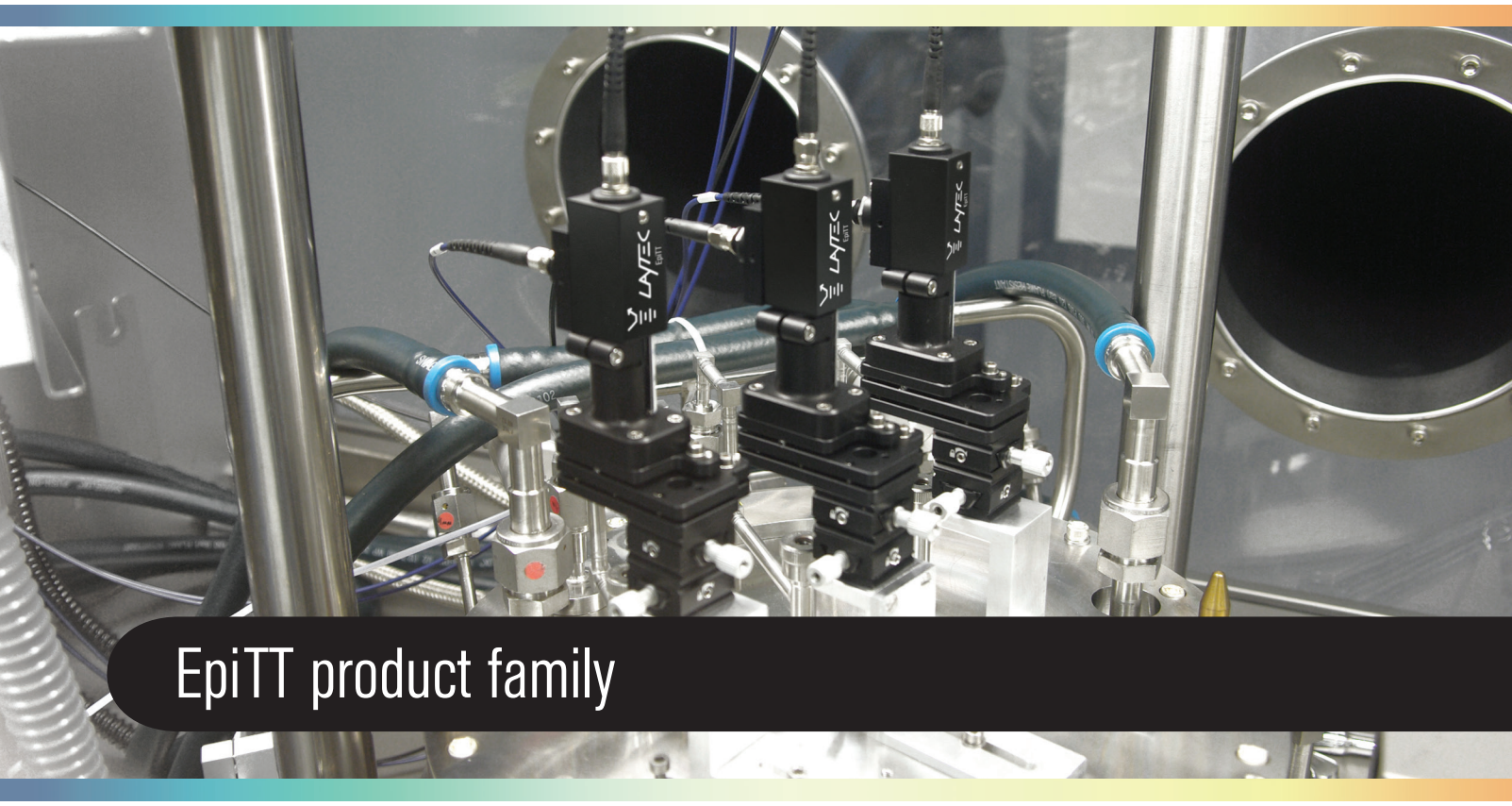


EpiTT product family

The EpiTT product family includes optical in-situ systems that measure emissivity-corrected wafer temperature and multi-wavelength reflectance. The EpiTT is also available as double-head (EpiTwin TT), triple-head systems (EpiTriple TT) or systems with four optical heads for multiple wafer ring configurations.

Features

Temperature	– Wafer/pocket selective true temperature (TT) measurement, based on emissivity corrected pyrometry – Up to three additional EpiTT heads possible (EpiTwin TT, EpiTriple TT or EpiTT with 4 optical heads) for measurements on additional positions (wafer rings, heating zones) – High precision calibration: factory calibration against a certified black body source and on-site calibration of the complete set-up with LayTec's calibration tool AbsoluT – Uniformity check (e.g. for comparison center to edge): temperature measurement at several positions on the wafer, on different wafers and on different wafer rings in case of Twin/Triple edition and in case of EpiTT with four optical heads
Reflectance	– Wafer selective reflectance measurement at three wavelengths – Wafer selective growth rate analysis – Recipe-controlled automated growth rate fit for multi-layer structures – Reflectance uniformity check: similar to temperature uniformity check (see above)
Additional features	– Optimized for 24 h/7 day operation in production environments – Measurement on single and multiple wafers (rotating or non-rotating), supporting satellite type susceptors even with multiple wafers per satellite – Wobble compensating optics

Features

Communication / Integration

- Data exchange with growth system control computer via hardware interface and/or TCP/IP protocol based software interface. Pre-configurations is possible for different growth systems.
- Remote controllable from growth recipe
- Heartbeat/watchdog signals for SPS integration
- SECS/GEM implementation on request
- Analog output up to 8 x 4–20 mA

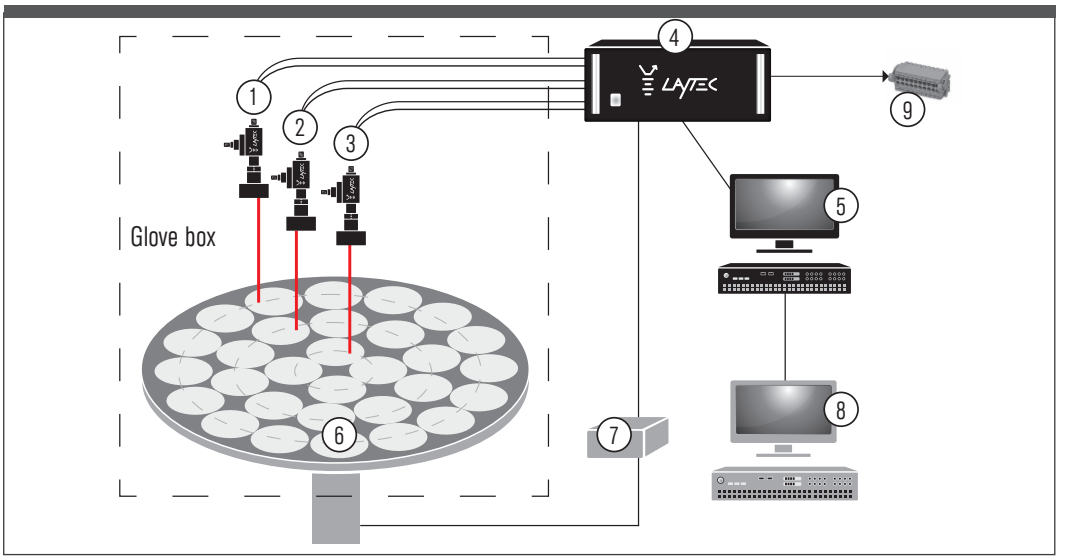
Measurable growth parameters

Reflectance*	Noise typically better than ± 0.5 %
Growth rate*	Accuracy better than ± 1 %
Temperature range*	T=450 °C to ~1300 °C for large viewport systems / accuracy better than ± 1K T=500 °C to ~1400 °C for narrow viewport systems / accuracy better than ± 1K Other temperature ranges on request (e.g. 1500 °C for UV LED applications, 1800 °C for SiC)
High temperature optical database includes	AlGaN, AlGaAs, InGaN, AlInGaP, Ge, InP, GaAs, Si_3N_4, Si, SiC Other materials available on request

* Contact LayTec for final technical specifications.

System components

EpiTriple TT as an example drawing



Parts

1, 2, 3 – EpiTT fiber optical head for true temperature (TT) and reflectance (R) measurements
4 – Electronic control unit
5 – LayTec control computer (includes: measurement PC, TFT flat screen, mouse, keyboard)
6 – Deposition system (not delivered by LayTec)
7 – Rotation encoder (from LayTec on request)
8 – Growth control computer (not delivered by LayTec)
9 – Additional analog output up to 8 x 4–20 mA (wiring not supplied by LayTec)

Description of the parts

Optical head

The products of our EpiTT family are equipped with 3 reflectance wavelengths as a standard. Other wavelength combinations are available on request.

Light source	High brightness LED
Standard wavelengths and bandwidth (nm)	405 ± 1 and 633 ± 1.5 and 950 ± 5
Alternative wavelengths available (nm)	488 ± 0.5, others on request
Life-time according to manufacturer (h)	>20 000

Frequency of reflectance measurements

Susceptor rotation frequency (rpm)	Frequency of reflectance measurement (Hz)
3 ... ~ 20	100
20 ...~ 100	2 kHz
100 ...~ 1500	8 kHz ... 12 kHz

The number of measurements within one susceptor revolution (max. sampling rate per round) and the time it takes to measure the exact same spot on the wafer a second time (data repetition rate) depend on susceptor/carrier rotation.

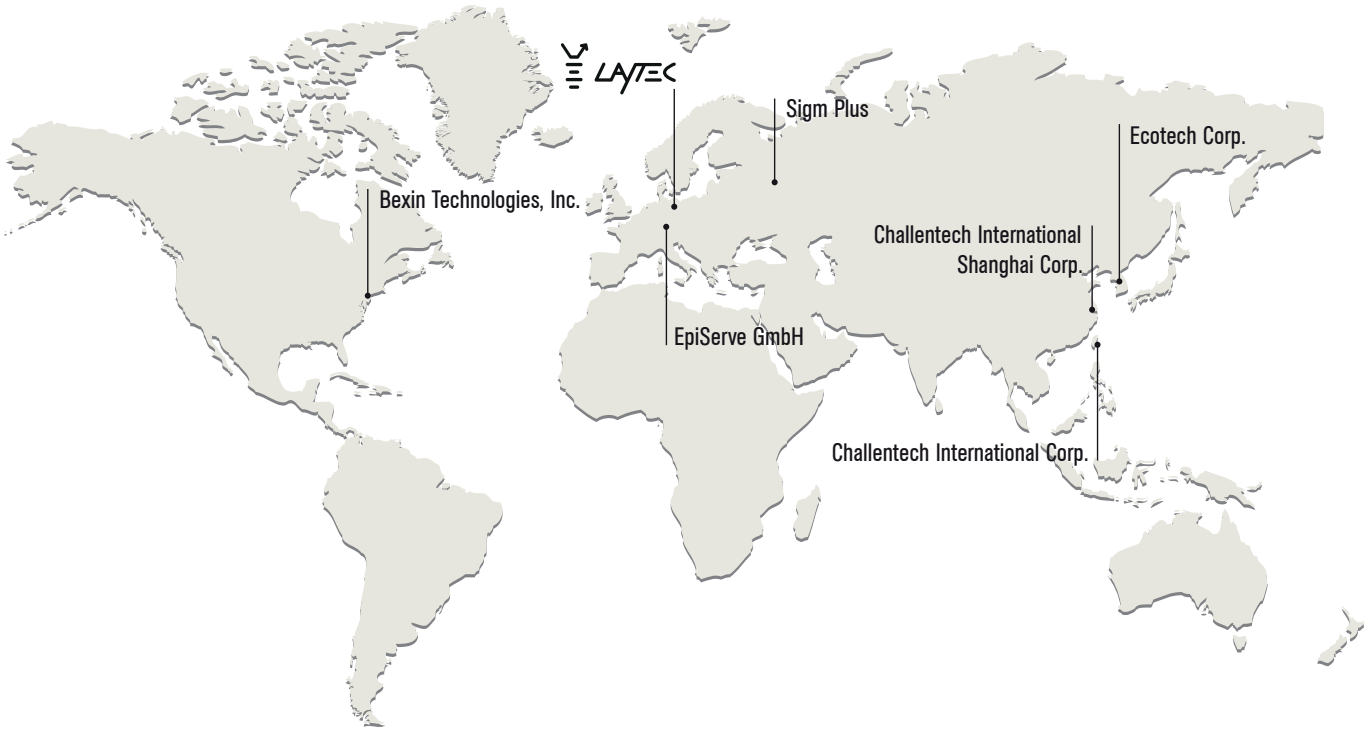
Examples for different rotation frequencies

Typical susceptor/ Carrier rotation (rpm)	Rotation frequency example (rpm)	Repetition rate (sec)	Spatial resolution: max. number of measurements per round
Slow rotation (0 and 3 ... ~ 25)	10	6	600
	20	3	300
Fast rotation (20 ... ~ 150)	60	4	2 000
	120	2	1 000
High speed rotation (100 ... ~ 1500)	600	2	800
	1200	1	400

Electronic control unit and PC

The electronic control unit and measurement PC are standard 19" boxes that can be easily mounted into existing 19" racks.

Global Network



We are the leading manufacturer of integrated optical metrology systems for all thin-film processes. LayTec systems can be customized for every specific process. For your specific application please contact LayTec directly or your local LayTec representative:

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* provide technical service as well

Specifications are subject to further technical development and may differ from those given in the data sheet. In certain cases, performance may be limited by reactor type and/or growth conditions. Please consult our technical sales team to see how LayTec metrology can best serve your specific application.

For further information please contact:

LayTec AG
Seesener Str. 10-13
10709 Berlin, Germany

Tel.: +49 (0)30 89 00 55-0
Fax: +49 (0)30 89 00 55-180
Email: info@laytec.de
Web: laytec.de

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