

CAMAG TLC SCANNER 4



CAMAG

OMICRON



The TLC Scanner 4 is the most advanced workstation for densitometric evaluation of TLC/HPTLC chromatograms. It can also be used for densitometric measurements of other planar objects.

All functions of the scanner are controlled by the software winCATS. Only the positioning of the object to be scanned is performed manually. If desired the operator can switch on the internal illumination to control or adjust the scan start position.

Optimal settings for electronic amplification are automatically selected for measurements in absorption and fluorescence mode.

Perfect evaluation with winCATS

The well structured and easy to use winCATS software controls and monitors all functions of the scanner and processes data up to the final result.

The winCATS standard program for the TLC Scanner 4 features:

- Short measurement times
- Measurement of up to 36 tracks with up to 100 substances per track
- Integration either with automatic or manual baseline correction / peak assignment
- Automatic or easy manual assignment of substance names to peaks
- Automatic recording of spectra of all detected or selected peaks
- Printout or export of color graphics of measurement data
- Report printout of the entire analysis including all measurement data and images of the TLC/HPTLC plate



A number of winCATS program options allow the user to fit the evaluation system to the respective need. The following options are available:

- **Quantitative evaluation**
supports the following calibration modes: single level calibration, multi level calibration with linear or nonlinear regression using internal or external standards. Statistics are available as relative standard deviation (cv) or confidence interval (ci).
- **Sub-component evaluation**
(included in the option "Quantitative Evaluation") can be used to quantify unknown peaks by relating them to the main component as is prescribed by European or US pharmacopoeias ("Related Compounds").
- **Dual-wavelength scan**
The chromatogram is scanned at two individually selectable wavelengths. During integration the signal from the second wavelength is subtracted from that of the first wavelength to eliminate matrix effects. Dual-wavelength scanning is also useful for the quantitation of incompletely resolved peaks.
- **Multi-wavelength scan**
The chromatogram can be scanned automatically at up to 36 different wavelengths. This permits multiple measurements between 190 and 900 nm in order to achieve optimum selectivity.

For quantitation, data from the optimum wavelength scan of each fraction can be selected. This software function is unique in Thin-Layer Chromatography!

- **Scanner qualification (Selftest)**
This option offers automatic monitoring of the mechanical, optical and electronic functions of the scanner. Results are evaluated, documented and saved. If appropriate, lamp positions and monochromator alignment can be automatically adjusted.
- **Track optimization**
Each track of a chromatogram is scanned several times with small lateral offset. From this data the optimum track following the peak maxima is calculated and used for quantitation. Thereby distorted chromatograms can be correctly evaluated.
- **Spectrum library**
Enables the user to create his own library files, which provides the only way the user can save and compare spectra recorded on different plates.

Note

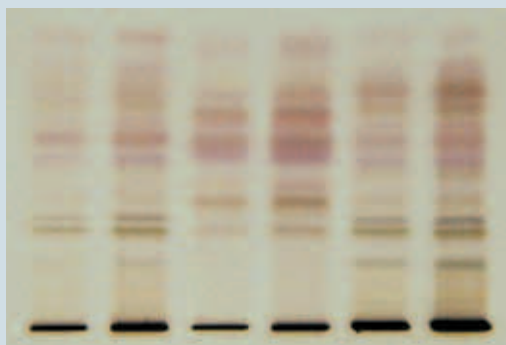
The TLC Scanner 4 with winCATS is compliant with the requirements of GMP/GLP and can be IQ/OQ qualified. If you want to use the instrument in a 21 CFR Part 11 environment, the option 21 CFR Part 11 "compliance ready" is required for each winCATS workstation.



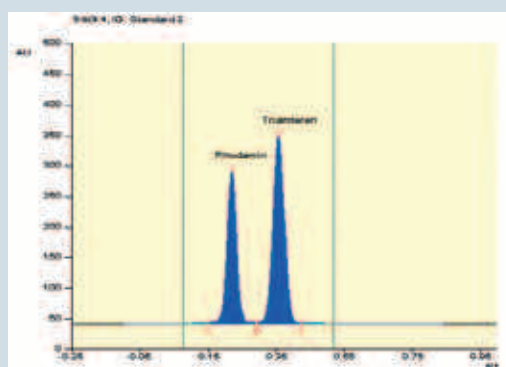
CAMAG TLC SCANNER 4

Key features

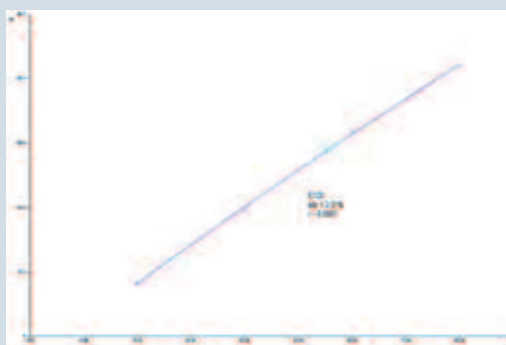
- Measurement of reflection, either in absorbance or fluorescence mode
- Object formats up to 200 × 200 mm
- Spectral range from 190 to 900 nm
- Automatic start of all lamps: deuterium, halogen-tungsten, and high pressure mercury lamp
- Data step resolution 25–200 μm
- Scanning speed 1–100 mm/s
- Spectra recording speed up to 100 nm/s
- Automatic selection of electronic amplification
- Rapid data transfer



Planar chromatogram



Analog curve



Calibration function



User-friendly operation

All functions of the scanner are controlled by winCATS software.

The electronic amplification is set automatically. In fluorescence mode this is performed by a "quick scan", which measures the complete plate, e.g. 18 tracks in 20 seconds, and determines the optimized settings from the result. In absorbance mode only one track is "quick scanned"; either track 1 (automatic mode) or a track of choice (manual mode).

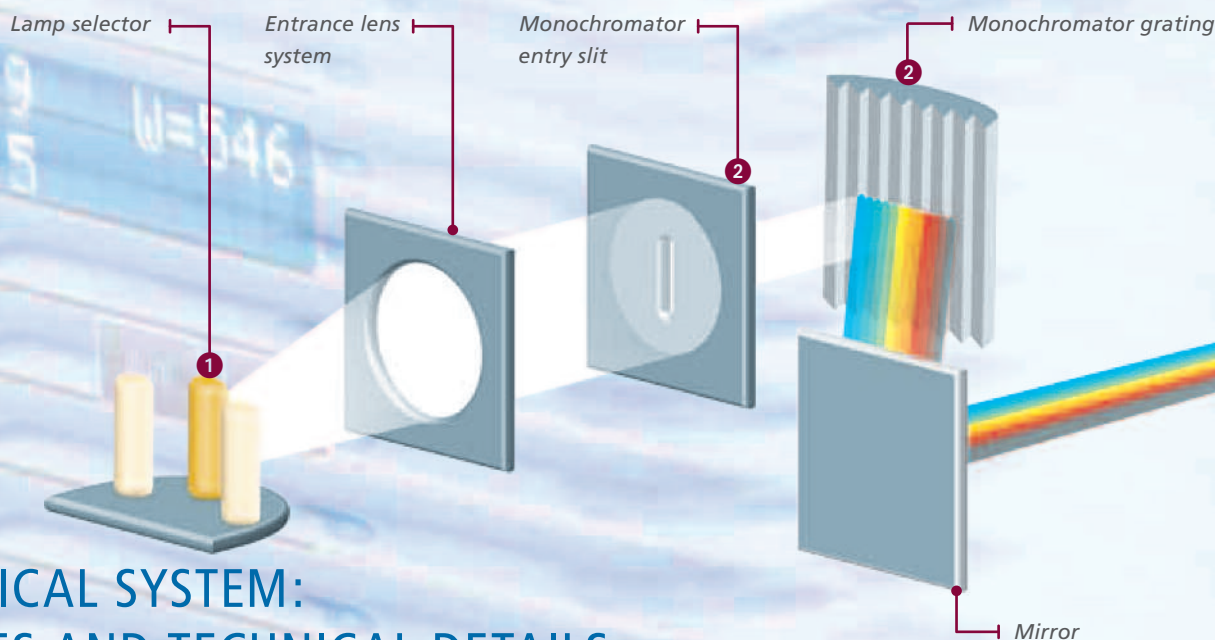
The 16 bit A/D converter ensures optimum resolution of the signal. This is particularly useful for the measurement of both low absorbance and weak fluorescence signals.

Scanner operation with winCATS software is convenient and easy to learn.



The object, here a 20×10 cm HPTLC plate, is simply positioned on the scanning table.

The coordinates are displayed during manual positioning of the stage and can be transferred into the program by mouse-click.



THE OPTICAL SYSTEM: FEATURES AND TECHNICAL DETAILS

The Optical System

- Any of the three light sources, high pressure mercury lamp, deuterium lamp, or halogen-tungsten lamp can be positioned in the light path by a motor drive. ①
- The signal of the measuring photomultiplier is continuously offset against the signal of the reference photomultiplier. ④ ⑤ This compensates for lamp aging and short-time fluctuations. It also reduces the warm-up time required to reach lamp stabilization.
- All components of the optical system, lamps, monochromator, scanning stage, and photomultiplier are mounted on one sturdy metal support. This ensures high precision of the detector signal.
- For scanning at wavelengths below 200 nm it is advisable to flush the monochromator with nitrogen. The scanner is equipped to do this.
- A monochromator bandwidth of 5 nm or 20 nm can be selected. 5 nm bandwidth is used for spectra recording, multi-wavelength scanning, and always when spectral selectivity is required. ② 20 nm bandwidth offers higher light intensity (improves the signal-to-noise ratio and thus the reproducibility of the measurement) and enables measurement of several fractions with slightly different absorption maxima in one scan.
- The lens system with 190–900 nm transmission range features automatic positioning for micro and macro slit sizes. This ensures that the light energy available with small slits in the micro position is almost the same as that for the corresponding slit in the macro position, which is four times larger. ③
- The light beam strikes the object at right angle. The photomultiplier is aligned at an angle of 30°. ⑤

Light sources

- Deuterium lamp, usable continuum 190–450 nm
- Halogen-tungsten lamp, usable continuum 350–900 nm
- High-pressure mercury lamp, line spectrum 254–578 nm

The lamp, which is positioned in the light path, is automatically ignited. All lamps are current stabilized.

Pilot lamp and compartment illumination

The slit is automatically illuminated with visible light when the compartment illumination is switched on. The scanning compartment is illuminated with a 4 watt fluorescent tube UV 254 nm which the user can replace by a UV 366 nm or a white light tube.

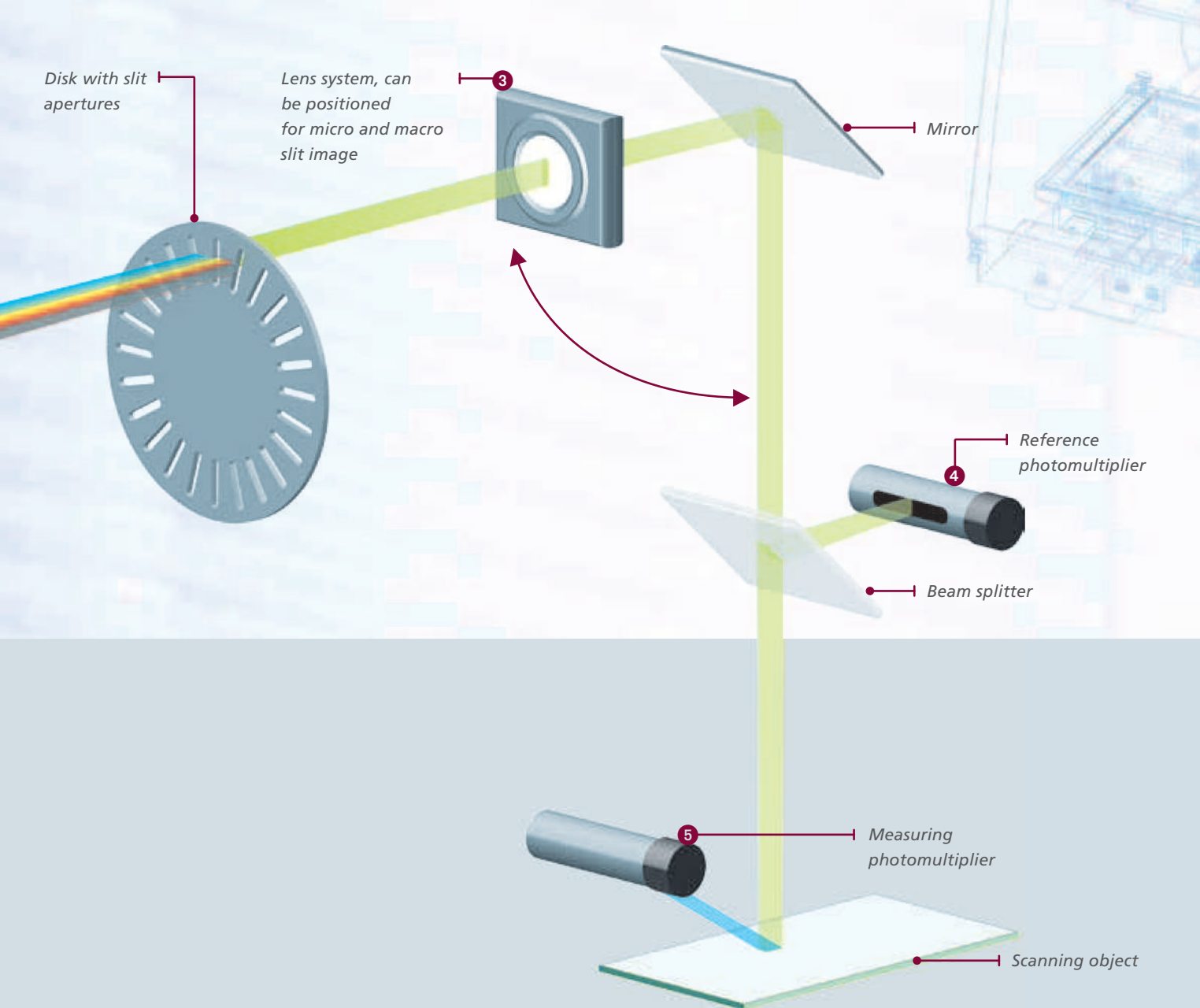
Optical system

Apochromatic suprasil-fluorite lens system, transmission range 190–900 nm, astigmatic entry lens for optimal slit illumination; automatic switching between micro and macro position for optimal light intensity.

Monochromator

Concave holographic grating, 1200 lines/mm, bandwidth selectable 5 or 20 nm, wavelength range 190–900 nm; monochromator driven by stepper motor, reproducibility of wavelength setting better than 0.2 nm, accuracy better than 1 nm; connector for flushing with nitrogen.

Maximum speed of spectra recording 100 nm/s, positioning at 200 nm/s.



Secondary filter

Motor-driven filter wheel with three automatically selected filters for the elimination of second order wavelengths; 400 nm cut-off filter for fluorescence measurements; three positions for user selected filters.

Scanning slit

Revolving disk with 20 fixed apertures; length of slit images selectable between 0.2 and 12 mm, width between 0.1 and 1.2 mm in 42 combinations.

Detector

Two matched broad band photo multipliers, multi alkali type, spectral sensitivity 185–900 nm.

Stage drive

Independent in both directions by stepper motors, micro step driven for smooth movement; reproducibility of positioning better than 50 µm in Y-direction, better than 100 µm in X-direction; maximum scanning speed 100 mm/s, positioning at 150 mm/s.

Mains voltage

115 V and 230 V selectable; 50/60 Hz; maximum energy use 180 W (tungsten and mercury lamp ignited).

A/D converter

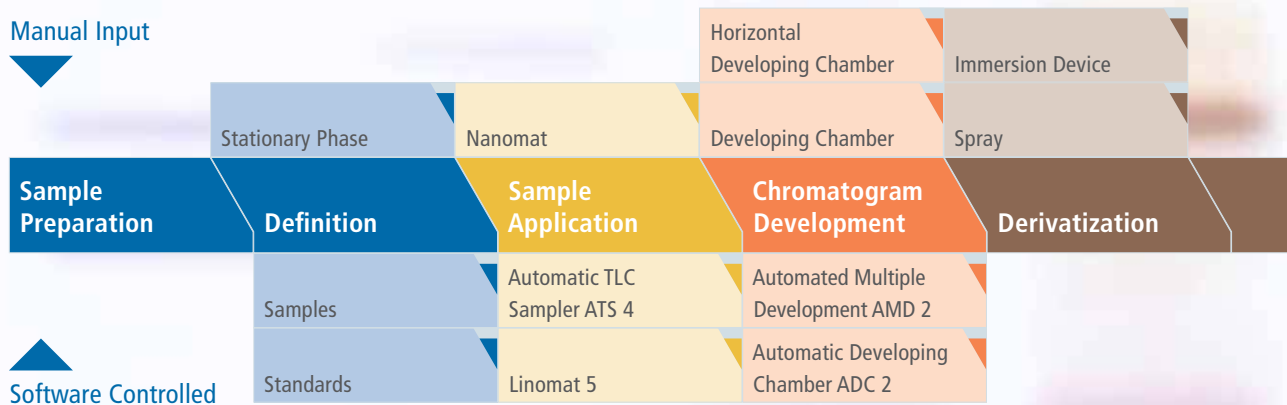
16 bit, 2-channel A/D converter, 100 ms per double conversion.

Connections/interfaces

Serial interface RS232 for communication to the computer, EquiLink for connection to winCATS software.

Dimensions

Width = 590 mm, depth = 650 mm, height = 367 mm; net weight 39 kg.



winCATS SOFTWARE

winCATS for all steps of instrumental Thin-Layer Chromatography

CAMAG has been developing software for densitometric evaluation of TLC/HPTLC chromatograms since 1980.

winCATS is the result of a unique integrated software concept covering all steps of Instrumental Thin-Layer Chromatography. The user can combine the individual modules to create a complete solution that meets all requirements with respect to instrument control, data acquisition, evaluation and documentation.

The modular design of winCATS allows selecting or disabling the individual steps of Thin-Layer Chromatography according to the task at hand.

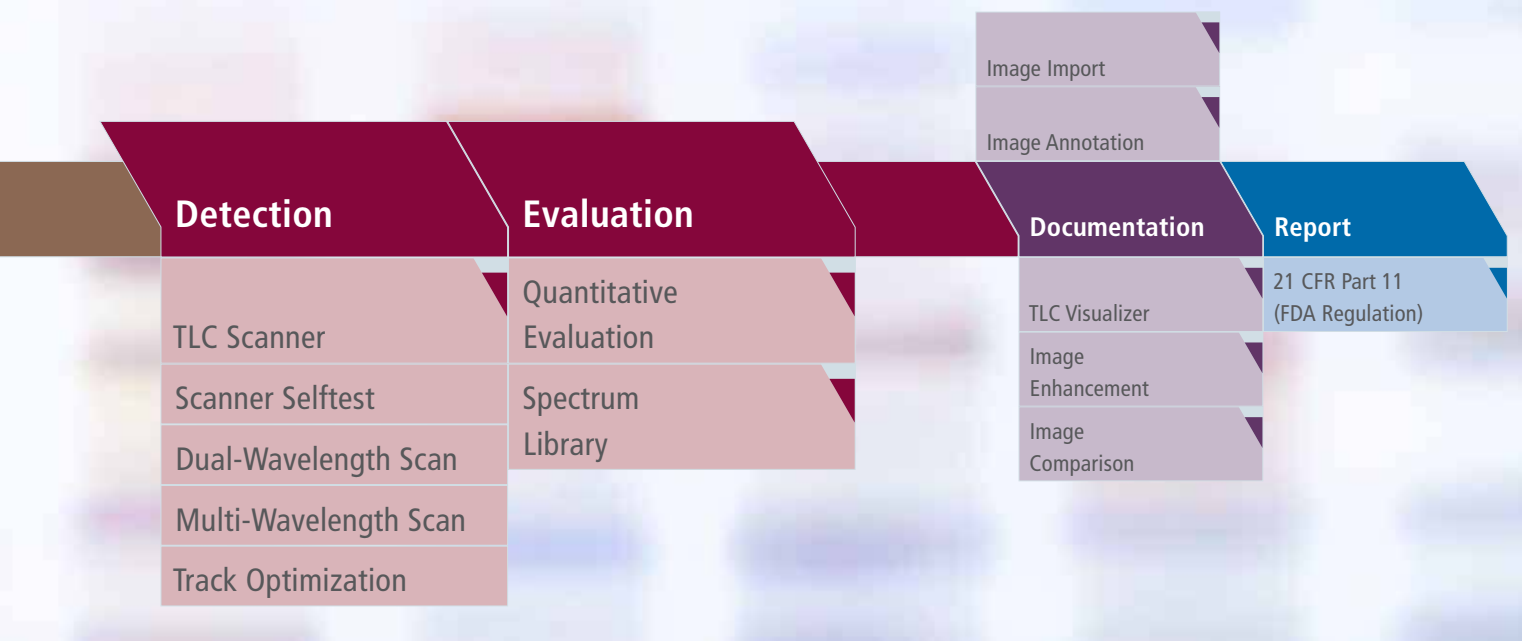
The program offers a unique combination of features:

- winCATS combines high performance with easy handling
- winCATS offers a two-stage on-screen help system, a brief info line and a detailed explanatory help text
- winCATS features a structured data management and high data safety with easy access to network and project directories
- winCATS stores the complete set of parameters used together with all data – from scanning raw data to documentation – in one single file, and prints everything if desired
- winCATS complies with the rules of GMP/GLP and 21 CFR part 11

winCATS features

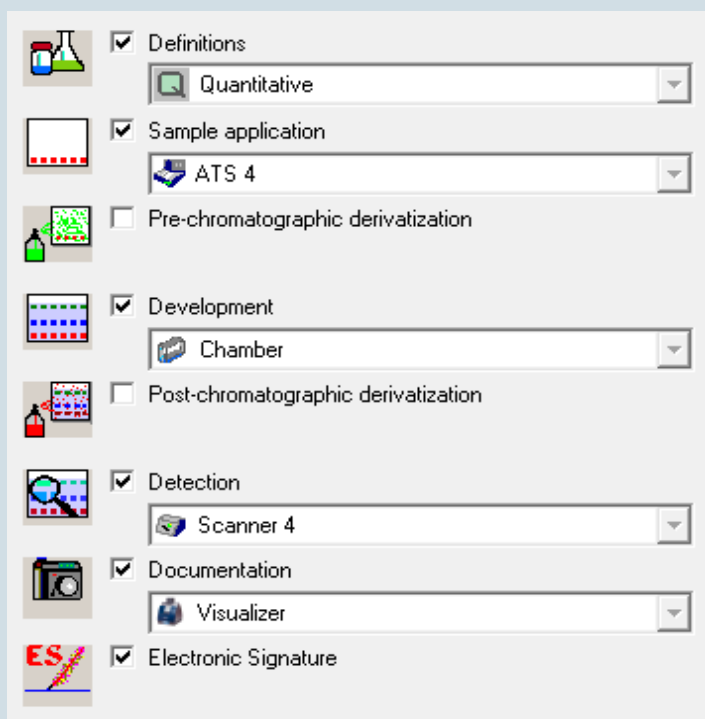
The winCATS standard program for the TLC Scanner 4 supports:

- Short measurement times
- Measurement of up to 36 tracks with up to 100 substances per track
- Integration either with automatic or manual baseline correction / peak assignment
- Automatic or easy manual assignment of substance names to peaks
- Automatic recording of spectra of all detected or selected peaks
- Printout or export of color graphics of measurement data
- Report printout of the entire analysis including all measurement data and images of the TLC/HPTLC plate



Modular design

The modular design of winCATS allows selecting or disabling the individual steps of Thin-Layer Chromatography according to the task at hand.



Workflow

Using the explorer type view the operator at all times remains in control over all active steps of the workflow. These are:

- Selection of plate material and its pre-treatment
- Definition of samples, standards, and the calibration method if applicable
- Sample application
- Chromatogram development
- Derivatization (pre and/or post chromatographic)
- Detection
- Spectra recording
- Quantitative evaluation
- Documentation

winCATS program options for TLC Scanner 4

Quantitative evaluation	page 12
Spectrum library	page 14
Track optimization	page 14
Dual-wavelength scan	page 15

Multi-wavelength scan	page 15
Scanner selftest	page 16
21 CFR Part 11 "compliance ready"	page 16



TLC SCANNER 4 AND winCATS

Data input

For routine analysis winCATS starts off with a method file containing all relevant data for the current task such as instruments, parameters, etc. This method can be validated for GxP work.

From this method an analysis file is generated and parameters unique to the actual analysis, i.e. sample names, amounts, etc. are adapted. After all steps in the method leading up to densitometric evaluation are completed, the plate is positioned on the stage and scanning is started.

Slit dimensions, scanning speed, light source, wavelength, etc. have already been defined within the winCATS method.

Scan settings

Slit dimension: 4.00 x 0.30 mm, Micro

Optimize optical system for maximum: Light

Scanning speed: 20 mm/s

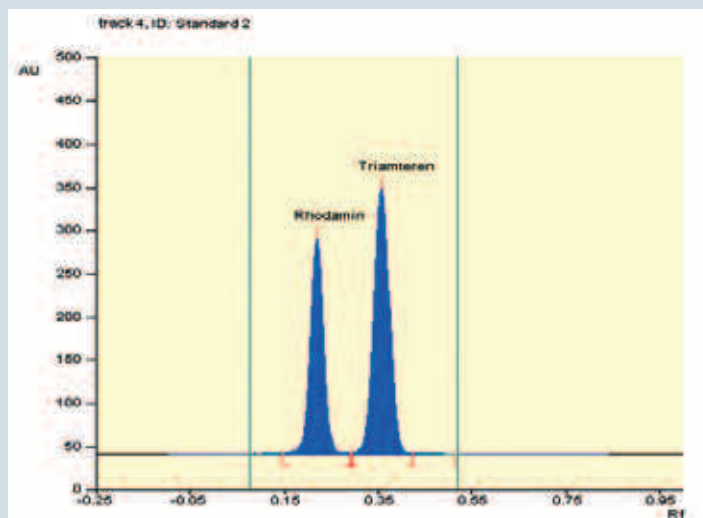
Data resolution: 100 µm/step

Measurement	1	2
Wavelength	254 nm	285 nm
Lamp	D2	D2
Measurement type	Remission	Remission
Measurement mode	Absorption	Absorption
Optical filter	Second order	Second order
Detector mode	Automatic	Automatic
Y-position for 0 adjust	5.0 mm	5.0 mm
Track # for 0 adjust	1	1
Track start for quick scan	Automatic	Automatic
Track end for quick scan	Automatic	Automatic
Track # for quick scan	Automatic	Automatic
Analog offset	10 %	10 %
Sensitivity	Automatic	Automatic

Data input of scan parameters

Measurement

The TLC Scanner 4 scans the plate and transfers raw data back to winCATS where baseline correction and peak recognition is performed automatically in the background.



A display of integrated peaks with substance names. This display mode enables manual baseline correction and peak integration by mouse-click.

Track	Rf	Assigned Substance	Max. Signal	Display
1	0.17	sulfomethoxazole	582 AU @ 265 nm	<input type="checkbox"/>
1	0.24	sulfamerazine	380 AU @ 269 nm	<input checked="" type="checkbox"/>
1	0.39	sulfamethazine	378 AU @ 269 nm	<input type="checkbox"/>
1	0.59	trimethoprim	371 AU @ 203 nm	<input type="checkbox"/>
1	0.73	dimetridazole	533 AU @ 311 nm	<input type="checkbox"/>

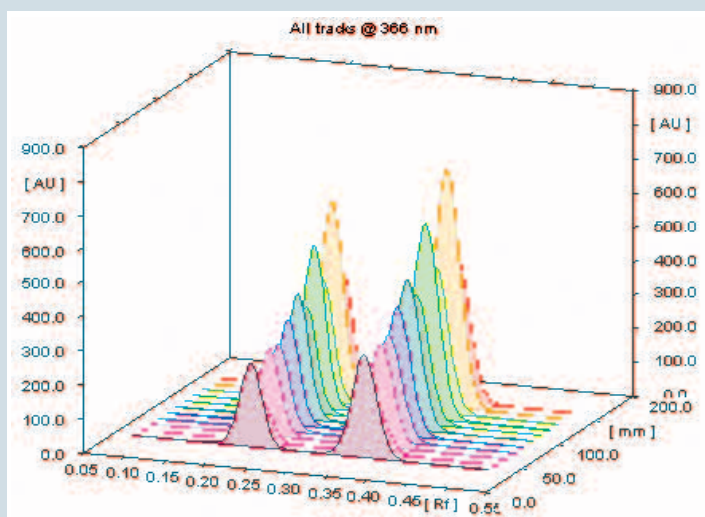
Spectra list



Evaluation

By clicking the right mouse key on an analog curve the display can be swivelled and tilted, and additional information can be displayed.

Analog curves can be displayed either individually or in a 3D diagram. Both can be printed in color together with the analysis report.

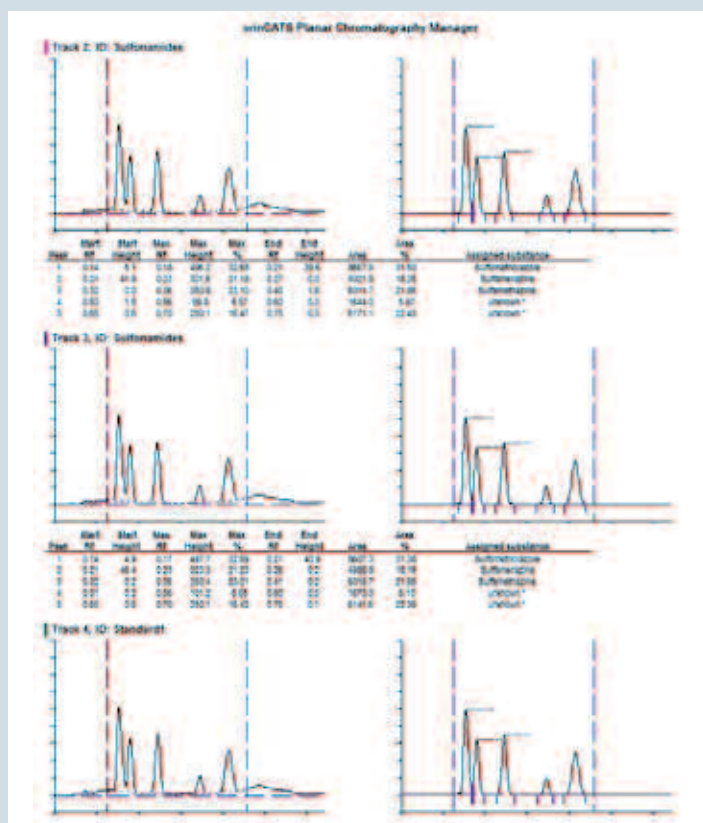


All 3D diagrams can be swivelled and tilted for easy evaluation.

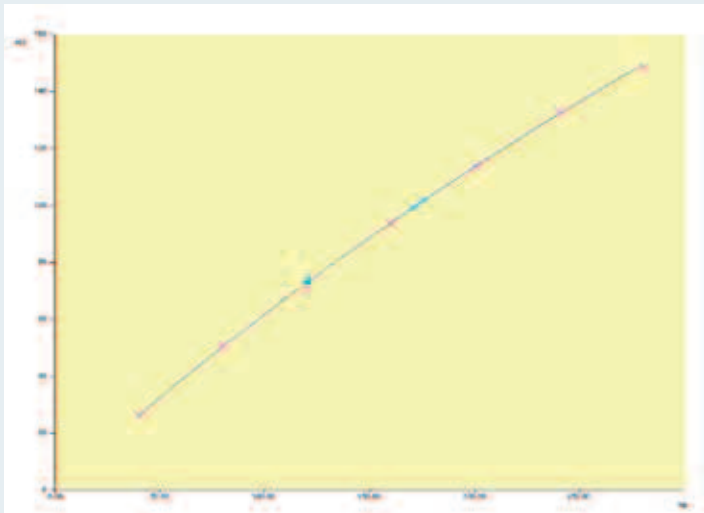
Recording of spectra

winCATS can automatically record spectra as soon as all peak positions are known. Spectra can be displayed individually or overlaid in one diagram.

Spectra can be measured from 190 to 900 nm. If the emission range of the deuterium lamp is exceeded, the scanner automatically switches to the halogen-tungsten lamp. Both lamps remain ignited.



Excerpts from a winCATS report (can be personalized by user)



QUANTITATIVE EVALUATION

Quantitative evaluation is based on the comparison of peak heights or peak areas of the unknowns with those of calibration standards chromatographed on the same plate.

Depending on the task at hand single-level or multi-level calibration can be selected.

Calibration modes

- Single-level calibration is suitable for analyses where the concentration of the unknowns shall be checked within narrow limits. Single-level calibration requires reduced calibration efforts.
- Multi-level calibration is used when the target values are expected in a comparatively wide range. winCATS offers a choice of four calibration modes, the selection is made based on which mode gave the best result during method validation.

Linear regression is a useful function when the calibration range is narrow or the absolute amounts per fraction are small, which is often the case by fluorescence scanning.

Non-linear regression becomes necessary when a wider calibration range is needed and/or the absolute amounts per fraction are high.

Polynomial regression is suitable for calibration over a wide concentration range.

Michaelis-Menten regression is suitable for calibration over a wide concentration range and for high amounts of substances. The Michaelis-Menten function type 1 passes through the origin. In cases where this behavior is not suitable, Michaelis-Menten type 2 may be chosen.

Flexible input screens for calibration data

winCATS offers a wide choice for data input: from entering "amount per fraction" to entering amounts from balance readings or from stock solutions.

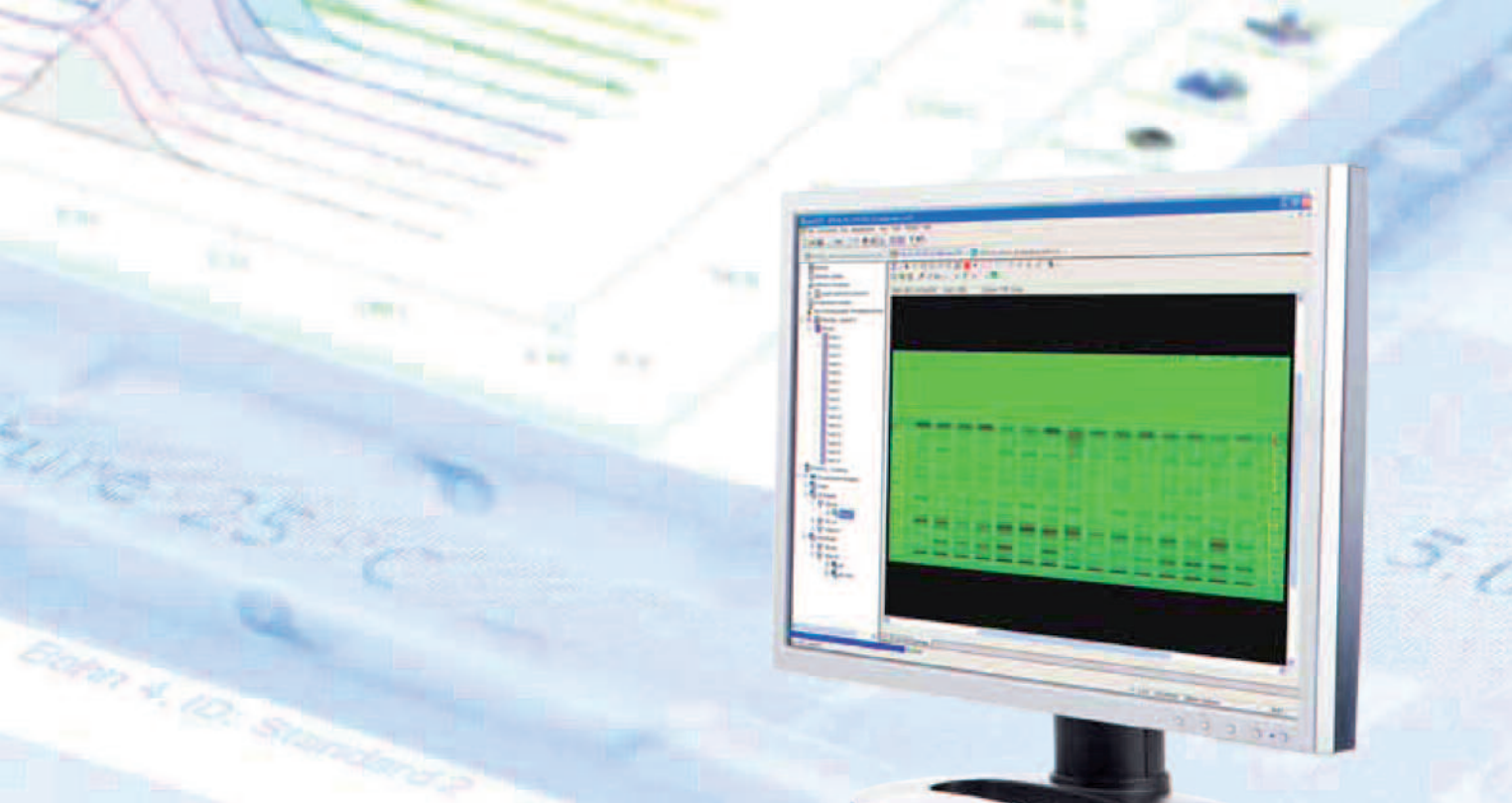
According to the European and the US Pharmacopoeia, related compounds can be quantified by comparison with small amounts of the main component in case their identification is not required. This main/subcomponent evaluation is part of the standard quantitative evaluation program.

Identity and purity checking by spectra comparison

The software option quantitative evaluation includes identity and purity checking of substances by spectra comparison. For identity checking spectra recorded at the peak maxima are compared with those of standard substances. The user can define a limit for the correlation coefficient, or let winCATS calculate identities by statistical criteria. For purity checking spectra are recorded at peak maximum and at both slopes. These spectra are then compared by winCATS either to match user specifications or according to statistical criteria.

Ordering information

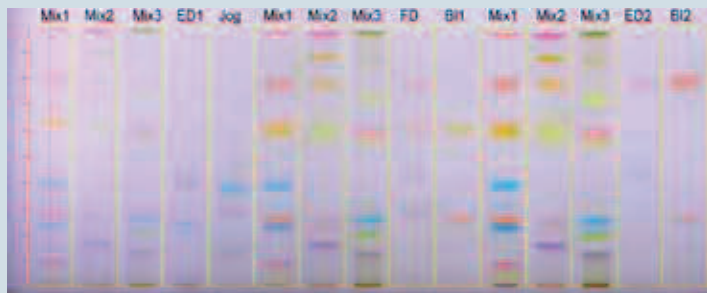
027.6315 Quantitative chromatogram evaluation



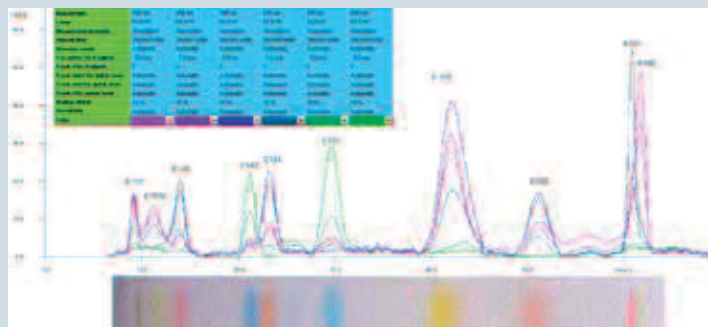
Application example

Analysis of 25 water-soluble food dyes in food

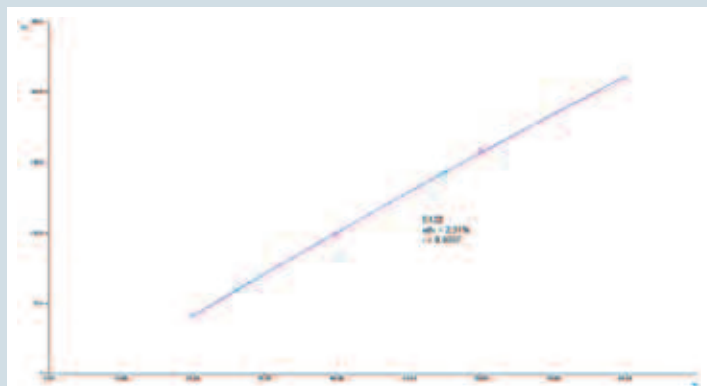
HPTLC is the most effective, rapid and cost-efficient solution for the analysis of water-soluble food dyes in food. Up to 20 runs can be chromatographed under identical conditions (by use of the Automatic Developing Chamber ADC2) within 12 minutes (see CBS 105 or www.camag.com).



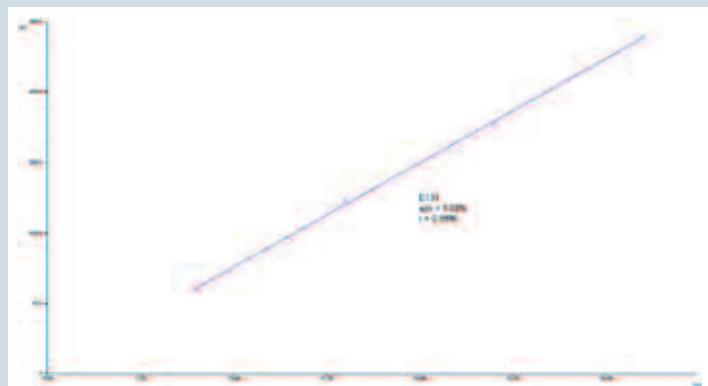
25 food dyes (split in 3 mixtures, application volumes of 1, 2, and 3 μ L) and 6 food samples (application volumes of 2 μ L; energy drink (ED), yoghurt (Jog), fruit drink (FD), bakery ink formulation (BI))



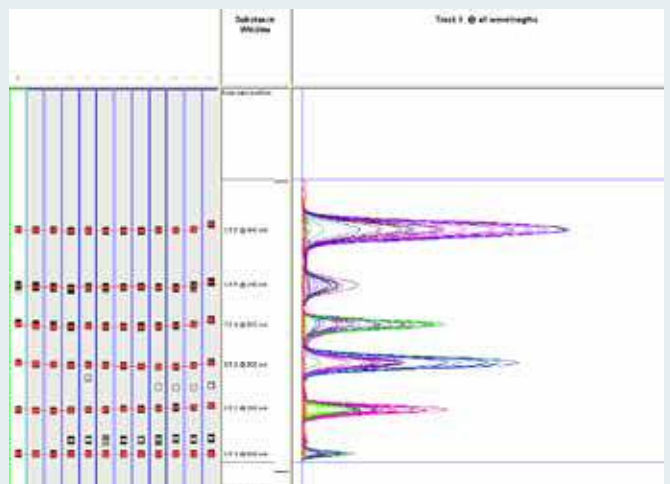
Multi-wavelength scan of mixture 1 (superposition of absorption curves at 6 wavelengths).



Calibration function of the red food dye E122 (x) and determination in fruit drink, energy drink and bakery ink formulation (+).



Calibration function of the blue food dye E131 (x) and determination in the yoghurt sample (+).



DUAL-WAVELENGTH SCAN AND MULTI-WAVELENGTH SCAN

The software option dual-wavelength scan serves for background correction. The chromatogram is scanned with two wavelengths, the measuring and the reference wavelength, which each can be selected between 190 and 900 nm.

As measuring wavelength one will usually select the wavelength of the absorption maximum of the substance to be calibrated. The reference wavelength should be sufficiently apart from this maximum absorbance in order to achieve good sensitivity, however, not too far away as otherwise irregularities in the layer will not be reliably compensated. A preceding recording of the spectrum is helpful for selecting the right combination of wavelengths.

The option multi-wavelength scan is a useful tool for the quantitation of analyte mixtures with components differing in absorption maxima.

The plate tracks can be scanned consecutively at up to 36 different wavelengths between 190 and 900 nm and the peak data is stored in one analysis file. During the consecutive quantitative evaluation each component can now be automatically evaluated at its maximum absorbance. This way the user is relieved from manually evaluating the same plate at different wavelengths.

For identity checking the 3D view of the multi-wavelength scan is another very helpful tool. The 3D views can be scaled, swivelled and tilted, and then copied to clipboard or saved as a bitmap file for use in other software, e.g. Word.

Ordering information

027.6346 Dual-wavelength scan



Ordering information

027.6348 Multi-wavelength scan



Selftest TLC Scanner	Units	Lower limit	Upper limit	Detected	Status
Basic electronics test					
Measuring electronics self diagnosis					passed
Main PM dark signal	mV	0.01	45.00	2.27	passed
Reference PM dark signal	mV	0.01	45.00	2.82	passed
PM match test : gain		10	50	31	passed
PM match test : high voltage	V	250	800	489	passed
PM relative sensitivity @ 400 nm	%	50.0	120.0	101.7	passed
Deuterium lamp tests					
Relative intensity	%	50.0	120.0	100.2	passed
Output noise	%	0.00	0.25	0.06	passed
Lateral adjustment	mm	8.77	9.09	9.01	passed
Slit illumination uniformity	%	90.0	100.0	93.0	passed
Equivalent burning time of this lamp	h	0.0	0.0	24.4	info only
Ignitions of this lamp		0	0	11	info only
Tungsten halogen lamp tests					
Output noise	%	0.00	0.25	0.06	passed

SCANNER SELFTEST

With this option an automatic selftest of the TLC Scanner 4 and a report can be generated.

In the scanner selftest procedure the following checks are performed:

- Wavelength accuracy of the monochromator
- Stage positioning
- Condition and alignment of all lamps
- Condition and alignment of the optical system
- Condition of the electronic system

The complete qualification procedure can be carried out automatically or manually in sections. Certain deficiencies in lamp alignment and monochromator adjustment can be automatically corrected.

Example

The stage with the test pattern (straight line) is moved multiple times at 0.1 mm increments in Y direction across the slit. The resulting analog curve is evaluated by the program. This test gives information about:

- Uniformity of slit illumination with the respective lamp, and
- Correct alignment of the lamp and the optical system

The result of each test is displayed on screen and can be printed as part of the qualification report. The report contains the target values and the values actually found together with a pass/fail judgment.

The option scanner selftest is required when the instrument shall be operated in a GxP environment.

Ordering information

027.6340 Scanner selftest



21 CFR PART 11 "COMPLIANCE READY"

Signing History	TimeStamp	Account	Reason/Remark
	15.09.2010 15:52:20	CAMAG user	Analyse wurde freigegeben

This option is required for compliance with the FDA regulation regarding the recording of electronic data and signatures.

Features :

- Safety of data acquisition and operation by user identification with password
- Secure storage of all results including raw data ensures complete data integrity and tracking
- Documentation of all activities in History Log/Audit Trail for secure tracking of electronic signatures according to 21 CFR Part 11 requirements

Ordering information

027.6380 21 CFR Part 11 "compliance ready"





INSTRUMENT QUALIFICATION

For customers working in a GMP/GLP environment, CAMAG offers Installation Qualification (IQ) and Operation Qualification (OQ) as service.

The Installation Qualification (IQ) is performed at the site and at the time of installation. It documents that all specifications and parameters comply with the manufacturer's specifications, environmental parameters and safety requirements.

The Operation Qualification (OQ) is initially performed subsequent to IQ and is repeated at certain intervals recommended by the manufacturer or defined by the customer. It documents that all modules of the qualified system function properly within the specified operating ranges.

The Performance Qualification (PQ) is an ongoing process which documents that the instrument or system is suitable for the given task. Thus only the user can perform PQ, employing his substances, following his task description and his test procedures (SOPs).



INSTRUMENT SERVICE

For all CAMAG instruments for which we offer IQ/OQ qualification we also offer service contracts.

A service contract includes:

- Preventive maintenance once per year or as required
- Adjustments and tests
- Optional performance of the qualification (OQ) at the same time



TECHNICAL DATA

Light sources

- Deuterium lamp, usable continuum 190–450 nm
- Halogen-tungsten lamp, usable continuum 350–900 nm
- High-pressure mercury lamp, line spectrum 254–578 nm

The lamp, which is positioned in the light path, is automatically ignited. All lamps are current stabilized.

Pilot lamp and compartment illumination

The slit is automatically illuminated with visible light when the compartment illumination is switched on. The scanning compartment is illuminated with a 4 watt fluorescent tube UV 254 nm which the user can replace by a UV 366 nm or a white light tube.

Optical system

Apochromatic suprasil-fluorite lens system, transmission range 190–900 nm, astigmatic entry lens for optimal slit illumination; automatic switching between micro and macro position for optimal light intensity.

Monochromator

Concave holographic grating, 1200 lines/mm, bandwidth selectable 5 or 20 nm, wavelength range 190–900 nm; monochromator driven by stepper motor, reproducibility of wavelength setting better than 0.2 nm, accuracy better than 1 nm; connector for flushing with nitrogen. Maximum speed of spectra recording 100 nm/s, positioning at 200 nm/s.

Secondary filter

Motor-driven filter wheel with three automatically selected filters for the elimination of second order wavelengths; 400 nm cut-off filter for fluorescence measurements; three positions for user selected filters.

Scanning slit

Revolving disk with 20 fixed apertures; length of slit images selectable between 0.2 and 12 mm, width between 0.1 and 1.2 mm in 42 combinations.

Detector

Two matched broad band photo multipliers, multi alkali type, spectral sensitivity 185–900 nm.

Stage drive

Independent in both directions by stepper motors, micro step driven for smooth movement; reproducibility of positioning better than 50 μm in Y-direction, better than 100 μm in X-direction; maximum scanning speed 100 mm/s, positioning at 150 mm/s.

Mains voltage

115 V and 230 V selectable; 50/60 Hz; maximum energy use 180 W (tungsten and mercury lamp ignited).

A/D converter

16 bit, 2-channel A/D converter, 100 ms per double conversion.

Connections/interfaces

Serial interface RS232 for communication to the computer, EquiLink for connection to winCATS software.

Dimensions

Width = 590 mm, depth = 650 mm, height = 367 mm; net weight 39 kg.



ORDERING INFORMATION

027.6200 CAMAG TLC SCANNER 4

for scanning by absorbance and fluorescence, equipped for objects up to 200 × 200 mm, wavelength range 190–900 nm, complete with deuterium lamp, tungsten-halogen lamp, and mercury vapor lamp, including Equilink (027.6312) to winCATS, but without winCATS license.

winCATS Software and options:

- 027.6300 winCATS license including one year of internet update service
- 027.6315 Quantitative chromatogram evaluation
- 027.6342 Spectrum library
- 027.6344 Track optimization
- 027.6346 Dual-wavelength scan
- 027.6348 Multi-wavelength scan
- 027.6340 Scanner selftest
- 027.6380 21 CFR Part 11 "compliance ready"

You can order the CAMAG TLC Scanner 4 as a complete system:

027.6288 CAMAG TLC Scanner 4, complete system

- 027.6200 CAMAG TLC Scanner 4, for scanning by absorbance and fluorescence, equipped for objects up to 200 × 200 mm, wavelength range 190–900 nm, complete with deuterium lamp, tungsten-halogen lamp, and mercury vapor lamp
- 027.6312 Equilink to establish a 2-way communication between the scanner and winCATS
- 027.6300 winCATS license including one year of internet update service
- 027.6315 winCATS option "Quantitative chromatogram evaluation"
- 027.6340 winCATS option "Scanner selftest"

i



Omicron Research Limited
Unit 11 Kennet Enterprise Centre
Charnham Lane, Hungerford, RG17 0EY
Tel: 01488 682700
Email: omicron-uk.com
www.omicron-uk.com

CAMMAG

OMICRON