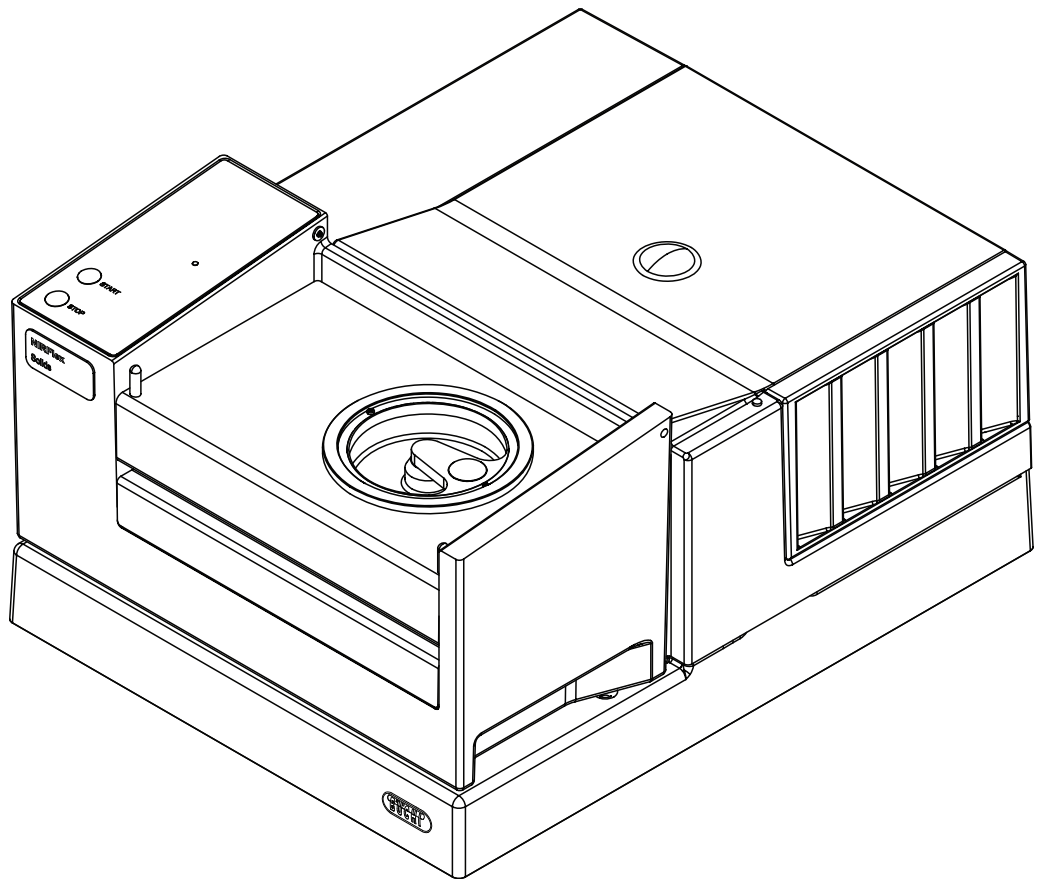




NIRFlex N-500

Technical data sheet

With its dedicated operator interchangeable measurement cells to accommodate many different sample types, the NIRFlex N-500 is a uniquely, flexible FT-NIR Spectrometer. Its Fourier Transform polarization technology guarantees the same superior performance across different environmental conditions; from laboratory to warehouse.



Scope of delivery

The following table depicts the most common package configurations by sample type and measuring mode.

	Basic Solids 001	Standard Solids 002	Advanced Solids 003	Basic Liquids 004	Standard Liquids 005	Advanced Liquids 006	Advanced Fiber Optic Solids 007	Advanced Fiber Optic Liquids 008	Advanced Solids Transmittance 010
NIRFlex N-500 Base Unit	•	•	•	•	•	•	•	•	•
NIRWare 1 Software CD incl. License Basic	•	•		•					
NIRWare 1 Software CD incl. License Advanced (CFR 21 Part 11)			•			•	•	•	•
NIRCal Calibration Software CD incl. License		•	•		•	•	•	•	•
NIRCal Toolbox CD incl. License		•	•		•	•	•	•	•
IQ/OQ Manual	•	•	•	•	•	•	•	•	•
Documentation Regulatory Compliance FDA/ EMEA			•			•	•	•	•

Measurement cell

	Basic Solids 001	Standard Solids 002	Advanced Solids 003	Basic Liquids 004	Standard Liquids 005	Advanced Liquids 006	Advanced Fiber Optic Solids 007	Advanced Fiber Optic Liquids 008	Advanced Solids Transmittance 010
Solids	•	•	•						
Solids transmittance*									•
Liquid				•	•	•			
Fiber optic solids							•		
Fiber optic liquids								•	

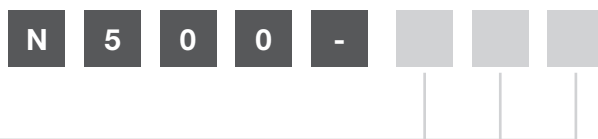
Add-Ons adapter

	Basic Solids 001	Standard Solids 002	Advanced Solids 003	Basic Liquids 004	Standard Liquids 005	Advanced Liquids 006	Advanced Fiber Optic Solids 007	Advanced Fiber Optic Liquids 008	Advanced Solids Transmittance 010
Petri dish	•	•	•						
Vial			•						
XL (irregular solid samples or transparent plastic bags)			•						
Tablet (reflectance measurement)			•						

* Sample plates should be ordered separately according to sample size and format

Order code

Choose the configuration according to your needs:



- 01 Basic Solids
- 02 Standard Solids
- 03 Advanced Solids
- 04 Basic Liquids
- 05 Standard Liquids
- 06 Advanced Liquids
- 07 Advanced Fiber Optic Solids
- 008 Advanced Fiber Optic Liquids
- 010 Advanced Solids Transmittance

Technical data

Base unit

Specification	NIRFlex N-500
Dimensions (W x D x H)	350 x 250 x 450 mm
Spectral range (if not specified differently for measuring cell)	800 - 2500 nm 12 500 - 4000 cm ⁻¹
Resolution (with boxcar apodization)	8 cm ⁻¹
Type of interferometer	Polarisation interferometer with TeO2 wedges
Wavenumber accuracy (measured with HF gas cell at an ambient temperature of 25 °C ± 5 °C)	± 0.2 cm ⁻¹
Signal-to-noise ratio	10000 (peak-to-peak noise of a linear corrected base- line)
Number of scans/sec.	2 - 4
Lamp type	Tungsten-halogen
Average life (lamp)	6000 h
Type of laser	12 VDC HeNe, wavelength at 632.992 nm
Analog digital converter	24 bit
Power consumption	350 W
Connection voltage	100 - 240 VAC ± 10 %
Frequency	50 / 60 Hz
Ethernet connection	100 Mbit/s

Measurement cells

NIRFlex Solids

Detector	Extended range InGaAs (temperature controlled)			
Operating temperature	5 - 35°C			
Sample holding accessories	Petri dish holder	Vial holder	XL* holder	Tablet holder
Sample dimensions	100 mm	10 - 15 mm	Adaptable	5 - 10 mm
Illumination spot diameter	9 mm	8 mm	9 mm	8 mm

*Customized XL Flow Cell for measurement of liquids in transreflectance available on demand. Functional principle

Background references applied	Petri dish holder	Vial holder	XL* holder	Tablet holder
Internal reference	•			
External reference	•	•	•	•
Max. number of samples per sequence	1	6	1	10
Measurement based on diffuse reflection**	•	•	•	•
Measurement based on transreflectance**	•			

**See Chapter "Measurement modes"

Compatible with	Petri dish holder	Vial holder	XL* holder	Tablet holder
Petri dishes	•			
High performance cup	•			
Unbreakable cup	•			
Vials		•		
Tablets				•
Small plastic bags			•	

NIRFlex Liquids

Sample temperature range	Ambient temperature plus 10 °C up to 65 °C
Reproducibility of set sample temperature	± 0.5 °C
Temperature overshoot	< 5 °C
Overheating protection, automatic switch-off	T > 90 °C
Detector	Extended range InGaAs (temperature controlled)
Diameter of measurement spot	2 mm
Type of cuvettes to be used*	Cuvettes 12.5 x 12.5 x 45 mm with path lengths of 1, 2 (standard), 5, and 10 mm using corresponding spacers
Time needed to achieve stable control of the set temperature	Ambient temperature to 65 °C: 15 min

*Disposable monouse glass vials available

NIRFlex Fiber Optic Solids/ Liquids/SMA

	Fiber Optic Solids/ SMA	Fiber Optic Liquids
Temperature range at probe tip	0 °C – 80 °C	0 °C – 150 °C
Max. pressure at the probe tip		6 bar
Detector	Extended range InGaAs (temperature controlled)	
Standard lengths of fiber optic probes	2 m, 3 m, 5 m*	2 m (available up to 7 m)
Path length	0.5 mm, 1.0 mm, 1.5 mm* (with transreflectance adapter)	2 mm (other path lengths available on request)
Number of optical fibers	> 560 (fiber bundle)	2 (single fiber)
Outer diameter of optical fibers	4 mm	600 µm
Time needed to achieve stable control of the set temperature	Ambient temperature to 65 °C: 15 min	

*Path length and length of glass fiber of SMA probes are customizable at convenience

Transreflectance adapter

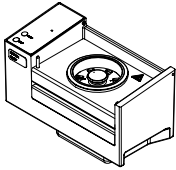
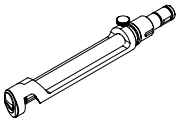
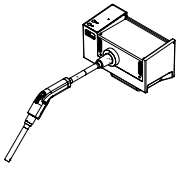
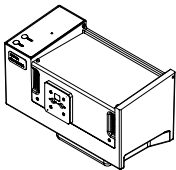
Max. operating temperature	120 °C
Material	Steel no. 1.4435
Transreflectance adapter window	Quartz glass (Infrasil 303)
Available path lengths (x2)	0.5 mm, 1.0 mm, 1.5 mm

NIRFlex Solids Transmittance

Detector	InGaAs (temperature controlled)
Spectral range	12 500 – 6000 cm ⁻¹ 800 – 1660 nm
Photometric dynamic range	0 – 6 AU
Photometric linearity	Tested by certified NIST standards (rare earth oxide mixture)
Typical signal-to-noise ratio	RMS for spectral segments of 300 cm ⁻¹ in the range of 11 000 – 6500 cm ⁻¹

Accessories

	Order no.	Image
Glass petri dishes 10 pcs. (up view) Not suitable for use with Transflectance Cover	11072073	
High performance cup	046259	
Robust cup	11055058	
Transflectance cover 0.3 mm Not suitable for use with robust cup	041636	
NIRFlex N500 Base Unit NIRFlex Interferometer incl. NIRWare Basic License	N505-003	
NIRFlex Solids Measurement of solid, cream and liquid samples in reflectance or transflectance mode.	N510-000	
Petri Dish holder Measurement of solid, cream and liquid samples in petri dish, high performance cup or unbreakable cup.	N510-001	
Vial holder For measurement of solid samples using glass vials.	N510-002	
XL holder Measurement of liquid samples in transflectance or solid samples in diffuse reflectance trough plastic bags or differents kinds of sample cups.	N510-003	
Tablet holder For measurement of tablets.	N510-004	
Set of Vials (200 pcs) For measuring solid samples in diffuse	N560-015	

	Order no.	Image
<p>NIRFlex Liquids</p> <p>Measurement of clear liquids in transmission mode. Possibility to work with cuvettes of 1, 2 and 5 mm path lengths, as well as disposable vials with 8mm diameter.</p>	N511-000	
<p>Transflectance adapter</p> <p>Open sleeve accessory for measurement of liquid samples with Fiber Optic Solids Order code N512-000.</p>	N512-006	
<p>NIRFlex Fiber Optic Liquids</p> <p>On-site measurement of liquid samples in transmission mode (2 mm path-length). Resistant to highly corrosive liquids.</p>	N513-000	
<p>NIRFlex Solids Transmittance</p> <p>Measurement of solids samples like tablets, capsules and powders in diffuse transmission. Various sample plates are available to accommodate a wide range of tablet sizes and shapes. The plate needs to be ordered separately.</p>	N514-000	
<p>NIRFlex Fiber Optic SMA</p> <p>Cell for reflectance as well as transmission measurement. Requires probes and fiber optic cables to be ordered separately.</p>	N515-000	
<p>Vials</p> <p>Set of 1000 disposable vials with 8 mm outer diameter.</p>	049889	

Maintenance kits

	Order no.
<p>Kit Customer NIRFlex N-500</p> <p>Frequently used wear and spare parts for self-servicing your device, conveniently gathered in one kit</p>	11062651

Description of function

The instrument is a benchtop Fourier Transformation Near Infrared spectrometer (FT-NIR) to identify and quantify analytes of interest. It generates an invisible near infrared interferogram beam which interacts with the molecules of a sample, generating a characteristic feedback. The feedback is picked up via a measurement cell by a detector and mathematically processed via Fourier transformation into a spectrum. This spectrum is characteristic for a given sample and allows identification as well as quantification of its components.

How the interferogram is generated

An interferogram is an interference pattern of phase-shifted beams. The NIRFlex is a single-beam polarization interferometer, generating its interferogram in four steps:

1. Polarization of the light source output

The polarizer ② generates a well-defined polarization output of the undefined polarized light, emitted by the light source ①. Thus, only diagonally polarized light is transmitted.

2. Beam splitting and orthogonal polarization

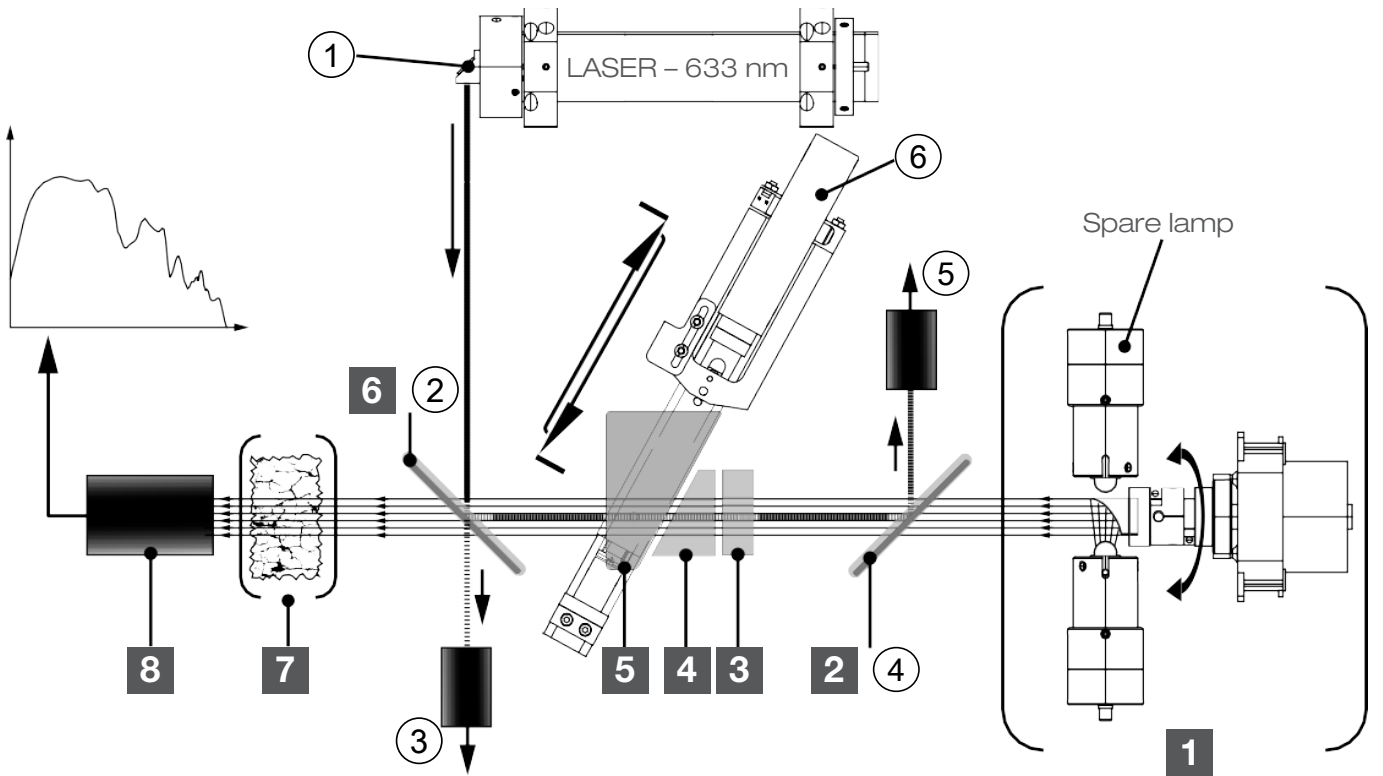
The polarized light enters a double refracting block (comparator) ③. Here, the light is broken down into two, orthogonally polarized components with a small, static phase shift.

3. Generating the ongoing phase shift

An assembly of two double refracting wedges is arranged after the comparator. Wedge ④ is stationary, while wedge ⑤ is constantly shifted back and forwards by a fast linear-drive. The movement and the geometric arrangement provides a change of thickness in the light path. This leads to an ongoing phase shift between the light beams.

4. Beam recombination and interferogram output

A second polarizer ⑥ converts the phase shifted beams into a single light output with intensity variation – the interferogram



Effective NIR light path

Number	Explanation
①	NIR light source assembly with spare lamp and motorized parabolic reflector
②	First polarizer
③	Comparator (double refracting block)
④	Stationary double refracting wedge
⑤	Moving double refracting wedge
⑥	Second polarizer
⑦	Sample
⑧	Interferogram detector

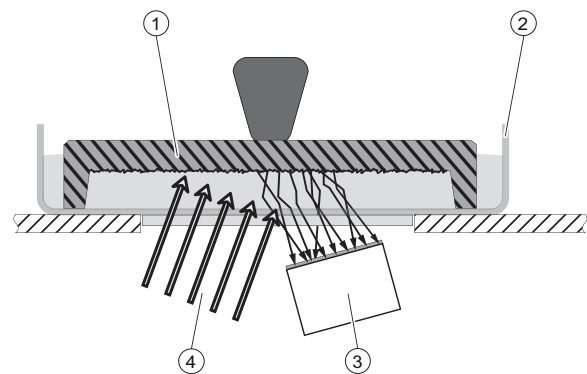
Reference laser signal path

Number	Explanation
1	Laser output window
2	Second polarizator (works as a beam splitter for the laser)
3	Laser output-power sensor
4	First polarizer
5	Laser feedback detector
6	Linear motor for wedge movement

Measurement modes

Transflectance mode

Translucent and opaque liquids can be analyzed via transflectance mode. The light penetrates the liquid, is diffusely reflected by the reference plate and passes through the sample a second time. The transflected rays contain the spectral information of the sample.

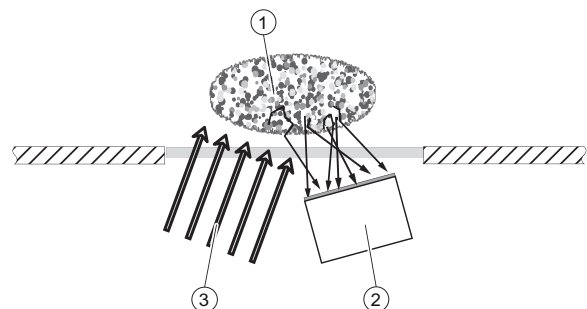


- ① Transflectance cover
- ② Petri dish
- ③ Sensor
- ④ Light

Diffuse reflection mode

Non-translucent materials can be analyzed via diffuse reflection.

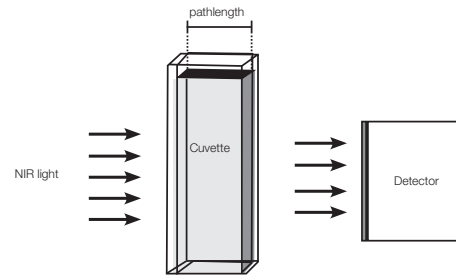
NIR light penetration is limited by the sample material. It interacts with the sample, is refracted and diffusely reflected into the sensor. The reflected rays contain the spectral information of the sample.



- ① Sample
- ② Sensor
- ③ Light

Transmission

NIR light is sent through a defined path Translucent and transparent length of sample material (e.g. in a cuvette). liquids The transmitted light contains the spectral information. This is the preferred method for testing liquids.



Diffuse transmission

The diffuse transmission mode is a mixture of "diffuse reflection" and "transmission" mode. The NIR light penetrates the sample:
is refracted
diffusely reflected
diffusely transmitted
The transmitted rays contain the spectral information of the sample.

