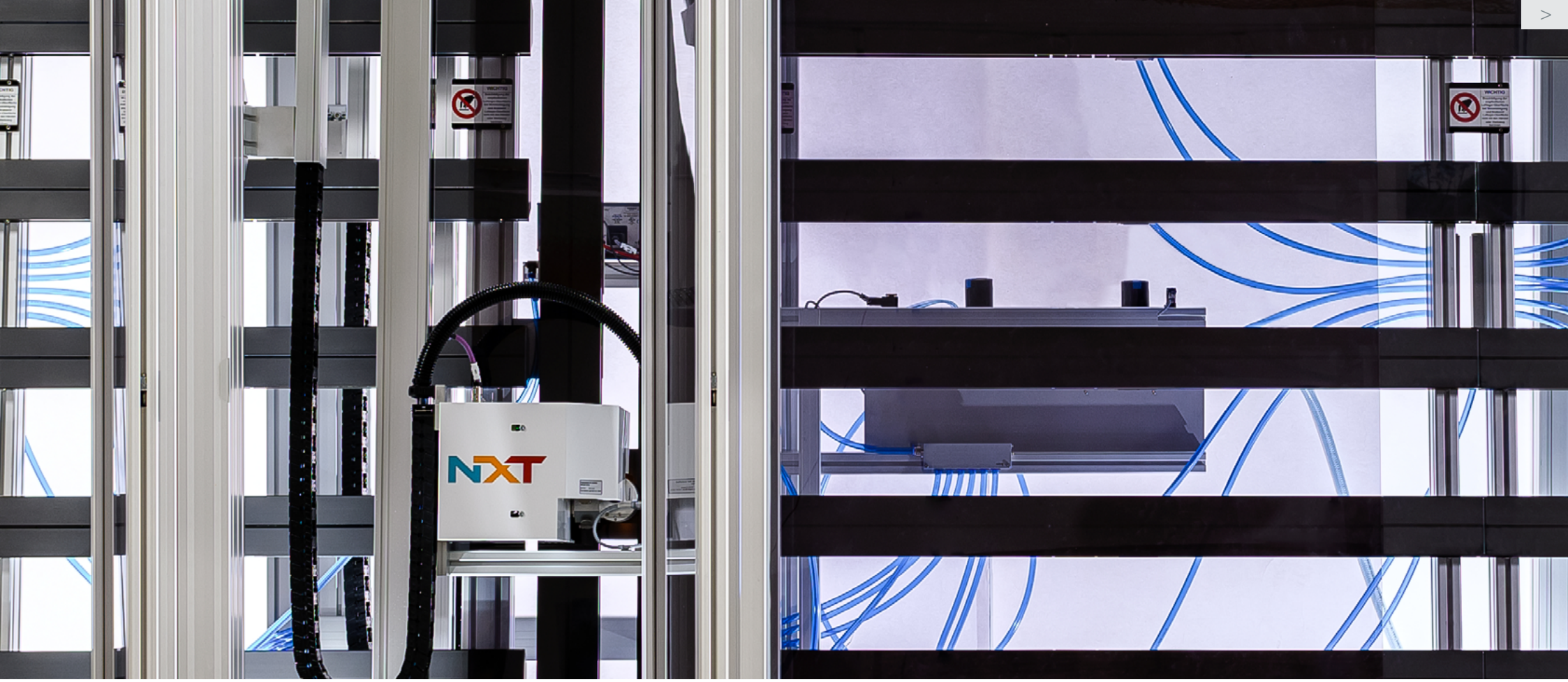
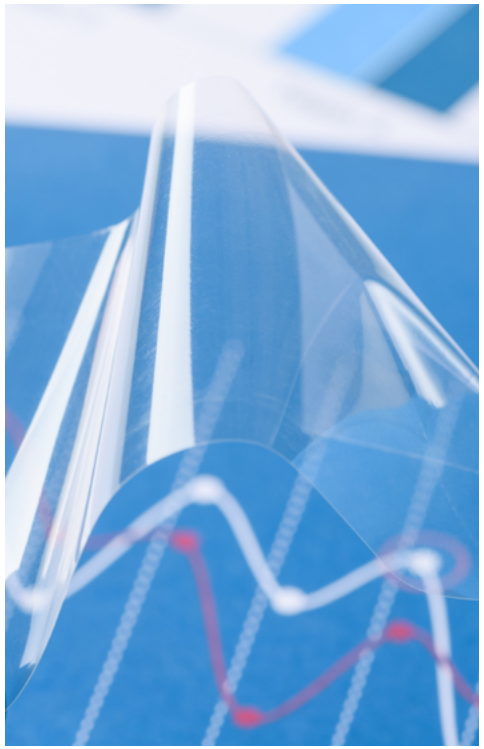
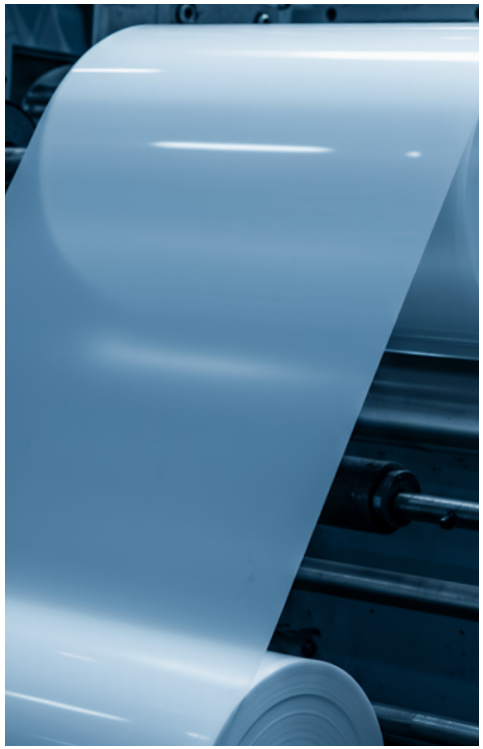
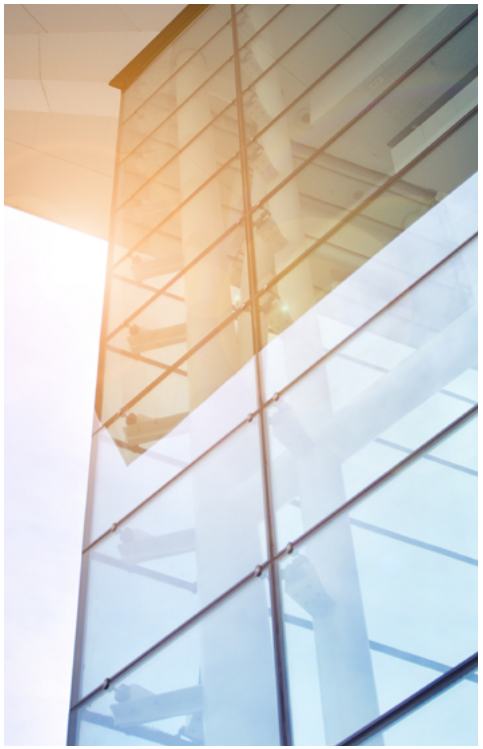


Metis

Precise measurement of thin layers,
with motion tolerance

NXT
Measuring Technology

Click at your desired area.

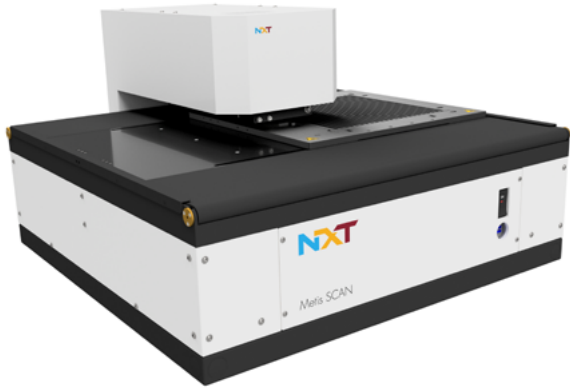
Precise process control for thin layers

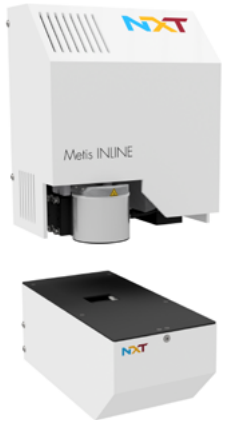
Thin layers and their optical parameters are subject to many factors during production – especially the coating process, material properties, pressure, temperatures, surface tensions, but also transport speeds.

Measuring samples can be wavy and in R2R applications, fast-moving foils can vibrate. When architectural or display glass is coated over a large area, the bending due to the transport equipment requires a high degree of tolerance for the movement and positioning of the measuring optics.

Do you want to measure your layers precisely – without the hassle of complex laboratory equipment? Fast and precise “on-the-fly” measurement is the strength of our Metis measurement systems. Increase your production quality and rate by consistently controlling the process of thin film deposition and measuring optical properties, in particular:

- Spectral reflection, transmission, absorptance
- Thickness of thin layers and layer stacks
- Material properties: refractive index n and absorption coefficient k
- Color





Precise with every movement – both INLINE and OFFLINE.

Use of an integrating sphere with an integrated light source

Spectral range:	380 – 1070 nm
	360 – 1050 nm (option)
	850 – 1700 nm (option)
2 spectral ranges combined:	360 – 1700 nm (option)

High photometric accuracy
- Spectra: ≈ 0.2 % (400 – 1000 nm)
- Long-term stability through internal correction channel
- Precise color measurement

Excellent tolerance for sample spacing and tilt
- ± 5 mm spacing deviation
- ± 2° tilt deviation
- Enables measurements on slightly curved samples

Modular design
- LITE (fixed stage)
- LAB (manually operated stage)
- SCAN (motorized stage)
- INLINE (static or motorized)

High measurement rate
≤ 0.1 s (spectrum recording)

Thickness measurement over a wide range
- 5 nm – 30 µm
- Individual layers and layer stacks
- Measurement of the optical constants n&k

Interfaces
Common standards for connection to your production line, including digital i/o, Profibus, TCP/IP

One principle, numerous possibilities.

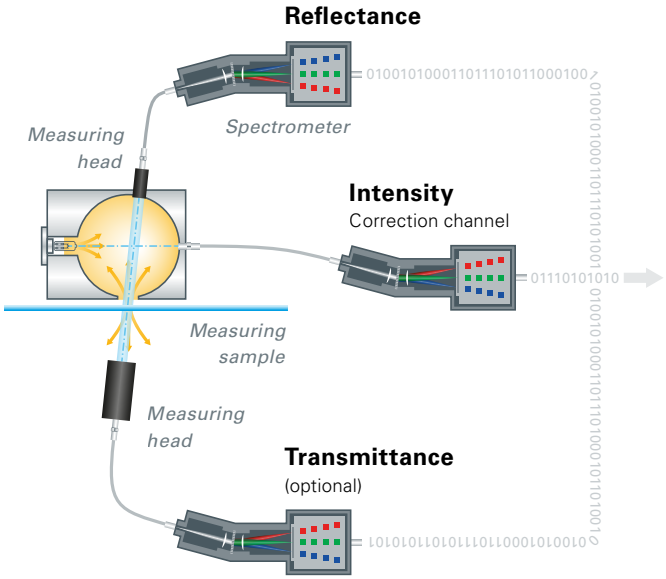
Our inline and offline systems always use the same measurement optics and electronics and consistently follow a single measurement principle:

1. Acquire measurement data
Your measuring sample is detected by a reflection measuring head with an integrated light source, the integrating sphere. Subsequently, a reflection spectrometer and an intensity spectrometer convert the optical signals into data signals, the so-called raw spectra. Depending on the measurement task, a transmission measuring head and a transmission spectrometer are also used.

2. Evaluating measurement data
We use the ETA-TCM software to process the raw spectra into measurement spectra. We determine the reflection and transmission capacity of the measuring sample and calculate both with the illumination intensity. Optional settings for filters, averages, factors and offsets can be made. You also define the relevant parameters when processing the measurement spectra in the evaluation modules, e.g. color, layer thickness and many more.

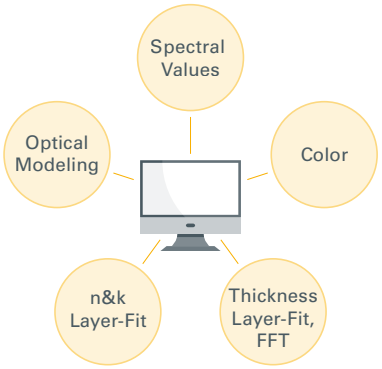
3. Measurement result
Your measurement values can be output as statistics, in tabular form and in graphical form.
You can set limits and have the respective deviations displayed. All results are stored and, thanks to digital i/o, TCP/IP and other interfaces, transmitted directly to your systems.

Acquire measurement data | **Evaluate measurement data** | **Measurement result**



Measurement data
Preparation of measurement data to spectra

Evaluation modules



Results
- Statistics
- Output of the results to the PLC of the production line
- Data logging

Visualization
Individual results,

Trend displays,

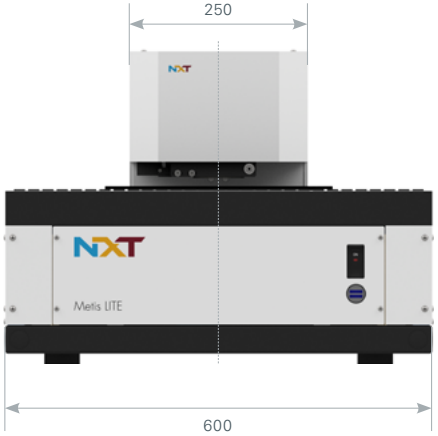
and many other display types.

ETA-TCM software
- Hardware control (shutters, lamps, references)
- Data management (settings, parameters, user data etc.)
- IO interface to the PLC of the production line

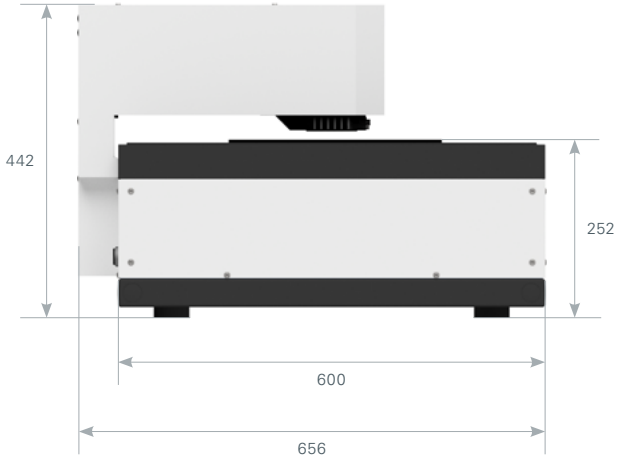
Measurement optics and electronics | **ETA-TCM software (Windows PC)**

Metis LITE RT-VIS

from front



from left



from top

Compact, manually operated table-top device
- Measurement in reflection and transmission
- For coated films and various substrates
- Integrated PC (also available without PC)

Sample sizes
For use in movable sample frames
- Minimum: 20 x 20 mm
- Maximum (with sample frame): 245 x 245 mm
- Maximum (without sample frame): 600 x 600 mm

Measuring table
- Dimensions: 600 x 600 mm
- Measuring position in the center, marked by engraving
- Rulers on the edge for positioning

Sample frame
- Dimensions: 245 x 245 mm
- Y-axis: sample frame guided in grooves
- X-axis: manual displacement of the sample on the frame

Weight
45 kg

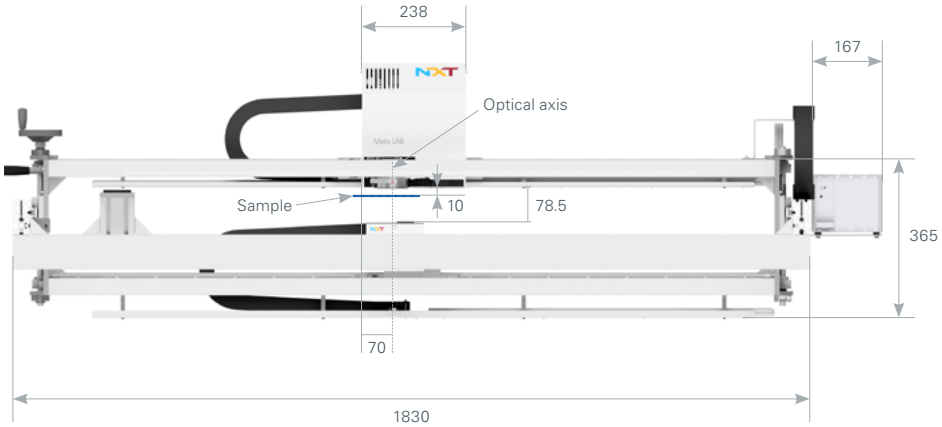
Power Consumption
Maximum: 460 VA
Average: 250 VA

Customizations
Other measuring table sizes or special sample frames are available on request.

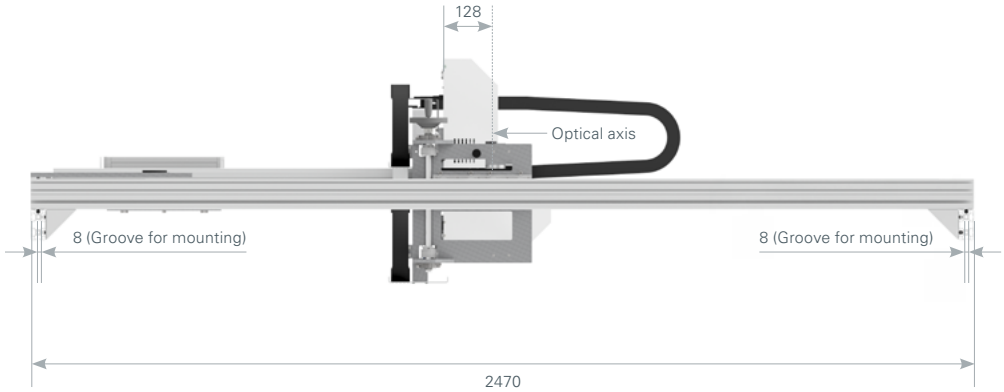
Certification
The measuring system meets the safety requirements of the Low Voltage Directive 2014/35/EU. UL certification is also available. Please contact us if required.

Metis LAB RT-VIS-X1800_Y1200

from front



from left



Manually operated laboratory device for large format measuring samples

- Measurement in reflection and transmission
- Measuring system for laboratory applications
- Horizontal recording of measuring samples
- For coated glass and films
- Spectral characterization in reflection and transmission

Sample sizes

Maximum: L 1800 x W 1200 mm
Sample thickness: 0.2 – 4 mm

Sample handling

The rack of the sample tray can be customized by NXT.

Power consumption

Maximum: 300 VA

Weight

86 kg

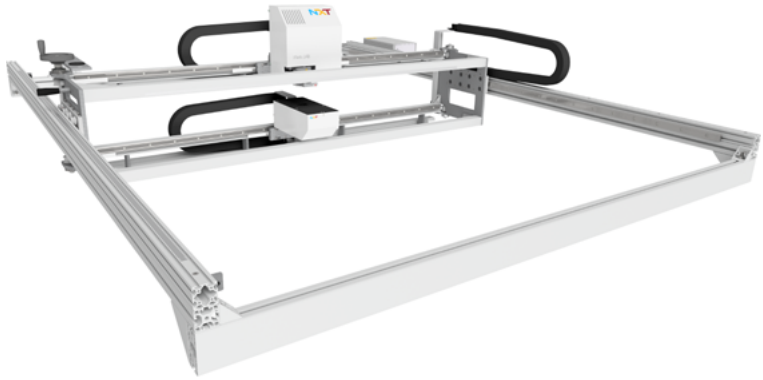
Customizations

Other sample sizes or special sample handling designs are available upon request to fulfill your specific requirements.

Certification

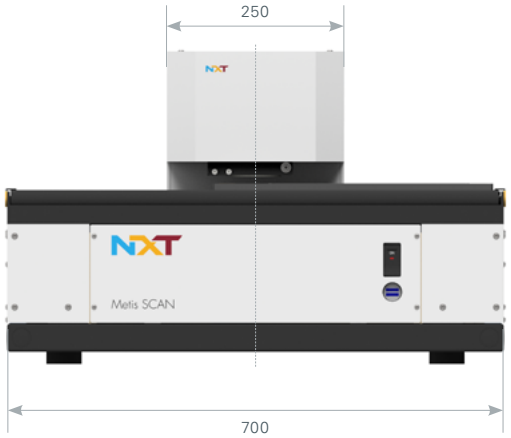
The measuring system meets the safety requirements of the Low Voltage Directive 2014/35/EU. UL certification is also available. Please contact us if required.

from top

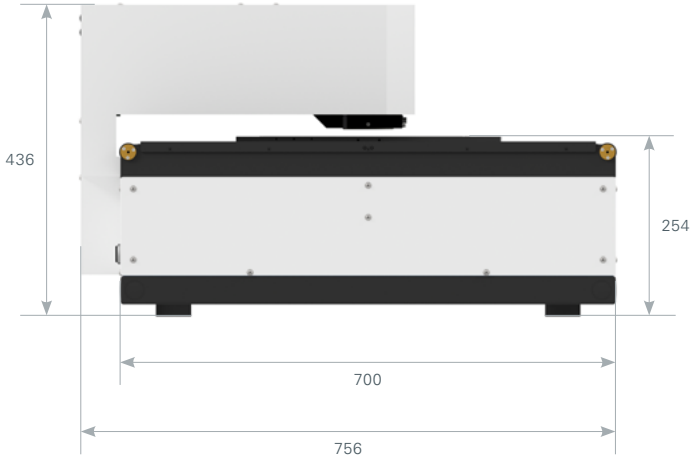


Metis SCAN RT-VIS-XY240

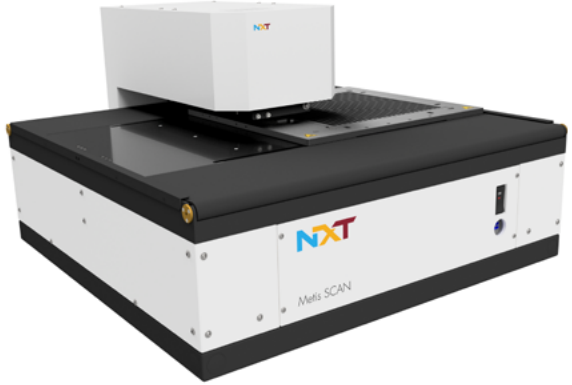
from front



from left



from top



Motorized scanning table-top device
- Measurement in reflection and transmission
- For coated films and various substrates
- Integrated PC (also available without PC)

Sample sizes
For use in moving sample frame
- Minimum: 20 x 20 mm
- Maximum: 245 x 245 mm

Measuring table
- Drive with stepper motors
- Travel range: 240 x 240 mm
- Positioning accuracy: ≤ 0.1 mm
- XY-scanning speed (full area):
  > 70 measuring points/minute

Weight
48 kg

Power consumption
Maximum: 300 VA

Customizations
Other measuring table sizes or special sample frames are available on request.

Certification
The measuring system meets the safety requirements of the Machinery Directive 2006/42/EC. UL certification is also available. Please contact us if required.

Metis SCAN RT-VIS-NIR-X1850_Y1500

from front

from right

Measuring system for large format measuring samples

- High-precision scanning for laboratory applications
- Measurement in reflection and transmission
- For coated glass and films
- Spectral characterization in reflection and transmission
- Optional surface resistance measurement using 4-point measurement (additionally integrated measuring instrument from a third-party provider)

Sample sizes

- Minimum: W 200 mm x H 300 mm
- Maximum: W 1850 x H 1500 mm
- Sample thickness: 0.2 – 4 mm
  Larger formats can be measured in cut-to-size pieces and the software can combine them to give an overall result.
- XY-scanning speed (full area):
  > 2000 measuring points/hour

Sample handling

- Samples are positioned upright and at a slight angle
- Transport of the measuring sample along the X-axis through the chambers
- Air bearings for damage-free sample transport (X-axis)
- Precise movement of the measuring unit along the Y-axis
- Positioning accuracy in the X- and Y-axis: ± 0.1 mm

Media and energy supply

- Electrical supply:
  – Mains voltage: 400 VAC, 50/60 Hz
  – Power consumption: Maximum 8 kVA
- Compressed air requirement:
  – Compressed air class: Class 3
  – Minimum pressure: 6 bar
  – Air consumption: 750 l/min

Dimensions

W = 5308 mm, H = 2813 mm, D = 1410 mm

Weight

2000 kg

Customizations

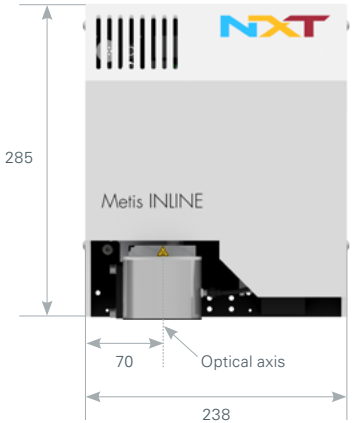
Other sample sizes or special sample handling designs are available upon request to fulfill your specific requirements.

Certification

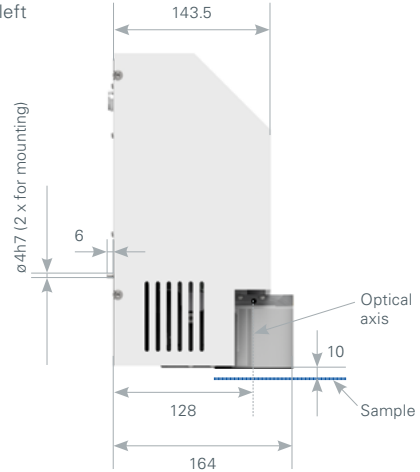
The measuring system meets the safety requirements of the Machinery Directive 2006/42/EC. UL certification is also available. Please contact us if required.

Metis INLINE R-VIS

from front



from left



from top

External power unit

Compact device for your production line

- Measurement in reflection
- Measurement *on the fly*
- Measurement insensitive to:
  - tilting of the measuring sample
  - distance of the measuring sample
  - slight curvature of the measuring sample
- Suitable for:
  - measuring samples with rough surfaces
  - coated films and various substrates
- External power unit
  (outside of the production line)
  - generates the power supply (12 VDC)
  - integrated digital i/o module

Weight

4.5 kg

Power consumption

Maximum: 60 VA

Power unit

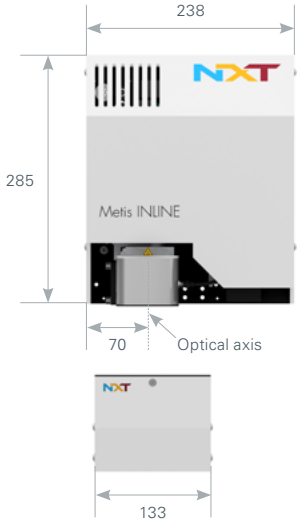
- Dimensions [mm]: W = 165, H = 139, D = 316
- Weight: 3.5 kg
- Electrical data:
  - Input voltage: 100 – 240 VAC/50 – 60 Hz
  - Output voltage: 12 VDC
  - 8 digital inputs and outputs

Certification

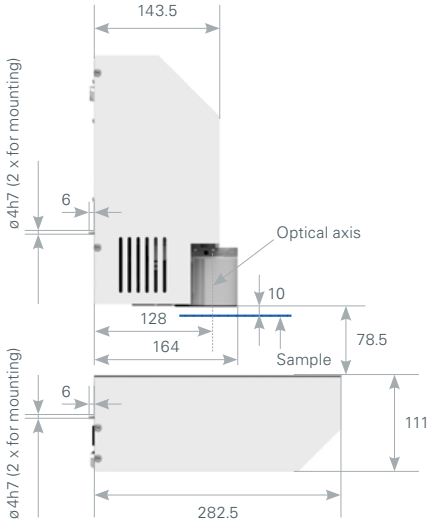
The measuring system meets the safety requirements of the Low Voltage Directive 2014/35/EU. UL certification is also available. Please contact us if required.

Metis INLINE RT-VIS

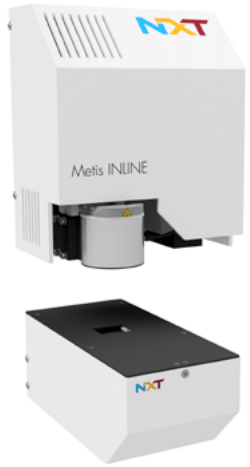
from front



from left



from top



External power unit

Compact device for your production line

- Measurement in reflection and transmission
- Measurement *on the fly*
- Measurement insensitive to:
  - tilting of the measuring sample
  - distance of the measuring sample
  - slight curvature of the measuring sample
- Suitable for:
  - measuring samples with rough surfaces
  - coated films and various substrates
- External power unit
  (outside of the production line)
  - generates the power supply (12 VDC)
  - integrated digital i/o module

Weight

7 kg

Power consumption

Maximum: 60 VA

Power unit

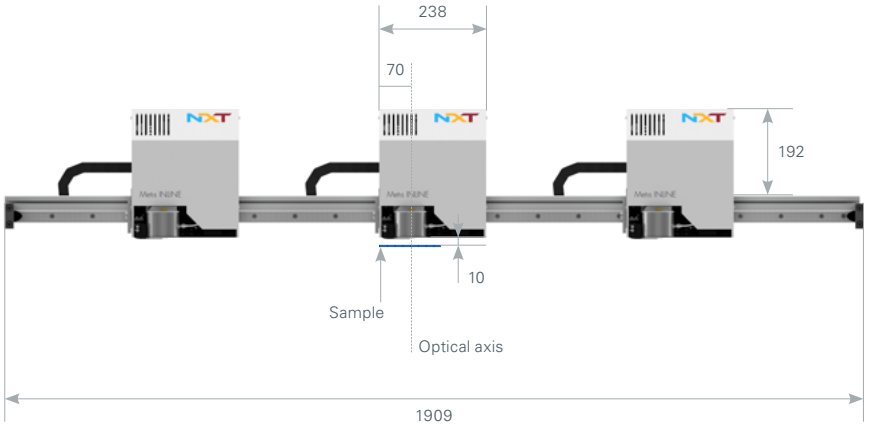
- Dimensions [mm]: W = 165, H = 139, D = 316
- Weight: 3.5 kg
- Electrical data:
  - Input voltage: 100 – 240 VAC/50 – 60 Hz
  - Output voltage: 12 VDC
  - 8 digital inputs and outputs

Certification

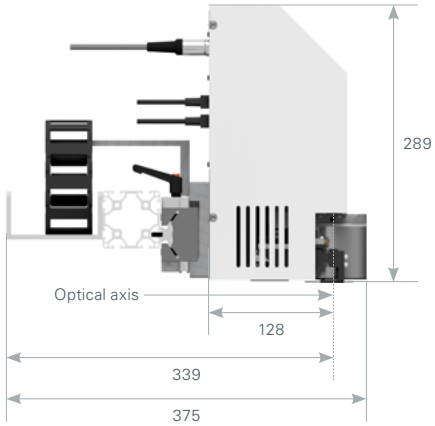
The measuring system meets the safety requirements of the Low Voltage Directive 2014/35/EU. UL certification is also available. Please contact us if required.

Metis INLINE R-VIS-3ch

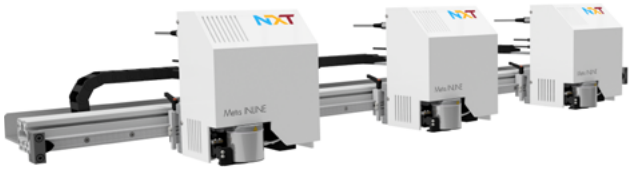
from front



from left



from top



External power unit

3 measuring positions for your production line

- Measurement in reflection
- Measurement *on the fly*
- 3 static measuring positions on guide rails adjustable
- Measurement insensitive to:
  - tilting of the measuring sample
  - distance of the measuring sample
  - slight curvature of the measuring sample
- Suitable for:
  - measuring samples with rough surfaces
  - coated foils and various substrates
- External power unit (outside of the production line)
  - generates the power supply (12 VDC)
  - integrated digital i/o module

Weight

34 kg

Power consumption

Maximum: 500 VA

Power unit

- Dimensions [mm]: W = 449, H = 139, D = 316
- Weight: 8 kg
- Electrical data:
  - Input voltage: 100 – 240 VAC/50 – 60 Hz
  - Output voltage: 12 VDC
  - 8 digital inputs and outputs

Customizations

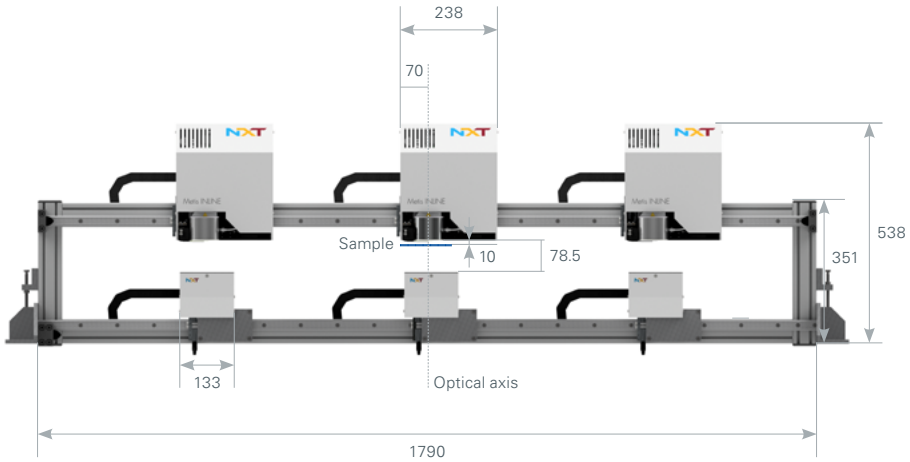
Other numbers of measuring positions or lengths of guide rails are available on request.

Certification

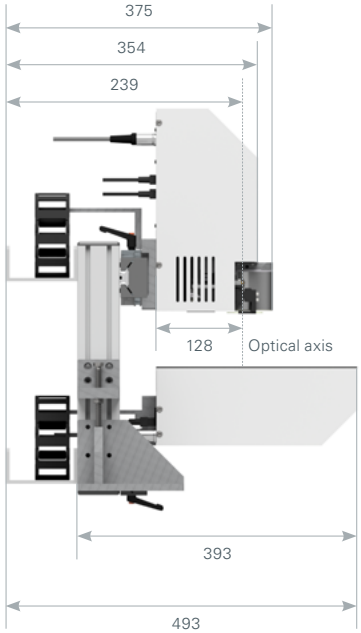
The measuring system meets the safety requirements of the Low Voltage Directive 2014/35/EU. UL certification is also available. Please contact us if required.

Metis INLINE RT-VIS-3ch

from front



from left



from top

External power unit

3 measuring positions for your production line

- Measurement in reflection and transmission
- Measurement *on the fly*
- 3 static measuring positions on guide rails adjustable as required
- Measurement insensitive to:
  - tilting of the measuring sample
  - distance of the measuring sample
  - slight curvature of the measuring sample
- Suitable for:
  - measuring samples with a rough surface
  - coated foils and various substrates
- External power unit (outside of the production line)
  - generates the power supply (12 VDC)
  - integrated digital i/o module

Weight

59 kg

Power consumption

Maximum: 500 VA

Power unit

- Dimensions [mm]: W = 449, H = 139, D = 316
- Weight: 8 kg
- Electrical data:
  - Input voltage: 100 – 240 VAC/50 – 60 Hz
  - Output voltage: 12 VDC
  - 8 digital inputs and outputs

Customizations

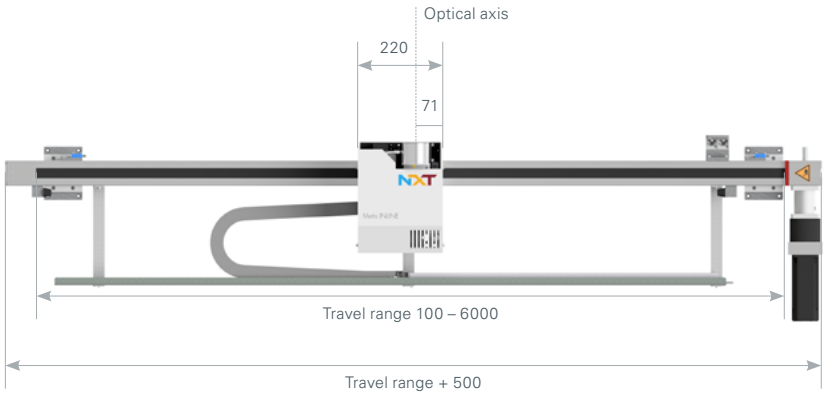
Other numbers of measuring positions or lengths of guide rails are available on request.

Certification

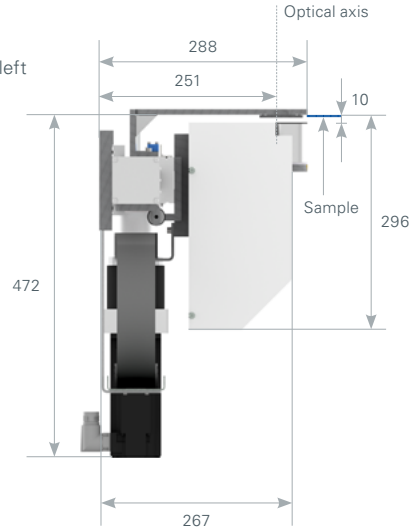
The measuring system meets the safety requirements of the Low Voltage Directive 2014/35/EU. UL certification is also available. Please contact us if required.

Metis INLINE R-VIS-X2000

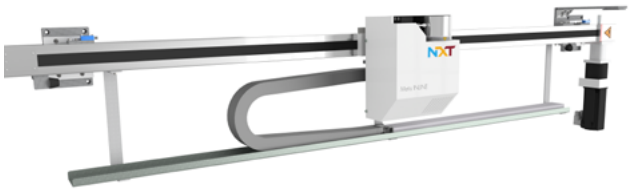
from front



from left



from top



Control cabinet

Measuring head on motorized linear axis for your production line

- Measurement in reflection
- Measurement *on the fly*
- Infinitely variable measuring positions with motorized linear axis
- Measurement insensitive to:
  - tilting of the measuring sample
  - distance of the measuring sample
  - slight curvature of the measuring sample
- Suitable for:
  - measuring samples with rough surfaces
  - coated films and various substrates
- External control cabinet (outside the production line)
  - controls the motor of the linear axis
  - generates the power supply (12 VDC)
  - integrated digital i/o module

Motorized linear axis

- Travel range: 1 m, 1.5 m, 2 m or customized
- Travel speed: > 100 mm/s

Weight

41 kg

Power consumption

Maximum: 500 VA

Control cabinet

- Dimensions [mm]: W = 800, H = 600, D = 300
- Electrical data:
  - Input voltage: 100 – 240 VAC/50 – 60 Hz
  - Output voltage: 12 VDC
  - 8 digital inputs and outputs

Customizations

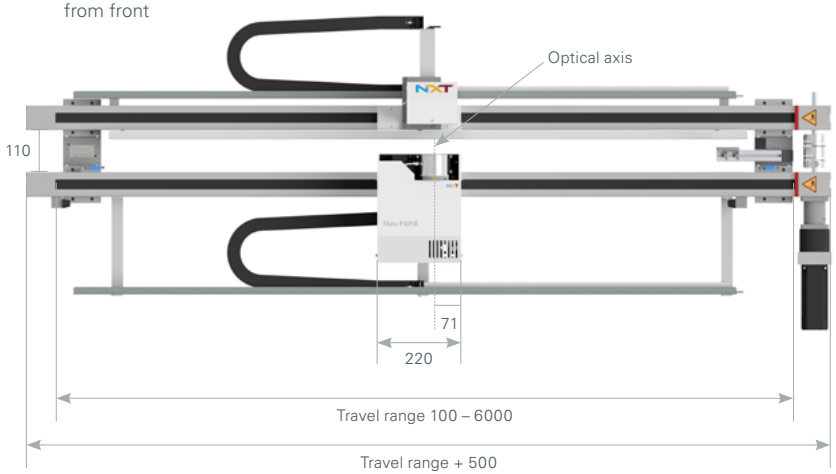
Other lengths or versions of the linear axis, additional operating and/or indicating elements are available on request.

Certification

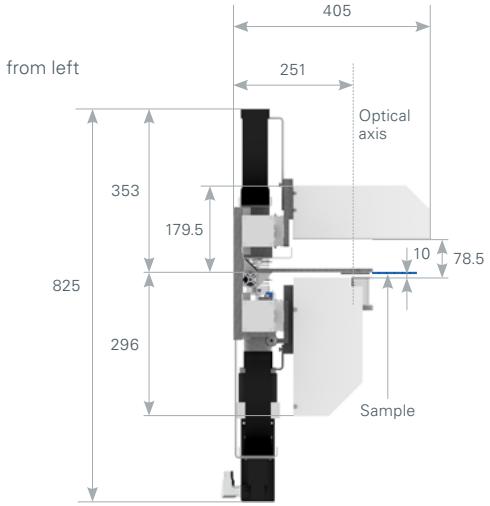
The measuring system meets the safety requirements of the Machinery Directive 2006/42/EC. UL certification is also available. Please contact us if required.

Metis INLINE RT-VIS-X2000

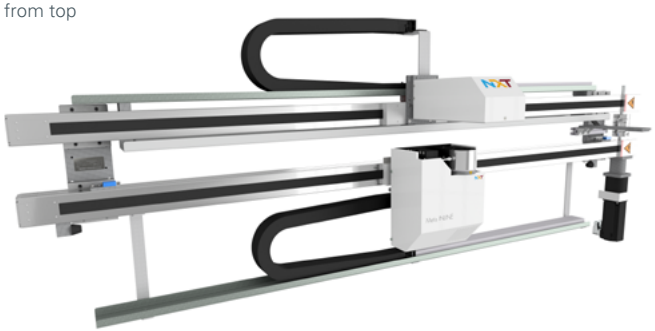
from front



from left



from top



Control cabinet

Measuring head on motorized linear axis for your production line

- Measurement in reflection and transmission
- Measurement *on the fly*
- Infinitely variable measuring positions with motorized linear axes
- Measurement insensitive to:
  - tilting of the measuring sample
  - distance of the measuring sample
  - slight curvature of the measuring sample
- Suitable for:
  - measuring samples with a rough surface
  - coated foils and various substrates
- External control cabinet (outside the production line)
  - controls the motor of the linear axes
  - generates the power supply (12 VDC)
  - integrated digital i/o module

Motorized linear axis

- Travel range: 1 m, 1.5 m, 2 m or customized
- Travel speed: > 100 mm/s

Weight

74 kg

Power consumption

Maximum: 500 VA

Control cabinet

- Dimensions [mm]: W = 800, H = 600, D = 300
- Electrical data:
  - Input voltage: 100 – 240 VAC/50 – 60 Hz
  - Output voltage: 12 VDC
  - 8 digital inputs and outputs

Customizations

Other lengths or versions of the linear axes, additional operating and/or indicating elements are available on request.

Certification

The measuring system meets the safety requirements of the Machinery Directive 2006/42/EC. UL certification is also available. Please contact us if required.

Measurement	
Measurement values	Spectral values: – Reflectance (R) – Transmittance (T) – Absorptance (A) Color measurement (R + T) Layer thickness – FFT (thick layers) Layer thickness – layer fit (thin layers) Material properties n&k – layer fit (refractive index n and absorption coefficient k)

Spectral measurement		
Wavelength range (λ-range)	VIS	380 – 1070 nm
	VIS_ext	360 – 1050 nm (optional)
	NIR	850 – 1700 nm (optional)
	VIS_ext-NIR	360 – 1700 nm (optional)
Precision		**Area**
R	0.1 %	0 – 5 %
	0.2 %	5 – 40 %
	0.4 %	40 – 100 %
T	0.2 % (for l > 400 nm)	0 – 100 %

Colorimetry	
Color accuracy (xyY)	x,y 3σ ≤ 0.002 Y 3σ ≤ 0.2
Repeatability* of color values	x,y 3σ ≤ 0.001 Y 3σ ≤ 0.05

* 100 consecutive measurements at a single static position

Layer thickness – FFT (thick layers)	
Thickness range	0.5 – 30 µm
Precision	± 0.05 µm
Repeatability	3σ ≤ 0.005 µm
Maximum number of simultaneously measurable layer thicknesses	4

Layer thickness – layer fit (thin layers)		
Thickness range	5 – 3000 nm	
Precision		**Area**
	± 0.5 nm	5 – 40 nm
	± 1.0 nm	40 – 200 nm
	± 2.0 nm	200 – 3000 nm
Repeatability*		**Area**
	3σ ≤ 0.1 nm	5 – 200 nm
	3σ ≤ 0.5 nm	200 – 1000 nm
	3σ ≤ 1.0 nm	1000 – 3000 nm
Maximum number of simultaneously measurable layer thicknesses	4	
Maximum number of layer thicknesses that can be modeled	40	

Material properties n&k – layer fit		
Precision (n)	Silicon layers Conductive layers Dielectric layers Others	± 0.03 ± 0.03 ± 0.02 ± 0.03
Repeatability (n)*	3σ ≤ 0.01	

The values given are typically achieved for homogeneous layers with a smooth surface and sufficient refractive index differences to neighboring layers.

General		
Measuring geometry	R (integrating sphere)	d / 8°
	T	8° angle
Size of measuring spot (customizable on request)	≈ 5 mm	
Required positioning accuracy of the measuring sample	Distance	± 5 mm
	Inclination	± 2°
Measurement speed (spectrum recording)	≤ 100 ms/Measurement point	
Evaluation speed (layer fit)	1 Layer thickness	≤ 0.2 s
	2 Layer thicknesses	≤ 1 s
	3 Layer thicknesses	≤ 5 s
	n&k evaluation	≤ 10 s

Environmental conditions	
Temperature	5 – 45 °C (41 – 113 °F)
Maximum humidity (non-condensing at 20 °C)	90 %

Electrical data	
Input voltage	100 – 240 VAC (± 10 %)
Frequency	50 – 60 Hz

Light source		
Halogen lamp	Power consumption	20 W
	Lifespan	≥ 2000 hrs.
	Color temperature	3000 K
UV-enhanced with LEDs	385 nm and 405 nm	
Option: UV-extended (VIS_ext) with LEDs	365 nm and 395 nm	

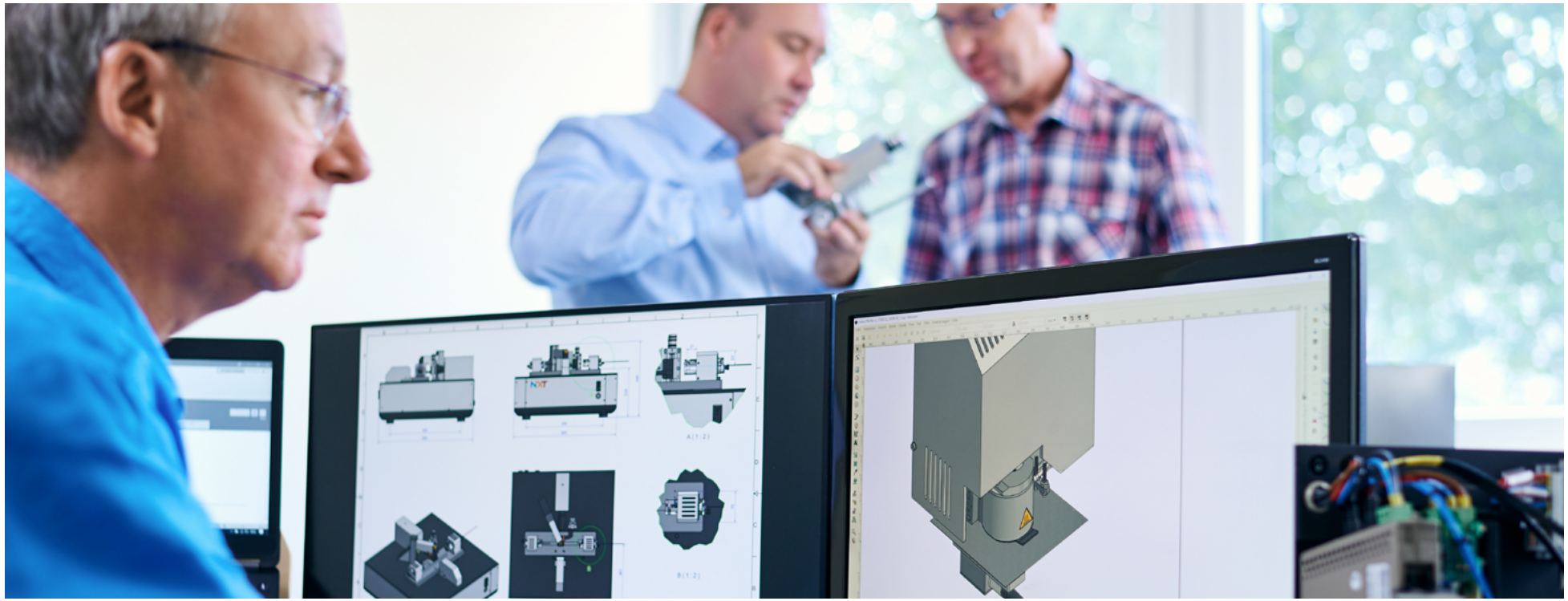
Spectrometer (VIS)	
Holographic transmission grating	
Spectral range	380 – 1070 nm
Silicon iodine line detector	512 pixels
Digitization	16 Bit
Interface	LAN

Option: Spectrometer (VIS_ext)	
Holographic transmission grating	
Spectral range	360 – 1050 nm
Silicon iodine line detector	512 pixels
Digitization	16 Bit
Interface	LAN

Option: Spectrometer (NIR)	
Holographic transmission grating	
Spectral range	850 – 1700 nm
Silicon iodine line detector	256 pixels
Digitization	16 Bit
Interface	LAN

Option: PC	
Operating system	Windows® 10 / 11
Processor type	Intel i7
Memory (RAM)	≥ 8 GB
Hard disk (HDD)	≥ 500 GB

Further specifications, such as the size and type of the measuring table (offline) or the type and length of the linear axis (inline), the motorization, dimensions and weight, etc., depend on the model of the Metis measuring system.



Customizable to your requirements

We support a variety of communication interfaces for integrating the Metis measuring system into your production line. Thanks to the modular design of our hardware and ETA-TCM software, our measuring systems can be configured to meet your specific requirements.

As the person responsible for the process, you define the relevant process windows in the software using adjustable limit values. Compliance with these limit values is checked and displayed.

This means that scrap can be sorted out, or even a drifting away of the process can be recognized and thus counteracted.

We would be happy to demonstrate our Metis measuring system at your premises, at our headquarters or at a branch near you.

You can check the measuring equipment capability yourself using the supplied reference samples and prove it with a measurement report.

Easy to learn and use

The configurable ETA-TCM software is the central operating element of the Metis measurement system.

We advise and train you as the person responsible for the process so that you can set process limits for balancing scrap and throughput yourself.

Depending on the complexity of the system, you usually only need half a day to three days of training to be able to operate the system safely.

In addition, the operation manual describes the details of operation and maintenance, so that not only simple operation but also basic maintenance work is guaranteed. For example, you can replace the lamp yourself.

Long-term stable and trouble-free

Due to the modular design of our measuring systems, identical and proven hardware is used. The susceptibility to failure is very low.

With over 30 years of experience, we have established standardized commissioning and quality assurance processes to ensure that our systems are of consistently high quality.

Long-term stability in the production process is ensured by automatic referencing and regular control of the measuring equipment capability using reference samples.

Some of our measuring systems have been in use for over 30 years, even in harsh industrial environments. We still provide them with regular maintenance and spare parts.

Made in Germany

Technical support

The replacement of wear parts can be found in the maintenance plan in the operation manual. The time required varies depending on the model but is usually minimal.

If you experience any difficulties, a quick analysis is possible using a service report that you can export from your ETA-TCM software and send to us. Your request will be processed by one of our technicians, who will contact you promptly.

More extensive maintenance to check the correct functioning of the entire measuring system is also carried out by one of our technicians. As a rule, a downtime of half a day to a whole day should be expected here. Or you can simply send us your measuring system. We will carry out the maintenance within a week.

Our service is also available beyond the specified lifetime of your system. We will inform you in good time if maintenance is no longer possible, e.g. due to discontinued parts, or if it is necessary to store parts at an extra charge.

NXT Measuring Technology

Detect deviations as and when they occur.

For over three decades, our high-precision spectrometric measuring systems have been supporting industrial companies all over the world to meet exacting quality standards and increase production efficiency at the same time.

We are convinced that only with the help of precise measurement data can manufacturers consistently meet their tight tolerance targets to achieve production excellence. That's why we support them with our team of skilled experts, backed by our customizable measuring devices and specialized software, to analyse and optimize their production processes. Our innovative solutions offer actionable insights to detect deviations where they occur, whether in dynamic production environments or controlled laboratory settings.

Let's explore how we can unlock new possibilities for your production processes, drive continuous improvement and achieve your efficiency goals – get in touch with us today!

NXT Measuring Technology

Let's talk about your new opportunities.

Are you looking for advice on your specific application, do you have questions about our measuring systems, or would you like a non-binding offer?

We look forward to hearing from you.

+49/2452/96001-10

sales@nxt91.com

We offer worldwide maintenance, service and support.

Germany and Europe:
NXT GmbH · Borsigstraße 78 · 52525 Heinsberg

India, Korea, Japan, China, Taiwan and other countries: nxt91.com/contact

nxt91.com