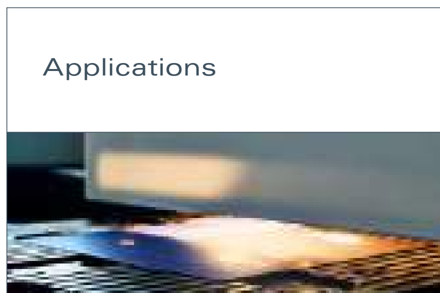
Helios-r8

Process and quality control
of Poly-Si coatings
on TOPCon solar wafers

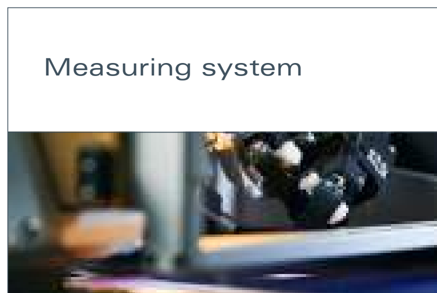
NXT
Securing Good Results

Click at your desired area.

Applications

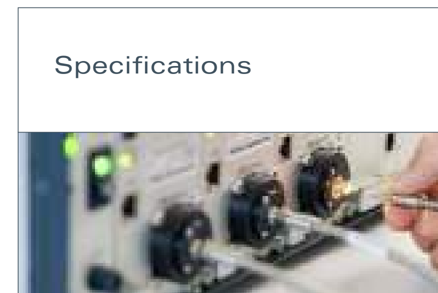


Measuring system

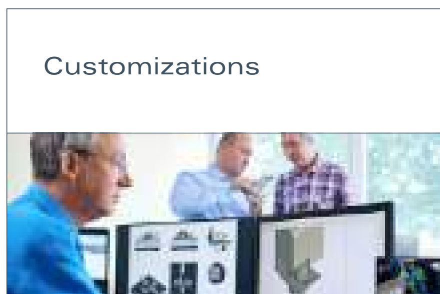


Models

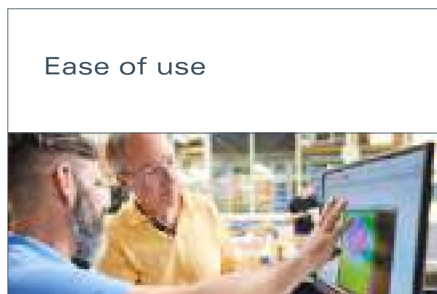
Specifications



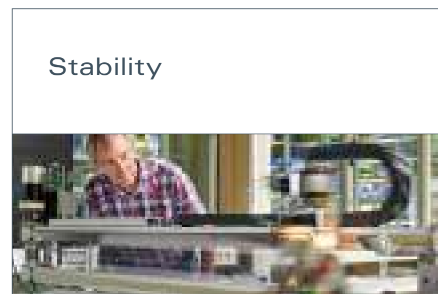
Customizations



Ease of use



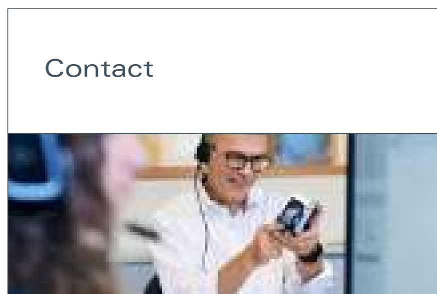
Stability



Support

About NXT

Contact



Precise process and quality control for your TOPCon wafers

In the production of modern, highly efficient TOPCon solar cells, Poly-Si layers are deposited on the etched rear side of the solar wafers over an extremely thin tunnel oxide layer. Both the layer thickness and the process-dependent optical constants of the Poly-Si layer determine the quality of the solar cells, especially the selective passivating contact on the rear side.

The Helios-r8 inline and offline measuring systems are perfect instruments to analyze and optimize the coating process of your solar wafers with Poly-Si.

It enables you to measure the layer thicknesses and the spectral optical constants n&k of the layers on the etched rear sides of the wafers.

Because of its high measurement speed, the Helios-r8 is perfectly suited for inline measurements and homogeneity measurements of the Poly-Si layers, where several points on the wafer surface are measured.

Experience it for yourself.

One principle, numerous possibilities.

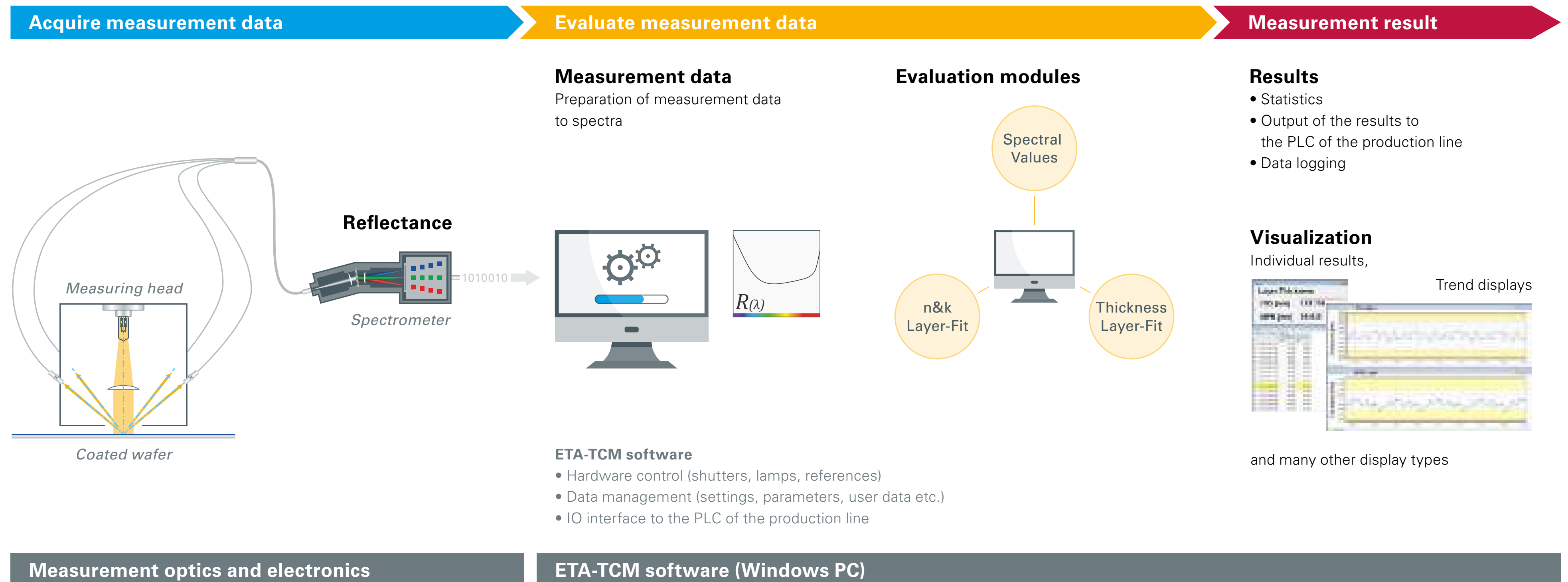
Our Helios-r8 systems are configured according to your requirements. The INLINE and OFFLINE systems always use the same measuring optics and electronics and constantly follow one measuring principle:

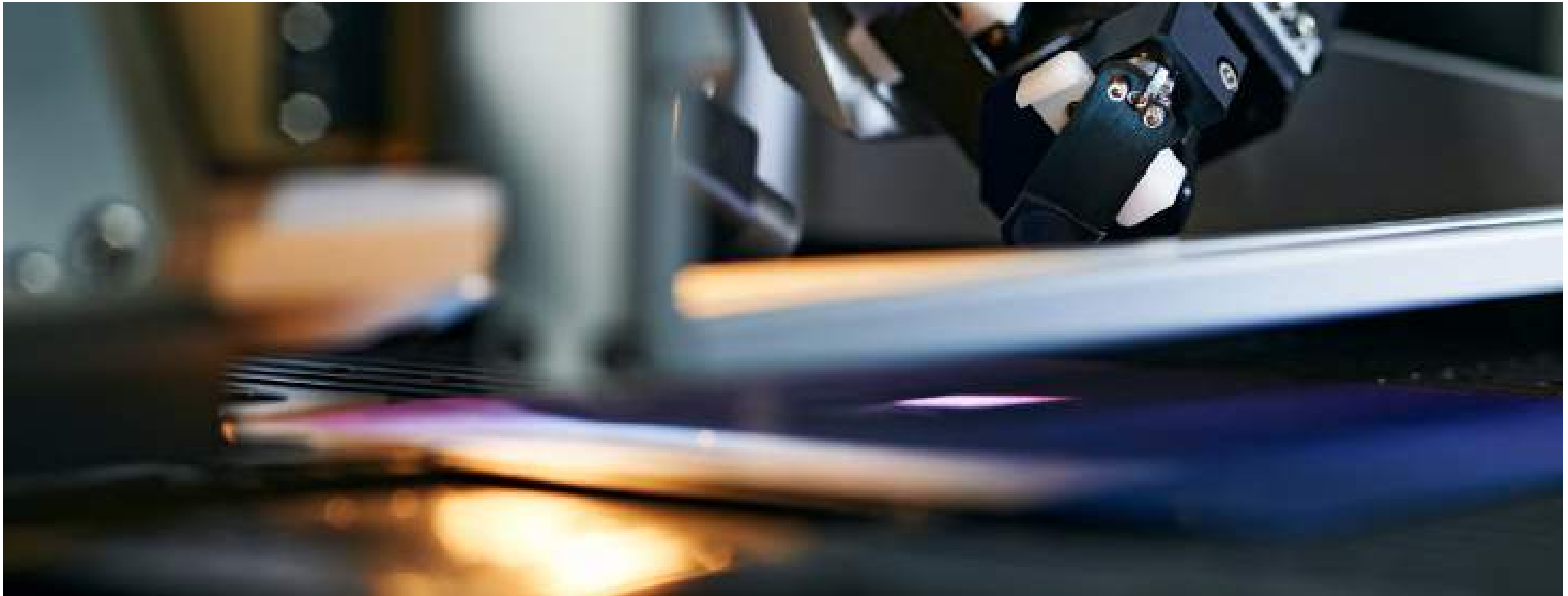
1. Acquire measurement data
The rear side of your coated wafers is illuminated axisymmetrically by a light source and then both reflected and scattered light is detected by multi-angle receiving optics. These optics are tolerant/insensitive to surface roughness and the orientation and thickness of the saw or etch structures on the rear side of the wafers.

Subsequently, a reflectance spectrometer converts 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. Based on this, we use spectral fits and optical models of the layer material to determine the thicknesses and material properties of the Poly-Si layers. The layer stack, including the tunnel oxide layer 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.





TOPCon Poly-Si layers. INLINE and OFFLINE measurement.

- Identical measurement hardware for accurate comparability
- Non-contact and non-destructive measurement
- Measurement insensitive to
  - Rotation of the wafer
  - Tilting of the wafer
  - Distance of the wafer
  - Surface roughness of the wafer
  - Orientation and depth of saw or etch structures of the wafer
- With integrated reference standard
- Very fast measurement (≤ 200 ms)

Suitable for

- Solar cell types:
  - TOPCon
  - n-type and p-type
  - bifacial
- Wafer surfaces:
  - etched, acidic or alkaline
  - bare etched
- Coating materials:
  - Doped Poly-Si

Measurement values for

- Layer thickness
- Refractive index n (n&k)

User friendly due to

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

Helios LAB-r8 | Manually operated tabletop device

- Measurement insensitive to:
  Rotation of the wafer, Tilting of the wafer, Distance of the wafer, Surface roughness of the wafer, Orientation and depth of saw or etch structures of the wafer
- 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

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

Weight

24 kg

Power consumption

Maximum: 150 VA

Average: 100 VA

Customizations

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

Power unit

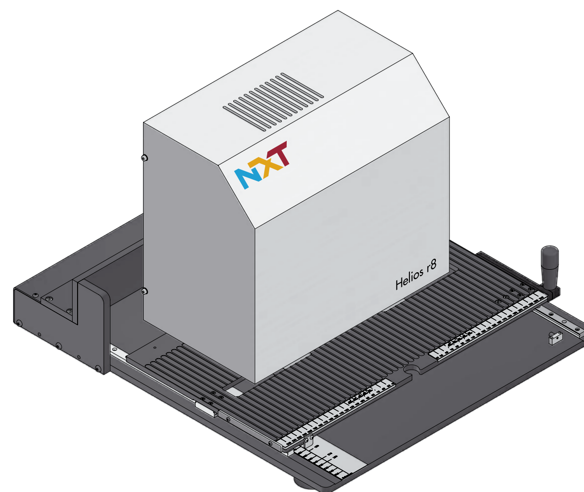
Dimensions [mm]: H = 139, B = 165, T = 316

Weight: 3.5 kg

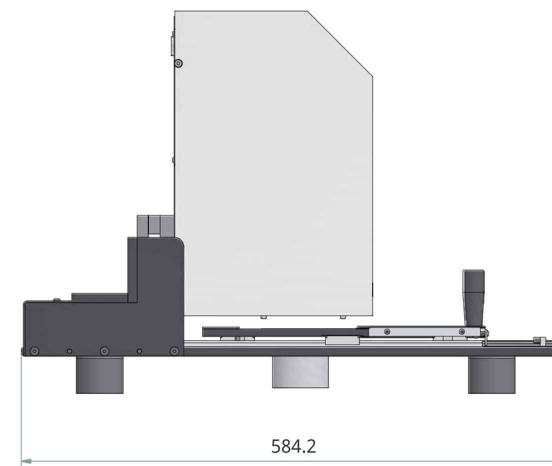
Electrical data

Input voltage: 100–240 VAC/50–60 Hz

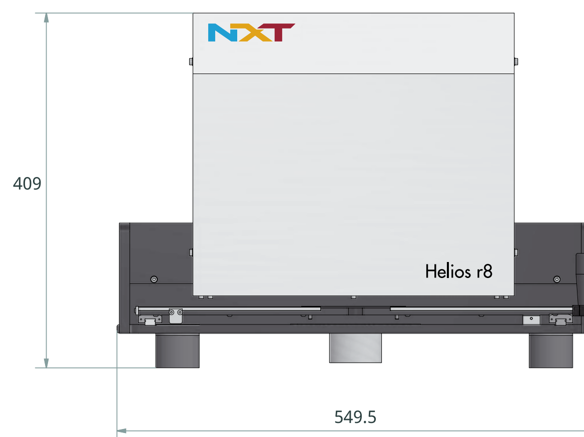
Output voltage: 12 VDC



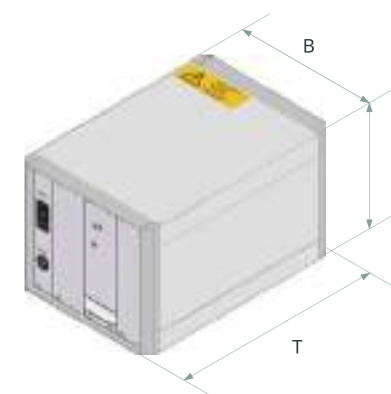
Helios LAB-r8 from top



from left



from front



External power unit

Helios SCAN-r8 I Motorized scanning tabletop device

- Integrated PC (also available without PC)
- Reference samples integrated in the measurement table
- For coated wafers

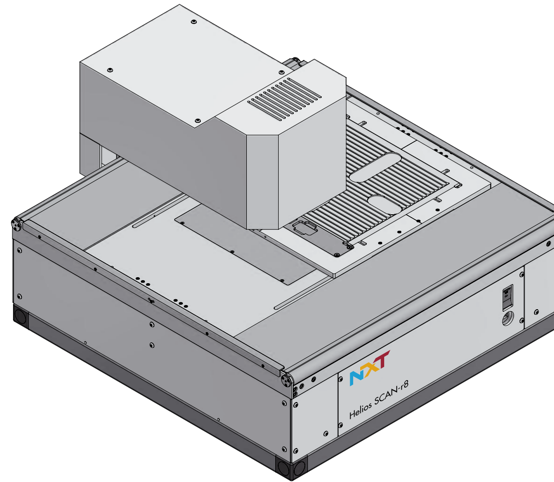
Wafer sizes
For mounting in moving sample frame
Minimum: 20 x 20 mm
Maximum: 245 x 245 mm

Measurement table
- Drive with stepper motors
- Traversing range of 240 x 240 mm
- Positioning accuracy ≤ 0,1 mm
- Typical measuring speed ≤ 0,1 s/measuring point

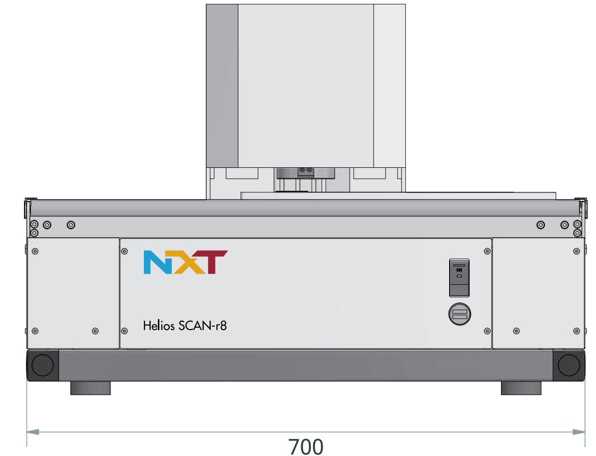
Weight
45 kg

Power consumption
Maximum: 400 VA
Average: 250 VA

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



Helios SCAN-r8 from top



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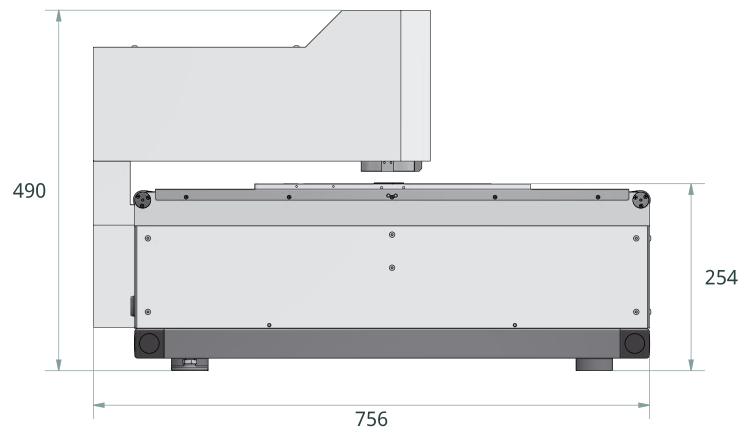


from left

Helios INLINE-r8s | Compact unit for your production line

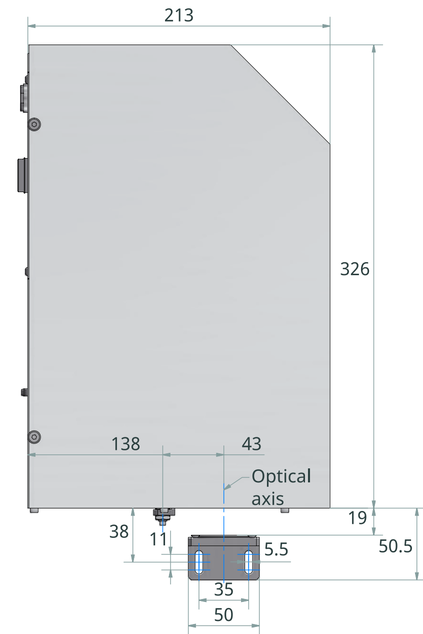
- *Real-time* measurement
- Integrated trigger sensor (measurement start/stop)
- Measurement insensitive to
  - Rotation of the wafer
  - Tilting of the wafer
  - Distance of the wafer
  - Surface roughness of the wafer
  - Orientation and depth of saw or etch structures of the wafer
- For coated wafers
- External power unit (outside the production line)
  - generates the power supply (12 VDC)
  - Integrated digital I/O module

Weight
Measurement unit: 7.3 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-r8s from top



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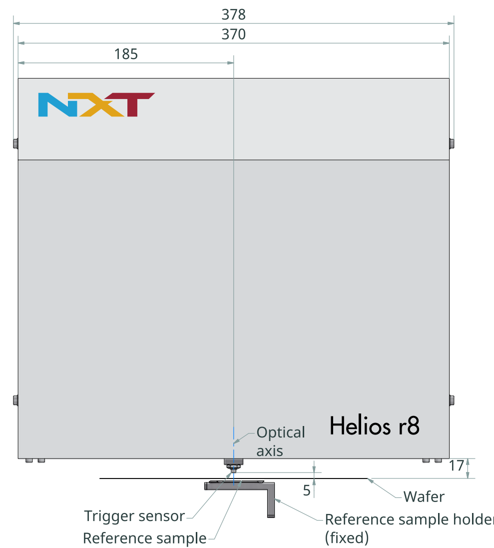
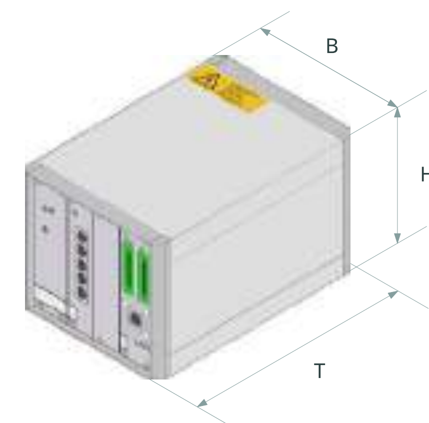


from front



External power unit

Helios INLINE-r8m I Compact unit for your production line

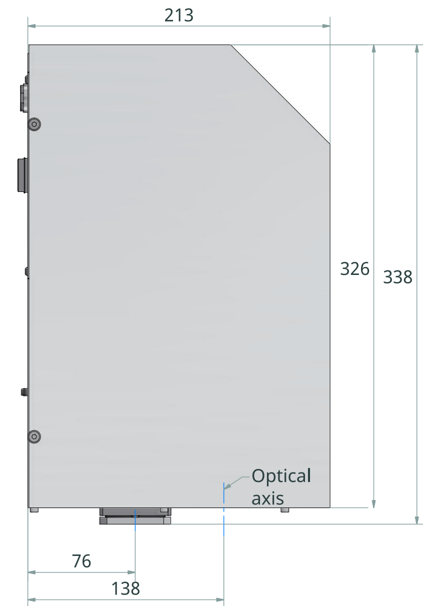
- Real-time measurement
- Integrated reference unit – motorized reference sample
- Measurement insensitive to
  - Rotation of the wafer
  - Tilting of the wafer
  - Distance of the wafer
  - Surface roughness of the wafer
  - Orientation and depth of saw or etch structures of the wafer
- For coated wafers
- External power unit (outside the production line)
- Generates the power supply (12 VDC)
- Integrated digital I/O module

Weight
Measurement unit: 7.8 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-r8m from top



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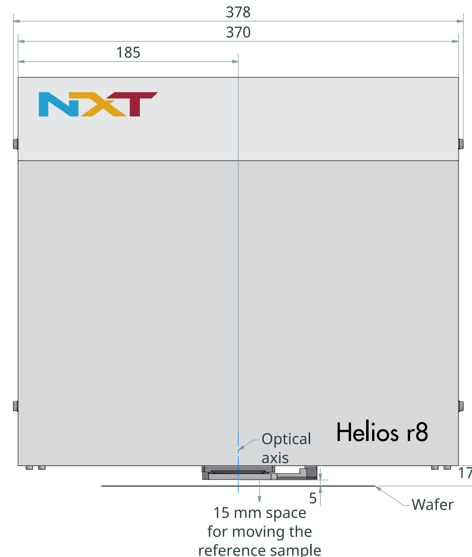

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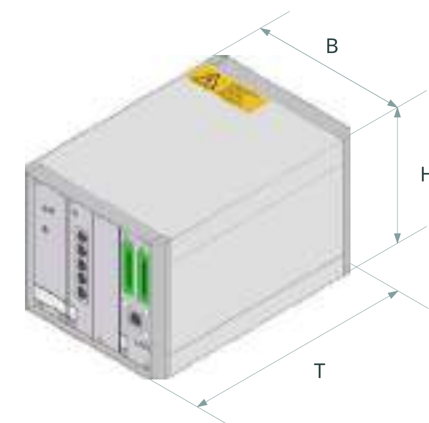


External power unit

Precise measurements, tailored to your Poly-Si layers

Measurement	
	Spectral values (integral, averaged)
	Layer thickness Poly-Si – layer fit
	n&k – Poly-Si layer fit
Measurement speed/measuring point[1]	≤ 200 ms

[1] 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	**Reproducibility**	**Range**
	0.1 %	0–5 %
	0.2 %	5–40 %
	0.4 %	40–100 %

Layer thickness – Layer-Fit / n&k – Layer-Fit		
Layer thickness range per layer material	Poly-Si	50–450 nm
Coating thickness accuracy		± 1 nm
Coating thickness repeatability *		≤ 0.1 nm
Refractive index range per layer material	Poly-Si	3.0–4,5
Refractive index accuracy		± 0.01
Refractive index repeatability *		≤ 0.005

* 100 consecutive measurements at a single static position

General	
Measuring geometry	Rotational symmetric
Transmitting optics	Axial
Receiving optics	Multi angle
Size of measuring spot (round)	≈ 20 mm
Working distance	≈ 17 mm
Distance tolerance	± 3 mm
Tilt tolerance	± 2°

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

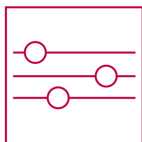
Spectrometer (VIS)	
Holographic transmission grating	
Number of spectrometers	1
Spectral range	380–1070 nm
Silicon diode array detector	256 pixels
Digitization	16 Bit
Interface	LAN

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

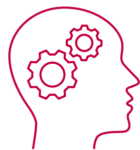
To integrate the Helios-r8 measuring system into your production line, we support a wide range of communication interfaces. Thanks to the modular design of our hardware and ETA-TCM software, our measuring systems can be configured specifically to your requirements.

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-r8 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.



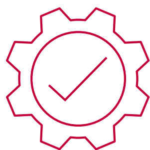
Easy to learn and operate

The configurable ETA-TCM software is the central User Interface of the Helios-r8 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.



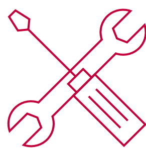
Reliable and stable in the long term

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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