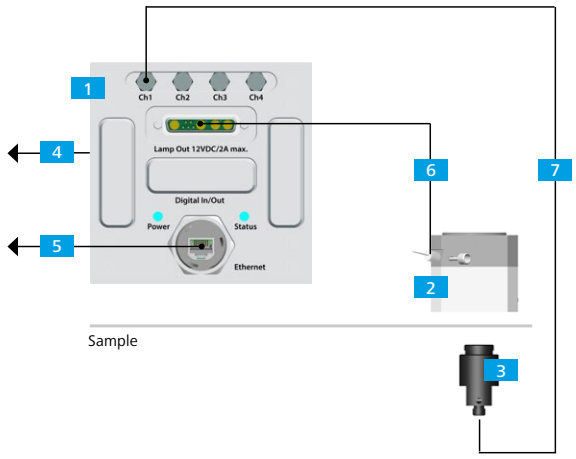
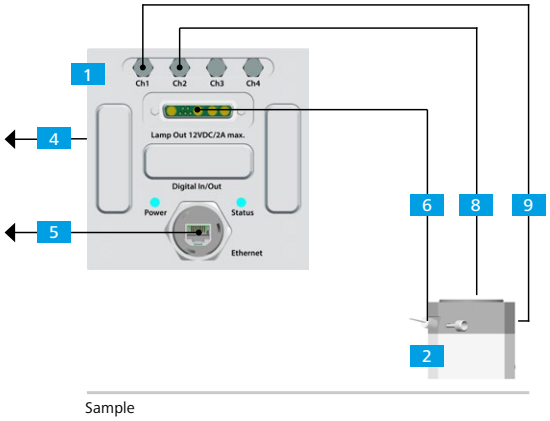
FilmDetect®

Hardware Configuration and Options

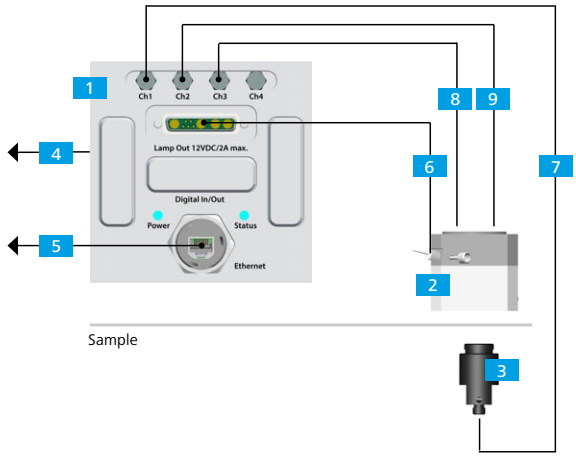
VIS Transmission
with illumination sphere



VIS Reflection
with illumination sphere and bypass



VIS Transmissions and Reflection
Combined measurement



1 Spectrometer MCS72x (380 nm – 1050 nm)
2 Illumination sphere OFR d/8 H
3 Achromatic optics, transmission
4 SV cable
5 Ethernet cable
6 Lamp cable MCS700 – OFR d/8 H
7 Light guide Transmission
8 Light guide Reflection
9 Light guide Bypass

Optional Accessory

Model based film analysis software Sample and probe holder for laboratory and at-line use embedded PC for sensor applications

Further Applications

Film Thickness by Fluorescence
Indirect thickness measurement via UV generated fluorescence (i.e. primer coatings)

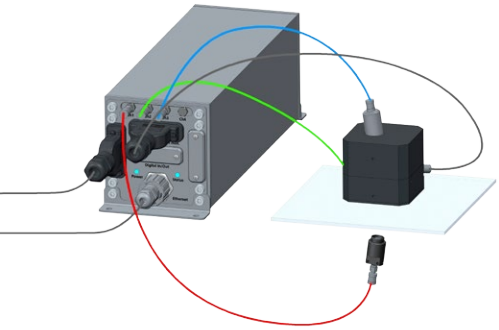
Plasma Inspection
Stabilizing the plasma in the vacuum chamber by optical emission spectroscopy

Carl Zeiss Spectroscopy GmbH
Carl-Zeiss-Promenade 10
07745 Jena

ZEISS
We make it visible.

FilmDetect®

Thin layer analysis with FilmDetect® from ZEISS. In-line, at-line and lab: Fast, precise and robust.



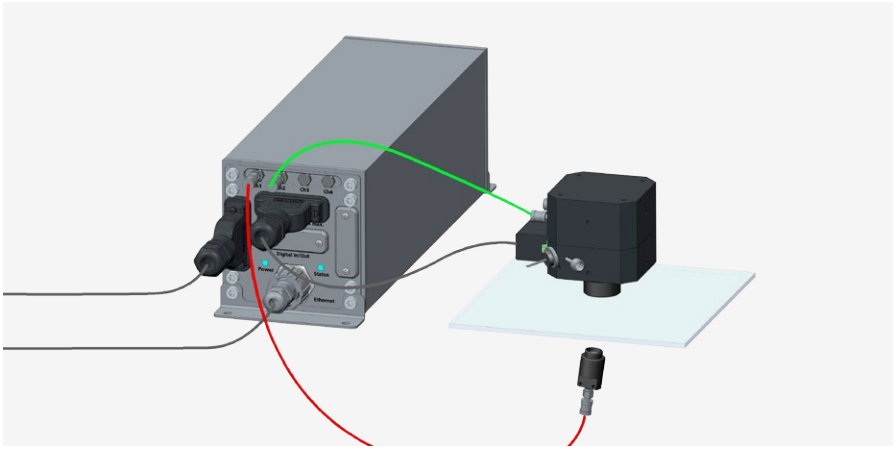
- Layer thickness and Color analysis in a fraction of a second
- Solid, reliable, compact Diode Array Spectrometer
- FilmDetect Analysis Software
- For use at your desktop or fully integrated into your production line
- Saves time and money through inline process monitoring and at your daily routine jobs

www.zeiss.com/spectroscopy

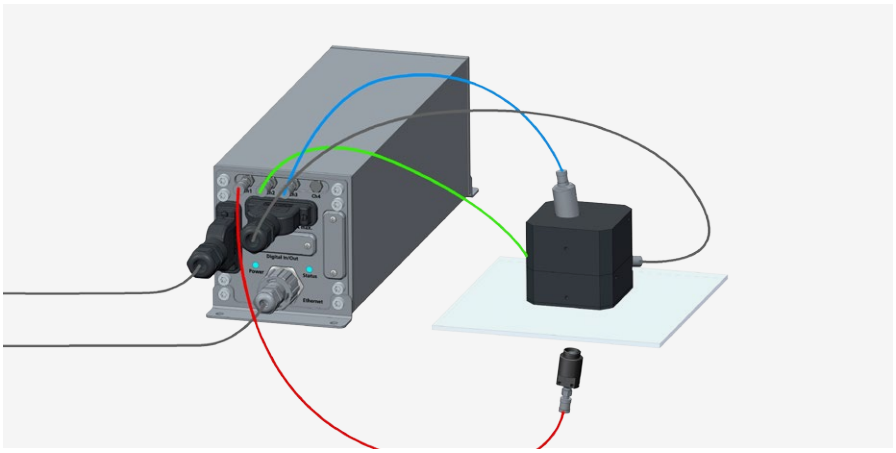
We make it visible.

FilmDetect®

Process monitoring system for thin film analysis



Transmission measurement with bypass



Reflection and transmission measurement with bypass

Inline Process control

ITO layers on foils, flexible printed circuit boards (FPCB), low emissivity (low-e) or smart glass coatings generate a distinctive spectrum. Therefore it is not necessary to determine all measurable parameters for the in-situ monitoring of the layer.

A more efficent and faster method is the checking of parameters that correlate with the layer thickness. For efficient in-situ process control the location of the reflection upper limits and one or more color indicators can also be used.

Thin Film Analysis (film thickness, color)

To control the uniformity of the coating of TiO_2 on flexible film, the film analysis sensor is used in a transmission setup for inline measurement of film thickness. This can be performed at the coating line at full processing speed. The application uses optional physical models for the analysis layer.

The quality of AR-hard coatings (ZrO_2 / SiO_2) on automotive head lights is are controlled using reflection measuring stations. The integrated model allows fast coating thickness measurement and data archiving by production production operators.

Micro-structured surfaces

The determination and recording of color parameters control the integral color impression of patterned film, such as those used in the production of security features (film holograms).

By monitoring the position of the spectral reflectance minimum, the film thickness is evaluated even on microstructured surfaces. Here, a large spot size is used enabling a fast and accurate inline process control.

FilmDetect®

Technical Specifications

System Overview

General	Description	Inline, in situ and atline process monitoring system for thin film analysis, spectral transmittance and reflectance (380 nm – 1050 nm), color, film thickness
Performance	Sampling rate	Up to 20 measurements per second (w/o model based calculations)
Configurations	Number and type of probes	1 Transmission (T) | 1 Reflection (R) | 1T + 1R (RT)
	Network type	Ethernet (using a second interface card to separate from factory network)
External interface	Field busses	Signal exchange via Digital I/O (hardware dependent), self-configuring OPC server, OPC client on request, Profibus DP on request, SQL on request
Triggering	Start trigger	Manual start External Trigger (OPC, Profibus, Digital I/O)
	Calibration trigger	Digital I/O, OPC, Profibus

Evaluation

Calculations	Color	i.e.: L*, a*, b*, dE (CIELAB)
	ISO 9050	i.e. solar transmittance, UV transmittance
	other	i.e. absorptance, multiglazing
Film evaluation	Min / Max	Min / Max finder for spectra evaluation
	FFT	FFT based algorithm for up to 2 layer
	Model based **(option)**	seamless integration of 3rd party model based software package (on request)
Result evaluation	Classification	Calculated values and whole spectra can be classified
	SPC (statistical process control)	Simple tolerance band (warning and error level) based signaling
	Output	All classification results can be shown on screen (color code) and sent to the external interface
Result presentations		Configurable table and diagram views, trend views, alarms, numerical values, color codes for tolerances
Data exchange	Formats	CSV file, OPC, Digital IO, (SQL on request)
	Production line integration	Result signaling to external equipment incl. PLC via external interface

Metrology Specification

Repeatability (spectroscopic measurement)	100 % Baseline (white standard, integration time < 50 ms)	< 0.1 % T | R Y, L*, a*, b* < 0.1 (CIELAB)
	10 % Baseline (gray standard, integration time < 50 ms)	< 0.5 % T | R Y, L*, a*, b* < 0.5 (CIELAB)
Accuracy (400 nm – 920 nm)	BK7 batch – 1 plate BK7 batch – 3 plates	Δ%R < 0.3 % dE < 0.5
Chromatic Accuracy	Compared to color tiles	dE < 1
	Compared to typ. samples	dE < 0.3
Film thickness FFT algorithm (optical thickness)	Number of layers (FFT)	2
	Measuring range (FFT, typical)	0.40 µm – 25 µm | 0.25 µm – 100 µm (optional)
	Accuracy (FFT, typical)	0.02 µm – 0.05 µm | 0.01 µm – 0.04 µm (optional)
	Repeatability (3 σ; typical)	10 % of accuracy
Film Thickness model based (optional) (optical thickness)	Number of layers (model based)	> 2 (application dependent)
	Measuring range (model based)	~ 0.01 µm – 100 µm (application dependent)
	Accuracy (model based)	~ 1 % of target value | ~ 0.5 % (optional) (application dependent)
	Model package included	SiO_2, Si_3N_4 at glass; TiO_2 (single layer 100nm) at PET; ITO at glass; Al-coating (10nm to 150 nm) at glass and polycarbonat; Hexamethyldisiloxane (HMDSO, i.e. Alusil) (5 – 100 nm) at Al (10 nm – 150 nm) at polycarbonat
	Additional model package	1 additional standard model with up to 3 layers Additional models on request