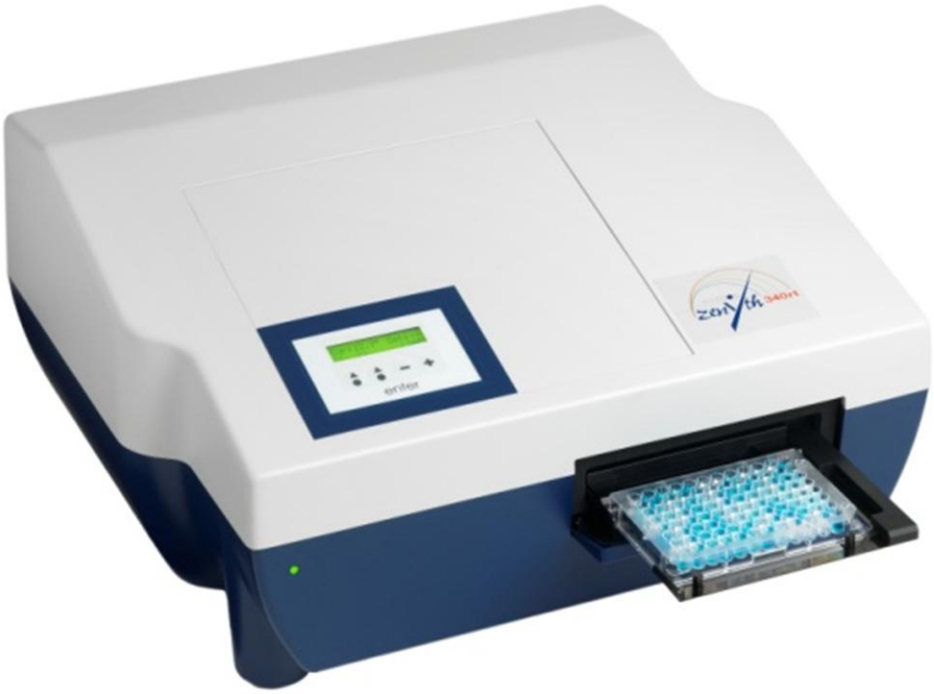

Biochrom Anthos Zenyth 340 Microplate Reader User's Manual

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Table of Contents

Safety Information

All Warnings and Cautions in this document include an exclamation point, a lightning bolt, or a light burst symbol framed within a triangle. Please pay special attention to the specific safety information associated with these symbols.

Warning and Caution Definitions

The exclamation point symbol is an international symbol which serves as a reminder that all safety instructions should be read and understood before installation, use, maintenance, and servicing is attempted.
When this symbol is displayed in this manual, pay special attention to the specific safety information associated with the symbol.

WARNING
A WARNING calls attention to a condition or possible situation that could cause injury to the operator.

CAUTION
A CAUTION calls attention to a condition or possible situation that could damage or destroy the product or the operator's work.

Electrical Safety
To prevent electrically related injuries and property damage, properly inspect all electrical equipment prior to use and immediately report any electrical deficiencies. Contact an Anthos service representative for any servicing of equipment requiring the removal of covers or panels.

High Voltage:

This symbol indicates the potential of an electrical shock hazard existing from a high voltage source and that all safety instructions should be read and understood before proceeding with the installation, maintenance, and servicing of all modules.

1. Voltages dangerous to human life are present in this device. Before removing any covers disconnect the device from the power source.
2. Ensure that the power cord supplied with the unit is used.
3. The power cord may only be inserted in a socket outlet provided with a protective ground (earth) contact. The protective action must not be negated by use of an extension cord without a protective grounding contact.
4. Do not replace fuses without first removing the main power cord. Ensure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse-holders is prohibited.

5. When the apparatus is connected to the main power source, the opening of the covers or removal of components is likely to expose life parts. The device shall be disconnected from all voltage sources before it is opened for adjustment or repair.
6. Any adjustment or repair of the opened apparatus under voltage should be avoided, but, if necessary, it must be carried out by qualified service personnel who are aware of the hazards involved.
7. Use the equipment only in the intended manner and as specified by the manufacturer, otherwise the protection provided by the equipment may be impaired.
8. Only the IBM mouse, model No.: 12J3618, is tested for EMC compliance and is recommended to be used with the instrument. High voltage peaks in the mains supply may disable the function of a computer mouse connected to the reader. Unplug and re-plug the mouse and eventually re-boot the instrument for resuming its function. Use a voltage-peak filter between power cord and mains socket, if repeated failures of the mouse indicate the occurrence of voltage peaks in the mains supply.

Chemical and Biological Safety

Normal operation of the Zenyth 340 Absorbance Detectors may involve the use of materials that are toxic, inflammable, infectious or otherwise biologically harmful. When using such materials, observe the following precautions:

1. Handle infectious samples according to good laboratory procedures and methods to prevent the spread of disease. Wear protective gloves.
2. Observe all cautionary information printed on the original solutions containers prior to their use.
3. Dispose of all waste solutions according to your facility's waste disposal procedures.
4. Operate the Zenyth 340 Absorbance Detectors in accordance with the instructions outlined in this manual, and take all the necessary precautions when using pathological, toxic, or radioactive materials.
5. Splashing of liquids may occur; therefore, take appropriate safety precautions, such as using safety glasses and wearing protective clothing, when working with potentially hazardous liquids.
6. Use an appropriately contained environment when using hazardous materials.
7. Observe the appropriate cautionary procedures as defined by your safety officer when using flammable solvents in or near a powered-up instrument.
8. Observe the appropriate cautionary procedures as defined by your safety officer when using toxic, pathological, or radioactive materials.

9. Wash your hands thoroughly after handling test fluids. If equipment has been in contact with hazardous substances, it must be disinfected prior to shipment in accordance with the effective provisions.

Moving Parts

Do not touch the plate during movement of the plate transport (risk of injury). Make sure that the lid is always closed prior to a measurement.

Keep the Zenyth 340 Absorbance Detectors work area clear to prevent obstruction of the movement.

1 General Information

1.1 System Description

Zenyth 340 is a visible and near UV range instrument that uses a tungsten filament halogen lamp and automated wavelength selection via a filter wheel.
Its mechanical concept is based on:

- Front loading, one-directional plate transport
- Fast moving scanning optics

This allows flexible adaptation to all plate formats from 6 to 384 wells.

1.1.1 Model Versions

Zenyth 340r	Remote Controlled Filter Photometer
Zenyth 340rt	Remote Controlled Filter Photometer with Temperature Control

1.1.2 Options

Temperature Control

ADAP 2.0 Software (3 modules available: ADAP Basic, ADAP Plus and ADAP Expert)

A wide range of Filters

1.1.3 Intended use

Zenyth 340 is intended for general laboratory and research use only.

1.1.4 Scope of Supply

Filters 340, 405, 450, 492, 620 nm

Manual

Power cable

Serial cable to PC

Dust cover

ADAP BASIC Software

Adapter for keyboard and mouse (only S model)

Spare air filters for fan (2)

Spare fuses (2)

1.2 Technical Data

1.2.1 Table of Specifications

Parameter	Specification
Measurement Method	Transmission Photometer
Light Source	Tungsten Halogen Lamp
Detector	Silicon Photodiode
Wavelength Range	340-750nm
Filter-wheel Positions	8
Available Wavelength	340, 405, 450, 492, 550, 595, 620, other wavelengths on request
Resolution	0.001 OD (0.1m OD in 0 – 1 OD)
Measurement Range	0 - 3.0 OD (specified)
Indication Range	0 – 4.0 OD
Accuracy	<±1.5% at 1 OD
Linearity	<±0.5% and ±0.005 OD from 0.1 up to 1.5 OD <±0.75% from 1.5 to 3.0 OD (400-750nm) <±0.7% and ±0.005 OD from 0.1 up to 2.0 OD (340-399nm)
Reproducibility	<±0.3% and ±0.005 OD at 1.000 OD (400-750nm) <±0.5% and ±0.005 OD at 2.000 OD (400-750nm) <±0.5% and ±0.005 OD at 1.000 OD (340-399nm)
Measurement Speed for 96-Well Plate	single wavelength: 10 Seconds dual wavelength: 20 Seconds kinetic single Wavelength Interval: 10 Seconds kinetic dual Wavelength Interval: 20 Seconds
Assumed Workload	5000 Measurements / Year
Temperature Control	from 4° C above Ambient up to 45°C in 1° C Steps
Measurement Modes	single wavelength dual wavelength multiple wavelength scan measurement kinetic measurement
Shaking	three speeds

1.2.2 Measurements and Weight

Weight: 14.4 kg

Dimensions (width x height x length): 47.3 cm x 25.0 cm x 39.8 cm

1.2.3 Power Supply

Operating voltage: 100-240 V, frequency range: 50-60 HFuses: 250VAC, 2 A -T, 5x20 mm,

1.2.4 Sound Pressure Level

Maximum sound pressure 71dBA
Maximum sound pressure at one meter 62dBA

1.2.5 Environmental Conditions

The working area has to be flat, dry, clean and vibration proof and leave additional room for cables, connections, computer, printer etc.

The ambient air has to be clean and free of corrosive vapors, smoke and dust. The instrument is rated to Pollution Degree II and Installation Category II.

The ambient temperature has to range between 15°C and 40°C for operation and between -25°C and +50°C for storage.

Indoor use only. Humidity has to range between 15% and 75%.

Height over sea level during operation up to 2000 m

1.2.6 Defects and Abnormal Stresses

Whenever it seems likely that safe operating conditions are impaired, the instrument shall be made inoperative, for example, remove the Power Cord, etc., and shall be secured against any unintended operation. Mark the device as unsafe for use.

This is the case if the device for example:

- shows signs of visible damage.
- fails to perform its intended functions.
- has been subjected to prolonged storage under unfavorable conditions.
- has been subjected to severe transport stress.

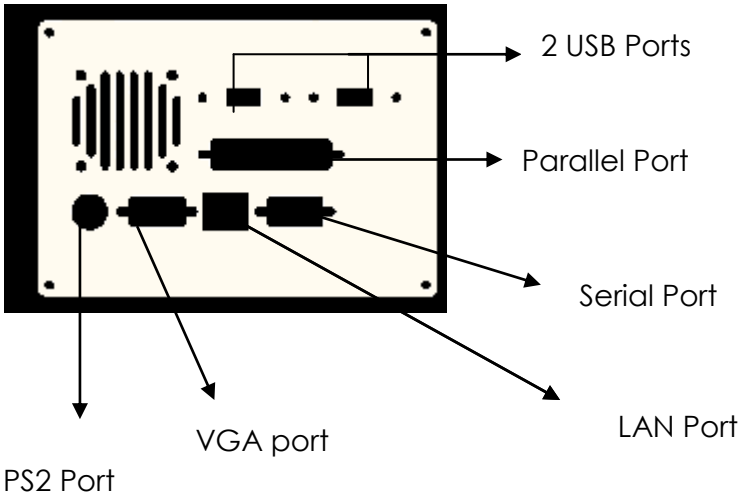
1.2.7 Liability

In original condition the instrument meets all safety regulations for a risk-free operation. Biochrom Ltd cannot warrant damages or any resulting costs caused by alterations, repairs or modifications of the equipment.

1.3 Interfacing

1.3.1 Zenyth 340r and 340rt

- Serial Interface for remote control via ADAP 2.0 Software.
- Parallel Interface to connect a printer
- **Note: All printers which have PCL transmission protocol can be used.**
- PS2 port to link mouse or keyboard or both
- USB ports for connection to an external floppy drive or memory stick
- VGA port to link to a PC screen
- LAN port for connecting to a network (See chapter 5).



2 Start-up and System Setup

2.1 Unpacking and Installation

The original Zenyth 340 packing has been especially designed to protect this equipment during transportation. It is therefore recommended to keep the original carton with its foam parts and the accessories box for re-use in case of future shipments. Warranty claims are void if transport damages are caused by improper packing.

Unpacking of Instrument

1. Check the box for any visible damage during transportation. In case of damage inform your supplier immediately and keep the damaged packing
2. Place the device on a suitable working surface
3. Connect the power cable
4. Connect the serial cable to the PC used for
5. Switch on main switch (rear left side). The Anthos Zenyth 340 performs the complete initialization and shows the main menu after approx. 30 seconds.

2.2 ADAP Installation and Setup

Please consult the ADAP 2.0 Software User's Manual for more information regarding the use of the Zenyth 340 r/rt.

1. Turn on the instrument: Connect instrument to a power source using the appropriate power cord.

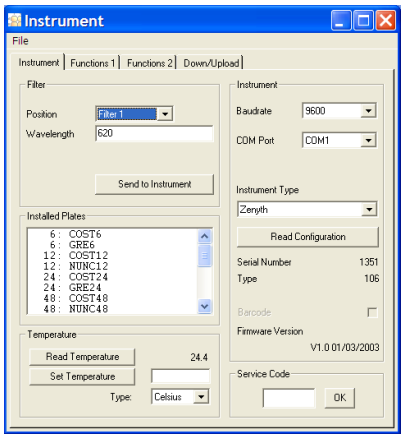
2. **Connect the instrument to a PC:**
   Connect to a PC via serial port to serial port or a serial port to USB port adaptor. To determine the communication port (com) used by the instrument, and open the device manager, found here: go to **Start\Control Panel\System\Hardware\ Device Manager\Ports**.

   Please Note:
   - Ensure that the instrument is connected using COM ports 1 – 9.
   - Some USB to RS232 converters do not work well; use a serial port whenever possible.
   - Ensure that you are using the original RS232 cable that was shipped with the instrument

3. **Connect instrument to ADAP software:** Insert CD supplied with the instrument into PC; install ADAP.

   Please Note: Before installing ADAP you must log in to the PC as an administrator.

4. Open ADAP. ADAP will prompt for a user ID and password. Use the pre-set ID and password: **sadmin\sadmin**. Once logged as **sadmin**, set specific user IDs, passwords and administrative rights. Select **Setup>Instrument** in the menu bar. A dialogue box will open:



Under the **Instrument** tab:

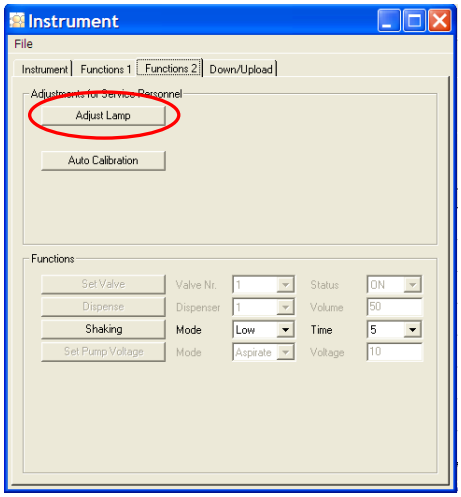
- In **Baudrate:** select Auto Sense
- In **COM** Port: select port
- In **Instrument Type**: select Zenyth

5. To confirm that the instrument is connected with the computer, select the **Read Configuration** button. The serial number of the instrument should now appear in the **Setup>Instrument** dialogue box along with compatible plate types in the **Installed Plates** window.

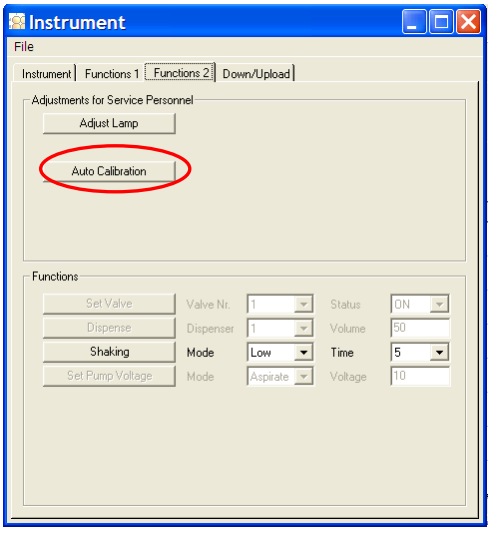
2.3 Calibration and Status-Check

Before the first use of the instrument after shipment a few automated re-adjustments and a status check shall be performed in the following sequence:

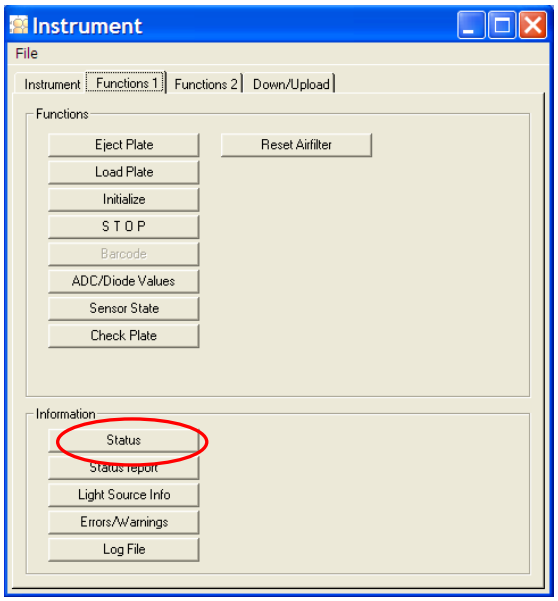
1. **Adjust the Lamp**. The brightness of the halogen bulb is adjusted for each filter installed. In the Setup>Instrument box, selection Function 2:



2. **Auto Calibration:** Verifies the movement of the plate and optics transporter: Select: Auto-Calibration:



3. To check that all aspects of the instrument are performing satisfactorily. Select Function 1 tab and **Status**:

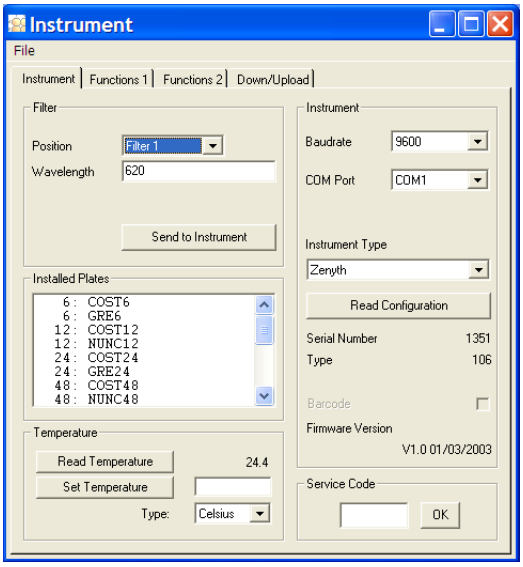


3 Quick Start Guide

1. **To turn on the instrument:** Connect instrument to a power source using the appropriate power cord.

2. **To connect the instrument to a PC:**
   Connect to a PC via serial port to serial port or a serial to USB port adaptor. Determine the communication port (com) used by the instrument. In the **Start** menu of the PC, go to **Control Panel\System\Hardware\Device Manager\Ports**.

3. **To connect instrument to ADAP software:**
   Insert CD supplied with the instrument into PC, install ADAP. Open ADAP. ADAP will prompt for a user ID and password. Use the pre-set ID and passwords are **sadmin\sadmin**. Once logged as **sadmin**, set specific user IDs, passwords and administrative rights. Select **Setup>Instrument** in the menu bar. A dialogue box will open:

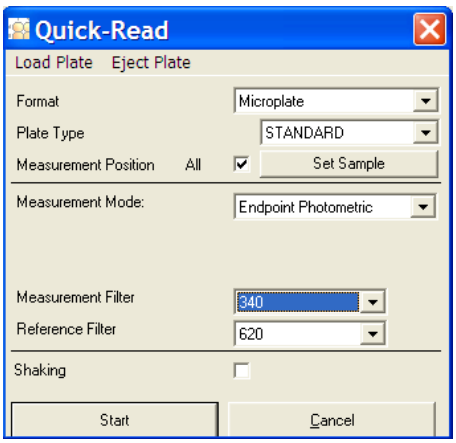


Under the **Instrument** tab:

- In **Baudrate:** select Auto Sense
- In **COM** Port: select port as determined in step 2.
- In **Instrument Type**: select Zenyth in the drop-down menus.

4. To confirm that the instrument is connected with the computer, select the **Read Configuration** button. The serial number of the instrument should now appear in the **Setup>Instrument** dialogue box along with compatible plate types.

5. **To measure a plate:** Select the  button in the menu bar.



In the **Quick-Read** dialogue box: Confirm that the correct format and plate type are selected.

- Select **All** in **Measurement Position** to read the entire plate.
- Select **Endpoint Photometric** for basic readings using a measurement and reference filter from the drop-down menu.

Please note: It is important to use a reference filter to account for optical inference from the plate.

6. Place plate with A1 in the upper left corner of the plate transport. Select **Start**. Absorbance measurements will appear in the open matrix in ADAP.

7. To export data into other software programs, select the OD tab and the copy icon:  and followed by **Copy All Displayed Data**. Data will paste as a matrix with filter wavelength, time and date.

4 Maintenance

ATTENTION: Read these pages entirely and carefully! All maintenance work requiring opening of the instrument must be performed only with mains disconnected and must be performed by a technical qualified person!

4.1 Electrical Safety Consideration

See also Safety Information at the beginning of this manual

ATTENTION: Voltages dangerous to human life are present in this device. Read these pages entirely before opening any seal or unscrew the instrument

When the instrument has to be opened for a lamp- or filter exchange the device must be disconnected from the power source.

Ensure that only fuses with the required current rate and of the specified type (2 A T) are used for replacement. The use of makeshift fuses and the short-circuiting of fuse-holders are prohibited.

When the instrument is connected to the main power source, the opening of covers or removal of components is likely to exposed live parts. The device must be disconnected from all voltage sources before it is opened for any exchange or cleaning.

Any adjustment or repair of the opened instrument under voltage should be avoided, but, if necessary, it must be performed by qualified service personnel who are aware of the hazards involved.

4.2 Cleaning and Disinfection

All parts of the reader that come into contact with potentially infectious material must be treated as potentially infectious areas. The cleaning and disinfection procedures should be performed by authorized trained personnel in a well-ventilated room while wearing disposable gloves, protective glasses and clothing.

The following materials are recommended for cleaning and disinfection of the reader:

- Lint-free tissues.
- Protein degrading mild detergent (e.g. Mucasol™ / Rogypon™) or saline solution (0.9% NaCl).

- Ethanol (70%) or chlorine solution (1500 ppm).

Never spray directly into the interior of the reader.

4.2.1 Cleaning

Clean the reader regularly and immediately after spillage. This has to be done with due care and attention. Always observe laboratory safety rules and regulations. Do not use force when cleaning the reader.

Wipe off spills immediately with soft tissue.

Avoid sedimentation of dust on the instrument and wipe off visible dust.

Cover the instrument with the dust cover if not in use.

<u>The following cleaning procedure should be performed on demand:</u>

1. Switch off the reader.
2. Carefully wipe off the entire reader with lint-free tissues that have been moistened in a mild protein degrading detergent or a saline solution.
3. Carefully wipe off the entire reader with lint-free tissues that have been moistened in ethanol or a chlorine solution.
4. Put lint-free tissues that have been moistened in ethanol or a chlorine solution onto the plate transport mechanism and let it soak for ± 30 minutes.
5. When a chlorine solution has been used, carefully wipe off the entire reader with lint-free tissues that have been moistened in water.
6. Dry the reader by wiping it off with lint-free tissues.

4.2.2 Disinfection

Before the reader is returned to the distributor it must be disinfected and a disinfection certificate must be completed.

<u>The following procedure must be used for disinfecting the reader:</u>

1. Switch off the reader and disconnect it from the mains power supply.
2. When used, disconnect the reader from any accessories (printer and PC).
3. Carefully wipe off the entire reader with lint-free tissues that have been moistened in a protein degrading mild detergent or a saline solution.
4. Carefully wipe off the entire reader with lint-free tissues that have been moistened in ethanol or a chlorine solution.
5. Put lint-free tissues that have been moistened in ethanol or a chlorine solution onto the plate transport mechanism and let it soak for ± 30 minutes.
6. When a chlorine solution has been used, carefully wipe off the entire reader with lint-free tissues that have been moistened in water.
7. Dry the reader by wiping it off with lint-free tissues.
8. Pack the reader in its original packaging.

9. Complete a disinfection certificate and make a copy of the certificate.

Enclose the disinfection certificate in the reader package and attach the copy to the outside of the package so that it is clearly visible.

5 Appendix:

5.1 Principles of Photometry Measurement

Light is electromagnetic wave radiation. Rays from 100nm to 400nm are defined as the ultraviolet spectrum of light. Only rays in the range from 400nm to 780nm are visible to the human's eye, rays with longer wavelengths are called infrared. Color impressions are caused by reflection of electromagnetic waves striking the surface of material substances. Substances absorb the complementary spectrum of their visual perceptible color. Hence green plants look green since they absorb red light (light of a wavelength perceived as red, e.g.: 750nm). A photometer is an optical electronic measuring device to determine the amount of light absorbed at a specific wavelength.

5.1.1 Absorbance Measurements

Experimental measurements return the value of transmission (**T**):
Transmission is defined as the percentage ratio between the total available light energy at the detector (measured through air) and the residual luminous energy after sample transmission at a specific wavelength.

$$\mathbf{T = I/I_0}$$ (I.....Light intensity after passing through the sample
I_0....Initial light intensity)

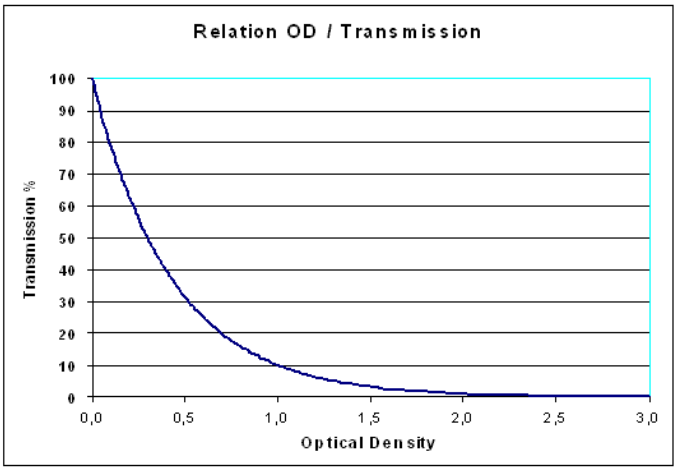
Transmission has no linear relation to concentration; therefore **A**bsorbance (**O**ptical **D**ensity) is calculated from Transmission by the formula:

A = OD = -log T, or **A = OD = log (1/T)**

Absorbance is related in a linear way to layer thickness and sample concentration according to the Beers law:

Absorbance (A) =Molar Absorptivity(ε) * pathlength (b) * concentration (c)

The following graph illustrates the relation between absorbance (sample concentration) and the light transmitted and measured at the detector:



It is important to keep in mind that the best measurement range of absorbance is from 0.1 to 1 OD or 90% to 10% of transmission. Measurements above 2 OD deal with less than 1% of the original light and will therefore have lower resolution and accuracy.

5.1.2 Measurement at Specific Wavelengths

A useful physical characteristic of molecules is specific transmission profile which is indicative of its concentration and composition. A measurement with white light renders different sample concentrations in a certain spectral range only to a small amount and accordingly inaccurate. A higher significance can be obtained by using only that part of the light spectrum, which is relevant to prove the respective wavelength of the substance.
Due to this fact interference filters of a narrow banded wavelength spectrum are employed in this instrument. Each substance has a certain absorption spectrum. A measurement should be performed by selecting the correct filter for the maximum absorption of the sample, because in this way the best differentiability of various sample concentrations can be reached. We can also state that the differing absorption amplitude of two uniformly composed samples is a measure for the concentration. For this reason measurements in the flank area of the spectrum are not very accurate and therefore to be avoided. In this connection, it has to be taken into consideration that - when using interference filters – wavelength tolerances of +/- 2 nm from the nominal wavelength value may also result in inaccuracies. Each sample has an absorption minimum not specific to the measurement value, which can be deducted from the measurement value automatically by choosing a suitable reference wavelength. This kind of measurement is referred to as bichromatic.