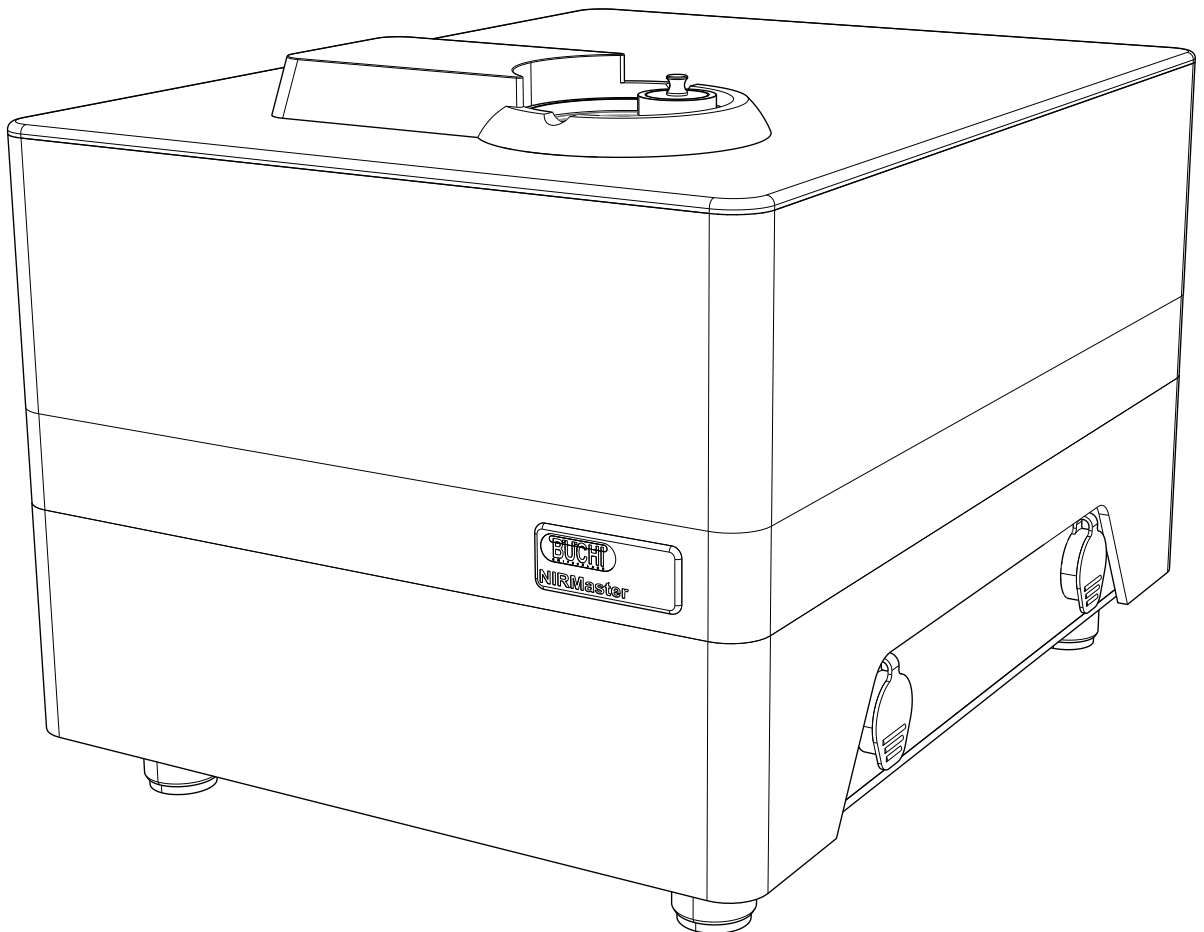




NIRMaster™ Essential

Technical data sheet

The NIRMaster™ Essential is the at-line version of BUCHI's proven FT-NIR spectrometer. Its hygienic clean design satisfies the needs of the food and feed industry especially in the production environment where rugged and protected standalone equipment is required. The NIRMaster™ Essential is designed to be controlled by a separate instrument PC.



Scope of delivery

NIRMaster™ Essential

NIRMaster™ Essential	•
Easy-Spin Drive	•
XL add-on	•
External reference	•
NIRWare Basic Software	•
Hardware manual	•
Food grade PMMA IP54	•

Order code

1 1 0 7 1 1 9 0 NIRMaster™ Essential

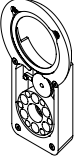
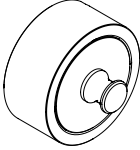
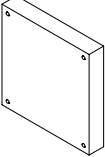

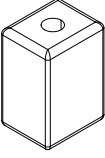
Technical data

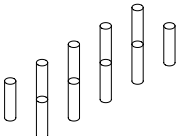
NIRMaster™ Essential

Specification	NIRMaster™ Essential
Dimensions (W x D x H)	420 x 560 x 360 mm
Weight	43 kg
Minimum clearance on all sides	150 mm
Connection voltage	100 - 240 VAC ± 10 %
Frequency	50 / 60 Hz
Power consumption	150 W
IP Code	54
Internal fuse	4A / 240V
Type of interferometer	Polarisation interferometer with TeO2 wedges
Spectral range	800 – 2500 nm 12 500 – 4000 cm ⁻¹
Resolution (with boxcar apodization)	8 cm ⁻¹
Wavenumber accuracy (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 between 5600–6000 cm ⁻¹)
Number of scans/sec.	2 - 4
Illumination spot diameter	9 mm
Analog digital converter	24 bit
Lamp type	Tungsten-halogen

Specification	NIRMaster™ Essential
Average life (lamp)	6000 h
Type of laser	12 VDC HeNe, wavelength at 632.992 nm
Connection voltage	100 - 240 VAC ± 10 %
Detector	Extended range InGaAs (temperature controlled)
Internal reference	Gold plate
External reference	Spectralon®
Sample rotation	Easy-spin drive, a magnetic spinner is included for high performance measurement of inhomogeneous sample

Spare parts

	Order no.	Image
Spinner	11056771	
External reference	11056371	
Outer filter holder with pads, 2 pcs	11056672	
Set spare filter pads 10 pcs	11056773	
Inner filter pads, 10 pcs	11056917	
Ferrit sleeve 5 mm	11056714	
Ferrit sleeve 6 mm	11056715	

	Order no.	Image
Housing-key	11056766	
Plug bushing 3-6mm 10 pcs	11056665	
Plug bushing 6-9mm 10 pcs	11056666	
Set round cord 10 pcs	11056667	
Spinner (inlay-) ring	11056772	
Replacement Window HPSC	046246	
Primary lamp module	N560-001	
Adapter plate for gold cell For both High Performance Transflectance Cells 11056994 or 11056995.	11056793	

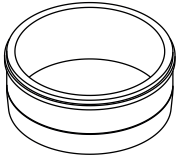
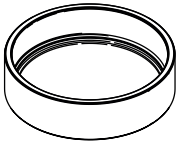
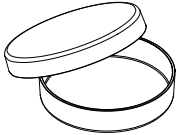
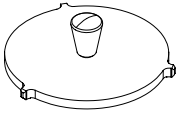
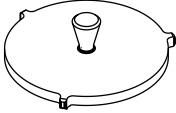
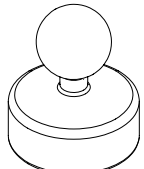
Accessories

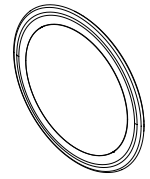
Compatibility

Sample holding accessories	Easy-Spin Magnetic spinner*	XL* glass spacer	Adapter plate for gold cell
Petri dishes	•		
High performance cup	•		
Unbreakable cup	•		
Small plastic bags		•	
High performance transfectance gold cell			•
Sample dimensions	100 mm	Adaptable	35 mm

*Included in system as described in Chapter "Scope of delivery"

**See Chapter Chapter "Measurement modes"

	Order no.	Image
High performance cup	046259	
Robust cup	11055058	
Glass petri dishes 10 pcs. (up view) Not suitable for use with Transfectance Cover	11072073	
Transfectance cover 0.3 mm Not suitable for use with robust cup	041636	
Transfectance cover for robust cup	11055998	
Pressing Stamp To compress and compact samples like ground meat or cheese. Stainless steel, approx. 1.8 kg.	11057584	



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 instrument 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

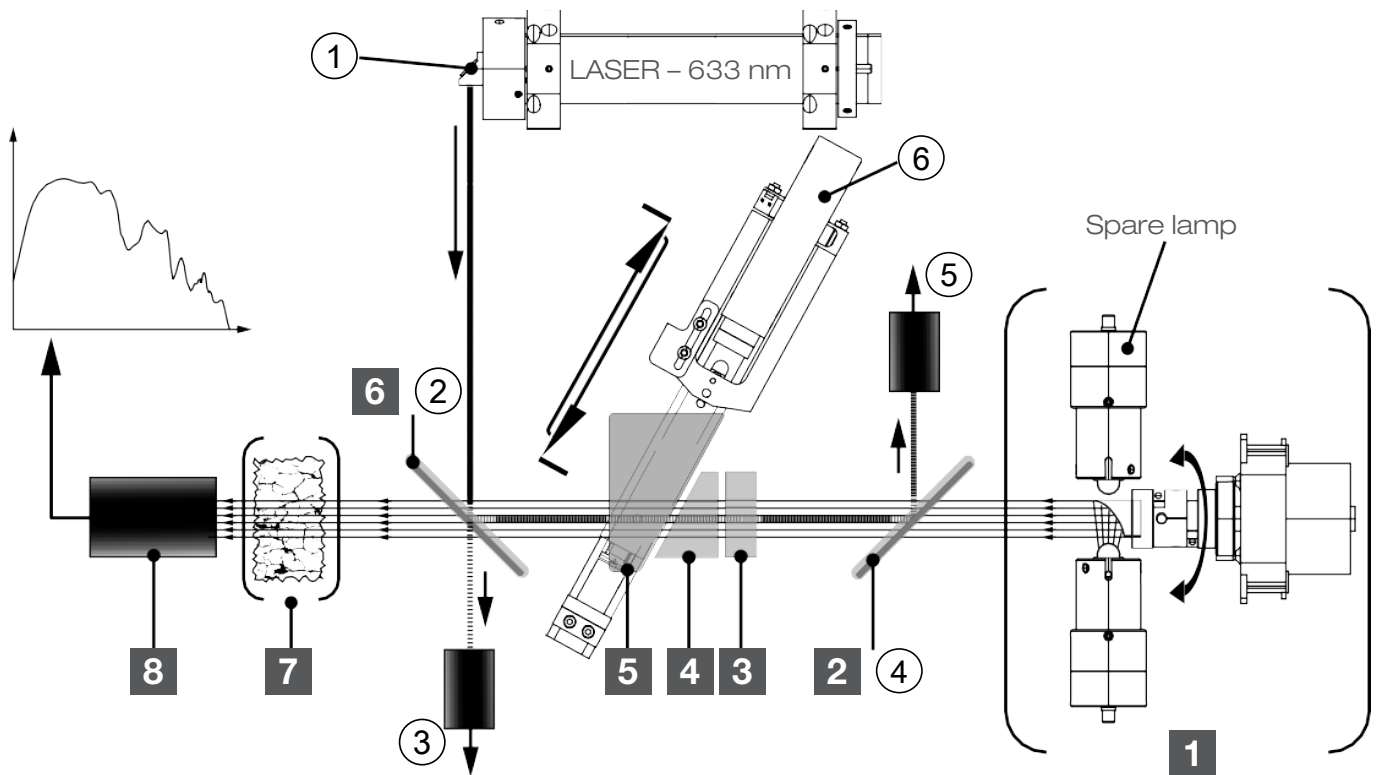
The polarized light enters a double refracting block (comparator) ③. Here, the light is broken down into two, orthogonally polarized components with a small, static phase shift.

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

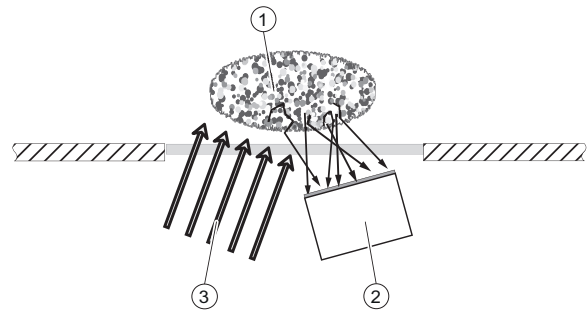
Number	Explanation
1	Laser output window
2	Second polarizator (works as a beam splitter for the laser)
3	Laser output-power sensor
4	First polarizer
5	Laser feedback detector
6	Linear motor for wedge movement

Measurement modes

Diffuse reflection mode

Non-translucent materials can be analyzed via diffuse reflection.

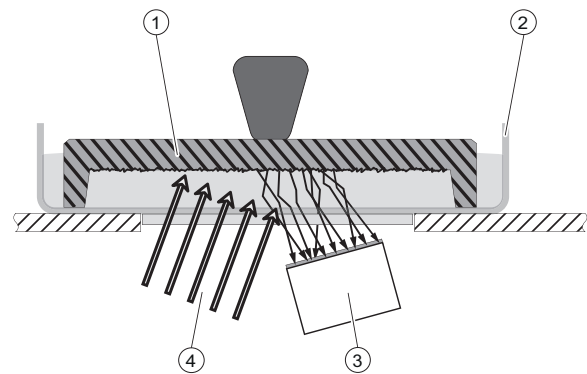
NIR light penetration is limited by the sample material. It interacts with the sample, is refracted and diffusely reflected into the sensor. The reflected rays contain the spectral information of the sample.



- ① Sample
- ② Sensor
- ③ Light

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 Sample cup
- ③ Sensor
- ④ Light