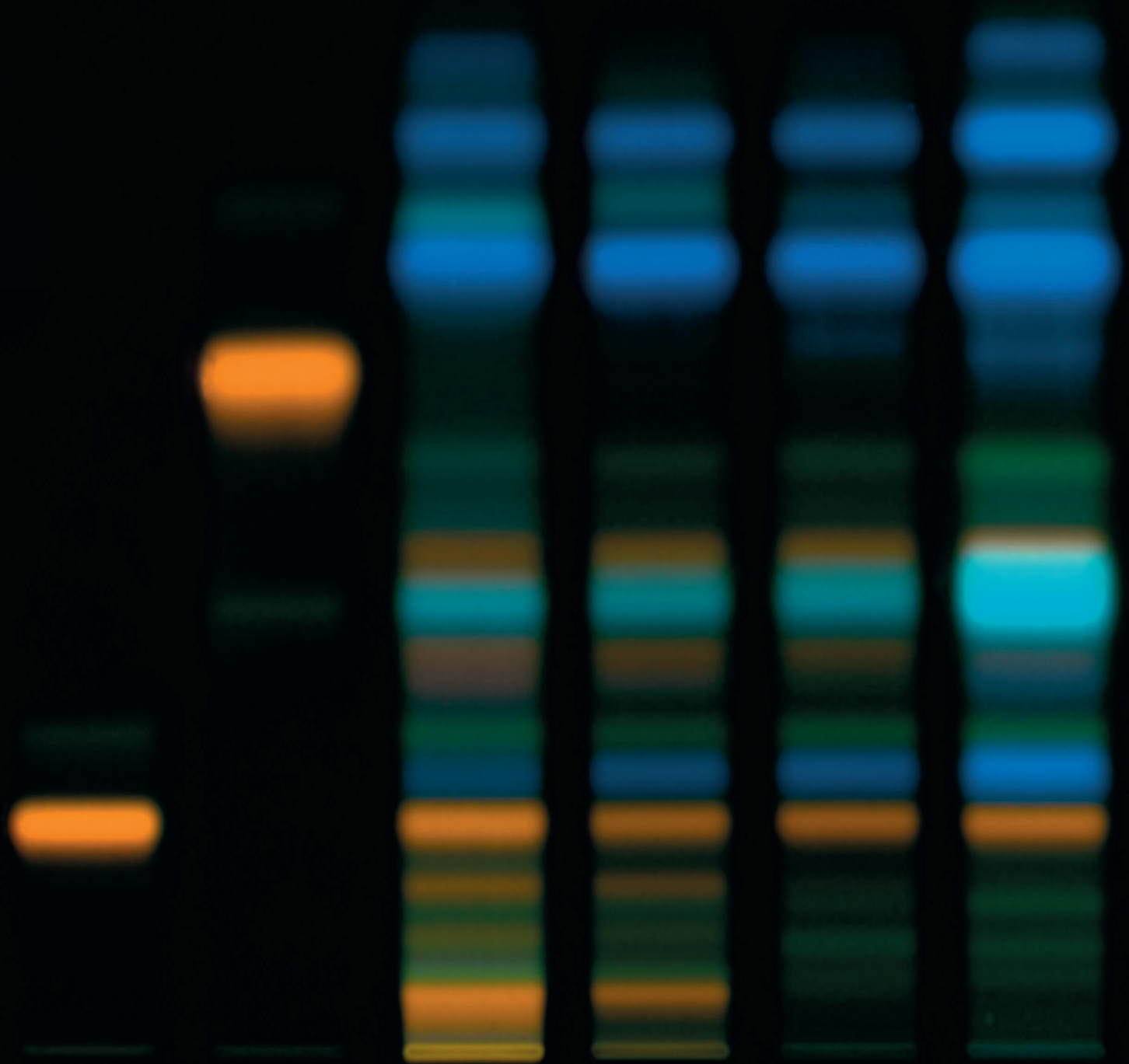


INSTRUMENTAL THIN-LAYER CHROMATOGRAPHY



CAMMAG

WORLD LEADER IN PLANAR CHROMATOGRAPHY



CAMAG – Your partner in all fields of Planar Chromatography

CAMAG has the tradition of serving planar chromatography since 1961. We develop and manufacture sophisticated instruments and associated software for the state-of-the-art analytical technique. Our products are marketed directly in Switzerland, through daughter companies in Germany and in the USA, and through carefully selected distributors worldwide. We see ourselves as a flexible, customer friendly, science based company that has made its mark as a reliable partner in all branches of planar chromatography. We provide competent customer support and technical service for our products as well as education and training for our customers' lab personnel.

CAMAG has everything your lab may need for planar chromatography. This catalog will help you to quickly find information about the products suitable for your tasks. The catalog may also serve as a short guide through all steps of the planar chromatography procedure. Methodological explanations are set apart from specific product information.

Please visit our homepage www.camag.com for additional information and the latest news.

Our team is always available for individual questions and support.

Terminology used in this catalog

In order to emphasize that the state-of-the-art method is something different from the simple thin-layer chromatography of yesterday, we are predominantly using the term Planar Chromatography but occasionally also TLC and HPTLC (high-performance thin-layer chromatography).

Overview

Steps of the TLC/HPTLC procedure	What is important?
Sample Application	The samples are applied onto the layer as spots or bands. Precision of the applied volume, exact positioning and compactness of the application zones are decisive for the quality of the analysis.
Chromatogram Development	The developing solvent (mobile phase) is drawn through the layer (stationary phase) by capillary action. Thereby the analytes are separated into their components which remain in their position on the layer after the mobile phase has been evaporated.
Derivatization	Substances that do not respond to visible or UV light can be made detectable by in-situ derivatization. The required reagents are transferred onto the chromatogram by spraying or immersion.
Chromatogram Evaluation	<p>From UV inspection to densitometry</p> <p>UV absorbing substances can be detected under UV light.</p> <p>Chromatograms can be documented, archived and quantitated by electronic image acquisition.</p> <p>Chromatogram evaluation by scanning densitometry offers a maximum of quantitative precision plus spectral selectivity. Online coupling with mass spectrometry opens new possibilities of identification.</p>
Software	All steps in the in the procedure are managed by the CAMAG TLC software. It collects and evaluates all data and generates analysis reports in conformity to GMP/GLP.
Basic Kits Consumables	With one of the basic kits a lab can efficiently start working with TLC/HPTLC.
CAMAG Services	CAMAG offers support with method development, training, instrument qualification, literature services and more.

What is offered by CAMAG?		Where can I find?	
Nanomat Automatic TLC Sampler 4 Linomat 5	Page 7 Page 8 Page 10	Sample Application	Pages 5–10
Developing Chambers smartAlert, smartCut Automatic Developing Chamber ADC 2 Automated Multiple Development AMD 2 HPTLC Vario System	Page 14 Page 15 Page 16 Page 17 Page 18	Chromatogram Development	Pages 11–18
Immersion Device TLC/HPTLC Sprayers TLC Plate Heater TLC Spray Cabinet	Page 21 Page 21 Page 22 Page 22	Derivatization	Pages 19–22
UV Lamps, UV Cabinet	Page 24	Chromatogram Evaluation	Pages 23–32
TLC Visualizer Bioluminizer	Page 26 Page 28	UV-Inspection	Page 24
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High Performance Thin-Layer Chromatography

The high performance version of planar chromatography distinguishes the technique. HPTLC comprises the use of chromatographic layers of utmost separation efficiency and the employment of state-of-the-art instrumentation for all steps in the procedure, precise sample application, standardized reproducible chromatogram development and software controlled evaluation. Of course, conventional TLC, manually performed und using inexpensive equipment still has its place in almost all laboratories as a convenient tool for simple and rapid separations.

TLC/HPTLC as opposed to column chromatography (GC, HPLC) utilizes a flat (planar) stationary phase and an open system. The basic steps sample application, chromatogram development and evaluation as well as any optional ones are performed relatively independent in time and location, which, on the one hand offers unsurpassed flexibility but on the other hand makes total automation difficult. Since many samples can be processed in parallel, TLC/HPTLC is rapid and cost effective.

Remarkable features of planar chromatography:

In addition to chromatogram detection/evaluation under visible or ultraviolet light, pre- and post-chromatographic derivatization is readily available, for which a practically unlimited variety of reagents can be used, since it is performed in the absence of the mobile phase.

Unlike with column chromatography, the user has a complete overview of the chromatogram as all fractions remain stored on the plate and any substances remaining in the start position are detectable. It is another advantage of planar chromatography that sample preparation can often be simplified, due to the one-time use of the stationary phase.

Standardized HPTLC analysis methods – qualitative or quantitative – can be validated. For customers regulated by GMP/GLP, we offer Installation Qualification (IQ) and Operating Qualification (OQ) for our instruments.

CAMAG's modern software concept ensures the reliable operation of our HPTLC systems and the documentation/storage of operating parameters and results as required by the customer.

TLC-MS online coupling, the comparatively new hyphenation of HPTLC and mass spectrometry, has the potential to become an indispensable technique for many analytical laboratories.

Important fields of application



Pharmaceutical applications

- Quality control
- Content Uniformity Test (CUT)
- Identity- and purity checks
- Stability tests, etc.



Herbals

- Identification
- Stability tests
- Detection of adulteration
- Assay of marker compounds, etc.



Clinical applications

- Lipids
- Metabolism studies
- Drug screening
- Doping control, etc.



Food and feed stuff

- Quality control
- Additives (e. g. vitamins)
- Pesticides
- Stability tests (expiration), etc.



Cosmetics

- Identity of raw material
- Preservatives, coloring materials, etc.
- Screening for illegal ingredients, etc.



Industrial applications

- Process development and optimization
- Process monitoring
- Cleaning validation, etc.



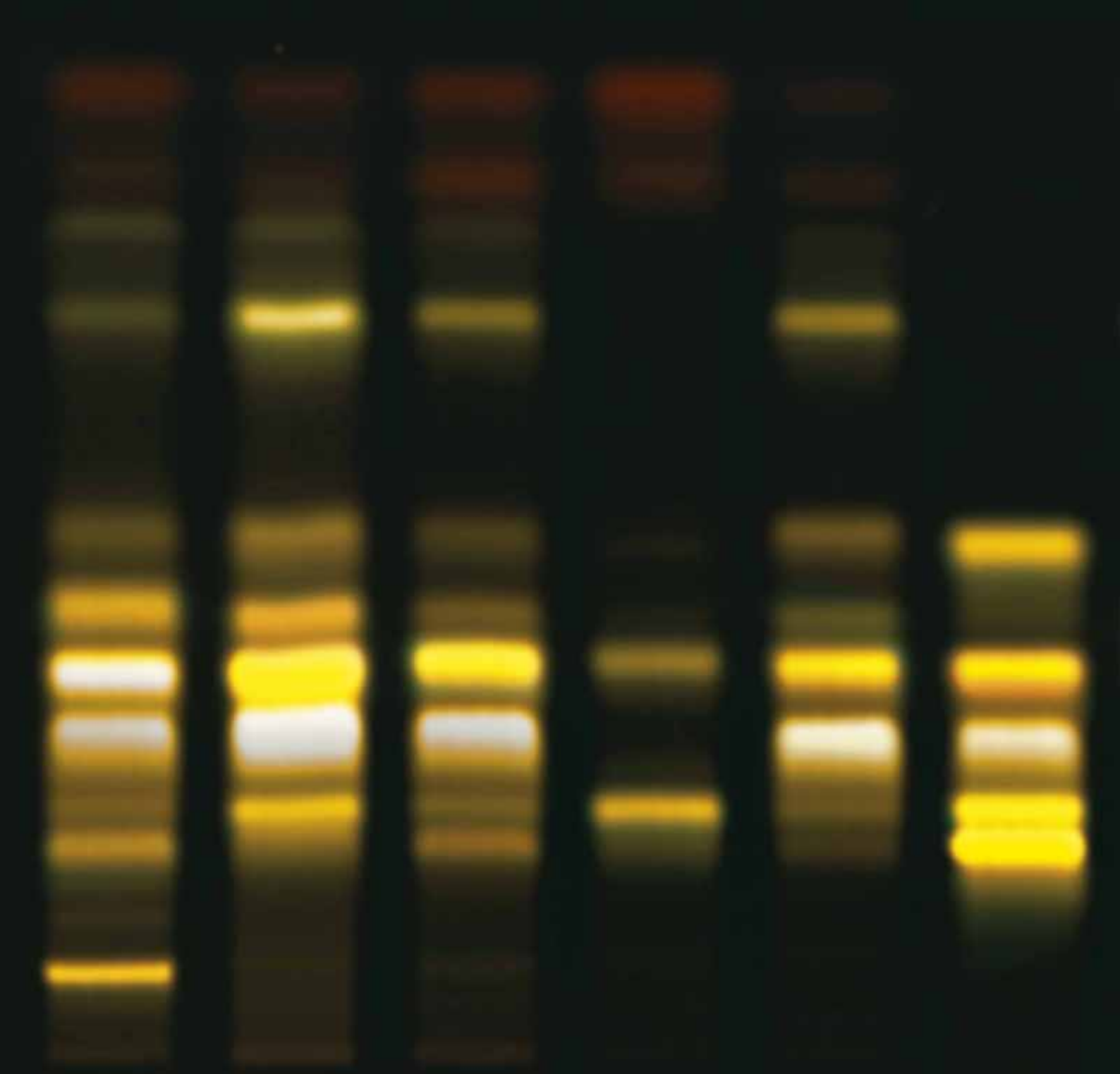
Environment

- Water
- Soil
- Residue analysis, etc.



Forensics

- Detection of document forgery
- Investigation of poisoning
- Dyestuff analyses, etc.



Sample Application

Sample application determines
quality and reproducibility of the analysis

Sample Application – Variations

Sample application is the first step in the workflow of planar chromatography and it affects significantly the quality of the result at the end of the process. The choice of the application technique and the device depend on the requirements of precision, sample volumes, number of analyses and the desired grade of automation.

Spot wise sample application using a fixed volume capillary is the simplest way. Sample volumes of 0.5 to 5 μL can be applied as spots onto conventional layers without intermediate drying, on HPTLC layers it is up to 1 μL per spot. It is recommended to guide the capillary by means of a Nanomat.

Spraying-on samples as narrow bands allows the application of significantly larger volumes. Starting zones in the form of narrow bands ensure the best resolution that can be achieved with the chromatographic system selected.

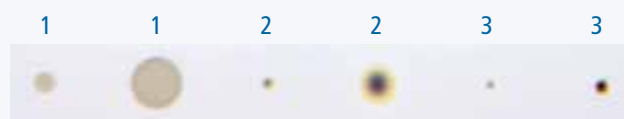
Very large sample volumes or samples with a high matrix content can be sprayed-on in the form of rectangles which, prior to chromatography, are focused into narrow bands by a short development step with a solvent of high elution strength.

Effect of the solvent and the technique of sample application on the chromatogram

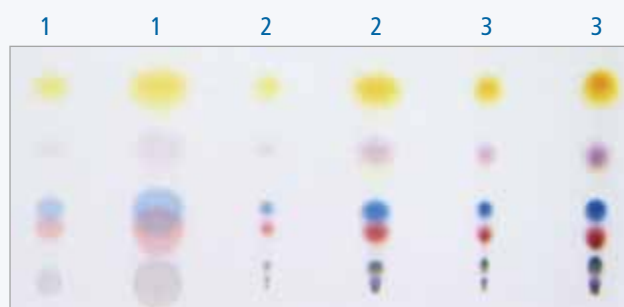
Mobile phase: toluene; detection: white light

Test dye mixture (0.5 and 5 μL) dissolved in

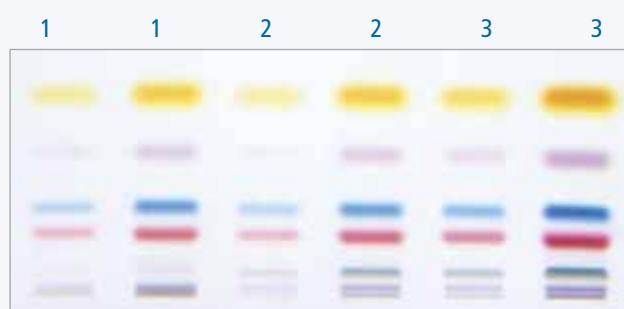
1: methanol 2: toluene 3: hexane



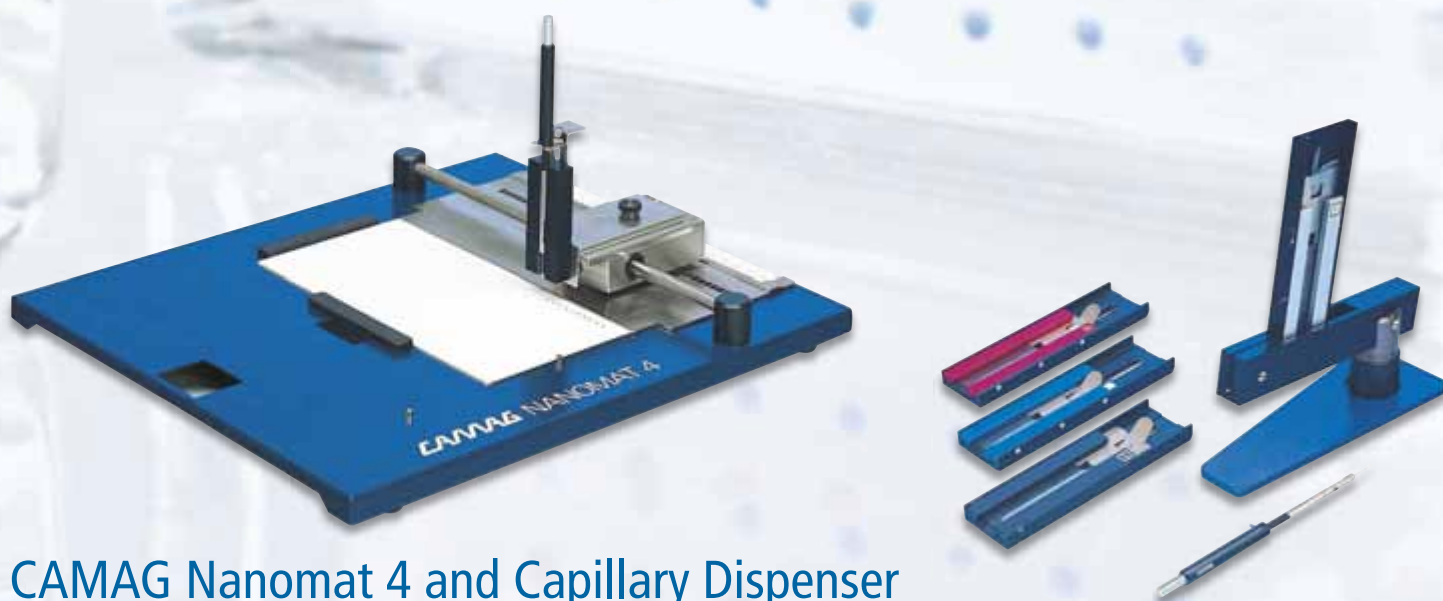
Contact application, prior to development



Developed plate after contact application of spots



Developed plate after spray-on application of bands



CAMAG Nanomat 4 and Capillary Dispenser

The Nanomat 4 serves for easy application of samples in the form of spots onto TLC and HPTLC layers, precisely positioned and without damage to the layer. The actual sample dosage is performed with a disposable capillary pipette, which is precisely guided, thus ensuring that the chromatogram can be scanned automatically according to a programmed pattern.

The Nanomat 4 is suitable for

- Conventional TLC plates including self-coated plates up to 20×20 cm
- HPTLC plates 10×10 cm and 20×10 cm
- TLC and HPTLC sheets up to 20×20 cm

Capillary pipettes

The capillary pipettes are loaded into the dispenser in magazines. Capillaries of 0.5, 1, 2, and 5 µL volume are available. Each capillary size requires an appropriate dispenser magazine. With the Universal Capillary Holder capillary pipettes are taken from the dispenser, then filled with sample solution and placed against the applicator head of the Nanomat 4.

Ordering information

CAMAG Nanomat 4 and Capillary Dispenser

022.4735 Nanomat 4 complete,
including

022.7655 Capillary Dispenser,
022.7786 Universal Capillary Holder,
022.7661 Dispenser Magazine for
1 µL Capillary Pipettes,
022.7771 Capillary Pipettes 1 µL,
pack of 5 × 100

022.7660 Dispenser Magazine for 0.5 µL
Capillary Pipettes

022.7661 Dispenser Magazine for 1.0 µL
Capillary Pipettes

022.7662 Dispenser Magazine for 2.0 µL
Capillary Pipettes

022.7665 Dispenser Magazine for 5.0 µL
Capillary Pipettes

022.7770 Capillary Pipettes 0.5 µL
pack of 5 × 100

022.7771 Capillary Pipettes 1.0 µL
pack of 5 × 100

022.7772 Capillary Pipettes 2.0 µL
pack of 5 × 100

022.7775 Capillary Pipettes 5.0 µL
pack of 5 × 100

Further information under www.camag.com/nanomat

CAMAG Automatic TLC Sampler 4 (ATS 4)



Automatic sample application is a key factor for productivity of the HPTLC laboratory. The requirements for an instrument serving this purpose, i.e. precision, robustness during routine use and convenient handling are fully met by the Automatic TLC Sampler 4. The ATS 4 offers fully automatic sample application for qualitative and quantitative analyses as well as for preparative separations. It is suited for routine use and high sample throughput in mass analysis.

Samples are either applied as spots through contact transfer (0.1–5 μL) or as bands or rectangles (0.5 to > 50 μL) using the spray-on technique. Starting zones in the form of narrow bands offer the best separation attainable with a given chromatographic system. Application in the form of rectangles allows precise application of large volumes without damaging the layer. Prior to chromatography, these rectangles are focused into narrow bands with a solvent of high elution strength.

The ATS 4 allows "overspotting", i.e. a sequential application from different vials onto the same position. This technique can be used e.g. in pre-chromatographic derivatization, spiking, etc.

Key features

- Fully automatic sample application, suitable for routine
- Application in the form of spots, bands, or rectangles
- Application of sample volumes between 0.1 and 5 μL by contact transfer
- Spray-on application of sample volumes between 0.5 and > 50 μL
- Data input and monitoring through software
- Application of solutions onto any planar medium (FreeMode)



Heated Spray Nozzle for ATS4 (option)

Heating at 60 °C cuts the time required for the application of aqueous solutions about in half. This is useful e.g. for trace analysis where comparatively large sample volumes have to be applied in order to reach a low detection limit



ATS 4 FreeMode Software

Free choice of application patterns on planar media of any format

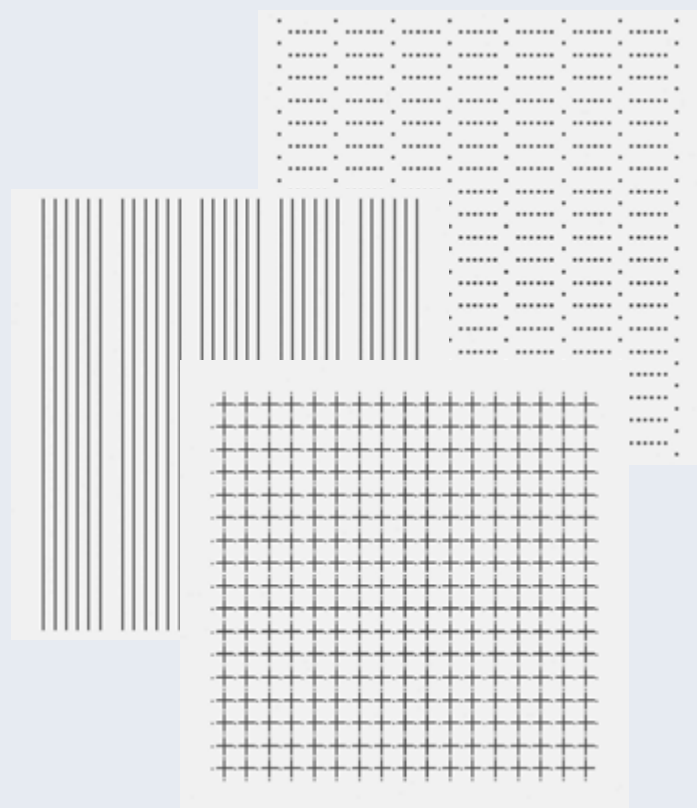
Examples

Sample application on the opposite edges of three HPTLC plates 20 x 10 cm from a 66-well plate in one application run allows high throughput, e.g. in screening analysis or in combinatorial chemistry.

Application of certain patterns for two-dimensional chromatography according to the "4 x 4" method

The free choice of application patterns can be used in the preparation of test kits for serological investigations using nitrocellulose membranes.

Depending on the characteristic of the test, bioactive substances are sprayed-on as bands rectangular one to another, series of spots, or long-drawn bands. The very good reproducibility with respect to application geometry, spot and band quality, as well as dosage precision ensures reliable evaluation of the test results.



Note

The Automatic TLC Sampler ATS 4 with winCATS meets all the requirements of GMP/GLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the option 21 CFR Part 11 "compliance ready" is required for each winCATS workstation.

Further information can be found in the special brochure "Automatic TLC Sampler" and under www.camag.com/ats

Ordering information

- 022.7400 CAMAG Automatic TLC Sampler 4, complete with standard accessories and Equilink, without software → *visionCATS*
- 022.7410 CAMAG Automatic TLC Sampler 4, with heated spray nozzle, complete with standard accessories and Equilink, without software → *visionCATS*
- 022.7450 Dosing Syringe Starter Kit for ATS 4 comprised of
695.0053 Dosing Syringe 25 µL for ATS 4, without needle
695.0046 Needle for spray-on application
695.0047 Needle for contact application

CAMAG Linomat 5



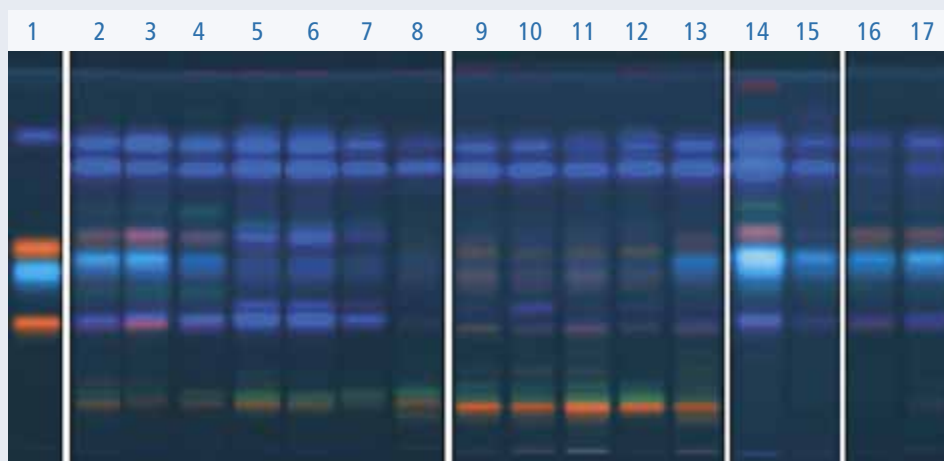
With the Linomat 5 samples are sprayed onto TLC/HPTLC plates in the form of bands with nitrogen or compressed air. Sample application is automatic, only changing the syringe (filling, inserting and rinsing) is manual. The Linomat is suitable for routine use.

Operation under software

When the Linomat is operated under software, plate dimensions, number and distance of tracks, designation, sample volumes and sequence are software controlled. All operating data are automatically transferred to the densitometric or image processing evaluation step.

Operation in stand-alone mode

In order to meet the requirements of users employing the Linomat only occasionally it can also be operated in stand-alone mode. Up to 10 application programs can be entered either manually via the keypad or transferred from a computer.



Sample application as bands

HPTLC fingerprint (flavonoids) of green tea samples representing different geographic origins.

Track assignment

- 1 Reference substances with increasing R_f :
rutin, chlorogenic acid, hyperoside, gallic acid
- 2– 8 Samples from China
- 9–13 Samples from Japan
- 14–15 Samples from India

For comparison:

- 16–17 Black tea from Sri-Lanka

Tracks taken from different plates

Note

The Linomat 5 with winCATS meets all the requirements of GMP/GLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the option 21 CFR Part 11 "compliance ready" is required for each winCATS workstation.

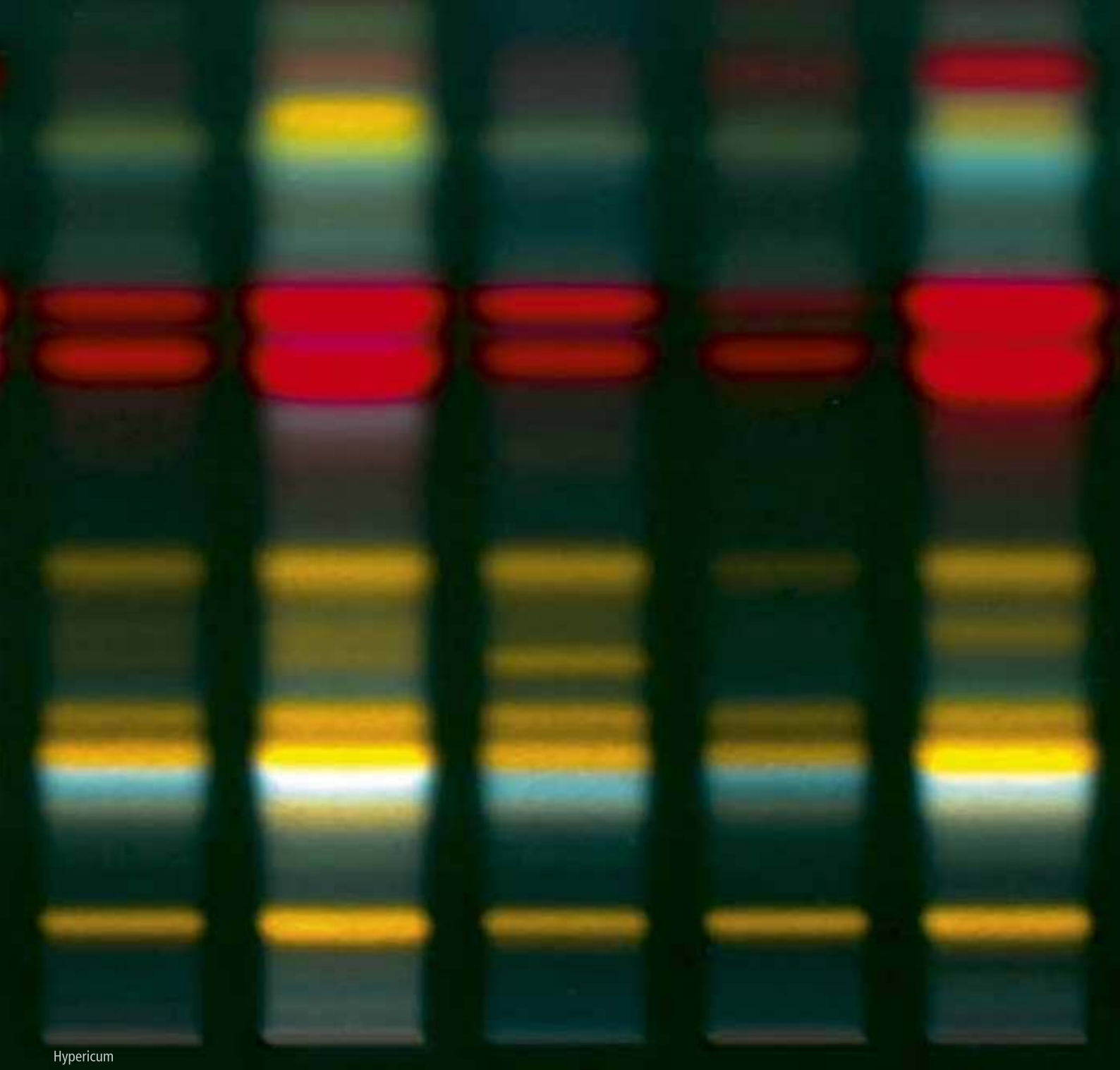
Further information can be found in the special brochure "Linomat 5" and under www.camag.com/linomat5

Ordering information

022.7808 CAMAG Linomat 5, complete with one dosing syringe 100 μ L, standard accessories and Equilink, without software
→ **visionCATS**

695.0014 Dosing Syringe 100 μ L for Linomat

695.0015 Dosing Syringe 500 μ L for Linomat



Hypericum

Chromatogram Development

Chromatogram development under reproducible standardized conditions is a key to the quality of the result

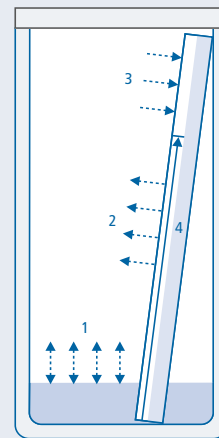
Chromatogram Development

TLC/HPTLC differs from all other chromatographic techniques in the fact that in addition to stationary and mobile phases, a gas phase is present, which can significantly influence the result of the separation.

The following considerations primarily concern silica gel as stationary phase and a process usually described as adsorption chromatography.

In the developing chamber four partially competing processes occur:

- 1 Between the components of the developing solvent and its vapor, an equilibrium will be established gradually. This process is called chamber saturation. Depending on the vapor pressure of the solvent components the composition of the gas phase can differ from that of the developing solvent.
- 2 The part of the layer which is already wetted with mobile phase contributes to the formation of the equilibrium.
- 3 While still dry, the stationary phase adsorbs molecules from the gas phase. Thereby polar components will be preferentially withdrawn from the gas phase and loaded onto the surface of the stationary phase. Allowing the plate to interact with the gas phase prior to starting chromatographic development is called layer preconditioning, which is not possible with all types of developing chambers. Lining the chamber with filter paper soaked with developing solvent supports this process. In case that preconditioning is not desired, a counter glass plate arranged a few mm apart suppresses it. This is called sandwich configuration.
- 4 During solvent migration, the components of the mobile phase may be separated by the stationary phase under certain conditions, causing the formation of secondary fronts, which is usually not desired.



Influence of relative humidity ("activity of the layer") with the same solvent migration distance



Choosing the type of developing chamber

Selection of the “appropriate” chamber is made during method development, depending on what parameters such as chamber saturation, preconditioning the layer, relative humidity, etc. influence the result. Often “practical” considerations are followed such as which chamber is available, which one must be used due to an SOP, or which one has been used in the past if a results comparison is to be made. Economical aspects like solvent consumption, optimal use of layer space, etc. are also considerations. Preconditioning of the layer with solvent vapor is possible with all type chambers described except the flat bottom chamber.

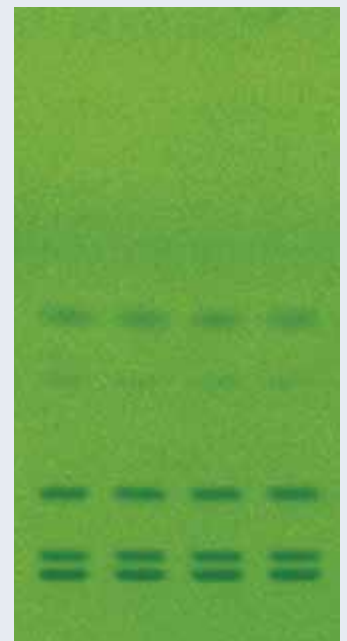
Efficient preconditioning at a controlled relative humidity is most conveniently effected with the ADC 2. Also the Horizontal Developing Chamber (HDC) provides this feature and – with limitations – the Twin Trough Chambers.

Sandwich configuration can be selected with the HDC.

Considered also should be the HPTLC Vario System (p. 18) which offers the time saving optimization of development conditions.



Development without preconditioning

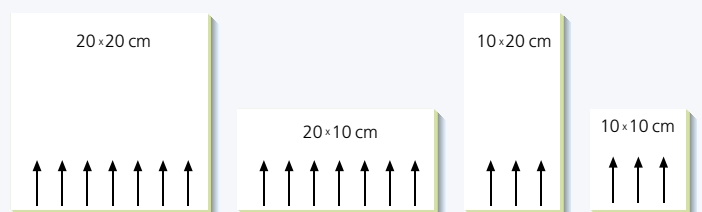


Development with preconditioning

Definition of plate and chamber formats

These format definitions are used in this catalog as well as in all CAMAG literature.

Note: certain plates can be developed in one direction only, e.g. plates with a concentration zone, GLP coded plates.





CAMAG Flat Bottom Chamber

This is the classical developing tank for thin-layer chromatography. It permits the plate to be developed under conditions of partial or complete saturation of the tank atmosphere with solvent vapors. The degree of layer preconditioning can not be controlled unless additional accessories are used.



CAMAG Twin Trough Chamber

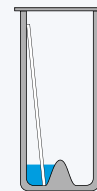
The CAMAG Twin Trough Chamber offer several ways to specifically influence chromatogram development in order to improve it.

Twin Trough Chamber: Low solvent consumption

20 mL of solvent are sufficient for a 20x20 cm chamber, 10 mL for the 20x10 cm chamber and 5 mL for a 10x10 cm chamber. This reduces not only solvent consumption but also disposal problems.

Reproducible preconditioning of the layer with solvent vapor

Developing solvent is placed in the trough opposite to the plate. Preconditioning can be performed with any solvent and for any duration. Development is started when developing solvent is placed into the trough with the plate.



Ordering information

CAMAG Flat Bottom Chamber

- 022.5259 Flat Bottom Chamber for plates 20 x 20 cm, with stainless steel lid
- 022.5250 Flat Bottom Chamber for plates 20 x 20 cm, with glass lid
- 022.5257 Flat Bottom Chamber for plates 20 x 20 cm, without lid
- 022.5150 Flat Bottom Chamber for plates 10 x 10 cm, with stainless steel lid
- 022.5151 Flat Bottom Chamber for plates 10 x 10 cm, without lid
- 022.5275 Flat Bottom Chamber light-weight for plates 20 x 20 cm, with glass lid
- 022.5270 Flat Bottom Chamber light-weight for plates 20 x 10 cm, with glass lid

CAMAG Twin Trough Chamber

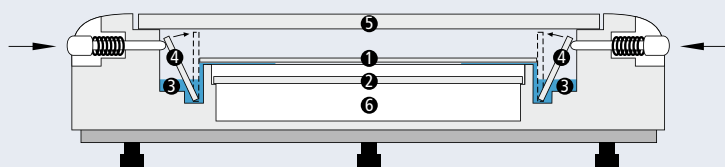
- 022.5256 Twin Trough Chamber for plates 20 x 20 cm, with stainless steel lid
- 022.5255 Twin Trough Chamber for plates 20 x 20 cm, with glass lid
- 022.5258 Twin Trough Chamber for plates 20 x 20 cm, without lid
- 022.5254 Twin Trough Chamber for plates 20 x 10 cm, with stainless steel lid
- 022.5253 Twin Trough Chamber for plates 20 x 10 cm, with glass lid
- 022.5261 Twin Trough Chamber for plates 20 x 10 cm, without lid
- 022.5155 Twin Trough Chamber for plates 10 x 10 cm, with stainless steel lid
- 022.5156 Twin Trough Chamber for plates 10 x 10 cm, without lid



CAMAG Horizontal Developing Chamber

In the Horizontal Developing Chamber the HPTLC plate is developed from both opposing sides towards the middle. This permits the number of samples to be doubled as compared with development in a tank, provided the separation distance of 45 mm, i.e. 50 mm minus 5 mm distance from the edge, is sufficient. In case a longer separation distance is desired, the HDC can be used for development from one side.

In the Horizontal Developing Chamber, a plate can be developed in the sandwich as well as in the tank configuration.



- 1 HPTLC plate (layer facing down)
- 2 Glass plate inserted to establish sandwich configuration
- 3 Reservoir for developing solvent
- 4 Glass strip for solvent transfer by capillary action
- 5 Cover plate
- 6 Conditioning tray

CAMAG smartAlert solvent front monitor

smartAlert serves for dependable monitoring the development of a plate in a glass developing chamber.

- Gives acoustic and visual notice when the mobile phase has reached the desired developing distance.
- Replaces a timer or stop watch.
- Works with glass chambers for plate sizes 20 x 20, 20 x 10 and 10 x 10 cm.
- Battery operated



CAMAG smartCut plate cutter

Convenient and precise cutting of TLC/HPTLC plates

- Cuts plates with a glass thickness up to 3 mm
- Makes smooth cuts on sensitive layers
- Desired size can be read directly from a scale
- Easy handling

Ordering information

022.8535 CAMAG Horizontal Developing Chamber for plates 20 x 10 cm

022.8530 CAMAG Horizontal Developing Chamber for plates 10 x 10 cm

022.5300 CAMAG smartAlert solvent front monitor

022.4300 CAMAG smartCut plate cutter

CAMAG Automatic Developing Chamber ADC 2



The Automatic Developing Chamber ADC 2 offers convenience, safety and reproducibility for the isocratic development of HPTLC plates and foils with the format 20 × 10 cm.

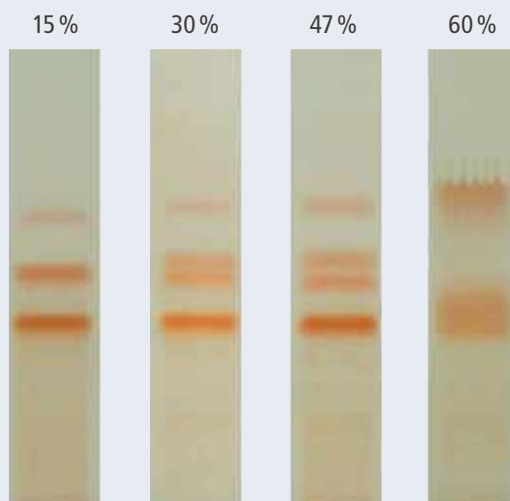
The Automatic Developing Chamber ADC 2 is the heart of a state-of-the-art HPTLC system. It performs the development step fully automatically, reproducibly, and independent of environmental effects. The activity and preconditioning of the layer, chamber saturation, developing distance and final drying can be pre-set and are automatically monitored by the ADC 2. Two modes of operation are possible: stand-alone with input of parameters via keypad, or remote operation by software with process monitoring, documentation of operating parameters, and reporting.

Key features

- Fully automatic development of 20 × 10 cm TLC/HPTLC plates
- A conventional 20 × 10 cm Twin Trough Chamber is used for development.
- This way, chromatographic conditions of already existing analytical procedures can be retained, but environmental and operational effects are excluded.
- Operation in stand-alone mode or software controlled
- The user is freed of all process monitoring responsibilities, operation is fully traceable.
- The option "Humidity Control" allows reproducible chromatography at defined activity of the layer. This feature is essential in method development when the influence of relative humidity shall be investigated.

Note

The Automatic Developing Chamber ADC 2 meets all the requirements of GMP/GLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the option 21 CFR Part 11 "compliance ready" is required for each winCATS workstation.



Effect of relative humidity on separation of polyphenols in green tea

Mobile phase: toluene – acetone – formic acid 9:9:2

Ordering information

022.8350 CAMAG Automatic Developing Chamber ADC 2, complete with standard Accessories and Equilink, without software → *visionCATS*

022.5261 Twin Trough Chamber for ADC 2

Further information can be found in the special brochure "Automatic Developing Chamber ADC 2" and under www.camag.com/adc

The CAMAG AMD 2 System Automated Multiple Development



The CAMAG AMD procedure allows thin-layer chromatography to be utilized for tasks that could not be performed by TLC in the past. Only the AMD procedure can be successfully employed for reproducible gradient development with silica gel as the stationary phase. In column liquid chromatography, gradient elution is common, but on reversed phases only, because a normal phase column would be irreversibly degraded, which is not acceptable in a technique depending on multiple use of the stationary phase.

The principle of the CAMAG AMD procedure

- The HPTLC plate is developed repeatedly in the same direction.
- Each successive run extends over a longer solvent migration distance than the one before.
- Between runs, the solvent is completely removed from the developing chamber and the layer is dried under vacuum.
- Each successive run uses a solvent of lower elution strength than that of the one used before. In this way, a stepwise elution gradient is formed.
- The combination of focusing effect and gradient elution results in extremely narrow bands. Their typical peak width is about 1 mm. This means that, within the available separation distance of 80 mm, up to 40 components can be completely resolved, i.e. with base line separation.

Note

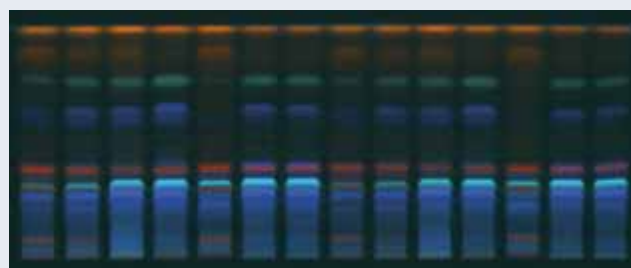
The AMD 2 with winCATS meets all the requirements of GMP/GLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the option 21 CFR Part 11 "compliance ready" is required for each winCATS workstation.

AMD 2 under winCATS

The AMD2, like other computer controlled CAMAG instruments, communicates with winCATS. The gradient, made from up to 5 solvent bottles, is defined by input into a table in winCATS. Gradient and developing distance for each run are graphically displayed for verification. All individual runs of the developing program are performed fully automatic and monitored by winCATS.

Key features

- Multiple development using a solvent strength gradient
- Separation power improved over regular HPTLC development by about factor 3
- Data input and monitoring through winCATS
- Utilizing time outside working hours if required



Separation of various rhubarb samples by AMD

Detection: UV 366 nm

Gradient in 10 steps: Methanol – dichloromethane from 40:60 to 10:90 in 9 steps over 40 mm developing distance followed by one step methanol – dichloromethane 10:90 over 70 mm

Ordering information

022.8860 CAMAG AMD 2 System comprised of chromatogram developing module, standard accessories and Equilink, without software

Further information can be found in the special brochure "AMD 2 System" and under WWW.camag.com/amd2



CAMAG HPTLC Vario System

Key features

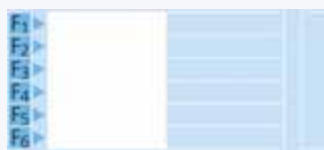
- Development with six different solvents can be tested side by side.
- Sandwich as well as tank configuration can be simulated side by side, making results directly comparable.
- Six different conditions of pre-equilibration, including relative humidity, can be tested simultaneously.
- These variations of developing conditions can be freely combined.

Time saving optimization of separation conditions using the HPTLC Vario System

Application examples, schematic: F_1, \dots = developing solvents, C_1, \dots = conditioning liquids

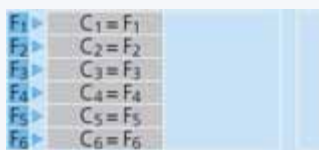
Optimization of the developing solvent

Development with 6 different solvents side by side, without preconditioning = development in sandwich configuration.



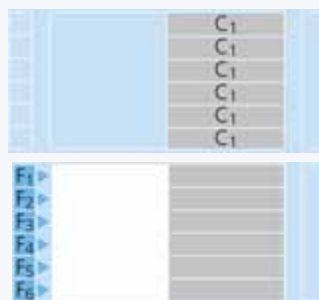
Optimization of the development solvent

Development with 6 different solvents side by side whereby the conditioning troughs contain the same six solvents = simulated tank development



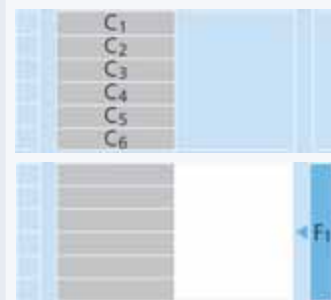
Optimization of the development solvent after uniform layer preconditioning

First step: pre-equilibration of all six tracks with the same conditioning liquid; then development with six different solvents (in sandwich configuration).



Optimization of preconditioning

Pre-equilibration with six different conditioning liquids; then development of all tracks with the same solvent.



Ordering information

022.8550 HPTLC VARIO System complete, comprising
 022.8555 HPTLC VARIO Chamber for 10×10 cm plates and
 022.8556 HPTLC Scoring unit for the preparation of TLC/
 HPTLC plates



Derivatization

The possibility of straight forward derivatization is a special feature of thin-layer chromatography

Pre- and Postchromatographic Derivatization

020 05

It is an inherent advantage of TLC/HPTLC that all fractions remain stored on the plate and can be readily derivatized after chromatography. Substances that do not respond to visible or UV light can be rendered detectable. In many cases, substances or classes of substances can be identified by specific reagents, enabling their selective detection.

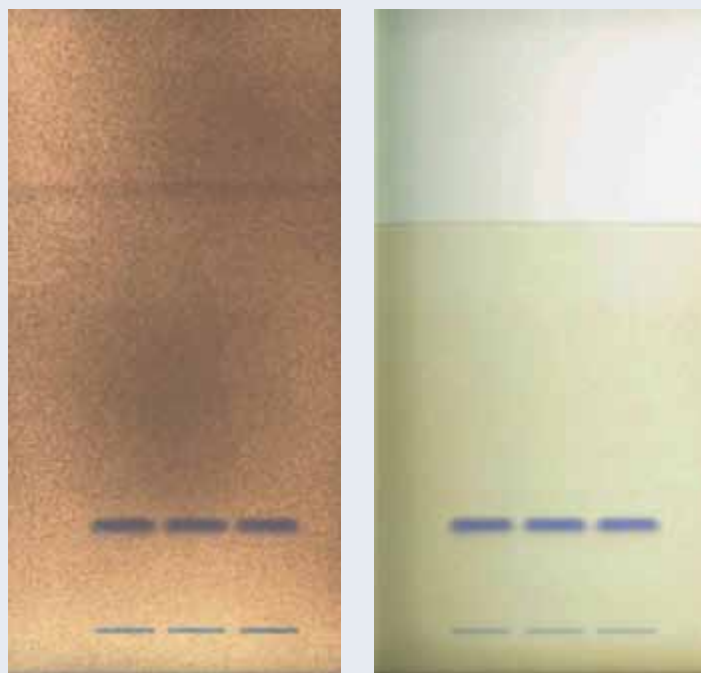
Pre-chromatographic derivatization is possible by overspraying the sample application zones with the Linomat or ATS 4.

For the transfer of liquid reagents for postchromatographic derivatization, one can choose between spraying or dipping. Provided the reagent is suitable, dipping is the preferred technique, particularly when a quantitative evaluation is intended. Usually reagent transfer by spraying can not be circumvented when two reagent solutions have to be applied in sequence without intermediate drying, for instance diazotation followed by coupling.

Whenever reagents are transferred by spraying, an efficient reagent mist removing device should be used to protect laboratory personnel against poisonous or irritating sprays or solvent vapors.

In most cases the derivatization reaction needs to be completed by heat treatment. Heating the chromatogram plate at the desired temperature with a plate heater specifically designed for this purpose is highly recommended. An oven used for this purpose will become permanently contaminated.

Comparison of reagent transfer by spraying and dipping



Derivatization of capsaicin with dichloroquinone-chloroimide-reagent/ammonia by spraying (1 g/L left side) and by dipping (0.25 g/L right side)



CAMAG Chromatogram Immersion Device

For proper execution of the dipping technique, the chromatogram plate must be immersed and withdrawn at a controlled uniform speed; otherwise tide marks may be left which interfere with densitometric evaluation. By maintaining a well defined vertical speed and immersion time, derivatization conditions can be standardized. The immersion device can also be used for the pre-washing of plates.

Key features

- Uniform vertical speed, freely selectable between 30 mm/s and 50 mm/s
- Immersion time selectable between 1 and 8 seconds and indefinitely (upward movement at another touch of the button)
- The device can be set to accommodate 10 cm and 20 cm plate height.
- Battery operated

Ordering information

- 022.6606 Chromatogram Immersion Device** for plates up to 20 x 20 cm, without dip tank
022.6627 Dip tank for plates 20x20 cm, with lid
022.6628 Dip tank for plates 20x10 cm, with lid
022.6619 Bench top rack for three dip tanks



CAMAG TLC/HPTLC Sprayer

The function is electro-pneumatic. Reagents are atomized into a fine aerosol spray with particles in the range of 0.3 to 10 µm. This ensures a homogeneous distribution over the layer at a low reagent consumption.

The TLC Sprayer consists of the charger and a pump unit with two kinds of spray heads, type A for spray solutions of normal viscosity (organic solvents), and type B for liquids of higher viscosity (e.g. sulfuric acid containing reagents).

Glass Reagent Sprayer

This all glass reagent sprayer is a low cost alternative to the TLC/HPTLC Sprayer. It comes with a rubber pump but may also be operated from a compressed air or nitrogen supply. The Erlenmeyer flask may be closed with a standard glass stopper.

022.6530 TLC/HPTLC Sprayer comprised of charger, pump unit with one each spray head type A and B, and one each reagent bottle 100 mL and 50 mL with cap

022.6535 Pack of 5 spray heads type A and 1 type B

022.6538 Pack of 6 spray heads type B

022.6536 Reagent bottle 100 mL with cap, pack of 6

022.6537 Reagent bottle 50 mL with cap, pack of 6

022.6539 Service kit for TLC sprayer

022.6100 Glass reagent spray with 100 mL Erlenmeyer flask



CAMAG TLC Plate Heater

The TLC Plate Heater is designed for heating a TLC/HPTLC plate to a selected temperature after a staining reagent has been applied.

The Plate Heater has a CERAN® heating surface which is resistant to all common reagents and is easily cleaned. The 20×20 cm heating surface has a grid to facilitate correct positioning of the TLC plate.

Programmed and actual temperature are digitally displayed. The temperature is selectable between 25 and 200 °C. The plate heater is protected from overheating.



CAMAG TLC Spray Cabinet

The TLC Spray Cabinet is designed for the complete removal of excessive spray mist while spraying a TLC plate with reagent.

There is no deflection of the spray jet before it reaches the plate, an effect often encountered in a normal laboratory fume hood. Particles rebounding from the plate are completely removed. The Spray Cabinet is also useful for drying plates after development, with or without the assistance of a hair dryer.

The cabinet is made of PVC. The blower, a radial fan driven by a motor outside of the fume duct, produces an airflow of 130 cubic feet (3.7 cubic meter) per minute. The bottom of the spray cabinet has a built in tray, which is removable for easy cleaning.

Dimensions: 470 × 490 × 490 mm (width × height × depth)

Ordering information

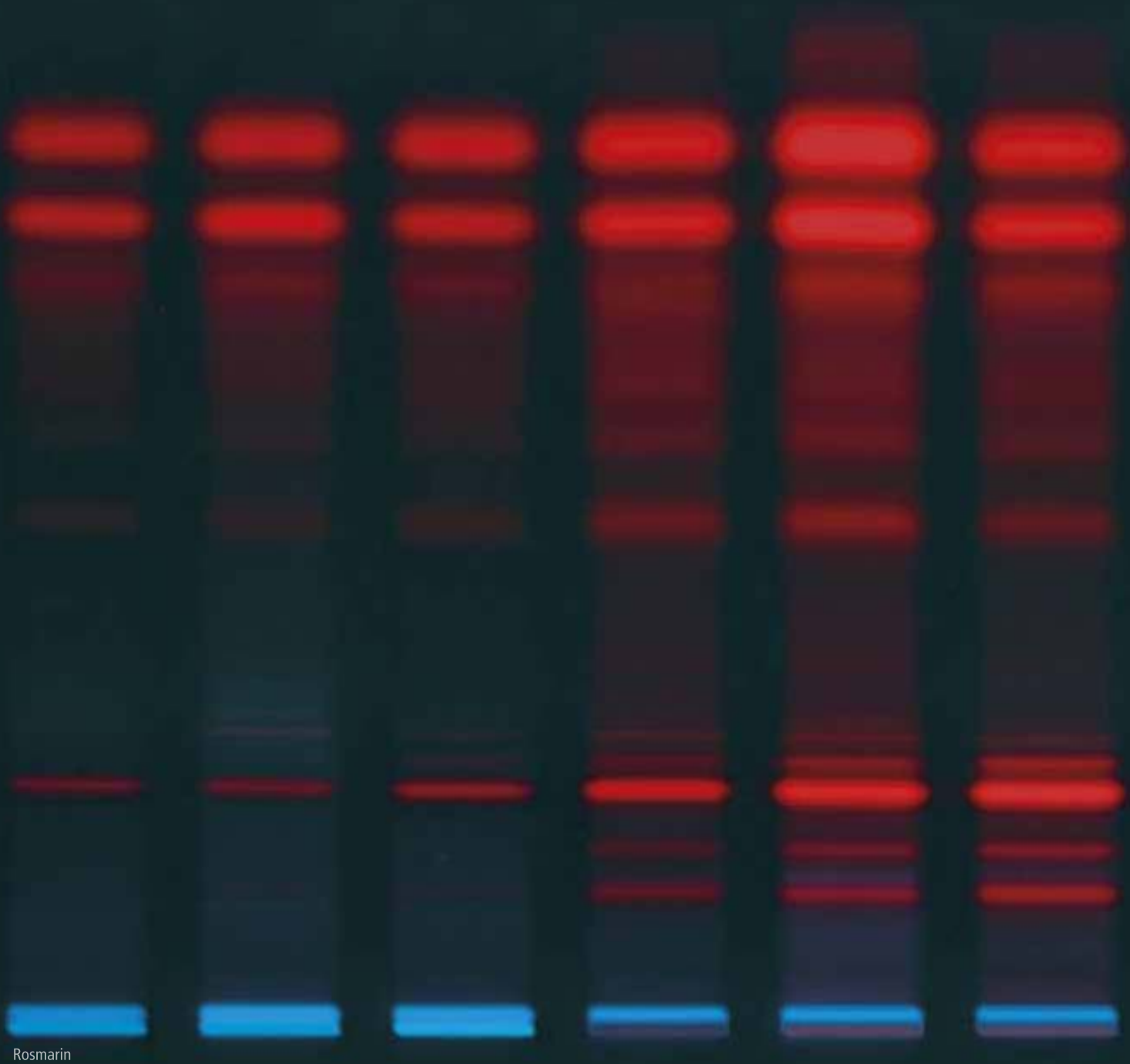
022.3306 TLC Plate Heater

022.6230 TLC Spray Cabinet with blower and 1.5 m flexible exhaust hose

022.6232 TLC Spray Cabinet with 1.5 m flexible exhaust hose for connection to an existing exhaust duct

022.6226 Exhaust hose extension 1.5 m, with adapter

Further information can be found under www.camag.com/derivatization



Chromatogram Evaluation

- Chromatogram inspection under UV light _____ **UV Lamps**
- Documentation, image acquisition _____ **Visualizer**
- Bioactivity detection _____ **Bioluminizer**
- Classical densitometry _____ **TLC Scanner 4**
- TLC/MS coupling _____ **TLC-MS Interface**

Chromatogram Inspection under UV Light



CAMAG Dual Wavelength UV Lamp

The lamp housing is made of anodized aluminum and of shock-resistant plastic. The lamp is operated on 12 V AC or DC power which is internally converted to 25–30 KHz high frequency. This ensures instantaneous ignition of the selected tube and the absence of any “flickering”. In order to reduce the user’s risk to exposure to UV radiation, the lamps are equipped with a timer that automatically turns off after 10 minutes. The stand holds the lamp in a position optimized for viewing a 20×20 cm area. It shields off extraneous light on three sides. The lamp can be lifted off the stand and directed against a larger object.

Key features

- Two wavelengths, 254 and 366 nm, 2 light tubes 8 W each
- Shock resistant housing 442 x 76x43 mm
- Powered with 12 V AC from the mains adapter supplied or via an optional connecting cable from 12 V DC
- Instantaneous ignition without flickering and optimum light efficiency due to operation on 25–30 KHz
- Automatic switch off by timer after 10 min to reduce risk of exposure to UV radiation

A TLC laboratory can hardly live without the use of ultraviolet light. Two types of UV light are required for inspecting thin-layer chromatograms:

Long-wave UV light 366 nm

Under long-wave UV light fluorescent substances appear as bright, often differently colored zones, on a dark background. The sensitivity increases with the intensity of the UV light and also with the efficiency visible light is eliminated.

Short-wave UV light 254 nm

Under 254 nm UV light substances absorbing light of that wavelength appear as dark zones on a bright background, when the TLC layer contains a fluorescent indicator excited by UV 254 nm.

CAMAG UV Cabinet

The CAMAG UV Cabinet is designed for inspecting thin-layer chromatograms or other objects under UV light in an undarkened room. It consists of a CAMAG Dual Wavelength UV Lamp and a viewing box. The front of the box is closed with a roller shutter. A glass filter in the viewing window protects the eyes against reflected UV light. Great care has been taken to ensure the correct distances between UV lamp, object and the observer’s eye in the interest of good illumination and easy viewing. Base measures 400 x 260 mm, 490 x 350 x 290 mm outside dimensions. The lamp can be lifted off the stand and directed against a larger object.

Ordering information

022.9120 CAMAG Dual Wavelength UV lamp, 254 and 366 nm, 8 W each

022.9070 CAMAG UV Cabinet with Dual Wavelength UV Lamp and viewing box

352.0010 Light tube short-wave UV 254 nm, 8 W

352.0011 Light tube long-wave UV 366 nm, 8 W

692.0042 UV Filter glass for CAMAG UV lamp

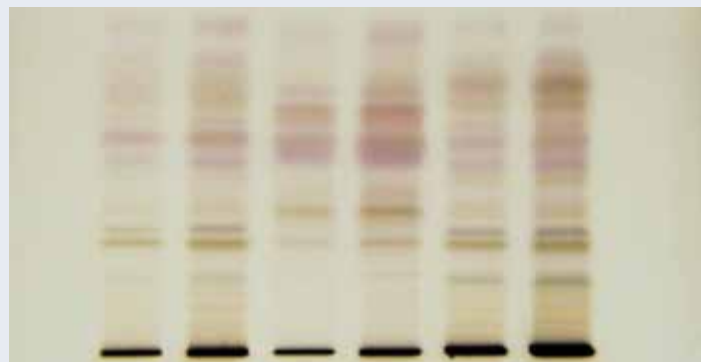
Documentation/ Image Acquisition



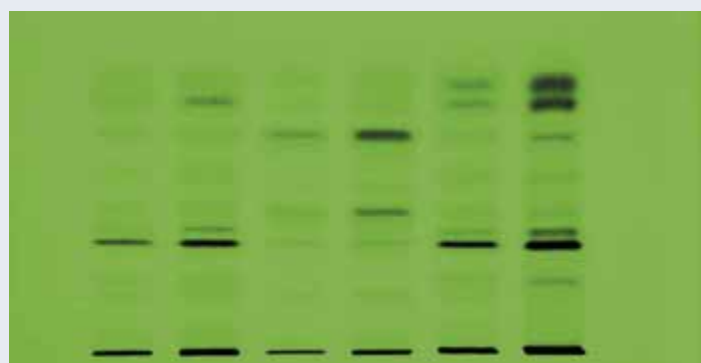
For electronic image acquisition visible polychromatic light is captured. When long-wave UV light is used for object illumination, the camera captures the light emitted by fluorescent substances. When short-wave UV light is used for illumination of a chromatogram layer containing fluorescence indicator, the camera – like the human eye – registers the visible light emitted from the layer background.

The quantification of image data is possible via the so called grey scale. Spectral selectivity is restricted to the colors of fluorescence.

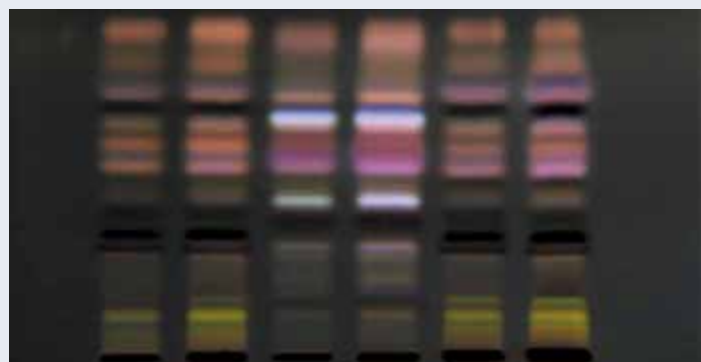
The strength of the electronic image acquisition is the overview of the complete chromatogram.



Chromatogram under white light



Chromatogram under UV 254 nm



Chromatogram under UV 366 nm



CAMAG TLC Visualizer

Digital image acquisition opens a new dimension for HPTLC, particularly in the field of sophisticated qualitative analysis.

The complete system TLC Visualizer is comprised of the illumination unit and a digital camera. It features ergonomic design and easy, intuitive handling with the relevant software,

The design of the illumination unit ensures homogeneity of the captured image under UV 254 nm, UV 366 nm and white light, the latter in direct mode, transmitted mode or combined. The light tubes are operated by 65 KHz high frequency in order to avoid synchronization problems with the digital camera. An automatic door control protects the operator against UV irradiation.

The powerful 12 bit camera combines high resolution (0.1 mm) with excellent color fidelity and low noise level. It features high reproducibility due to its automatic image optimization and fixed capturing parameters for all illumination modes.

The software offers easy and intuitive handling and automatic background correction with a fast data transfer. Archiving of all images from one plate together with all operational data of the analysis is effected in one file.

The software module "Professional Image Enhancement" provides additional optimization options such as the use of color profiles, layer structure subtraction and the possibility of serial shots.

The module "Image Comparison Viewer" serves for the comparison of tracks from multiple images/plates on the same screen.

Image Comparison

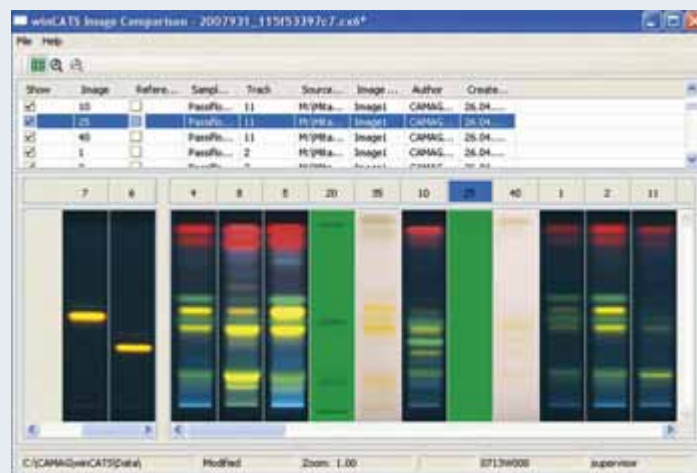
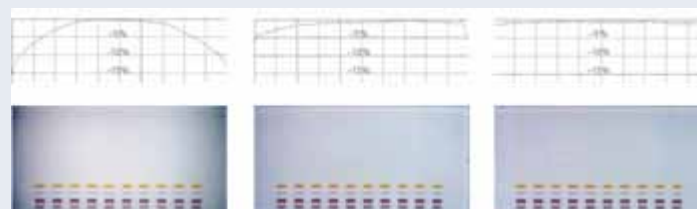


Image Comparison View: Selected tracks of images taken of the same plate under UV 254 nm (20, 25), white light (35, 40) and UV 366 nm (all other tracks) are compared

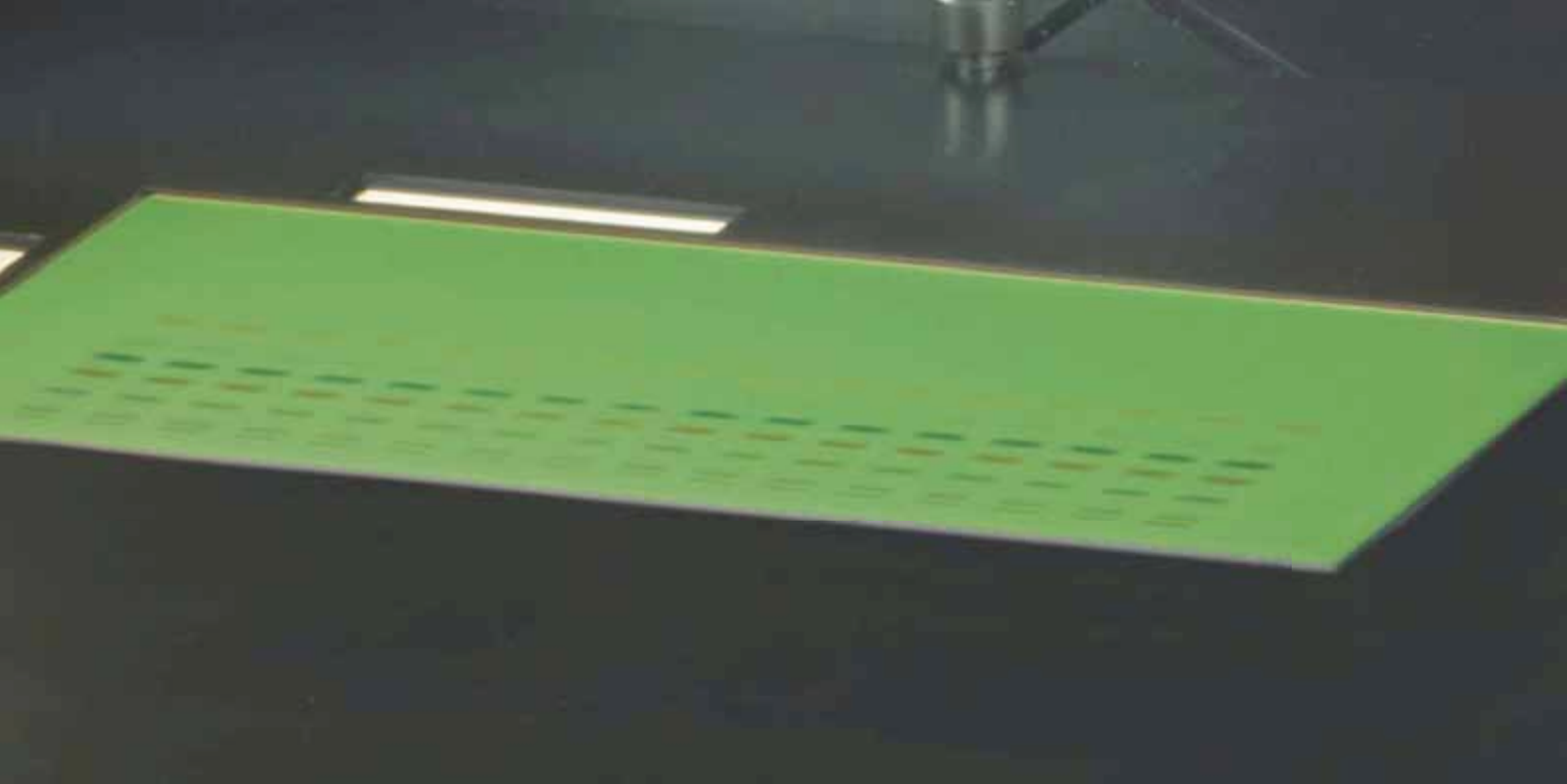
Example for white light



No Correction

Standard Correction

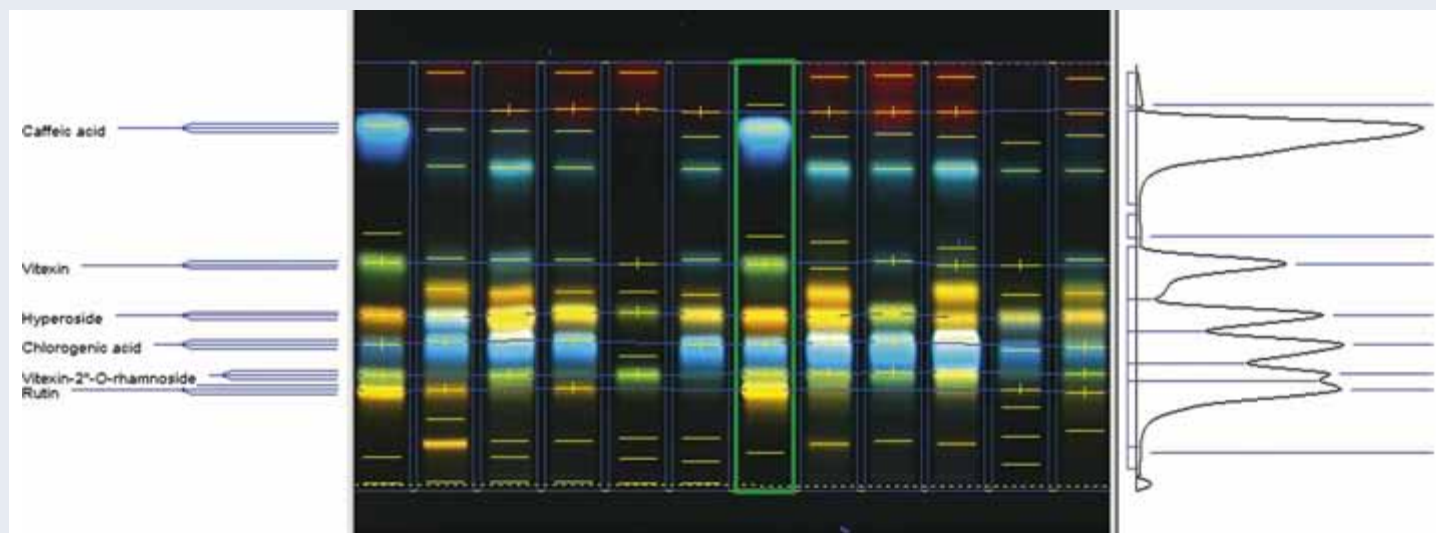
Individual Correction with "Professional Image Enhancement"



VideoScan

The VideoScan software allows evaluation of stored data captured with the TLC Visualizer. The program is easy to use and rapid. Flexible applications such as profile comparison of tracks from several chromatograms, evaluation of tracks with variable distances, distorted tracks, etc. are provided. Quantitative evaluation can be done at any time, even years after capture.

Quantification is possible via peak area and/or peak height, using single or multi level calibration, linear or polynomial.



Note

The TLC Visualizer with winCATS meets all the requirements of GMP/GLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the option 21 CFR Part 11 "compliance ready" is required for each winCATS workstation.

Ordering information

022.9780 CAMAG TLC Visualizer, complete with high-resolution 12 bit CCD camera with 12 mm objective (for 20 × 20 cm plates), with Equilink, without software → *visionCATS*

022.9781 CAMAG TLC Visualizer, complete with high-resolution 12 bit CCD camera with 16 mm objective (for 10 × 10 and 20 × 10 cm plates), with Equilink, without software → *visionCATS*

022.9579 CAMAG VideoScan Chromatogram Evaluation Software

Further Information can be found in the special brochure "CAMAG TLC Visualizer" and under www.camag.com/tlcvisualizer

Selective Detection of Bioactive Compounds

CAMAG BioLuminizer®



The Bioluminizer system is comprised of a compartment excluding any extraneous light, climate controlled for extended stability of the plate, and a 16 bit CCD digital camera of high resolution and high quantum efficiency. It features ergonomic design and easy, intuitive handling in stand-alone mode using the special software.

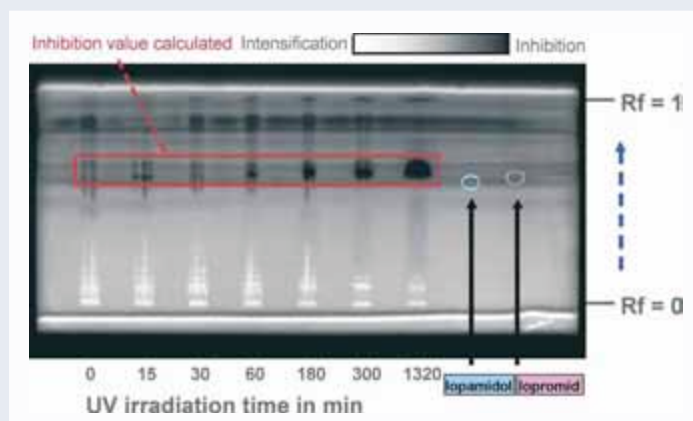
With the Bioluminizer bioactivity can be detected and registered economically and with short response time. Special antibacterial protection measures are not necessary, as the bioluminescent bacteria *Vibrio fischeri* are atoxic for humans.

- Cooled 16 bit CCD camera with high resolution and high quantum efficiency
- Climate controlled compartment for prolonged stability of the plate
- User friendly compact design, easy to clean

Hyphenating TLC/HPTLC and bioassay is an excellent tool for identification of single toxic compounds in complex sample matrices.

The method is suitable for the detection of toxins in foodstuff, beverages, cosmetics, waste water, drinking water and for the detection of bioactivity in natural products.

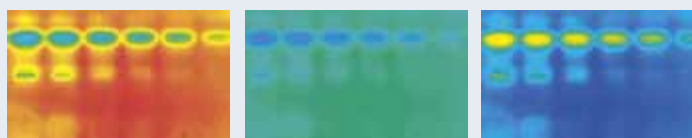
After chromatographic separation of the complex sample the plate is immersed in a suspension of bioluminescent bacteria *Vibrio fischeri*. The reaction takes place within a very short time. All zones with inhibitory or toxic effects appear as dark zones on the luminescent plate background.



Example

Processed waste water containing X-ray contrast media is frequently irradiated with UV light. The HPTLC/bioluminescence image shows the bioactive effect of degradation products. As can be seen, an increase of the irradiation time generates substances with a distinctively inhibitory effect on the bioluminescent bacteria. In a cuvette test, this inhibitory effect would have been masked by degradation products.

The example is taken from an internship report at the "Zweckverband Landeswasserversorgung" in Langenau, Germany.

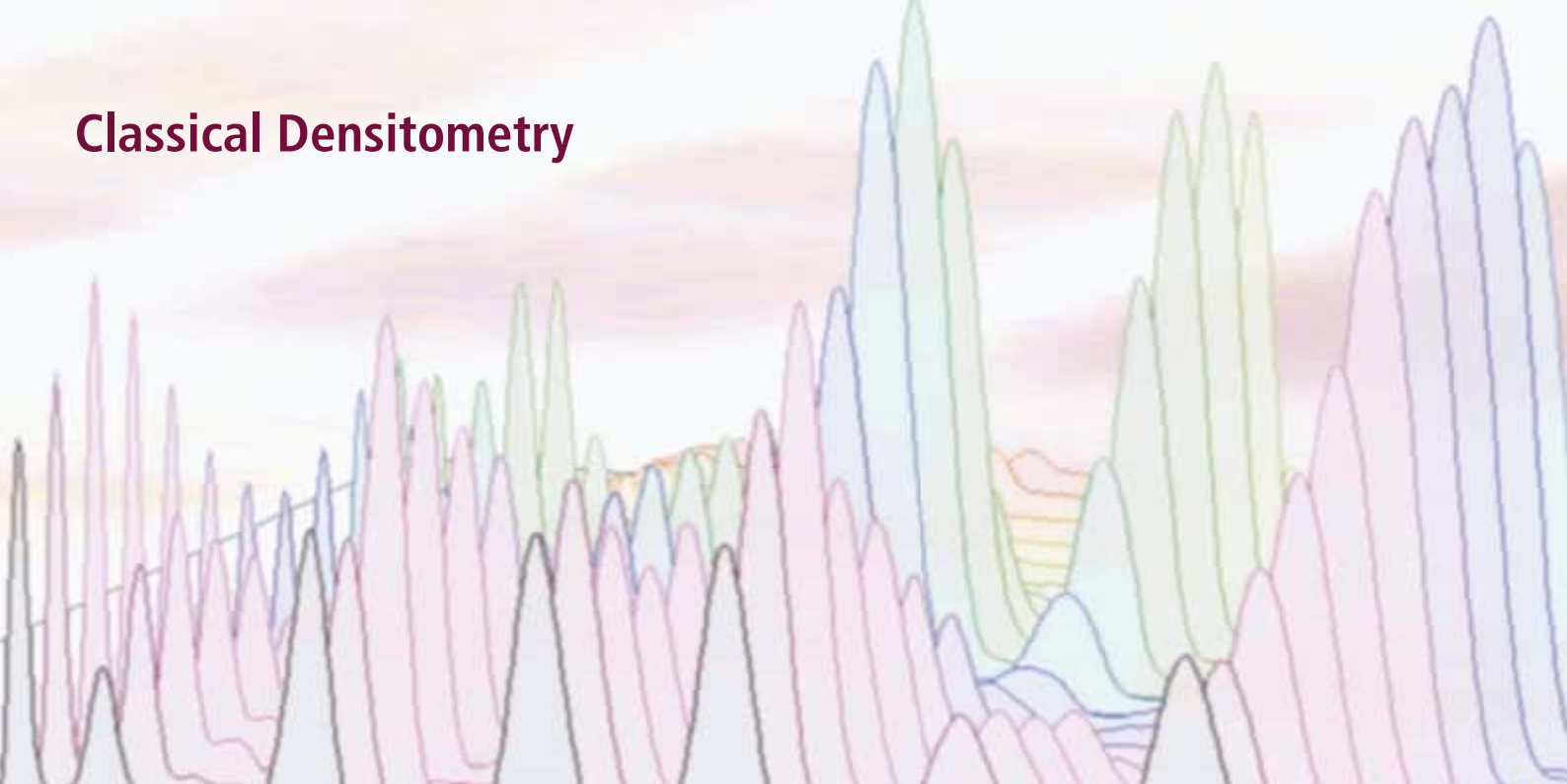


Ordering information

022.9750 CAMAG BioLuminizer® for detection of bioluminescence patterns on HPTLC plates, including special software

Further information can be found in the special brochure "CAMAG BioLuminizer®" and under www.camag.com/bioluminizer

Classical Densitometry



In classical densitometry the tracks of the chromatogram are scanned with monochromatic light in the form of a slit selectable in length and width. The spectral range of the CAMAG TLC Scanner 4 is 190–900 nm. Reflected light is measured either in the absorbance or in the fluorescence mode. From the acquired data quantitative results are computed with high precision and spectral selectivity.

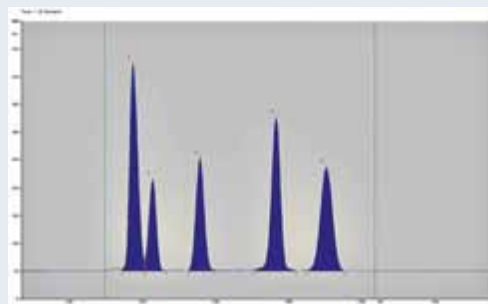
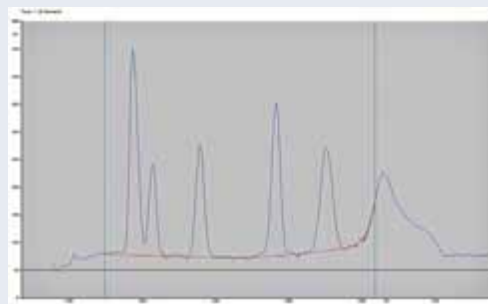
With the TLC Scanner 4 absorption and fluorescence excitation spectra can be recorded. The strengths of classical densitometry as compared with image evaluation are spectral selectivity and the higher precision of quantitative determinations.

Recommendations

Applying samples in the form of narrow bands allows densitometric evaluation by aliquot scanning, i.e. scanning with a slit about $\frac{2}{3}$ of the track width. This improves reproducibility as the center portion of the sample zone is homogeneous and positioning errors, which can occur with samples applied as spots, are avoided.

For quantification sample zones should always be scanned with the wavelength of maximum absorbance which can be determined by spectra recording or by multi-wavelength scanning.

For further recommendations reference the TLC Scanner 4 instruction manual.



Automatic baseline correction and peak integration of six different sulfonamides

CAMAG TLC Scanner 4



The TLC Scanner 4 is the most advanced workstation for densitometric evaluation of TLC/HPTLC chromatograms and other planar objects.

All functions of the scanner are controlled by the winCATS software. Only positioning of the object to be measured is performed manually and, if desired, switching on the internal illumination to assist correct positioning. Optimal settings of the electronic amplification are automatically selected for scanning in absorbance or fluorescence mode respectively.

The 16 bit A/D converter ensures optimally adapted resolution of the measurement signal.

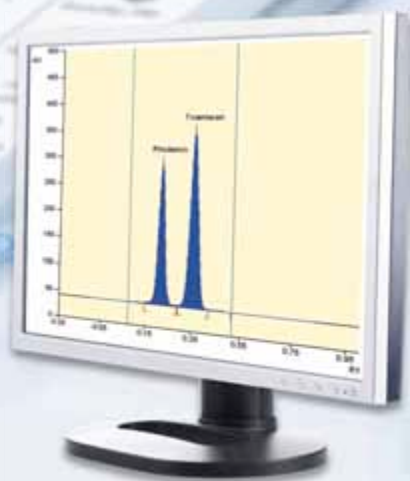
Key features

- Measurement of reflected light, either in absorbance or fluorescence mode
- Object formats up to 20 × 20 cm
- 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 with a speed up to 100 nm/s
- Automatic adjustment of the analog system
- Rapid data transfer

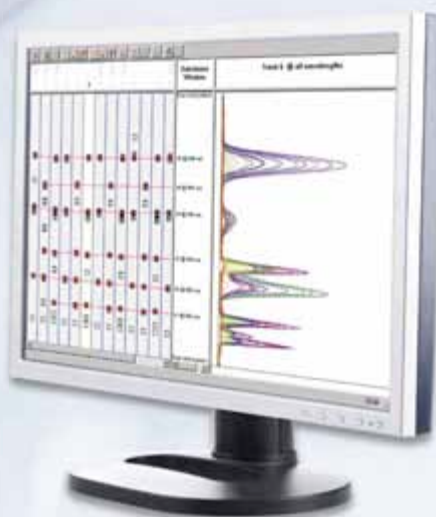


The object, here a 20 × 10 cm HPTLC plate, is conveniently positioned on the scanning table which then automatically moves to the start position.

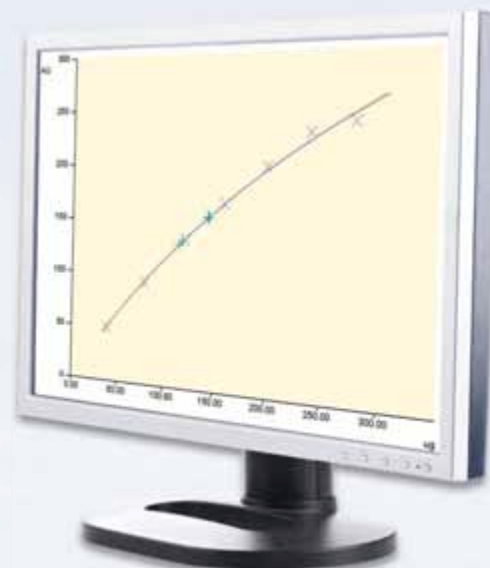
The coordinates are displayed during manual positioning and can be transferred into the program by mouse click.



Detected peaks are displayed with substance names. In this step baseline and peak markers can be changed manually.



Substance assignment: each peak is automatically assigned to its optimum wavelength before evaluation.



Polynomial regression

Perfect evaluation with winCATS

The Planar Chromatography Manager winCATS organizes all steps of instrumental thin-layer chromatography from sample application through quantitative evaluation.

The well structured and easy to use software controls all functions of the TLC Scanner and processes all measuring data up to the final result. The winCATS standard program for TLC Scanner 4 comprises scanning the chromatogram with subsequent integration, computing results, and print-out of the analysis protocol with details in the form of colored graphics as required by the user. Also spectra recording is included in the standard program.

A number of winCATS program options allow the user to adapt the evaluation system to his needs.

The following options are available:

- Quantitative evaluation supports: Single level calibration and multi level calibration with linear or nonlinear regression using internal or external standards. Statistics as relative standard deviation (cv) or confidence interval (ci). Subcomponent evaluation supporting quantitation of 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 freely 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 with up to 36 selectable wavelengths between 190 and 900 nm. For quantitation, data from the scan at the optimum wavelength for each compound is used. This winCATS function is unique to thin-layer chromatography!
- Track optimization: Each track of the chromatogram is scanned several times with a small lateral offset. From this data the optimum virtual track following the peak maxima is calculated and used for quantitation.
- Scanner qualification (selftest): This option offers automatic monitoring of the mechanical, optical and electronic functions of the scanner. Results are evaluated, documented and stored. When appropriate, lamp positions and monochromator alignment are automatically adjusted.

Note

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

Ordering information

027.6200 CAMAG TLC Scanner 4 complete with Equilink, without software

Further information can be found in the special brochure "CAMAG TLC Scanner 4" or under www.camag.com/tlc-scanner

TLC-MS Coupling



CAMAG TLC-MS Interface

Hyphenating TLC and mass spectrometry opens new application areas for Planar Chromatography

Not all samples are suitable to be processed by HPLC-MS or HPLC-DAD systems. This can be due to no or low UV response of the compounds or their impurities, to heavy matrix load or to incompatibility of the HPLC mobile phase with MS detection. In these cases HPTLC is an efficient alternative.

Hitherto zones with unknown substances had to be scraped off from the TLC/HPTLC plate, extracted in a tube and transferred into the MS. Now a very convenient and universal TLC-MS Interface is available which elutes zones of interest semi-automatically and feeds them online into the HPLC-MS system. This can be of various brands and techniques (APCI-MS,

APPI-MS or EI-MS). Only the zones of interest need to be extracted and are MS analyzed within minutes.

The chromatogram zones are eluted from the HPTLC plate with methanol or another suitable solvent using the round or oval elution head with a flow speed appropriate for the HPLC-MS system, e.g. 0.2 mL/min. Positioning of the elution head is done semi-automatically with the help of the laser pointing device incorporated in the Interface or according to the coordinates determined by the TLC Scanner or the TLC Visualizer. After each circle the elution head is cleaned automatically.



The oval elution head is preferable for narrow, closely neighboured zones.

Ordering information

022.8406 CAMAG TLC-MS Interface for online coupling HPTLC with HPLC/MS including two elution heads, one round 4 mm and one oval 2 x 4 mm

Further information can be found in the special brochure "CAMAG TLC-MS Interface" or under www.camag.com/tlcms



Software

winCATS
visionCATS

CATS = CAMAG TLC Software

winCATS Software

winCATS organizes the work flow of instrumental thin-layer chromatography

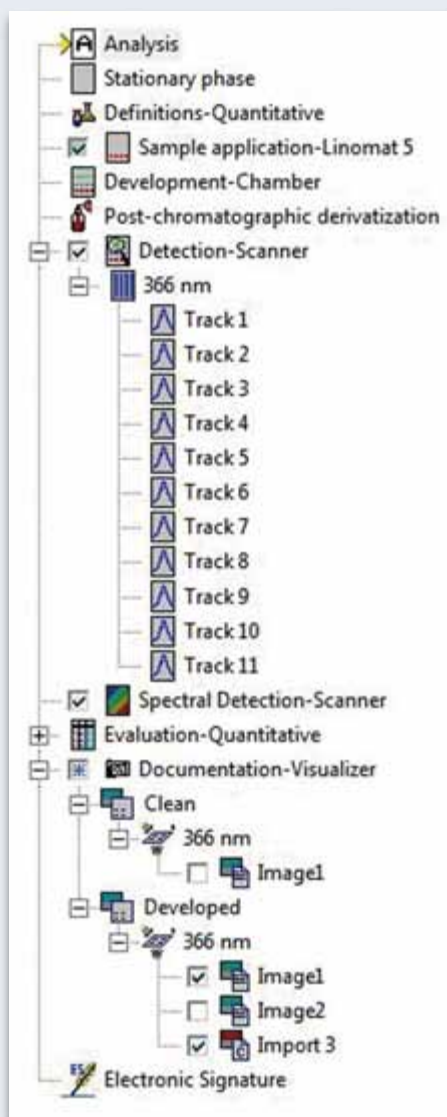
winCATS is the name of the integrated software concept that incorporates all steps of the procedure. The modular design of winCATS allows the user to select or deselect any step of the procedure as is appropriate for the given analytical task.

The explorer like tree structure provides an overview of the step and the progress of an analysis with all parameters and data.

- Stationary phase: input of plate material and pre-treatment of the layer
- Definition of samples, standards, and calibration method, if applicable
- Sample application: selection of the application device, input of control parameters and monitoring their execution. For manually operated devices all steps can be document as well.
- Chromatogram development: selection of the instrument, input of operating parameters and monitoring their execution
- Derivatization - pre- or post chromatographic
- Detection: selection of the instrument, input of control parameters and monitoring their execution, integration and peak assignment when applicable
- Quantitative evaluation: computing and presentation of results
- Image documentation: selection of device and camera, input of control parameters and monitoring the image capture and subsequent functions
- Electronic signature: part of the option 21CFR part 11 "compliant ready", additional parts include the automatically created «Audit-Log» and "System-Log" and several security relevant functions.

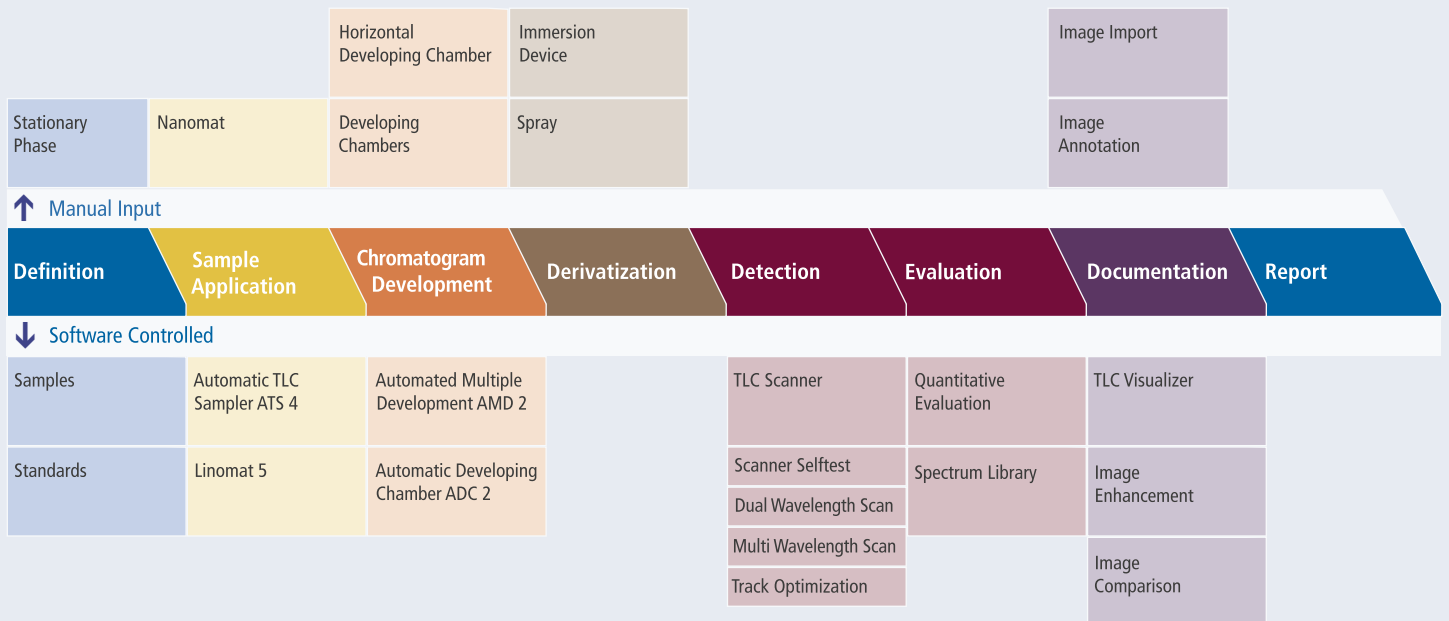
For winCATS controlled instruments all steps used in each analysis are automatically performed and documented. For instruments not controlled by winCATS the user enters parameters manually through input dialogs. All data including images pertaining to the current analysis are finally stored by winCATS in one file and can be printed at any time.

Keeping track of TLC analyses





winCATS for all steps of instrumental thin-layer chromatography



Ordering information can be found in the special brochure "winCATS – Planar Chromatography Manager" and under www.camag.com/wincats.



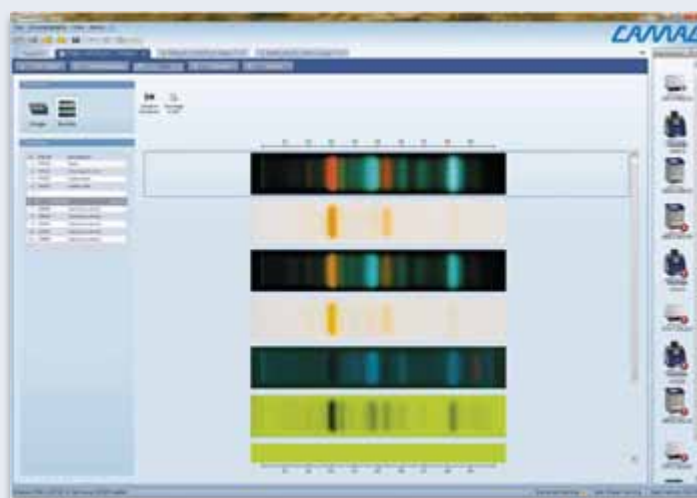
visionCATS

A new generation of CAMAG TLC Software – visionCATS – is currently under development. Based on the latest concepts in software engineering and with a wide range of options it will meet all requirements of today's users. A modern architecture, intuitive handling and a sample oriented data structure ensure its trouble free use, whether in a single workstation or in a network. A data bank provides convenient access to all information relevant to each analyzed sample.

At the time this catalog goes to press visionCATS focuses on the qualitative analysis of complex samples such as herbal drugs, traditional herbal medicines botanical dietary supplements, herbal raw materials for cosmetics, etc. It covers all aspects of qualitative HPTLC in a cGMP compliant routine as well as in a flexible research environment.

Instruments that presently can be operated by visionCATS are: Linomat 5, ATS 4, ADC 2 and TLC Visualizer. Incorporation of TLC Scanner 4 for quantitative HPTLC analysis is foreseen for a later date.

Considering these developments, this catalog describes the operation of all software controlled instruments on the basis of winCATS, which will remain the central software for a complete CAMAG HPTLC system for quantitative analysis. winCATS will be supported along with visionCATS in the future.



Note

All CAMAG systems operated under visionCATS will meet all the requirements of GMP/GLP and can be IQ/OQ qualified.

Current information on visionCATS can be found under www.camag.com/visioncats.

Instruments which at this time can already be operated by visionCATS – completely or to a limited extent – are marked in this catalog → *visionCATS*



Basic Kits Consumables Accessories

Basic Kits

All CAMAG Basic Kits have been composed so that a lab can efficiently start working with thin-layer chromatography. These assemblies are configured to allow upgrading to a complete system for quantitative TLC without items becoming redundant. Also transition from using conventional TLC layers to high performance layers is straight forward.



- 022.0227 CAMAG HPTLC Basic Kit for qualitative and quantitative analyses using 20 x 10 cm HPTLC layers, comprised of**
- 022.4730 CAMAG Nanomat 4
 - 022.7650 Capillary Dispenser with Universal Capillary Holder, Dispenser Magazine for 1 μ L Capillaries Pipettes 022.7761 and one pack of 5 x 100 Capillary Pipettes 1 μ L
 - 022.7660 Dispenser Magazine for 0.5 μ L capillaries
 - 022.7770 Capillary Pipettes 0.5 μ L, pack of 5 x 100
 - 2 x 022.5254 Twin Trough Chamber 20 x 10 cm with stainless steel lid
 - 022.5244 Saturation pads, pack of 100
 - 022.5300 smartAlert solvent front monitor
 - 022.8535 Horizontal Developing Chamber 20 x 10 cm
 - 022.6530 TLC/HPTLC Sprayer
 - 034.5642 HPTLC plates Merck Silica gel 60 F254, 20 x 10 cm, pack of 50
 - 032.8003 CAMAG Test Dye Mixture III, 10 mL
 - 022.9070 CAMAG UV Cabinet with dual wavelength UV lamp
- 022.0226 CAMAG HPTLC Basic Kit for qualitative and quantitative analyses using 10 x 10 cm HPTLC layers, comprised of**
- 022.4730 CAMAG Nanomat 4
 - 022.7650 Capillary Dispenser with Universal Capillary Holder, Dispenser Magazine for 1 μ L Capillaries Pipettes 022.7761 and one pack of 5 x 100 Capillary Pipettes 1 μ L
 - 022.7660 Dispenser Magazine for 0.5 μ L capillaries
 - 022.7770 Capillary Pipettes 0.5 μ L, pack of 5 x 100
 - 2 x 022.5155 Twin Trough Chamber 10 x 10 cm with stainless steel lid
 - 022.5244 Saturation pads, pack of 100
 - 022.5300 smartAlert solvent front monitor
 - 022.8530 Horizontal Developing Chamber 10 x 10 cm
 - 022.6530 TLC/HPTLC Sprayer
 - 034.5628 HPTLC plates Merck Silica gel 60 F254, 10 x 10 cm, pack of 25
 - 032.8003 CAMAG Test Dye Mixture III, 10 mL
 - 022.9070 CAMAG UV Cabinet with dual wavelength UV lamp
- 022.0216 CAMAG TLC Basic Kit for qualitative and quantitative analysis using conventional layers, comprised of**
- 022.4730 CAMAG Nanomat 4
 - 022.7650 Capillary Dispenser with Universal Capillary Holder, Dispenser Magazine for 1 μ L Capillaries Pipettes 022.7761 and one pack of 5 x 100 Capillary Pipettes 1 μ L
 - 022.7662 Dispenser Magazine for 2 μ L capillary pipettes
 - 022.7665 Dispenser Magazine for 5 μ L capillary pipettes
 - 022.7772 Capillary Pipettes 2 μ L, pack of 5 x 100
 - 022.7775 Capillary Pipettes 5 μ L, pack of 5 x 100
 - 2 x 022.5256 Twin Trough Chamber 20 x 20 cm with stainless steel lid
 - 022.5244 Saturation pads, pack of 100
 - 022.5300 smartAlert solvent front monitor
 - 022.6100 Glass reagent spray
 - 034.5715 TLC plates Merck Silica gel 60 F254, 20 x 20 cm, pack of 25
 - 032.8001 CAMAG Test Dye Mixture I, 30 mL
 - 022.9070 CAMAG UV Cabinet with dual wavelength UV lamp

TLC/HPTLC Precoated Plates



MERCK Precoated Layers for High Performance Thin-Layer Chromatography ("HPTLC")

Designation	layer (µm)	size (cm)	quant./pkg
034.5628 HPTLC plates silica gel 60 F 254	200	10×10	25
034.5629 HPTLC plates silica gel 60 F 254	200	10×10	100
034.3726 HPTLC plates RP-2 F 254s	200	10×10	25
034.3725 HPTLC plates RP-8 F 254s	200	10×10	25
034.3124 HPTLC plates RP-18 W F 254s	200	10×10	25
034.3724 HPTLC plates RP-18 F 254s	200	10×10	25
034.6464 HPTLC plates CN F 254s	200	10×10	25
034.2668 HPTLC plates Diol F 254	200	10×10	25
034.5647A HPTLC plates NH ₂ F 254s	200	10×10	25
034.5642 HPTLC plates silica gel 60 F 254	200	20×10	50
034.5648 HPTLC plates silica gel 60 F 254, ultra pure for pharmacopoeial methods	200	20×10	50
034.1552 HPTLC plates silica gel 60 WR F 254s	200	20×10	25
034.5548 HPTLC aluminium sheets silica gel 60 F 254	200	20×20	25
034.5445 HPTLC plates LiChrospher® Si 60 F 254s	180	20×10	25
034.5647B HPTLC plates LiChrospher® Si 60 WRF 254s	100	20×10	25

MERCK Precoated Layers for (conventional) TLC

Designation	layer (µm)	size (cm)	quant./pkg
034.5729 TLC plates silica gel 60 F 254	250	10×20	50
034.5715 TLC plates silica gel 60 F 254	250	20×20	25
034.1798 TLC plates silica gel 60 F 254, with concentration zone	250	20×20	25
034.5423 TLC plates RP-18 F 254s	200	10×20	50
034.5554 TLC aluminium sheets silica gel 60 F 254	200	20×20	25
034.5559 TLC aluminium sheets RP-18 F 254s	200	20×20	20
034.5804 LuxPlate Si 60 F254	250	10×20	50
034.5805 LuxPlate Si 60 F254	250	20×20	25

CAMAG Test Dye Mixtures

Test dye mixtures are useful for functional checks on individual steps in the TLC procedure and for studying the influence of specific parameters.

Ordering information

CAMAG bietet drei verschiedene Testfarbstoffgemische an:

032.8001	Test Dye Mixture I, 30 mL – dimethyl yellow – oracet blue 2R – oracet red (for silica gel)
032.8002	Test Dye Mixture II, 30 mL – sudan black – artisil blue – sudan yellow – fat orange fat red 7B (for aluminium oxide)
032.8003	Test Dye Mixture III, 10 mL – indophenol – oracet violet 2R – ariabel red 28.9 – sudan blue II – dimethyl yellow – oracet red G (for HPTLC silica gel)

In-House Preparation of TLC Plates

Today, in-house preparation of TLC plates is indicated when special layers are required which are not available as precoated plates, e.g. layers containing silver nitrate, buffer substances or other reagents, or layers of adsorbent mixtures. Logistic or economic reasons may play a role in exceptional cases.

Automatic TLC Plate Coater

The glass plates to be coated are conveyed underneath a hopper filled with the adsorbent suspension. The layer thickness is governed by a fixed gate of 300 and 500 μm or by an adjustable gate for layer thicknesses 0–2 mm. The plate movement is motor driven at a uniform speed of 10 cm/s onto a plate holder for eight 20 x 20 cm plates

TLC Plate Coater, hand operated

The manual plate coater functions in the same manner as the automatic coater, with the exception that the plates are pushed through by hand, one after the other and lifted off on the other side.

TLC Plate Box

The TLC Plate Box holds ten 20 x 20 cm plates. The body with slide rails, the handle and the removable bottom are all made of stainless steel, the cover is of transparent plastic. Bottom and cover are removed for drying the plates in an oven to increase air circulation.

Drying Rack

The Drying Rack consists of ten individual aluminum trays 20 x 20 cm, which can be stacked quickly and conveniently. The Drying Rack is convenient to use when plates are prepared with the automatic plate coater in runs of more than 8. The Drying Rack also comes in handy for plates smaller than 20 x 20 cm.

Ordering information

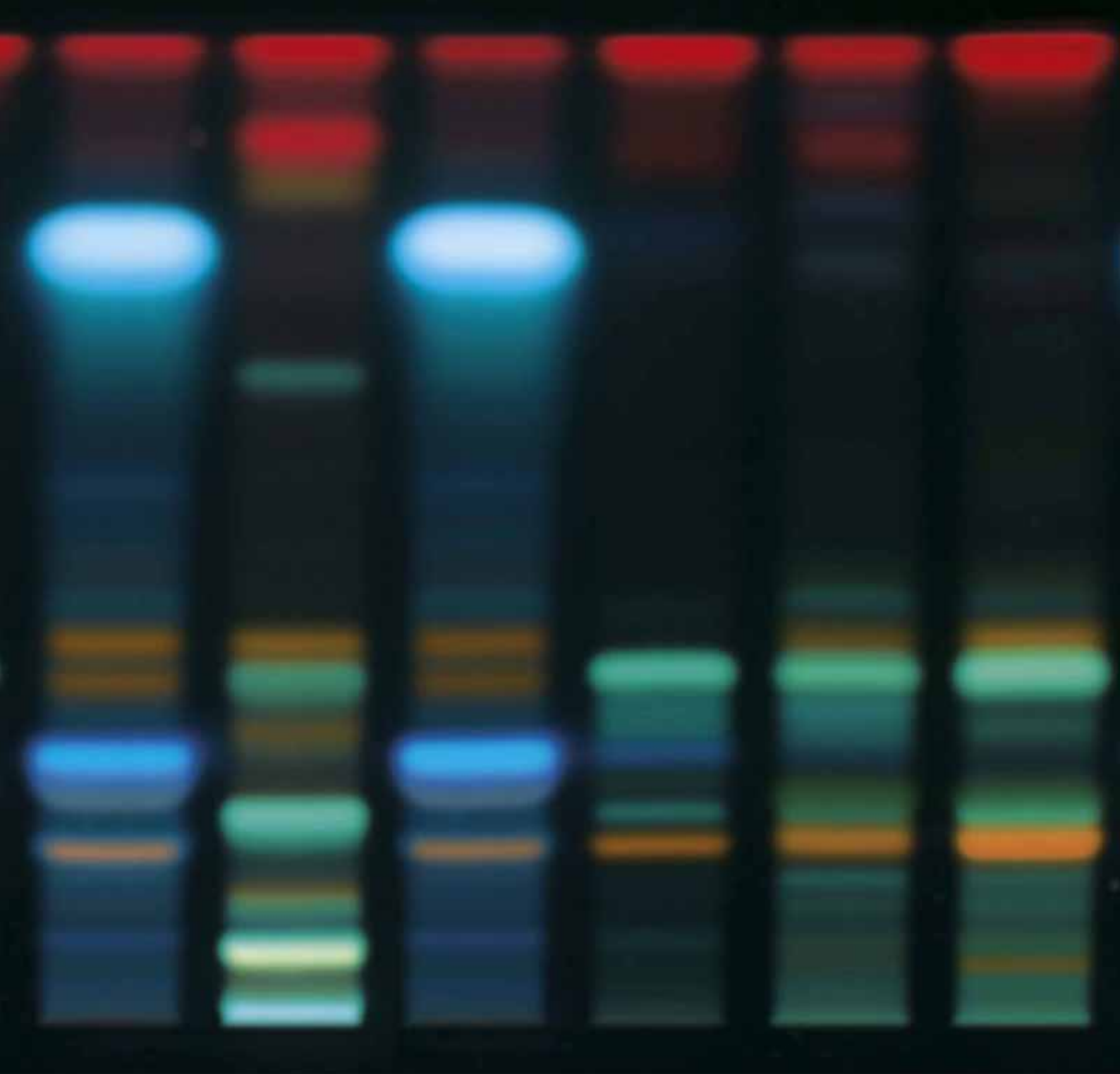
022.1602	Automatic TLC Plate Coater
022.1251	TLC Plate Coater hand operated
022.3250	TLC Plate Box
022.3200	Drying Rack
022.2200	Glass Plates 20 x 20 cm, pack of 10
022.2100	Glass Plates 10 x 20 cm, pack of 10



Adsorbents for in-house preparation of TLC plates

033.1092	Aluminium Oxide Merck GF (type 60/E), 500 g
033.7731	Silica Gel Merck G (type 60), 1 kg
033.7730	Silica Gel Merck GF (type 60), 1 kg
033.7736	Silica Gel Merck H (type 60), 1 kg
033.7739	Silica Gel Merck HF (type 60), 1 kg
033.7741	Silica Gel Merck HF254+366 (type 60), 1 kg





CAMAG Services

Competent Advice
Training Courses
CAMAG Bibliography Service



CAMAG Laboratory Services

The CAMAG Laboratory offers you professional HPTLC solutions for your analytical problem. The lab in Muttenz has existed for more than 40 years and has undergone many stages of development. Since 2012 it is supplemented by an application lab at CAMAG Berlin. The staff of both laboratories have many years of experience in development of customized HPTLC methods. While focusing on the analysis of medicinal plants and products derived thereof, expertise is also provided in HPTLC analysis of pharmaceuticals, food and beverages as well as environmental and forensic applications.

1) Method development and validation

Depending on the analytical goal qualitative and quantitative methods are developed from the basics or existing methods are customized and optimized.

2) Feasibility studies

Following a detailed discussion of the analytical goal with the customer, the lab can evaluate whether HPTLC or TLC can offer an advantageous solution. Costs of analysis per sample and general performance of a method during routine use are evaluated.

3) Contract analyses

Your samples are analyzed by HPTLC according to an existing method, e.g. AOAC, USP, PhEur, BHP, PhHelv, PhPRCh, AHP, etc. in an ISO 17025 or GMP compliant environment. The CAMAG Laboratory can also work according to your in-house method or employ its own validated methods. A detailed analytical report is generated for each project.

4) Consulting and training

CAMAG helps you get started! Whether you intend setting up a new lab, ensuring compliance with cGMP, or you are dealing with the authorities concerning registration, we can offer HPTLC solutions that save you time, hassle and money. Select one of our courses or let us provide customized training at your site to stay up-to-date with new developments in HPTLC technology. Let us show you how to optimally use your equipment, get reliable results, and develop and validate methods yourself.

5) Applied research

We offer guest residences at our laboratory for students, scholars, and researchers to engage in research projects. These are focused on, but not limited to practical aspects of modern HPTLC and analysis of botanicals. We publish results in journals, textbooks, through conferences and seminars as well as on our website. It is our goal to make available to the public high quality data illustrating the capabilities of HPTLC.

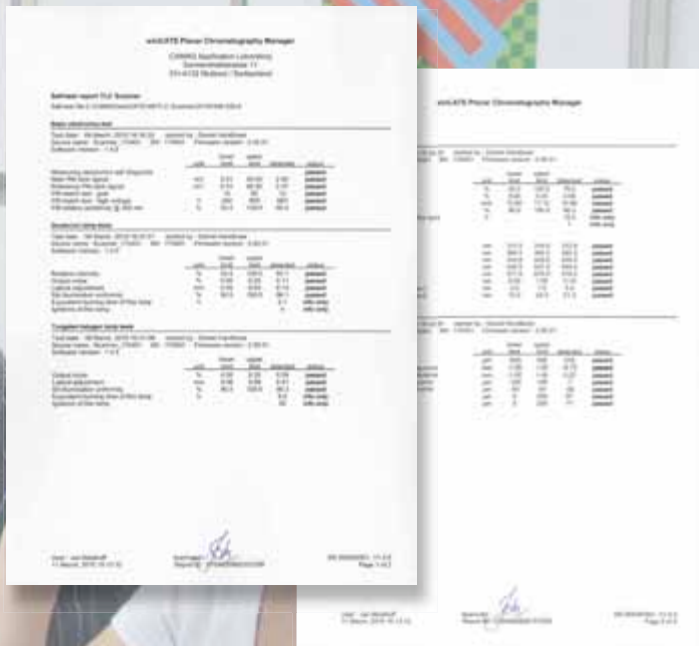
Education and training

The CAMAG Laboratory is also your partner when it comes to education and training in the field of planar chromatography.

In Muttenz we offer courses on the following subjects:

- High Performance Thin-Layer Chromatography
- Method development
- HPTLC for Quality Control of Botanicals
- HPTLC for the chemical and pharmaceutical industry
- Automated multiple development (AMD)

The CAMAG lab in Berlin is focused on feasibility studies and assistance of our customers in their choice of equipment appropriate for their task.



Instrument Qualification

For customers regulated by GMP/GLP, CAMAG offers Installation Qualification (IQ) and Operation Qualification (OQ) as service.

The Installation Qualification (IQ) is performed on 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 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.

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

CAMAG offers IQ and OQ procedures for the following instruments and programs:

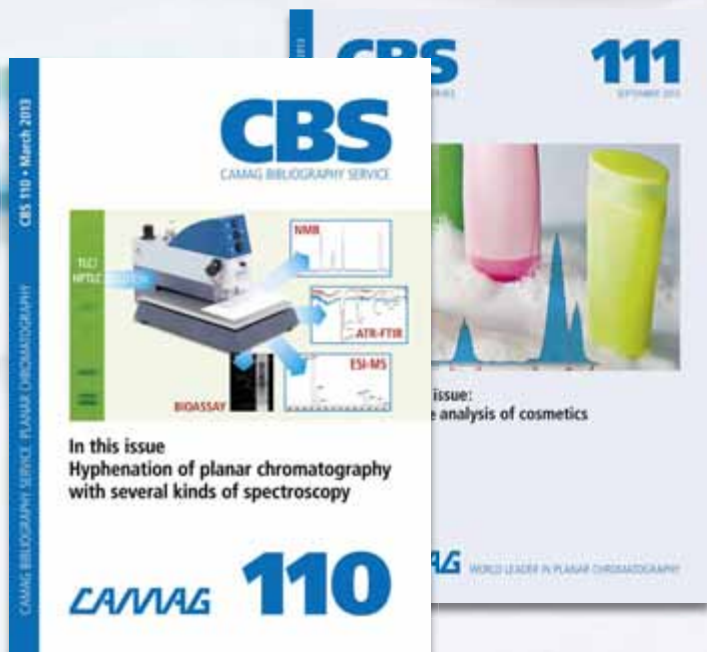
- winCATS with or without 21 CFR Part 11 «compliance ready»
- Linomat 5
- Automatic TLC Sampler ATS 4
- Automatic Developing Chamber ADC 2
- System for Automated Multiple Development AMD 2
- TLC Scanner 3
- TLC Scanner 4
- VideoScan
- DigiStore 2
- TLC Visualizer

Instrument Service

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

A service contract may include (options):

- Preventive maintenance once per year
- Repetition of Operation Qualification
- Reduced rates for repairs of instruments with service contract



CAMAG Bibliography Service "CBS" Planar Chromatography

CAMAG has been publishing this unique periodical on thin-layer chromatography publications regularly since 1965. It appears twice a year, usually in March and September, and is available to CAMAG customers at no charge. The literature abstracts of the current CBS issue can also be accessed on the internet.

A "CBS" abstract contains – if quoted in the original publication:

- Name(s) of author(s)
- Address of corresponding author
- Original title, if published in one of the common Western hemisphere languages
- English translation of the title, if original is not English
- Publication details
- Brief abstract of the TLC related content with particular reference to separation systems, detection methods, quantification, results, etc.
- Key words

The purpose of the "CBS" is to inform readers about the existence of TLC related papers in their particular field of interest. Reprints or photocopies of papers abstracted in the CBS are not available from CAMAG.

CUMULATIVE CAMAG BIBLIOGRAPHY SERVICE "CCBS"

The most comprehensive compilation of TLC literature is now available as database. It includes all CBS abstracts since May 1983 which means TLC/HPTLC publications since 1982. It is updated after every regular CBS issue. At the time of print of this catalog it contained about 10'000 abstracts.

The most recent version of CCBS is available for download free of charge from our website www.camag.com. With this database you can carry out your own exhaustive TLC/HPTLC literature search:

- Enter your search word, e.g. an author's name, a substance, a technique, a reagent or a term from the key words of the abstract.
- Start the search routine.
- The abstracts in which the key word occurs appear separately and in sequence on the screen together with an indication of the total number of abstracts in which the search word was found.

Application Notes/ HPTLC Fingerprint Analysis

On our website you can find application notes for qualitative and quantitative HPTLC analyses. Contact lab@camag.com for validated methods including the validation protocol.

Further available are methods for HPTLC fingerprint analysis/screening of numerous herbal drugs for their safe identification.

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Specifications are subject to change
without notice

CAMAG – Global Presence



CAMAG markets its products in Switzerland directly from the headquarters, in Germany and the United States through their subsidiaries. In more than 70 other countries CAMAG is represented by selected companies.

CAMAG distributors regularly send their product specialists for education and training to our headquarters. Furthermore CAMAG organizes training courses overseas, e.g. in the Far East. The task of CAMAG product specialists is to advise customers in system selection and application competence and in the operation of their CAMAG systems. Service engineers of our distributors are also regularly trained in Muttenz.

To our customers and distributors is a comprehensive web-based information offer available: www.camag.com for product and company information, www.camag-laboratory.com for applications.

CAMAG is a flexible, customer oriented and scientifically sound company, which in its 50 years company history has profiled as a valued partner in all areas of Planar Chromatography.

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