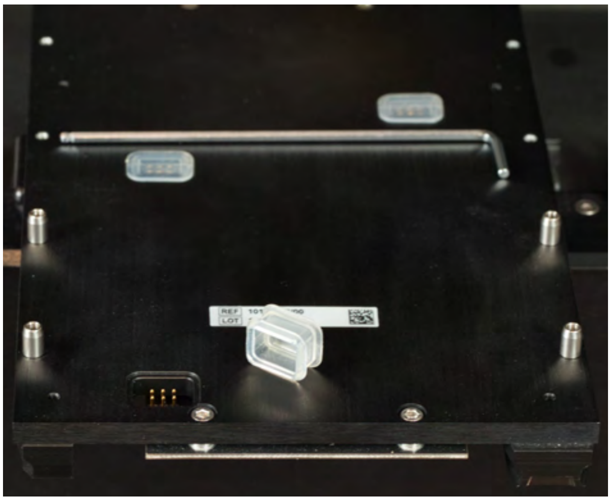


Fig. 19: MFX Active Base Plate, Silicone Cap Removed

Step 4: Mount the Base Station to the Active Carrier.
As there is an electrical connection at the bottom of the Base Station, be careful when positioning the Base Station. Insert the Base Station carefully on the MFX Active Carrier Base to not bend the connector.

It is possible to mount the FLUOREYE in 0 degree or 180-degree orientation. There are multiple positions to place the FLUOREYE on the MFX Active Carrier Base.

Step 5: As soon as the Base Station is placed correctly, use the 4 screws to fix it.

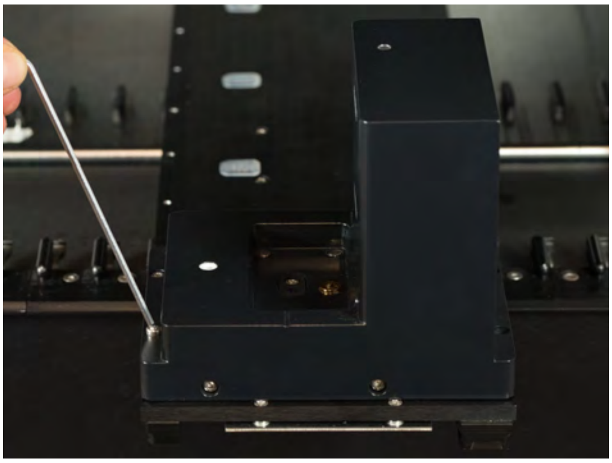


Fig. 20: Fixing the Base Station to the Active Carrier

Step 6: Mount the MFX Active Carrier Base to the desired position.

> *i* Keep in mind that the Connector Station with the Adapter cable is already fixed in the back of the Instrument. Refer to the Chapter "4.2 Electrical Connection" [▶ 27] to learn how the cable for the active Carrier must be installed.

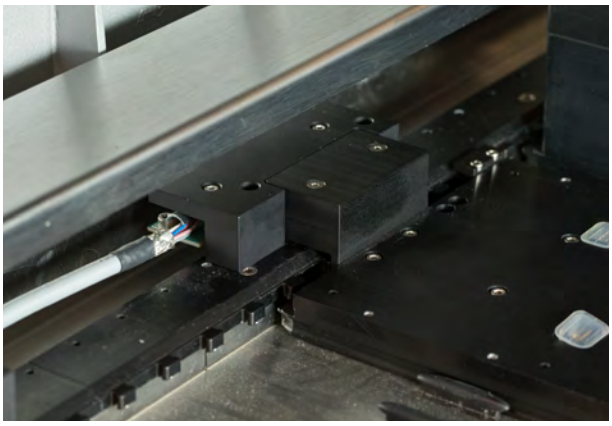


Fig. 21: Connector Station with Adapter Cable

Step 7: Finally, place the mobile device in the Base Station. Make sure the connection pins (for charging the mobile device) are located above the charging pins of the Base Station. Due to the magnetic charging pins, the mobile device is kept in place.

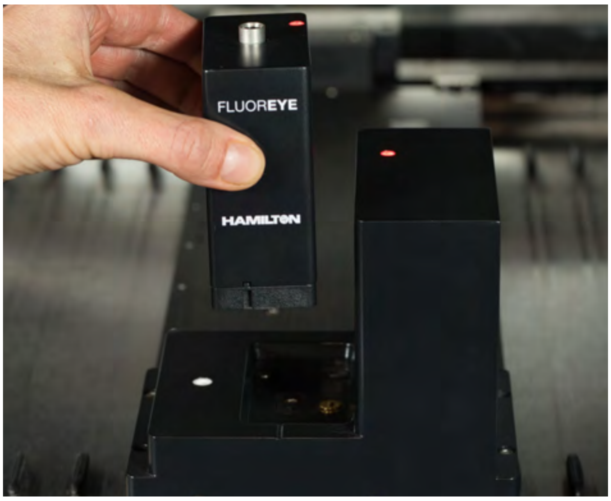


Fig. 22: Placing the Mobile Device in the Base Station

4.2 Electrical Connection

Since FLUOREYE is used on the Active Base Plate, no additional cables or additional electrical connections must be used. The Base Station is powered by the Active Base Plate and charges the mobile device whenever placed in the Base Station.

The Adapter Cable of the Connector Station is connected to the TCC1 or TCC2 connector of the Periphery Connector, at the left side of the instrument.

Make sure that the Microlab STAR Instrument is switched off before sliding the MFX Active Carrier Base onto the deck and connecting it with the Connector Station on the Carrier Stops.

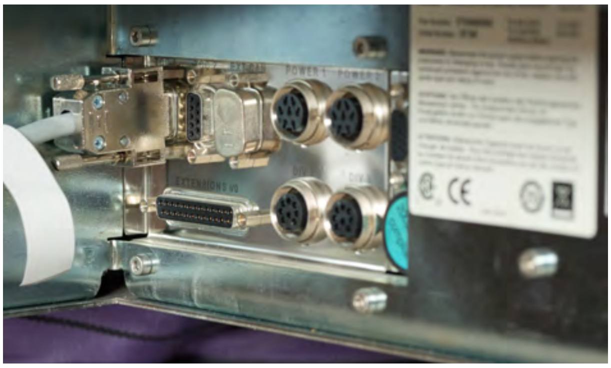


Fig. 23: Periphery Connector at the Left Side of the Instrument

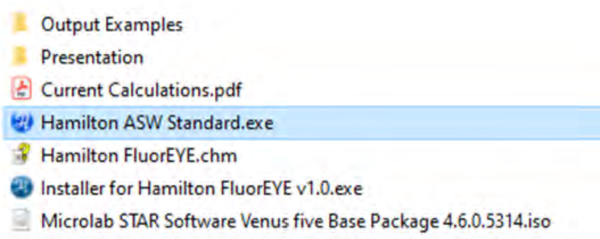
4.3 VENUS Integration

4.3.1 Installing the FLUOREYE Library

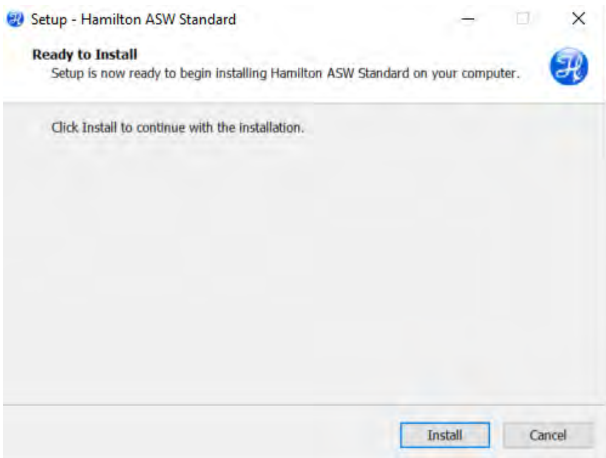
As a prerequisite, the ASW Standard Library must be installed.

Follow the steps shown below to install the Library, Driver, and the Demo Method.

Step 1: Start HAMILTON ASW Standard.exe.
The file is either available on the Resource Center, or you will receive a download link when trying to install the Hamilton FLUOREYE.exe



⇨ The setup dialog opens.

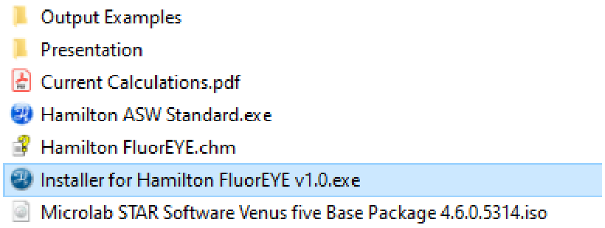


Step 2: Start the installation by clicking Install.

⇨ After the successful installation, the following dialog is shown.

Step 3: Confirm the dialog with Finish.

Step 4: Now, install the FLUOREYE library.

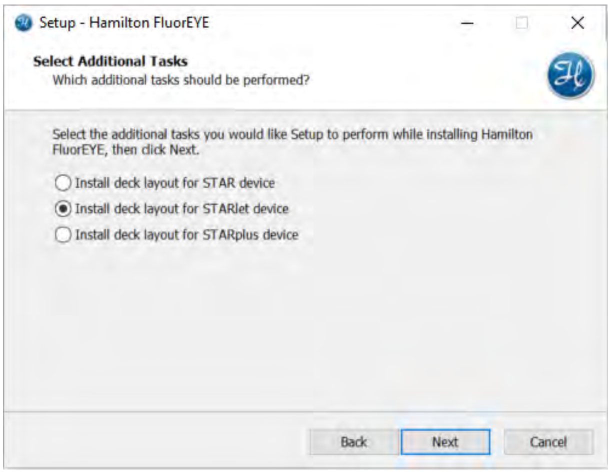


i	Keep in mind that your version may be more current than the one shown. The installation procedure does not change.

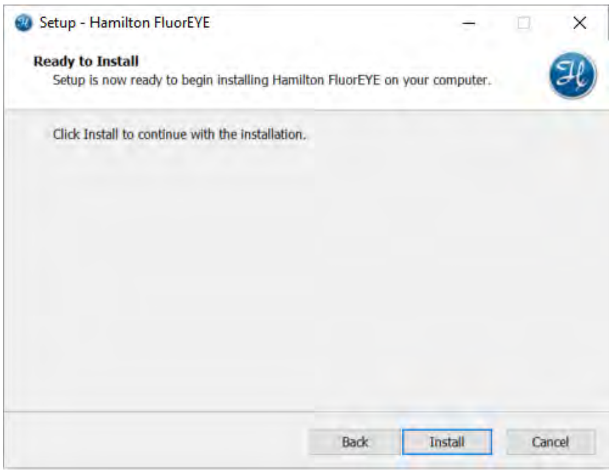
⇨ The welcome screen of FLUOREYE is shown.

Step 5: Click Next to continue.

Step 6: In the next dialog, select the size of the instrument deck.



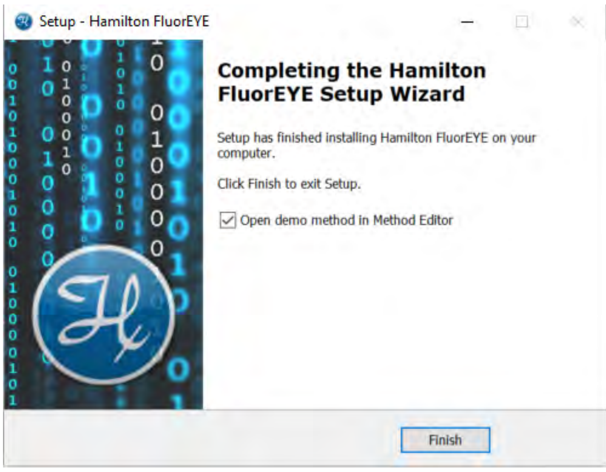
Step 7: Confirm the selection with Next.



Step 8: Start the installation by clicking Install.

⇨ The necessary files are now copied.

⇨ Once the installation is done, the completion screen is shown.



Step 9: To directly open the Method Editor with the demo method, leave the checkbox checked and click on Finish.

4.3.2 Programming the FLUOREYE

4.3.2.1 Library Description

The Demo Method is installed in the following folder:

`C:\Program Files (x86)\HAMILTON\Methods\Library Demo Methods`

(Keep in mind that the windows part of the path may be language-dependent)

Have a look at the following description of the Demo Method.

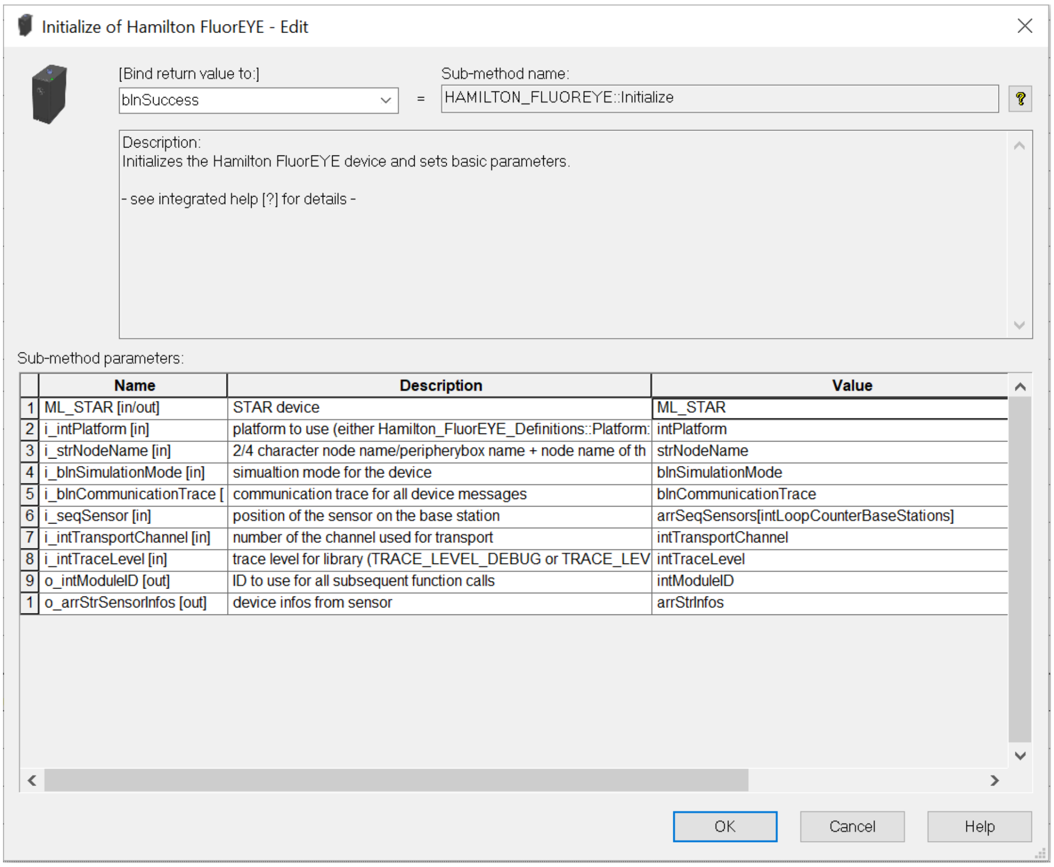
In general, FLUOREYE always uses the following structure of commands. Note that some of the steps are only used in the preparation phase or on an optional basis.

1. Initialize
2. Get Battery Level (optional)

3. PositionOffsetTeach (optional)
4. SetMeasurementValues
5. FunctionTest (optional)
6. SensorPickup
7. SensorMeasure
8. SensorEject

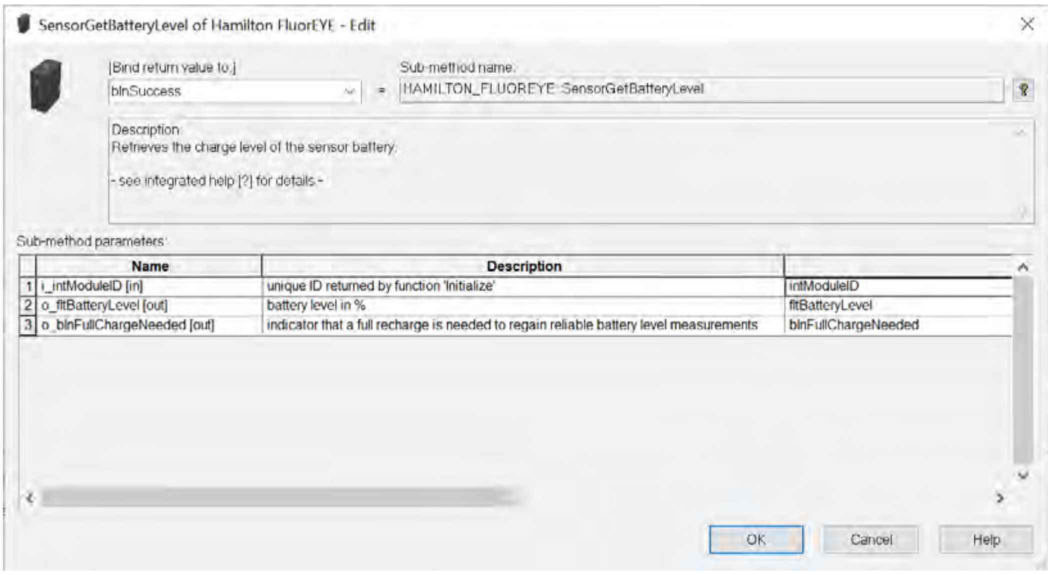
Here is a description of the individual steps for the above-mentioned cycle. Keep in mind that surrounding programming steps are necessary, e.g. the definition of used variables, etc. All these can be seen in the delivered demo method, whereas here only the individual steps are explained.

Initialize



ML_STAR[in/out]	Defines the host device.
i_intPlatform	Definition of the platform: 1 = STAR (with VENUS), 2 = Microlab VANTAGE (with VENUS on VANTAGE).
i_strNodeName	The node name is used to identify each module. Per default, the value ‘M1’ is used. This is the factory setting, having all DIP switches in the Base Station set to ‘ON’. Refer to the Help of this command for an overview of DIP switch settings.
i_blnSimulation	This parameter defines whether control commands are sent to the physical device or mimicked in simulation.
i_blnCommunicationTrace [in]	For deeper analysis, additional communication traces can be activated. Keep in mind that activation all communication traces will generate large logfiles.
i_seqSensor [in]	This sequence defines where to pick up the mobile device. It is defined automatically when adding the module to the deck layout.
i_intTransportChannel [in]	Definition of the channel number to pick up the mobile device. In order to distribute the load, the channel to handle the mobile device can be alternated. Keep in mind that changing the channel may require the execution of the SensorPositionOffsetTeach command, to make sure the measuring position is correct. Having more than 8x 1000ul channels or additional functions like a camera channel may reduce the available positions on your deck layout. Please make sure that the selected channel is able to travel over all measuring sequence positions.
i_intTraceLevel [in]	Same as the communication details, also the library trace level can be set. Use 1 for a reduced set and 2 for the debug details as well.
o_intModuleID [out]	The ModuleID is used to distinguish the source of the messages sent to the software. It is best practice to define a variable upfront and use it here, as this variable will be needed in almost all the following commands.
o_arrStrSensorInfos [out]	Define an array to get basic information of the sensor such as serial number and revision. Please refer to the help section for the complete list of available data.

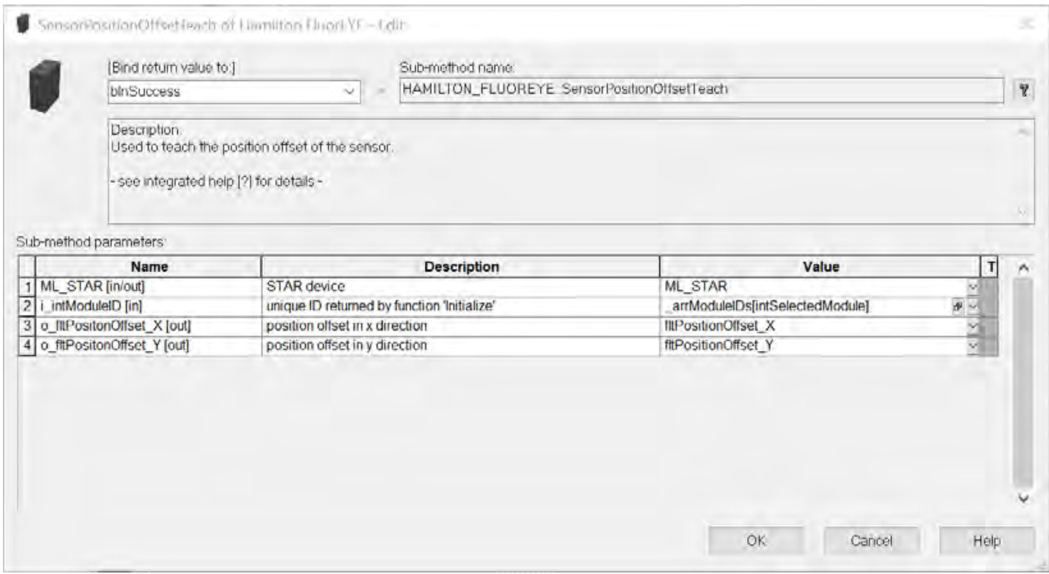
Get Battery Level



i_intModuleID [out]	The ModuleID is used to distinguish the source of the messages sent to the software. Please use the value generated by the Initialize command.
o_fltBatteryLevel [in]	This output indicates the percentage of the charging level of the mobile device.
o_blnFullChargeNeeded [out]	As soon as the charging level of the mobile device is below 33%, the value switches from 0 to 1 and indicates that a full charge is necessary. Refer to the command’s Help for further details (e.g. how to find out how long a full charge may take).

SensorPositionOffsetTeach

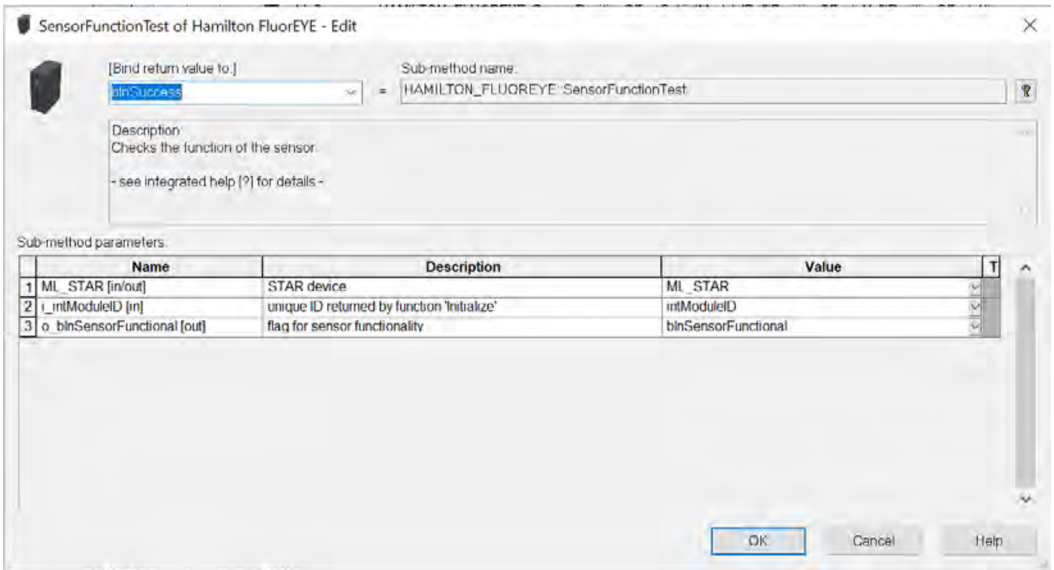
In order to compensate channel imprecisions, it is possible to execute a SensorPositionOffsetTeach command. This command picks up the mobile device and moves it over a test ring on the Base Station. The LEDs are switched on and it is now possible to check visually how centric the light circle fits the reference ring. Please refer to the section [LINK] to get more details.



ML_STAR[in/out]	Defines the host device.
i_intModuleID [in]	The ModuleID is used to distinguish the source of the messages sent to the software. Please use the value generated by the Initialize command.
i_fltPositionOffset_X [in]	Defines the correction made by the operator in X (that means on the ‘left-to-right’ axis of the instrument).
i_fltPositionOffset_Y [in]	Defines the correction made by the operator in Y (that means on the ‘front-to-back’ axis of the instrument) Please refer to the Help section of this command for further details of the teaching dialog etc.

SensorFunctionTest

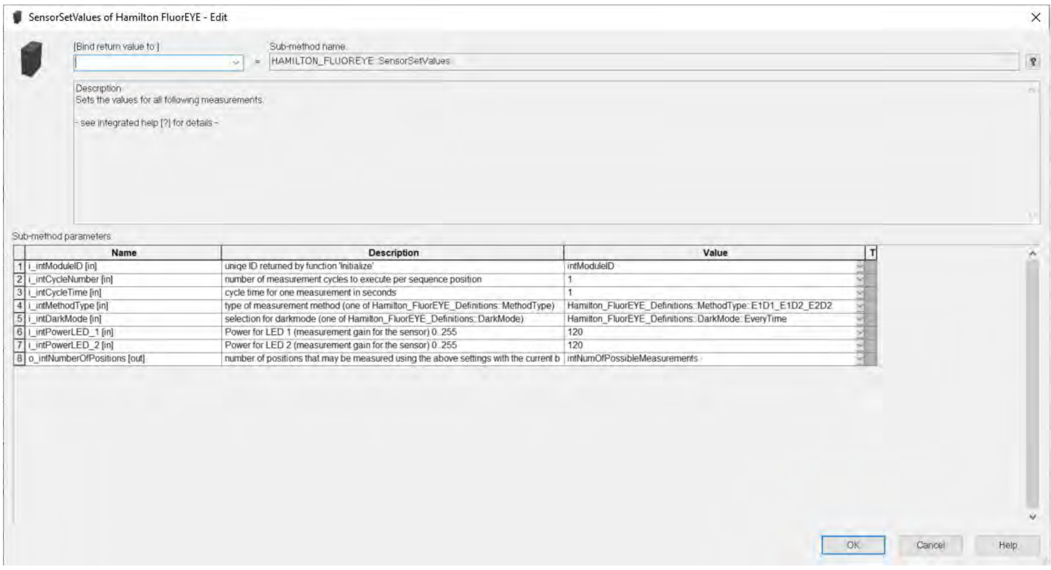
To test the basic functionality of both Base Station and mobile device, the command SensorFunctionTest can be used. While the mobile device is parked in the Base Station, both measuring systems are triggered to measure. A small reference point in the Base Station is used to bring the system into saturation. This value is then sent from the mobile device to the Base Station and into the software. Thus, the measuring systems (LED & detector), the pairing, the Bluetooth connection as well as the driver's proper function are checked. The duration of this check is ~8 seconds.



ML_STAR[in/out]	Defines the host device.
i_intModuleID [in]	The ModuleID is used to distinguish the source of the messages sent to the software. Please use the value generated by the Initialize command.
o_blnSensorFunctional [out]	This flag indicates whether the sensor works fine (1) or there are issues (0). In this case, please contact a Hamilton representative.

SensorSetValues

SensorSetValues is used to define the parameters for the measurement. Please keep in mind that these parameters may have a major influence on the generated results (e.g. the LED power) as well as the execution time (e.g. cycle number, cycle time, dark mode settings).



i_intModuleID [in]	The ModuleID is used to distinguish the source of the messages sent to the software. Please use the value generated by the Initialize command.
i_intCycleNumber [in]	The number of measure cycles per sequence position (well). If more than one measurement is taken, the average of the number of measurements is calculated and the result is sent back.
i_intCycleTime [in]	This value defines the pause in between two measurements. It is only used if the CycleNumber is > 1.
i_intMethodType [in]	Refer to the Help section of the command to see the possible measurement modes. Example 1: Mode 1 = E1D1: The LED 1 with the excitation wavelength 470 nm (E1) and the sensor with detection wavelength 520 nm (D1) is used for the measurement. Example 2: Mode 4: First, the LED 1 with the excitation wavelength 470 nm (E1) and the sensor with detection wavelength 520 nm (D1) is used for the measurement. Directly afterwards, the LED 2 with the excitation wavelength 625 nm (E2) and the sensor with detection wavelength 680 nm (D2) is used for the measurement.
i_intDarkMode [in]	To check the influence of the ambient light, a dark measurement can be executed. This value needs to be subtracted from the signal result. Sample value = measured signal – dark value.

4.3.2.2 Demo Method

With the installation of the Library, the demo method is installed as well.

The demo method can be found here (pathname may be language-dependent):

`C:\Program Files (x86)\HAMILTON\Methods\Library Demo Methods \Hamilton FLUOREYE Demo.med`

Ensure that the layout of the Demo Method is identical to the layout on the actual instrument. The position of the Base Carrier may vary depending on your current installation.

Step 1: Start the VENUS software and open the Hamilton FLUOREYE Demo Method.

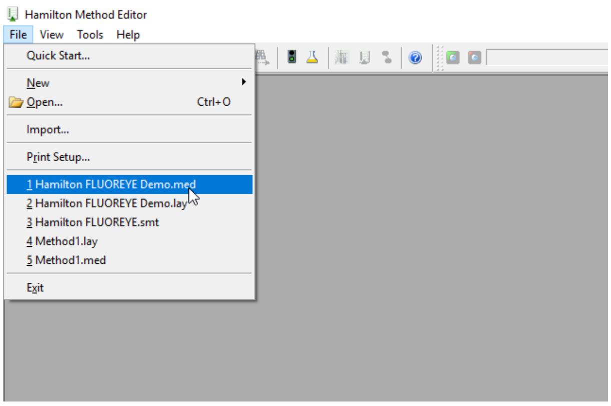


Fig. 24: Opening the Hamilton FLUOREYE Demo Method

⇨ The Method opens and shows the four main blocks.

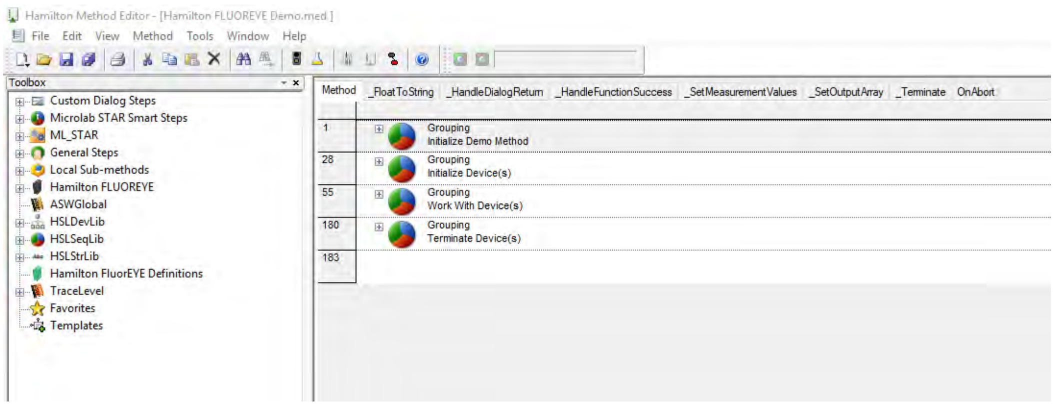


Fig. 25: Four Main Blocks of the Demo Method

Step 2: Click the green traffic light icon to start the Method.

⇨ The Starting Dialog is displayed.

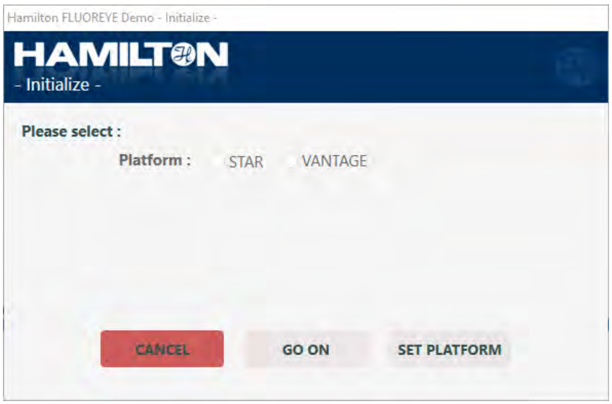


Fig. 26: Initialize Dialog, First Query

Step 3: First, select the platform to be used and confirm with SET PLATFORM.

⇨ The dialog is extended by the Node Name entry.

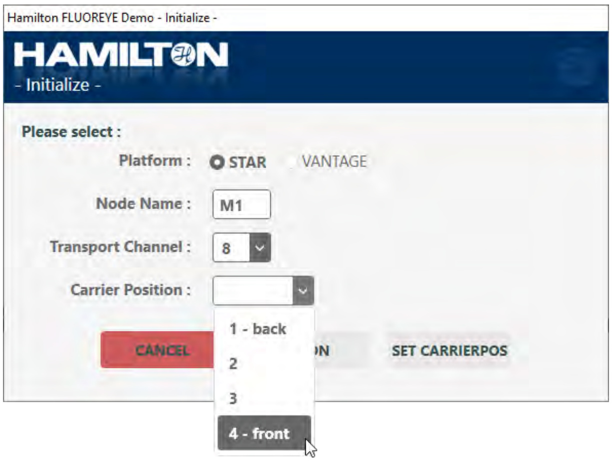


Fig. 27: Initialize Dialog, All Queries Displayed

Step 4: Enter the Module ID (normally M1 when using a single module only) and confirm with SET NODE NAME.

⇨ The dialog is extended by the Transport Channel entry.

Step 5: Select the Transport channel (1 = back, high number = front) and confirm with SET TRANSPORT CHANNEL.

⇨ The dialog is extended by the Carrier Position entry.

i As the Demo Method has a modular setup, the communication settings "Node Name" and "Transport Channel" must be set for each method step.

Step 6: Define the position of the FLUOREYE Base Station (1 = back, 4 = front) and confirm with SET CARRIERPOS.

⇨ As soon as the definitions are done, the Module and Instrument can be initialized.

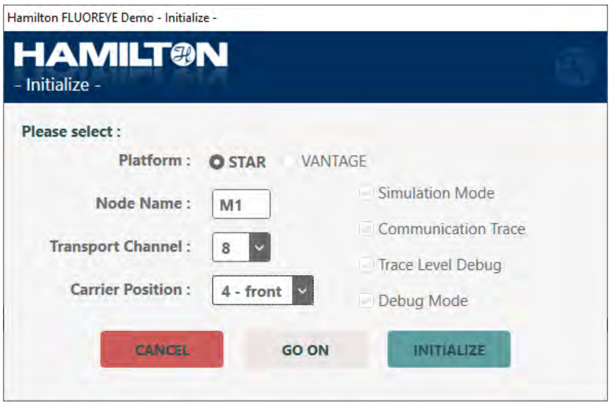


Fig. 28: Initialize Dialog, Ready for Initialization

Step 7: Click INITIALIZE.

⇨ As a sign of successful communication, the technical details of the mobile device are shown in the next dialog.

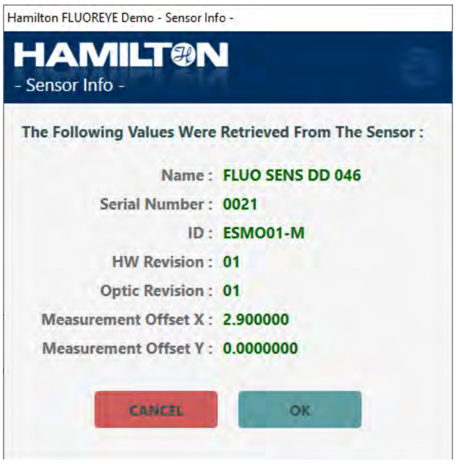


Fig. 29: Sensor Info Dialog

Step 8: Confirm with OK.

⇨ The Initialize Dialog is displayed again.

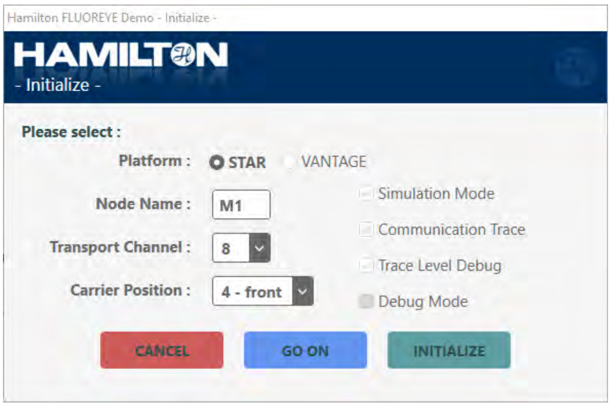


Fig. 30: Initialize Dialog, Ready for Operation

Step 9: Click GO ON.

⇨ The possible tasks are displayed.

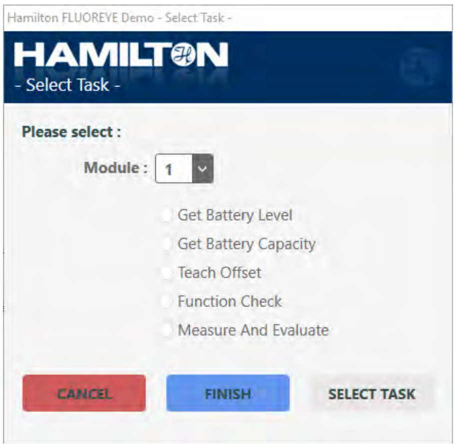


Fig. 31: Select Task Dialog

Step 10: Select the module to use.

Step 11: Select the task.
Refer to the following sections for further information on each task.

Get Battery Level

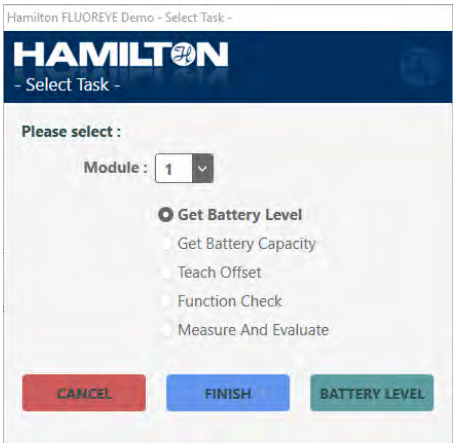


Fig. 32: Get Battery Level Task Selected

The "Get Battery Level" function reads the charging state of the battery.

The result of this request is displayed in a dialog:

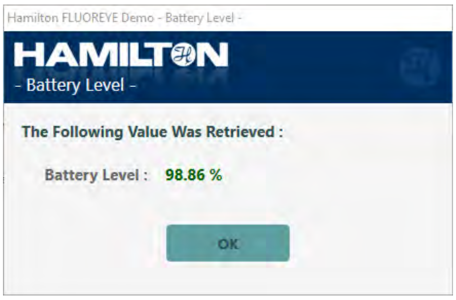


Fig. 33: Get Battery Level Task Result

i	When using the FLUOREYE in Simulation mode, there will be an error in ~14% of the cases, indicating that the current battery power is insufficient to execute the measurement. The routine in the background checks the current computer time and uses low second values to trigger the error.

Get Battery Capacity

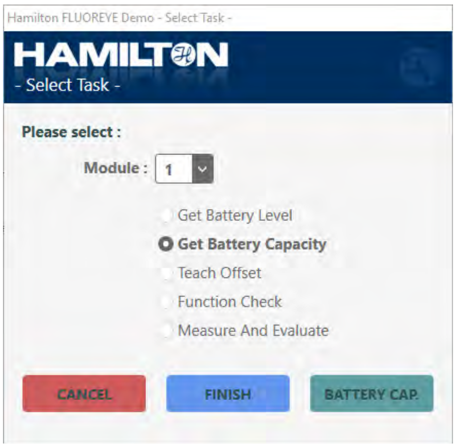


Fig. 34: Get Battery Capacity Task Selected

This function calculates the current battery capacity based on the nominal capacity.

The batteries normally contain a higher amount of energy than the nominal capacity. Since the capacity is calculated based on the nominal capacity, it is possible to receive values higher than 100%

Fig. 35: Get Battery Capacity Task Result

Teach Offset

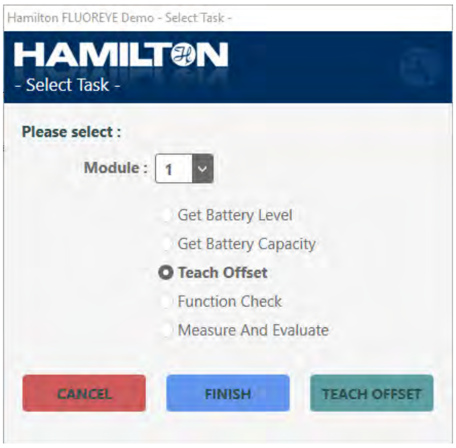


Fig. 36: Teach Offset Task Selected

As the mobile device is operated by a Pipetting Channel, there might be slight differences in the vertical angle. In combination with the traveling distances, an angular error results in an off-center measurement point. To avoid false positioning of the light beam, the Module provides a teaching function to compensate for this possible issue.

A Teaching Task includes the following steps:

- Picking up the mobile device
- Moving the mobile device above the teaching point of the Base Station.
- Positioning the light beam in the center of the teaching position based on operator's input.
- Storing the values and use them for all sensor movements.

Keep in mind that the offset values are individual per Pipetting Channel (as the angle deviation is also individual per Pipetting Channel). Therefore, perform a Teaching operation whenever you choose to use a different Transport Channel.

Teach Position Offset Dialog

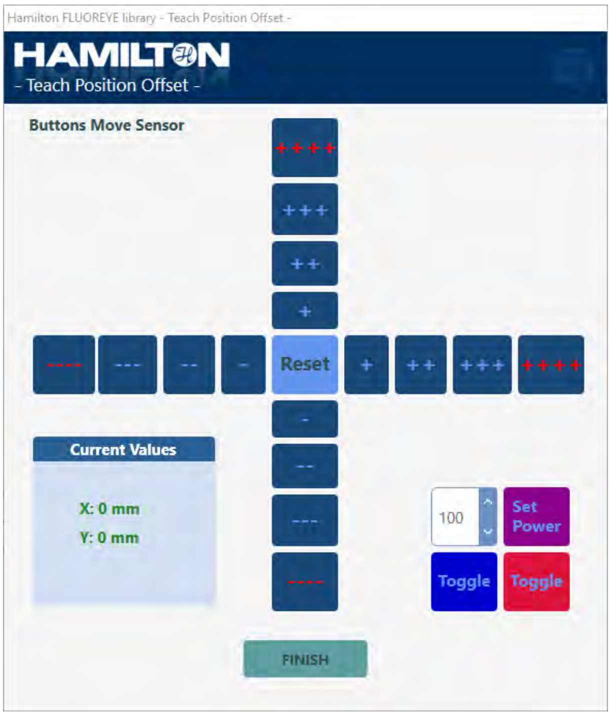


Fig. 37: Teach Position Offset Dialog, No Movements Done

The buttons represent the X- and Y-axis of the Transport channel. Mouse over to see the individual steps that are taken by clicking this button. In the lower-right corner, the LEDs can be switched on off, and the intensity is selectable.

Every time you click on one of the buttons (except 'FINISH'), the dialog is closed, the operation is executed, and the dialog is reopened with the updated values (current values).

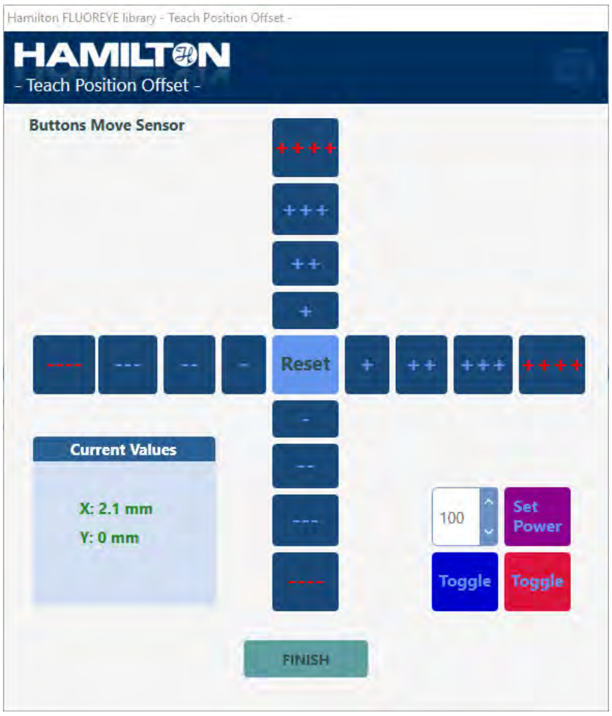


Fig. 38: Teach Position Offset Dialog, Values Updated After Movement

Make sure the light beam exactly meets the Teaching Position hole and completely disappears.

If the light dot of the sensor leaves the white circle of the marker, the system is misaligned. In this case, please contact a Hamilton representative.

Fig. 39: Teaching Marker

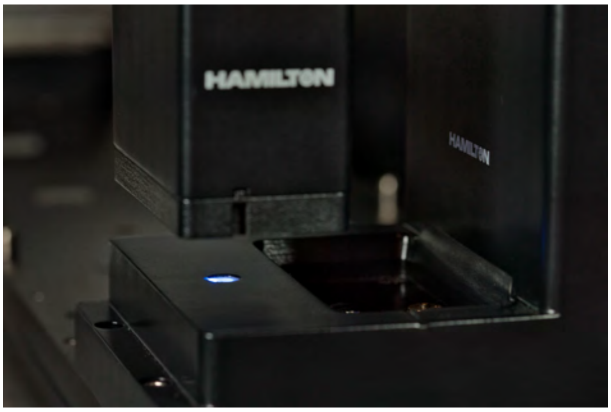


Fig. 40: Mobile Device Moved Above Teaching Marker

Whenever this ideal positioning is reached, Click FINISH to close the Teaching dialog.

As a summary, the retrieved values are listed:

Fig. 41: Teach Offset Task Confirmation

Function Check

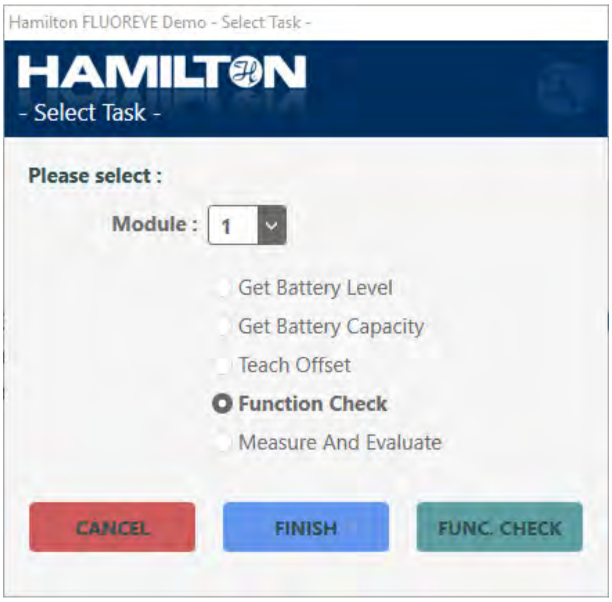


Fig. 42: Function Check Task Selected

The Function Check performs a measurement while the mobile device is sitting in the Base Station. A small emitting source is installed and will provide a signal when excited. This proves a proper function of the whole system including LEDs, detector, battery, RFID Tag, Bluetooth connection, and loading function.

The result of the Function Check is shown in the next dialogs.

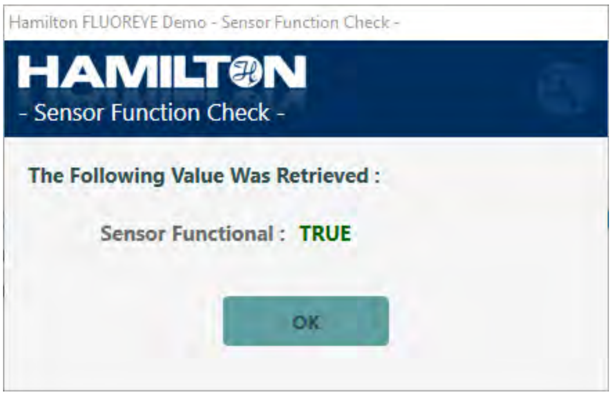


Fig. 43: Function Check Task Result, Sensor Good

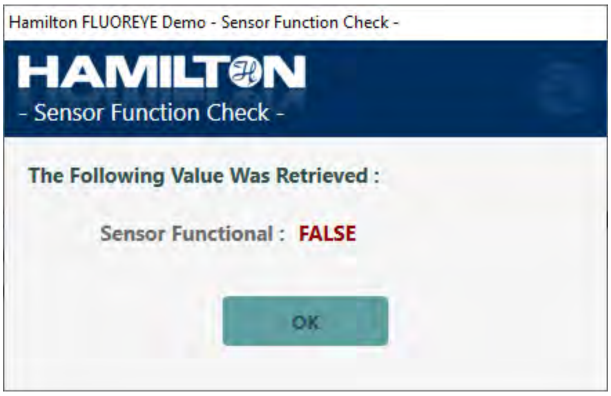


Fig. 44: Function Check Task Result, Sensor Faulty

If you receive a FALSE answer, retry the Function Check. Check if the system is properly powered, and if no dirt can be found in the Base Station (especially on the reference source) or at the mobile device lens and let the mobile device charge for a few minutes.

If other tests still provide the same result, contact your Hamilton representative.

Measure and Evaluate

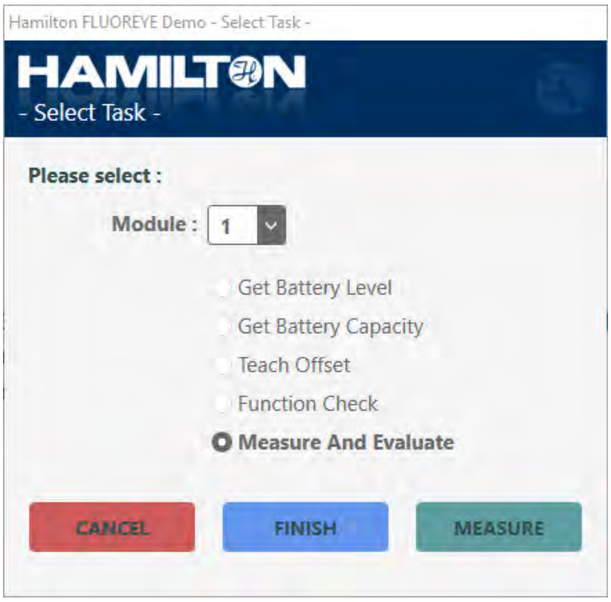


Fig. 45: Measure and Evaluate Task Selected

With the Measure and Evaluate task the different modes to measure a well and all the details can be configured. This is the most important function.

After clicking MEASURE, the dialog to set up the details is shown:

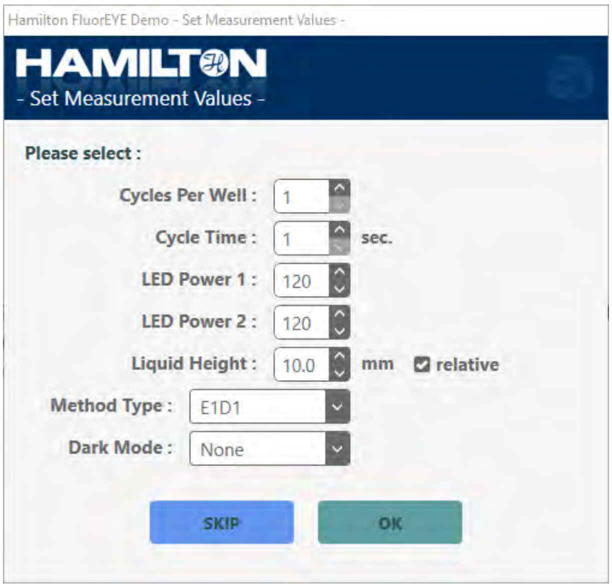


Fig. 46: Set Measurement Values Dialog

Cycles per Well	Defines the number of measuring cycles in the same well. Please note that for every value > 1 the average of all measurements is returned.
Cycle time	The cycle time defines the time before the next of measurement after excitation can take place [in seconds]
LED Power 1	This value controls the intensity of the LED 1.
LED Power 2	This value controls the intensity of the LED 2.
Liquid Height	The measuring distance of the optical system is exactly 16 mm below the lower housing border. To get reproducible results at the highest sensitivity, please maintain a constant distance of 16 mm between the liquid surface and the lower border of the mobile device housing. There is a relative and an absolute mode. While the relative mode defines the height of the liquid in the well relative to the well bottom, the absolute mode refers to the instrument origin. The relative mode can therefore be used if the labware and the liquid level is known. The absolute mode can be used if there were pipetting operations and the values of the liquid levels are stored using the ‘Get Last Liquid Level’ functionality of the VENUS Software.

i	The demo method only uses one single height (absolute or relative) for the whole sequence to reduce complexity.

Method Type	Use this setting to choose between the different options of the optical system.

Dark Mode

In order to compensate for possible influences from ambient light, the module comes with a dark mode. Having this setting activated, the mobile device reads out the ambient light level before switching on any of the LEDs. The measured dark value must then be subtracted from the measured value with excitation. Choose from a single dark value measurement at the beginning of the measurement, getting a dark value for every well and having no dark value measurement activated.

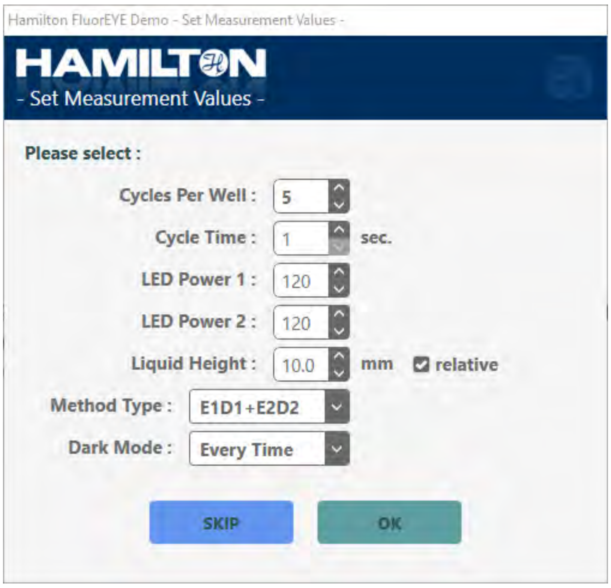


Fig. 47: Set Measurement Values Dialog, Example Data

Before the measuring is done, the Software calculates the number of possible read-outs using the given settings and the current charge level of the battery. This can be easily compared to the number of reading positions.

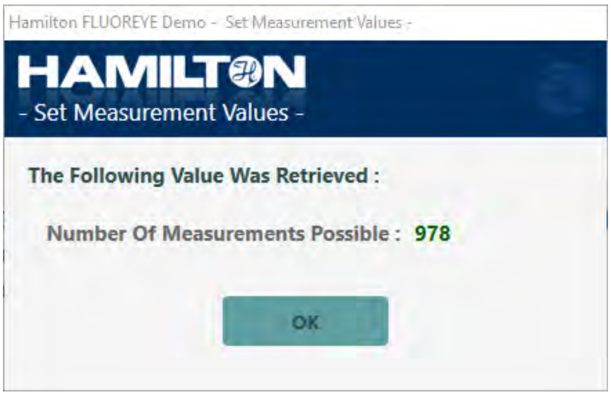


Fig. 48: Set Measurement Values Dialog, Possible Number of Measurements Calculated

In the Demo Method, a 96 well plate is read out column-wise, starting at A1. The sequence size defines how many wells will be measured. The example below will measure the first three columns of the test plate.

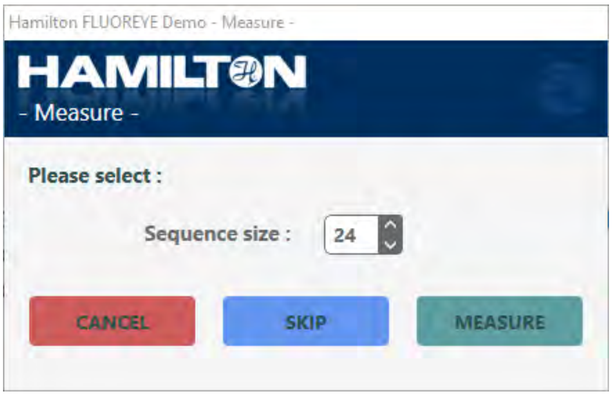
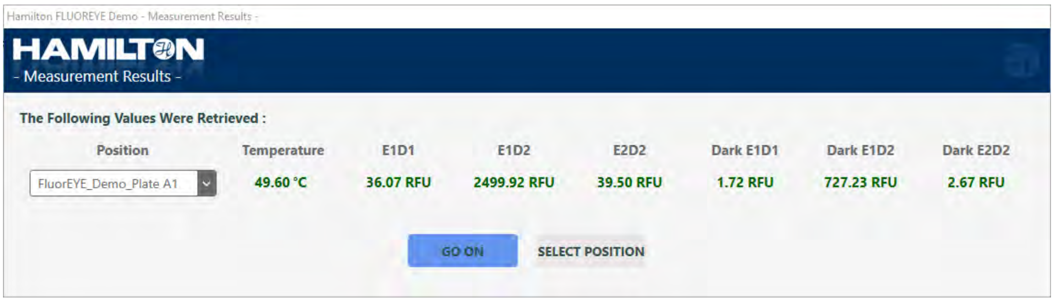


Fig. 49: Measure Dialog

When done, a quick overview dialog of the results is displayed:



After selecting a new position from the drop-down, the button SELECT POSITION changes to UPDATE, and all shown values are reset. Click on UPDATE to close and reopen the dialog with the values of the selected position.

As a further step, the results can be written to an output file for later use.

Define the File Format, the location, and the content of this file in the Write Output File dialog:

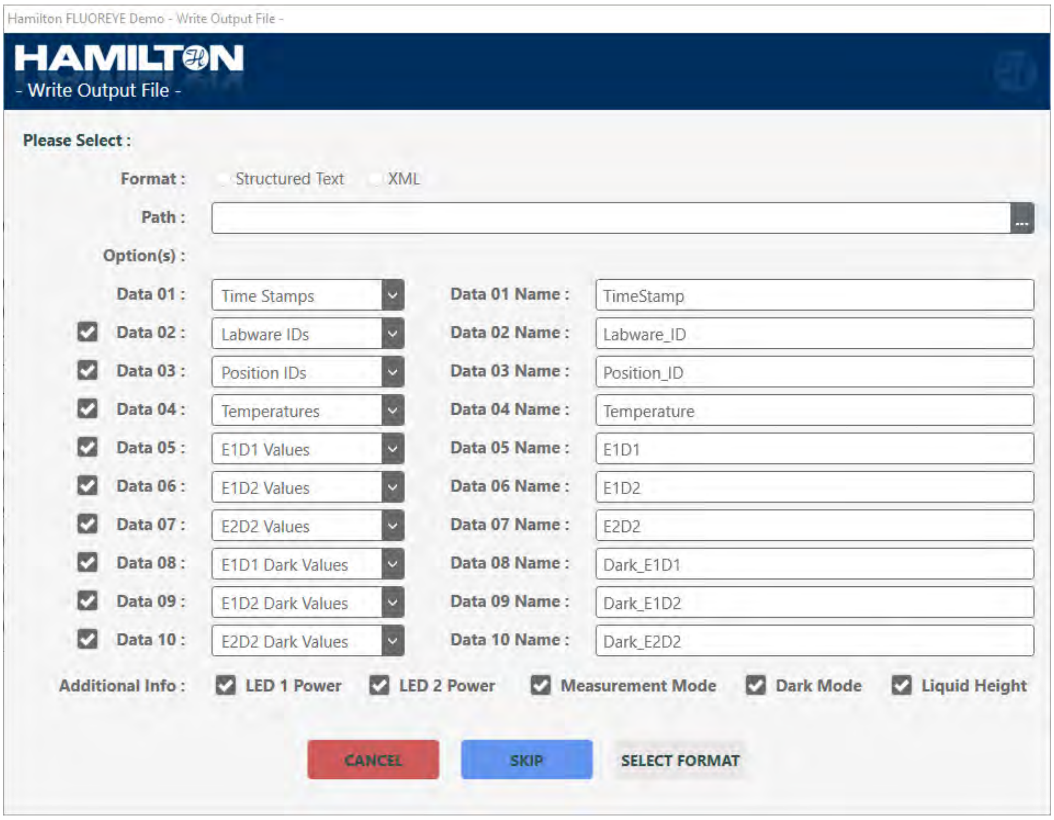


Fig. 50: Write Output File Dialog

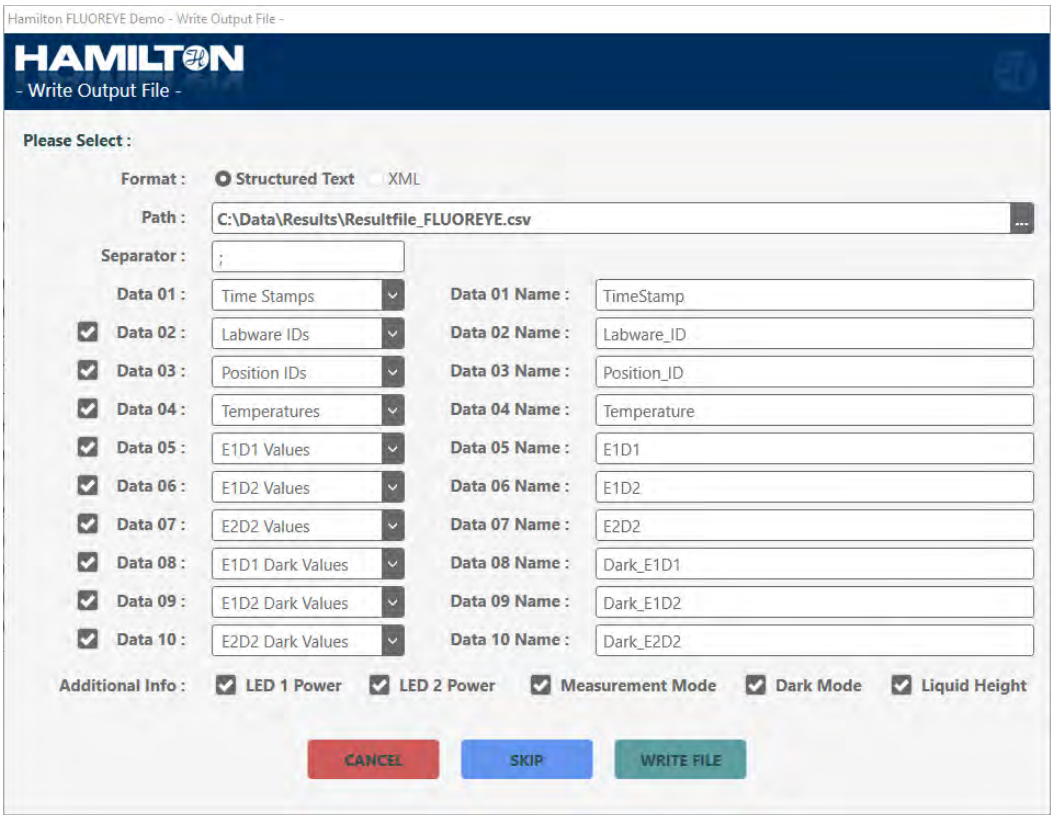


Fig. 51: Write Output File Dialog, Path Entered

Confirm the Export with WRITE FILE.

5 Operation

FLUOREYE is always placed on the ML STAR or Microlab VANTAGE platform and operated by the respective platform software. It is not intended to be used as a standalone unit.

Follow the instructions and guidelines regarding the safe operation of the host platform (e.g. regarding electricity, flammable liquids, acid etc.). Only use FLUOREYE in a safe environment as specified in the platform manuals.

Switching on the Instrument

When switching your instrument on, make sure that the mobile device is placed properly in the Base Station. After a moment of pairing, the two LEDs on top of the Base Station and mobile device must be on permanently. This indicates a successful pairing.

Keep in mind that the colors of the LED may be different, as the mobile device LED also indicates the battery loading status. For the pairing indication, it is just important that both LEDs are constantly on.

LED Base Station	LED Mobile Device	Meaning
Off		Power not connected / Instrument off
	Off	Device in deep sleep mode (10min no activity) or battery defective
Flashing slowly	Flashing slowly	Pairing ongoing (takes a few seconds)
Constantly ON	Constantly ON	Pairing successful
Flashing quickly	Flashing quickly	Data transfer ongoing while measuring
	Constant green	Loading state above 80%
	Constant yellow	Loading state above 50%
	Constant red	Loading state above 30%, charge the device

6 Maintenance

6.1 Intervals

Hamilton recommends inspecting and cleaning the FLUOREYE regularly to maximize its lifespan:

- Daily Inspection

  Recommended before shut-down at the end of the day.
- Weekly Cleaning

  Recommended before shut-down at the end of the week.

6.2 Materials Required

Personal Protective Equipment

- Protective Goggles
- Disposable Latex Gloves
- Protective Clothing

Cleaning Agents

Depending on the degree of contamination, the following cleaning agents are suitable for cleaning parts of the module.

Suitable Cleaning Agents	Concentration	Risk to Instrument	Other Comments
Water	Distilled or de-ionized water	–	–
Alcohol	70% ethanol 70% 2-Propanol (isopropanol)	Dissolve plastics, stress crack on transparent plastics	–
Detergents	Mild detergent Special detergents	Check before with vendor of the agents	–
Paper Towel	–	–	Use lint-free paper towels only

NOTICE

Insufficient Cleaning

Failure to clean and disinfect impedes safe and reliable operation.

- Use only cleaning agents that are suitable for Laboratory instruments.
  The vendor of the disinfectant and cleaning agent can provide more information.
- Pay very close attention to the exposure times listed by the cleaning agent manufacturer.
- Failure to follow manufacturers' recommendations can lead to insufficient and/or incomplete cleaning and disinfection.

NOTICE

Sensitive Instrument Surface

- Do not use cleaning or disinfecting solutions that contain hypochlorite, such as bleach, on the instrument or module(s).

Recommended Vendors of Cleaning and Disinfection Agents

Vendor	URL
Borer Chemie AG	http://www.borer.ch
Bode Chemie GmbH	http://www.bode-chemie.de
Schülke & Mayr GmbH	http://www.schuelke.com

6.3 Daily Inspection

Check the proper position of the mobile device in the Base Station.

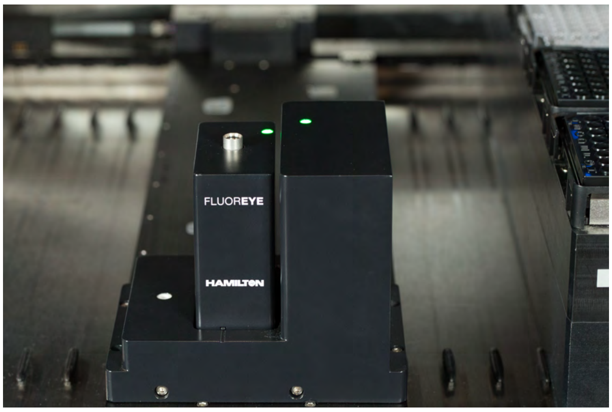


Fig. 52: Mobile Device Properly Placed

NOTICE

Discharge of the Mobile Device Battery

The mobile device attached to a channel when not in use stresses the channel and/or leads to a discharge of the mobile device battery.

- Do not leave the mobile device attached to a channel when not in use.

6.4 Weekly Maintenance

Step 1: Carefully remove the FLUOREYE mobile device from the Base Station.

Fig. 53: Removing Mobile Device

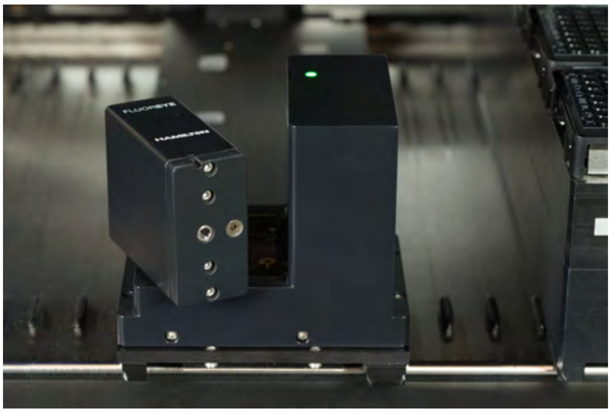


Fig. 54: Bottom of Mobile Device

Step 2: Check the optical channel at the bottom of the mobile device.

Fig. 55: Optical Channel at the Bottom of the Mobile Device.

Step 3: If you detect any dust or liquid spillage or other pollution, use the accompanying tissue to clean the lens.

Fig. 56: Lens Cleaning Tissue

Step 4: For more persistent stains, it is also possible to clean the surface with a cloth moistened with pure alcohol (Isopropanol or Ethanol).
Avoid the use of aggressive solvents such as Acetone. If you are not sure, please contact a Hamilton representative.

Step 5: Clean the loading bay of the Base Station and make sure there is no dust or liquid in the loading bay.
Do not touch the loading pins with fingers.
Only use the recommended cleaning agents.

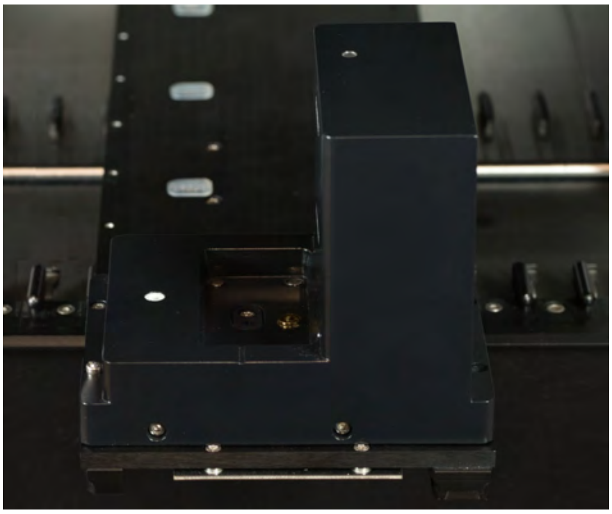


Fig. 57: Base Station

Step 6: Place the mobile device in the Base Station.

7 Troubleshooting

The FLUOREYE library shows error messages in case of malfunction.

Instrument not powered

- Check wall socket power
- Check instrument cable connection
- Check instrument fuses
- Check cable connection TCC – Active Carrier
- Check Connection to Active Carrier
- Base Station FLUOREYE
- Check for dirt/dust in the Base Station Loading Bay

No Communication (wrong CAN address / DIP switch settings)

Refer to the Service Manual to set the DIP switches correctly. Per default, all DIP switches should be set to ON which results in a Node name setting to 'M1'.

Battery of Mobile Device not charged sufficiently

- Place the FLUOREYE mobile device to the Base Station FLUOREYE.
- Make sure the LEDs show the correct color indication for loading.

FLUOREYE Driver not / not properly installed

- If no connection is possible, please uninstall the driver and check the operating system / software compatibility.

FLUOREYE Library not / not properly installed

- If no connection is possible, please uninstall the library and check the operating system / software compatibility.

Library Commands not used according to intended use

- Use the embedded Help of the FLUOREYE library to check the intended use of the commands. Another source of information is the FLUOREYE Demo Method that shows the correct use of the library commands.

No (or no specified) labware at measuring position

- Provide according labware on the measuring position.
- Keep in mind that special, black plastic ware is needed for optimal results.

Wrong labware at measuring position

- Refer to the labware information section in this guide.
- For best results, use the recommended black plastic ware.

No meaningful parameter: large number of measurement cycles

- The measuring time might be very long if the number of cycles is set very high. Please note that the result is accurate even on single / low number measurements.

No meaningful parameter: very long delay between measurements

- However, you have the option of defining long time delays between the single measurements, keep in mind that is not recommended for the most applications

No meaningful parameter: Reading distance incorrect

The precision of the measurement is directly linked to the measurement distance (the distance between the lower edge of the FLUOREYE mobile device and the surface of the liquid level).

The highest sensitivity is given at 16 mm.

- Make sure the distance of 16 mm is maintained.

  The FLUOREYE library provides options to use either a fixed height for all wells or individual heights per well.

  It is also possible to use a relative height (based on the well bottom) or an absolute height (based on the origin of the instrument).

  The second option is especially useful if the liquid levels are known from a previous Aspirate or surface dispense step.

Sensor too hot

- In the rare case that the sensor temperature is too hot, please allow the FLUOREYE mobile device to cool down. If the error appears repetitively, please contact your Hamilton representative.

Changing light conditions with single dark value measurement

There might be variations in the results if the ambient light conditions change during the measurement. This might be the case if the dark value is only measured at the beginning of the measurement.

- The best option to avoid variations is to maintain stable light conditions.
- As a second option, measure the dark value for every well directly before the fluorescent measurement takes place.

Sensor lens dirty

- Clean the lens according to the maintenance instructions in this guide.
- Keep in mind that the FLUOREYE mobile device contains sensitive optical devices that require careful handling.

Reference measurement failed

The reference measurement based on different standards might fail if the standards cannot be found at the specified positions.

- In this case, incorrect standard curve values are used for the calculation which leads to wrong results. Please make sure that the definitions are correct.

8 Parts and Accessories

8.1 Parts

Part Number	Description
10141149	FLUOREYE
10141150	FLUOREYE Mobile Device
10141151	Base Station FLUOREYE

8.2 Accessories

Part Number	Description
10112368	MFX Active Carrier Base

9 Technical Specifications

Electrical Data

Parameter	Specification
FLUOREYE Mobile Device	
Battery Voltage	3.7 V
Battery Capacity	500 mAh
Base Station FLUOREYE	
Power Supply Voltage	42 V DC
Communication	CAN

Physical Dimensions

Parameter	Mobile Device	Base Station
Length	68 mm	134 mm
Width	35 mm	91 mm
Height	84 mm	110 mm
Weight	190 g	320 g

Ambient Conditions

Parameter	Operation	Storage	Transportation
Temperature	+15°C to +35°C	–25°C to +70°C	–25°C to +70°C
Relative Humidity	15% to 85% (non-condensing)	10% to 90% (non-condensing)	10% to 90% (non-condensing)
Overvoltage Category	II		
Pollution Degree	2		
Altitude	up to 2000 m / 6561 ft. above sea level		
Indoor use only			

Regulatory

Parameter	Specification
Low Voltage Directive 2014/35/EU	containing IEC/EN 61010-1 General Safety Requirements
Electromagnetic Compatibility, Radiation and Immunity	EN 61326-1 Class B, EN 61326-1 Basic environment FCC Part 15, Class A
Overvoltage Category	II
Pollution Degree	2

10 Appendix

10.1 Getting Technical Assistance

If additional assistance with the Module is required, please contact an authorized Hamilton Company distributor or the Hamilton Company directly. Regional contact information is provided in sections "10.1.1 Support in the Americas and Pacific Rim" [▸ 62] and "10.1.2 Support in Europe, Asia, and Africa" [▸ 62]. Please have the following information available when requesting technical assistance:

- Part Number
- Configuration
- Description of the Problem
- Laboratory Contact Information

If possible, provide the following additional information:

- What was happening at the time of the error
- What has been tried so far to solve the problem
- Version of software
- Screenshots of any errors
- Photos that could more readily illustrate the problem
- Trace files, log files (found in the “Hamilton Company/Logfiles” directory)
- The export package file of the corresponding method

10.1.1 Support in the Americas and Pacific Rim

Hamilton Company
4970 Energy Way, Reno, Nevada 89502, USA

Toll Free (USA and Canada), General: 800-648-5950
Toll Free (USA and Canada), Service Hotline: 800-527-5269

Telephone: + 1-775-858-3000
Fax: +1-775-856-7259
E-Mail: tech@hamiltoncompany.com

10.1.2 Support in Europe, Asia, and Africa

Hamilton Bonaduz AG
CH-7402 Bonaduz
Switzerland

www.hamiltoncompany.com

Please contact your local Hamilton representative.

10.2 Regulatory

10.2.1 Radio Interference FCC

This equipment has been tested and found to comply with the limits for a Class “A” digital device, pursuant to both Part 15 of the FCC Rules and the radio interference regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the present manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.