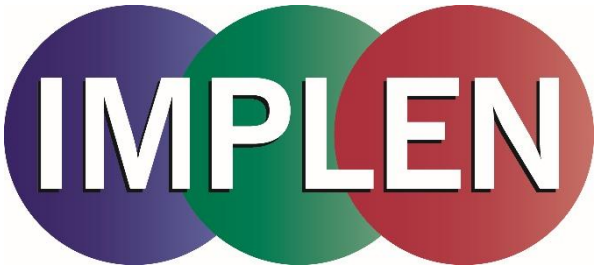


NanoPhotometer® N30-Touch

User Manual

Version 1.3

Software Version: NPOS 4.6m build 16350

The end user of the NanoPhotometer® N30-Touch product (“End User”) hereby takes full responsibility for safe storage and backup of all files and/or data that may be created, saved on or transferred from the device. End User acknowledges that it is possible that data and/or files may be lost or damaged, and further acknowledges and agrees that it has sole responsibility to maintain all appropriate backup of files and data. By using the NanoPhotometer® N30-Touch device, End User hereby agrees to these terms, and agrees that Implen shall not be held liable for any loss, deletion or damage of any data or files for any reason, including any damages attributable thereto.

Telephone support is available using one of the following phone numbers from your geographic region:

Europe, Asia, South Pacific, Middle East, Africa

Phone: +49 89 72637180
Fax: +49 89 726371854
Email: support@implen.de
Website: www.implen.de

Implen GmbH
Schatzbogen 52
81829 München
Germany

Declaration of conformity for the NanoPhotometer® (N30-Touch)

This is to certify that the Implen NanoPhotometer® N30-Touch conforms to the requirements of the following directives:

2014/35/EU	Low Voltage Equipment Safety Directive
2014/30/EU	Electromagnetic compatibility (EMC) directive
IEC 60529	Protection class IP20
2011/65/EU	Restrictions on the use of certain Hazardous Substances in Electrical and Electronic Equipment (ROHS)
2012/19/EU	EC Directive on Waste Electrical and Electronic Equipment (WEEE) 2003/108/EC & 2008/34/EC. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product.
FCC 47 CFR Part15 §15.107 and §15.109	
EN 301 489-1 V1.9.2	Radio and ancillary equipment for portable use (portable equipment); EUT Operating frequency range: 2.4 – 2.4835 GHz
EN 300 328 V1.8.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive
EN 301 489-17 V2.2.1	Electromagnetic compatibility and Radio Spectrum Matters (ERM)
Standards, to which conformity is declared, where relevant, are as follows:	
IEC/EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements.
EN61326-1:2013	Electromagnetic compatibility- generic emission standard electrical equipment for measurement, control, and laboratory use.

Signed:

Dr. Thomas Sahiri
Managing Director
Implen GmbH

Table of Contents

1. NanoPhotometer® N30-Touch at a Glance

NanoPhotometer® N30-Touch Overview

The Implen NanoPhotometer® N30-Touch is a simple to use UV/Visible spectrophotometer with a 4096 CMOS array detector. The NanoPhotometer® N30-Touch runs on a Linux-based operating system (NPOS) that is designed for the use of pre-programmed and custom applications with a high degree of flexibility and processing power.

The N30-Touch device comes with two pre-programmed applications, namely the Nucleic Acids and Protein UV applications. There are **three upgrade options in the form of extension packages** to extend the device capabilities for future applications.

Equipped with our Sample Compression Technology™, the device provides a contained sample environment, independent of surface tension and free from evaporation, enabling easy sample handling and the capability to accurately measure difficult samples, even in the presence of detergent or organic solvents. This technology works on the principle of squeezing the sample between two quartz surfaces allowing for unmatched precision and accuracy without the need for dilutions. Combined with our True Path Technology™ the system offers lifetime accuracy and precision without the need for maintenance or recalibration.

Note: It is recommended to use a properly calibrated pipette with high-quality tips to ensure delivery of appropriate sample volumes for NanoVolume sample applications.

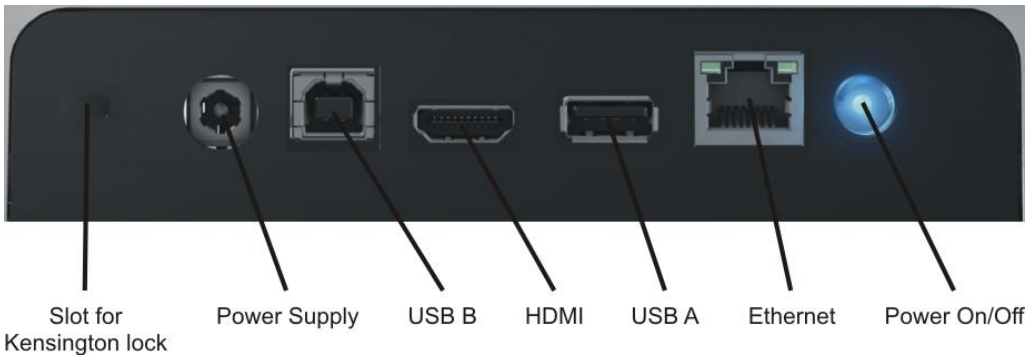
Blank Control™ gives a warning message for blanks with high background. High background absorbance can be caused by a contaminated blank, blank buffer or by residues from previous users. Insufficient blank readings are the main cause for inaccurate measurements. Blank Control™ will protect the user from wasting time and precious sample on inaccurate readings caused by high background blanks or inappropriate cleaning. For more detailed information see our Technical Note #1 Blank Control™ which can be downloaded from the Implen webpage: https://www.implen.de/technical-notes/.

Sample Control™ * is a quality control technology that identifies air bubbles, sample impurities, turbidity, lint residues and potential contaminations. Sample Control™ monitors handling characteristics and sample quality in real time to ensure that the measured concentrations are reproducible and most precise.

**Included in the Applications extension package*

NANOPHOTOMETER® N30-TOUCH

INSTRUMENT REAR PANEL



To boot/shut down the NanoPhotometer® N30-Touch press the on/off power button briefly (< 1 second) on the back of the NanoPhotometer® N30-Touch.

Note: A long push (> 3 seconds) initiates a hard reset. Only activate a hard reset of the NanoPhotometer® N30-Touch when necessary. To avoid unnecessary hard reboots, it is recommended to power down the unit from the onboard touch screen by pressing the power button (⏻) in the bottom left corner of the home screen.

INSTRUMENT BOTTOM VIEW

Model name, device serial number and FCC ID are located on the identification plate on the bottom of the instrument.

ACCESSORIES

STANDARD ACCESSORIES

- **Connecting Cable ***

USB connecting cable to connect the NanoPhotometer® N30-Touch to a computer to control the NanoPhotometer® N30-Touch via computer * (please see page 13 Software Installation).

- **NanoPhotometer® N30-Touch Power Adapter**

Power adapter for the NanoPhotometer® N30-Touch.

Note: Use only the power adapter supplied with your instrument or a replacement part from the manufacturer or your supplier.

- **Dust Cover**

**Only used with the Connectivity extension package*

OPTIONAL ACCESSORIES

- **Standard Solution (N30-Touch)**

The NanoPhotometer® N30-Touch is recalibration free therefore it is not necessary to review the photometric accuracy on a regular basis. However, if the SOPs of a laboratory require a routine control of the photometric accuracy, our standard solutions can be used.

Note: Specifications of the standard solution are guaranteed for at least one year. Please see expiration date. Once a vial is opened it should be used within 30 minutes.
Note: Please read the Material Safety Data Sheet carefully prior to using this product.

- **Barcode Reader**

It is possible to import sample names from 1D and 2D barcodes. Connect a compatible barcode reader to the USB port of the NanoPhotometer® N30-Touch and push on the sample name input window. After scanning a barcode the sample name will be shown in the input window. The imported name can then be edited or replaced completely.

Barcode readers that have been tested and verified compatible:

1D: Honeywell Voyager 95X0 Single-Line Laser Scanner
Datalogic Touch65
1D & 2D: AGPtEK SC36
Honeywell Xenon 1900g

- **DYMO Label Printer***

It is possible to connect a DYMO Label printer to the NanoPhotometer® N30-Touch for direct printing on standard or cryo labels. Recommended and tested printers are the DYMO LabelWriter 4XL/5XL (label size 10.3 x 15.8 cm) and the DYMO LabelWriter 450/550 (5.4 x 10 cm).

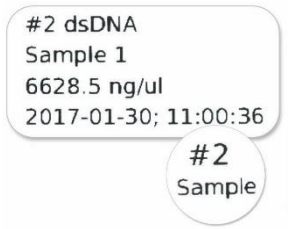
Cryo labels can be printed with DYMO Label printer 4XL and 450 using the following label format: 26 x 12.7 mm and 9.5 mm circle (landscape).

Note: Cryo label paper is not available/compatible for the DYMO Label printer 5XL and 550.

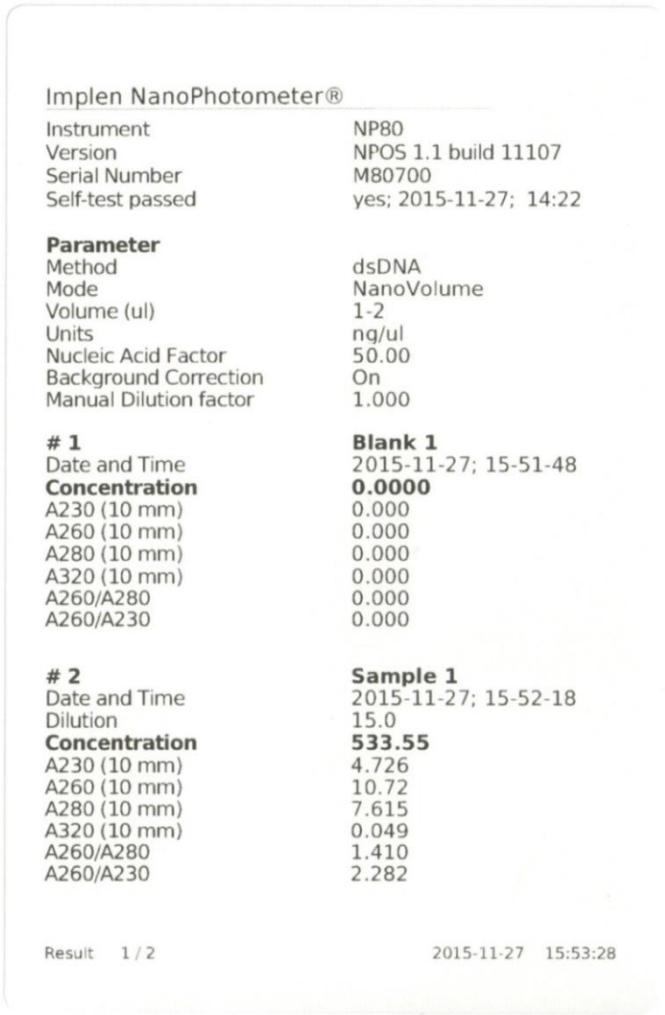
Note: After starting the NanoPhotometer® N30-Touch, plug in the DYMO printer. The home screen will be shown. Wait at least for 30 seconds for driver installation.

Cryo labels (26 x 12.7 mm and 9.5 mm circle):

**Only available with the Connectivity extension package*



Note: Orientation of cryo labels on carrier foil needs to be landscape.

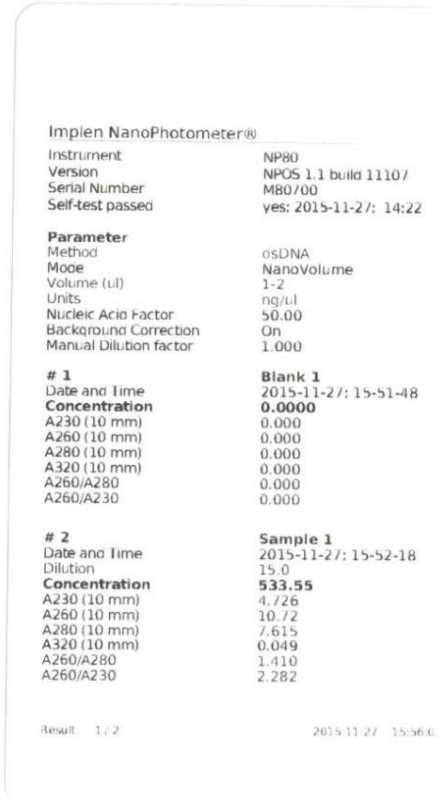


Implen NanoPhotometer®

Instrument	NP80
Version	NPOS 1.1 build 11107
Serial Number	M80700
Self-test passed	yes; 2015-11-27; 14:22
Parameter	
Method	dsDNA
Mode	NanoVolume
Volume (ul)	1-2
Units	ng/ul
Nucleic Acid Factor	50.00
Background Correction	On
Manual Dilution factor	1.000
# 1	**Blank 1**
Date and Time	2015-11-27; 15-51-48
Concentration	**0.0000**
A230 (10 mm)	0.000
A260 (10 mm)	0.000
A280 (10 mm)	0.000
A320 (10 mm)	0.000
A260/A280	0.000
A260/A230	0.000
# 2	**Sample 1**
Date and Time	2015-11-27; 15-52-18
Dilution	15.0
Concentration	**533.55**
A230 (10 mm)	4.726
A260 (10 mm)	10.72
A280 (10 mm)	7.615
A320 (10 mm)	0.049
A260/A280	1.410
A260/A230	2.282

Result 1 / 2 2015-11-27 15:53:28

Printout for DYMO LabelWriter 4XL/5XL



Implen NanoPhotometer®

Instrument	NP80
Version	NPOS 1.1 build 11107
Serial Number	M80700
Self-test passed	yes; 2015-11-27; 14:22
Parameter	
Method	dsDNA
Mode	NanoVolume
Volume (ul)	1-2
Units	ng/ul
Nucleic Acid Factor	50.00
Background Correction	On
Manual Dilution factor	1.000
# 1	**Blank 1**
Date and Time	2015-11-27; 15-51-48
Concentration	**0.0000**
A230 (10 mm)	0.000
A260 (10 mm)	0.000
A280 (10 mm)	0.000
A320 (10 mm)	0.000
A260/A280	0.000
A260/A230	0.000
# 2	**Sample 1**
Date and Time	2015-11-27; 15-52-18
Dilution	15.0
Concentration	**533.55**
A230 (10 mm)	4.726
A260 (10 mm)	10.72
A280 (10 mm)	7.615
A320 (10 mm)	0.049
A260/A280	1.410
A260/A230	2.282

Result 1 / 2 2015-11-27 15:56:0

Printout for DYMO LabelWriter 450/550

Note: The printouts are optimized for the label size of the DYMO LabelWriter 4XL. All other DYMO printers can be used. However, the font size will be zoomed to utilized paper size.

- **HP Printer***

**Printing from your N30-Touch is only available with the Connectivity extension package*
Printing from the NanoPhotometer® N30-Touch is possible via USB (HP printers) and through network connection. Network printing should be possible with AirPrint / IPP compatible printers supporting PDF format. For network printer settings see page 83 Network Printer.

Note: IPP version 2.2 is required and some printer configuration settings might need to be changed in order to allow communication with the NanoPhotometer® N30-Touch.

The following HP printers have been tested and deemed compatible to print via USB connection:

- HP LaserJet 3030
- HP LaserJet m1522nf MFP
- HP LaserJet 400 color M451nw
- HP DeskJet 2543
- HP DeskJet 1110

Further HP printers are available upon request.

Note: After starting the NanoPhotometer® N30-Touch, plug in the HP printer. The home screen will be shown. Wait at least for 30 seconds for driver installation.

CONNECTIVITY

- **USB A (for result storage/device upgrades only)**

There is a USB A port on the front as well as the rear panel of the NanoPhotometer® N30-Touch which is compatible with standard portable USB 2.0 storage devices (back) and USB 3.0 (front) for direct data transfer in a variety of formats including Excel.

- **HDMI**

There is an HDMI port located on the rear panel of the NanoPhotometer® N30-Touch which is compatible with HDMI 1.4 cables (or better) to connect the NanoPhotometer® N30-Touch to HDMI compatible monitors.

Note: The maximum HDMI cable length is 5 meters.

**The following features are only available with the Connectivity extension package:*

- **USB A***

*With the Connectivity package, it is also possible to connect a mouse, keyboard, barcode reader, DYMO printer or HP printer directly to the NanoPhotometer® N30-Touch.

Note: We recommend using FAT/FAT32 formatted 2.0 USB flash drives. The USB flash drive size is due to the standard formatting currently limited to 64 GB. Encrypted USB flash drives are not compatible with the NanoPhotometer® N30-Touch.
Note: Cordless Bluetooth mice are not supported. Use wired mice only.
Note: Connect mouse and keyboard before starting the NanoPhotometer® N30-Touch.

- **USB B***

There is a USB B port located on the rear panel of the instrument which is compatible with the USB cable provided to connect the NanoPhotometer® N30-Touch to a computer. This USB connection can be used to control the NanoPhotometer® N30-Touch via computer.

- **LAN***

There is an Ethernet (LAN) connection port on the rear panel of the instrument which enables the NanoPhotometer® N30-Touch to connect with the local network. This Ethernet connection can be used for data transfer from the NanoPhotometer® N30-Touch to a local network, to control the NanoPhotometer® N30-Touch via a control device and network printing.
Data transfer is possible by saving on a defined network folder (see page 82 Network Folder) or on the NanoPhotometer® N30-Touch file server (see page 31 Data Transfer via File Server).
Note: Plug in the LAN cable before starting the NanoPhotometer® N30-Touch.
Note: The maximum LAN cable length is 10 meters. Bit rate is 1 Gbit/s

- **Wi-Fi®***

The NanoPhotometer® N30-Touch is equipped with Wi-Fi®, which can be used as a Wi-Fi® network or as a Wi-Fi® Hotspot. The Wi-Fi® network allows same functionality as the Ethernet connection including direct printing via AirPrint / IPP compatible printers supporting PDF format.

Note: IPP version 2.2 is required and some printer configuration settings might need to be changed in order to allow communication with the NanoPhotometer® N30-Touch.

The Wi-Fi® Hotspot provides the option to control the NanoPhotometer® N30-Touch by other Wi-Fi® devices like computer, tablets or smartphones.

Wi-Fi® Hotspot connection details:
SSID: NanoPhotometer®N30-Touch serial number
Password: Implenuser

Note: Due to the limitations of some handheld devices saving to a wireless device is limited to 40 measurements per dataset. Larger datasets can be saved on the NanoPhotometer® N30-Touch itself.

Only available with the Connectivity extension package

NANOPHOTOMETER® N30-TOUCH SPECIFICATIONS

NanoVolume Performance – N30-Touch

Detection Range dsDNA	5 – 1.500 ng/µl *(1 – 16.500 ng/µl*)*
Detection Range BSA	0.15 – 44 mg/ml *(0.03 – 478 mg/ml*)*
Sample Volume	0.3 – 2 µl
Photometric Range (10 mm equivalent)	0.1 – 30 A *(0.02 – 330 A*)*
Path length	0.67 and 0.07 mm
Dilution Factor	15 and 140

Optical Specifications

Wavelength Scan Range	200 – 650 nm *(200 - 900nm*)*
Measure Time For Full Scan Range	2.5 – 4.0 seconds
Wavelength Reproducibility	± 0.2 nm
Wavelength Accuracy	± 0.75 nm
Bandwidth	< 1.5 nm
Absorbance Reproducibility	< 0.002 A @ 0 - 0.3 A @ 280 nm CV < 1% @ 0.3 – 1.7 A @ 280 nm
Absorbance Accuracy	< 1.75 % @ 0.7 A @ 280 nm of the reading
Stray Light	< 0.5% @ 240 nm using NaI
Optical Arrangement	1 x 4096 CMOS Array
Lamp	Xenon flash lamp
Lifetime	10^9 flashes, up to 10 years

Expanded ranges available with the Performance extension package

Processing Power and Compatibility

Operating System	Linux based NPOS
Onboard Processor	Intel Celeron dual core 2.4 GHz
Internal Data Storage	*64 GB**
Software Compatibility	Windows 8, 10 (32 & 64 bit), OS X (Intel x86 und Apple M1), iOS and Android OS

General Specifications

Main Body Size	200 mm x 200 mm x 120 mm
Weight	3.8 – 5.2 kg depending on configuration
Power Requirements	90 - 250 V ± 10%, 50/60 Hz, supplied external power supply: 90 W, 18/19 V DC; typ. power consumption: 20 W
Display	1024 x 600 pixels; touchscreen glove compatible
Certifications	CE, IEC 61010-1:2012 and EN 61326-1:2013
In- and Output Ports	2x USB A *(USB B, HDMI, Ethernet, Wi-Fi® *)*
Security	Slot for Kensington lock

Features and specifications are subject to change without notice.
US Patents 20080204755 and 20080106742
Windows is a trademark of Microsoft. Mac OS & iOS are trademarks of Apple, Inc. Android OS is a trademark of Google. Linux is a trademark of Linus Torvalds.

**Internal storage (64 GB) and connectivity features only available with the Connectivity extension package*

2. GETTING STARTED

SPECTROPHOTOMETER INSTALLATION

SAFETY INFORMATION

Before commencing installation, please take time to familiarize yourself with warning labels and symbols on your instrument and their meaning. These are to inform you where potential danger exists or particular caution is required. Improper use may cause personal injuries or damage to the instrument. The instrument must only be operated by appropriately trained and experienced personnel. Please read the complete user manual prior to use.

⎓ Direct current
Overvoltage category: Class II
Maximum operating altitude: < 2000 m
Polution degree: 2

Do not open the instrument as this can expose the operator to electrical power, UV light, and delicate fiber optics or damage the instrument.

Do not use damaged power cords, accessories, and other peripherals with your NanoPhotometer® N30-Touch. Use only the delivered and specified power supply.

Do not expose the NanoPhotometer® N30-Touch to strong magnetic, electrical fields, water, chemicals or any type of liquid as heavy rain or moisture.

Do not put the instrument into fire, as it may swell or explode. Do not store at or use near any type of heat source, especially temperatures above 60°C or in an explosive atmosphere.

Do not leave your NanoPhotometer® N30-Touch on your lap or near any part of your body to prevent discomfort or injury from heat exposure.

Do not place objects on top of the NanoPhotometer® N30-Touch.

Biological samples may contain or have the potential to transmit infectious diseases. Be aware of the health hazard presented by such samples and wear appropriate protective equipment. Handle such samples with the greatest of care and according to applicable regulatory and organization requirements before working with such potential infectious materials.

Note: Do not spill any biological samples on instrument components. If spill occurs, disinfect the instrument immediately following your laboratory protocols and the cleaning instruction of the instrument (see page 94 Maintenance).

The symbol on the product, or on the documents accompanying the product, indicates that this appliance may not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment. Disposal must be carried out in accordance with local environmental regulations for waste disposal.

UNPACKING AND POSITIONING

Check the contents of the package against the delivery note. If any shortages are discovered, inform your supplier immediately.

Inspect the instrument for any signs of damage caused in transit. If any damage is discovered, inform your supplier immediately.

Ensure your proposed installation site conforms to the environmental conditions for safe operation: indoor use or dry environment.

Note: Do not expose your NanoPhotometer® N30-Touch near liquids, chemicals, rain, moisture or dusty environments.

Working temperature range 10 - 40°C.

Storage temperature range is 0 - 40°C. Do not store the instrument below or above this temperature.

If the instrument is subjected to extreme temperature changes, it may be necessary to allow the instrument to equilibrate. Turn the instrument off and then on again once thermal equilibrium has been established (~2-3 hours).

Maximum relative humidity (non-condensing) of 80% up to 31°C decreasing linearly to 50% at 40°C.

The instrument must be placed on a stable, level surface that can support 4-5 kg. Ensure that air can circulate freely around the instrument. Confirm while powered on that no materials reduce air circulation. Avoid direct sunlight as it may bleach parts of the instrument and can cause damage to plastic parts.

The equipment should be positioned such that in the event of an emergency the main plug can be easily located and removed.

Always carry the instrument by holding the main corpus of the instrument and not e.g. on the optional attached display or NanoVolume pedestal.

The equipment must be connected to power with the 90W power supply/cord supplied by Implen. The power outlet must have a protective conductor (earth/ground). It can be used on 90-250 V ± 10%, 50-60 Hz power supply system. The device has a typical operating power consumption of approximately 20 W.

Please read the complete user manual before first use.

Turn the instrument on using the power button on the rear panel after it has been plugged in. The instrument will perform a series of self-diagnostic checks.

Please contact original supplier immediately if technical or sample handling difficulties are experienced.

Note: If this equipment is used in a manner not specified or in environmental condition not suitable for safe operation, the protection provided by the equipment may be impaired and the instrument warranty voided.

SOFTWARE INSTALLATION

NPOS OVERVIEW

NPOS is a Linux-based operating system designed for the NanoPhotometer® N30-Touch.

NPOS can store data either to a common directory or be configured to save to independent directories according to file format and/or instrument.

NPOS can save data in an Implen IDS format, PDF or as an Excel format file.

Note: PDF and Excel files cannot be opened on the NanoPhotometer® N30-Touch. Files need to be transferred to a computer or device where Excel or a PDF reader is available.
Note: Please do not connect the instrument to a computer until the NanoPhotometer® N30-Touch NPOS software is installed on the computer.

REQUIREMENTS AND COMPATIBILITY*

The NPOS user interface is designed that all features can be operated by using a touchscreen. If the software is installed on a computer without touchscreen, the user interface can be operated by using keyboard and mouse. Before starting the installation process, ensure that the software of the control device is compatible.

Controlling your N30-Touch via PC/tablet/smartphone is only available with the Connectivity extension package

Compatible Control Devices

Computer:
PC: Windows 8 / Windows 10 (32 & 64 bit) / Windows 11
Mac: macOS Catalina / Big Sur (Intel x86 und Apple M1)
Tablets (minimum requirements):
iPad: iOS 13
Android (quad core 1.2 GHz with 1 GB RAM): Android version 10
Smartphones (minimum requirements):
iPhone: iOS 13
Android (quad core 1.2 GHz with 1 GB RAM): Android version 10

Note: There are two user interfaces of the software available; one for built-in touchscreen, computer and tablets and one for smartphones.

INSTALLING SOFTWARE ON COMPUTER*

**Controlling your N30-Touch via PC/tablet/smartphone is only available with the Connectivity extension package*

The NanoPhotometer® N30-Touch software can be installed on compatible Windows and Mac computer systems. Various operating systems and computer hardware may cause the set-up procedure to differ from that described here. This process is given as guidance only; it may need adaptation for other systems.

Note: Do not connect the NanoPhotometer® N30-Touch to the PC/Mac before NPOS installation.
Note: If a previous version of the NPOS software is already installed on the computer, remove the USB cable and uninstall the NPOS software before installing the new software version.
Note: The Windows and Mac installation files are located on the Implen USB flash drive which is included with the NanoPhotometer® N30-Touch at time of delivery. The files are available for free download at any time in the download area of the Implen website (www.implen.de.downloads).

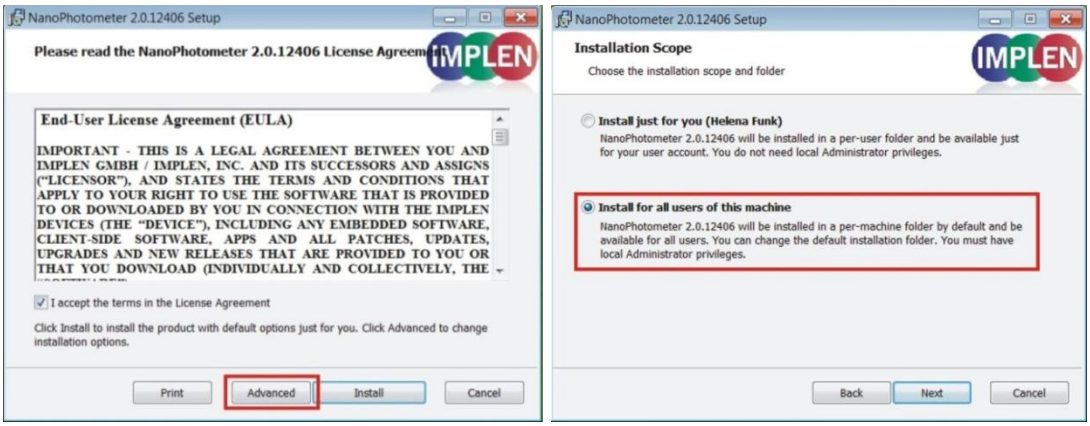
- **NPOS installation for single user on Windows computer***

**Controlling your N30-Touch via PC is only available with the Connectivity extension package*

1. Check the installed version of the NanoPhotometer® N30-Touch firmware (Preferences/About) and update it to the latest version if necessary, before starting the installation/update of the NPOS software on your computer.

2. Start the NPOS installation file and follow the installation routine for **single user installation**.
   Installation file can be found on the Implen USB flash drive which is included with the NanoPhotometer® N30-Touch at time of delivery or can be downloaded from the Implen webpage: www.implen.de/downloads.
   Full administration rights are required for the installation. If you have insufficient privileges, installation may fail. If in doubt consult your computer administrator.

3. For multi user installation (only necessary for Windows installation) choose on the License Agreement dialog the option “Advanced” and on the following dialog “Install for all users of this machine”



4. Start the NPOS software and select the desired connection. For a connection via USB cable, connect the NanoPhotometer® N30-Touch to the PC using the USB cable supplied. For a connection via Wi-Fi® hotspot, ensure a stable Wi-Fi® connection between the PC and NanoPhotometer® N30-Touch Wi-Fi® HotSpot (**SSID**: serial number, **password**: Implenuser). For a network connection, connect the NanoPhotometer® N30-Touch to the local network via an Ethernet cable or Wi-Fi® network (see page 79
5. Network).

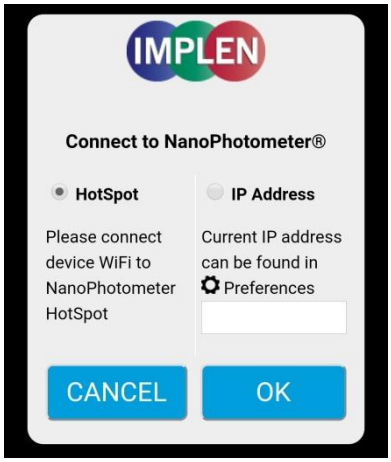
Note: If there is Avira installed on your computer, it is recommended to switch off the browser safety. This may interfere with the NPOS running on your computer.

INSTALLING NANOPHOTOMETER® N30-TOUCH APP ON TABLET/SMARTPHONE*

**Controlling your N30-Touch via tablet/smartphone is only available with the Connectivity extension package*

The NanoPhotometer® N30-Touch App can be installed as an application on tablets and smartphones with compatible Android and iOS operating systems (see page 13 Requirements and Compatibility). The NanoPhotometer® N30-Touch App is available for free download in the app store (Apple Store and Google Play Store).

1. Download and install the NanoPhotometer® N30-Touch App from the app store
2. Connect the tablet or smartphone via Wi-Fi® HotSpot (**SSID**: Serial number, **password**: Implenuser) or WLAN network to the NanoPhotometer® N30-Touch.
3. Open the NanoPhotometer® N30-Touch App and choose the connection type:



4. When connected the NanoPhotometer® N30-Touch will recognize the tablet/smartphone as a remote control device and measurements can be initiated from the tablet or smartphone.
5. Results will be shown on the tablet or smartphone once measurements have been taken.

Note: In order to install the NanoPhotometer® N30-Touch App on a tablet or smartphone, the device must have an established internet connection to access the app store for app download.
Note: The version of the app and the software of the NanoPhotometer® N30-Touch should be the same. Different versions may have not full functionality.

First Steps and Configuration Wizard

When starting the Implen NPOS the first time an Implen configuration wizard is shown. Please accept the End User License Agreement (EULA) and select the country in which the NanoPhotometer® N30-Touch is used and confirm.

Printer Installation*

**Printing from your N30-Touch is only available with the Connectivity extension package*

For printers connected via USB connection:

1. Switch NanoPhotometer® N30-Touch on / home screen
2. Connect DYMO/HP printer via USB cable
3. DYMO/HP printer is ready to use after 30 seconds

Note: Make sure that the home screen is shown when connecting a printer. If the USB connection between the printer and the NanoPhotometer® N30-Touch is established while a method is open, the printer function may fail.

Always return to the home screen before connecting a printer.

Note: Check printer compatibility (page 7 HP Printer)

For network printers:

1. Assure either LAN or Wi-Fi® network connection
2. Set printer IP in preferences (page 83 Network Printer)
3. Printer is available in methods for printing

3. NanoPhotometer® N30-Touch Basics

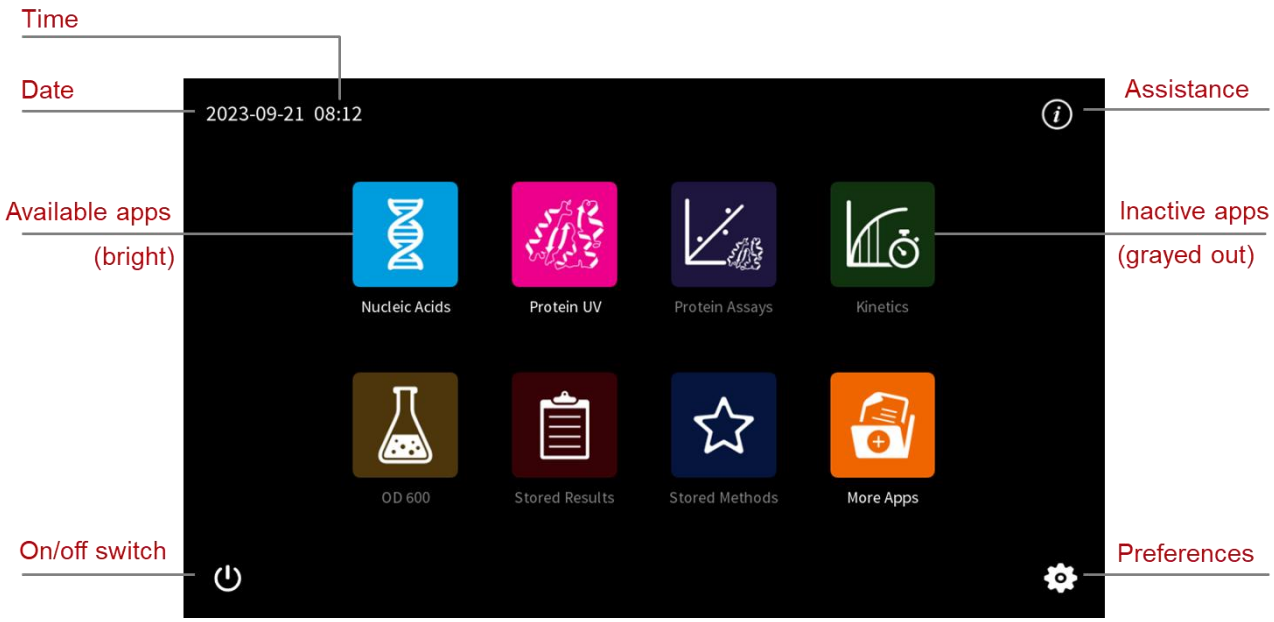
The NanoPhotometer® N30-Touch applications require a minimum sample volume of 0.3 µl.

N30-Touch Applications Overview

The NanoPhotometer® N30-Touch comes with two pre-programmed applications, Nucleic Acids and Protein UV. To select a method, tap the corresponding icon and the method opens immediately.

Method Icons		Description
	**Nucleic Acids**	Concentration, purity, and *dye incorporation for DNA, RNA, Oligos, and other nucleic acids
	**Protein UV**	Protein UV determination at 280 nm (or in a range of 200 - 330 nm), purity and *dye incorporation

Home screen view of the NanoPhotometer® N30-Touch:



*Dye label measurements only available with the Applications extension package

N30-Touch Expansion Packages Overview

There are three upgrade options for the N30-Touch available. These extension packages include the Performance package, the Applications package, and the Connectivity package.

Performance Package

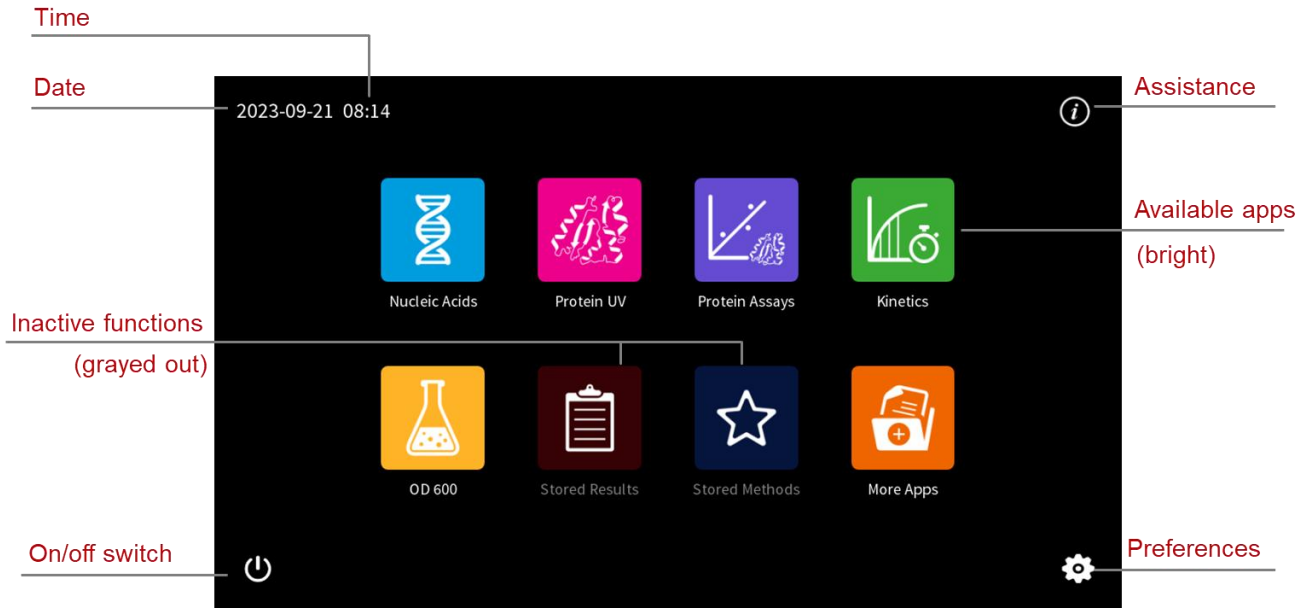
Expand your device's detection range for both DNA and protein measurements. This upgrade package also includes the expanded full spectrum scan mode from 200 to 900 nm for all measurements.

	N30-Touch	PERFORMANCE Package
Detection Range (dsDNA)	5 - 1,500 ng/µl	1 - 16,500 ng/µl
Detection Range (BSA)	0.15 - 44 mg/ml	0.03 - 478 mg/ml
Full Spectrum Scan Range	200 - 650 nm	200 - 900 nm

Applications Package

This package grants you access to the entire range of applications (including Protein Assays, Kinetics, OD600, Wavelength, Wavescan, Concentration, Absorbance/Ratio, Standard Curve, and Custom Apps) as well as additional features such as Dye label measurements, and Sample Control™ which identifies sample impurities, potential contaminations, turbidity, lint residue, and air bubbles.

Home screen view of the NanoPhotometer® N30-Touch upgraded with the Applications extension package:



Applications available with the Applications package:

Kinetics — Time vs. Absorbance readings

Protein Assays — BCA (562 nm) and Bradford (595 nm) Assays, Lowry* (750 nm) *(*only in combination with the Performance package)*

OD600 — Measures cell density at 600 nm (or in a range of 200 – 650 nm; (**Performance package: 200 - 900 nm*)

More Apps — Additional applications

Wavelength — Define one or multiple wavelength between 200 – 650 nm (**Performance package: 200 - 900 nm*) for absorbance measurements

Wavescan — Define desired full scan range anywhere between 200 - 650 nm (**Performance package: 200 - 900 nm*)

Concentration — Define extinction coefficient for automatic concentration calculations

Absorbance/ Ratio — Define two wavelengths absorbance/ratio calculation

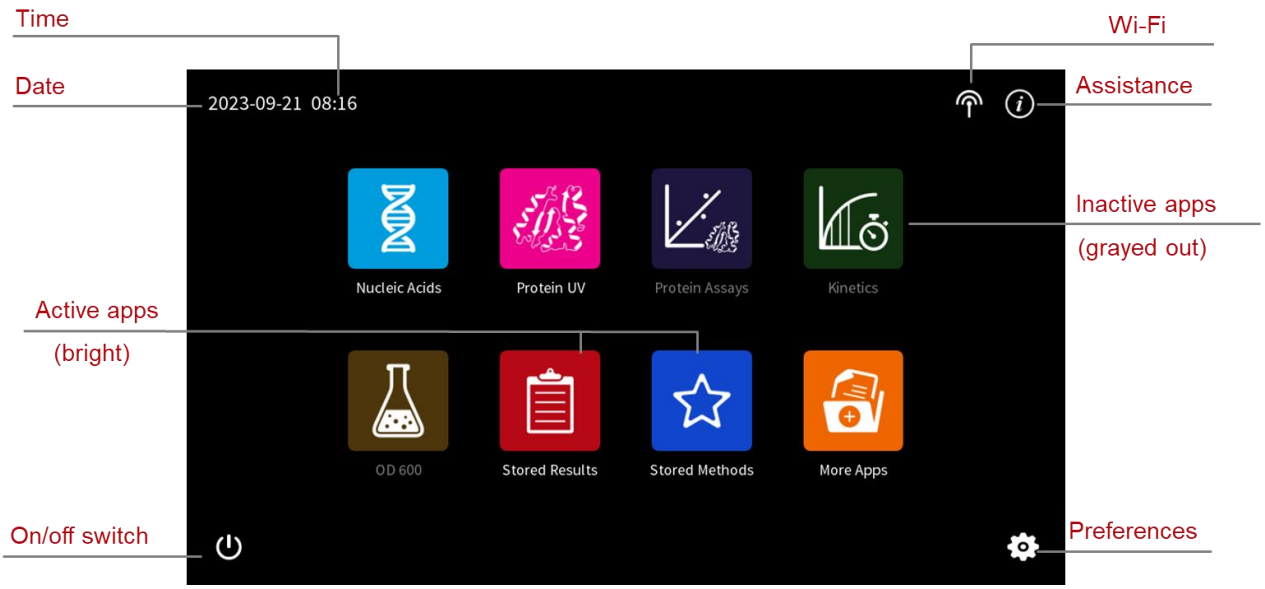
Standard Curve — Create a standard curve at a defined wavelength

Custom Apps — Optional custom applications for personalized methods tailored to individual spectroscopy needs

CONNECTIVITY PACKAGE

This package extends your device capabilities to include Wi-Fi, USB A/B, HDMI, and LAN connections, allowing remote unit control via PC/Tablet/Smartphone, and network printing. LIMS integration is also available via REST API and Push Service. This package also enables onboard storage of methods and results, with a total of 64 GB of storage space.

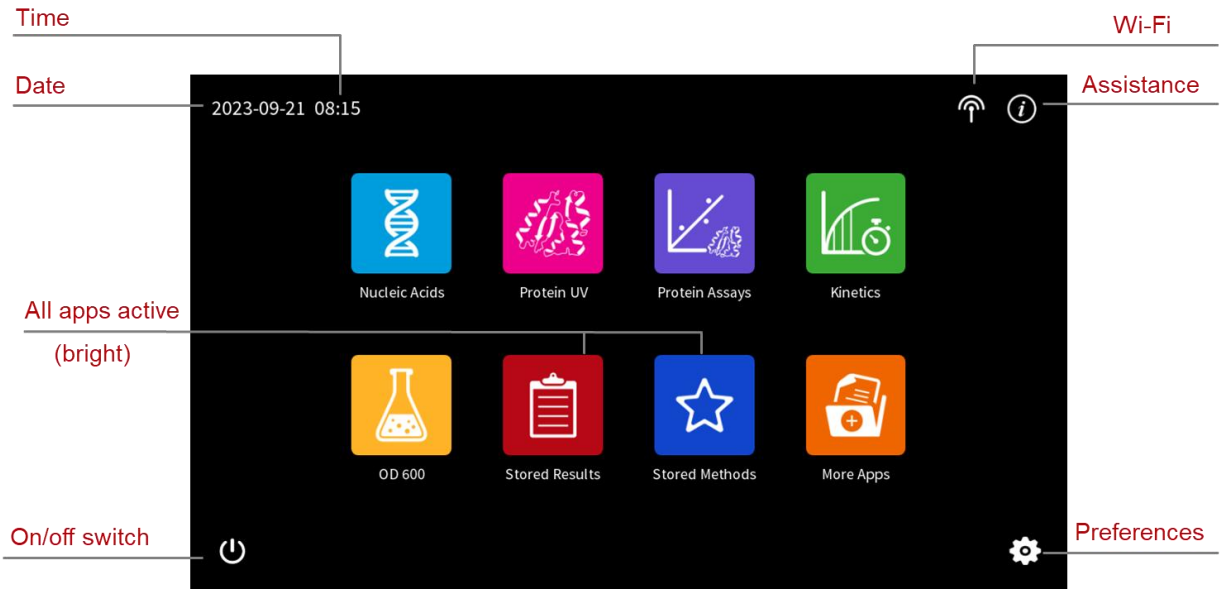
Home screen view of the NanoPhotometer® N30-Touch uograded with the Connectivity extension package:



Additional features available with the Applications package:

	**Stored Results**	Archive of stored results
	**Stored Methods**	Collection of stored custom methods

If the Applications and Connectivity extension packages are activated, the upgraded device will display the following Home Screen:



ICONS

Icon	Name	Action
	Wi-Fi® Network	Wi-Fi® network active; status of Wi-Fi® connection 
	Wi-Fi® Hotspot	Wi-Fi® hotspot active
	Assistance	Opens the assistance page
	Preferences	Opens the preferences page
	Home Screen	Returns to home screen with application icons for method selection.
	Store Method	Opens a dialog pop up with the possibility to store the actual method parameter to a custom method
	Save Data	Opens a save dialog pop up
	Leave Method	Returns to the previous application selection
	Back	Returns to the previous page (smartphone only)
	Next/Confirm	Confirms parameter and opens the next screen (smartphone only)
	Print Data	Opens a print dialog pop up (only shown when a printer is available)
	Delete Data	Opens a delete dialog pop up
	Parameter	Opens parameter window
	Results	Opens result window
	Graph	Opens graph result window
	Table	Open/shows results in table format
	Add Folder	Adds a new folder to the directory
	Manage Data	Opens a dialog pop up with several action options including delete, rename or import folders/files/data as well as copying or move folders/files/data to defined directories
	Delete	Deletes added functions in parameter; empties input windows
	Full Scale	Restores graph to original size without zoom
	Cancel	Returns to the previous screen/closes window without implementing any changes

BUTTONS

BLANK

When opening a method and starting a sample measurement, a blank measurement is required. For the blank measurement, either water or sample buffer can be used to give the NanoPhotometer® N30-Touch a reference of what zero should be. It is recommended to re-apply the blank solution and measure it as a sample to ensure the graph of the blank spectra is a flat line.

To initiate the spectral scan of the sample push the sample button. The data will be temporarily stored until the method is exited; at this time the user needs to define if the samples should be saved.

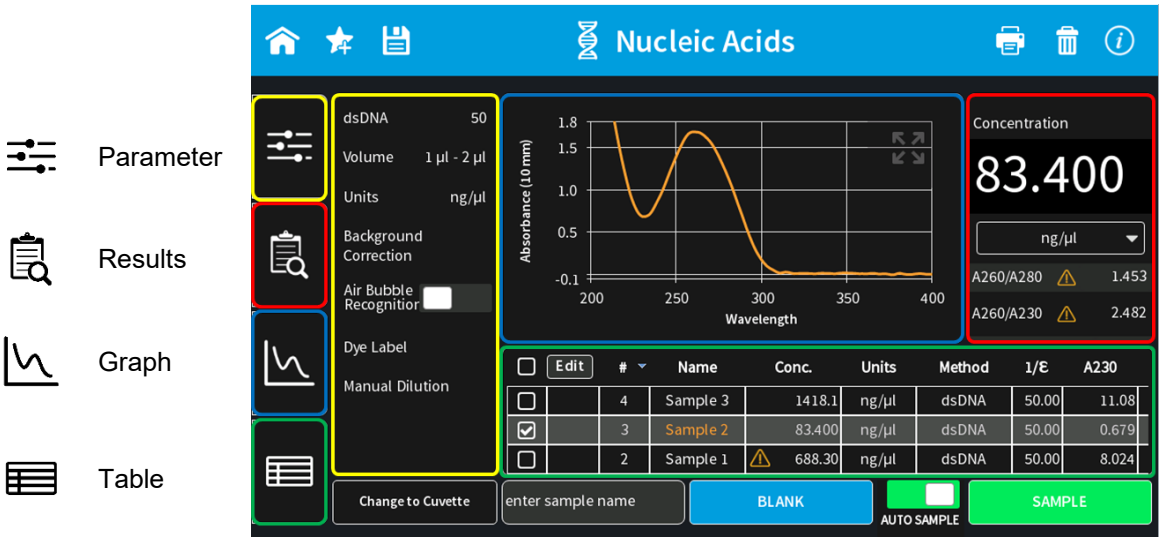
The auto sample button is disabled by default. When switched on sample measurements are started automatically as soon as the lid arm is closed. Auto sample function is only available for sample and not for blank measurements.

MEASUREMENT SCREENS

METHODS

- **Side Tab Bar**

On the left side of the measurement screen there is a vertical tab bar that contains four tabs including: parameters, results, graph, and table. The different tabs allow the user to organize the measurement screen. It is possible to show or hide the different areas on the screen. Default screen for computer shows all areas, for the built-in screen and the tablet version the table is hidden.



Note: There is no tab bar available for smartphone versions. The parameter, results and graph screens are shown full screen. Parameters need to be confirmed (>) to get to the measurement screen. It is possible to toggle between the results and graph area by swiping left and right. There is no table area available for smartphones.

Parameter area

In the parameter area it is possible to define all necessary parameters for a measurement. The standard measurement screen shows the parameter area open by default. The parameter area is automatically hidden when starting either a blank or sample measurement by pressing the Blank or Sample button. It is also possible to hide the parameter area by tapping the parameter tab in the vertical side tab bar.

Results area

The results area shows the method specific results of the grey highlighted measurement in the table including concentration, absorbances, and relevant ratios. It is also possible to change the units of the calculated concentrations in the results area with a dropdown selection menu.

Table area

The table area collects the results of all samples in an active method. The first table column shows a tick box. Selecting the samples with the tick box the graphs are overlaid in the graph area. With the header tick box it is possible to select/unselect all samples (maximum number of sample selection is 30). The second column of the table indicates whether the measurement is saved (💾) or not saved (blank field).

With the edit button the sample name of a single sample can be edited.

1. Select one sample in the table (selected sample will be highlighted in grey)
2. Push on Edit button
3. Change sample name
4. Confirm with the “Confirm” button

Note: It is not possible to edit sample names of opened IDS files.

Graph area

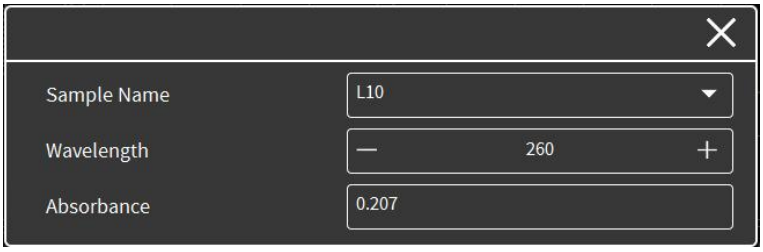
The graph area shows a chart with the graph of the actual measurement or the selected line(s) in the table (tick box selection). There is an overlay toggle switch on the left bottom of the graph area. If the overlay option is enabled the graphs of the measurements will be automatically overlaid. To change the overlaid graphs use the tick boxes in the table.

Note: It is only possible to overlay up to 30 graphs in a chart. If more than 30 data are selected a message will appear that says “More than 30 samples have been selected. Only 30 will be shown in graph.”
Note: The overlay button is not available on the NanoPhotometer® N30-Touch touch screen and smartphones, only on tablets and computer versions.

It is possible to zoom in and out any area of the diagram (x- and y-axis). Undo the zoom by tapping the full scale icon (⛶).

Note: Maximum zoom is 20 nm for the x-axis and 0.01A for the y-axis.

As legend option the sample name in the table is colored in the same color as the graph in the chart.
Pressing the graph opens a pop up which shows the sample name, wavelength and absorbance of the selected wavelength. It is possible to display the results of other graphs by changing the sample name with the dropdown option.



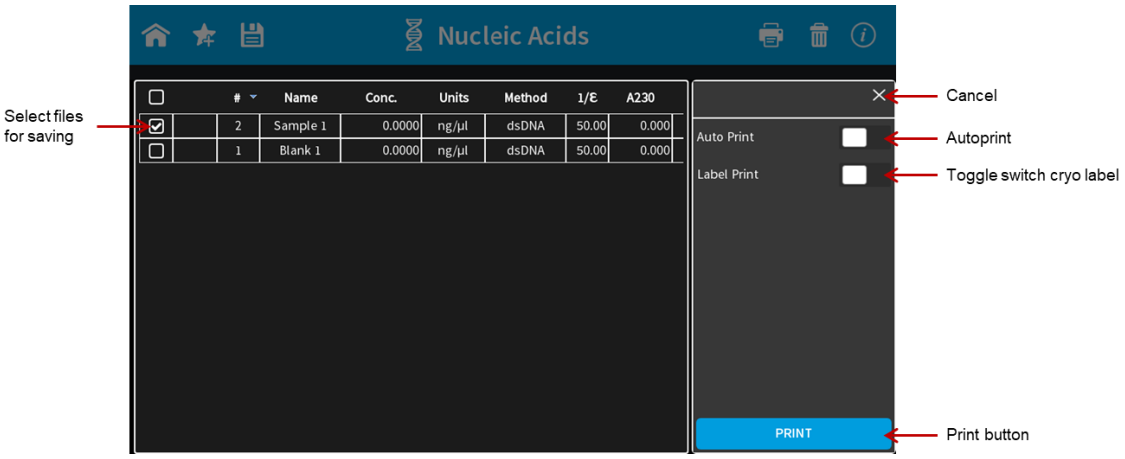
DATA PROCESSING DIALOGS

PRINT*

**Printing from your N30-Touch is only available with the Connectivity extension package.*

Selecting the print icon (🖶) opens a full screen dialog window with various print options. The print icon is only shown if a printer is available.
The print command is sent primarily to DYMO or HP printers if they are directly connected to the NanoPhotometer® N30-Touch via USB cable. If no USB printer is available, the print command is sent to the defined network printer, if configured. Network printers can be configured in the preferences by entering the printer IP (see page 83 Network Printer). All ticked samples are printed.

Note: If a printer is directly connected to the NanoPhotometer® via USB, this printer will have the highest priority and will be used by default when selecting Print on NanoPhotometer®. In order to print utilizing a printer on the network, please disconnect the connected USB printer.



Note: The print icon is only shown, if a printer is available.
Note: It is only possible to operate one printer at a time. Do not connect more than one printer to the NanoPhotometer® N30-Touch.
Note: The print option is not available in smartphone apps.

- **Auto Print***

If the auto print function is enabled, each measurement will be printed directly after the measurement. Auto print function is available for DYMO printer, HP printer connected via USB cable and network printer.

Note: Default setting for auto print is off. If enabled in one method it is set default on for all methods and needs to be switched off if not required.
Note: The auto print function is not available for printing via control device (local computer printer).

- **Cryo Label Print***

To print on cryo labels connect a DYMO printer (4XL or 450) to the NanoPhotometer® N30-Touch and insert the specified cryo label paper (26 x 12.7 mm and 9.5 mm circle / landscape mode).

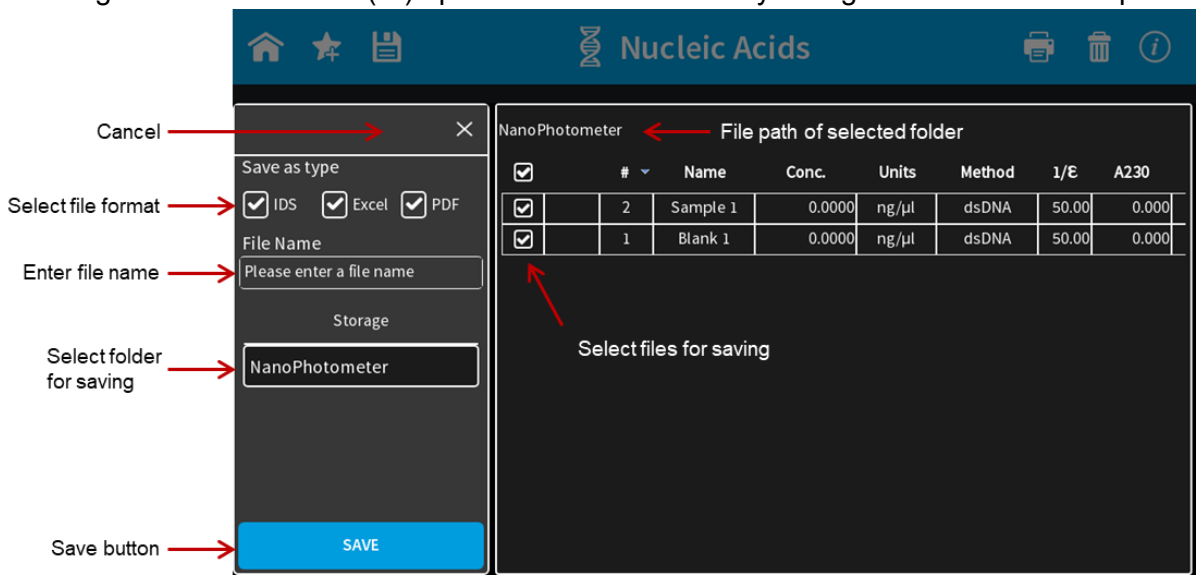
Note: Cryo label paper is not available/compatible for the DYMO Label printer 5XL and 550.

SAVE

**Ensure that you have a USB flash drive connected for storage.*

**Onboard storage is only available with the Connectivity extension package*

Selecting the save data icon ( ) opens a full screen overlay dialog window with save options.



By default all samples are ticked in the first column of the table and will be saved. It is possible to select samples for saving by using the tick boxes. The header tick box selects/deselects all samples.

Note: In the smartphone app there are always all measurements saved, no selection possible.

- **Save as Type**

With the Save as Type option it is possible to specify the file type for saving. File type options include Excel, PDF and Implen Document Source (IDS). It is possible to save different file formats simultaneously.

Note: IDS files cannot be saved on control devices. IDS files can only be saved in the NanoPhotometer® storage*, defined network folder* or on a USB flash drive. It is not possible to save IDS files from opened data. In these cases the IDS tick box is grayed out.
Note: PDF and Excel files cannot be opened on the NanoPhotometer® N30-Touch. The files need to be transferred to a computer or device where Excel or PDF reader is available.
Note: All data saved on the NanoPhotometer® N30-Touch are stored on an internal micro SD card*. It is recommended to back up the data regularly to a hard drive of a computer or network. In the rare case that the micro SD card crashes data loss cannot be ruled out.

Implen Document Source File

The Implen Document Source (IDS) file is a specific file format, which can only be opened with the NPOS software. It is a hardcopy file which cannot be changed. This file type contains all measurement information including raw data, results, values, and parameters.

Note: The saved files contain only the selected samples at the time the file is saved.

Excel File

Measurement data can be saved as Excel file. This file type contains all measurement information including raw data, results, and parameters.

Note: The saved files contain only the selected samples at the time the file is saved.

PDF File

Measurement data can be saved as PDF file. This file type contains all measurement information including raw data, results, and parameters.
It is possible to configure the table columns for PDFs and printouts in preferences (page 84 Report Configuration).

Note: The saved files contain only the selected samples at the time the file is saved.

- **File Name**

Enter the name for the file. Allowed characters are: A…Z a…z 0…9 , . - ( ) @ ! = _ ~ ; [ ] { } ‘

Note: Blank character is not allowed.

- **Storage***

Shows the folder directory, to select the save location. Options include: NanoPhotometer®*, USB flash drive (if connected), Network folder (if defined) * and Control Device *. If Control Device is selected the data will be transferred to the control device that is currently connected with the NanoPhotometer® N30-Touch.

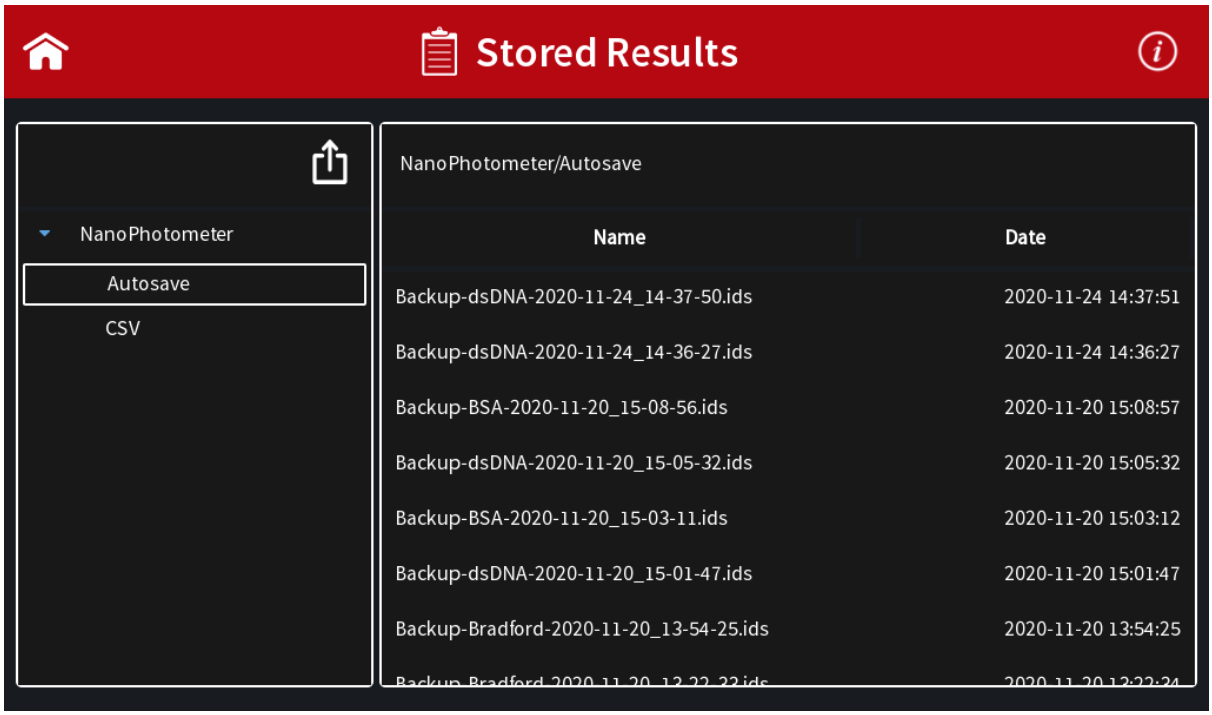
Note: It is not possible to save IDS files to a control device like computer (PC/Mac), tablets or smartphones.

- **Auto Save***

To prevent data loss, all measurements are automatically stored as IDS file on the internal memory of the NanoPhotometer® N30-Touch. These backup copies can be found in the Autosave folder of the NanoPhotometer® (Stored Results/NanoPhotometer/Autosave) for up to ten days. Files contain the base name Backup, the method name, and a time/date stamp.
After ten days the autosave files are automatically moved to an autosave archive folder. The autosave archive folder can only be accessed via NanoPhotometer® N30-Touch file server (see page 31 Data Transfer via File Server). Data in the autosave archive folder are not automatically deleted.

**Network connectivity features, and unit control via smartphone/tablet/PC, internal storage, and auto save functions are only available as part of the Connectivity extension package*

The content of the Autosave Archive folder can be deleted via the action button in Stored Results:

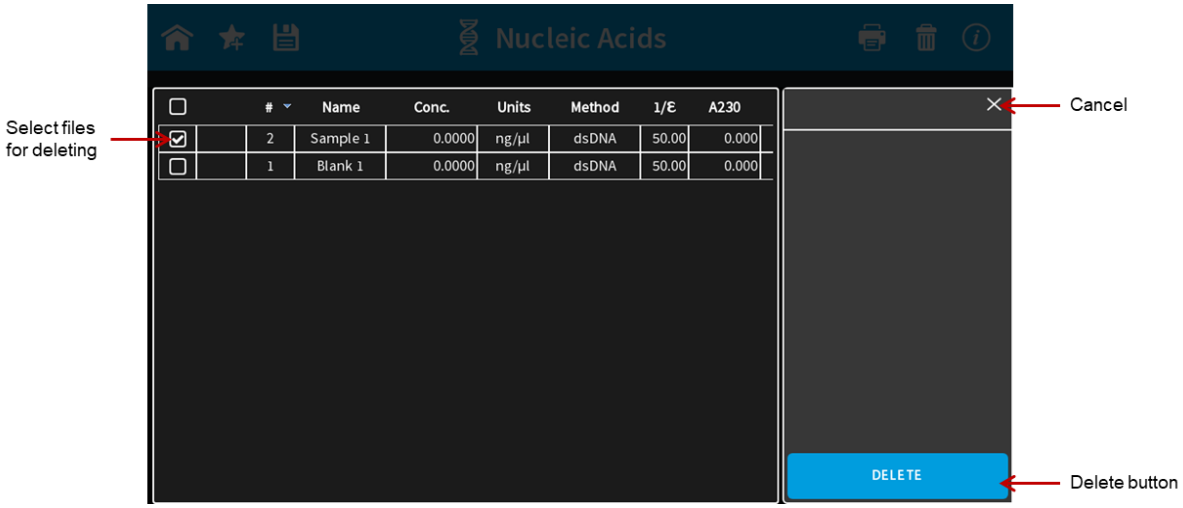


DELETE*

**Onboard storage is only available with the Connectivity extension package.*

Selecting the delete icon (🗑) opens a full screen overlay dialog window. All data which are selected (tick) in the first table column will be deleted. The header tick box selects/deselects all samples. Initiate the deletion with the delete button. Confirm the deletion in the following warning message: “Do you want to delete all/selected files?” select cancel (x) will return to the delete menu screen or confirm with delete to delete the selected data.

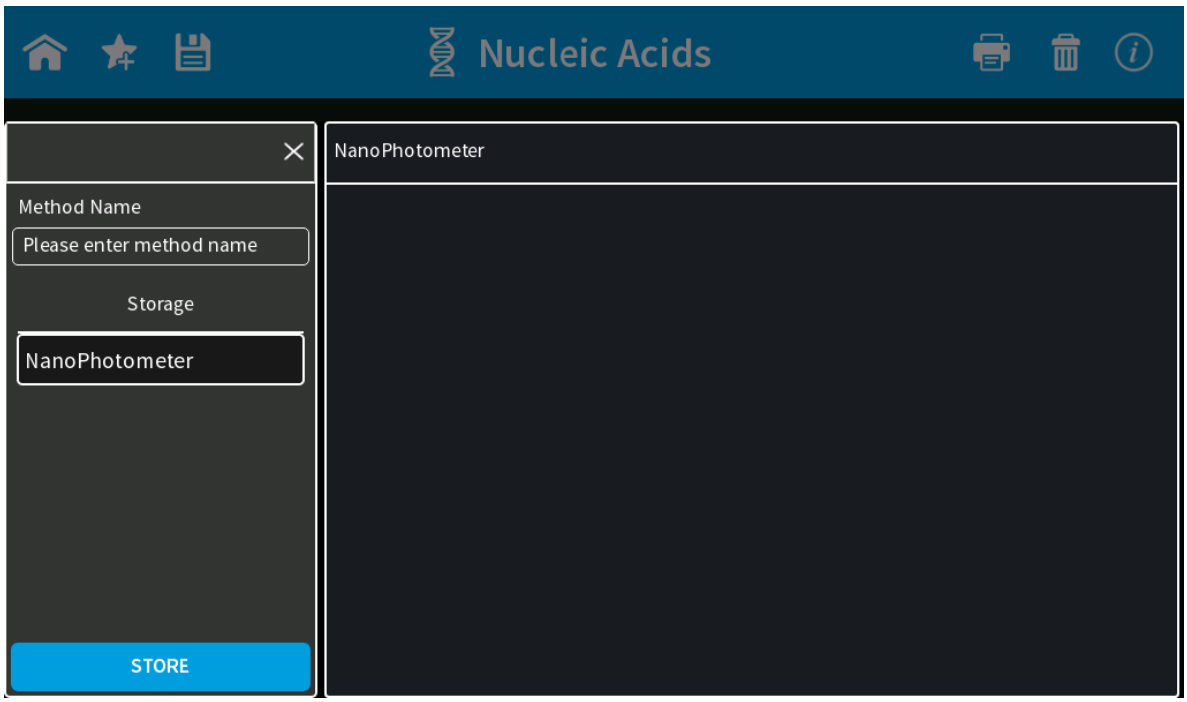
Note: The delete function is not available for the software version designed for smartphones.



STORE METHODS*

**Store Methods feature only available as part of the Connectivity extension package*

With the favorite icon it is possible in each method to save the parameter settings for easy access of custom defined methods. Select the desired parameter settings and open the Stored Method dialog by pressing the favorite icon .



Enter a method name and select a save location in the folder. Options include: NanoPhotometer® *, USB flash drive (if connected) and Network folder * (if defined). Push the store button to save the method.

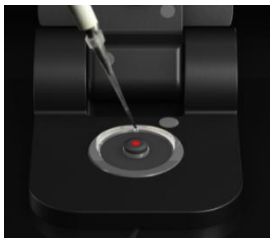
Stored Methods can be opened on the home screen by opening Stored Methods (see page 74 Stored Methods).

BASIC OPERATION

NanoVolume applications start with a minimum sample volume of 0.3 µl.

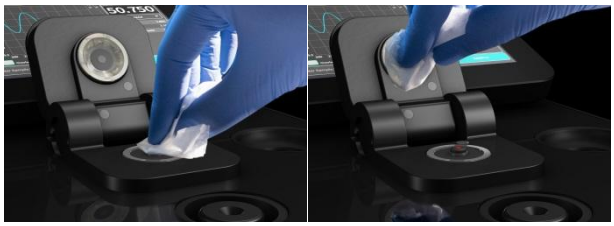
MEASUREMENT BASICS

1. Select a method depending on your sample and set the parameters for the measurement.
2. Ensure that the sample window on pedestal and the mirror in the lid arm are clean.
3. Raise the lid arm and pipette the appropriate amount of blank solution onto the illuminated sample window on pedestal. The Illumination turns automatically off when the lid arm is lowered.



Note: Do not overfill the well.
Note: The red light (LED) illumination can be switched of in Preferences

4. Lower the lid arm and initiate a blank measurement with the blank button
5. Clean the measurement window and mirror on the lid arm with a slightly wet lint-free tissue. Use water, 70% ethanol or isopropanol if needed.



Note: Make sure that the metal contact face (around the measurement window and the mirror) is clean.

Note: Do not use aggressive solvents such as strong acids or bases or organic solvents at any time (see page 30 Solvent Compatibility). If unsure please contact support@implen.de for detailed information about your specific reagent/solvent.

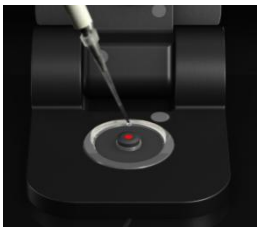
6. It is possible to enter a sample name for each sample in the input window “enter sample name”.

   Note: Allowed characters are: A…Z a…z 0…9 , . - ( ) @ ! = _ ~ ; [ ] { } ‘ blank character

7. Raise the lid arm and pipette the appropriate amount of sample solution onto the illuminated sample window. Upon completion of measurement raise lid arm, clean the surfaces and apply the next sample.
   Note: Parameter setting Volume 1 - 2 µl adjusts the path length automatically. The parameter setting Volume 0.3 µl measures only the 0.07 mm path length for higher concentrations (dsDNA > 420 ng/µl / BSA > 12.6 mg/ml).

Note: The sample window on pedestal must be clean and residual fluff from any cleaning wipe must be removed for optimum performance.

Sample Handling Tips



- The sample window on pedestal is illuminated with a low energy red light to assist with accurate sample application. The red light is switched off once the lid arm is closed. It is possible to disable the illumination feature in preferences of the NPOS software.
- The minimum volume that can be used for NanoVolume samples is 0.3 µl dsDNA > 420 ng/µl and BSA > 12.6 mg/ml. For automatic path length setting at least 1µl is needed.
- The maximum volume that can be used for NanoVolume samples is 2.0 µl.
- The sample can be fully recovered after measurement with a pipette if desired.
  Note: Minimal cross contamination cannot be avoided on molecular level.
- Proper cleaning is important to ensure accurate measurements. In most cases a dry lint-free laboratory wipe is sufficient to clean the sample quartz surfaces. In the case of highly concentrated samples or certain proteins, the recommended procedure for cleaning is to use a slightly wet lint-free laboratory wipe (with water or 70% EtOH depending on sample type) to thoroughly clean the sample surface.
- It is mandatory that the metal contact face around the measurement window and the mirror is clean.

Solvent Compatibility

Most solvents typically used in life science laboratories are compatible with the NanoPhotometer® N30-Touch NanoVolume sample surfaces. The following solvents are compatible for use with the NanoPhotometer® N30-Touch at room temperature:

- Acetone (≤ 5%)
- Acetonitrile
- Benzene
- Butanol
- Carbon tetrachloride
- Chloroform
- Ethanol
- Ether
- HEPES
- Hexane
- Isopropanol
- MES
- Methanol
- Methylene chloride
- MOPS
- Phenol (≤1%)
- N-propanol
- Toluene
- Phosphate containing buffers
- PBS (pH 4-10)
- Citrate
- Borate
- Chloride salts
- Acids > pH 2
- Bases < pH 10

Note: Highly concentrated acids and bases are not recommended. It is recommended to wipe the sample surface with a lint-free laboratory wipe immediately upon completion of each measurement. For more information about compatibility of specific solvents not listed above, please contact the Implen support team (support@implen.de) to check the compatibility.

DATA TRANSFER VIA FILE SERVER*

**These features are only available as part of the Connectivity extension package.*

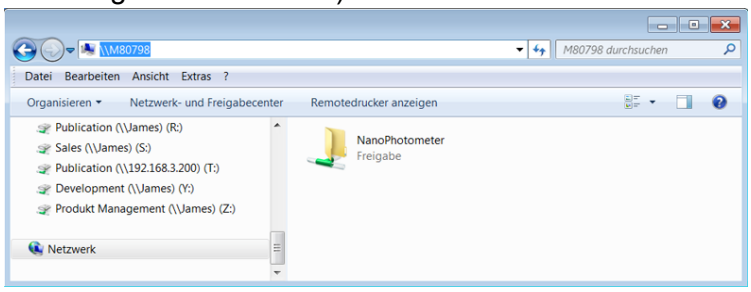
All data saved on the NanoPhotometer® N30-Touch can easily be accessed from and transferred to a computer via the NanoPhotometer® N30-Touch file server. Connection options are LAN/WLAN, USB cable or Wi-Fi® Hotspot.
It is possible to create user accounts for password secured file server access. User accounts for file server access can be activated in Preferences see page 81 File Server Access.

- **File Server Access via LAN/WLAN***

FOR THE FILE SERVER ACCESS VIA LAN/WLAN IT IS NECESSARY THAT BOTH THE COMPUTER AND THE NANOPHOTOMETER® N30-TOUCH ARE CONNECTED TO THE SAME LAN/WLAN NETWORK. FOR CONNECTION OF THE NANOPHOTOMETER® N30-TOUCH TO LAN/WLAN SEE PAGE 79

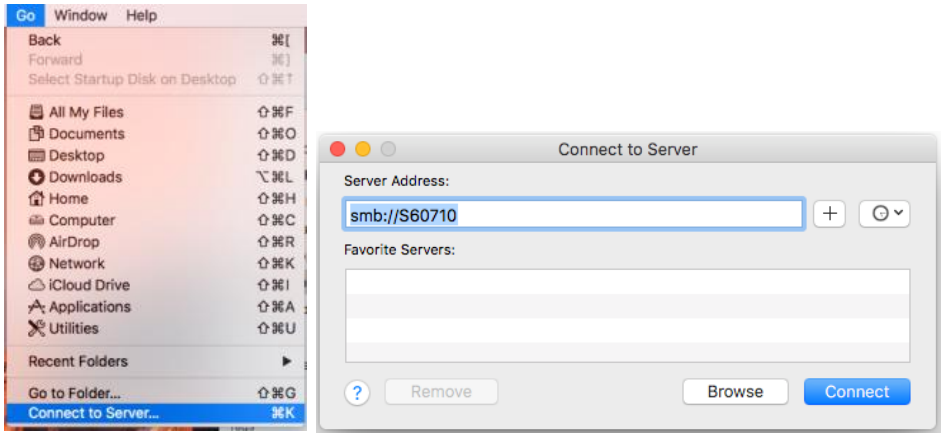
Network.

For **Windows computer** open the Windows explorer and enter the serial number or the NanoPhotometer® N30-Touch IP in the address bar of the Windows Explorer (e.g. \\M80798\ or \\Assigned IP Address\).



Note: Serial number and IP address of the NanoPhotometer® N30-Touch can be found in the NanoPhotometer® N30-Touch software under Preferences/General/About.

For a **MAC computer** open the "Connect to Server" dialog in the "Go" menu of the Mac OS X Finder and enter the NanoPhotometer® N30-Touch serial number or the active NanoPhotometer® N30-Touch IP address in the server address field to connect.



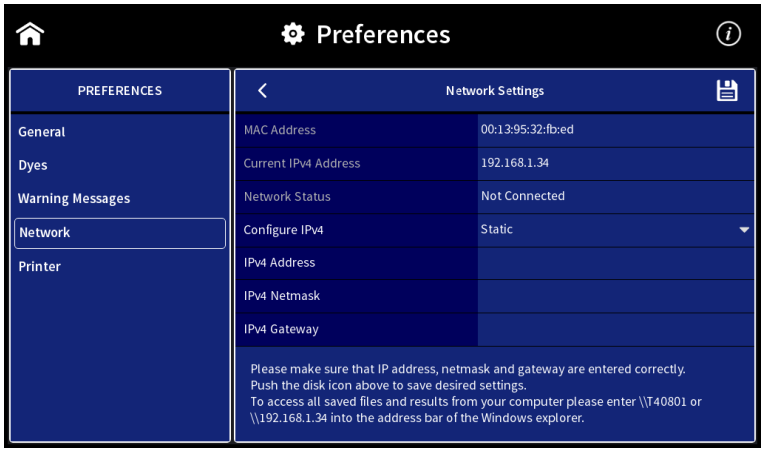
Note: Serial number and IP address of the NanoPhotometer® N30-Touch can be found in the NanoPhotometer® N30-Touch software under Preferences/General/About.

- **File Server Access via USB cable***

For file server access via USB cable connection, connect the NanoPhotometer® N30-Touch with a USB A/B cable to the computer and open the Windows Explorer or Connect to Server option for Mac (see file server access via LAN/WLAN) and enter \\192.168.7.1\ for connection.

- **File Server Access via Wi-Fi® Hotspot***

For file server access via Wi-Fi® Hotpot the Wi-Fi® Hotspot needs to be active on the NanoPhotometer® N30-Touch. For activation see page 80.



WLAN Settings. The computer needs to be connected to the NanoPhotometer® N30-Touch Wi-Fi® Hotspot (SSID: NanoPhotometer® N30-Touch serial number; password: Implenuser). Open the Windows Explorer or Connect to Server option for Mac (see file server access via LAN/WLAN) and enter \\192.168.8.1\ for connection.

These features are only available as part of the Connectivity extension package.

4. NanoPhotometer® N30-Touch Applications

The NanoPhotometer® N30-Touch comes with two pre-programmed applications, namely the Nucleic Acid und Protein UV methods. There is an upgrade package option available for full application access, namely the Applications package. Any application method can be selected by tapping the icon once or clicking on the icon (computer based software).

Nucleic Acids 

Method Overview

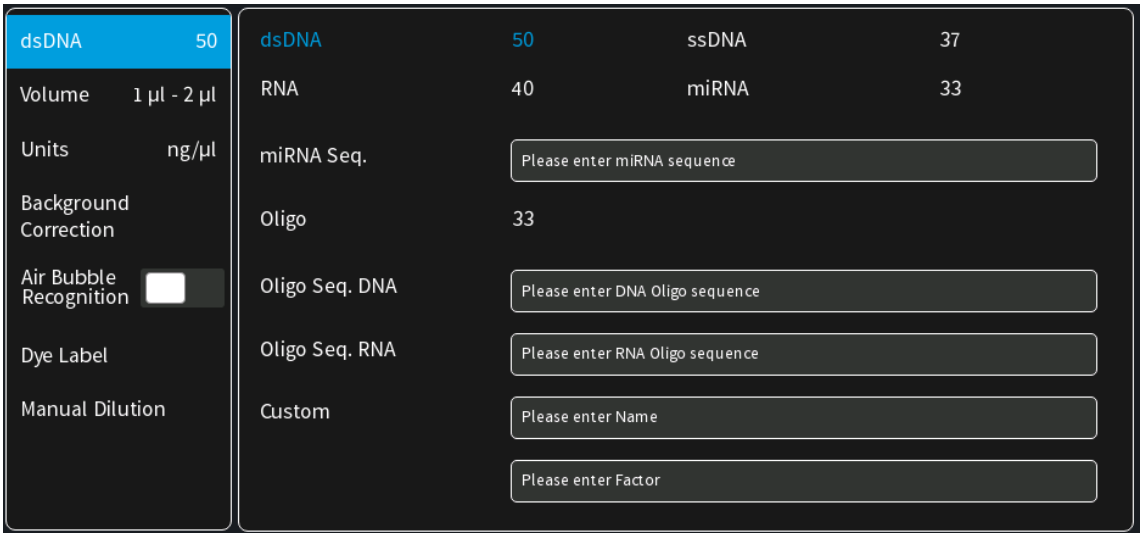
Nucleic acids in solution absorb light with a peak in the ultraviolet region of 260 nm. For determination of nucleic acid concentration in solution the absorbance at wavelength 260 nm is used along with the Beer-Lambert law. In addition to calculating concentrations of nucleic acids, absorbance measurements are also useful for estimating purity of nucleic acids by calculating the 260/280 nm and 260/230 nm ratios.

Sample Control™ gives useful information about sample conditions. It recognizes air bubbles, sample impurities, turbidity, lint residues and potential contaminations. If Sample Control™ detects any irregularity an alert icon ⚠ is shown in the result/table area. A push on the alert icon shows additional information about the irregularity.

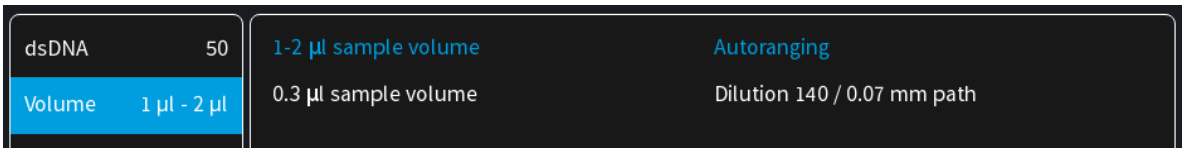
Measurement Protocol

1. Select the Nucleic Acids icon on the home screen.

2. To change the nucleic acid type press dsDNA and a list with available options opens on the right side. Options are: dsDNA, ssDNA, RNA miRNA, miRNA Sequence, Oligo, Oligo Sequence and Custom (see Table 1 on page 36). It is possible to enter a name for the custom nucleic acid factor for documentation.

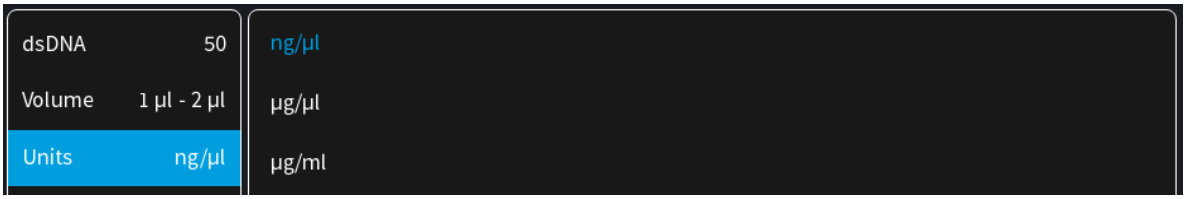


3. Select the volume of sample to be applied.



Note: 1 - 2 µl (default): automatic path length setting; 0.3 µl measures only the 0.07 mm path length (for samples with concentrations > 420 ng/µl dsDNA)

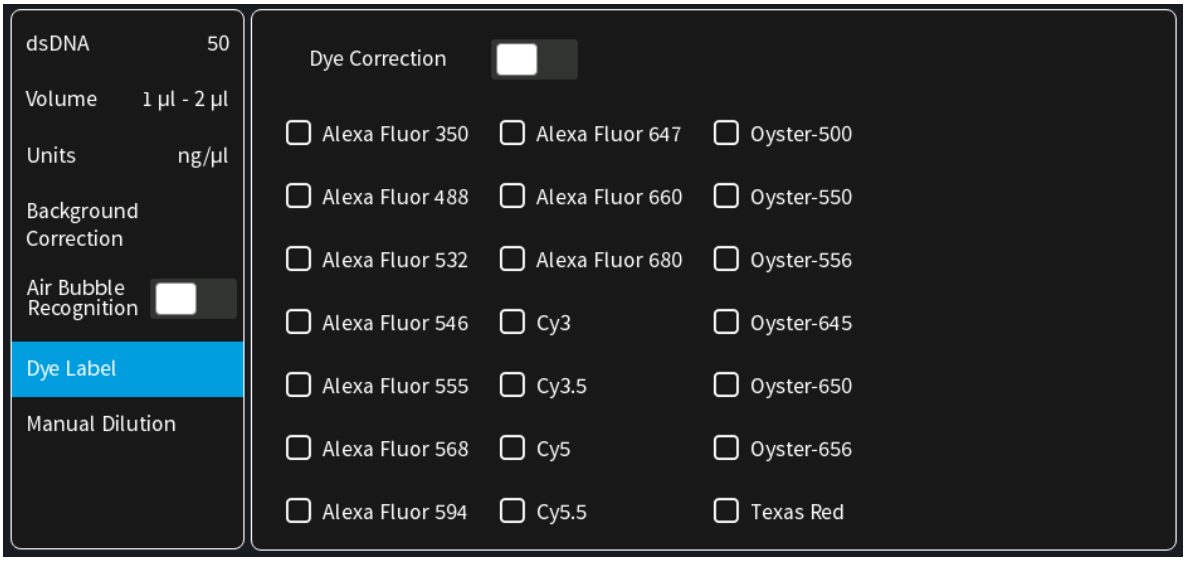
4. Select the Units in which the concentration should be calculated.
Options are ng/µl (default), µg/µl and µg/ml. pmol/µl if a nucleic acid sequence is entered for nucleic acid factor calculation.



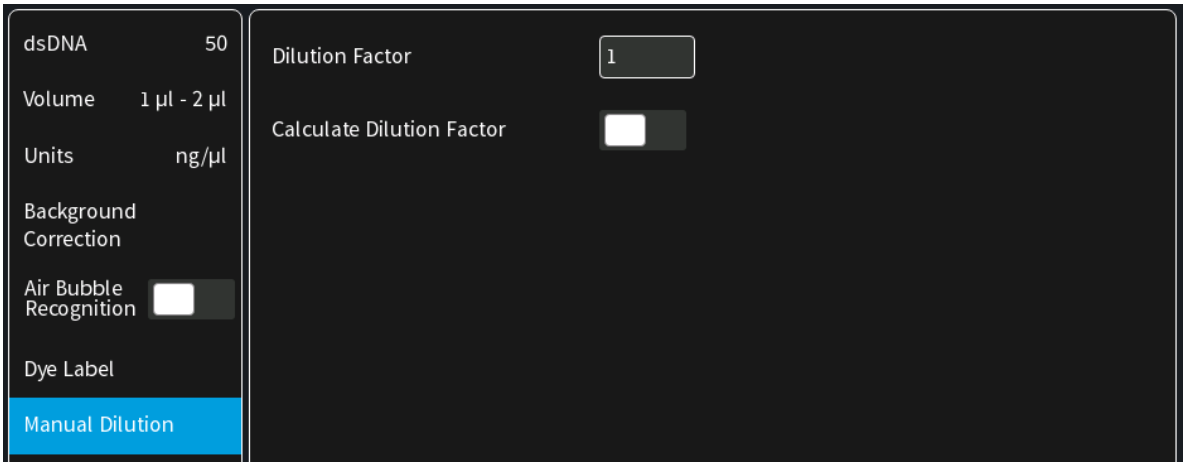
5. The background correction is enabled at 320 nm by default. Selection options are 320 nm, 340 nm or any wavelength in the range of 220 – 350 nm. The background correction can be disabled with the toggle switch.

6. Air bubble recognition*: *This feature is available only with the Applications extension package.* This feature is disabled by default. Setting to on detects air bubbles, lint residues and bad sample conditions of the sample.
   Note: Lint residues and bad sample conditions are detected even if the air bubble recognition is set to off.

7. Dye labels*: *This feature is available only with the Applications extension package.*
   For dye labelled samples tick the dye labels in the list, which should be used for result calculation.
   Note: If the used dye is not available in the list, please go to preferences and add a custom dye to the dye list.
   There is an option for dye correction which can be enabled/disabled with a toggle switch.
   Note: Dye correction is only available for single dye selection.



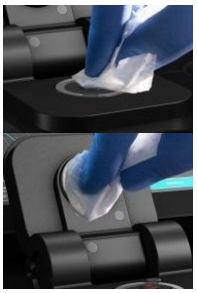
8. Option to set/calculate a dilution factor for manual diluted samples.



9. Apply the blank ddH_20 or buffer to the illuminated sample window on the pedestal and close the lid arm for the reference measurement and select blank to initiate the reading.
   Note: The illumination of the sample window can be switched off in the preferences.

10. Use a lint-free laboratory wipe to clean both the sample window on pedestal and mirror in lid arm prior to applying the next sample.

    Note: It could be helpful to apply the blank a second time and read it as a sample to ensure a proper blank.



11. Apply sample to the sample window on pedestal and press the sample button to initiate the measurement.

CALCULATIONS

▪ Nucleic Acid Concentration

To determine the concentration of nucleic acids in solution, the absorbance is measured at a wavelength of 260 nm. The function describing the relationship between concentration and absorbance is a modification of the Beer-Lambert law equation. The concentration of the nucleic acid samples can be calculated with or without background correction depending on enabled/disabled background correction parameter.

Without background correction:

$C = A_{260} * Factor_{nuc} * Đ$

With background correction:

$C = (A_{260} - A_{BKG}) * Factor_{nuc} * Đ$

C	Concentration in ng/µl
A_{260}	Absorbance at 260 nm (10 mm path)
A_{BKG}	Absorbance at selected background wavelength (10 mm path)
Đ	Manual dilution factor
$Factor_{nuc}$	Nucleic acid factor in ng*cm/µl

Table 1. Nucleic acids extinction coefficients (ε_{nuc})

Type	$Factor_{nuc}$
dsDNA	50 ng*cm/µl
ssDNA	37 ng*cm/µl
RNA	40 ng*cm/µl
miRNA	33 ng*cm/µl
Oligo	33 ng*cm/µl
miRNA Seq.	calculated via extinction coefficient of constituent nucleotides entered
Oligo Seq.	calculated via extinction coefficient of constituent nucleotides entered
Custom	Option to enter any factor between 15 and 150 ng*cm/µl

- **Dye-labeled Nucleic Acid Concentration***

**This feature is available only with the Applications extension package.*

For dye-labeled nucleic acids, the concentration of the nucleic acid is calculated using a modified form of the Beer-Lambert equation. For these calculations, the instrument considers the absorption maximum of the dye and a certain dye-specific correction factor at 260 nm (see Table 2 on page 40). The concentration of a dye-labeled nucleic acid is calculated with or without background/dye correction as follows:

With background and with dye correction:

$$C = \left[(A_{260} - A_{BKG}) - \left(cf_{dye} * (A_{max,\,dye} - A_{BKG})\right)\right] * Factor_{nuc} * Đ$$

With background and without dye correction:

$$C = (A_{260} - A_{BKG}) * Factor_{nuc} * Đ$$

Without background and with dye correction:

$$C = \left[A_{260} - \left(cf_{dye} * A_{max,\,dye}\right)\right] * Factor_{nuc} * Đ$$

Without background and without dye correction:

$$C = A_{260} * Factor_{nuc} * Đ$$

C	Concentration in ng/µl
A_{260}	Absorbance at 260 nm (10 mm path)
A_{BKG}	Absorbance at selected background wavelength (10 mm path)
$A_{max,\,dye}$	Absorbance value at the absorbance maximum of the dye (10 mm path)
$Factor_{nuc}$	Nucleic acid factor in ng*cm/µl
cf_{dye}	Dye-dependent correction factor at 260 nm
Đ	Manual dilution factor

Note: Dye correction is only available for single dye selection.

- **Dye Concentration***

**This feature is available only with the Applications extension package.*

For dye-labeled nucleic acids, the concentration of the dye is calculated using a modified form of the Beer-Lambert equation. For these calculations, the instrument considers the absorption maximum of the dye, the dye-specific extinction coefficient (see Table 2 on page 40). The dye concentration is calculated with or without background correction as follows:

With background correction:

$$C = \frac{(A_{max,\,dye} - A_{BKG}) * Đ}{m\varepsilon_{dye} * 10^{-6}}$$

Without background correction:

$$C = \frac{A_{max,\,dye} * Đ}{m\varepsilon_{dye} * 10^{-6}}$$

C	Concentration in ng/µl
$A_{max,\,dye}$	Absorbance value at the absorbance maximum of the dye (10 mm path)
A_{BKG}	Absorbance at 320 nm (10 mm path)
$m\varepsilon_{dye}$	Molar extinction coefficient of dye in $M^{-1}*cm^{-1}$
Đ	Manual dilution factor

- **Frequency of Incorporation (FOI)***

**This feature is available only with the Applications extension package.*

FOI is the degree of labeling based on dye incorporation in a labeled nucleic acid sample. It is generally expressed as the number of dye molecules incorporated per 1000 nucleotides. FOI can be calculated with or without background/dye correction as follows:

With background correction with dye correction:

$$FOI = \frac{324.5 * (A_{max,\,dye} - A_{BKG})}{m\varepsilon_{dye} * 10^{-6} * \left(A_{260} - A_{BKG} - cf_{dye} * (A_{max,\,dye} - A_{BKG})\right) * Factor_{nuc}}$$

With background correction without dye correction:

$$FOI = \frac{324.5 * (A_{max,\,dye} - A_{BKG})}{m\varepsilon_{dye} * 10^{-6} * (A_{260} - A_{BKG}) * Factor_{nuc}}$$

Without background correction and with dye correction:

$$FOI = \frac{324.5 * A_{max,\,dye}}{m\varepsilon_{dye} * 10^{-6} * (A_{260} - cf_{dye} * A_{max,\,dye}) * Factor_{nuc}}$$

Without background correction and without dye correction:

$$FOI = \frac{324.5 * A_{max,\,dye}}{m\varepsilon_{dye} * 10^{-6} * A_{260} * Factor_{nuc}}$$

FOI	Frequency of Incorporation (dye per 1,000 bases)
A_{260}	Absorbance at 260 nm (10 mm path)
A_{BKG}	Absorbance at selected background wavelength (10 mm path)
$A_{max,\,dye}$	Absorbance value at the absorbance maximum of the dye (10 mm path)
$m\varepsilon_{dye}$	Extinction coefficient of dye in $M^{-1}*cm^{-1}$

$Factor_{nuc}$	Nucleic acid factor in ng*cm/µl
cf_{dye}	Dye-dependent correction factor at 260 nm

Table 2. Dye Types, Absorbance Max, Extinction coefficient, and dye-dependent correction factors:

NanoPhotometer® N30-Touch (with Applications package)	Dye Type	Absorbance maximum of Dye (nm)	Molar ext. coeff. of dye $m\varepsilon_{dye}$ in $M^{-1}*cm^{-1}$	Dye-dependent correction factor at 260 nm cf_{dye}
N30-Touch	Alexa Fluor 350	346	19,000	0.25
N30-Touch	Alexa Fluor 488	495	71,000	0.30
N30-Touch	Alexa Fluor 532	532	81,000	0.24
N30-Touch	Alexa Fluor 546	554	112,000	0.21
N30-Touch	Alexa Fluor 555	555	150,000	0.08
N30-Touch	Alexa Fluor 568	578	91,300	0.45
N30-Touch	Alexa Fluor 594	590	90,000	0.43
N30-Touch	Cy3	550	150,000	0.08
N30-Touch	Cy3.5	581	150,000	0.08
N30-Touch	Oyster-500	503	78,000	0.29
N30-Touch	Oyster-550	553	150,000	0.05
N30-Touch	Oyster-556	560	155,000	0.03
N30-Touch	Texas Red	603	112,000	0.23
N30-Touch **	Alexa Fluor 647	650	239,000	0.00
N30-Touch **	Alexa Fluor 660	663	132,000	0.00
N30-Touch **	Alexa Fluor 680	679	184,000	0.00
N30-Touch **	Cy5	649	250,000	0.05
N30-Touch **	Cy5.5	675	250,000	0.05
N30-Touch **	Oyster-645	649	220,000	0.05
N30-Touch **	Oyster-650	653	200,000	0.04
N30-Touch **	Oyster-656	660	200,000	0.04

***only available in combination with Performance package*

- **Ratios**

Reactions utilizing nucleic acids often require minimum purity standards. Common contaminants of nucleic acid samples include: proteins, organic compounds, and other. Based on the common contaminants of nucleic acid samples, the 260/280 and 260/230 ratios are calculated for nucleic acids to give an indication of the purity of the samples. Pure DNA and RNA preparations have expected 260/280 ratios of ≥ 1.8 and ≥ 2.0 respectively. An elevated absorbance at 230 nm can indicate the presence of impurities as well; 230 nm is near the absorbance maximum of peptide bonds and also indicates buffer contamination since TRIS, EDTA and other buffer salts absorb at 230nm. When measuring RNA samples, the 260/230 ratio should be > 2.0; a ratio lower than this is generally indicative of contamination with guanidinium thiocyanate, a reagent commonly used in RNA purification and which absorbs over the 230-260 nm range. If a ratio is detected out of the acceptable range an alert icon ⚠ is shown in the results/table area. A push on the alert icon shows additional information. The ranges for acceptable ratio values can be defined in preferences. The ratios are calculated with or without background correction according to if the background correction is activated during the measurements or not as follows:

Without background correction:

$$260/280 \text{ ratio} = \frac{A_{260}}{A_{280}}$$

$$260/230 \text{ ratio} = \frac{A_{260}}{A_{230}}$$

With background correction:

$$260/280 \text{ ratio} = \frac{A_{260} - A_{BKG}}{A_{280} - A_{BKG}}$$

$$260/230 \text{ ratio} = \frac{A_{260} - A_{BKG}}{A_{230} - A_{BKG}}$$

PROTEIN UV

METHOD OVERVIEW

The Protein UV method exploits the inherent absorbance of proteins at 280 nm in combination with the Beer-Lambert Law, where each protein is characterized by a protein specific extinction coefficient (ε) which can be used to determine total protein concentration of a solution. The intrinsic absorbance of proteins is due to the presence of aromatic amino acids in their structure, primarily tryptophan and tyrosine, as well as cysteine (oxidized cysteine residues in a disulphide bond). The aromatic amino acid residues in a protein containing tryptophan and tyrosine exhibit strong intrinsic absorbance at 280 nm, with a lesser contribution by phenylalanine. Therefore, it is the aromatic amino acid residues which dictate the extinction coefficient at 280 nm for a protein.

The most straightforward method to determine concentration of a purified, homogenous protein with a known extinction coefficient (ε) is by direct measurement of UV280 provided as long as the protein contains no prosthetic groups with strong absorption in the same region. However, for unknown proteins including homogenous protein mixtures, it is possible to make direct A_{280} measurements using a composite ε value derived from comparison of many proteins, although this will only provide an approximate but close estimate of the true protein concentration.

The NanoPhotometer® N30-Touch determines protein concentration by performing calculations based on specific ε values, either pre-programmed in the instrument or entered manually by the user. Extinction coefficient (ε) values at 280 nm vary greatly for different proteins due to their particular aromatic amino acid content. Fixed ε values are pre-programmed in the software for certain proteins (see Table 3 on page 46). However, if the protein of interest is not included in the pre-programed methods it is also possible to manually enter the specific ε for the protein of interest using the custom Mol. Ext. Coefficient, custom Ext. Coefficient or custom 1/Ɛ protein factor option. For correct calculation, it is necessary to supply either: a) the molar extinction coefficient (ε_M in $M^{-1}*cm^{-1}$) and the molecular weight expressed in molar mass units (g/mol); b) the mass extinction coefficient (ε in l/g*cm) or c) the protein factor 1/Ɛ of the protein.

To determine the degree of dye labelling of a protein, the absorbance measured at the wavelength corresponding to the absorbance maximum of the fluorescence dye is used (see Table 3 on page 46). The corresponding extinction coefficient of the dye is used along with the Beer-Lambert Law to determine the dye concentration.

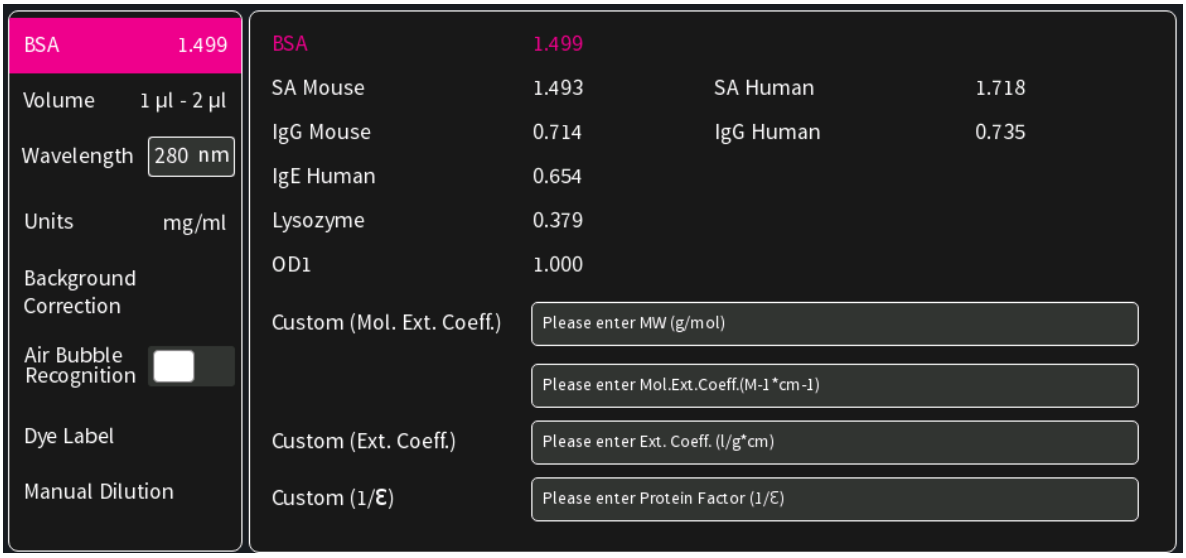
Note: It is important to ensure the extinction coefficient and units entered are correct in order to ensure that calculations are performed properly for accurate concentration values.

Sample Control™ gives useful information about air bubbles, sample impurities, turbidity, lint residues and potential contaminations. If the Sample Control™ detects any irregularity an alert icon ⚠ is shown in the result/table area. A push on the alert icon shows additional information about the irregularity.

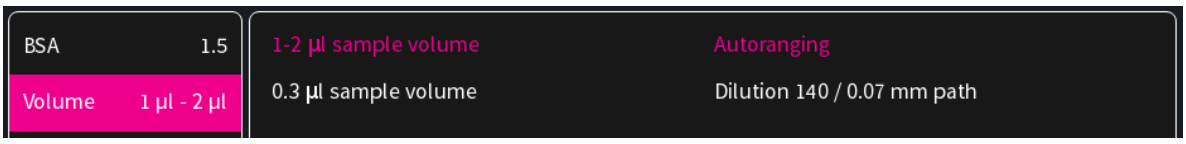
MEASUREMENT PROTOCOL

1. Select the Protein UV icon on the home screen.

2. To change the protein type push on BSA and a list with available options opens on the right side.
   Options are: BSA, SA Mouse, SA Human, IgG Mouse, IgG Human, IgE Human, Lysozyme, OD1, Custom (Molar Extinction Coefficient), Custom (Extinction Coefficient) and Custom (1/Ɛ).
   - For Custom (Mol. Ext. Coefficient) enter Molecular Weight in g/mol and the Mol. Ext. Coefficient in $M^{-1}*cm^{-1}$
   - For Custom (Ext. Coefficient) enter the Ext. Coefficient in l/g*cm
   - For Custom (1/Ɛ) enter the calculated protein factor 1/Ɛ

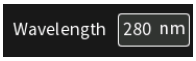


3. Select the volume of sample to be applied.

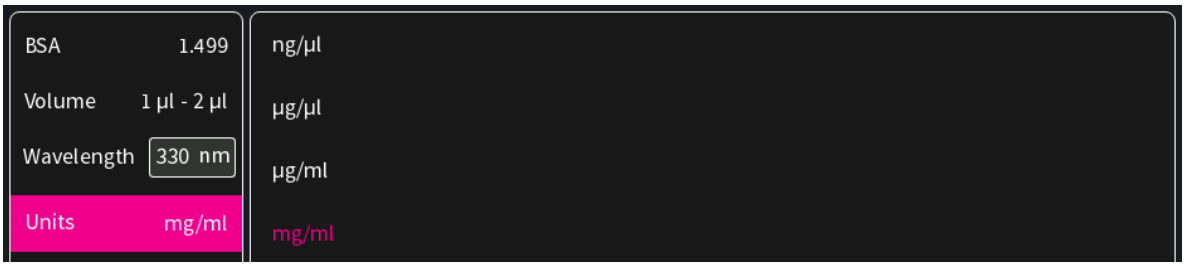


Note: 1-2 µl (default): automatic path length change; 0.3 µl measures only the 0.07 mm path length (possible for samples with concentrations e.g. BSA > 12.6 mg/ml)

4. The wavelength for protein measurements can be changed in the range of 200 – 330nm depending on the wavelength peak of the protein.
   Default setting is 280 nm



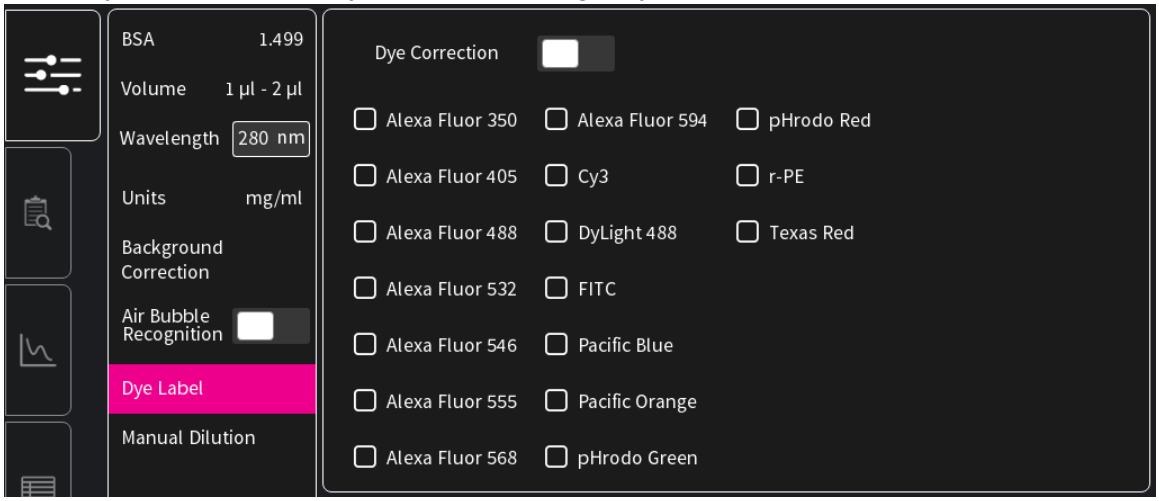
5. Select the Units in which the concentration should be calculated. Options are ng/µl, µg/µl, µg/ml and mg/ml (default).



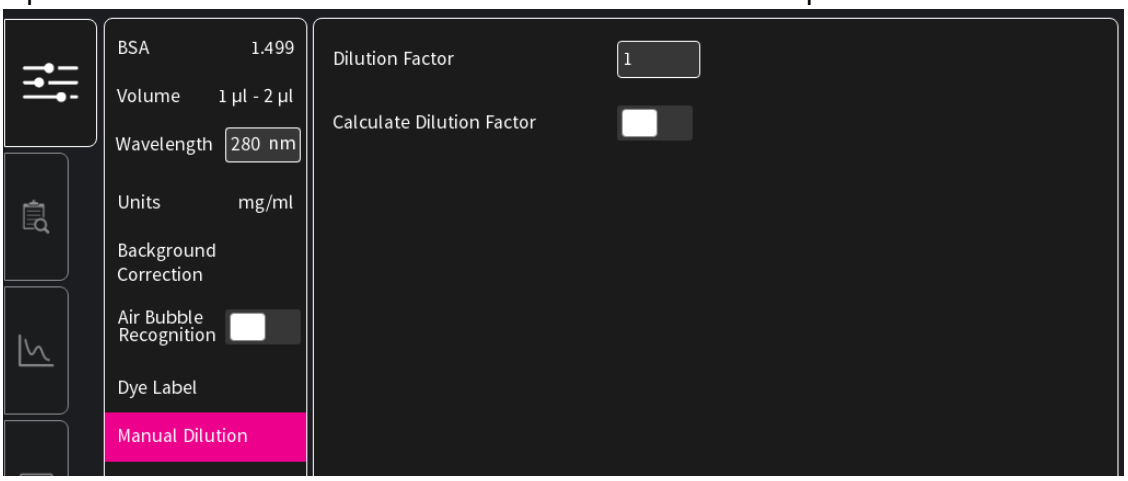
6. The background correction is enabled at 320 nm by default. Selection options are 320 nm, 340 nm or any wavelength in the range of 220 – 350 nm. The background correction can be disabled with the toggle switch.

7. Air bubble recognition*: *This feature is available only with the Applications extension package.* This feature is disabled by default. When enabled it detects air bubbles, lint residues and poor conditions of the sample.
Note: Lint residues and bad sample conditions are detected even if the air bubble recognition is set to off.

8. Dye labels*: *This feature is available only with the Applications extension package.*
For dye labelled samples tick the dye labels in the list, which should be used for result calculation.
Note: If the used dye is not available in the list, please go to preferences and add a custom dye to the dye list.
There is an option for dye correction which can be enabled/disabled with a toggle switch.
Note: Dye correction is only available for single dye selection.



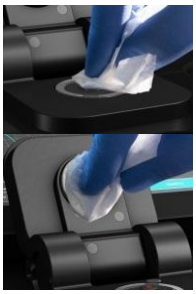
9. Option to set/calculate a dilution factor for manual diluted samples.



10. Apply the blank ddH_20 or buffer to the illuminated sample window on pedestal for the reference measurement and select blank to initiate the reading.
    Note: The illumination of the sample window can be switched off in the preferences.

11. Use a lint-free laboratory wipe to clean both the sample window on pedestal and mirror in the lid arm prior to applying the next sample.

    Note: It can be helpful to apply the blank a second time and read it as a sample to ensure a proper blank.



12. Apply sample to the sample window on pedestal and press the sample button to initiate the measurement.

CALCULATIONS

- **Protein UV280 Concentration**

The protein concentration in the Protein UV method is calculated with the absorbance value of the sample at 280 nm or entered wavelength in the range of 220-350 nm along with the extinction coefficient defined by the user. The protein concentration is calculated with or without background correction as follows:

With background correction:

$C = (A_{280} - A_{BKG}) * Factor_{prot} * Đ$

Without background correction:

$C = A_{280} * Factor_{prot} * Đ$

C Concentration (mg/ml)
A_{280} Absorbance at 280 nm (10 mm path) or entered wavelength
A_{BKG} Absorbance at selected background wavelength (10 mm path)
$Factor_{prot}$ Protein factor in g*cm/l (1/Ext. Coeff. or MW/Mol.Ext. Coeff.)
Đ Dilution factor

Table 3. Protein extinction coefficients (ε_{prot})

Type	$Factor_{prot}$ [g* cm/l]	Ext. Coeff. [l/g*cm]	Mol. Ext. Coeff. [$M^{-1}*cm^{-1}$]	MW [g/mol]
BSA	1.499	0.6670	44,289	66,400
SA Mouse	1.493	0.6700	44,220	66,000
SA Human	1.718	0.5820	40,370	69,365
IgG Mouse	0.714	1.4000	224,000	160,000
IgG Human	0.735	1.3600	204,000	150,000
IgE Human	0.654	1.5300	290,700	190,000
Lysozyme	0.379	2.6400	37,984	14,388
OD1	1.000	N/A	N/A	N/A

- **Dye-labeled Protein UV280 Concentration***

**This feature is available only with the Applications extension package.*

For dye-labeled proteins, the concentration of the protein is calculated using a modified form of the Beer-Lambert equation. For these calculations, the instrument considers the absorption maximum of the dye, and a certain dye-specific correction factor at 280 nm (see Table 4 on page 48). The dye concentration is calculated with or without background/dye correction for are as follows:

With background and with dye correction:

$$C = \left[A_{280} - A_{BKG} - \left(cf_{dye} * (A_{max,\,dye} - A_{BKG})\right)\right] * Factor_{prot} * Đ$$

With background and without dye correction:

$$C = (A_{280} - A_{BKG}) * Factor_{prot} * Đ$$

Without background and with dye correction:

$$C = \left(A_{280} - (cf_{dye} * A_{max,\,dye})\right) * Factor_{prot} * Đ$$

Without background and without dye correction:

$$C = A_{280} * Factor_{prot} * Đ$$

C Concentration in mg/ml
A_{280} Absorbance at 280 nm (10 mm path)
A_{BKG} Absorbance at selected background wavelength (10 mm path)
$A_{max,\,dye}$ Absorbance value at the absorbance maximum of the dye (10 mm path)
$Factor_{prot}$ Protein factor in g*cm/l (1/Ext. Coeff. or MW/Mol.Ext. Coeff.)

cf_{dye} Dye-dependent correction factor at 280 nm
Đ Dilution factor

- **Dye Concentration***

**This feature is available only with the Applications extension package.*

For dye-labeled proteins, the concentration of the dye is calculated using a modified form of the Beer-Lambert equation. For these calculations, the instrument considers the absorption maximum of the dye, and a dye-specific extinction coefficient (see Table 4 on page 48). The dye concentration is calculated with or without background correction for are as follows:

With background correction:

$$C = \frac{\left((A_{max,\,dye} - A_{BKG}) * Đ\right)}{m\varepsilon_{dye} * 10^{-6}}$$

Without background correction:

$$C = \frac{(A_{max,\,dye} * Đ)}{m\varepsilon_{dye} * 10^{-6}}$$

C Concentration
$A_{max,\,dye}$ Absorbance at the max dye absorbance value (10 mm path)
A_{BKG} Absorbance at selected background wavelength (10 mm path)
$m\varepsilon_{dye}$ Extinction coefficient of dye in $M^{-1}*cm^{-1}$
Đ Dilution factor

- **Degree of Labeling (DOL)***

**This feature is available only with the Applications extension package.*

DOL is the degree of labeling based on the average number of dye molecules coupled to a protein molecule. The degree of labeling can be determined from the absorption spectrum of the labeled antibody with or without background/dye correction as follows:

With background and with dye correction:

$$DOL = \frac{(A_{max,\,dye} - A_{BKG}) * m\varepsilon_{prot}}{\left((A_{280} - A_{BKG}) - cf_{dye} * (A_{max,\,dye} - A_{BKG})\right) * m\varepsilon_{dye}}$$

With background and w/o dye correction:

$$DOL = \frac{(A_{max,\,dye} - A_{BKG} * m\varepsilon_{prot}}{(A_{280} - A_{BKG}) * m\varepsilon_{dye}}$$

W/o background and with dye correction:

$$DOL = \frac{A_{max,\,dye} * m\varepsilon_{prot}}{(A_{280} - cf_{dye} * A_{max,\,dye}) * m\varepsilon_{dye}}$$

W/o background and w/o dye correction:

$$DOL = \frac{A_{max,\ dye} * m\varepsilon_{prot}}{A_{280} * m\varepsilon_{dye}}$$

DOL	Degree of labeling/dye per protein ratio
$A_{max,\ dye}$	Absorbance value at the absorbance maximum of the dye (10 mm path)
A_{280}	Absorbance at 280 nm (10 mm path)
A_{BKG}	Absorbance at selected background wavelength (10 mm path)
$m\varepsilon_{dye}$	Extinction coefficient of dye in $M^{-1}*cm^{-1}$
$m\varepsilon_{prot}$	Molar extinction coefficient of protein ($M^{-1} * cm^{-1}$)
cf_{dye}	Dye-dependent correction factor at 280 nm

Table 4. Dye Types, Absorbance Max, Extinction coefficients, and dye-dependent correction factors

NanoPhotometer® N30-Touch (available with Applications package)	Dye Type	Absorbance maximum of Dye (nm)	Molar ext. coeff. of Dye $m\varepsilon_{dye}$ in $M^{-1}*cm^{-1}$	Dye-dependent correction factor at 280 nm cf_{dye}
N30-Touch	Alexa Fluor 350	346	19,000	0.19
N30-Touch	Alexa Fluor 405	401	34,000	0.70
N30-Touch	Alexa Fluor 488	495	71,000	0.11
N30-Touch	Alexa Fluor 532	532	81,000	0.09
N30-Touch	Alexa Fluor 546	554	112,000	0.12
N30-Touch	Alexa Fluor 555	555	150,000	0.08
N30-Touch	Alexa Fluor 568	578	91,300	0.46
N30-Touch	Alexa Fluor 594	590	90,000	0.56
N30-Touch **	Alexa Fluor 647	650	239,000	0.03
N30-Touch **	Alexa Fluor 680	679	184,000	0.05
N30-Touch **	Alexa Fluor 790	785	260,000	0.08
N30-Touch	Cy3	550	150,000	0.05
N30-Touch **	Cy5	649	250,000	0.05
N30-Touch **	DyLight 649	654	250,000	0.04
N30-Touch	DyLight 488	493	70,000	0.15
N30-Touch	FITC	494	70,000	0.30
N30-Touch	Pacific Blue	409	30,000	0.20
N30-Touch	Pacific Orange	397	24,500	0.60
N30-Touch	pHrodo Green	505	75,000	0.20
N30-Touch	pHrodo Red	560	65,000	0.12
N30-Touch	r-PE	566	1,863,000	0.17
N30-Touch	Texas Red	595	80,000	0.18

***only available in combination with Performance package*

- **Ratios**

Protein samples e.g. from whole cell lysates may contain nucleic acids. To check the purity of the isolated protein, the 260/280 ratio is calculated to give an indication of the nucleic acid contamination. A pure protein preparation has an expected 260/280 ratios of ~ 0.57. If a ratio is detected out of the acceptable range an alert icon ⚠ is shown in the results/table area. A push on the alert icon shows additional information. The ranges for acceptable ratio values can be defined in preferences.
The ratio is calculated with or without background correction according to if the background correction is activated during the measurements or not as follows:

Without background correction:

$$260/280 \text{ ratio} = \frac{A_{260}}{A_{280}}$$

With background correction:

$$260/280 \text{ ratio} = \frac{A_{260} - A_{BKG}}{A_{280} - A_{BKG}}$$

PROTEIN ASSAYS*

**The Protein Assays application is only available with the Applications extension package.*

METHOD OVERVIEW

Protein concentration may be measured using colorimetric assays, in which certain reagents are added to the protein solution to generate a colored product; either a protein-cupric ion chelate as in the Lowry and BCA assays or a protein-dye complex as in the Bradford assay. In these colorimetric assays, the absorbance is measured in the visible range at the appropriate wavelength for each assay and compared against a standard curve prepared by serial dilution of a protein standard of known concentration. A linear, linear zero or 2nd order regression analysis of the calibration standard data points is calculated by the NanoPhotometer® N30-Touch. A correlation coefficient (R^2) in the range of 0.95 to 1.00 indicates a good fit to a straight line.

- **Bradford Assay**

Method depends on quantifying the binding of a dye, Coomassie Brilliant Blue, to an unknown protein and comparing this binding to that of a standard curve prepared from a set of known protein of known concentrations at 595 nm. This standard is usually BSA (bovine serum albumin).

- **BCA Assay**

Method depends on a reaction between cupric ions and peptide bonds coupled with the detection of cuprous ions using bicinchoninic acid (BCA), giving an absorbance maximum at 562 nm. The BCA process is less sensitive to the presence of detergents used to solubilize membranes.

- **Lowry Assay***

**Lowry Assay is only available with the Performance extension package in addition to the Applications package.*

Method is based on the Biuret reaction. Under alkaline conditions the divalent copper ion forms a complex with peptide bonds in which it is reduced to a monovalent ion. Monovalent copper ion and the radical groups of tyrosine, tryptophan, and cysteine react with Folin reagent to produce an unstable product that becomes reduced to molybdenum/tungsten blue. The bound reagent changes color from yellow to blue. This binding is compared with that obtained with a standard protein at 750 nm; this is usually BSA (bovine serum albumin).

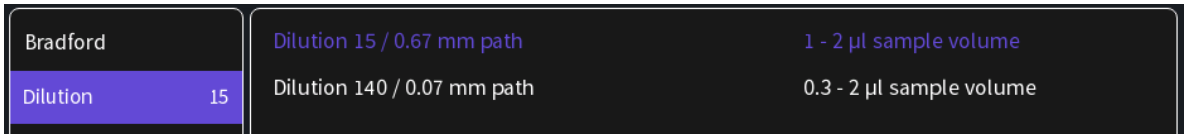
Note: Detailed protocols are customarily supplied with these assay kits, and must be closely followed to ensure that accurate results are obtained.

MEASUREMENT PROTOCOL

1. Select protein assays icon from home screen.

2. To change the assay type click on Bradford and a list with available options opens on the right side.
   Options are: BCA Assay, Bradford Assay, Lowry Assay* (**only with Performance package*)

3. Select the dilution depending on the sample concentration



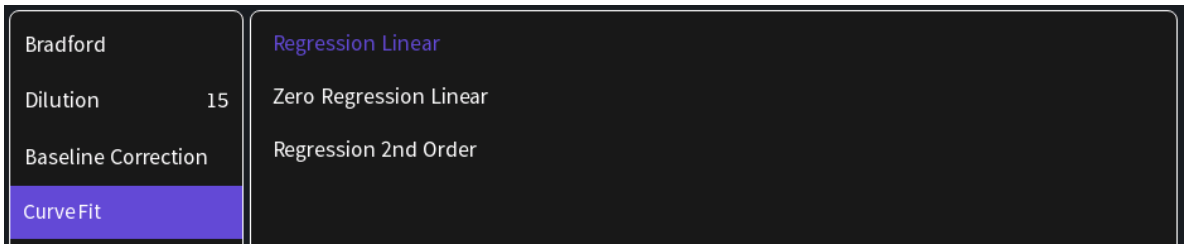
Note: There is no automatic path length setting available in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm) depending on your sample concentration.

4. Default values for the baseline correction are depending on selected protein assay type.
   - BCA default value: off
   - Bradford default value: 350 nm
   - Lowry* default value: 405 nm (**only with Performance package*)
   -

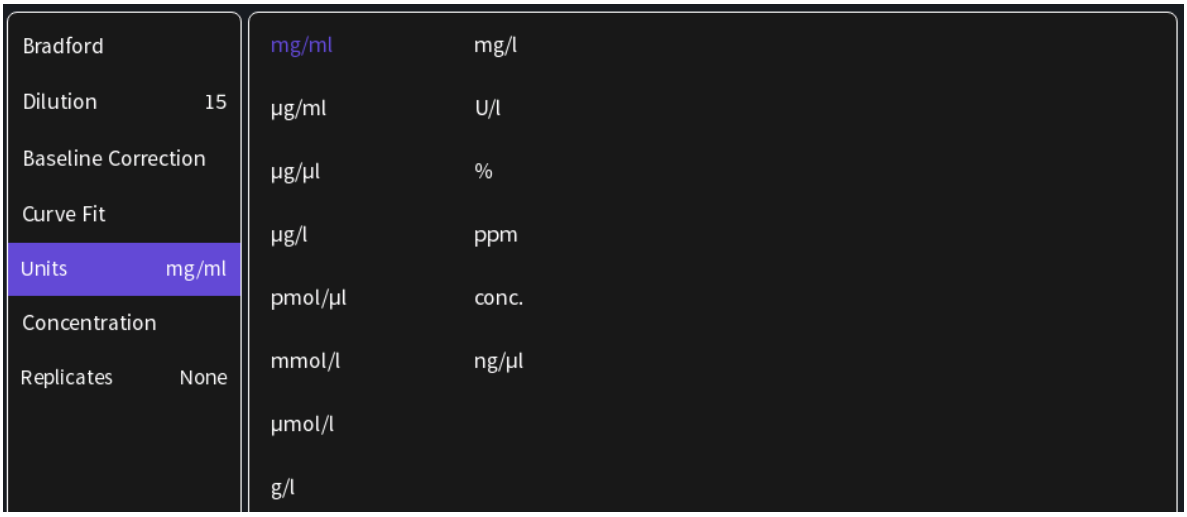
Note: Wavelength values 200 - 650 nm only (up to 900 nm with the Performance package).

Note: It is recommended to use the default baseline for each assay.

5. Select curve fit type: Options are linear regression, zero regression (forces the straight line through the origin) and 2nd order regression.

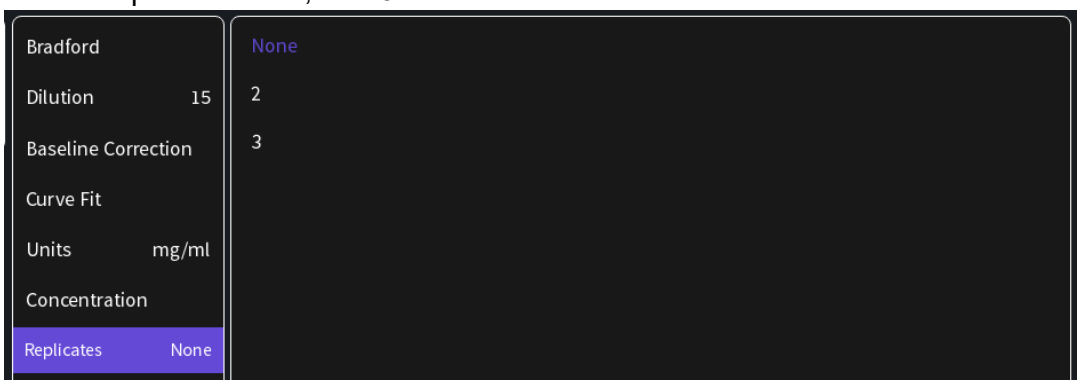


6. Select Unit



7. Add up to 20 Concentrations by pressing the Add Concentration button. Added concentrations can be deleted with ⊗. Enter the concentrations of the standards for the standard curve.

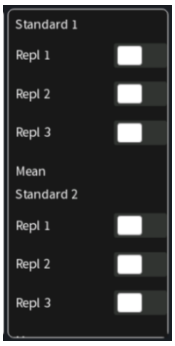
8. Select Replicates none, 2 or 3



9. Measure a blank and depending on the replicate selection, all required concentrations. Absorbances of the replicates will be shown in the results area and if replicates are selected a mean value for each standard. It is possible to exclude single measurements from the curve calculation by switching the toggle switch off.

   Note: After the first sample measurement the standard curve can no longer be altered.

   Once a Standard curve is created or loaded from a stored method it will be used for concentration calculations of measured samples. It may be necessary to do a blank measurement.



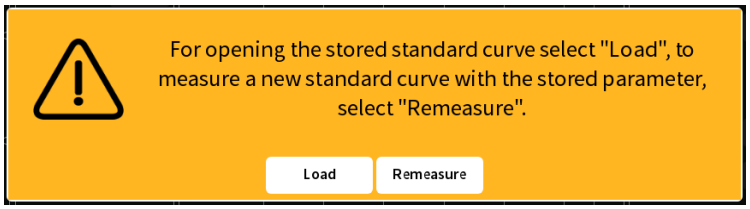
10. Apply sample and press the sample button to initiate the sample measurement.

Note: Once the sample measurement is initiated it is no longer possible to change the standard curve.

SAVING AND LOADING STANDARD CURVES*

**Available only with the Connectivity extension package.*

It is possible to save measured standard curves as a Stored Method. To save the standard curve push the store method button and enter a method name, select a folder and save with the Store button.
Methods can be opened in the Stored Methods menu on the home screen. Opening a saved Protein Assay method shows a message with the option to load or remeasure the standard curve.



CALCULATIONS

Protein concentration is determined using the standard curve by correlating absorbance values of samples with known concentration to calculate the concentration of the unknown sample. In order to maintain accuracy and precision please ensure that the R^2 value of the standard curve is 0.95 or greater.

KINETICS*

**The Kinetics application is only available with the Applications extension package.*

METHOD OVERVIEW

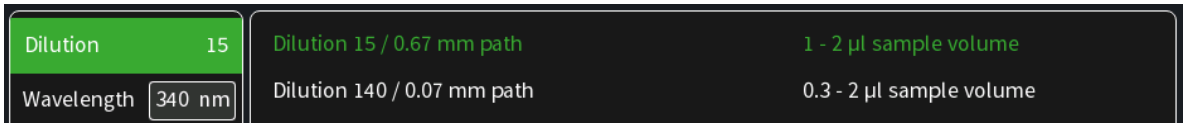
The Kinetics application is useful for: measuring initial rates of enzyme-catalyzed reactions, performing progress-curve analysis for complete reactions, calculating basic Michaelis-Menten parameters for single-substrate reactions, and measuring enzyme inhibition. Simple kinetics studies, where the change in absorbance is followed as a function of time at a fixed wavelength, can be readily performed with the NanoPhotometer® N30-Touch. The rate of a chemical reaction can be measured using spectrophotometric methods by studying the change in absorbance at a fixed wavelength as a function of time. These changes in absorbance reflect corresponding changes in the concentration of reactants or products as the reaction progresses. The rate of many chemical reactions can be markedly accelerated by the presence of catalysts, which remain chemically intact during the reaction. Catalysts in the case of biochemical reactions are generally represented by enzymes, which are specialized protein catalysts. However, a few examples of special reactions catalyzed by RNA molecules also exist. Studying the kinetics of a reaction can reveal important details of the catalytic mechanism involved in terms of sequence steps, transition state of reactants or nature of enzyme inhibitors.

MEASUREMENT PROTOCOL

Note: If a kinetic is started from a control device via Wi-Fi® connection (tablet or smartphone) – (feature only available as part of the Connectivity package); please set the auto lock of the tablet or smartphone to never. Otherwise the kinetics will be interrupted when the smartphone or tablet is locked, because the Wi-Fi® connection may be lost.

1. Select the Kinetics icon on the home screen

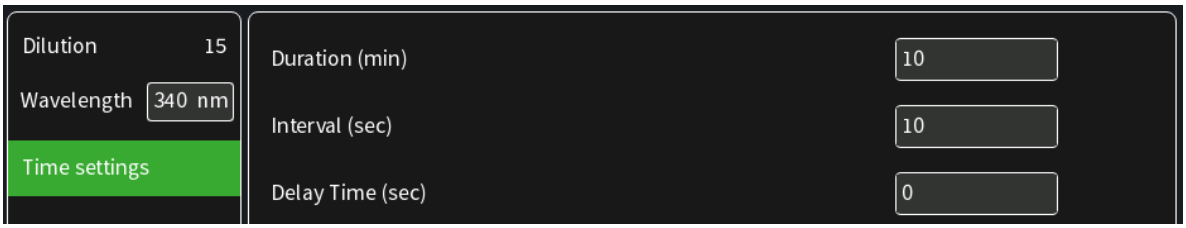
2. Select the dilution depending on the sample concentration.



Note: There is no automatic path length setting available in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm).

3. Default wavelength (λ) is 340 nm but can be changed in the range of 200–650 nm (*with Performance package 200–900 nm*), depending on the application.

4. Time settings:
   - Enter the duration time in minutes over which measurements are to be taken. Possible range is 1–3000 minutes.
   - Enter the interval time between measurements in seconds. Possible interval times are 5-3,600 seconds, depending on the duration time.
   - Enter the delay time in seconds before the first measurement is taken. Possible delay time is between 0–3,600 seconds, depending on the duration time.



Note: A maximum of 500 samples is possible. Please consider this when choosing the duration and interval time.

5. Apply the blank ddH_20 or buffer to the illuminated sample window on pedestal for the reference measurement and select blank to initiate the reading.

6. Apply sample to the sample window on pedestal and select the sample button to initiate the measurements. Once the kinetic is started the Blank button turns to a Pause/Continue button and the Sample button to a Stop button.

Note: While the kinetics is running it is not possible to change the parameters, save data or delete data. Change of parameters is only possible before starting the kinetic readings. Save and delete data is only available after the kinetic session is stopped.
Note: Auto print and cryo label print is not available in Kinetics.

CALCULATIONS

All absorbance values are normalized to a 10 mm path.

A_0 = absorbance of start value (10 mm path)
A_n = absorbance of actual value time n (10 mm path)
dA = absorbance of actual value – absorbance of start value
Slope = linear regression fit of all actual measurement points
Final A = absorbance of final value
R^2 = $R^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$ [O_i = observed slope value; E_i = expected slope value]

OD600*

**The OD600 application is only available with the Applications extension package.*

METHOD OVERVIEW

The growth of bacteria in liquid culture media is commonly monitored by measuring the optical density at 600 nm (OD600) in small samples taken from the cultures. OD600 measurements are typically used to determine the stage of growth of the bacterial culture, thereby ensuring that cells are harvested at an optimum point that corresponds to an appropriate density of live cells. Growth of bacterial cells typically progresses through a series of consecutive phases including: lag, log, stationary and decline (see Figure 1).

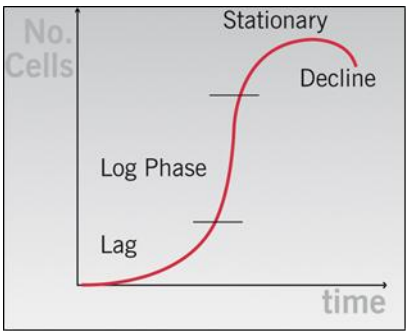


Figure 1: Bacterial Growth Curve

In general, cells should be harvested towards the end of the log phase using the optical density of the samples to determine when this point has been reached. Since optical density in the case of OD600 measurements results from light scattering rather than light absorption, this value varies depending on the type of bacterial cells in the culture in terms of size and shape. Cells are routinely grown until the absorbance at 600 nm (known as OD600) reaches ~0.4 prior to induction or harvesting. A linear relationship exists between cell number (density) and OD600 up to an absorbance value of ~0.6.

As mentioned above, for turbid samples such as cell cultures, the absorbance measured is due to light scattering, and not the result of molecular absorption. Since the extent of scattering is affected by the optics of the system (distance between the cell holder and instrument exit slit, monochromator optics, slit geometry, etc.), different spectrophotometer types will tend to give different OD600 readings for the same turbid sample. Therefore, if results from different spectrophotometers are to be compared, they must be normalized first using appropriate calibration curves. For more information see Technical Note #8 OD 600 which can be downloaded from the Implen webpage: https://www.implen.de/technical-notes/.

A calibration curve can be constructed by comparing measured OD600 to expected OD600. Expected OD600 is determined by counting cell number using an alternative technique (for example microscope slide method) and converting to OD600 using the rule of thumb that 1 OD600 = 5 x 10^8 cells/ml for *E. coli*.

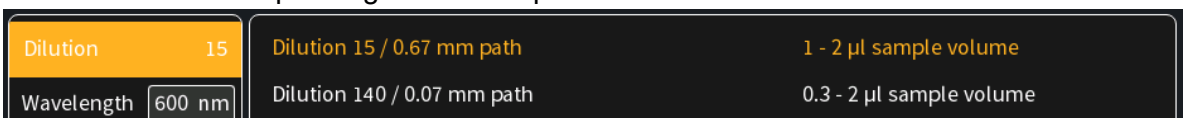
The NanoPhotometer® N30-Touch comes with a correction factor of 1 by default. To compare OD600 values between different spectrophotometers, it is necessary to determine the constant deviation or ratio between the absorbance values for the same sample from each instrument and use this factor within the setting “correction factor” of your NanoPhotometer® Software.

Note: To prevent the suspension settling too quickly and giving an OD reading that changes with time, glycerol should be added to the sample.

MEASUREMENT PROTOCOL

1. Select the OD600 icon on the home screen

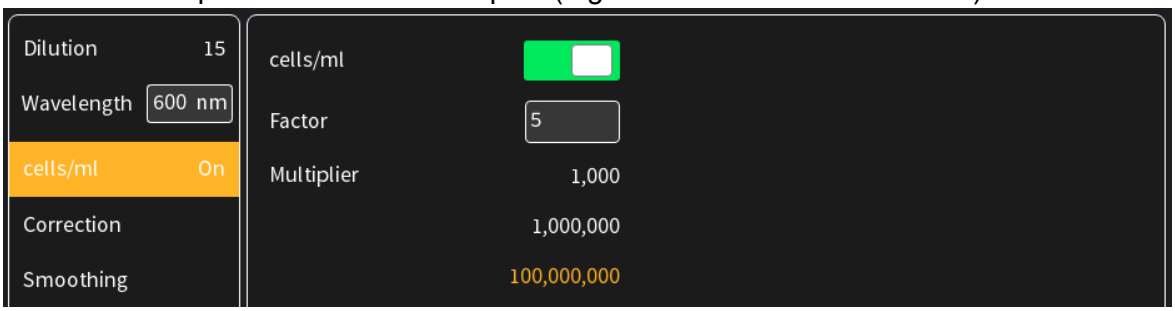
2. Select the dilution depending on the sample concentration



Note: There is no automatic path length setting in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm)

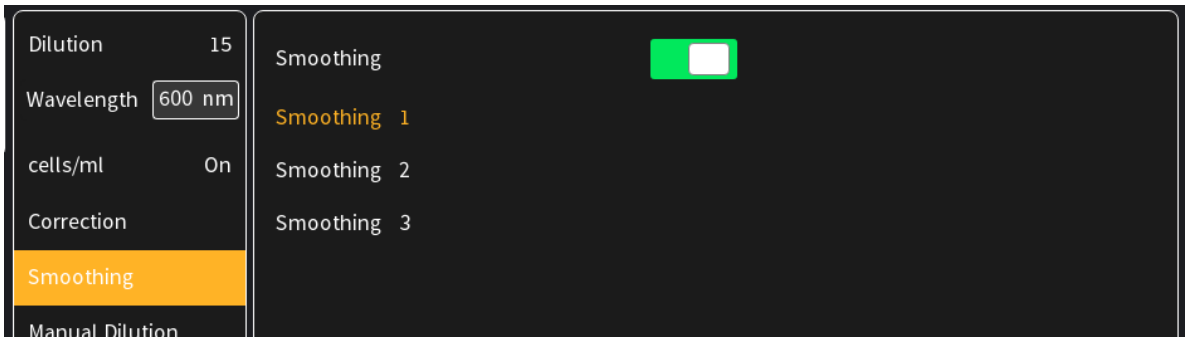
3. Default wavelength is 600 nm but the wavelength can be changed in the range of 200–650 nm (*with Performance package: 200–900 nm*), depending on the application.

4. Toggle switch cells/ml is disabled by default. Enable cells/ml to get the cells/ml calculated. Enter the cell specific factor and multiplier (e.g. 1 OD600 = 5 x 108 cells/ml)



5. Enter the correction factor to compensate for different optical configurations between the NanoPhotometer® N30-Touch and other instruments.

6. Option to smooth the graph with different boxcars. Options: Off, 1 = boxcar 11 (default), 2 = boxcar 21 and 3 = boxcar 61



7. Option to set/calculate a dilution factor for manual diluted samples.

8. Apply the blank dd$H_2$0 or buffer to the illuminated sample window on pedestal for the reference measurement and select blank to initiate the reading.

9. Apply sample to the sample window on pedestal and select the sample button to initiate the measurement.

CALCULATIONS

OD600 = A_{600} * Đ * cf

OD600	Optical density at 600 nm
A_{600}	Absorbance at 600 nm (10 mm path)
Đ	Dilution factor
cf	Correction factor for spectrophotometer

Cells/ml = A_{600} * Đ * cf * multiplier

A_{600}	Absorbance at 600 nm (10 mm path)
Đ	Dilution factor
cf	Correction factor for spectrophotometer
multiplier	Multiplier of sample

MORE APPS*

**Available only as part of the Applications extension package.*

The More Apps icon located on the home screen opens another menu screen with access to icons for additional applications available on the NanoPhotometer® N30-Touch. The applications featured in this menu include: Wavelength, Concentration, Wavescan, Absorbance/ratio, Standard curve and Custom applications.

MORE APPS: WAVELENGTH*

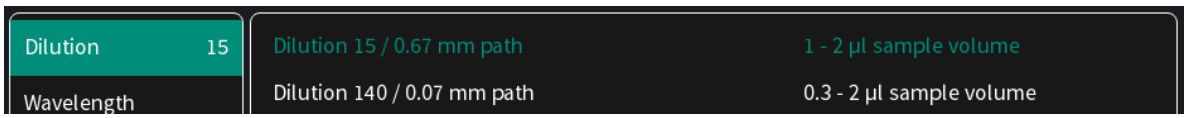
**The Wavelength application is only available with the Applications extension package.*

METHOD OVERVIEW

In the wavelength application it is possible to measure simple absorbance (A) of a sample at specific wavelengths. It is possible to add up to 20 different wavelengths.
The wavelength method includes a calculation tool to define and calculate customer defined formulas.

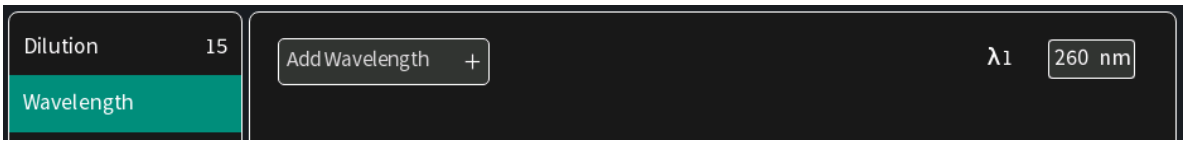
MEASUREMENT PROTOCOL

1. Select the More Apps icon from the home screen and the Wavelength icon from the More Apps screen.
2. Select the dilution depending on the sample concentration.



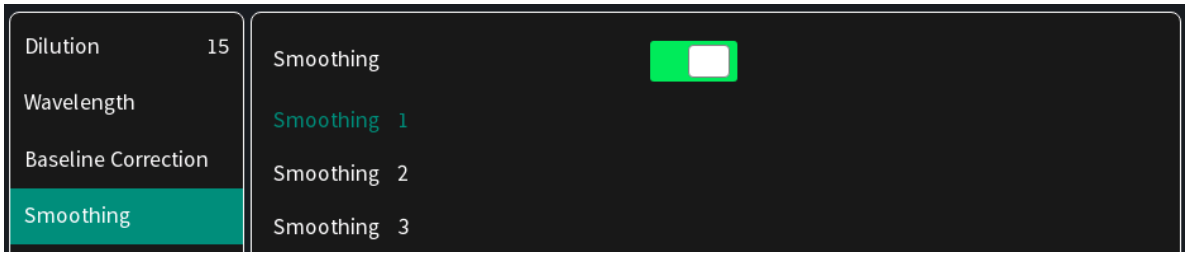
Note: There is no automatic path length setting in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm).

3. Enter desired wavelength (λ) to be measured. It is possible to measure up to 20 wavelengths simultaneously. More wavelength (λ) options can be added by selecting the Add Wavelength button. Added wavelength can be deleted with ⊗



4. Baseline correction is set off by default. Enabling the baseline corrections shows a list with different wavelength options: 377 nm, 604 nm, 650 nm, 770 nm* and 823 nm* (** >650 nm wavelengths only available in combination with Performance package*). Option to enter any wavelength between 200 nm and 650 nm (*up to 900 nm with the Performance package*).

5. Option to smooth the graph with different boxcars. Options: Off, 1 = boxcar 11 (default), 2 = boxcar 21 and 3 = boxcar 61



6. Option to enter formulas to calculate

It is possible to enter up to 5 different custom formulas for result calculation.

Formula Acceptance Guidelines:

1. Numbers:
   Up to 20 significant figures if no decimal separator is used
   Up to 4 significant figures if a decimal separator (period ".") is used
2. Numeric Operations:
   + (add), - (subtract), * (multiply), / (divide) and parentheses ()
3. Absorbance:
   Axxx e.g. for absorbance at 260 nm: A260

Note: Do not use blank character.

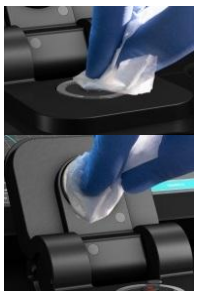
Example:
Nucleic Acid (dsDNA) concentration calculation with background correction at 320 nm:
(A260-A320)*50

7. Option to set/calculate a dilution factor for manual diluted samples.

8. Apply the blank ddH_20 or buffer to the illuminated sample window on pedestal for the reference measurement and select blank to initiate the reading.

Note: The illumination of the sample window can be switched off in preferences.

9. Use a lint-free laboratory wipe to clean both the sample window on pedestal and mirror in lid arm prior to applying the next sample.
Note: It can be helpful to apply the blank a second time and read it as a sample to ensure a proper blank.



10. Apply sample to the sample window on pedestal and press the sample button to initiate the measurement.

CALCULATIONS

- **Formula Calculation:**

Depends on the entered formula in the parameter concentration.

- **Absorbance Calculation:**

Absorbance is formally defined as the decimal logarithm (base 10) of the reciprocal of transmittance:

$$A = \log\left(\frac{1}{T}\right) = -\log T$$

$$T = 10^{(-A)}$$

Note: Corresponding absorbance value e.g. Absorbance value (λ = 230) etc. normalized to 10 mm path length.

MORE APPS: WAVESCAN *

**The Wavescan application is only available with the Applications extension package.*

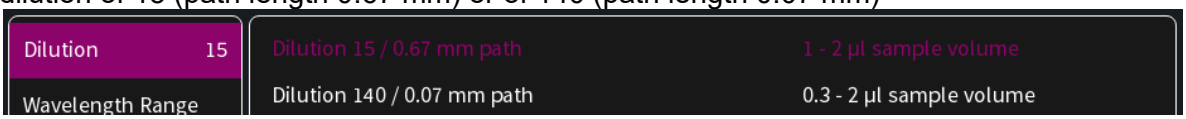
METHOD OVERVIEW

Using the wavescan application it is possible to obtain the complete spectral scan for a defined wavelength range between 200-650 nm or from 200-900 nm (*with the Performance extension package*).

MEASUREMENT PROTOCOL

1. Select the More Apps icon from the Home screen and the Wavescan icon from the More Apps screen

2. Select the dilution depending on the sample concentration
   Note: There is no automatic path length setting in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm)

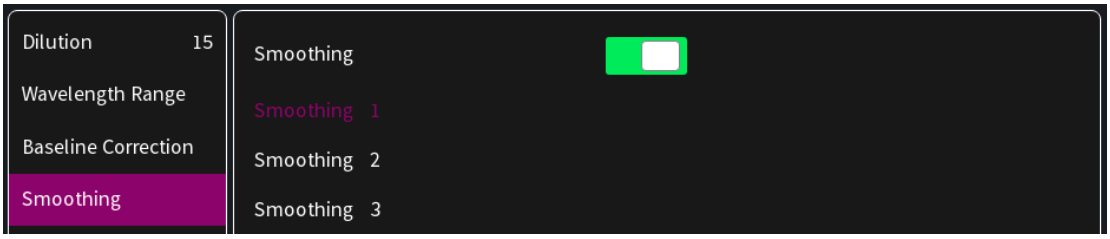


3. Set Start and End Wavelength to define the scan range.

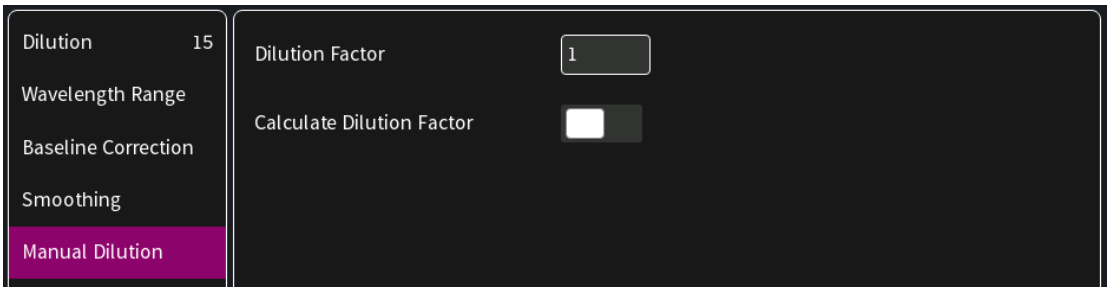
   Note: If samples with a different wavelength range are selected, the graphs are shown on full scan range of 200–650 nm (with Performance package: 200–900 nm).).

4. Baseline correction is set off by default. Enabling the baseline corrections shows a list with different wavelength options: 377 nm, 604 nm, 650 nm, 770 nm* and 823 nm* *(*>650 nm wavelengths only available in combination with Performance package*). Option to enter any wavelength between 200 nm and 650 nm (*up to 900 nm with the Performance package*).

5. Option to smooth the graph with different boxcars. Options: Off, 1 = boxcar 11 (default), 2 = boxcar 21 and 3 = boxcar 61

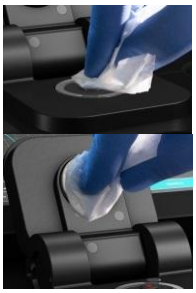


6. Option to set/calculate a dilution factor for manual diluted samples.



7. Apply the blank dd$H_2$0 or buffer to the illuminated sample window on pedestal for the reference measurement and select blank to initiate the reading.
Note: The illumination of the sample window can be switched off in the preferences.

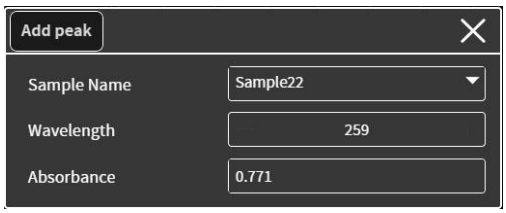
8. Use a lint-free laboratory wipe to clean both the sample window on pedestal and mirror in lid arm prior to applying the next sample.
Note: It can be helpful to apply the blank a second time and read it as a sample to ensure a proper blank.



9. Apply sample to the sample window on pedestal and press the sample button to initiate the measurement.

CALCULATIONS

No calculations necessary: values are reported based on 10 mm path length.
The results show prominent peaks with wavelength and absorbance values. If a peak of interest is not shown in the results the peak can be selected by pressing the graph. The peak can then be added to the results by tapping on the Add Peak button in the pop-up window.



MORE APPS: ABSORBANCE RATIO*

**The Absorbance Ratio application is only available with the Applications extension package.*

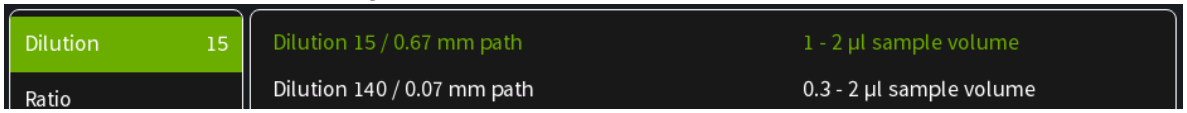
METHOD OVERVIEW

In this mode, it is possible to determine simple absorbance ratios for a given sample by measuring the absorbance at two wavelengths specified in the parameters of the method relative to a blank.

MEASUREMENT PROTOCOL

1. Select the More Apps icon from the home screen and the Absorbance/Ratio icon from the More Apps screen

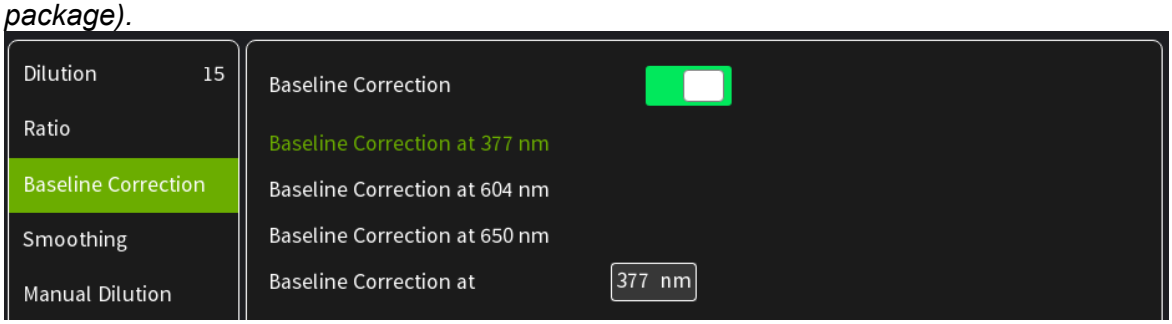
2. Select the dilution depending on the sample concentration



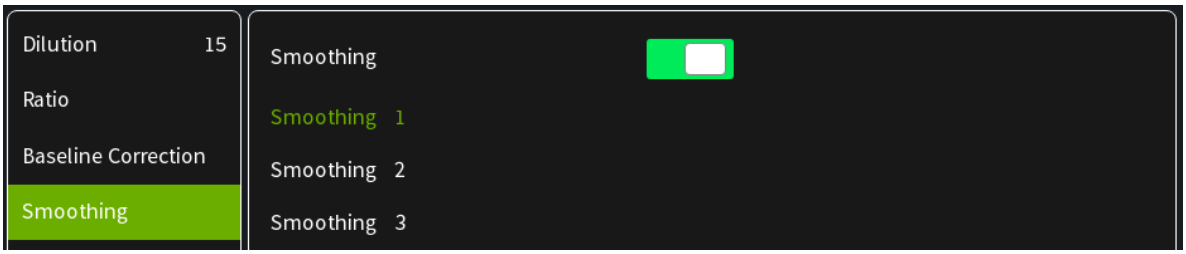
Note: There is no automatic path length setting in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm).

3. Enter desired wavelengths (λ 1-1 and λ 1-2) for ratio calculation. It is possible to measure up to 20 absorbance/ratios simultaneously. More wavelengths for ratio calculation can be added by selecting the Add Ratio button. Added ratios can be deleted with ⊗.

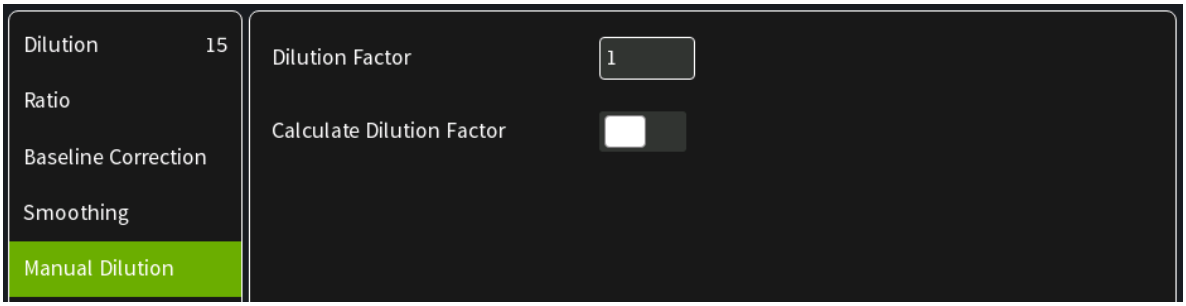
4. Baseline correction is set to off as default. Enabling the baseline corrections shows a list with different wavelength options: 377 nm, 604 nm, 650 nm, 770 nm* and 823 nm* *(*>650 nm wavelengths only available in combination with Performance package)*. Option to enter any wavelength between 200 nm and 650 nm *(up to 900 nm with the Performance package)*.



5. Option to smooth the graph with different boxcars. Options: Off, 1 = boxcar 11 (default), 2 = boxcar 21 and 3 = boxcar 61



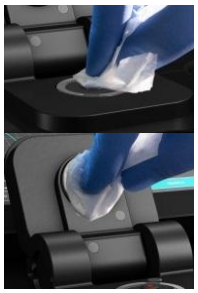
6. Option to set/calculate a dilution factor for manual diluted samples.



7. Apply the blank ddH_20 or buffer to the illuminated sample window on pedestal for the reference measurement and select blank to initiate the reading.
   Note: The illumination of the sample window can be switched off in the preferences.

8. Use a lint-free laboratory wipe to clean both the sample window on pedestal and mirror in lid arm prior to applying the next sample.

   Note: It can be helpful to apply the blank a second time and read it as a sample to ensure a proper blank.



9. Apply sample to the sample window on pedestal and press the sample button to initiate the measurement.

CALCULATIONS

The absorbance ratio is calculated from the two path lengths specified by the user in the parameters.

$$\lambda_1 : \lambda_2 = \frac{\lambda_1}{\lambda_2}$$

$\lambda_1 : \lambda_2$ = Absorbance Ratio
λ_1 = Absorbance 1 corresponding absorbance value 1 selected normalized to 10 mm path
λ_2 = Absorbance 2 corresponding absorbance value 2 selected normalized to 10 mm path

MORE APPS: CONCENTRATION*

**The Concentration application is only available with the Applications extension package.*

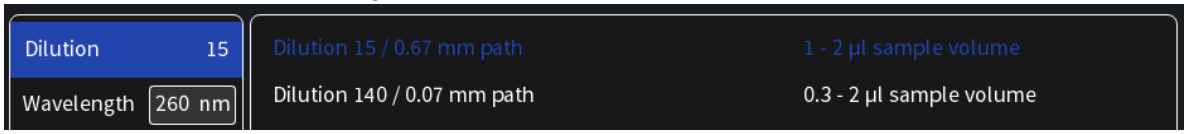
METHOD OVERVIEW

In this mode, concentration can be calculated for a sample by determining the absorbance at a specific wavelength relative to a reference. The concentration is then obtained by multiplying the measured absorbance by a specific factor. This factor may be known in advance and entered by the user, or it may be calculated by the instrument by measuring a set of standard (standard curve method) with known concentrations to create a standard curve.

MEASUREMENT PROTOCOL

1. Select the More Apps icon from the home screen and the Concentration icon from the More Apps screen.

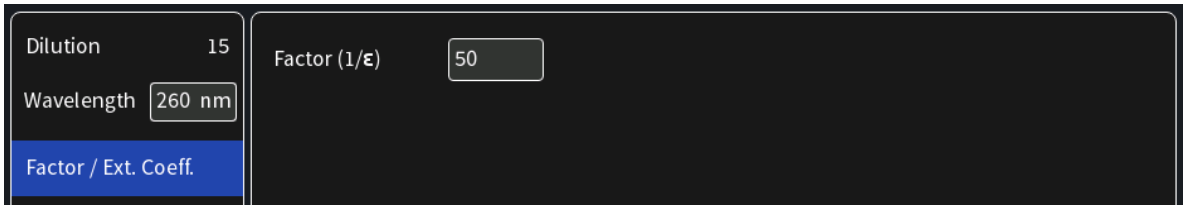
2. Select the dilution depending on the sample concentration.



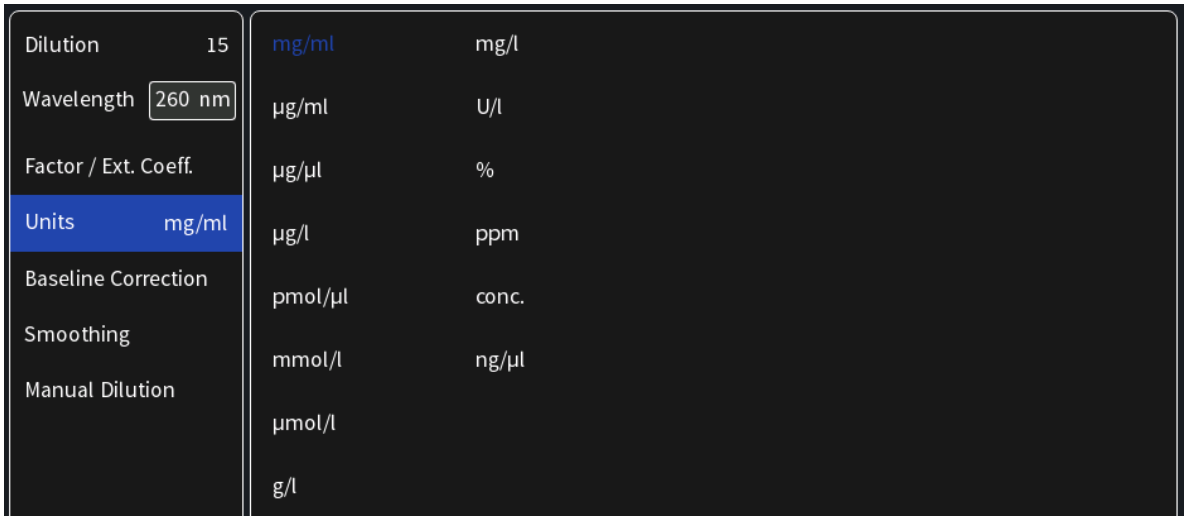
Note: There is no automatic path length setting in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm).

3. Default wavelength is 260 nm but can be changed in the range of 200-650 nm (*with Performance package: 200–900 nm*), depending on the sample/application.

4. Enter a factor for concentration calculation.

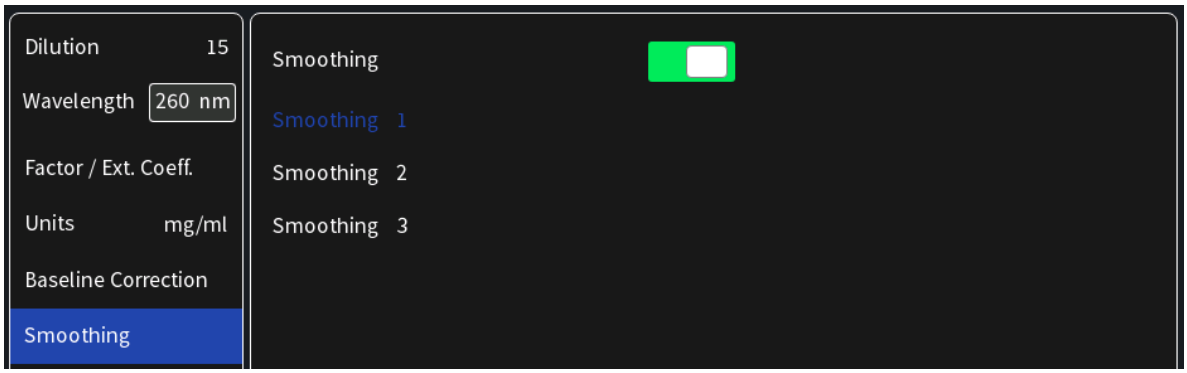


5. Unit selection

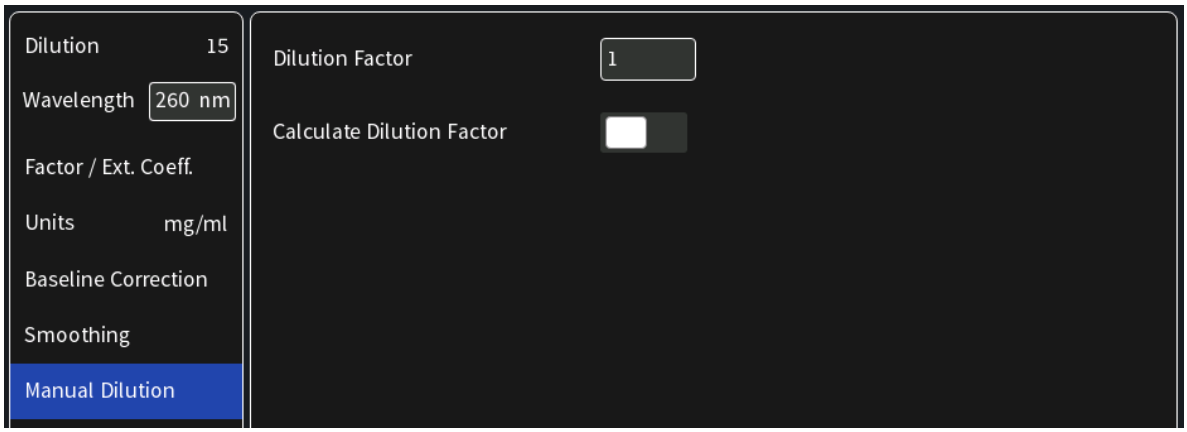


10. Baseline correction is set off by default. Enabling the baseline corrections shows a list with different wavelength options: 377 nm, 604 nm, 650 nm, 770 nm* and 823 nm* (**>650 nm wavelengths only available in combination with Performance package*). Option to enter any wavelength between 200 nm and 650 nm (*up to 900 nm with the Performance package*).

6. Option to smooth the graph with different boxcars. Options: Off, 1 = boxcar 11 (default), 2 = boxcar 21 and 3 = boxcar 61



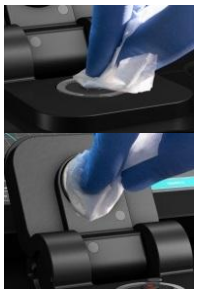
7. Option to set/calculate a dilution factor for manual diluted samples.



8. Apply the blank ddH_20 or buffer to the illuminated sample window on pedestal for the reference measurement and select blank to initiate the reading.
Note: The illumination of the sample window can be switched off in the preferences.

9. Use a lint-free laboratory wipe to clean both the sample window on pedestal and mirror in lid arm prior to applying the next sample.

Note: It can be helpful to apply the blank a second time and read it as a sample to ensure a proper blank.



10. Apply sample to the sample window on pedestal and press the sample button to initiate the measurement.

CALCULATIONS

In this method, the concentration of the sample is calculated based on the Beer-Lambert law given the user specified wavelength of interest and user defined extinction coefficient. The equations for calculating concentration without background correction are as follows:

Without background correction:

$$C = A_n * \varepsilon * Đ$$

C	Concentration (ng/µl)
A_n	Absorbance at user specified path length n (10 mm path)
Đ	Dilution factor
ε	extinction coefficient/factor

MORE APPS: STANDARD CURVE*

**The Standard Curve application is only available with the Applications extension package.*

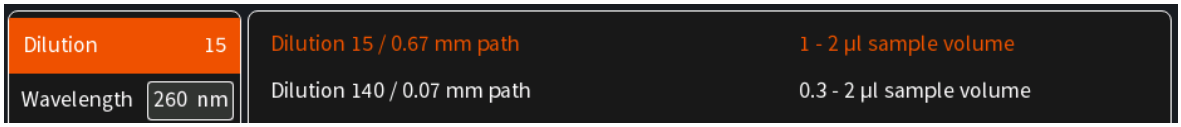
METHOD OVERVIEW

The construction of a calibration curve from multiple standards of known concentrations can be created and stored on the NanoPhotometer® N30-Touch. The standard curve can be used to quantify samples of the same type with unknown concentrations. This application provides an extremely useful tool with which to integrate, expedite and simplify the measurement and calculations involved in determining the concentration of analytes in unknown samples. If a zero concentration standard is required, include it in the number of standards to be entered using a reagent blank and entering 0.00 for concentration.

MEASUREMENT PROTOCOL

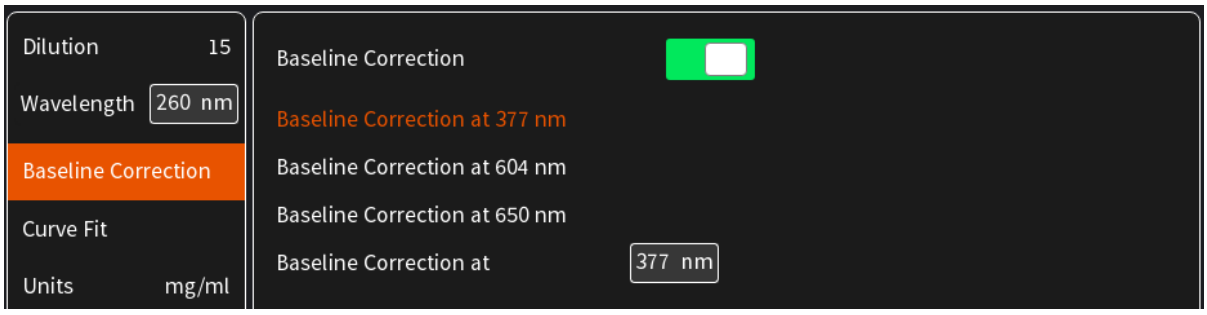
1. Select the More Apps icon from the home screen and the Standard Curve icon from the More Apps screen.

2. Select the dilution depending on the sample concentration

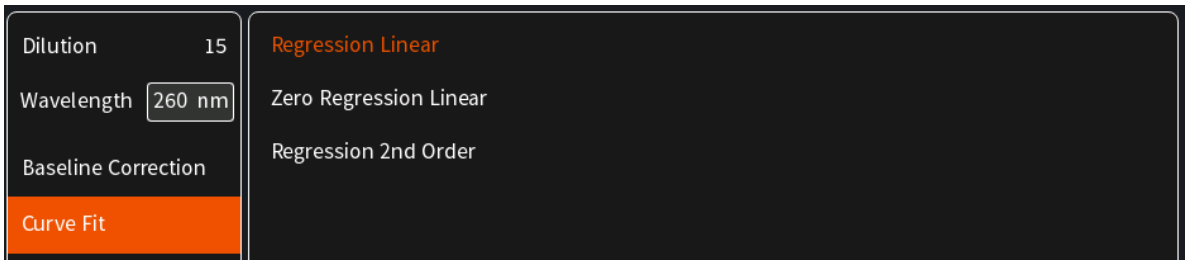


Note: There is no automatic path length setting in this method. Select either a virtual dilution of 15 (path length 0.67 mm) or of 140 (path length 0.07 mm).

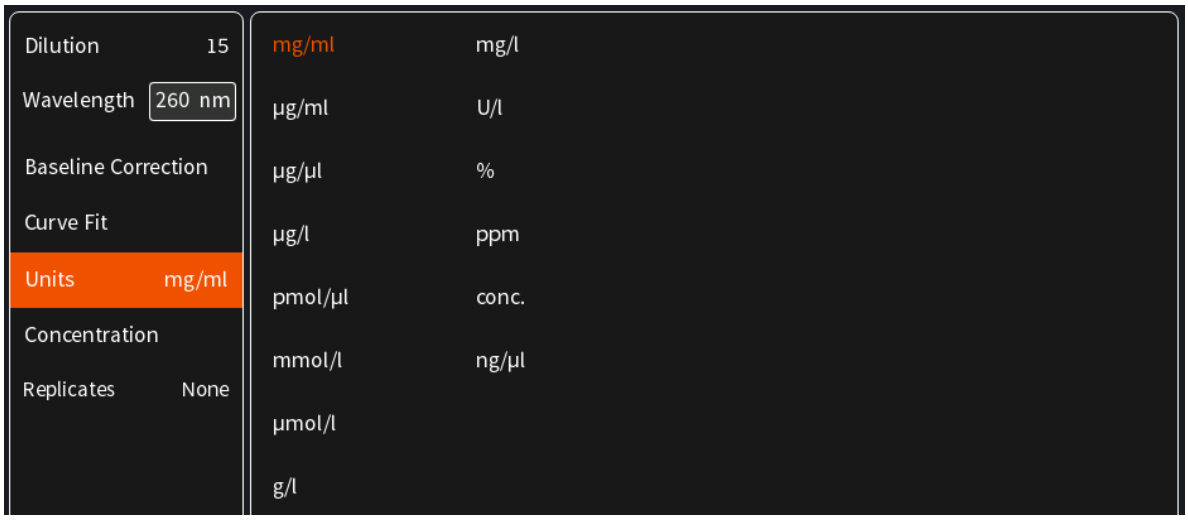
3. Baseline correction is set off by default. Enabling the baseline corrections shows a list with different wavelength options: 377 nm, 604 nm, 650 nm, 770 nm* and 823 nm* *(* >650 nm wavelengths only available in combination with Performance package*). Option to enter any wavelength between 200 nm and 650 nm (*up to 900 nm with the Performance package*).



4. Select the curve fit type: Options are linear regression, zero regression (forces the straight line through the origin) and 2nd order regression.

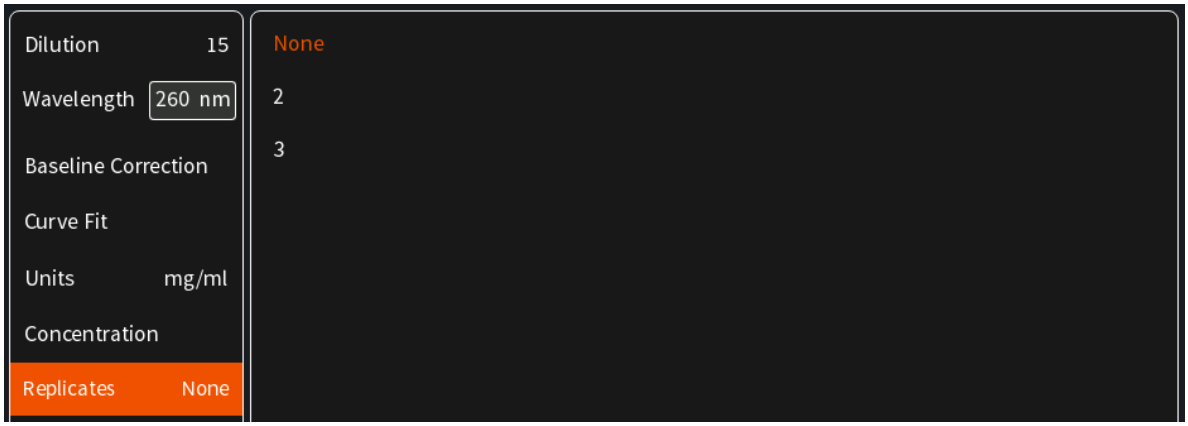


5. Select Unit



6. Add up to 20 Concentrations by pressing the Add Concentration button. Added concentrations can be deleted with ⊗
Enter the concentrations of the standard curve.

7. Select Replicates none, 2 or 3



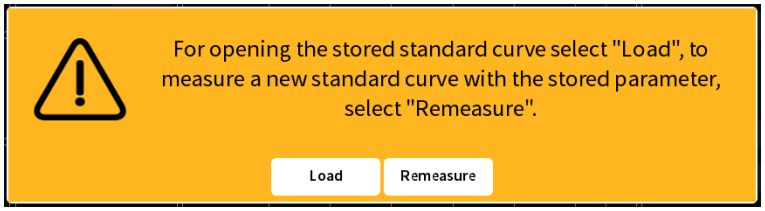
8. Once Standard curve is created or loaded it will be used for concentration calculations in the method. It might be necessary to do a blank measurement.

9. Apply sample and press the sample button to initiate the measurement. **Note**: Once the sample measurement is initiated it is not possible to make changes to the standard curve.

SAVING AND LOADING STANDARD CURVES*

**Connectivity package.*

It is possible to save measured standard curves as a Stored Method. To save the standard curve push the store method button and enter a method name, select a folder and save with the Store button.
Methods can be opened in the Stored Methods menu on the home screen. Opening a saved Protein Assay method shows a message with the option to load or remeasure the standard curve.



CALCULATIONS

Concentration is determined via the absorbance values provided by the standard curve based on the curve fit selection including the following options: linear regression, zero regression and 2nd order regression.

CUSTOM APPS*

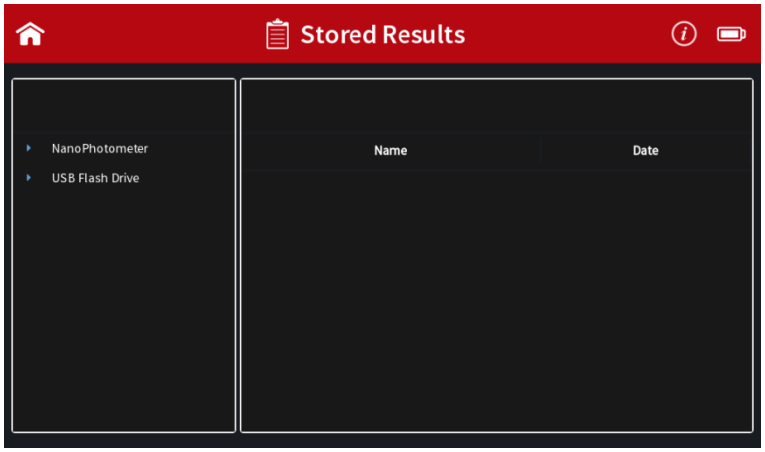
**The Custom Apps feature is only available with the Applications extension package.*

There is an option for designing customer specific Custom Apps which can be loaded to the NanoPhotometer® N30-Touch. For more information about designing custom applications to suit individual research needs please contact Implen directly for assistance.

STORED RESULTS*

**The Stored Results feature is only available with the Connectivity extension package.*

The Stored Results icon opens a directory of folders containing files of results that have been previously saved.



On the left side of the screen all available directories/storages are shown: NanoPhotometer®, Control Device, Network and/or USB flash drive (depending on availability). By tapping on a storage folder the subfolders of this storage folder will be shown on the left side and the individual files on the right side. On the right side of the screen all saved result files of the selected folder are shown and can be opened by a long or double click.

Folders can be deleted, renamed, moved or copied by pressing the icon. It is also possible to delete, rename, move or copy files by pressing the icon.

The file path of the selected folder is shown on the top of the right file area.

Note: PDF and Excel files cannot be opened on the NanoPhotometer® N30-Touch. Files need to be transferred to a computer or device where Excel or a PDF reader is installed.

Note: Control device is only available on computer, tablets and smartphones not on the NanoPhotometer® N30-Touch version of the software.

For data transfer via Ethernet or Wi-Fi® see page 30 Data Transfer.

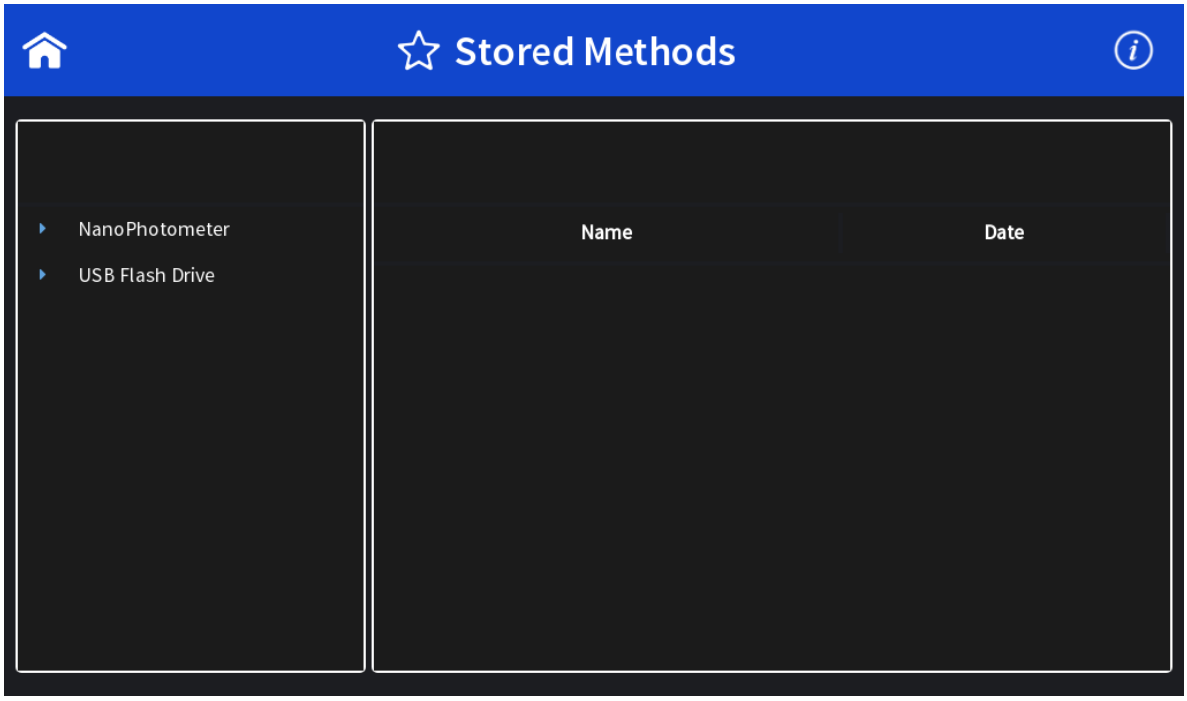
Backup copies are saved in the Autosave folder of the NanoPhotometer® N30-Touch (Stored Results/NanoPhotometer/Autosave) for up to ten days. After ten days the autosave files are automatically moved to an autosave archive folder. The autosave archive folder can only be accessed via NanoPhotometer® N30-Touch file server. Data in the autosave archive folder are not automatically deleted.

The content of the Autosave Archive folder can be deleted via the action button in Stored Results. Make sure that a backup is created before deleting the Autosave Archive folder content.

STORED METHODS*

**The Stored Methods feature is only available with the Connectivity extension package.*

The stored methods icon opens the directories of folders containing methods stored by the user.



On the left side of the screen all available directories/storages are shown: NanoPhotometer®, Control Device, Network and/or USB flash drive (depending on availability). By tapping on a storage folder, the subfolders of this method folder are shown on the left side and the individual files on the right side. On the right side of the screen all saved method files of the selected folder are shown and can be opened by a long or double click. On the top of the right area the file path of the selected folder is shown.
New folders can be created by pressing +. Folders can be deleted, renamed, moved or copied by tapping the ⍐ icon. It is also possible to delete, rename, move or copy methods by tapping the ⍐ icon.

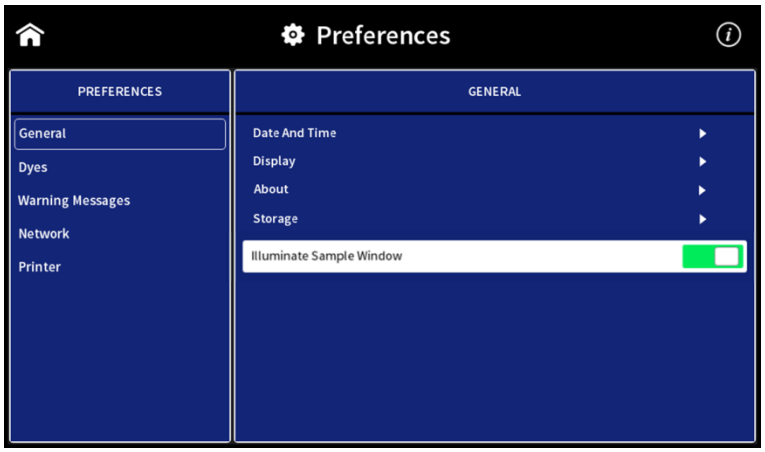
5. PREFERENCES

System preferences can be set by selecting preferences on the home screen. The preferences menu includes: General, Dyes, Warning Messages, Network, Printer and CFR21. The preference options of the selected menu item are listed in the window on the right.

Note: Preferences are not available on smartphones with screen sizes less than 7 inches.

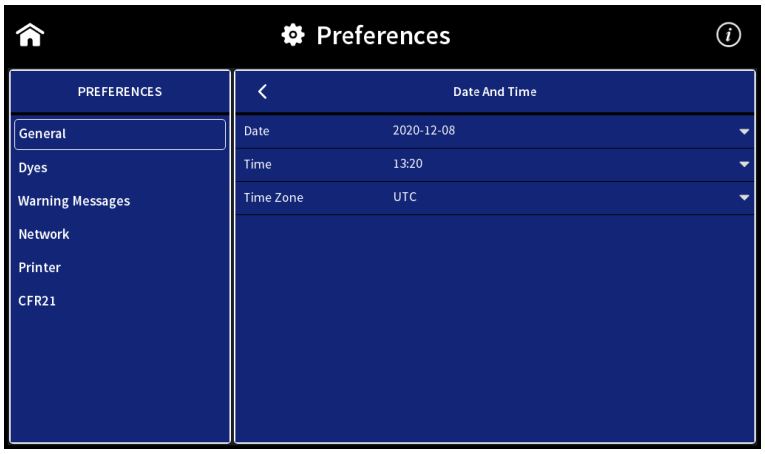
GENERAL

Selecting General in the Preferences menu opens a window to the right of the preferences menu with the following options: Date and Time, Display, About, Storage and Illumination Sample Window.



DATE AND TIME

Within the Date and Time it is possible to set the actual date and time of the NanoPhotometer® N30-Touch or change the time zone.

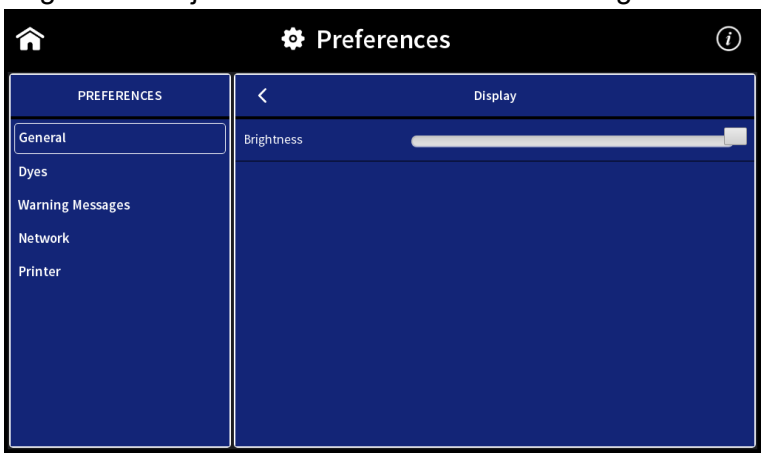


To change the time zone or the date and/or time, push on the appropriate field to open the selection options. The changed settings are shown below the time zone field. To apply the changes, the NanoPhotometer® N30-Touch must be rebooted. Start the reboot by pressing the Set and Reboot button.

Note: Do not change the date and time at the same time as the time zone. Make sure that the UTC time is set correctly before changing the time zone.

DISPLAY

Brightness: adjustment of the built-in screen brightness



ABOUT

In About the following information of the NanoPhotometer® N30-Touch are shown: NanoPhotometer® Version, Serial Number, Ethernet IP Address, Wi-Fi® IP Address, Hardware Version, Firmware Version, Time & Date of Initialization Test and Status of Initialization.

STORAGE

Shows the total storage capacity and the free space of the internal NanoPhotometer® N30-Touch storage (*64 GB onboard storage space only available as part of the Connectivity extension package*).

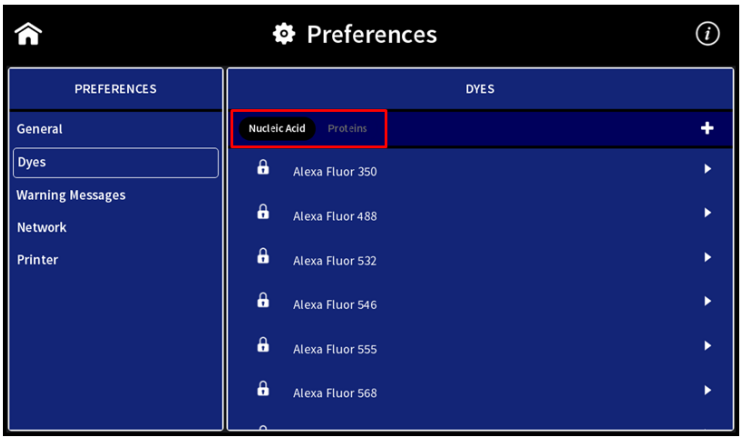
ILLUMINATION SAMPLE WINDOW

Toggle switch to switch on/off the illumination of the sample window.

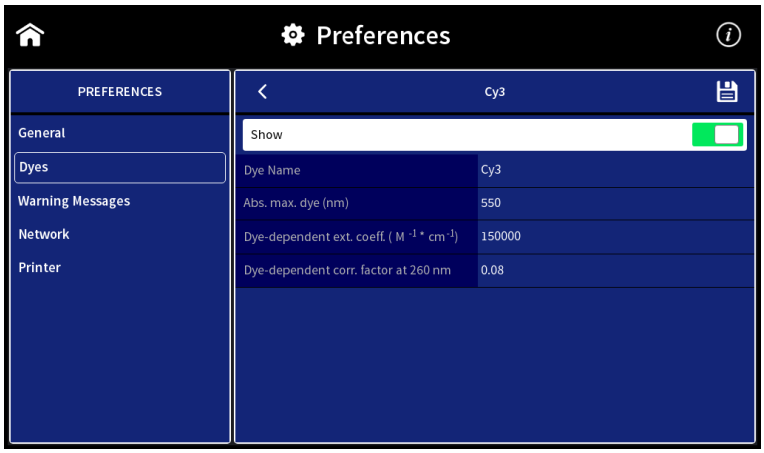
DYES*

**Dye measurements (<650 nm) only available with the Applications extension package.*
**Dye measurements (>650 nm) only available with the Applications and Performance extension packages used in combination.*

There is a list of preprogrammed dye-labels for both nucleic acid dyes and protein dyes. To toggle between the nucleic acid and protein list push on the Nucleic Acid/Protein buttons in the header.

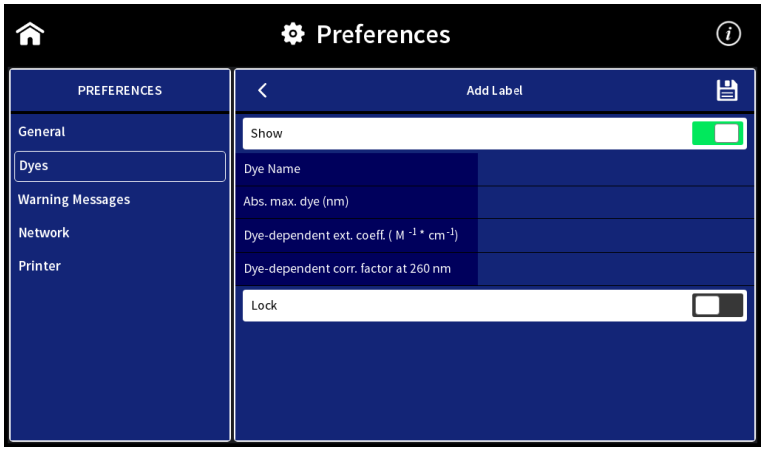


Each dye has either a lock icon (🔒) in front of the dye name indicating that the dye is locked and cannot be changed or a delete symbol (🗑). The delete option is only available for unlocked and not preprogrammed dyes.
Selecting a dye name opens a new screen with the dye information: dye name, absorbance maximum dye (nm), dye-dependent extinction coefficient ε_{dye} ($M^{-1} * cm^{-1}$), and dye-dependent correction factor as well as the option to show the dye in the parameter list of the application (Nucleic Acid or Protein UV).



Note: It is not possible to delete a dye from the default factory list; custom dyes can be deleted if they are not locked.

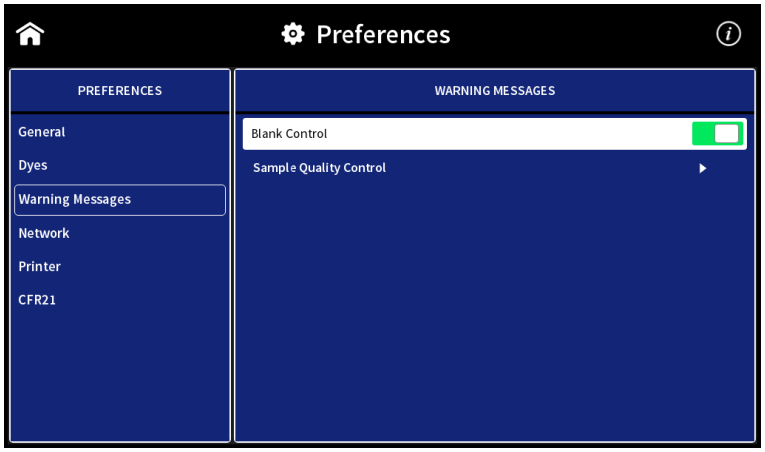
It is possible to add a new dye to the list by selecting the + button to add a new dye. A window will open where it is possible to enter the: dye name, dye absorbance maximum (nm), dye-dependent extinction coefficient ε_{dye} ($M^{-1} * cm^{-1}$), and dye-dependent correction factor. There is a toggle switch available to lock the dye to prevent deleting a dye from the dye list accidentally.



WARNING MESSAGES

BLANK CONTROL

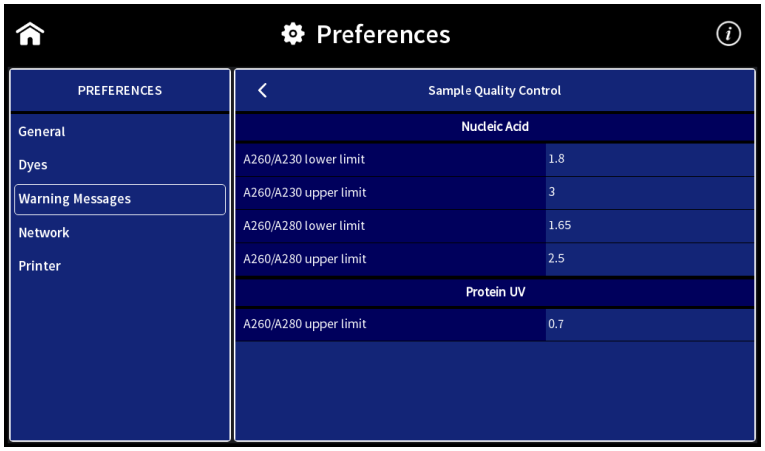
Toggle switch to switch on/off the Blank Control™ of the NanoPhotometer® N30-Touch.
Note: Blank Control™ is available for all NanoVolume methods.



SAMPLE QUALITY CONTROL

It is possible to change the upper and the lower limit of the ratio alert warning messages.
Default values for nucleic acid ratios are:
260/230 ratio 1.8 A - 3 A and 260/280 ratio 1.65 A - 2.5 A.

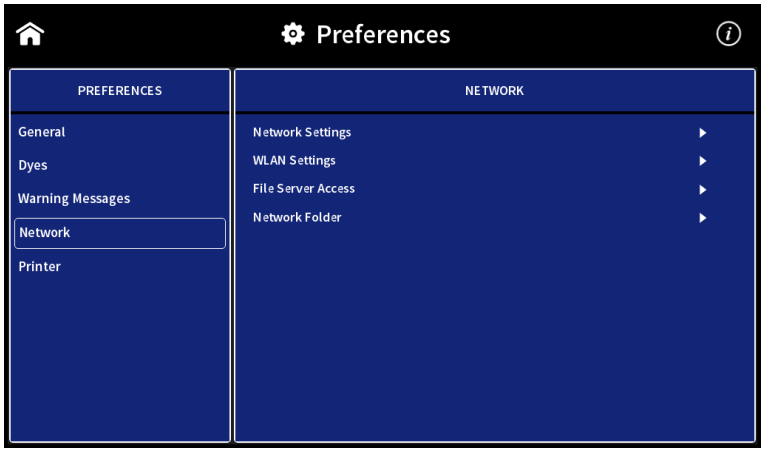
Default value for Protein UV ratio is:
260/280 ratio is 0.7 A.



NETWORK*

**Network functions are only available with the Connectivity extension package.*

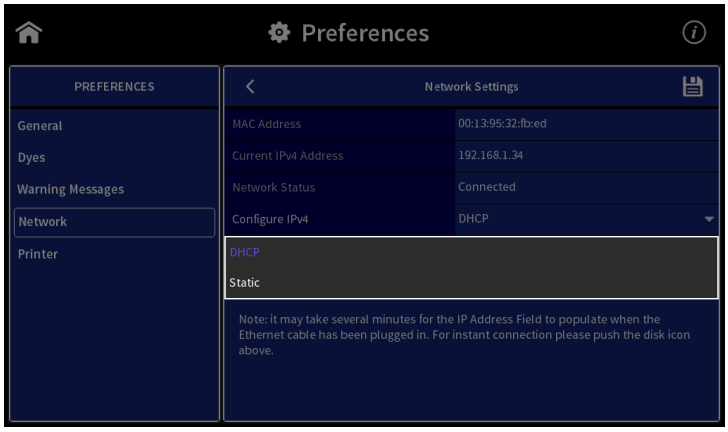
Selecting Network in the Preferences menu opens a window to the right of the preferences menu with the following options: Network Settings, WLAN Settings, File Server Access and Network Folder.



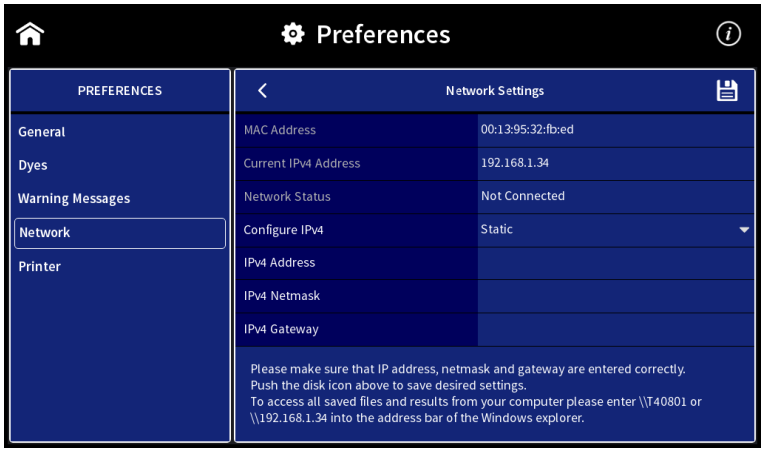
NETWORK SETTINGS*

**Network functions are only applicable to the Connectivity extension package.*

In Network Settings it is possible to choose between a Dynamic Host Configuration Protocol (DHCP) and a static network configuration. The DHCP protocol is used by default. Connect the NanoPhotometer® N30-Touch with the Ethernet and the IP is automatically set during the startup of the NanoPhotometer® N30-Touch. If no IP Address is listed for Current IPv4, push the disk icon (🖴) to search for an available IP address.



For static IP configuration select Static in the Configure IPv4 dropdown and enter the IPv4 address, netmask and gateway then confirm with disk icon (💾).

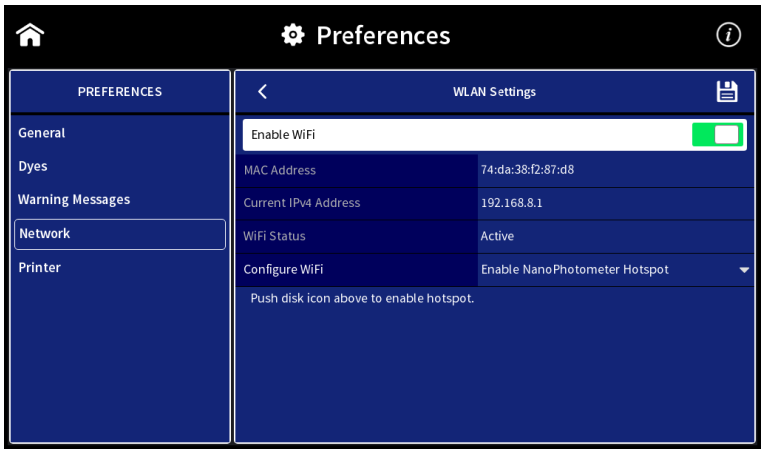


WLAN Settings*

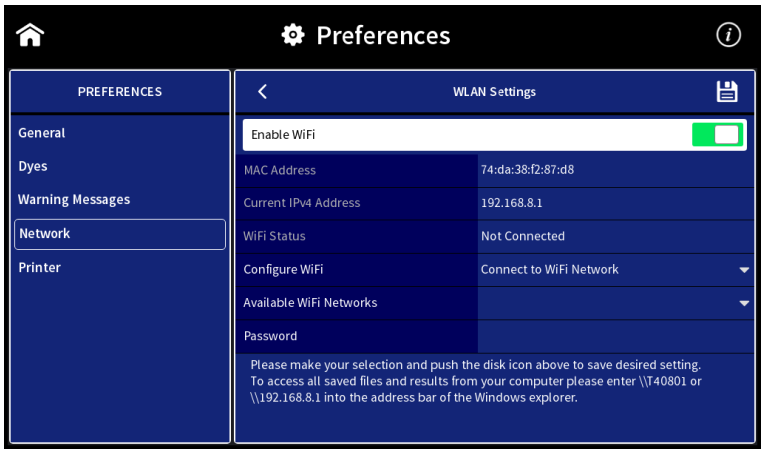
**WLAN/Wi-Fi®/Wi-Fi® Hotspots are only available with the Connectivity extension package.*

The WLAN Setting preferences allow the user to switch off the Wi-Fi® or to set up a Wi-Fi® Hotspot (Wi-Fi® Access Point) or a Wi-Fi® network.

To set up a Wi-Fi® Hotspot select “Enable NanoPhotometer Hotspot” in the dropdown and press the save icon. The Wi-Fi® Hotspot can be used to connect a computer, Android smartphone/tablet, iPad or iPhone via Wi-Fi® to the NanoPhotometer® N30-Touch.



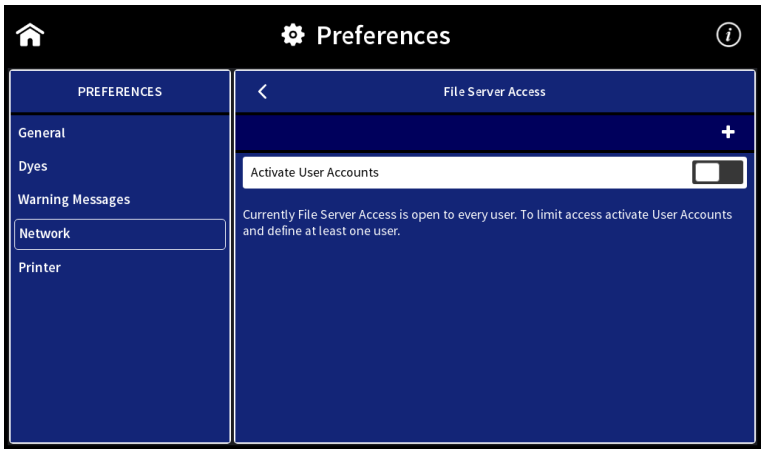
To set up a Wi-Fi® network select “Connect to Wi-Fi® Network” in the dropdown. Select an available Wi-Fi® network from the dropdown list or choose other for hidden networks and enter the password. Confirm with the disk icon (🖫).



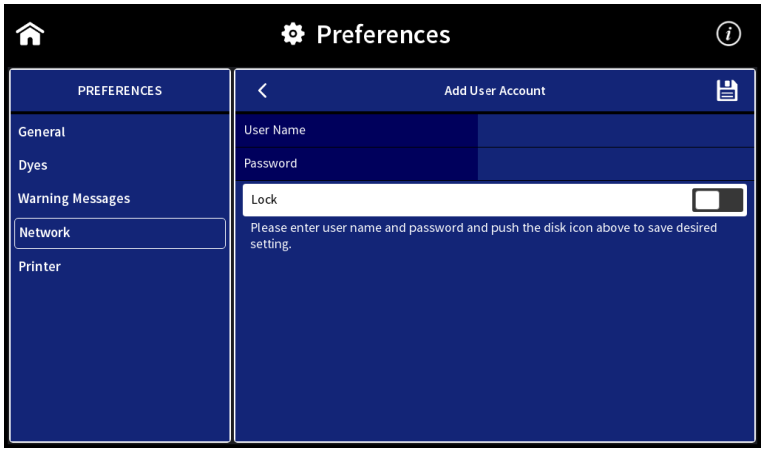
File Server Access*

**Available only with the Connectivity extension package.*

The File Server Access preferences allow creating user accounts to limit the access to the NanoPhotometer® N30-Touch file server via network. By default, access to the file server is open to any user. It is necessary to create at least one user account to activate the file server access option.



To create a user account push on the + button and enter a user name and password. Confirm with the disk icon (🖫).

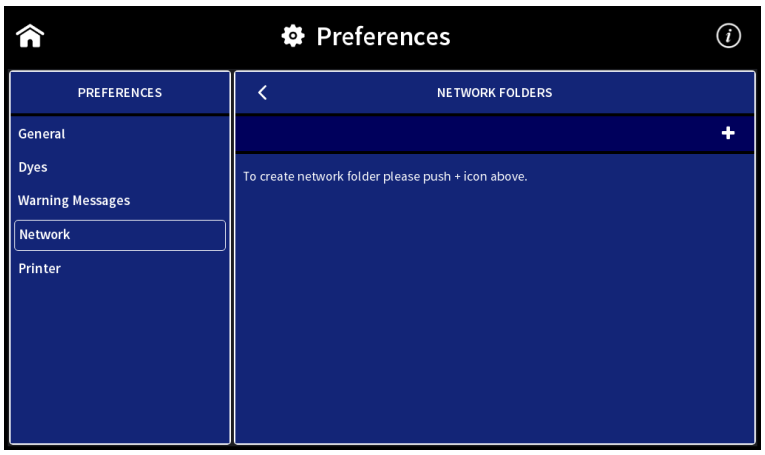


Note: Allowed characters for user name are: A…Z a…z 0…9 _ -
Do not use Blank character.

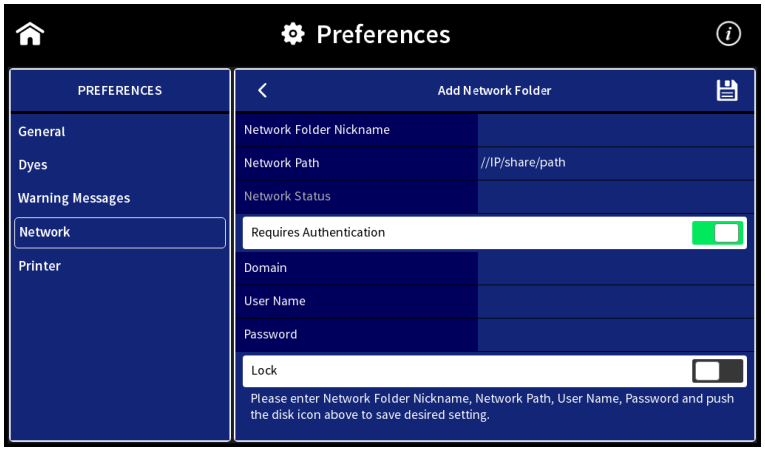
NETWORK FOLDER*

**Available only with the Connectivity extension package.*

The network folder preferences allow creating network folder for saving data directly from the NanoPhotometer® N30-Touch to a network folder.



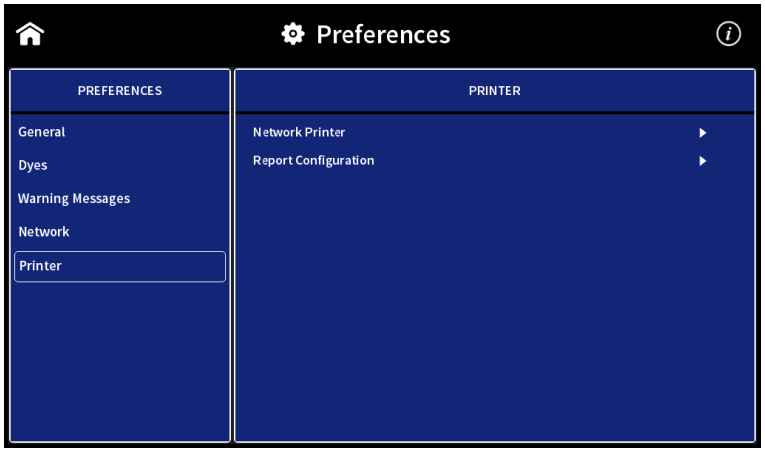
To add a network folder push the + icon and enter network folder nickname and network path of the network folder. If the local network requires authentication enter user name and password for login and if necessary the domain. To save the Network folder press the disk icon (🖫).



PRINTER*

** Printing features are only available with the Connectivity extension package.*

Selecting Printer in the Preferences menu opens a window to the right of the preferences menu with the following options: Network Printer and Report Configuration.



NETWORK PRINTER*

**Printing features are only available with the Connectivity extension package.*

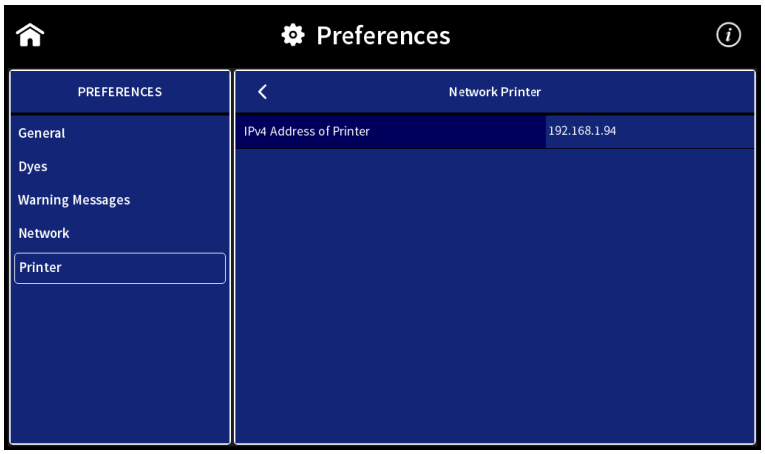
It is possible to print via network (Ethernet) or AirPrint® / IPP compatible (supporting PDF format) printers in the network.

Note: IPP version 2.2 is required and some printer configuration settings might need to be changed in order to allow communication with the NanoPhotometer® N30-Touch.

Enter the IP of the network printer to the input window.

Note: For printing on network printer the NanoPhotometer® N30-Touch needs to be connected to the network either via Ethernet (LAN cable) or Wi-Fi® network.

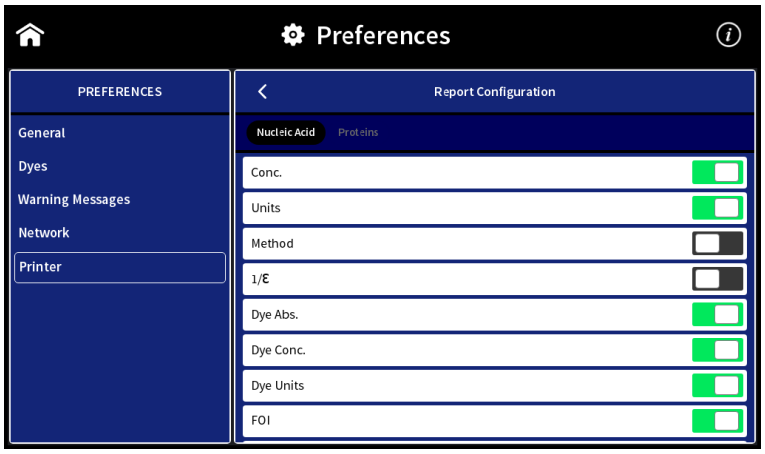
Note: If a printer is directly connected to the NanoPhotometer® N30-Touch via USB, this printer will have the highest priority and will be the printer used by default when selecting Print on NanoPhotometer® N30-Touch. In order to print utilizing a printer on the network, please disconnect the installed USB printer.



REPORT CONFIGURATION

**Report configuration feature is only available with the Connectivity extension package.*

In report configuration it is possible to define the table columns of PDF files and A4 printouts. This feature is available for the methods Nucleic Acids and Protein UV. To toggle between the nucleic acid and protein list push on the Nucleic Acid/Protein buttons in the header.



6. TROUBLESHOOTING

INITIALIZATION TEST

The NanoPhotometer® N30-Touch initialization test is performed automatically every time the instrument is powered on. If the instrument passes the initialization test the home screen is shown. If the instrument does not pass the test, a message window will appear explaining the reason for the failed test along with the recommended solution. If the ok button is selected, the window is closed and the home screen will be shown. Initialization failed will be displayed on top of all method screens. If the initialization test fails please contact the Implen Support Team.

MESSAGES

The software gives three different kind of messages: confirmation (green), warning (yellow) and alert (red)
Confirmation messages are shown e.g. after the initialization test has passed successfully or if files or folders are copied or moved successfully. These messages are self-explaining and not listed in the user manual.

IMPORTANT WARNING MESSAGES:

Message Text	Explanation/Solution
Air bubble, lint residue or bad sample. Please reapply sample.	Air bubble recognition is on and has detected either an air bubble, lint residue or a bad sample like e.g. a turbid sample. Check sample, clean the sample window on pedestal and mirror in the lid arm thoroughly and reapply sample carefully. To avoid air bubbles apply sample by reverse pipetting.
Another control device is currently connected.	Message is shown on a control device when another control device is currently connected with an open measurement session. Please close method on control device.
High absorbance at 250-280nm, 280-340nm, 340-400nm, 400-475nm, 475-550nm, 550-625nm, 625-650nm. Bad Blank or insufficient cleaning.	The warning message is shown when a blank measurement detects a significant absorbance a potential area of interest. The warning message shows the wavelength range where the absorbance is appearing. Two things can cause high absorbance in a blank measurement: either the blank solution/buffer has an absorbance in this wavelength range or the sample window on pedestal and the mirror in the lid arm was not cleaned properly after the last reading. Clean the sample window on pedestal and the mirror in the lid arm thoroughly and check the blank solution for absorbance (Use water for blank and measure the blank buffer as sample).
Instrument connected to control device! Do you really want to intercept?	This message is shown on the NanoPhotometer® N30-Touch when a method is open on another control device. Push on OK and the measurements session is interrupted and the data are saved in the

	auto save folder.
Lint residue or bad sample. Please reapply sample.	Displayed when Air Bubble Recognition is off. Software has detected either a lint residue or a bad sample like e.g. a turbid sample. Check sample, clean the sample window on pedestal and mirror in the lid arm thoroughly and reapply sample carefully.
Maximum absorbance level at specified wavelength reached. Calculations may lead to low/wrong results.	The concentration of the sample used is too high and exceeds the specified absorbance range. Maximum absorbance is 330 A (10 mm path). Dilute sample and measure again.
Maximum level exceeded.	This message is shown when for example, too many dyes or wavelength are added with the Add + button. It is possible to add up to 20 dyes or wavelengths.
Measurement currently in progress. Please close method on device.	Displayed when there is an open measurement session on the NanoPhotometer® N30-Touch and the user is trying to connect via a control device (phone, tablet or computer). In order to move forward with connection of control device, please close method on NanoPhotometer® N30-Touch.
No printer present.	Printer connection is lost. Please check printer connection. If it is still not working go back to home screen reconnect the printer and wait for 30 seconds. If the message still appears please create a log file and send it to Implen customer support.
Sample concentration too low for 0.3 µl - change volume and parameter settings to 1 µl	The measurement parameters for 0.3 µl NanoVolume samples read only the 0.07 mm path length (dilution 140). The utilized sample concentration is too low. Please use 1 µl of the sample and change the volume setting to 1-2 µl. Minimum concentrations for the 0.07 mm path length for dsDNA 420 ng/µl and for BSA 12.6 mg/ml.

IMPORTANT ALERT MESSAGES:

ERROR: Lid open - please close lid.	Lid arm is open during initialization test. Close lid arm and confirm with OK.
Firmware not found - **NPOS.bin** must be in root folder of USB flash drive	Make sure that the file name is NPOS.bin without any additions or extensions like from multiple downloads, otherwise rename file to NPOS.bin exactly. NPOS.bin file must be in the root folder of the USB flash drive. Make sure that the NPOS.bin file for installation has a higher software version than the installed one. NPOS software is not downward compatible.

Firmware not found - **NPOSX.bin** must be in root folder of USB flash drive	NPOSX.bin file must be in the root folder of the USB flash drive. If necessary unzip the downloaded installation file. The file name should not have any additions or extensions like from multiple download. Do NOT rename an NPOS.bin to NPOSX.bin. Make sure that the NPOS.bin file for installation has a higher software version than the installed one. NPOS software is not downward compatible.
Initialization failed – problem with optical path. Please contact Implen customer support.	Clean the sample window on pedestal and the mirror in the lid arm with 70% EtOH and distilled water then reboot the NanoPhotometer® N30-Touch. If the message still appears please create a log file and send it to Implen Customer Support.
Initialization failed 51/52/53/54/55. Please contact Implen customer support.	Possible hardware failure. Please create a log file and send it to Implen Customer Support.
Initialization failed. Please contact Implen customer support.	Clean the sample window on pedestal and the mirror in the lid arm with 70% EtOH and distilled water and then reboot the NanoPhotometer® N30-Touch. If the message still appears please create a log file and send it to Implen Customer Support.
NanoVolume head not clean! Please clean sample windows thoroughly.	Clean the sample window on pedestal and the mirror in the lid arm with 70% EtOH and distilled water and then reboot the NanoPhotometer® N30-Touch. If the message still appears please create a log file and send it to Implen Customer Support.
No connection possible	Connection is lost between control devices and NanoPhotometer® N30-Touch. Check the connection. If the message still appears please create a log file and send it to Implen Customer Support.
Server Not Available	Internal software communication problem during an open measurement session. Reboot the NanoPhotometer® N30-Touch. If the message still appears please create a log file and send it to Implen Customer Support.
Server Side Failure	Internal software communication problem during an open measurement session. Reboot the NanoPhotometer® N30-Touch. If the message still appears please create a log file and send it to Implen Customer Support.
Software update failed. Please contact Implen customer support.	Make sure that the file name is NPOS.bin without any additions or extensions like from multiple downloads, otherwise rename file to be NPOS.bin exactly. NPOS.bin file must be in the root folder of the USB flash drive. Try the update a second time, if it still fails please create a log file and send it to Implen Customer Support.

SYSTEM FREEZE

In case of harsh ESD impulses it could happen that the device does freeze or switch-off. Please wait first about 30 sec to see if the system recovers automatically itself. If there is no reaction please press the power key at the instrument rear 4 sec to switch-off and then again shortly to restart the system.

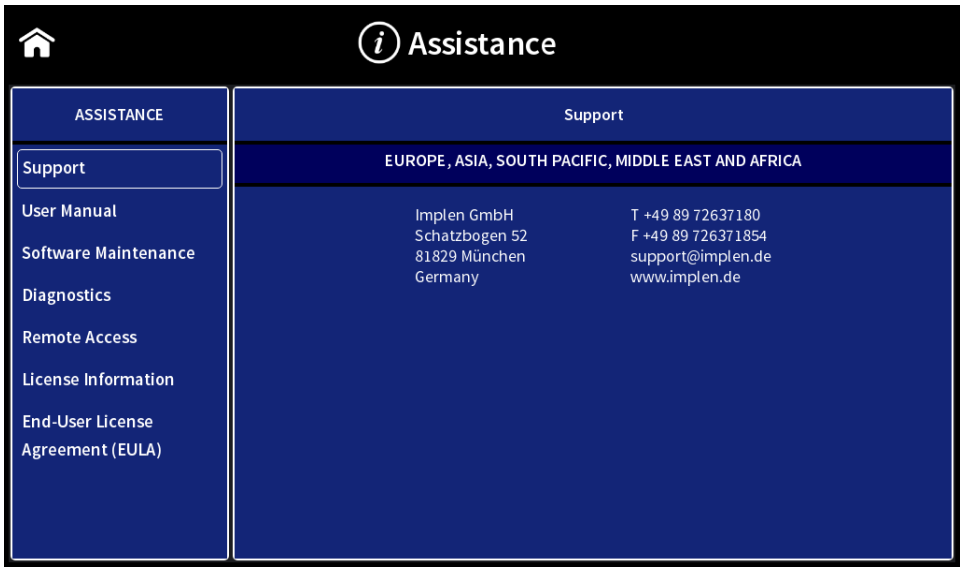
7. ASSISTANCE

The Assistance menu includes: support, report a problem (only available for tablet and computer versions), user manual, software maintenance, diagnostics and legal as functions to help with any technical issues or questions that may arise with the NanoPhotometer® N30-Touch.

Note: Assistance is not available on smartphones with screen sizes less than 7 inches.

SUPPORT

Selecting support on the left side assistance menu will show the available options for contacting Implen.



REPORT PROBLEM

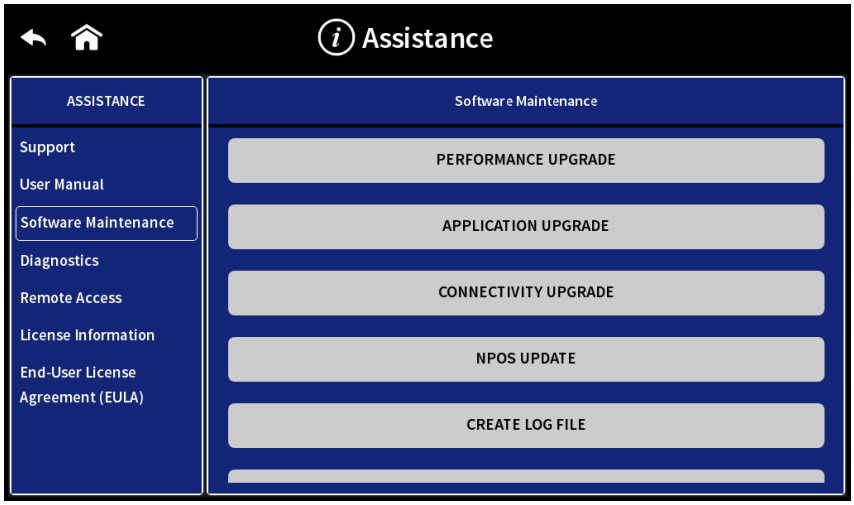
The function to report a problem is only available for computer and tablet versions. Selection of Report Problem in the assistance menu, a form with the following information is shown on the right side: first name, last name, phone number, email, and country. A dropdown menu provides the option to select the type of problem and includes the following choices: error message, software, firmware, measurements, and other. It is possible to enter a question or comment at the end of the form. Once the form is completed and the send button is selected a message will be sent directly to Implen and the appropriate support person will contact the end user as soon as possible to provide further support.

Note: The report a problem function is only available for computer and tablet versions.

USER MANUAL

The current user manual can be downloaded using the QR code or download link.

SOFTWARE MAINTENANCE



UPGRADE N30-TOUCH WITH EXTENSION PACKAGES

To upgrade the N30-Touch a license key is necessary.

Upgrade steps:
- Save the NPOS.lic (license file) into the root folder of a USB flash drive
- Insert the USB flash drive into the NanoPhotometer® N30-Touch
- Select Assistance/Software Maintenance
- Start the upgrade with the “Performance/Applications/Connectivity Package” button
- NanoPhotometer® N30-Touch reboots. After the reboot the full extension package is available.

For further information about the upgrade license keys and quotation please get in contact with the Implen team at info@implen.cn or visit www.implen.cn/nanophotometer-n30-upgrades.

NPOS UPDATE

Download the firmware update file (zip folder) from the Implen homepage: www.implen.de/downloads/ and unzip the file into the root folder of a USB flash drive.

Note: Do not change the file names of the unzipped installation files.
Note: Save all data on the NanoPhotometer® N30-Touch before updating.
Note: Make sure that the NanoPhotometer® N30-Touch is connected to power and that the power connection is not interrupted during the update**.**

It is recommended to do the update via the built-in touchscreen. If the touchscreen is not available it is also possible to do the update via computer or tablet (only available with the Connectivity extension package). In this case it is necessary to relaunch the NanoPhotometer® Go software after the reboot of the NanoPhotometer® Go. For tablets the Wi-Fi® connection needs to be reconnected.

Note: Always update the firmware of the NanoPhotometer® N30-Touch first and then update the client software (PC/Mac, smartphone, and tablet) (only available with the Connectivity extension package).

Update procedure:
1. Unzip the installation file to a USB flash drive into the root folder
2. Insert in the USB flash drive to the USB port of the NanoPhotometer® N30-Touch
3. Select Assistance/Software Maintenance
4. Push on “Update” and wait until the NanoPhotometer® N30-Touch reboots

Note: Once you have updated the firmware of the NanoPhotometer® N30-Touch, please update the client software (PC/Mac, tablet, smartphone) (only available with the Connectivity extension package).

Create Log File

To create a log file insert a USB flash drive to the USB port of the NanoPhotometer® N30-Touch. Push on “Create Log File”. The log (NPOS.log) file will be saved on the root folder of the USB flash drive.

Factory Reset

There is an option to reset the instrument to factory settings. By selecting the reset button a window will open that says “Reset the NanoPhotometer®?” Selecting the cancel button will close the window without changing the settings and selecting reset will open a window that will ask again “Reset the NanoPhotometer® to factory settings? All data, stored methods and settings will be lost.” If it is confirmed the factory settings will be restored.

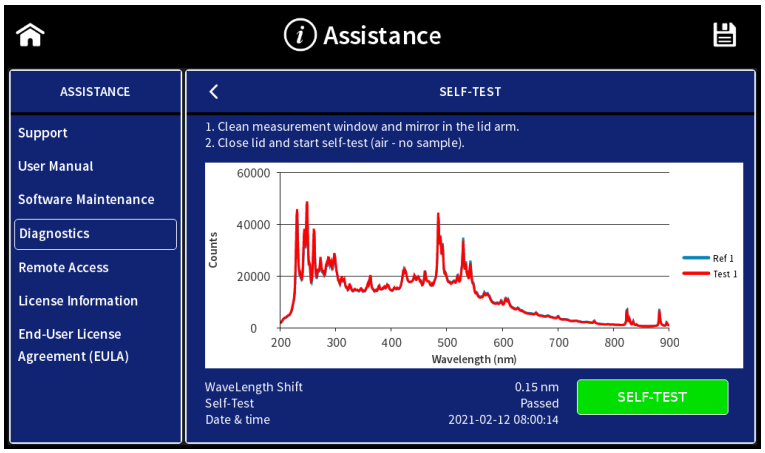
Note: All stored methods, settings and data on the NanoPhotometer® N30-Touch will be deleted if the reset option is executed.

Create Backup

Option to create backup file to recover data and settings of the NanoPhotometer® N30-Touch at a later date. To create a backup file insert a USB flash drive to the USB port of the NanoPhotometer® N30-Touch. Press “Create Backup”. The backup (NPOS.bak) file will be saved into the root folder of the USB flash drive.
In the case a NanoPhotometer® N30-Touch recovery is necessary please get in touch with the Implen support team (support@implen.de).

DIAGNOSTICS

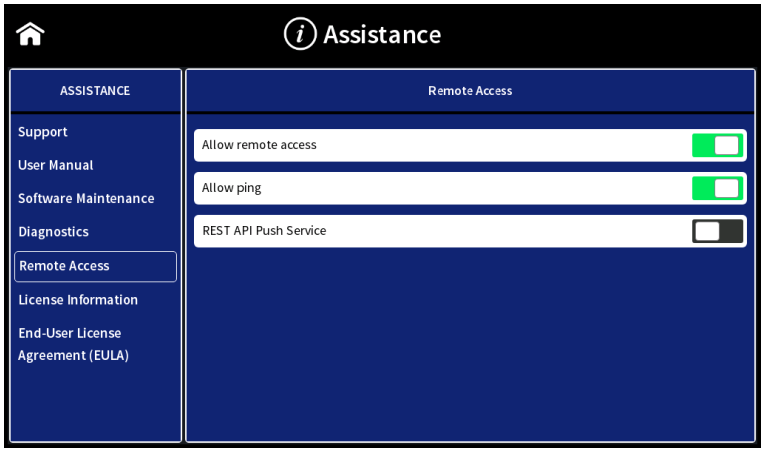
Diagnostics offers the possibility of performing the self-test without rebooting the NanoPhotometer® N30-Touch. Make sure that the measurement head is clean and no sample is applied and push the self-test button to start the self-test. As result reference and signal counts and the wavelength shift are shown. If the self-test is fails, please contact the Implen support (support@implen.de).



REMOTE ACCESS*

**Remote Access feature is only available with the Connectivity extension package.*

Option to enable remote access, ping and Rest API Push Services.



Remote access and ping are active after booting the NanoPhotometer® N30-Touch and are automatically switched off after 15 minutes. A renewed activation for remote access is possible for 30 minutes at a time. The activation of ping remains active until the next restart of the NanoPhotometer.

Rest API push service might be necessary for integration to LIMS systems. It is default off and can be switched on if necessary. It will stay active after switched on.

For further information contact the Implen support team (support@implen.de).

LICENSE INFORMATION

The NPOS software is Copyright of Implen and its affiliates. The NPOS software includes some open source software components under the licenses listed.

END-USER LICENSE AGREEMENT (EULA)

Shows the end-user license agreement.

TRADEMARKS

Windows is a trademark of Microsoft. AirPrint, Mac OS, OS X, iOS, iPhone and iPad are trademarks of Apple. Android OS is a trademark of Google. Linux is a trademark of Linus Torvalds.

CONTACT IMPLEN

There is an option to contact Implen for instruments connected to the internet. For any support issues and questions please contact the Implen team directly:

Europe, Asia, South Pacific, Middle East, Africa

Phone: +49 89 72637180
Fax: +49 89 726371854
Email: support@implen.de
Website: www.implen.de

Implen GmbH
Schatzbogen 52
81829 München
Germany

8. MAINTENANCE

MAINTENANCE FREE TECHNOLOGY

The NanoPhotometer® N30-Touch technology is maintenance free. Regular maintenance and calibration is not necessary.

For facilities that are working according to national as well as international guidelines and standards including: Good Laboratory Practice (GLP), Good Manufacturing Practice (GMP), or ISO9000-9004; the proper performance of the spectrophotometer has to be tested and proven on a regular basis with individually set intervals. Implen provides certified NanoPhotometer® N30-Touch secondary standards as an optional accessory. These NanoPhotometer® N30-Touch standard solution sets are suitable for the control and documentation of the wavelength accuracy and the photometric accuracy of your system. IQ/OQ documentation is also available. Please contact your local Implen office or an authorized Implen partner for further information.

Note: Further information on the secondary standards can be downloaded from the Implen website in the download area - quality control (https://www.implen.de/downloads/).

Support agreements that help to fulfill the demands of regulatory guidelines concerning GLP/GMP include: calibration certification using filters traceable to international standards (during production and quality control), certified engineers and calibrated test equipment, approved to ISO 9001 standard, automatic self-diagnostic calibration test during start of the NanoPhotometer® N30-Touch, result is documented in each data output file, and possibility to save a Implen Document Source (IDS) file (no data manipulation possible).

REPLACEMENT PARTS

- **Lamp Replacement**

The NanoPhotometer® N30-Touch is equipped with a xenon flash lamp with a lifetime of 10^9 flashes (up to 10 years). This lamp should not need replacement for several years. In the unlikely event the lamp does need to be replaced, this should be done by the manufacturer or a certified service engineer from your supplier.

- **Touchscreen Replacement**

The optional touchscreen can only be assembled or replaced by the manufacturer or a certified service engineer from your supplier.

CLEANING AND GENERAL CARE

Switch off the NanoPhotometer® N30-Touch and disconnect the power cord prior to external cleaning. Use a soft wet cloth or dry microfiber cloth to clean all external surfaces. A mild liquid detergent may be used to remove stubborn marks.

Approved disinfectant solutions include: Apesin disinfection spray (Tana Chemi GmbH), Incidin Liquid & Inciddin Foam (Ecolab), and Lysoformin Spezial (Lysoform Dr. Hans Roseman GmbH).
Note: Observe all necessary precautions if dealing with hazardous samples or solvents.

9. WARRANTY

Implen guarantees that the product supplied has been thoroughly tested to ensure that it meets its published specification. The warranty is as defined in our current terms and conditions and is only valid if the product has been used according to the instructions supplied. Implen or your supplier can accept no liability of loss or damage arising from the faulty or incorrect use of this product.

10. ALPHABETICAL APPENDIX