**Diffuse Reflectance Measurements**

The integrating sphere allows a wide range of measurements.
- Diffuse and specular samples
- Total hemispherical reflectance
- Specular excluded diffuse reflectance
- Transmittance of turbid or scattering samples
- Diffuse reflectance of powder samples

Measurements of total hemispherical reflectance are made with or without the spectral component eliminated. Spectral reflectance and sample transmission may also be measured.

---

**Universal Reflectance Measurements**

The ReflectaScan™ Spectrophotometer is designed as a universal diffuse and specular reflectance measuring instrument capable of scanning samples over the wavelength range 190-1100nm. An integral printer plots results and an external printer may be used.

---

**Integrating Sphere**

A dedicated, compact high performance Spectralon™ integrating sphere is used for diffuse reflectance and diffuse transmittance measurements. The sphere unit has its own silicon diode detector which uses a separate signal channel within the Spectrophotometer.

---

**Colour Computations Using Diffuse Reflectance**

Onboard software provides automatic analysis and computation of colour samples when scanned.

Overlaid scans of two blue samples from the Dulux paint range are shown; each is specified by its British Standard number shown on the chart.

The automatic analysis of the scans of two very similar pink colours, also from the Dulux range, is shown on the lower graph which displays the overlaid scans. The automatic analysis of each scan is shown and the automatically generated table of colour difference is also shown.

The specular component was excluded from all scans.

---

**Turbid or Scattering Samples**

The sphere unit is equipped with a 10mm pathlength cuvette holder so that transmittance measurements may be made for both turbid or normal samples. Scattering solid films may also be accommodated for measurement.
Coated Lens Reflectance

The optical performance of the anti-reflection coatings on ophthalmic lenses is specifically catered for by the specular reflectance unit. A conical rest is provided to accommodate lenses up to 90mm diameter. Measurements are made with reference to an uncoated lens and the system is excellent for the production control of vacuum coated lenses.

Specular Reflectance

A dedicated specular reflectance unit is used for specular reflectance measurements of surfaces and coated ophthalmic lenses. The unit is ideal for quality assurance in the production of anti-reflection coatings and the measurement of thin film thickness, for instance in the semiconductor industry. Many of these systems are now in use around the world.

Ophthalmic Lens Transmission

The transmission characteristics of tinted ophthalmic lenses may readily be measured using the CE 3077 lens mounting system. The lens is accurately centred on a carrier plate which is kinematically mounted on the body of the lens holder.

Automatic Thin Film Measurement

The measurement of thin deposited films is important in many optical and electronic industries.

The CE3075 Specular Reflectance unit is valuable for measuring the thickness of thin transmitting films such as epitaxial films of silicon oxide on a silicon wafer.

A reflectance scan against wavelength produces a series of reflectance maxima and minima, due to optical interference, from which the ReflectaScan instrument automatically calculates the film thickness for films down to 0.1 microns thick.

The scan shown here gave a film thickness of 1.05 microns.

Automatic Colour Computations

On board software provides a wide range of colour calculations including tristimulus values, chromaticity, CIE L* a* b*, CIE L* u* v*, whiteness etc.

Standard illuminant tables include CIE, a, b and c and CIE D50, D65 and D75. Observer tables include 2º and 10º angles.

<table>
<thead>
<tr>
<th>SCAN 100</th>
<th>SCAN 101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval: 5 nm</td>
<td>Interval: 5 nm</td>
</tr>
<tr>
<td>Illuminant: C</td>
<td>Illuminant: C</td>
</tr>
<tr>
<td>Observer: 2 degree</td>
<td>Observer: 2 degree</td>
</tr>
<tr>
<td>ASTM Colour: 0.2</td>
<td>ASTM Colour: 0.8</td>
</tr>
<tr>
<td>Saybolt: 28.3</td>
<td>Saybolt: -16</td>
</tr>
</tbody>
</table>

Petrochemical Applications

Calculations using the transmission characteristics of petrochemical samples is widely used in the industry. The overlaid transmission spectra of two petrochemical samples are shown here as recorded by the CE3055. Scan 100 is of a highly refined, water white, oil used as a reference and scan 101 is of a pale yellow mineral oil. The instrument automatically calculates the Saybolt and ASTM colour reference as printed out below.

Oil Colour

A reflectance scan against wavelength produces a series of reflectance maxima and minima, due to optical interference, from which the ReflectaScan instrument automatically calculates the film thickness for films down to 0.1 microns thick.

The scan shown here gave a film thickness of 1.05 microns.
CE 3055 ReflectaScan™ Reflectance Spectrophotometer
4nm bandpass, 190-1100nm wavelength range, built in integrating sphere signal channel, cell holder, power cable and operators manual.

CE 3073 Integrating Sphere Unit
Spectralon™ sphere with integral silicon detector, 10mm turbid sample cuvette holder, film holder, 0˚ and 11˚ sample rests and internal rotatable mirror system.

CE 3075 Specular Reflectance Unit
With flat sample rest, conical lens mounting rest, mounted front surface aluminised plain reference mirror and mounting thumb screws.

CE 3077 Opthalmic Lens Holder
Holder for transmission measurements with lens centring and mounting plate, and mounting thumb screws.

8000 70 01 Dot matrix printer
Includes cable.

8000 72 01 Colour Ink Jet printer
Includes cable.

8000 73 01 Laser printer

OPTIONAL SOFTWARE
DataStream
Fast transfer of data to a PC for use with Excel or other spread sheets.

Colour Scan Software
For calculation of tristimulus chromaticity, CIE L*a*b*, CIE L*u*v* and thin film thickness etc.

Quant S
Quantitation of corrected bands, difference spectra, spectral stripping, overlayed spectra, spectral storage.

Program W
Wavelength program for up to 10 wavelengths and timed interval measurements at a fixed wavelength.

Validation
Absorbance validation using certified standards, wavelength validation using certified standards, optical bandwidth, etc.

ORDERING
CE 3055 ReflectaScan™ Reflectance Spectrophotometer
CE 3073 Integrating Sphere Unit
CE 3075 Specular Reflectance Unit
CE 3077 Opthalmic Lens Holder

SPECIFICATION

Optical Monochromator
Littrow using 1200 L/mm holographic grating

Optical Bandwidth
4nm

Wavelength Range and Accuracy
190-1100nm, better than ±1nm

Wavelength Reproducibility
±0.1nm

Self Test and Calibration
Automatic at switch on

Wavelength Scale Expansion
Selectable by keyboard entry 1-100nm/cm

Scan Speed
Selectable by keyboard entry 1-4000nm/min

Straylight
Typically <0.01% at 220nm and 340nm

Display Screen - Backlit LCD
Displays menus, plots etc with six screen widths of viewing available by scrolling

Photometric Ranges
Display of 0.0-3.3A, 0-200%T, 0-9999C, %R

Photometric Accuracy
±0.005A or 1% whichever is greater

Photometric Noise
Less than ±0.0002A (500nm)

Baseline Flatness
Better than ±0.002A most of range

Baseline Stability
Better than 0.001A/hour, 500nm

Overlayed Scans
Scans and derivatives with or without offset

Spectral Reprocessing
Scans manipulated; replotted over any range

Integral Printer
Prints scans and data

Scan Storage
Up to 100 stored security code protected

Curve Fitting and Editing
Linear, quadratic or cubic; up to 30 standards

Wavelength Programming
Up to 10 wavelengths

Method Storage
Up to 100 methods stored in safe memory

Derivative Spectra
1st and 2nd derivatives

Time Course Plotting
Plots may be reprocessed and stored

Real Time Clock
Timed and dated reports

Computer/printer interfaces
Bi-directional serial RS232C and parallel port

Size & Weight
480 x 340 x 205mm, 19.5kg

Power Requirements
110-250V, 50/60Hz, 170W

Integrating Sphere Unit
2” diameter Spectralon™ sphere with integral silicon diode detector, lever operated internal beam reflecting mirror, 0˚ sample rest for specular excluded measurements, 11˚ sample rest for total hemispherical reflectance measurements, 10mm cuvette holder for turbid and scattering samples, and film holder. Mounted Spectralon standard.

Specular and Lens Reflectance Unit
Horizontal sample stage with rest for flat samples, conical rest for lenses, integral beam polarizer and mounted front aluminised mirror reference standard.

Ophthalmic Lens Holder
Holder for transmission measurements. Kinematically mounted lens centring plate with lens clamping facilities.

ORDERING ACCESSORIES AND SPARES

Lamps
Deuterium lamp with hours indicator 2202 01 42
Tungsten halide lamp - in pairs 2303 01 40

Printers, Cables
RS232 9 pin PC cable and protocol manual 2021 83 00
Dot matrix printer, includes cable 8000 70 01
Colour ink jet printer, includes cable 8000 72 01
Printer connection cable 8000 71 00

Cecil Instruments policy is one of continuous development. We therefore reserve the right to change specification without notice.

CECIL INSTRUMENTS LIMITED  MILTON TECHNICAL CENTRE
CAMBRIDGE CB24 6AZ  ENGLAND
TEL: 01223 420821  FAX: 01223 420475
E-MAIL: info@cecilinstruments.com  Email: www.cecilinstruments.com

ISO 9001 : 2000 CERTIFIED COMPANY