# Optical Monitoring Systems for Vacuum Coaters

EssentOptics develops and manufactures optical monitoring systems for installation in the vacuum coaters. The systems are used for the in-situ control of the vacuum deposition processes, where high process reproducibility and precise optical parameters are critical. The systems incorporate originally designed spectrometers and monochromators and are classified into two groups by the measuring method:

- AKRA series with monochromators
- IRIS series with spectrometers

## AKRA Single Wavelength Optical Monitoring System

AKRA Single Wavelength Optical Monitoring Systems are designed for single wavelength monitoring of the deposition processes of all major types of coatings in the spectral range from 200nm up to 5000nm. The final spectral control range can be chosen in accordance to the actual needs and applications. Additionally, the user can scan the entire measured spectrum after the deposition of each layer and compare the obtained spectrum with calculated one. The AKRA systems give the field-proven possibility to control the deposition process of the complex coatings in the infrared range. It means the direct control in the range of 1.5µm up to 5.0µm and the second-order control up to 14µm.


## IRIS Broadband Optical Monitoring System

IRIS Broadband Optical Monitoring Systems offer unmatched monitoring speed and are designed for the real-time full-spectrum control of the deposition of coatings in the range from 190nm up to 1700nm depending on the chosen system configuration. The spectrometer allows to display the entire spectrum of growing layer on the system's control screen at any time. This opens the possibilities to high-yield production of the complex optical coatings like band-pass filters, cut-off filters, dichroic filters etc., including those in which required optical characteristics shall be obtained at specific wavelengths or within several spectral intervals. The feature of the IRIS systems is a “from-process-to-process” high reproducibility of the optical parameters also for sophisticated coatings.


## Software Capabilities

The software package includes the following main features:

- Screen zooming of the photometric function (Oy) and spectral range (Ox)
- Possibiliy to display up to 5 optical spectra on the process screen
- Selection of the spectra color (up to 10 colors) for more distinctive and comfortable use
- Layer-by-Layer uploading of the calculated spectra and their comparison with the deposited spectra for correction and fine-tuning of the deposition process
- Choice of the optimal measurement time, averaging criteria, as well as the level of sensitivity of the detector
- Process report save and print-out function contains graphs, tabular values, time and date of the report, caoting name, including necessary comments to any coating or completed process run
- Process spectra can be saved as a graphic and/or text file for easy data and process analysis
- Vast database of optical glassess is pre-loaded for calibration of control system
- End-point detection capability
- Real time re-calibration and direct bradband monitoring for production of multi-layer sophisticated coatings (for substrates placed on calotte)

## IRIS Technical Specifications (broadband, spectrometer)

| | IRIS 0204 | IRIS 0207 | IRIS 0211 | IRIS 0407 | IRIS 0411 | IRIS 1017 | IRIS 0417 |
|---|---|---|---|---|---|---|---|
| spectral range, nm | 190-380 | 190-740 | 190-1100 | 380-740 | 380-1100 | 950-1700 | 380-1700 |
| spectral resolution, nm | 0.8 | 0.8 (<380)<br>1.6 (>380) | 0.8 (<380)<br>1.6 (>380) | 1.6 | 1.6 | 3.2 | 1.8 (<1050)<br>3.6 (>1050) |
| spectral reproducibility, nm | 0.2 | 0.4 | 0.4 | 0.4 | 0.4 | 0.8 | 0.4 (<1050)<br>0.8 (>1050) |
| accuracy of wavelength setting, nm | 0.4 | 0.8 | 0.8 | 0.8 | 0.8 | 1.6 | 0.8 (<1050)<br>1.6 (>1050) |
| measurement accuracy, $\Delta T/T$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| reproducibility of measurement, $\Delta T/T$ | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| stability, %/hour | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| scattered light level, $\Delta T/T_{max}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| measurement time, ms | 10-80 | 10-80 | 10-80 | 10-80 | 10-80 | 10-80 | 10-80 |
| power consumption, W | 50 | 50 | 50 | 30 | 30 | 30 | 30 |
| power supply, VAC | 100-240 | 100-240 | 100-240 | 100-240 | 100-240 | 100-240 | 100-240 |
| power supply, Hz | 50/60 | 50/60 | 50/60 | 50/60 | 50/60 | 50/60 | 50/60 |
| weight net, kg | 10 | 12 | 14 | 14 | 10 | 12 | 10 |
| communication port | USB 2.0 | USB 2.0 | USB 2.0 | USB 2.0 | USB 2.0 | USB 2.0 | USB 2.0 |

## AKRA Technical Specifications (single wavelength, monochromator)

| | AKRA 0211 | AKRA 0411 | AKRA 0217 | AKRA 0417 | AKRA 0426 | AKRA 1550 | AKRA 0450 |
|---|---|---|---|---|---|---|---|
| spectral range, nm | 200-1100 | 380-1100 | 200-1700 | 380-1700 | 380-2600 | 1500-5000 | 380-5000 |
| spectral resolution, nm | 2.4 | 2.4 | 2.4 (<1050)<br>4.8 (>1050) | 2.4 (<1050)<br>4.8 (>1050) | 2.4 (<1050)<br>4.8 (>1050) | 4.8 (<3000)<br>9.6 (>3000) | 2.4 (<1000)<br>4.8 (<3000)<br>9.6 (>3000) |
| spectral reproducibility, nm | 0.25 | 0.25 | 0.25 | 0.25 | 0.5 | 1.0 | 0.5 (<1000)<br>1.0 (>1000) |
| accuracy of wavelength setting, nm | 0.5 | 0.5 | 0.5 | 0.5 | 1.0 | 2.0 | 1.0 (<1000)<br>2.0 (>1000) |
| measurement accuracy, $\Delta T/T$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| reproducibility of measurement, $\Delta T/T$ | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.01 | <0.01 |
| stability, %/hour | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| scattered light level, $\Delta T/T_{max}$ | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.01 | <0.01 |
| measurement time, single line, ms | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| measurement time, complete range, s | 60-150 | 20-30 | 60-150 | 60-150 | 60-150 | 60-150 | 150-300 |
| power consumption, W | 80 | 50 | 80 | 50 | 50 | 50 | 50 |
| power supply, VAC | 100-240 | 100-240 | 100-240 | 100-240 | 100-240 | 100-240 | 100-240 |
| power supply, Hz | 50/60 | 50/60 | 50/60 | 50/60 | 50/60 | 50/60 | 50/60 |
| weight net, kg | 10 | 12 | 14 | 14 | 10 | 12 | 10 |
| communication port | RS-232 | RS-232 | RS-232 | RS-232 | RS-232 | RS-232 | RS-232 |