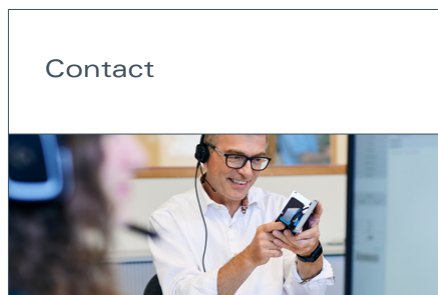
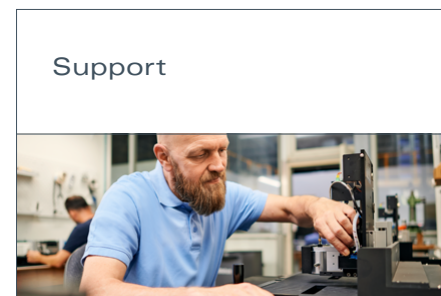
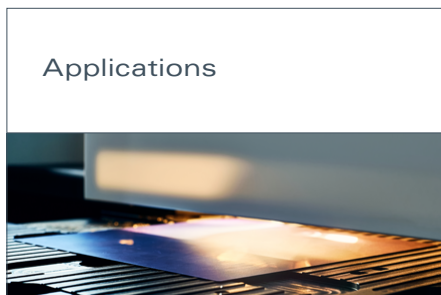




Helios-tn

Controlling coating processes on
silicon-based solar wafers

Click at your desired area.





Precise coating control for your solar wafers

Whether SiN_x , AlO_x , SiO_x , SiO_xN_y – TCO (ITO, AZO,...) – Doped Poly-Si:

Functional coatings are increasingly being used for improving the efficiency of modern crystalline solar cells such as PERC/PERT, IBC, TOPCon, or HJT.

Vacuum coating of the high-performance materials on the wafers gives the ultra-thin silicon wafers, among other benefits, better anti-reflective properties and the desired passivation.

Both the material properties and the coating thicknesses significantly influence the quality of the solar modules. Both factors must therefore be precisely determined during production.

That is why you should trust the Helios-tn systems. These reliable instruments allow you to measure, analyze, and optimize the coatings layer by layer at any time. This enables you to control the entire manufacturing process and ensure the high standard of your modules. See for yourself and be convinced. Experience it for yourself.

One principle, numerous possibilities.

Our INLINE and OFFLINE systems always use the same measuring optics and electronics and constantly follow one measuring principle:

1. Acquire measurement data

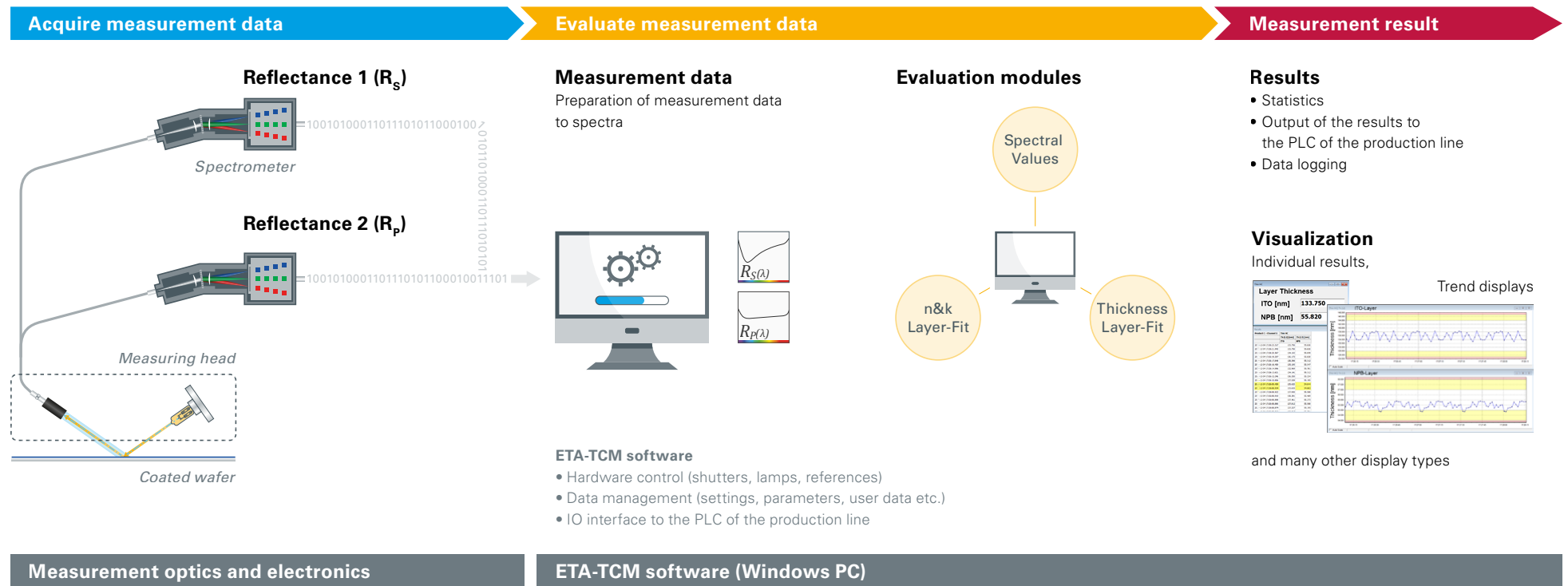
Your coated wafer is illuminated by a light source at a flat angle and captured by a reflection measuring head. The reflected light is split into the two polarization directions, R_s and R_p . Subsequently, two reflectance spectrometers convert the optical signals into data signals, so-called raw spectra.

2. Evaluating measurement data

Using the ETA-TCM software, we process the raw spectra into measurement spectra and determine the reflectance of the wafer in two polarization directions as well as the ellispometric spectral parameter Psi from the R_p/R_s ratio. Filters, averages, factors and offsets can be optionally set. The thicknesses and material properties of layers are then determined from the R_s , R_p and Psi measurement spectra by spectral fits. The layer stack and the parameters (n&k) for the spectral fit are defined in a settings dialog.

3. Measurement result

Your measured values are displayed in tabular and graphical formats. Optionally, you can view statistics. By setting limits you can generate good/bad signals for your wafers. All results are stored and can be directly communicated to your systems via various interfaces, such as Digital IO, TCP/IP, Profibus.





All coatings, all processes. INLINE and OFFLINE measurement.

- Identical measurement hardware for accurate comparability
- Non-contact and non-destructive measurement
- Measuring optics adjustable by tilting to match the wafer surface structure
- With integrated reference standard
- Very fast measurement (≤ 200 ms)

Suitable for

- Solar cell types:
 - PERC/PERT, IBC, TOPCon, HJT
 - Front and rear side
 - n-type and p-type
 - bifacial

- Wafer surfaces:
 - polished
 - textured
 - etched
 - bare etched
- Coating materials:
 - Dielectric layers (SiN_x , AlO_x , SiO_x , SiO_xN_y)
 - Transparent conductive oxides (ITO, AZO, ...)
 - Doped Poly Si

Spectra for

- R_s polarization
- R_p polarization
- Psi (from R_p/R_s)

Measurement values for

- Layer thickness
- Refractive index n (n&k)
- Single and multiple layers
- Measurement of 2–3 parameters simultaneously

User friendly due to

- Easy operation
- User-definable quality limits
- Good/bad indication

Helios LAB-tn | Manually operated tabletop device

- Measuring optics adjustable by tilting to match the wafer surface structure
- Integrated reference samples in the measurement table
- For coated wafers
- External power unit provides voltage supply (12 VDC)

Wafer sizes

For mounting in moving sample frame

Minimum: 20 x 20 mm

Maximum: 245 x 245 mm

Measurement table

- X- and Y-axis manually traversable
- Traversing range X = 300 mm, Y = 300 mm
- Rulers on X- and Y-axis
- High-quality surface for placing the wafers

Weight

30 kg

Power consumption

Maximum: 150 VA

Average: 100 VA

Customizations

Other measurement table sizes or special sample frames are available upon request.

Power unit

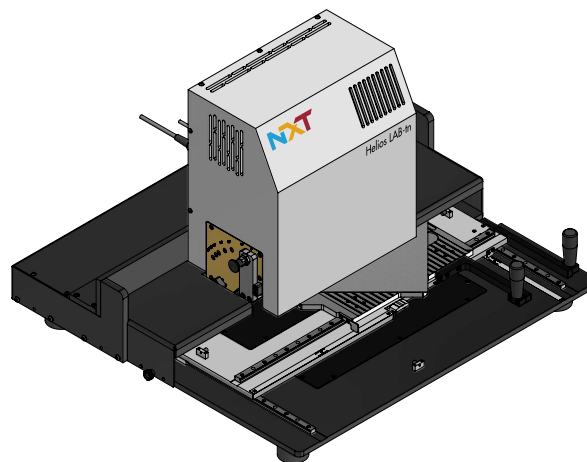
Dimensions [mm]: H = 139, B = 165, T = 316

Weight: 3.5 kg

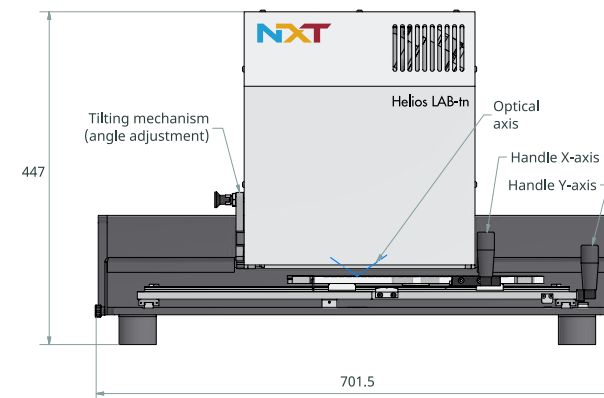
Electrical data

Input voltage: 100 – 240 VAC / 50 – 60 Hz

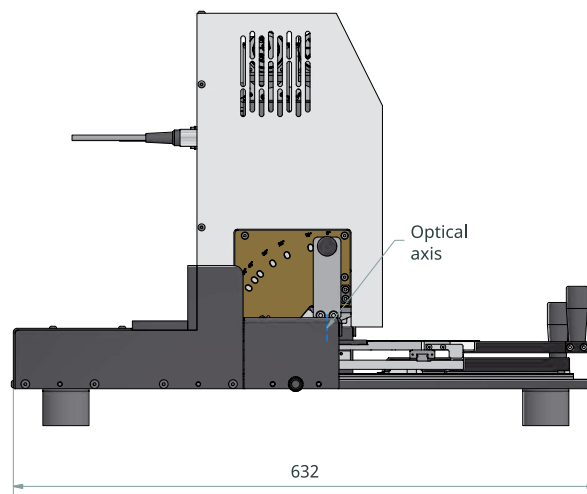
Output voltage: 12 VDC



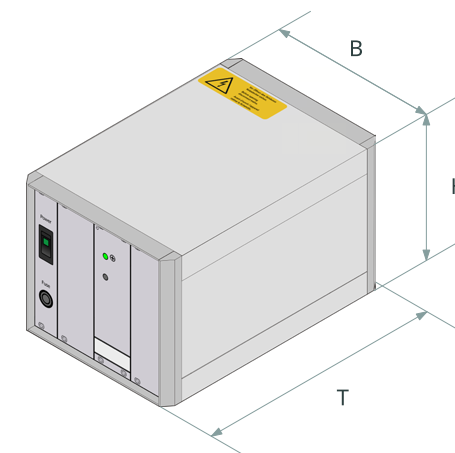
Helios LAB-tn from top



from front



from left



External power unit

Helios SCAN-tn | Motorized scanning tabletop device

- Integrated PC (also available without PC)
- Measuring optics adjustable by tilting to match the wafer surface structure
- Integrated reference samples in the measurement table
- For coated wafers

Wafer sizes

For mounting in moving sample frame

Minimum: 20 x 20 mm

Maximum: 245 x 245 mm

Measurement table

- Drive with stepper motors
- Traversing range of 300 x 300 mm
- Positioning accuracy ≤ 0.1 mm

Weight

45 kg

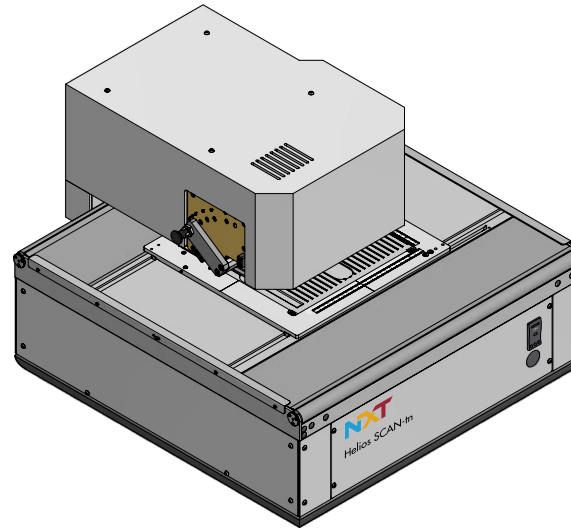
Power consumption

Maximum: 400 VA

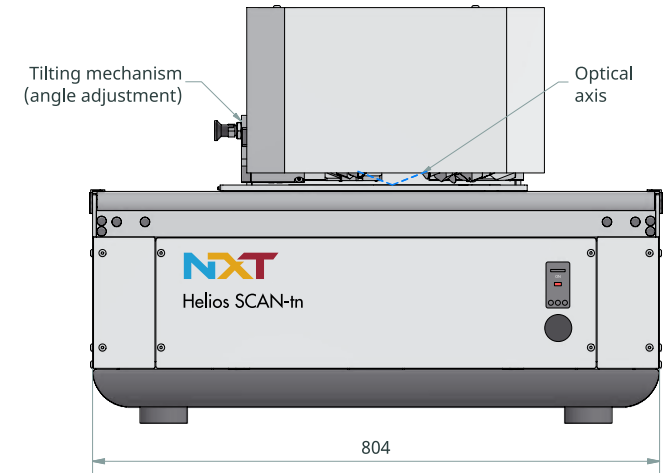
Average: 250 VA

Customizations

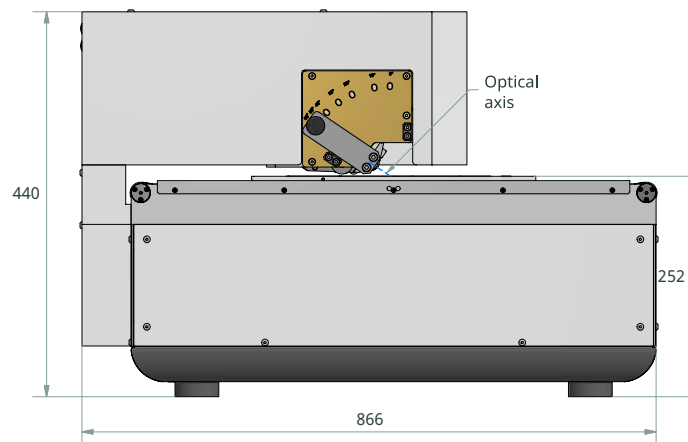
Other measurement table sizes or special sample frames are available upon request.



Helios SCAN-tn from top



from front



from left

Helios INLINE-tn | Compact unit for your production line

- Real-time measurement
- Integrated trigger sensor (measurement start/stop)
- Measuring optics adjustable by tilting to match the surface structure of the wafer
- Integrated reference unit - motorized reference samples
- For coated wafers
- External power unit (outside the production line)
 - generates the power supply (12 VDC)
 - Integrated digital I/O module

Weight

Measurement unit: 9.6 kg

Power consumption

Maximum: 150 VA

Average: 100 VA

Power unit

Dimensions [mm]: H = 139, B = 165, T = 316

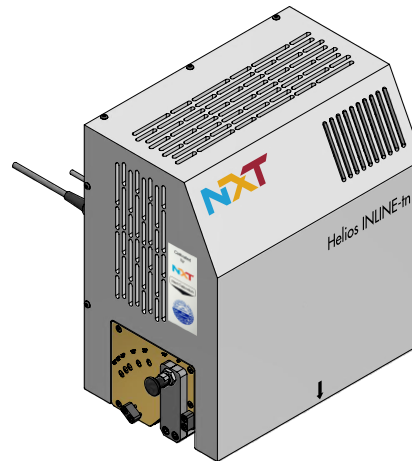
Weight: 3.5 kg

Electrical data

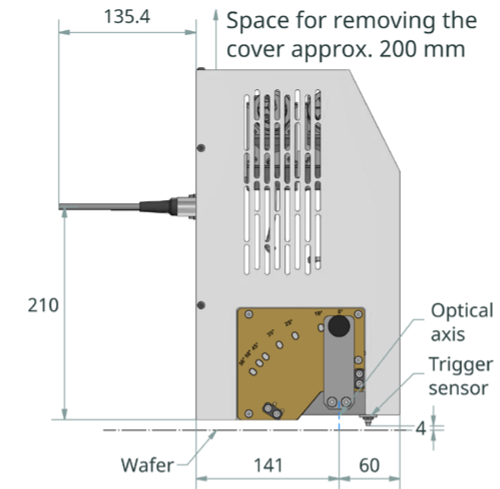
Input voltage: 100 – 240 VAC / 50 – 60 Hz

Output voltage: 12 VDC

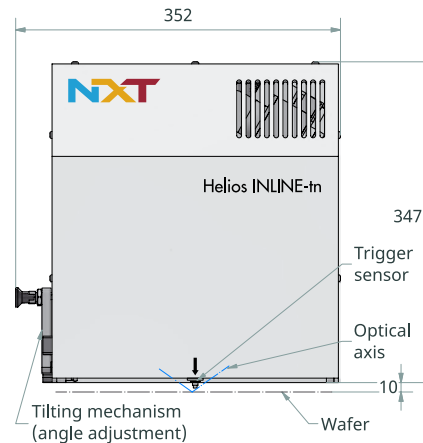
8 digital inputs and outputs



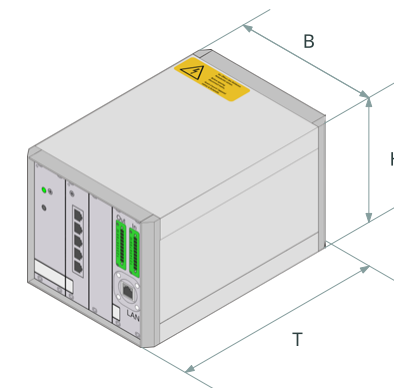
Helios INLINE-tn from top



from left



from front



External power unit

Precise measurements, tailored to your layers



Measurement	
	Spectral values (integral, averaged)
	Layer thickness fit (single layer and double layer ¹)
	n&k – layer fit (single layer and double layer ¹)
Measurement speed/measuring point ²	≤ 200 ms (spectral acquisition) ≤ 200 ms (single layer evaluation) ≤ 500 ms (double layer evaluation ¹)

¹ The possibilities to measure bilayers are very limited and have to be discussed in detail.

² Spectrum acquisition runs in parallel to the evaluation, which is processed in a queue.

Spectral reflectance/Spectral values		
Wavelength range (λ -range)	VIS	380–1050 nm
Reproducibility for ranges of reflectance R_s and R_p	Reproducibility	Range
	0.1 %	0–5 %
	0.2 %	5–40 %
	0.4 %	40–100 %

Layer thickness/n&k – Layer Fit: [Evaluation Cases](#)

Layer thickness and n&k for single and double layers can be measured in different combinations – tailored to your requirements.

For each of these different evaluation cases, there are associated specifications for the measurement.

Case 1 | Single layer

Measure layer thickness and refractive index

Measurement of thickness of a single layer and measurement of refractive index

Layer thickness – layer fit/n&k – layer fit		
Layer thickness range per layer material ¹	SiN _x	50–300 nm
	AlO _x	70–300 nm
	SiO _x	80–300 nm
	TCO (ITO, AZO,...)	70–300 nm
	Poly-Si	30–300 nm
Layer thickness accuracy		± 1 nm
Layer thickness repeatability*		≤ 0.1 nm
Refractive index range per layer material	SiN _x	1.9–2.35
	AlO _x	1.4–1.65
	SiO _x	1.4–1.65
	TCO (ITO, AZO,...)	1.4–2.2
	Poly-Si	3.0–4.5
Refractive index accuracy		± 0.02
Refractive index repeatability*		≤ 0.004

¹ With a fixed refractive index of the material, it is possible to measure significantly thinner layers as well.

* 100 consecutive measurements at a single static position.

Case 2 | Double layer

Measure thickness and refractive index of one layer, e.g. AlO_x+SiN_x or poly-Si+SiN_x

For one layer, the values (thickness and n&k) are known, while the measurement of thickness and n&k is performed for the other layer.

Alternatively: Measure the total thickness and weighted average refractive index of a 2-fold or 3-fold layer

Layer thickness – layer fit/n&k – layer fit	
Layer thickness range of the total thickness	50–300 nm
Layer thickness accuracy	± 1 nm
Layer thickness repeatability*	≤ 0.1 nm
Refractive index accuracy	± 0.02
Refractive index repeatability*	≤ 0.004

Case 3 | Double layer

Measure thickness of both layers and refractive index of one layer

In some cases it is possible to measure the thickness and n&k of the top layer and for the layer below the thickness with known n&k.

Layer thickness – layer fit/n&k – layer fit	
Layer thickness range of total thickness	50–300 nm
Layer thickness accuracy	± 1 nm
Layer thickness repeatability*	≤ 0.1 nm
Refractive index accuracy	± 0.02
Refractive index repeatability*	≤ 0.004

General	
Measurement geometry	Synchronized 2-channel reflectance spectrometry with oblique light incidence
Angle adjustment of optical axis (adjustable with tilting mechanism)	0° / 10° / 25° / 35° / 45° / 50° / 56°
Size of measuring spot (elliptical)	≈ 5 x 8 mm
Working distance	≈ 10 mm
Distance tolerance	± 2 mm
Tilt tolerance	± 2°

Light source		
Halogen lamp	Power consumption	20 W
	Service life	≥ 2000 hrs.
	Color temperature	3000 K

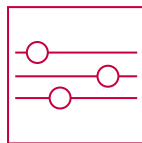
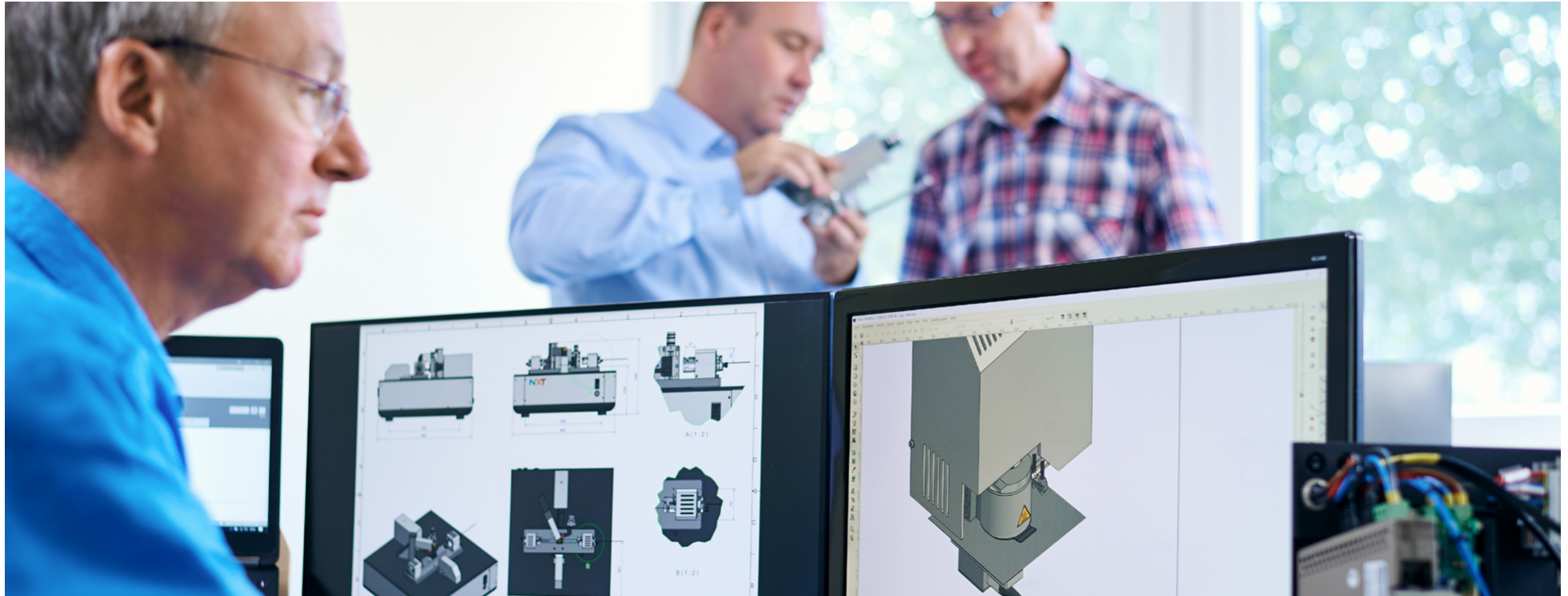
Spectrometer (VIS)	
Holographic transmission grating	
Number of spectrometers	2
Spectral range	380–1070 nm
Silicon diode array detector	256 pixels
Digitization	16 Bit
Interface	LAN

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

Environmental conditions	
Temperature	5–45 °C (50–90 °F)
Maximum humidity (non-condensing at 20 °C)	90 %

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

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



Configurable according to your preferences

To integrate the Helios-tn measuring system into your production line, we support a wide range of communication interfaces. Thanks to the modular design of our hardware and ETA-TCM software, our measuring systems can be configured specifically to your requirements.

As a process owner, you define the relevant process windows in the software based on adjustable limits. The compliance with these threshold values is verified and displayed.

This allows for the sorting of defective products and also the detection and prevention of process drift.

We would be pleased to demonstrate our Helios-tn measuring system at your premises, our headquarters or at a branch office located near you.

The measurement capability can be verified by using the provided reference samples, and the results can be documented through a measurement report.



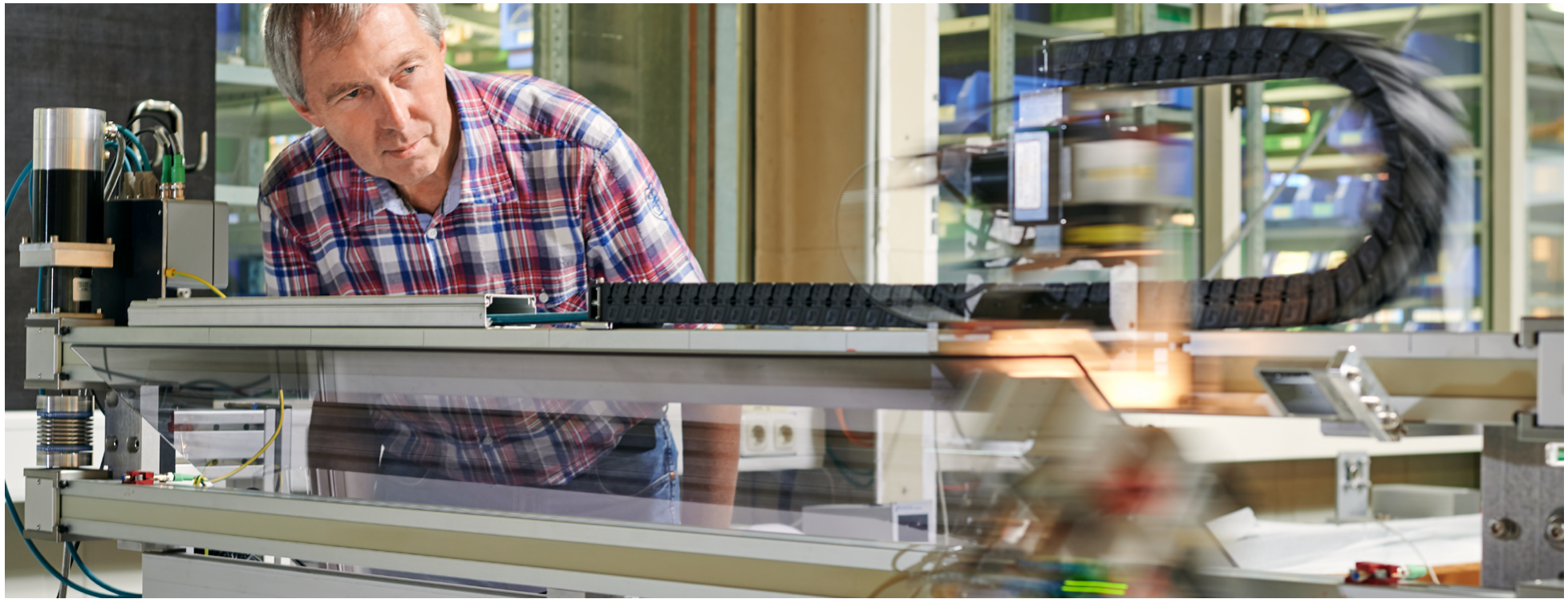
Easy to learn and operate

The configurable ETA-TCM software is the central User Interface of the Helios-tn measuring system.

As a process owner, you will receive guidance and training from us, enabling you to independently set process limits to optimize the balance between Scrap and Throughput.

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

In addition, details on operation and maintenance are described in the operation manual, ensuring not only ease of use but also basic maintenance. For example, you can replace the lamp yourself.



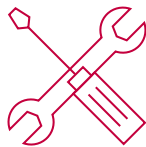
Reliable and stable in the long term

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

With our 30 years of experience, we have established standardized commissioning and quality assurance processes to ensure consistent quality of our systems.

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

Our measuring systems have been in operation for over 30 years, even in harsh industrial environments. They are still periodically maintained and supplied with spare parts by us.



Technical support

The replacement of wear parts can be found in the maintenance schedule in the operation manual.

The required time may vary depending on the model, but it is generally minimal.

In case of difficulties, a quick analysis can be performed based on a service report that can be exported from your ETA-TCM software and sent to us.

Your request will be handled by one of our technicians who will promptly contact you for further assistance.

More extensive maintenance to ensure the correct functioning of the entire measuring system is also

carried out by one of our technicians. In this case, a downtime of half a day to a full day can usually be expected. Alternatively, you can simply send us your measuring system, and the maintenance will be completed within one week at our facility.

Our service is available beyond the specified lifespan of your system. We will inform you in a timely manner if maintenance becomes unfeasible, for example, due to discontinued components, or if a paid inventory stocking is required.



Your processes in focus

NXT GmbH is a global leader in providing comprehensive quality assurance solutions for specialized industries.

Our modular measuring systems with high-precision measuring optics and an excellent evaluation software (ETA-TCM), are fully developed and manufactured in-house with a high degree of manufacturing depth.

Whether offline or inline – all systems are based on the same measuring technology and can be configured and customized according to your specific needs.

In addition to high-precision measuring systems, we provide active customer support and training worldwide.

Our headquarters are located in Heinsberg, Germany, with branch offices in China, Taiwan, and Korea, as well as a network of representatives for service and support worldwide.



Let's talk about your new possibilities.

Are you looking for consultation regarding 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.

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