Lonza

Nebula® Microplate Reader Operator's Manual

Catalog Number 25-375S Multimode
Catalog Number 25-365S Absorbance

RT-MN039EN 04/26

Lonza Part Number for Nebula® Reader: 25-375S Multimode,
25-365S Absorbance

Revision A

Nebula® Reader Manufacturer

Lonza Walkersville

8830 Biggs Ford Rd

Walkersville, MD 21793

USA

Refer to the WinKQCL® Software Manual for instructions for the use of this reader with Lonza products.

WARNING

CAREFULLY READ AND FOLLOW THE INSTRUCTIONS PROVIDED IN THIS DOCUMENT BEFORE OPERATING THE INSTRUMENT.

Notice

Every effort has been made to avoid errors in text and diagrams; however, Lonza assumes no responsibility for any errors, which may appear in this publication.

It is the policy of Lonza to improve products as new techniques and components become available. Lonza therefore reserves the right to change specifications at any time with appropriate validation, verification, and approvals.

We would appreciate any comments on this publication.

Manufacturer

Lonza Walkersville

8830 Biggs Ford Road

Walkersville, MD 21793

USA

Copyright Information

Declaration for EU Certificate

Nebula® Reader is designed and built in compliance with the basic safety and health requirements of applicable EC Directives. With the declaration of conformtity, the manufacturer declares conformity with the provisions of the Directives.

About the Instructions for Use

Original Instructions. This document describes the Nebula® Reader. It is intended as reference and instructions for use. This document instructs how to:

- Install the instrument
- Operate the instrument
- Clean and maintain the instrument

Trademarks

The following product names and any registered and unregistered trademarks mentioned in this document are used for identification purposes only and remain the exclusive property of their respective owners:

- Nebula® and WinKQCL® are trademark of Lonza Walkersville in major countries

Warnings, Cautions, and Notes

The following types of notices are used in this publication to highlight important information or to warn the user of a potentially dangerous situation:

Note
Gives helpful information.

CAUTION

INDICATES A POSSIBILITY OF INSTRUMENT DAMAGE OR DATA LOSS IF INSTRUCTIONS ARE NOT FOLLOWED.

WARNING

INDICATES THE POSSIBILITY OF SEVERE PERSONAL INJURY, LOSS OF LIFE OR EQUIPMENT DAMAGE IF THE INSTRUCTIONS ARE NOT FOLLOWED.

WARNING

THIS SYMBOL INDICATES THE POSSIBLE PRESENCE OF BIOLOGICALLY HAZARDOUS MATERIAL. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.

WARNING

THIS SYMBOL INDICATES THE POSSIBLE PRESENCE OF FLAMMABLE MATERIALS AND A RISK OF FIRE. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.

ATTENTION

NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE TREATMENT OF WASTE.

- **DO NOT TREAT ELECTRICAL AND ELECTRONIC EQUIPMENT AS UNSORTED MUNICIPAL WASTE.**
- **COLLECT WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SEPARATELY.**

FOR CALIFORNIA RESIDENTS ONLY:

WARNING

THIS PRODUCT CAN EXPOSE YOU TO CHEMICALS SUCH AS LEAD WHICH IS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM. FOR MORE INFORMATION GO TO: WWW.P65WARNINGS.CA.GOV/PRODUCT.

Symbols

	Manufacturer
	Date of manufacture
	CE Conformity Marking
	United Kingdom Conformity Assessed marking shows that the labeled product is following the applicable regulation in Great Britain.
	Consult Instructions for Use
	Catalog number
	Serial Number
	USB label
	WEEE symbol
	China RoHS symbol
	TÜV SÜD MARK

Table of Contents

1. Safety

1.1 Instrument Safety

1. Always follow basic safety precautions when using this product to reduce the risk of injury, fire, or electrical shock.
2. Read and understand all information in the Instructions for Use. Failure to read, understand, and follow the instructions in this document may result in damage to the product, injury to operating personnel or poor instrument performance.
3. Observe all WARNING and CAUTION statements in this document.
4. Never open the housing of the Nebula® Multimode Reader while the instrument is plugged into a power source.
5. Never force a microplate into the instrument.
6. The Nebula® Reader is intended as a general purpose laboratory instrument for professional use. Observe proper laboratory safety precautions, such as wearing protective clothing and using approved laboratory safety procedures.

CAUTION

EVERY PRECAUTION HAS BEEN TAKEN TO ENSURE THAT THE PLATE HEIGHTS AND WELL DEPTHS ARE CORRECT ACCORDING TO THE DEFINED PLATE TYPE. THIS PARAMETER IS USED TO DETERMINE THE MINIMUM DISTANCE BETWEEN THE TOP OF THE PLATE AND THE CEILING OF THE MEASUREMENT CHAMBER. ADDITIONALLY, LONZA HAS ADDED A VERY SMALL SAFETY GAP TO PREVENT ANY DAMAGE OCCURRING TO THE MEASUREMENT CHAMBER AS A RESULT OF SMALL CHANGES IN PLATE HEIGHT. THIS DOES NOT AFFECT THE PERFORMANCE OF THE INSTRUMENT. USERS MUST ENSURE THAT THE PLATE DEFINITION FILE SELECTED CORRESPONDS TO THE ACTUAL PLATE BEING USED.
USERS SHOULD ALSO TAKE CARE THAT NO POTENTIAL FLUORESCENT CONTAMINATION LIES ON TOP OF THE PLATE. BE AWARE THAT SOME PLATE SEALERS LEAVE BEHIND A STICKY RESIDUE THAT MUST BE COMPLETELY REMOVED BEFORE STARTING MEASUREMENTS.

CAUTION

BEFORE STARTING MEASUREMENTS, MAKE SURE THAT THE MICROPLATE POSITION A1 IS INSERTED CORRECTLY. THE POSITION OF WELL A1 HAS TO BE ON THE UPPER LEFT SIDE.

CAUTION

TO INSURE THE OPTIMAL WORKING OF LONZA INSTRUMENTS WE RECOMMEND A SERVICE INTERVAL OF 12 MONTHS.

It is assumed that the instrument operators, because of their vocational experience, are familiar with the necessary safety precautions for handling chemicals and biohazardous substances.

Adhere to the following laws and guidelines:

1. National industrial protection law
2. Accident prevention regulations
3. Safety data sheets of the reagent manufacturers

WARNING

DEPENDING ON THE APPLICATIONS, PARTS OF INSTRUMENT MAY COME IN CONTACT WITH BIOHAZARDOUS/INFECTIOUS MATERIAL. MAKE SURE THAT ONLY QUALIFIED PERSONNEL OPERATE THE INSTRUMENT. IN CASE OF SERVICE OR WHEN RELOCATING OR DISPOSING OF THE INSTRUMENT, ALWAYS DISINFECT THE INSTRUMENT ACCORDING TO THE INSTRUCTIONS GIVEN IN THIS MANUAL.

2. General Description

2.1 Instrument

The Lonza Nebula® Reader is designed for use in the QC lab for endotoxin testing and it provides high performance for the vast majority of today's microplate applications and research, and is robotic compatible.

There are two available configurations:

- Multimode - offering both Absorbance and Fluorescence capabilities
- Absorbance

Each configuration is clearly identified on the device's front panel.

- Nebula® Multimode Reader, p/n 25-375S

- Nebula® Absorbance Reader, p/n 25-365S

2.1.1 Intended Use

The Nebula® Reader has been designed as a general purpose laboratory instrument for professional use, supporting common 96-well microplates conforming to the ANSI/SBS standards (see 5.6 Recommended Types of Microplates for further details).

Note
System Validation by Operating Authority is required. The Nebula® Reader has been validated on a selected set of assays only. It is the responsibility of any operating authority to ensure that the Nebula® Reader has been validated for every specific assay used on the instrument.

2.1.2 Multifunctionality

The following measurement techniques are supported by the Nebula® Reader:

- Fluorescence Intensity (FI) Top (available in Nebula® Multimode Reader, p/n 25-375S)
- Absorbance (available in both Nebula® Multimode Reader, p/n 25-375S and Nebula® Absorbance Reader, p/n 25-xxx

Any common 96-well microplate well conforming to the ANSI/SBS standards (ANSI/SBS 1-2004; ANSI/SBS 2-2004, ANSI/SBS 3-2004 and ANSI/SBS 4-2004) may be measured with any of the above measurement techniques. Switching between measurement techniques or plate formats is fully automated via software. It is not necessary to manually reconfigure the optics in order to switch between the reading modes supported by the Nebula® Reader.

2.1.3 Performance

The Nebula® Reader has been designed to meet the requirements of a general-purpose laboratory instrument.

2.1.4 User Friendliness

The Nebula® Reader offers unparalleled flexibility in wavelength selection for fluorescence intensity and absorbance measurements. Via software any wavelength can be easily adjusted within the specified wavelength range. In addition to single wavelength measurements, absorbance and fluorescence spectra can be recorded. When running a spectrum there is no restriction due to cut-off filters.

The Nebula® Reader offers high flexibility for the customization of fluorescence and absorbance measurements.

Note
If the instructions given in this document are not correctly performed, the instrument will either be damaged, or the procedures will not be performed correctly and the safety of the instrument is not guaranteed.

2.1.5 Onboard Control Button

The Nebula® Reader possesses an onboard control button to control plate movements without the need to be connected to the software. Upon pressing the **Plate In/Out** button, the current position of the plate carrier is automatically recognized, and the plate is moved into or out of the instrument.

2.1.6 Rear View

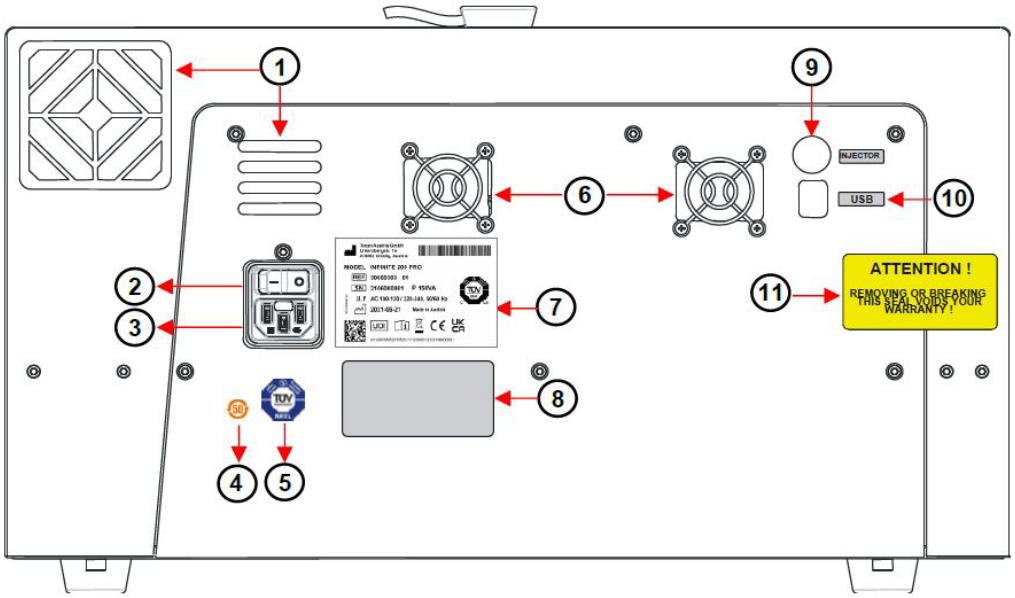


Figure 1: Rear panel

1	Instrument Fan	
2	Main Power Switch	
3	Main Power Socket	
4	Label – China RoHS symbol	
5	Label – Technical Inspection Agency (TÜV)	
6	Power Supply Fan	
7	Name Plate	
8	Label	
9	Injector Connection	
10	USB Connection	
11	Warranty Label	ATTENTION REMOVING OR BREAKING THIS SEAL VOIDS YOUR WARRANTY!

CAUTION

ONLY LONZA AUTHORIZED SERVICE TECHNICIANS ARE ALLOWED TO OPEN THE INSTRUMENT. REMOVING OR BREAKING THE WARRANTY SEAL VOIDS THE WARRANTY.

2.2 Measurement Techniques

The following sections provide an introduction to the Nebula® Reader measurement techniques. To keep this compact, a few simplifications have been made.

2.2.1 Fluorescence

IMPORTANT: Fluorescence capabilities are only available in the Nebula® Multimode Reader configuration.

The Nebula® Reader offers the basic fluorescence measurement technique Fluorescence Intensity (FI) (or simply Fluorescence).

Fluorescent molecules emit light of specific wavelength when struck by light of shorter wavelength (Stokes Shift). In particular, a single fluorescent molecule can contribute one fluorescence photon (quantum of light). This is a part of the energy, which has been absorbed before (electronic excitation), but could not be released quickly enough into thermal energy.

The average time it takes between excitation and emission is called the fluorescence lifetime. For many fluorescent molecular species, fluorescence lifetime is on the order of nanoseconds (prompt fluorescence). After excitation, fluorescence emission occurs with a certain probability (quantum yield), which depends on the fluorescent species and its environmental conditions.

2.2.2 Absorbance

Absorbance is a measure for the attenuation of monochromatic light when transmitted through a sample. Absorbance is defined as:

$A = LOG_{10} (I_0 / I_{SAMPLE})$,

Where I_{SAMPLE} is the intensity of the light being transmitted, I_0 the light intensity not attenuated by sample. The unit is assigned with Optical Density (OD)

Thus, 2.0 OD means $10^{2.0}$ or 100-fold attenuation (1% transmission),

1.0 OD means $10^{1.0}$ or 10-fold attenuation (10% transmission), and

0.1 OD means $10^{0.1}$ or 1.26-fold attenuation (79.4% transmission).

If the sample contains only one species absorbing in that narrow band of wavelengths, the background corrected absorbance (A) is proportional to the corresponding concentration of that species (Lambert-Beer's Law).

2.3 Optical System

2.3.1 *Fluorescence Intensity System*

IMPORTANT: Fluorescence capabilities are only available in the Nebula® Multimode Reader configuration.

The optical system of the fluorescence top system of the Nebula® Reader is sketched below.

The system consists of:

- Light source system
- Excitation double monochromator
- Fluorescence top optics
- Emission double monochromator
- Fluorescence detection

The solid arrows indicate the light path of the excitation light; the dashed arrows indicate the emission light path.

To simplify the system, the **Flash Monitor** (see section Flash Monitor, page 17) is not shown. Each monochromator unit, (2) and (4), is built of two gratings and a schematic view is displayed in more detail in the figures below.

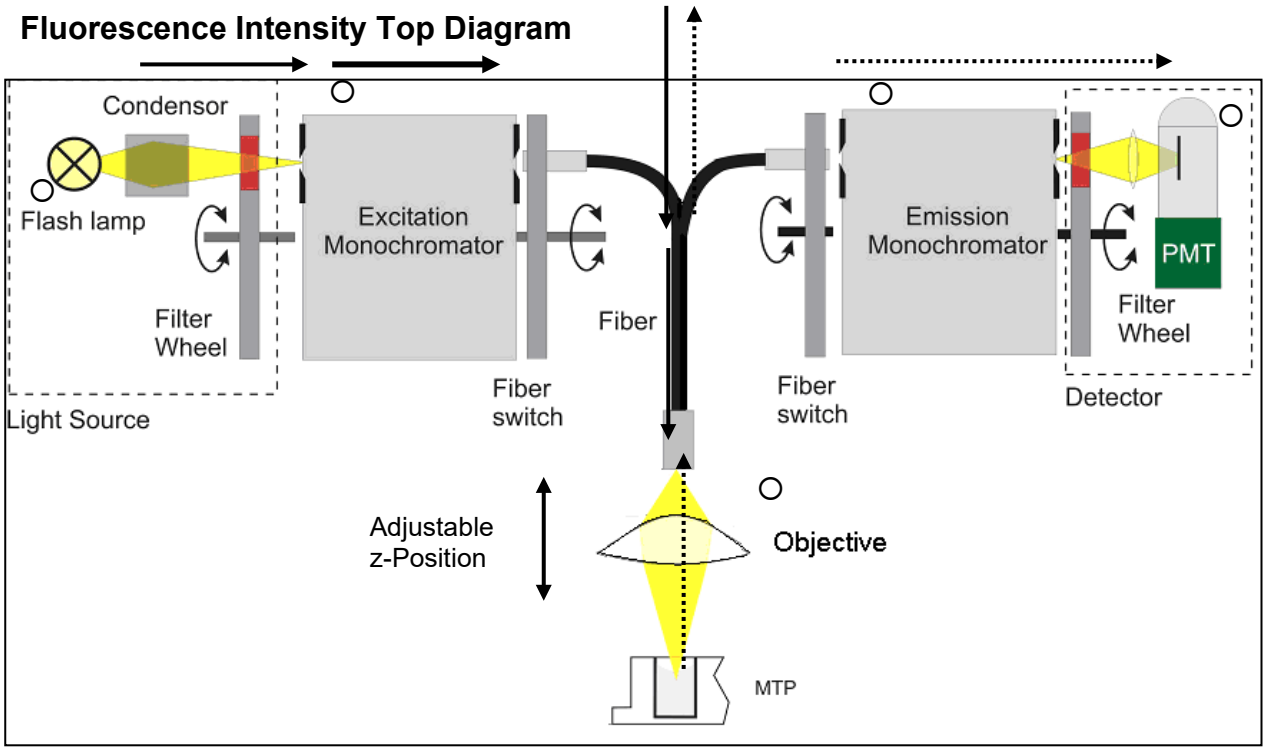


Figure 2: Optical System Fluorescence Top

Fluorescence Intensity Light Source System

Fluorescence applications usually require a specific range of excitation wavelengths.

The Nebula® Reader light source system is built from the following components:

- Flash Lamp
- Condensing Optics
- Filter Wheel
- Excitation Double Monochromator
- Fiber Optic Bundle
- Flash lamp Monitor

Flash Lamp

The Nebula® Reader utilizes a high energy Xenon arc discharge lamp (flash lamp). The flash sparks across a small gap between two electrodes. The lamp bulb contains a high pressure Xenon atmosphere. The flash decays within a few microseconds. The flash frequency is 40 Hz.

The Nebula® Reader uses the flash lamp for fluorescence and for absorbance measurements, main benefits of this singular kind of lamp are:

High intensity from the deep UV to the near IR

Many applications - only one kind of lamp

No warm up time required

Condenser

Condenser type optics from fused silica focus the flash light onto the entrance slit of the excitation monochromator.

Filter Wheel

A filter wheel is located between the condenser and the excitation monochromator. The filter wheel contains wavelength specific optical filters, which are necessary to block undesired diffraction orders produced by the optical gratings. The filters are set automatically.

Excitation Double Monochromator

In both fluorescence and absorbance applications, the Excitation Double Monochromator is used to select any desired wavelengths from the flash lamp spectrum in the range from 230 to 850 nm (spectrally enhanced version) for fluorescence intensity and from 230 nm to 1000 nm for absorbance applications.

In many cases, fluorescence emission spectra do not depend on the exact excitation wavelength; therefore, in order to achieve a maximum total fluorescence signal, a broad excitation bandwidth should be used.

The bandwidth of the Nebula® Monochromator System is < 9 nm for wavelengths > 315 nm and < 5 nm for wavelengths ≤ 315 nm.

For a more detailed description of how a monochromator works, see below.

Description of how a Monochromator Works

A monochromator is an optical instrument that enables any wavelength to be selected from a defined optical spectrum. Its method of operation can be compared to a tunable optical filter, which allows both the wavelength and bandwidth to be adjusted.

A monochromator consists of an entrance slit, a dispersive element and an exit slit. The dispersive element diffracts the light into the optical spectrum and projects it onto the exit slit. A dispersive element can be realized by using a glass prism or an optical grating. Modern monochromators such as those used in the Nebula® Reader are designed with optical gratings.

Rotating the optical grating around its vertical axis moves the spectrum across the exit slit and only a small part of the spectrum (band pass) passes through the exit slit. This means that when the monochromator entrance slit is illuminated with white light, only light with a specific wavelength (monochromatic light) passes through the exit slit. The wavelength of this light is set by the rotation angle of the optical grating. The bandwidth is set by the width of the exit slit. The bandwidth is defined as full width at half maximum (FWHM).

Monochromators block undesired wavelengths, typically amounting to 10^3. This means when the monochromator is set for light with a wavelength of 500 nm and the detector detects a signal of 10,000 counts, light with different wavelengths creates a signal of only 10 counts. For applications in the fluorescence range, this blocking is often not sufficient, since the fluorescence light to be detected is usually much weaker than the excitation light. To achieve a higher level of blocking, two monochromators are connected in series, i.e. the exit slit of the first monochromator acts as the entrance slit of the second monochromator simultaneously. This is known as a double monochromator. In this case, the blocking count reaches a factor of 10^6, a value typically achieved by Interference filters.

In the Nebula® Reader, a double monochromator is installed on both the excitation and detection side. This opens the opportunity for easy selection of excitation and fluorescence wavelengths with no limitations by cut off filters.

Fiber Optic Bundle

Light from the exit slit of the Excitation Monochromator is coupled into a fiber optic bundle, which guides the light either to the top measuring optics. The lower end of each fiber bundle acts as a color specific light source. In both cases, a small portion of the light is always guided to the flash lamp monitor diode.

Flash Monitor

The light energy of single flashes may fluctuate slightly. To take these variations into account, a silicon photodiode monitors the energy of every single flash. Fluorescence and Absorbance measurement results are compensated correspondingly.

Fluorescence Top Optics

Flash light enters the optical system and is focused by the condenser onto the entrance slit of the Excitation Monochromator. The wavelength of the excitation light is selected within the monochromator. After passing the monochromator, the excitation light is coupled into a fiber bundle, which guides the light to the top measuring head. The light is then focused into the sample by the top lens system.

The fluorescence light is collected by the top lens system again, coupled into the fluorescence fiber bundles and guided to the detection system.

The Fluorescence Measuring Optics Top is built from the following components:

- Fluorescence Intensity Lens System Top
- Fluorescence Fiber Bundle

Fluorescence Intensity Lens System Top

The exit side of the bundle acts as a color specific light source. The lens system at the end of the excitation top fiber is designed to focus the excitation light into the sample, and also collect the fluorescence light and focus it back onto the fluorescence fiber bundle.

The objective lenses are made from fused silica. This material provides high UV transmission and is virtually void of auto-fluorescence.

Excitation Spot Size

The size of the fiber bundle cross section determines the diameter of the beam waist (spot size) in the microplate well. The spot diameter is about 3 mm for the top optics.

Fluorescence Fiber Bundle Top

The fiber bundle plugged into the top measuring head contains a homogeneous mixture of both excitation and emission fibers. The emission fibers guide the fluorescence light to the emission monochromator head where a lens system focus the light onto the entrance slit of the Emission Monochromator.

Fluorescence Intensity Detection

The fluorescence detection system is used for fluorescence from above (top) the microplate wells.

The fluorescence light is focused onto the entrance slit of the Emission Monochromator. After passing the monochromator the light is focused onto the detector (PMT). A filter wheel is located between the monochromator and the PMT.

The Fluorescence Detection system is built from the following components:

- Emission Double Monochromator
- Filter Wheel PMT
- PMT Detector

Emission Double Monochromator (Nebula® Mulitmode Only)

Similar to the Excitation Double Monochromator, the Emission Double Monochromator is used to select any wavelength of the fluorescence signal. It acts like an adjustable filter to discriminate scatter of excitation light and nonspecific fluorescence. The wavelength range is selectable from 280 – 850 nm in the spectrally enhanced instrument. The bandwidth is 20 nm.

Filter Wheel PMT

The filter wheel contains wavelength specific optical filters, which are necessary to block undesired diffraction orders produced by the optical gratings. The filters are set automatically.

PMT Detector

A photo-multiplier tube (PMT) is used for the detection of such low light levels associated with fluorescence. The PMT of the spectrally enhanced version of the Nebula® Reader is sensitive up to the near infrared (NIR) while still having low dark current. Electronic circuitry uses analog to digital conversion of PMT output current. Adjusting the PMT gain enables measurement of a wide range of concentrations in lower or higher concentration domains. For details, see Section 4.5.1 Instrument Parameters.

2.3.2 Absorbance System

For absorbance measurements, a similar optical path is used as for fluorescence excitation.

The absorbance system consists of:

- light source
- excitation monochromator
- absorbance MTP optics
- absorbance MTP measurement module

Condenser type optics focus the light through the excitation filters and then through the entrance slit to the excitation monochromator. A fiber bundle then guides the light from the excitation monochromator to the absorbance MTP optics, which focuses the light into the wells. The absorbance MTP measurement module is located underneath the plate carrier. These modules measure the light being transmitted through the sample.

Before measurement of the microplate (MTP), a reference measurement is performed with the plate carrier moved out of the light beam.

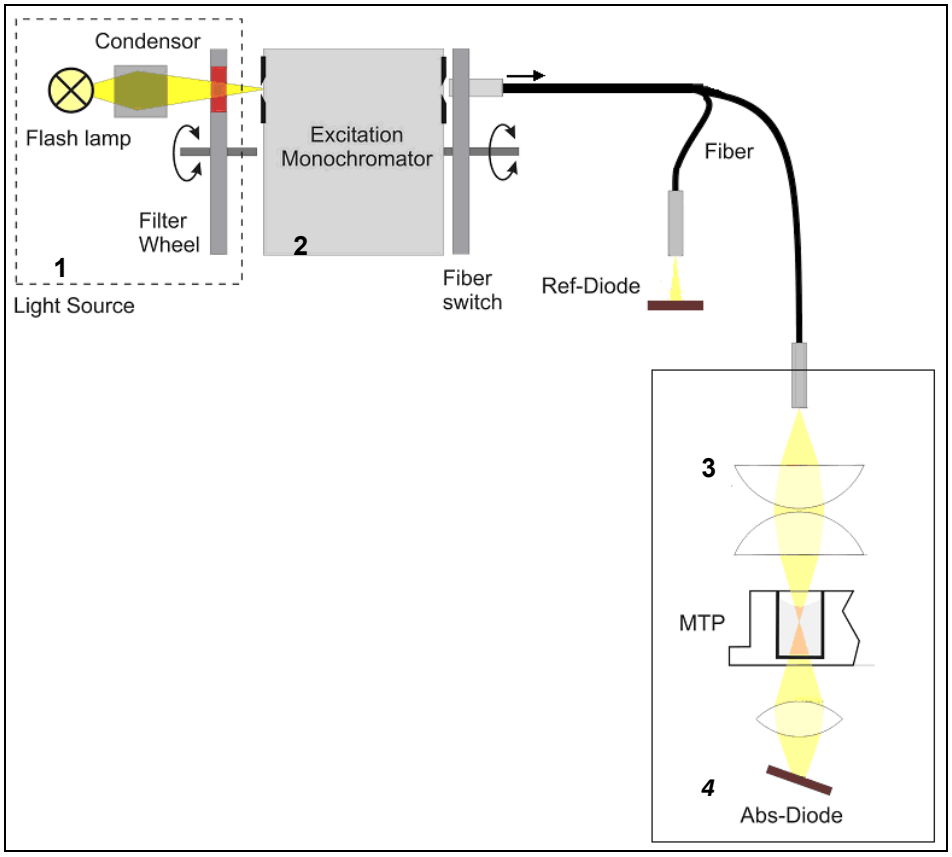


Figure 4: Optical System Absorbance Nebula® Reader.

For details about the light source (1) and the excitation monochromator (2), please refer to Fluorescence Intensity Light Source System, page 17.

Absorbance Optics MTP

A fiber bundle guides the light from the excitation monochromator system to the absorbance MTP optics.

The absorbance optics consists of a pair of lenses focusing the light beam into the well of the microplate.

The spot size of the absorbance light beam is 0.7 mm in diameter.

Absorbance Detection MTP

A silicon photodiode is used for the measurement of the transmitted light. It is sensitive to a wide range of wavelengths. The photodiode is well suited for the light levels being encountered with absorbance measurements up to 4 OD.

3. Installation

3.1 Unpacking and Inspection

The delivered packaging includes the following items:

- CABLE USB 2.0 A/B 1.8 M with housing receptacle ferrite
- Transport lock (mounted)
- Certificate of Compliance

CAUTION

THE NEBULA® READER HAS BEEN TESTED WITH THE SUPPLIED USB CABLE. IF ANOTHER USB CABLE IS USED, LONZA CANNOT GUARANTEE THE CORRECT PERFORMANCE OF THE INSTRUMENT.

3.1.1 Unpacking Procedure

1. Visually inspect the container for damage before it is opened.
   Report any damage immediately.
2. Select a location to place the instrument that is flat, level, vibration free, away from direct sunlight, and free from dust, solvents and acid vapors. Allow at least 10 cm distance between the back of the instrument and the wall or any other equipment. Ensure that the plate carrier cannot be accidentally hit when moved out. Ensure that the main switch and the main cable can be reached at all times and are in no way obstructed.
3. Place the carton in an upright position and open it.
4. Lift the instrument out of the carton and place it in the selected location. Take care when lifting the instrument and ensure that it is held on both sides.
5. Visually inspect the instrument for loose, bent or broken parts.
   Report any damage immediately.
6. Compare the serial number on the rear panel of the instrument with the serial number on the packing slip.
   Report any discrepancy immediately.
7. Check the instrument accessories against the packing list.
8. Save packing materials and transport locks (see next section) for further transportation purposes.

WARNING

THE NEBULA® READER IS A PRECISION INSTRUMENT AND WEIGHS FULLY EQUIPPED APPROX. 16 KG.

CAUTION

THE MAXIMUM LOAD FOR THE NEBULA® READER COVER IS 16 KG, HOWEVER THE LOAD MUST BE DISTRIBUTED EVENLY ACROSS THE ENTIRE SURFACE OF THE COVER.

CAUTION

THE MAXIMUM LOAD FOR THE PLATE TRANSPORT IS 100 G. OVERLOADING THE PLATE CARRIER CAN CAUSE INSTRUMENT DAMAGE WHICH MAY REQUIRE SERVICE.

CAUTION

ALLOW AT LEAST 10 CM DISTANCE BETWEEN THE BACK OF THE INSTRUMENT AND THE WALL OR ANY OTHER EQUIPMENT.

3.2 Removal of the Transport Locks

CAUTION

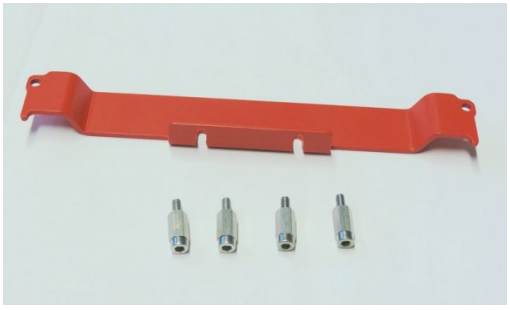
REMOVE THE TRANSPORT LOCK BEFORE OPERATING THE INSTRUMENT.

The instrument is delivered with the plate carrier locked into place, so that it cannot be damaged. Before the instrument can be used the transport lock must be removed using the following procedure:

1. Ensure that the instrument is disconnected from the main power supply.
2. Open the plate carrier compartment flap.
3. Remove the screws and pull the plate carrier out manually.

4. Remove the screws from the transport lock.

5. Remove the transport lock from the plate carrier.



6. The transport locks should be saved for further transportation purposes.

CAUTION

SAVE PACKING MATERIALS AND TRANSPORT LOCKS FOR FURTHER TRANSPORTATION PURPOSES. THE NEBULA® READER MUST BE SHIPPED ONLY WITH THE ORIGINAL PACKAGING AND INSTALLED TRANSPORT LOCKS.

3.3 Transport and Storage

3.3.1 Transport

The Nebula® Reader must be shipped using the original packing and installed transport locks. Before shipping the instrument, it must be thoroughly disinfected (see 7.3 Instrument Disinfection).

3.3.2 Storage

Select a location to store the instrument that is flat, level, vibration free, away from direct sunlight, and free from dust, solvents and acid vapors

Storage Specifications

Temperature	- 20 °C to + 60 °C	-4 °F to + 140 °F
Relative Humidity	< 80 % non condensing	

3.4 Power Requirements

The instrument is auto sensing and it is therefore not necessary to make any changes to the voltage range. Check the voltage specifications on the rear panel of the instrument and ensure that the voltage supplied to the instrument is correct to this specification.

The voltage range is 100-120/220-240V.

If the voltage is not correct, please contact your distributor.

CAUTION

DO NOT USE THE INSTRUMENT IF THE VOLTAGE SETTING IS NOT CORRECT. IF THE INSTRUMENT IS SWITCHED ON WITH THE INCORRECT VOLTAGE SETTING IT WILL BE DAMAGED.

WARNING

IF THE INSTRUCTIONS GIVEN IN THIS DOCUMENT ARE NOT CORRECTLY PERFORMED, THE INSTRUMENT WILL EITHER BE DAMAGED OR THE PROCEDURE WILL NOT BE PERFORMED CORRECTLY AND THE SAFETY OF THE INSTRUMENT IS NOT GUARANTEED.

3.5 Switching the Instrument On

CAUTION

**BEFORE THE INSTRUMENT IS SWITCHED ON FOR THE FIRST TIME AFTER INSTALLATION,
IT SHOULD BE LEFT TO STAND FOR AT LEAST 3 HOURS, SO THERE IS NO POSSIBILITY OF CONDENSATION CAUSING A SHORT CIRCUIT.**

1. Ensure the computer is switched OFF and the instrument's main power switch on the back panel of the instrument is in the OFF position.
2. Connect the computer to the instrument with the delivered USB interface cable.
3. Insert the power cable into the main power socket (with protective ground connection) on the back panel of the instrument.
4. Switch the instrument ON using the main power switch on the back panel of the instrument.

CAUTION

THE NEBULA® READER HAS BEEN TESTED WITH THE SUPPLIED USB CABLE. IF ANOTHER USB CABLE IS USED, LONZA CANNOT GUARANTEE THE CORRECT PERFORMANCE OF THE INSTRUMENT.

CAUTION

DO NOT REPLACE DETACHABLE MAIN POWER SUPPLY CORDS WITH INADEQUATELY RATED CORDS.

4. Operating the Instrument

4.1 Introduction

The Nebula® Reader is operated using a personal computer based software control. **WinKQCL®** Software may be used as the user interface. For details see the corresponding software Instructions for Use. This short introduction provides a general understanding of instrument parameters and operation. Suggestions are made on how to optimize instrument parameters for your applications.

Every effort has been made to ensure that the instrument will work correctly even if the default parameters are not appropriate for a particular application - with an important exception:

CAUTION

MAXIMUM PLATE HEIGHT IS 23 MM (INCLUDING LID).

CAUTION

BEFORE STARTING MEASUREMENTS, MAKE SURE THAT THE MICROPLATE POSITION A1 IS INSERTED CORRECTLY. THE POSITION OF WELL A1 HAS TO BE ON THE UPPER LEFT SIDE.

CAUTION

IN CASE OF SIGNIFICANT SOILING OF THE PLATE TRANSPORT, THE SPRING MECHANISM MIGHT NOT WORK PROPERLY, AND CAN LEAD TO WRONG POSITIONING. PLEASE CONTACT YOUR LOCAL SERVICE CENTER.

IMPORTANT

WHEN OPERATING THE NEBULA® READER ALWAYS WORK ACCORDING TO GLP GUIDELINES.

CAUTION

THE NEBULA® READER HAS A FAN ON THE BACKSIDE OF THE INSTRUMENT THAT DRAWS IN AIR. DO NOT BLOCK THE FAN THE AIR FILTER HAS TO BE CHECKED EVERY 4 WEEKS AND BE REPLACED WHEN DIRTY. THE AIR FILTER MUST BE REPLACED AFTER 12 MONTHS.

4.2 General Operating Features

The Nebula® Reader has some general behavior and options, which are independent from a particularly selected measurement technique.

4.2.1 Instrument Start Up

Before the instrument is switched ON, check if the USB interface cable is connected.

Instrument Power On

When switching ON the instrument no initialization steps are performed.

Connect to Instrument

When the WinKQCL® Software connects to the instrument, communication is established between the instrument and the user interface.

The following steps are performed:

- OS filter wheels are initialized
- Plate transport is initialized.
  (The plate transport is not moved out automatically.)
- The instrument is ready for use.

4.3 General Options

The following options may be taken independently from the particular measurement technique.

Note

To keep temperature on a constant level and provide uniformity across the plate, the plate must be placed in incubation position.

When the heating function is used during shaking, the temperature may vary slightly.

Temperature Control

Some assays require an exact operating temperature. The Nebula® Reader can set up a specific temperature within a specific range, provide uniformity across the plate, and keep the temperature constant above ambient. The main cooling fans stop ventilation.

Heating up the measurement chamber will take some time. Please check the temperature control display. If not incubated externally, the microplate should be left for equilibration before the measurement is started.

Temperature range: 5 °C above ambient to 42 °C.

Kinetic Measurements

WinKQCL® Software allows a plate to be measured repeatedly in equidistant time intervals.

IMPORTANT: Fluorescence capabilities are only available in the Nebula® Multimode Reader configuration.

4.4 Optimizing Fluorescence Measurements

Fluorescence measurement results may be optimized by tuning instrument parameters on the one hand, and by selecting appropriate materials on the other hand.

4.4.1 Instrument Parameters

Gain Settings

The Nebula® Reader fluorescence detection system uses an analog to digital (ADC: Analog Digital Converter) conversion of PMT signal. The gain setting controls the amplification of the PMT when converting fluorescence light into electrical current. The ADC needs a suitable input range of PMT current to provide a proper signal to noise ratio (S/N) on the one hand, and linearity on the other hand. Therefore, the gain should be tuned to make highest concentration microplate wells give highest possible readings. Then, readings of lower concentration microplate wells separate from background - as far as the background noise level allows for that.

Note
If any well of interest is assigned >>>>> (overflow), you may manually reduce the gain, or select an automatic gain option (see the software Instructions for Use).

PMT Properties

The gain for fluorescence intensity is selectable from 1 – 255. The performance of the PMT depends on the supply voltage. The Nebula® Reader PMTs are specified from 300 to 1250 V. The relationship between the gain settings of the Nebula® Reader and the voltage supply is described in Equation 1. The intended use of the Nebula® Reader PMT is therefore specified for gain settings from 60 to 255. Gain settings below 60 are possible, but the performance of the PMT is not specified for voltage supply < 300 V. Lonza therefore does not take responsibility for measurement results of Nebula® Reader when using gain settings below 60.

Equation 1:
$$U = \frac{Gain}{255} * 1250V$$

Where U is the voltage, Gain is the selected gain setting, 255 is the maximum possible gain and 1250 V is the maximum voltage supply of the PMT.

Example:

A gain of 100 corresponds to a voltage supply of 490 V:

Equation 2:
$$U = \frac{100}{255} * 1250 = 490V$$

4.5 Optimizing Absorbance Measurements

4.5.1 Measurement Parameters

Flash Settings

On the fly measurements with 1 flash(read) per well are performed for all absorbance measurements. This has been found to produce optimal results in kinetic assays.

4.5.2 Disconnecting the Instrument

When disconnecting, communication between the instrument and the computer is terminated.

Note
Remove the microplate before disconnecting the instrument from the computer.

4.5.3 Instrument Shut Down

Upon shut down, the instrument activity is stopped immediately. Normally, you should disconnect before shut down. In the rare case of an unexpected hardware error, immediate instrument shut down will reduce the risk of possible damage.

5. Instrument Features

5.1 Introduction

Note
All specifications are subject to change without prior notification.

The following types of measurement are provided with the Nebula® Readers:

Measurement Type	Description	Configuration
Fluorescence Intensity Top	Fluorescence Intensity	Multimode
Absorbance	Absorbance	Absorbance, Multimode

All standard 96-well microplates that conform to the following standards can be measured in any of the above measurement types:

- ANSI/SBS 1-2004;
- ANSI/SBS 2-2004;
- ANSI/SBS 3-2004 and
- ANSI/SBS 4-2004.

The instrument can perform kinetic measurements.

Reading may be restricted to one part of the microplate.

5.2 Instrument Specifications

The table below lists the technical specifications of the instrument:

Parameters	Characteristics
General	
Measurement	Software controlled
Interface	USB
Filter Handling:	
Nebula® Reader	Monochromator-based wavelength selection – no filters necessary
Plate Definition	Via scanning software
Temperature Control	From 5 °C above ambient up to 42 °C
Plate Shaking	Linear shaking
Light Source	High energy xenon flash lamp, life time: 10^8 flashes
Optics	Fused Silica Lenses
Detectors:	
Fluorescence	Spectrally enhanced PMT: red-sensitive PMT
Absorbance	Silicon photodiode

Parameters	Characteristics
General	
Power Supply	Auto-sensing: 100 – 120 V/220 – 240 V, 50-60 Hz
Power Consumption	150VA

Parameters	Characteristics	
Physical		
Outer Dimensions:		
Basic instrument	Width: 425 mm Height: 253 mm Depth: 457 mm	16.73 inches 9.96 inches 17.99 inches
Weight:		
Nebula®	15.8 kg	
Environmental		
Ambient Temperature:		
Operation	+ 15 °C to + 30 °C	(+ 59 °F to + 86 °F)
Non-operation	- 20 °C to + 60 °C	(- 4 °F to + 140 °F)
Relative Humidity:		
Operation	< 80 % non condensing	
Over-voltage Category	II	
Usage	General Laboratory Instrument	
Noise Level	< 60 dBA	
Pollution Degree	2	
Method of Disposal	Electronic waste (infectious waste)	

5.3 Fluorescence Intensity

Parameters	Characteristics
Wavelength Range	Excitation: 230 - 850 nm Emission: 280 - 850 nm
	selectable in 1 nm steps

Gain Setting	Values	Measurement Range
Manual	1 - 255	0 - 60,000 RFU
Optimal	automatic	0 - 60,000 RFU
Calculated from Well	automatic	0 - 60,000 RFU

TRF Parameters	Characteristics
Integration Time	10 - 2000 µs
Lag Time	0 - 2000 µs

5.3.1 Definition of the Detection Limit

The detection limit is the fluorophore concentration where the background-subtracted signal equals 3 times the standard deviation of the background noise.

When selecting 1 flash per well, the plate carrier does not stop at the measurement position. Using more flashes per well may improve the detection limit, but the total measurement time will be longer.

5.4 Absorbance

Parameters	Characteristics
Wavelength Range	230 – 1000 nm no filter necessary, selection in 1 nm steps possible
Measurement Range	0 – 4 OD

The following specifications are valid for the wavelength range from 300 – 700 nm for the Nebula® reader.

Plate type (number of wells)	96
Accuracy 0 – 2 OD	< ± (1 % + 10 mOD)
Accuracy 2 – 3 OD	< ± 2.5 %
Baseline Flatness	± 10 mOD (1 sigma)
Wavelength Accuracy	≤ ± 1.5 nm λ > 315 nm; ≤ ± 0.8 nm λ ≤ 315 nm

The specifications are valid for measurements performed with 25 flashes (reads) per well.

5.5 “On the Fly” Measurements

On the Fly measurements are the fastest measurements possible using the Nebula® Reader. These measurements are performed using only one flash (number of flashes).

96-well plates (FI, Absorbance) Measurement time: < 20 s

(Plate-in/out movement not included).

5.6 Recommended Types of Microplates

We do not recommend using volumes less than a third of the maximum volume. When using lower volumes, check the availability of a suitable plate type.

All standard 96-well microplates (maximum plate height 23 mm including lid) that conform to the following standards can be measured:

- ANSI/SBS 1-2004,
- ANSI/SBS 2-2004;
- ANSI/SBS 3-2004 and
- ANSI/SBS 4-2004.

6. Quality Control

6.1 Periodic Quality Control Tests

Depending on usage and application, we recommend a periodic evaluation of the instrument.

The tests described in the following sections do not replace a full evaluation by the manufacturer or authorized dealers. But the tests may be performed periodically by the user to check significant aspects of the instrument performance.

The tests described below all make use of the MultiCheck plate. Please refer to the MultiCheck Instructions for Use for more details on the testing procedure.

CAUTION

BEFORE STARTING MEASUREMENTS, MAKE SURE THAT THE MICROPLATE POSITION A1 IS INSERTED CORRECTLY. THE POSITION OF WELL A1 HAS TO BE ON THE UPPER LEFT SIDE.

CAUTION

THIS SECTION PROVIDES INSTRUCTIONS ON HOW TO CHECK THE SPECIFICATIONS OF THE INSTRUMENT. IF THE RESULTS OF THESE CONTROL TESTS DO NOT LIE WITHIN THE OFFICIAL SPECIFICATIONS OF THE INSTRUMENT, PLEASE CONTACT YOUR LOCAL SERVICE CENTER.

CAUTION

USE OF THE TRAY INSERT CAN CAUSE FAILURES DURING MULTICHECK TESTING FOR MEASUREMENT POSITION VERIFICATION. THE MULTICHECK PLATES ARE CALIBRATED WITHOUT THE TRAY INSERT, INTRODUCING THE TRAY INSERT COMPONENT DURING READER CALIBRATION CREATES OFFSET TO WHERE THE PLATE IS AND WILL RESULT IN THE TEST FAILING.

6.2 Test Description

Note
All specifications are subject to change without prior notification.

Material/Reagents:

MultiCheck plate

MultiCheck plate (not included with Nebula® Reader)
Description
The MultiCheck Plate is used as a general purpose qualification control tool for checking basic functions of the major instrument components. This plate will test the following components:

Positioning
- Fluorescence Top (Multimode only)
- Transport Regularity (Multimode only)
- Absorbance

Performance
- Fluorescence Top (Multimode only): Precision, Signal/Blank, Linearity
- Absorbance: Accuracy, Precision, Linearity

Wavelength Checks
- Excitation Wavelength: Accuracy, Precision
- Emission Wavelength (Multimode only): Accuracy, Precision

Pass/Fail Specifications:

Please refer to the data sheet and the instructions for use found in your MultiCheck plate (not included with Nebula® Reader).

7. Cleaning and Maintenance

7.1 Introduction

CAUTION

ENSURE THAT THE MICROPLATE IS REMOVED FROM THE INSTRUMENT BEFORE IT IS PREPARED FOR SHIPMENT. IF A MICROPLATE IS LEFT IN THE INSTRUMENT, FLUORESCENT SOLUTIONS MAY SPILL ONTO THE OPTICAL PARTS AND DAMAGE THE INSTRUMENT.

The cleaning and maintenance procedures are important in order to prolong the instrument's life and to reduce the need for servicing.

This section contains the following procedures:

- Liquid Spills
- Instrument Disinfection
- Disinfection Certificate
- Instrument and Material Disposal

WARNING

ALL PARTS OF THE INSTRUMENT THAT COME INTO CONTACT WITH POTENTIALLY INFECTIOUS MATERIAL MUST BE TREATED AS POTENTIALLY INFECTIOUS AREAS.

IT IS ADVISABLE TO ADHERE TO APPLICABLE SAFETY PRECAUTIONS, (INCLUDING THE WEARING OF POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING) TO AVOID POTENTIAL INFECTIOUS DISEASE CONTAMINATION WHEN PERFORMING CLEANING PROCEDURES AND ALSO WHEN MAKING ADJUSTMENTS TO THE INSTRUMENT.

7.2 Liquid Spills

1. Switch OFF the instrument.
2. Wipe up the spill immediately with absorbent material.
3. Dispose of contaminated material appropriately.
4. Clean the instrument surfaces with a mild detergent.
5. For biohazardous spills clean with B30 (Orochemie, Max-Planck-Str. 27, D-70806 Kornwestheim).
6. Wipe cleaned areas dry.

WARNING

ALWAYS SWITCH-OFF THE INSTRUMENT BEFORE REMOVING ANY KIND OF SPILLS ON THE INSTRUMENT. ALL SPILLS MUST BE TREATED AS POTENTIALLY INFECTIOUS. THEREFORE, ALWAYS ADHERE TO APPLICABLE SAFETY PRECAUTIONS, (INCLUDING THE WEARING OF POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING) TO AVOID POTENTIAL INFECTIOUS DISEASE CONTAMINATION.

ADDITIONALLY, ALL RESULTING WASTE FROM THE CLEAN-UP MUST BE TREATED AS POTENTIALLY INFECTIOUS AND THE DISPOSAL MUST BE PERFORMED ACCORDING TO THE INFORMATION GIVEN IN CHAPTER 7.3.3 DISPOSAL.

IF THE SPILL OCCURS IN THE INSTRUMENT, A SERVICE TECHNICIAN IS REQUIRED.

WARNING

ENSURE THAT THE MICROPLATE IS REMOVED FROM THE INSTRUMENT BEFORE IT IS PREPARED FOR SHIPMENT. IF A MICROPLATE IS LEFT IN THE INSTRUMENT, FLUORESCENT SOLUTIONS MAY SPILL ONTO THE OPTICAL PARTS AND DAMAGE THE INSTRUMENT.

7.3 Instrument Disinfection

All parts of the instrument that come into contact with the patient samples, positive control samples or hazardous material must be treated as potentially infectious areas.

WARNING

THE DISINFECTION PROCEDURE SHOULD BE PERFORMED ACCORDING TO NATIONAL, REGIONAL, AND LOCAL REGULATIONS.

WARNING

ALL PARTS OF THE INSTRUMENT THAT COME INTO CONTACT WITH POTENTIALLY INFECTIOUS MATERIAL MUST BE TREATED AS POTENTIALLY INFECTIOUS AREAS.

IT IS ADVISABLE TO ADHERE TO APPLICABLE SAFETY PRECAUTIONS, (INCLUDING THE WEARING OF POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING) TO AVOID POTENTIAL INFECTIOUS DISEASE CONTAMINATION WHEN PERFORMING THE DISINFECTION PROCEDURE.

Before the instrument is returned to the distributor for servicing, it must be disinfected and a disinfection certificate completed. If a disinfection certificate is not supplied, the instrument may not be accepted by the servicing center or it may be held by the customs authorities.

7.3.1 Disinfection Solutions

The instrument should be disinfected using the following solution:

- B30 (Orochemie, Max-Planck-Str. 27; D-70806 Kornwestheim)

7.3.2 Disinfection Procedure

WARNING

THE DISINFECTION PROCEDURE SHOULD BE PERFORMED IN A WELL-VENTILATED ROOM BY AUTHORIZED TRAINED PERSONNEL WEARING DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING.

If the laboratory has no specific disinfection procedure, the following procedure should be used to disinfect the outside surfaces of the instrument:

1. Disconnect the instrument from the main power supply.
2. Disconnect the instrument from any accessories that are used.
3. Carefully wipe all outside surfaces of the instrument with a wad of cotton wool soaked in the disinfecting solution.
4. Make certain, that the same disinfection procedure is performed with the plate carrier.
5. Repeat the disinfection procedure on any accessories, which are also being moved for returned.
6. After the disinfection procedure has been performed, make certain that the disinfection certificate is completed.
7. Complete a safety certificate and attach it to the outside of the box so that it is clearly visible.

7.3.3 *Disposal*

Follow laboratory procedures for bio-hazardous waste disposal, according to national and local regulations.

This gives instructions on how to lawfully dispose of waste material accumulating in connection with the instrument.

CAUTION

OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

ATTENTION

DIRECTIVE 2002/96/EC ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE TREATMENT OF ELECTRICAL AND ELECTRONIC EQUIPMENT WASTE

- **DO NOT TREAT ELECTRICAL AND ELECTRONIC EQUIPMENT AS UNSORTED MUNICIPAL WASTE.**
- **COLLECT WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SEPARATELY.**

7.3.4 Disposal of Packing Material

According to Directive 94/62/EC on packaging and packaging waste, the manufacturer is responsible for the disposal of packing material.

Returning Packing Material

If you do not intend to keep the packing material for future use, e.g. for transport and storage purposes, return the packaging of the product, spare parts and options via the field service engineer to the manufacturer.

7.3.5 Disposal of Operating Material

WARNING

BIOLOGICAL HAZARDS CAN BE ASSOCIATED WITH THE WASTE MATERIAL (MICROPLATE) OF PROCESSES RUN ON THE INSTRUMENT.

TREAT THE USED MICROPLATE, OTHER DISPOSABLES, AND ALL SUBSTANCES USED, IN ACCORDANCE WITH GOOD LABORATORY PRACTICE GUIDELINES.

INQUIRE ABOUT APPROPRIATE COLLECTING POINTS AND APPROVED METHODS OF DISPOSAL IN YOUR COUNTRY, STATE OR REGION.

7.3.6 Disposal of the Instrument

Please contact your local Lonza service representative before disposing of the instrument.

CAUTION

ALWAYS DISINFECT THE INSTRUMENT BEFORE DISPOSAL.

Pollution degree	2 (IEC/EN 61010-1)
Method of disposal	Contaminated waste

WARNING

DEPENDING ON THE APPLICATIONS, PARTS OF THE INSTRUMENT MAY HAVE BEEN IN CONTACT WITH BIOHAZARDOUS MATERIAL.

- **MAKE SURE TO TREAT THIS MATERIAL ACCORDING TO THE APPLICABLE SAFETY STANDARDS AND REGULATIONS.**
- **ALWAYS DECONTAMINATE ALL PARTS BEFORE DISPOSAL (I.E. CLEAN AND DISINFECT).**

8. Troubleshooting

Error #	Error Text	Description
1	Command is not valid	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
2	Parameter out of range	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
3	Wrong number of parameters	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
4	Invalid parameter	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
5	Invalid Parameter at pos	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
6	[prefix] is missing	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
7	RS485 Timeout at module [module descr]	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
8	Invalid module number [Nr]	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
9	Binary Transfer command: [cmd] at module [n]	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
10	Error at command [cmd] at module [n],	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
11	LID open	Plate transport or filter slide lid were open during a measurement or the instrument was used in very bright environment (<< 500 LUX). Please check if the lid closes completely or if the environment was too bright.
13	Z Motor out of Safety-Range	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
14	Filter is not defined	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
15	X drive init error	Hardware Failure Plate Transport Module. Please report this error to your local Lonza Scientific Support office.
16	Y drive init error	Hardware Failure Plate Transport Module. Please report this error to your local Lonza Scientific Support office.

Error #	Error Text	Description
17	z drive init error	Hardware Failure z-drive Module. Please report this error to your local Lonza Scientific Support office.
21	Invalid Command: [cmd]	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
22	Invalid Operand: [cmd]	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
23	Invalid Command Sequence: [cmd]	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
24	N/A	N/A
26	Plunger Overload:	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
27	Valve Overload:	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
28	Plunger Move not allowed:	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
29	Command Overflow	Unspecific internal communication error. Please report this error to your local Lonza Scientific Support office.
30	Prepare: [s]: Gain:[g], Counts: [cts]	Unspecific Hardware failure. Please report this error to your local Lonza Scientific Support office.
31	[ERR] at module [mod] (cmd:[cmd])	Unspecific Hardware failure. Please report this error to your local Lonza Scientific Support office.
32	MTP is in Out-Position	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
33	[val] ... not set at (Ratiolabel [n])	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
35	Invalid Parameter Length (max: [n] char allowed)	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
36	Checksum Error	Communication Error on USB interface. Please report this error to your local Lonza Scientific Support office.
37	Init Error at module [mod#]	Unspecific Hardware Failure. Please report this error to your local Lonza Scientific Support office.
38	Instrument Initialization Error	Unspecific Hardware Failure. Please report this error to your local Lonza Scientific Support office.

Error #	Error Text	Description
42	Instrument is locked	Instrument is locked after a serious hardware problem. For unlocking a reboot is necessary. Please report this error to your local Lonza Scientific Support office.
43	Prepare: [channel]: Wavelength:[lambda] Gain:[g], Counts: [cts]	Unspecific Hardware failure. Please report this error to your local Lonza Scientific Support office.
44	Steploss Error	Actuator failure. Please report this error to your local Lonza Scientific Support office.
45	Sync Scan: Number of EX-Steps does not match EM-Steps	Unspecific error in the Instrument - Computer communication protocol. Please report this error to your local Lonza Scientific Support office.
46	Handshake timeout at module	Unspecific Hardware Failure. Please report this error to your local Lonza Scientific Support office.
47	Motor Timeout	Unspecific Hardware Failure. Please report this error to your local Lonza Scientific Support office.
48	[Value] is not in defined a Range	Unspecific Hardware Failure. Please report this error to your local Lonza Scientific Support office.
49	Sensor is broken	Sensor Failure. Please report this error to your local Lonza Scientific Support office.

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