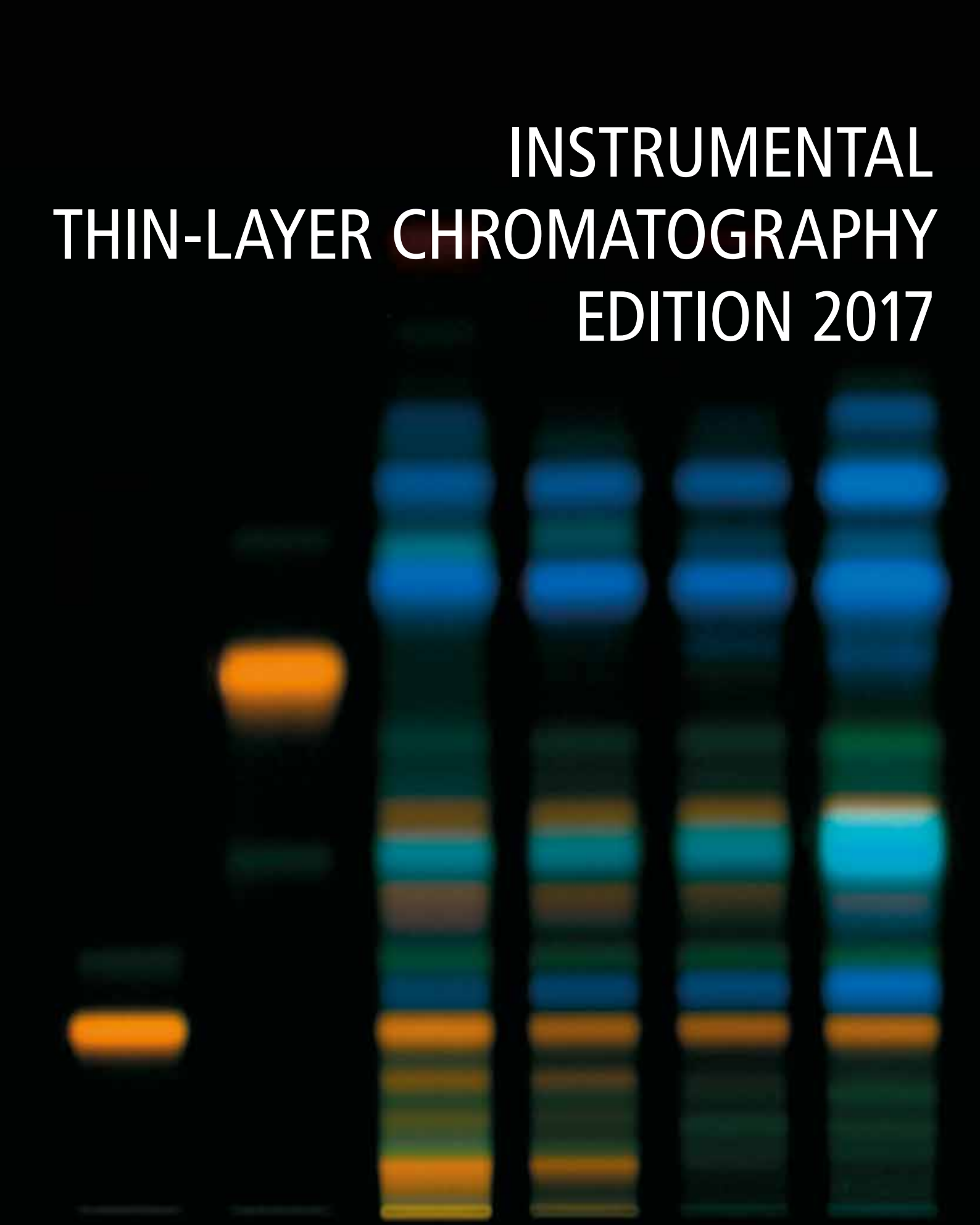
INSTRUMENTAL THIN-LAYER CHROMATOGRAPHY EDITION 2017



CAMAG®

WORLD LEADER IN PLANAR CHROMATOGRAPHY

Front page: HPTLC chromatogram of green tee extract

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climate neutral
Print | ID: 53203-1603-1021

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 though 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	From UV inspection to densitometry UV absorbing substances can be detected under UV light. Chromatograms can be documented, archived and quantitated by electronic image acquisition. Chromatogram evaluation by scanning densitometry offers a maximum of quantitative precision plus spectral selectivity. Online coupling with mass spectrometry opens new possibilities of identification.
Software	All steps in the in the procedure are managed by CAMAG HPTLC software. It collects and evaluates all data and generates analysis reports in conformity to cGMP/cGLP.
Basic Kit Consumables	With the basic kit a lab can efficiently start working with conventional TLC
CAMAG Services	CAMAG offers support with method development, training, instrument qualification, literature services and more.

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 postchromatographic 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 cGMP/cGLP, we offer Installation Qualification (IQ) and Operating Qualification (OQ) for our instruments.

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

TLC/HPTLC-MS online coupling, the comparatively new hyphenation of TLC/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.

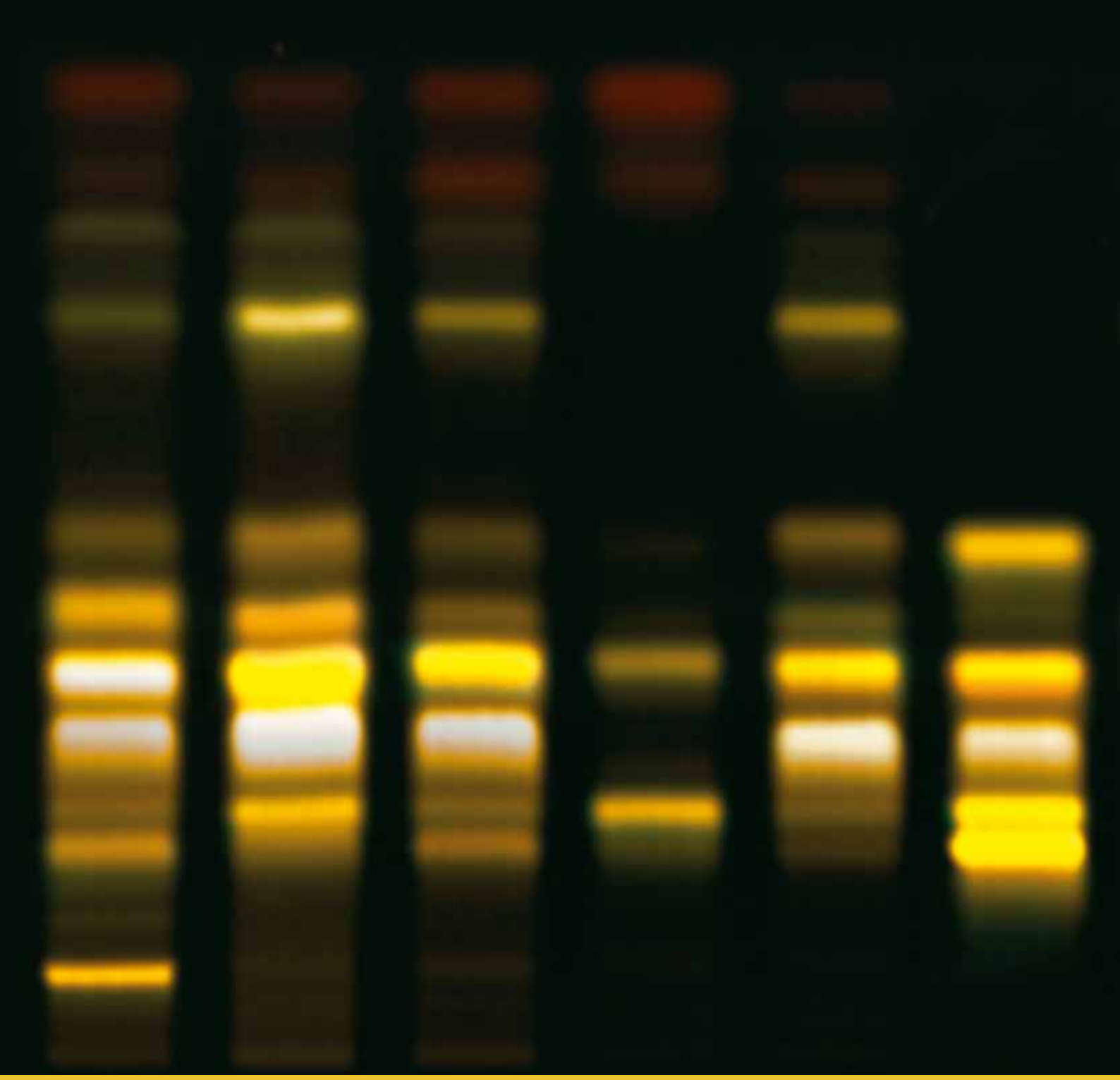
Food and feed stuff
- Quality control
- Additives (*e. g.* vitamins)
- Pesticides
- Stability tests (expiration), etc.

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.

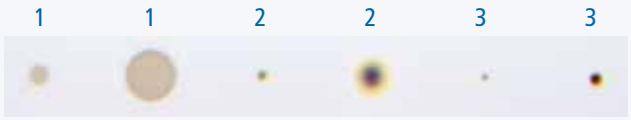
Spraying-on samples as narrow bands allows the application of significantly larger volumes. Starting zones in the form of narrow bands ensure the best resolution that can be achieved with the chromatographic system selected.

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.

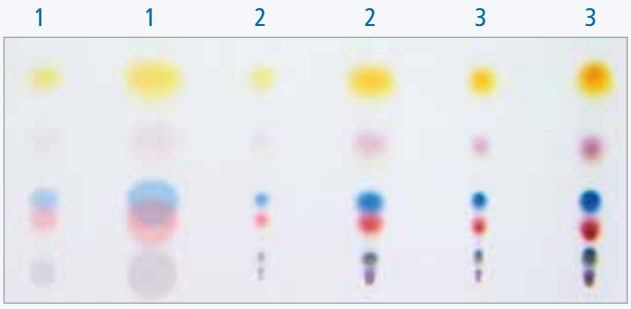
Effect of the solvent and the technique of sample application on the chromatogram

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, 1.0, 2.0, and 5.0 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

040.1500 CAMAG® Nanomat 4 Complete-Kit

022.4730	**CAMAG® Nanomat 4,**
022.7655	Capillary Dispenser,
022.7786	Universal Capillary Holder,
022.7661	Dispenser Magazine for 1 µL capillaries,
022.7771	Disposable Capillary Pipettes 1 µL, pack of 5 × 100

022.7660	Dispenser Magazine for 0.5 µL capillaries, without capillaries
022.7661	Dispenser Magazine for 1 µl capillaries, without capillaries
022.7662	Dispenser Magazine for 2 µL capillaries, without capillaries
022.7665	Dispenser Magazine for 5 µL capillaries, without capillaries

022.7770	Capillary Pipettes 0.5 µL pack of 5 × 100
022.7771	Capillary Pipettes 1 µL pack of 5 × 100
022.7772	Capillary Pipettes 2 µL pack of 5 × 100
022.7775	Capillary Pipettes 5 µL pack of 5 × 100

Further information at www.camag.com/nanomat

CAMAG Automatic TLC Sampler 4 (ATS 4)

Automatic sample application is a key factor for productivity of the TLC/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
- Data input and monitoring through *visionCATS* software
- Application of solutions onto any planar medium (FreeMode)

Heated Spray Nozzle for ATS 4 (optional)

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

Ordering information

022.7400 CAMAG® Automatic TLC Sampler 4 (ATS 4), incl. 25 µL Dosing syringe (695.0053), Spray-on needle for dosing syringe (695.0046), Contact transfer needle for dosing syringe (695.0047), without software

022.7410 CAMAG® Automatic TLC Sampler 4 (ATS 4), with heated spray nozzle, incl. 25 µL Dosing syringe (695.0053), Spray-on needle for dosing syringe (695.0046), Contact transfer needle for dosing syringe (695.0047), without software

Note

The Automatic TLC Sampler ATS 4 with *visionCATS* meets all the requirements of cGMP/cGLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the *visionCATS* Option „21 CFR Part 11" is required.

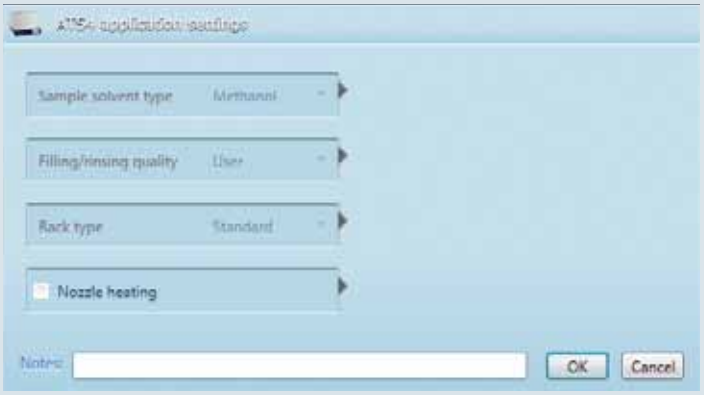
Detailed ordering information: www.camag.com/ats4

Operation of the ATS 4 with *visionCATS* HPTLC Software

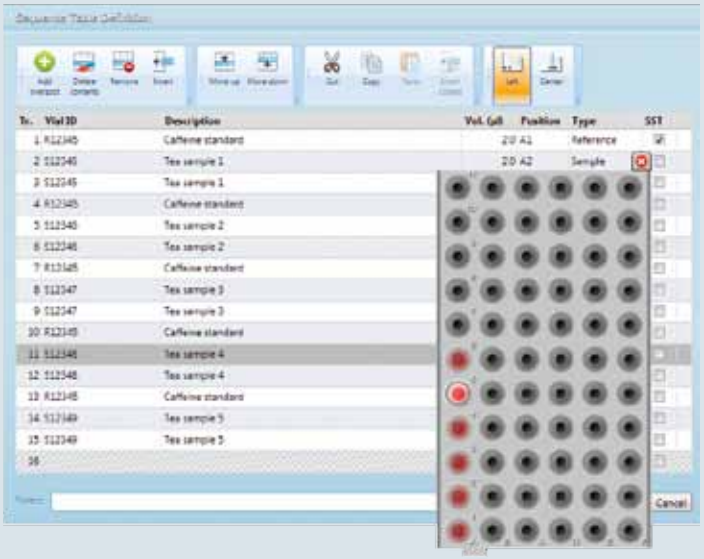
Precise sample application is a crucial factor for the quality of the HPTLC analysis and the results obtained. When using *visionCATS* HPTLC software with its easy to navigate user interface to control the ATS 4, a fully automated sample application for routine use and high sample throughput is supported.

The dialog box for instrument parameters offers user-friendly default combinations. For instance, the user can select the solvent type most similar to the solvent actually used. The software will then automatically adapt the instrument defaults to optimize its application regarding viscosity, volatility and surface tension. Another example of a pre-selected combination is the filling/rinsing quality which determines how often the syringe is rinsed, the filling process repeated, etc. All these pre-selections can be individually adjusted to a specific task.

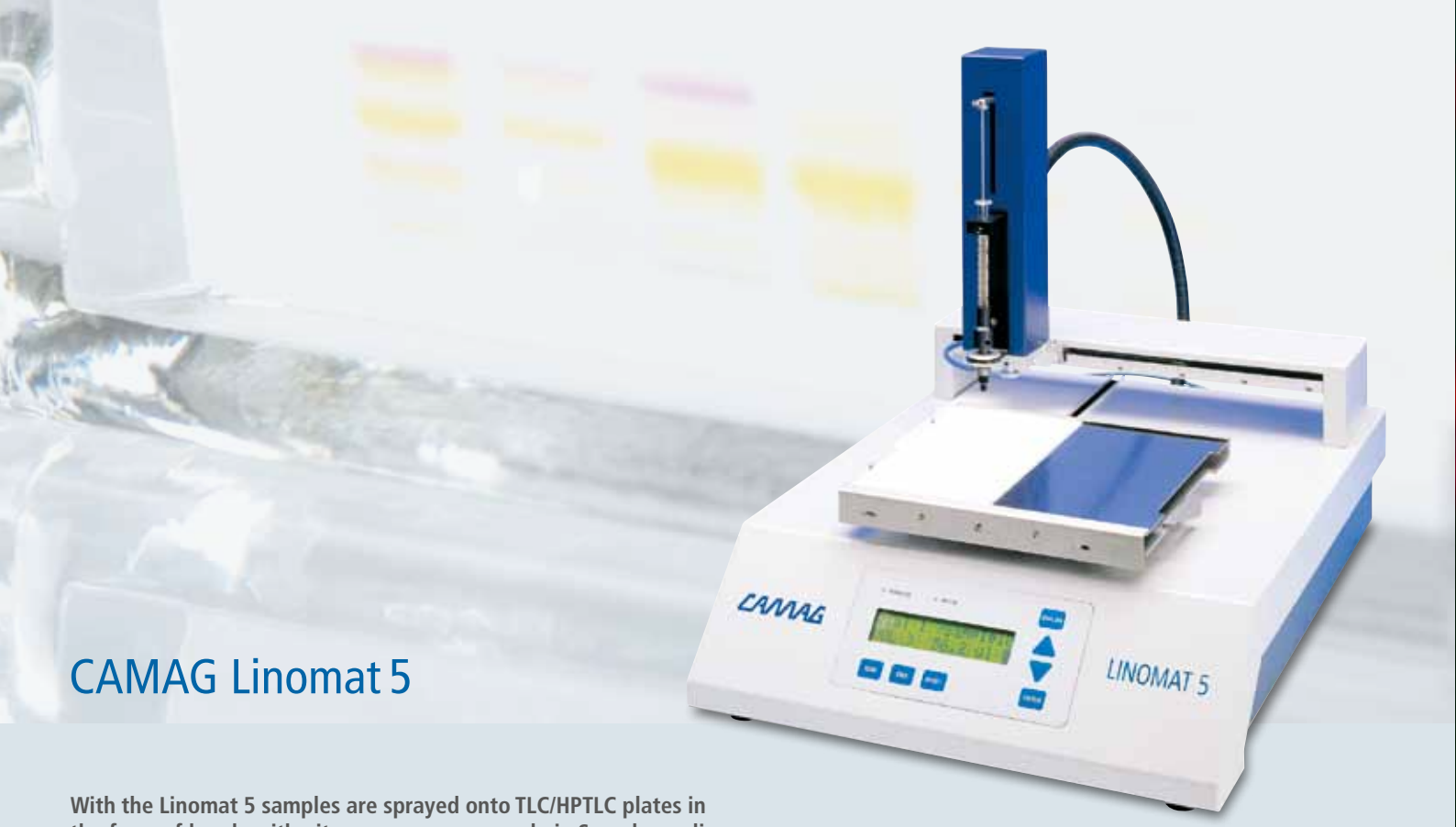
The dialog for entering the sequence of samples is clearly arranged and easy to use. Tracks can be automatically arranged evenly spaced across the plate, sample designations can be inserted from a prepared list, etc. The program progress is displayed on screen as long as the instrument remains connected to the computer.



The dialog box for ATS 4 application settings offers user-friendly default combinations. All pre-defined parameters can be individually adjusted.



Easy sequence setup with *visionCATS*: the sequence table holds all information required to fully automated run a series of samples, *e.g.* sample location (rack position and application position), sample volume, sample name, etc.



CAMAG Linomat 5

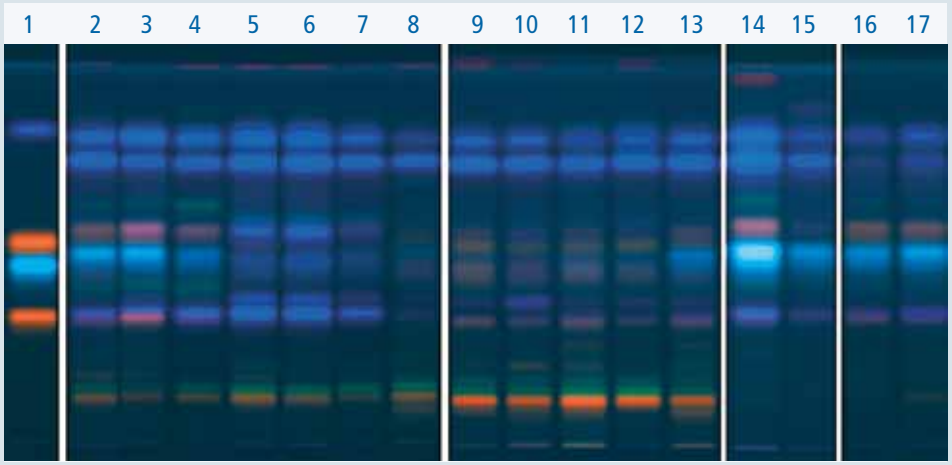
With the Linomat 5 samples are sprayed onto TLC/HPTLC plates in the form of bands with nitrogen or compressed air. Sample application is automatic, only changing the syringe (filling, inserting and rinsing) is manual. The Linomat is suitable for routine use.

Software-controlled operation

A software-controlled operation of the CAMAG Linomat 5 allows to rapidly enter all data on the sample sequence, plate dimensions, number and distance of tracks, designation, sample volumes. 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

HTPLC 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

Ordering information

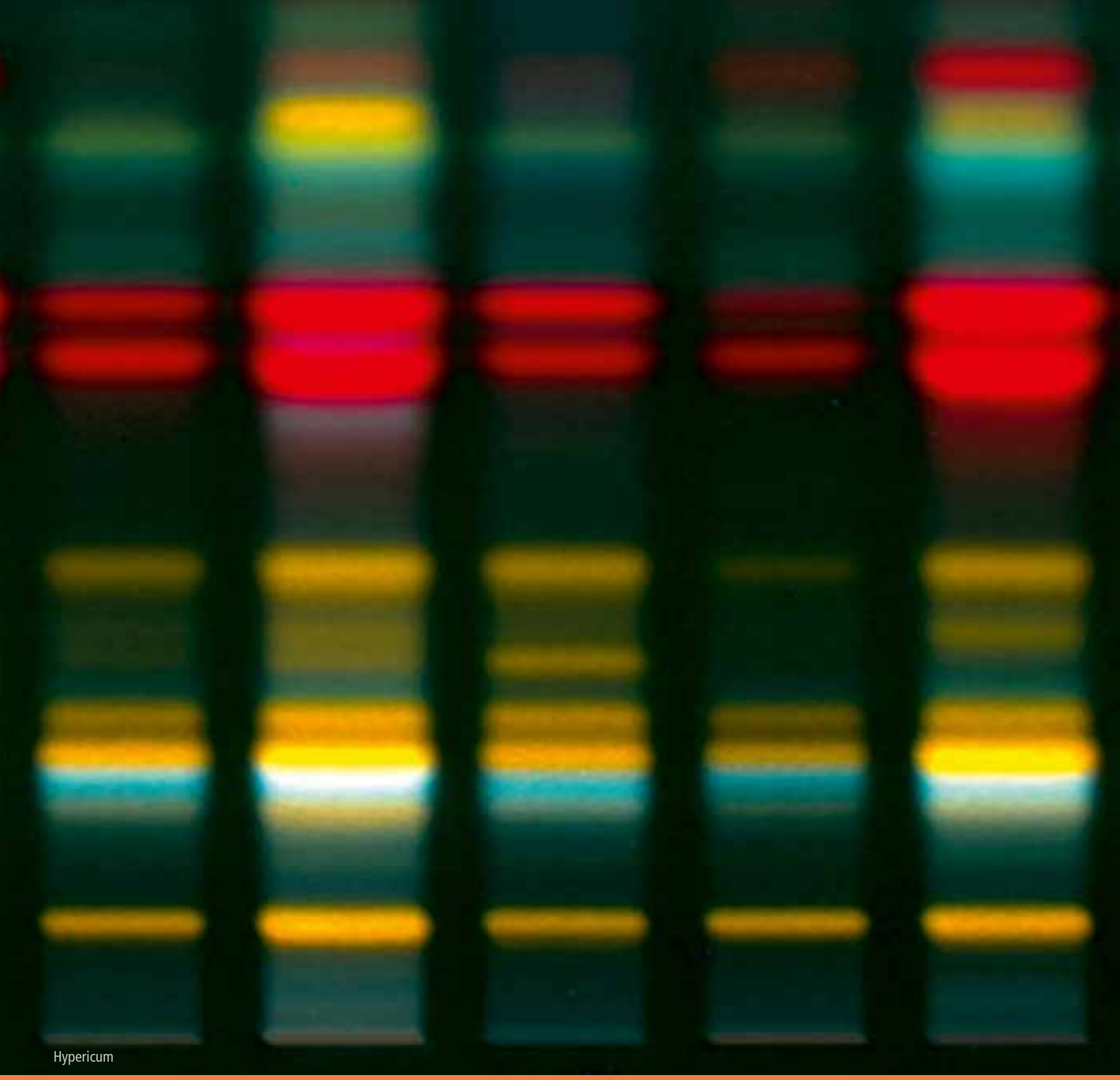
022.7808 CAMAG® Linomat 5, including one dosing syringe 100 µL, without software

695.0014 Dosing Syringe 100 µL for Linomat
695.0015 Dosing Syringe 500 µL for Linomat

Note

The Linomat 5 with *visionCATS* meets all the requirements of cGMP/cGLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the *visionCATS* Option „21 CFR Part 11" is required.

Detailed ordering information: www.camag.com/linomat5



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.

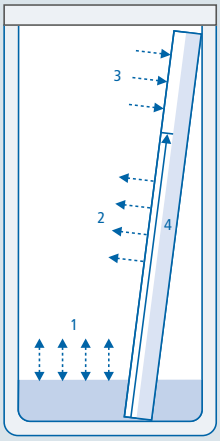
In the developing chamber four partially competing processes occur:

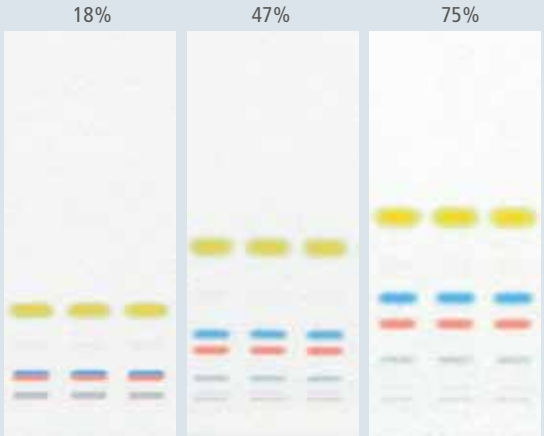
1 Between the components of the developing solvent and its vapor, an equilibrium will be established gradually. This process is called chamber saturation. Depending on the vapor pressure of the solvent components the composition of the gas phase can differ from that of the developing solvent.

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

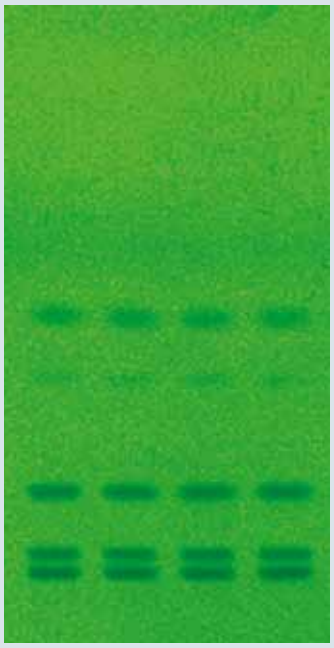
Selection of the "appropriate" chamber is made during method development, depending on what parameters such as chamber saturation, preconditioning the layer, relative humidity, etc. influence the result. Often "practical" considerations are followed such as which chamber is available, which one must 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

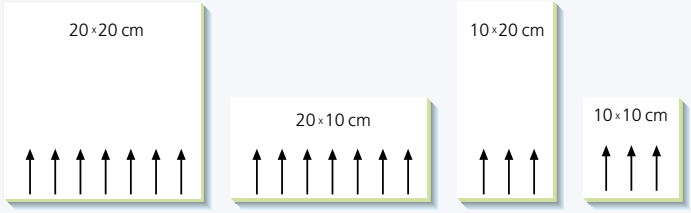


Development with preconditioning

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

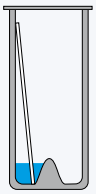
This is the classical developing tank for TLC/HPTLC. It permits the plate to be developed under conditions of partial or complete saturation of the tank atmosphere with solvent vapors. The degree of layer preconditioning can not be controlled unless additional accessories are used.

CAMAG Twin Trough Chamber

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

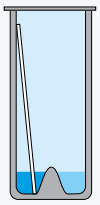
Twin Trough Chamber:
Low solvent consumption

20 mL of solvent are sufficient for a 20 × 20 cm chamber, 10 mL for the 20 × 10 cm chamber and 5 mL for a 10 × 10 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 for plates 20 × 20 cm, with stainless steel lid
022.5250 for plates 20 × 20 cm, with glass lid
022.5257 for plates 20 × 20 cm, without lid

022.5150 for plates 10 × 10 cm, with stainless steel lid
022.5151 for plates 10 × 10 cm, without lid

022.5275 light-weight for plates 20 × 20 cm, with glass lid
022.5270 light-weight for plates 20 × 10 cm, with glass lid

CAMAG® Twin Trough Chamber

022.5256 for plates 20 × 20 cm, with stainless steel lid
022.5255 for plates 20 × 20 cm, with glass lid
022.5258 for plates 20 × 20 cm, without lid

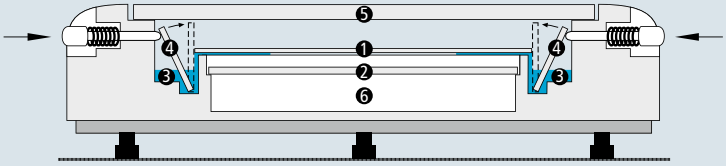
022.5254 for plates 20 × 10 cm, with stainless steel lid
022.5253 for plates 20 × 10 cm, with glass lid
022.5261 for plates 20 × 10 cm, without lid

022.5155 for plates 10 × 10 cm, with stainless steel lid
022.5156 for plates 10 × 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 configuration 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 glass 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 × 20, 20 × 10 and 10 × 10 cm
- Battery operated

CAMAG smartCut plate cutter

Convenient and precise cutting of TLC/HPTLC plates

- Cuts glass plates with a 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 × 10 cm
022.8530 CAMAG® Horizontal Developing Chamber for plates 10 × 10 cm

022.5300 CAMAG® smartAlert solvent front monitor
022.4300 CAMAG® smartCut plate cutter

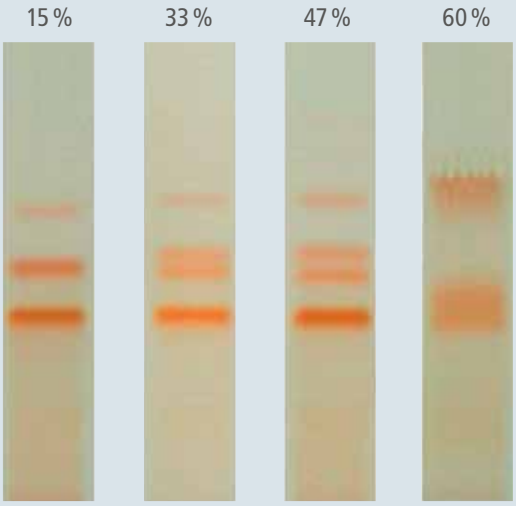
CAMAG Automatic Developing Chamber 2 (ADC 2)

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.



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 2 (ADC 2), including CAMAG® Twin Trough Chamber for ADC 2 022.5261) for 20 × 10 cm plates, without software

Detailed ordering information: www.camag.com/adc2

Note

The Automatic Developing Chamber ADC 2 with *visionCATS* meets all the requirements of cGMP/cGLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the *visionCATS* Option „21 CFR Part 11" is required.

CAMAG AMD 2 System
Automated Multiple Development

The CAMAG AMD procedure allows Planar Chromatography to be utilized for tasks that could not be performed by HPTLC 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

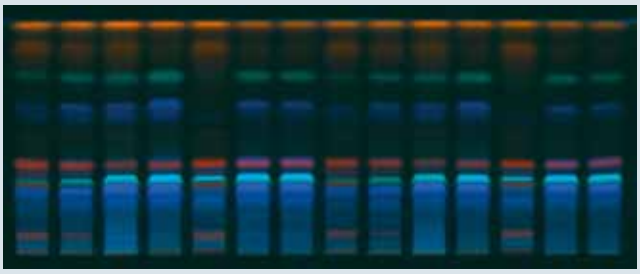
- The HPTLC plate is developed repeatedly in the same direction.
- Each successive run extends over a longer solvent migration distance than the one before.
- Between runs, the solvent is completely removed from the developing chamber and the layer is dried under vacuum.
- Each successive run uses a 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.

AMD 2 under winCATS

The AMD 2 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 Automated Multiple Development comprising chromatogram developing module, standard accessories and Equilink, without software

Detailed ordering information: www.camag.com/amd2

Note

The AMD 2 with winCATS meets all the requirements of cGMP/cGLP 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.

CAMAG HPTLC Vario System

Key features

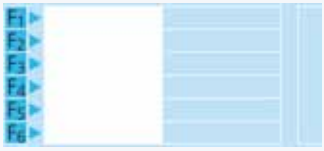
- Development with six different solvents can be tested side by side.
- Sandwich configuration as well as tank configuration can be simulated side by side, making results directly comparable.
- Six different conditions of pre-equilibration, including relative humidity, can be tested simultaneously.
- 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 … = developing solvents, C_1 … = conditioning liquids

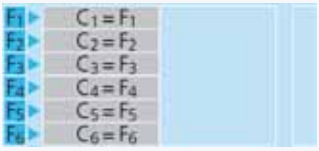
Optimization of the developing solvent

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



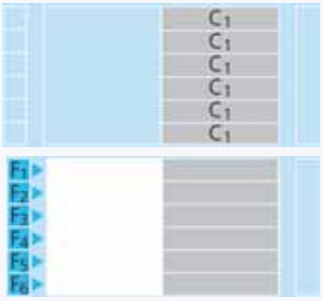
Optimization of the development solvent

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



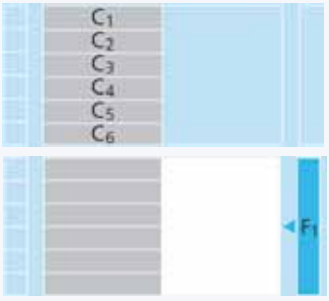
Optimization of the development solvent after uniform layer preconditioning

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 CAMAG® HPTLC Vario System, consisting of
022.8555 CAMAG® HPTLC Vario Chamber and
022.8556 HPTLC Scoring Unit

Derivatization

The possibility of straight forward derivatization
is a special feature of TLC/HPTLC

Pre- and Postchromatographic Derivatization

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.

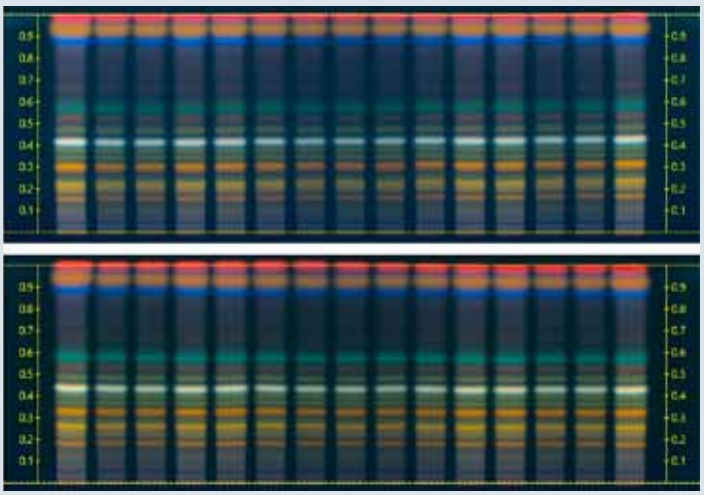
Pre-chromatographic derivatization is possible by overspraying the sample application zones with the Linomat 5 or the Automatic TLC Sampler ATS 4.

For the transfer of liquid reagents for postchromatographic derivatization, one can choose between spraying or dipping. Dipping and automated spraying are the preferred techniques, 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 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 automated spraying and dipping



Derivatization of Ginkgo leaf extracts with Natural Product reagent and polyethylenglycol solution by spraying with 2 mL (above) and dipping in 200 mL (below)

CAMAG Chromatogram Immersion Device

For proper execution of the dipping technique, the 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

CAMAG TLC 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 fairly 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.

Ordering information

022.6606	**CAMAG® Chromatogram Immersion Device 3** for TLC and HPTLC plates up to 20 × 20 cm, without dip tank
022.6627	Dip tank for plates 20 × 20 cm, with lid
022.6628	Dip tank for plates 20 × 10 cm, with lid
022.6619	Bench top rack for three dip tanks

022.6530	**TLC Sprayer,** complete with spray head type A and B, reagent bottle 100 mL, reagent bottle 50 mL
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 Derivatizer

Derivatization means another step in the TLC/HPTLC process, consequently causing an increase in the variance. If an experienced technician performs reagent transfer by manual spraying, the relative standard deviation of the measured values significantly rises up to 12.0%. In contrast with the Derivatizer, the standard deviation increases only slightly to between 2.5 and 4.5%

The Derivatizer is an automated spraying device which sets a new standard of reproducibility in the reagent transfer onto TLC/HPTLC plates by employing a unique „micro droplet" spraying technology. The Derivatizer ensures homogeneous and reproducible application of the most common reagents. To meet the diverging physicochemical properties of the different reagents, *e.g.* acidity or viscosity, four different color-coded spray nozzles are employed, and the user can select from six spraying levels. The Derivatizer is available for two different plate formats (20 × 20 and 20 × 10 cm).

Color-coded spray nozzles

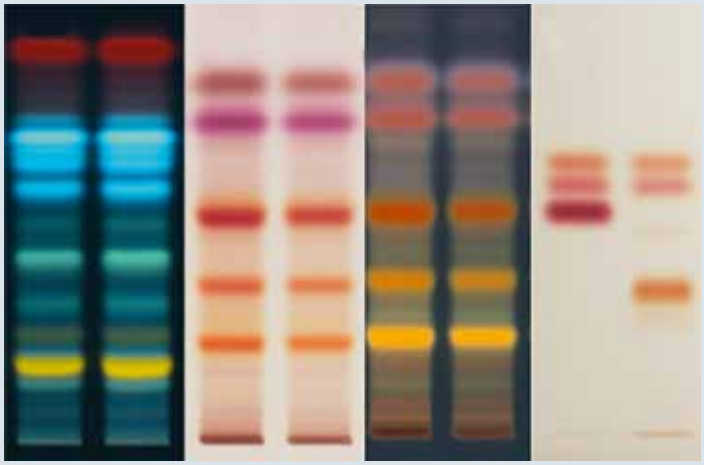
Key features

- Unique micro droplet spraying technology
- Reproducible and user-independent results
- Highly homogeneous reagent transfer
- Reagent consumption (2–4 mL)
- Environmentally friendly and safe handling through a closed system
- Easy cleaning

The nozzle generates an extremely fine reagent mist, which evenly distributes in the chamber and gradually condenses on the TLC/HPTLC plate.

Examples of derivatized chromatograms

Visual observation of results achieved with the Derivatizer reveals a very high homogeneity.



A B C D

HPTLC chromatograms derivatized with Natural Product reagent/Polyethylene glycol solution under UV 366 nm (A), Anisaldehyde reagent under white light (B) and UV 366 nm (C),and Fast blue salt B reagent under white light (D)

The following most common reagents have been tested and validated by the CAMAG laboratory for use with the Derivatizer:

- Sulfuric acid reagent (10% in methanol)
- Anisaldehyde reagent
- Natural product reagent
- Polyethylene glycol solution
- Iodine solution (0.5% in ethanol)
- Dragendorff reagent
- Fast blue salt B reagent
- Ehrlich's reagent
- Phosphomolybdic acid reagent
- Ninhydrin reagent
- Copper (II) sulfate reagent
- Aniline-diphenylamine-phosphoric acid reagent
- Vanillin reagent
- Potassium hydroxide solution (5% in methanol)
- Aqueous solutions (enzymatic solutions, *etc.*)

Ordering information

022.6000 CAMAG® Derivatizer with hoods for 20 × 10 and 20 × 20 cm plates
022.6010 CAMAG® Derivatizer with hood for 20 × 10 cm plates
022.6020 CAMAG® Derivatizer with hood for 20 × 20 cm plates

Detailed ordering information: www.camag.com/derivatizer

CAMAG TLC Plate Heater 3

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/HPTLC 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 2

The TLC Spray Cabinet is designed for the complete removal of excessive spray mist while spraying a TLC/HPTLC 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.

Ordering information

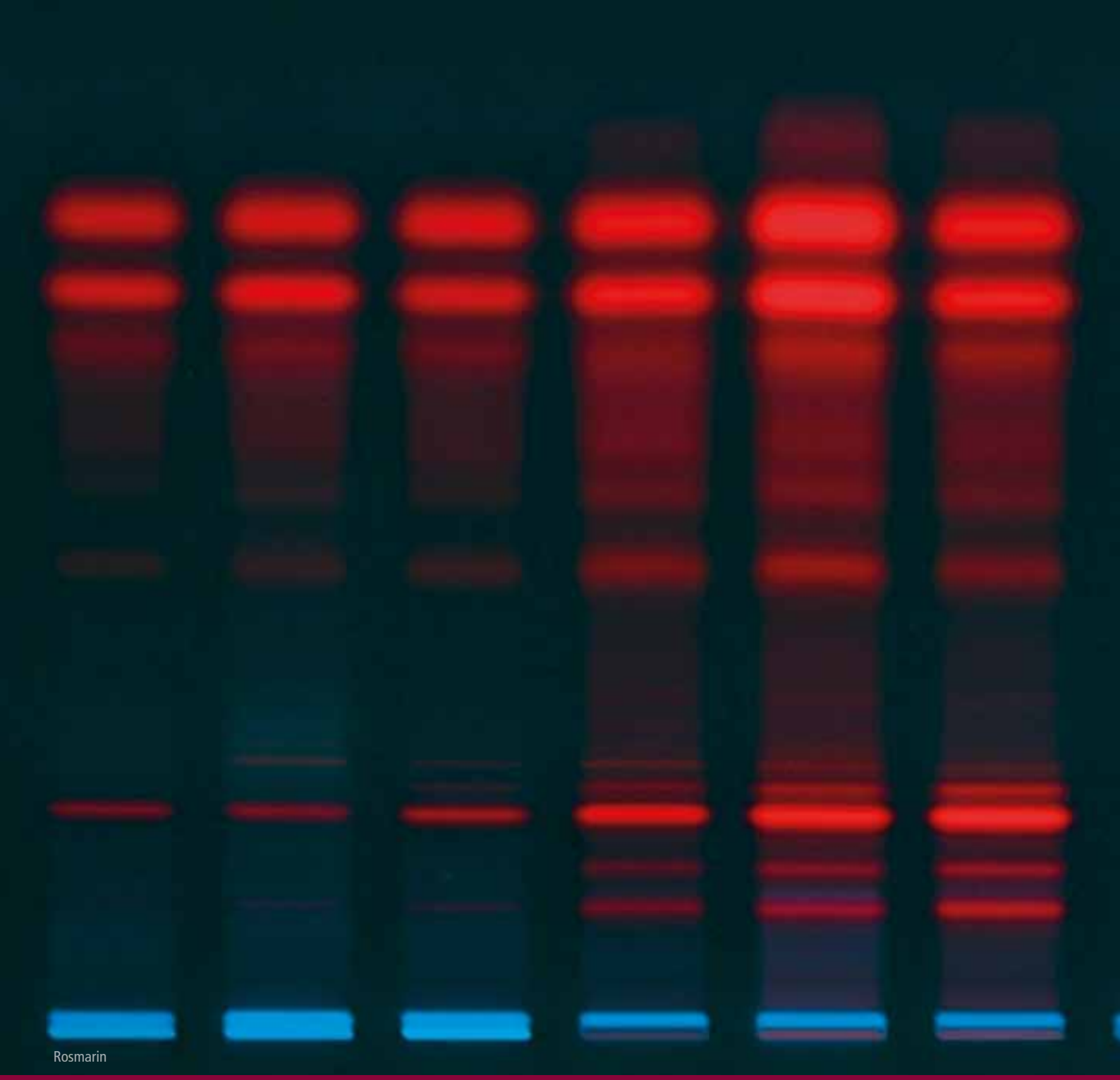
022.3306 CAMAG® TLC Plate Heater 3
Stainless steel housing, flat ceramic top, for TLC/HPTLC plates up to 20 × 20 cm, digital temperature display, temperature range 25–200 °C.

022.6230 CAMAG® TLC Spray Cabinet 2 with blower and flexible exhaust hose 1.5 m

022.6232 CAMAG® TLC Spray Cabinet 2 without blower, for connection to existing forced flow conduit, with 1.5 m flexible exhaust hose 127 mm diameter

022.6226 Exhaust hose extension 1.5 m with adapter

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



Rosmarin

Chromatogram Evaluation

Chromatogram inspection under UV light _____ **UV Lamp 4**
Documentation, image acquisition _____ TLC **Visualizer 2**
Bioactivity detection _____ **Bioluminizer**
Classical densitometry _____ **TLC Scanner 4**
Hyphenation of TLC/HPTLC with MS ___ **TLC-MS Interface 2**

Chromatogram Inspection under UV Light

CAMAG UV Lamp 4

The UV Lamp 4 is designed primarily for use in a TLC/HPTLC laboratory. Users benefit from a convenient one-button operation for each UV tube. In order to reduce the user's risk of UV radiation exposure, the UV Lamp 4 is equipped with two safety features: in addition to the built-in timer (which automatically switches off the lamp after 10 minutes) a tilt sensor automatically turns off the lamp in case the lamp is tilted more than 30 degrees. Beyond optimized handling and improved safety features, the UV Lamp 4 comes with a more homogeneous illumination and higher UV light intensity.

Key features

- Two UV tubes for illumination (1 × UV 254 nm, 1 × UV 366 nm, each 8 W)
- Convenient handling through one button operation for each UV tube
- Homogeneous illumination
- High level of user safety through tilt sensor and timer

Two types of UV light are required for inspecting 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/HPTLC layer contains a fluorescent indicator excited by UV 254 nm.

CAMAG UV Cabinet 4

The UV Cabinet 4, a combination of the UV Lamp 4 and the Viewing Box 4, is specially designed for UV observation with minimal influence of ambient light. Thanks to a compact footprint, the UV Cabinet 4 requires only minimum space. The observation port has a built-in UV filter in the viewing window ensuring effective eye protection. The interior is accessible via a roller shutter on the front.

Key features

- Chromatogram inspection with minimal influence of ambient light
- Eye protection through UV filter in the viewing window
- Minimum space requirements through compact footprint

Ordering information

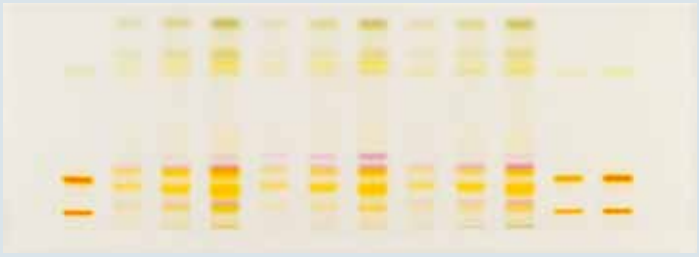
040.2000 CAMAG® UV Cabinet 4, incl. CAMAG® UV Lamp 4 and CAMAG® Viewing Box 4
022.9160 CAMAG® UV Lamp 4, 254/366 nm, 2 x 8 W
022.9060 CAMAG® Viewing Box 4
022.9165 Stand for CAMAG® UV Lamp 4

Documentation/ Image Acquisition

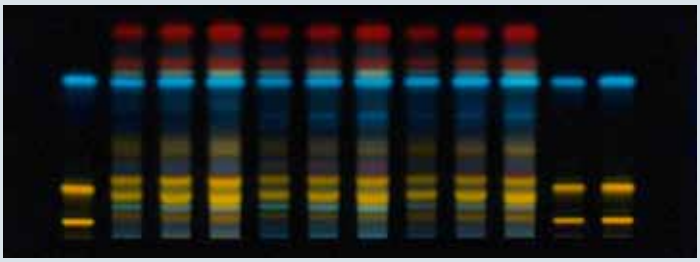
For electronic image acquisition visible polychromatic light is captured. When long-wave UV light is used for object illumination, the camera captures the light emitted by fluorescent substances. When short-wave UV light is used for illumination of a chromatogram layer containing fluorescence indicator,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

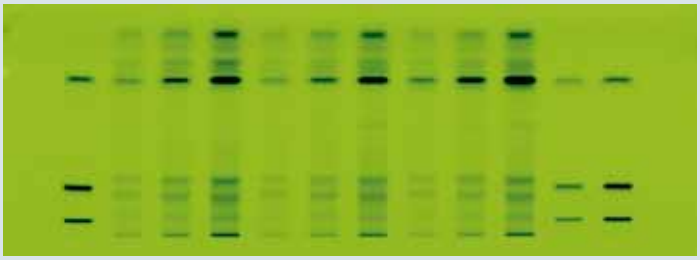
The strength of the electronic image acquisition is the overview of the complete chromatogram.



Chromatogram under white light



Chromatogram under UV 366 nm



Chromatogram under UV 254 nm

CAMAG TLC Visualizer 2

Imaging and Documenation System for TLC and HPTLC Plates

The visual presentation of the complete chromatogram showing all samples and standards side by side is one of the most convincing arguments for Thin-Layer Chromatography. No other chromatographic technique can directly express the result as a color image and make it available for visual evaluation.

To reproducibly acquire and preserve best quality images of TLC/HPTLC chromatograms under different illuminations this high end imaging and documentation system is now available. With its new digital CCD camera a maximum resolution of 82 µm on the plate is obtained.

Key features

- Reproducible high-quality images acquired under homogenous illumination with the selected light
- Easy and intuitive operation with *visionCATS*
- High-dynamic-range imaging (HDRI)
- Side by side comparison of tracks originating from the same or different plates and/or different illumination modes
- Various image enhancement tools, *e.g.* Spot Amplification
- ("Spot Amp"), Clean Plate Correction and Exposure Normalization
- Image-based profile generation from reference and sample tracks, and subsequent peak integration and calibration
- New digital CCD camera with a maximum resolution of 82 µm on the plate
- USB 3.0 for easy PC connection and rapid data transfer
- Meets all requirements to be used in a cGMP/cGLP environment
- IQ/OQ qualification and 21 CFR Part 11 ready

Ordering information

022.9810 CAMAG® TLC Visualizer 2 documentation system with 12 mm lens. Suited for object formats up to about 21 × 28 cm (20 × 20 cm TLC plates). *visionCATS* software is not included.

022.9811 CAMAG® TLC Visualizer 2 documentation system with 16 mm lens*. Suited for object formats up to about 16 × 21 cm (20 × 10 and 10 x 10 cm TLC/HPTLC plates). *visionCATS* software is not included.

*16 mm lens leads to an increased image resolution for HPTLC plates

Detailed ordering information: www.camag.com/tlcvisualizer2

Note

The TLC Visualizer 2 with *visionCATS* meets all the requirements of cGMP/cGLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the visionCATS Option "21 CFR Part 11" is required.

CAMAG TLC Visualizer 2 operated under *visionCATS*

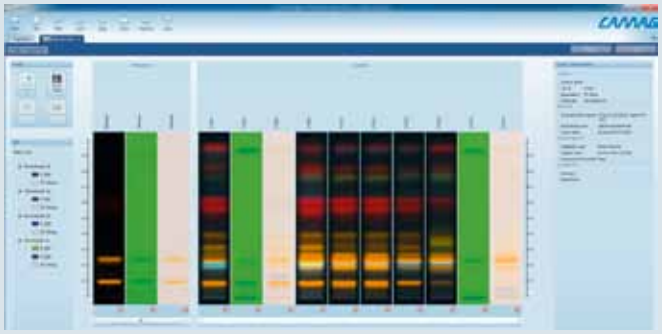
visionCATS organizes the workflow of TLC/HPTLC, controls the involved CAMAG instruments, and manages data. Professional image acquisition and documentation of TLC/HPTLC chromatograms ensuring highest reproducibility is the major purpose of the TLC Visualizer 2.

For the evaluation of acquired images sophisticated enhancement tools and functions for annotation and determination of position (R_F) are required.

This is where *visionCATS* comes into play and virtually unleashes the power of TLC/HPTLC. *visionCATS* features a powerful database at its heart, enabling an all new sample-based approach. The state-of-the-art software supports low-noise, high-dynamic-range imaging (HDRI) and includes a comprehensive set of image enhancement tools. With the "Comparison Viewer", tracks originating from the same or different plates and/or different illumination modes can be compared on the same screen side by side which allows the creation of "virtual plates". Detailed on-screen instructions effectively guide the user through the image acquisition process.

The image enhancement tools featured in *visionCATS* exploit the full potential of the TLC Visualizer 2. Images are automatically captured based on an optimized control of the illumination and parameters specified in the TLC/HPTLC method. Sophisticated algorithms guarantee the highest image quality for identification of even the weakest zones.

"Data View" allows for visual evaluation of a plate in different illumination modes and offers a broad range of helpful tools, *e.g.* the R_F tool displays the R_F value of zones on the digital image or a rectangular zoom function.



"Comparison Viewer": selected tracks of images taken from different plates under UV 366 nm, UV 254 nm, and white light can be displayed side by side.

"Exposure Normalization" for visualization of weak zones (right) and original image (left)

Selective Detection of Bioactive Compounds

CAMAG BioLuminizer®

The Bioluminizer system is consisting 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.

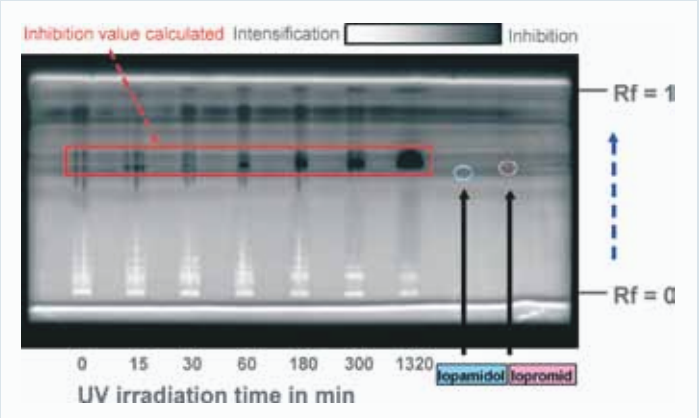
With the Bioluminizer bioactivity can be detected and registered economically and with short response time. Special antibacterial protection measures are not necessary, as the bioluminescent bacteria *Vibrio fischeri* are atoxic for humans.

- 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 TLC/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.

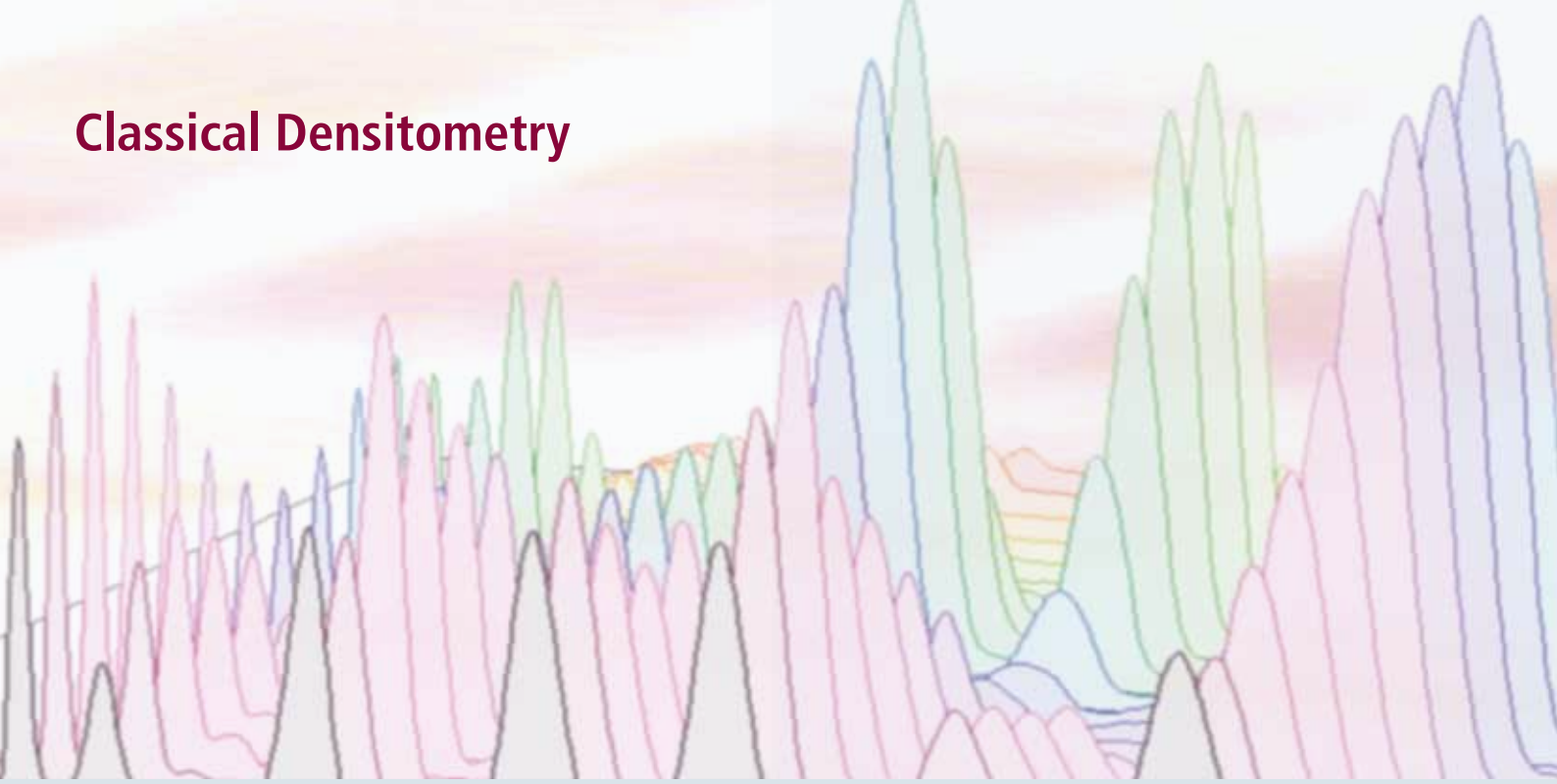
The example is taken from an internship report at the "Zweckverband Landeswasserversorgung" in Langenau, Germany.

Ordering information

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

Detailed ordering information: 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 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.

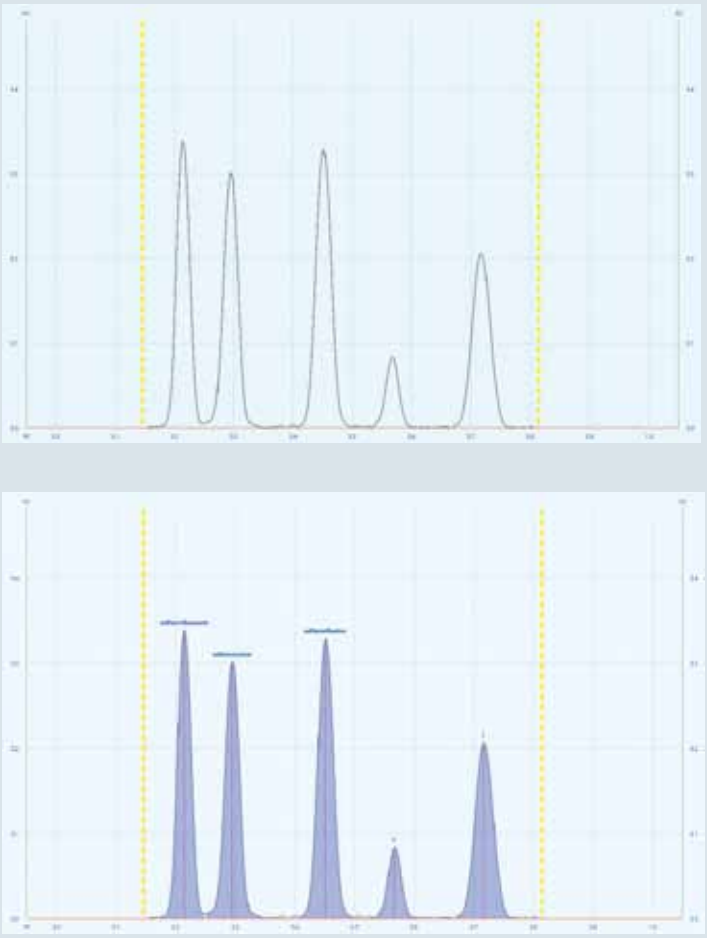
With the TLC Scanner 4 absorption and fluorescence excitation spectra can be recorded. The strengths of classical densitometry as compared with image evaluation are spectral selectivity and the higher precision of quantitative determinations.

Recommendations

Applying samples in the form of narrow bands allows densitometric evaluation by aliquot scanning, *i.e.* scanning with a slit about $^{2}/_{3}$ 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 TLC Scanner 4 are controlled by *visionCATS* 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

Ordering information

027.6200 CAMAG® TLC Scanner 4, for the densitometric evaluation of TLC/HPTLC chromatograms, spectral range 190 to 900 nm, plate sizes up to 20 x 20 cm, absorbence and fluorescence mode, without winCATS or *visionCATS* software

Detailed ordering information: www.camag.com/tlcscanner

Note

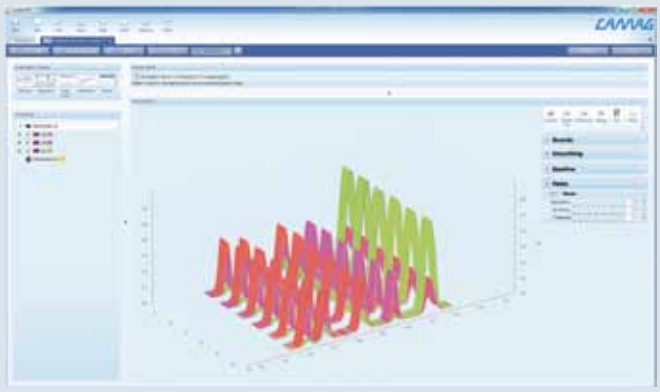
The TLC Scanner 4 with *visionCATS* meets all the requirements of cGMP/cGLP and can be IQ/OQ qualified. If the instrument shall be used in a 21 CFR Part 11 environment, the *visionCATS* Option „21 CFR Part 11" is required.

Quantitative evaluation with CAMAG TLC Scanner 4

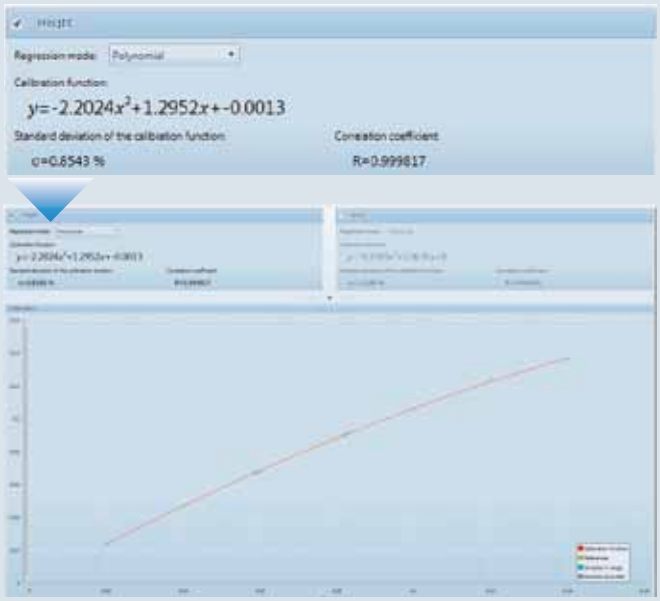
visionCATS controls the TLC Scanner 4 and enables quantitative evaluation of the generated densitometric data. The spectral range of light from 190 to 900 nm is available for selecting single wavelengths for Scanning Densitometry. Detection can thus be fine-tuned to match the spectral properties of the analyte to its optimized specificity and sensitivity of the detection. For almost unlimited flexibility, several scanning steps, *e.g.* before and after derivatization, can be selected. Each scanning step may also include up to 31 individual multi-wavelength scans using different light sources (deuterium lamp, mercury lamp, tungsten lamp). The detection modes absorption or fluorescence can be combined. The generated data can then be evaluated. Integration of peaks and assignment to separated substances is a matter of a few mouse clicks.

Quantification of substances can be performed via peak height or peak area. The best fitting calibration model with single-level calibration or multilevel calibration via linear, polynomial or Michaelis-Menten regression is selected. With *visionCATS* and the TLC Scanner 4 UV spectra can be measured as well. The selected peak positions, which are detected from a previous densitogram, are automatically scanned at the defined wavelengths. Spectra can be measured from 190 to 900 nm and displayed individually or overlaid in one diagram.

Peak Assignment: the separated compounds are assigned. For quantification, data from the multi-wavelength scan at the optimum wavelength for each compound is used.



3D View and Peak Integration: densitograms are displayed in 3D, top or front view. Several peak integration and baseline correction settings can be selected.



Calibration Curve: for evaluation the best fitting calibration model is used. Quantification can be done via peak height or area.

Hyphenation of TLC/HPTLC with MS

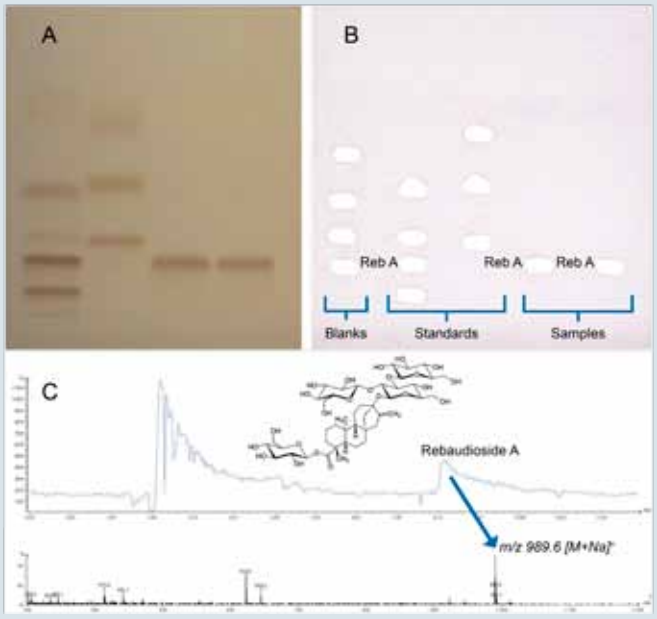
CAMAG TLC-MS Interface 2

Identification and confirmation of unknown substances

The elution-based TLC-MS Interface 2 is a highly convenient and versatile instrument allowing for rapid and contamination-free elution of TLC/HPTLC zones with online transfer to a mass spectrometer. Through the pioneering concept of hyphenating high-performance Thin-Layer Chromatography with mass spectrometry unequivocal substance identification is possible. The TLC-MS Interface 2 can be installed plug & play with any LC-MS system without adjustments or mass spectrometer modifications. Depending on the MS system, a substance can be identified within a minute via its mass spectrum, or for an unknown substance zone, the respective sum formula can be obtained. Furthermore, interesting zones can be eluted into vials for further investigations with, *e.g.*, NMR, (ATR-)FTIR, ESI-MS, and MALDI-MS.

The chromatogram zones are eluted from the TLC/HPTLC plate with methanol or another suitable solvent with the flow speed appropriate for the LC-MS system. The round elution head is used for circular zones and the oval elution head for zones in the form of bands. After elution the eluate is either transferred online to the mass spectrometer or collected in a sample vial for further offline analysis.

The TLC-MS Interface 2 features a modified elution head and an easily accessible, exchangeable filter, arranged in front of the valve. Cleaning is facilitated as compared to the previous version, making it highly efficient. By pushing a button, the elution path is cleaned of matrix particles with compressed air, increasing the lifetime of the filter and preventing the system from becoming blocked. These filters can be easily replaced without any modification to the elution head.



Characterization of separated compounds by mass spectrometry (Steviol glycosides in Stevia formulations)*

A: Chromatogram for localizing the zones (derivatized with β-naphtol reagent)

B: HPTLC plate after elution of zones with the CAMAG TLC-MS Interface 2

C: HPTLC-ESI-MS spectra of Rebaudioside A, m/z 989.6 $[M+Na]^+$

**Morlock et al., Journal of Chromatography, A, 1350 (2014) 102–111*

Ordering information

022.8440 CAMAG® TLC-MS Interface 2, including oval elution head 4 × 2 mm

022.8441 CAMAG® TLC-MS Interface 2, including round elution head 4 mm

Detailed ordering information: www.camag.com/tlc-ms2

Software

visionCATS

		Horizontal Developing Chamber
Stationary Phase	Nanomat	Developing Chamber
▲ Manual Input		
Definition	**Sample Application**	**Chromatogram Development**
▼ Software-controlled		
Samples	Automatic TLC Sampler ATS 4	Automatic Developing Chamber ADC 2
Standards	Linomat 5	

visionCATS HPTLC Software

HPTLC Analysis – made easy

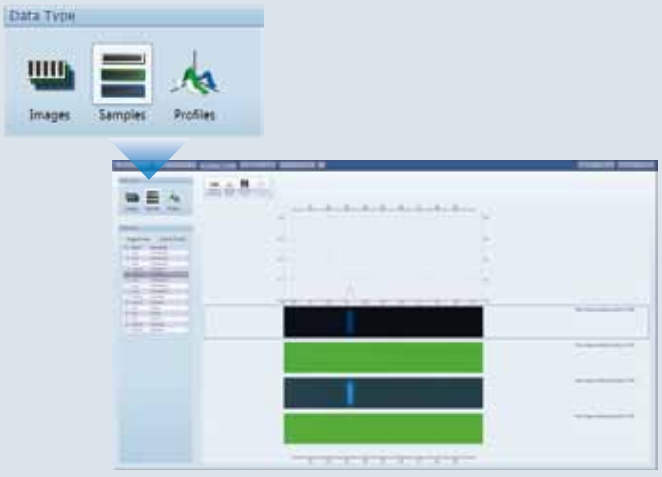
visionCATS stands for ease of use and intuitive simplicity. The software organizes the workflow of HPTLC, controls the involved CAMAG instruments, and manages data.

The easy to navigate user interface effectively guides the user through the chromatographic process – from definition of samples and substances to reporting of results. Simply select one of the default methods and start working: fill in the sequence table, select a mobile phase and the derivatization reagent.

If necessary modify detection parameters. Then *visionCATS* will guide you. Creating your own method is easy as well: just select the desired steps. The new sample-oriented approach allows for creating virtual plates from tracks originating from different plates, *e.g.* for batch-to-batch comparison or long-term stability testing.

With *visionCATS* relevant samples can be located easier and faster than ever: a powerful search tool within the file explorer that includes extended preview functionalities enables the user to easily search for text and date, samples, methods, and analysis files.

HPTLC Analysis – made easy: create your own method with a few mouse clicks



Sample View: all available data related to the sample are displayed

Guided Analysis: select a method and *visionCATS* will guide you

Chromatogram Immersion Device			
Derivatizer			
Derivatization	**Evaluation: Detection**	**Evaluation: Documentation**	**Report**
	TLC Scanner 4	TLC Visualizer 2	

Key Features

Image Comparison Viewer

With the fully integrated Image Comparison Viewer tracks originating from the same or different plates and/or different detection modes can be compared on the same screen side-by-side.

Image Enhancement Tools

visionCATS supports low-noise, high-dynamic-range imaging (HDRI) and includes a comprehensive set of Image Enhancement Tools.

Scanning Densitometry and Spectral Evaluation

Following their chromatographic separation substances on the plate can be measured by Scanning Densitometry. Recording of UV/Vis spectra and their comparison with reference spectra allows identification.

Quantitative Analysis

To determine the substance concentration in a sample after densitometric or image analysis, five different quantification functions (*e.g.* linear and polynomial regression modes) are available. Several scanning steps and up to five different evaluations can be performed in one analysis file.

HPTLC Method Library

For seamless import of validated methods and images of standards and reference materials, *visionCATS* provides a free of charge HPTLC Method Library for licensed users.

Regulatory Compliance

visionCATS supports compliance with cGMP/cGLP and 21 CFR Part 11.

State-of-the-art Software Architecture

visionCATS is based on a client/server system, enabling scalability from a single workstation to a multi-user lab network.

Plate Preview: provides an overview of steps and samples of an analysis or method incl. instrument parameters and thumbnails of the acquired image

File Explorer: search entry for name, ID or keyword A; file results B; preview of a selected analysis with the thumbnail of the captured images C

Ordering information: www.camag.com/visionCATS

Basic Kit Consumables

Basic Kit (for conventional TLC)

The CAMAG Basic Kit has been composed so that a lab can efficiently start working with TLC. This assembly is configured to a allow upgrading to a complete system for quantitative TLC without items becoming redundant.

040.1000 CAMAG® TLC Basic Kit, consisting of

022.4730 **CAMAG® Nanomat 4**
022.4300 **CAMAG® smartCut plate cutter** to cut TLC/HPTLC glass plates up to 20 × 20 cm
022.5155 **CAMAG® Twin Trough Chamber** for 10 × 10 cm plates, with stainless steel lid
022.5256 **CAMAG® Twin Trough Chamber** for 20 × 20 cm plates, with stainless steel lid
022.5300 **CAMAG® smartAlert solvent front monitor** (only suitable for glass plates)
022.9060 **CAMAG® Viewing Box 4** for CAMAG UV lamps of the 022.91XX series
022.9160 **CAMAG® UV lamp 4** dual wavelength 254/366 nm, 2 × 8 W
022.6100 Glass Reagent Sprayer, all glass, with 100 mL erlenmeyer flask
022.5244 Saturation pads, pack of 100 (20 × 20 cm)
022.7650 Capillary dispenser consisting of universal capillary holder (022.7786), one dispenser magazine for 1 µL capillaries (022.7661 and one package of 5 × 100 disposable capillary pipettes 1 µL (022.7771)
022.7662 Dispenser magazine for 2 µL capillaries, without capillaries
022.7665 Dispenser magazine for 5 µL capillaries, without capillaries
022.7772 Disposable capillary pipettes 2 µL, pack of 5 × 100
022.7775 Disposable capillary pipettes 5 µL, pack of 5 × 100
034.5715 MERCK TLC plates silica gel 60 F 254, 20 × 20 cm, pack of 25

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

Designation	layer (µm)	size (cm)	quant./pkg
034.5628 HPTLC plates silica gel 60 F254	200	10 × 10	25
034.5629 HPTLC plates silica gel 60 F254	200	10 × 10	100
034.3726 HPTLC plates RP-2 F254s	200	10 × 10	25
034.3725 HPTLC plates RP-8 F254s	200	10 × 10	25
034.3124 HPTLC plates RP-18 W F254s	200	10 × 10	25
034.3724 HPTLC plates RP-18 F254s	200	10 × 10	25
034.6464 HPTLC plates CN F254s	200	10 × 10	25
034.2668 HPTLC plates Diol F254	200	10 × 10	25
034.5647A HPTLC plates NH2 F254s	200	10 × 10	25
034.5642 HPTLC plates silica gel 60 F254	200	20 × 10	50
034.5648 HPTLC plates silica gel 60 F254, ultra pure for pharmacopoeial methods	200	20 × 10	50
034.1552 HPTLC plates silica gel 60 WR F254s	200	20 × 10	25
034.5548 HPTLC aluminium sheets silica gel 60 F254	200	20 × 20	25
034.5445 HPTLC plates LiChrospher® Si 60 F254s	180	20 × 10	25
034.5647B HPTLC plates LiChrospher® Si 60 WR F254s	100	20 × 10	25

MERCK Precoated Layers for Thin-Layer Chromatography (TLC)

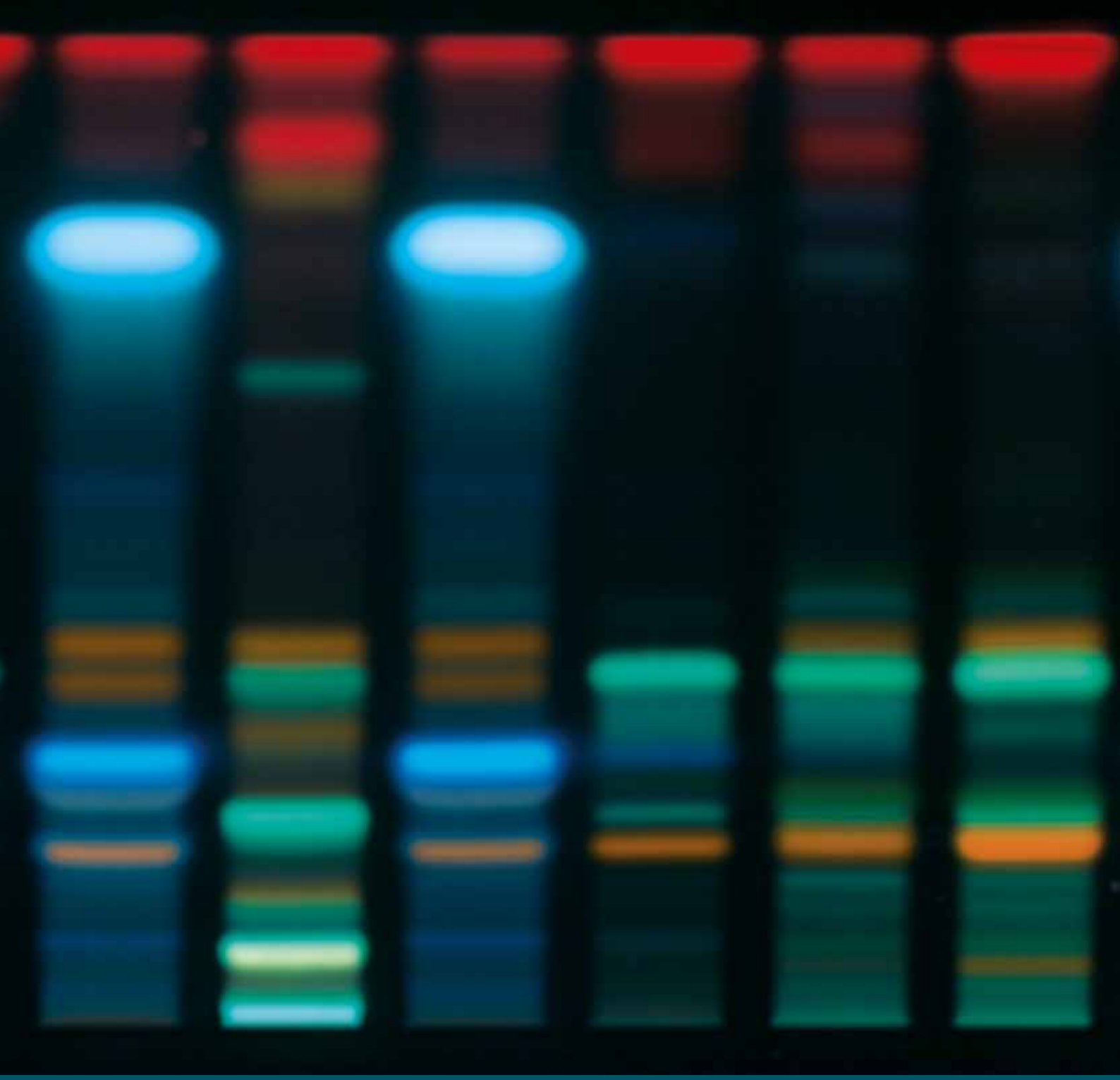
Designation	layer (µm)	size (cm)	quant./pkg
034.5729 TLC plates silica gel 60 F254	250	10 × 20	50
034.5715 TLC plates silica gel 60 F254	250	20 × 20	25
034.1798 TLC plates silica gel 60 F254, with concentration zone	250	20 × 20	25
034.5423 TLC plates RP-18 F254s	200	10 × 20	50
034.5554 TLC aluminium sheets silica gel 60 F254	200	20 × 20	25
034.5559 TLC aluminium sheets RP-18 F254s	200	20 × 20	20
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/HPTLC procedure and for studying the influence of specific parameters.

Ordering information

032.8001	Test Dye Mixture I, Toluene, 30 mL – for silica gel
032.8002	Test Dye Mixture II, Toluene, 30 mL – for aluminium oxide
032.8003	Test Dye Mixture III, Toluene, 10 mL – for HPTLC siliga gel
032.8006	Test Dye VI, powder for 30 mL – for IQ/OQ under *visionCATS* Software
032.8007	Test Dye VII (powder) – for IQ/OQ on Derivatizer
993.0015	Ethanol Solution standards for OQ tests, 2 vials of 10 mL with certificate
993.0016	Test Dye for AMD 2 OQ, Toluene, 10 mL
993.0018	Test Substance (powder) – for IQ/OQ on ATS 4 and Linomat 5



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 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:

- HPTLC today
- HPTLC for the analysis of botanicals
- Method development and validation in HPTLC

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 working in a cGxP regulated environment, CAMAG offers Installation Qualification (IQ) and Operation Qualification (OQ) as service.

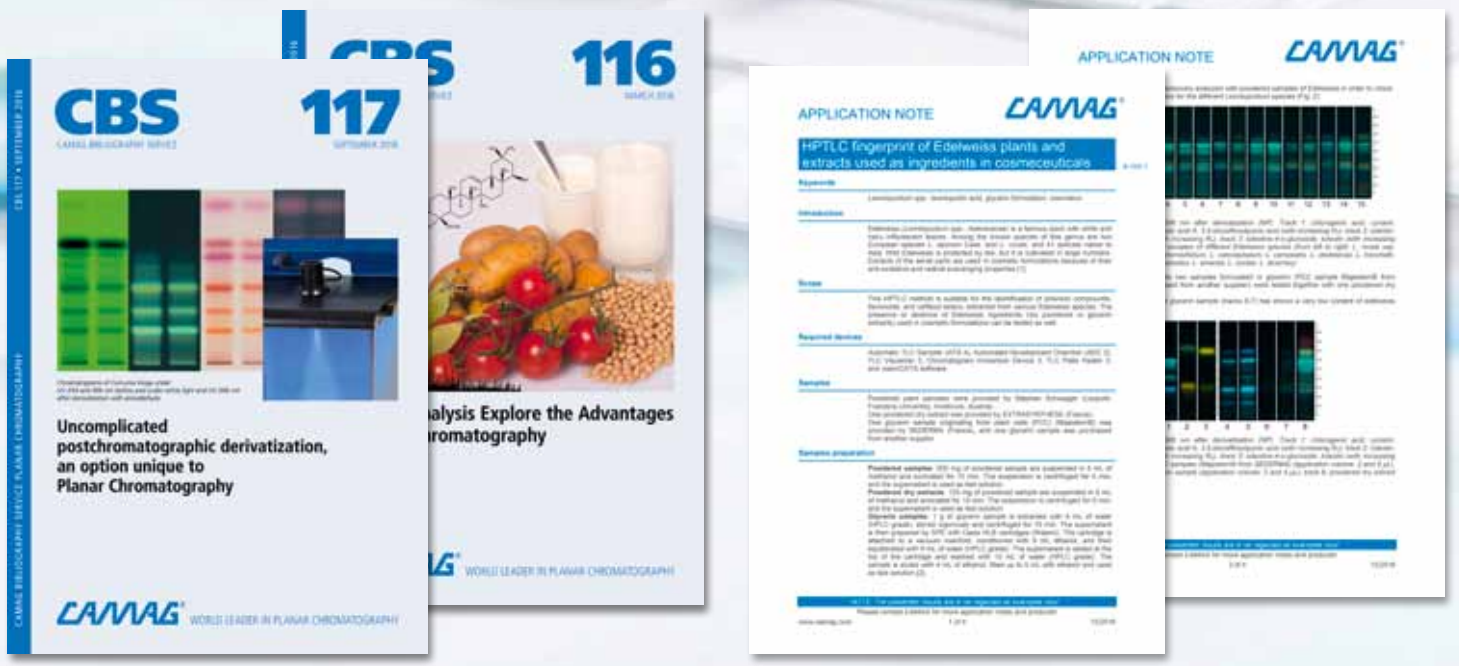
The Installation Qualification (IQ) is performed on the site and at the time of installation. It documents that all key aspects of the installation comply with the manufacturer's specifications, codes, safety and design parameters.

The Operation Qualification (OQ) is performed subsequent to installation and is repeated at certain intervals recommended by the manufacturer or defined by the customer. It documents that all modules of the equipment perform consistently throughout 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 qualification procedures for the following products:

- AMD 2 System Automated Multiple Development
- Automatic Developing Chamber 2 (ADC 2)
- Automatic TLC Sampler 4 (ATS 4)
- DigiStore 2
- Derivatizer
- Linomat 5
- TLC Scanner 3
- TLC Scanner 4
- TLC Visualizer
- TLC Visualizer 2
- TLC-MS Interface
- TLC-MS Interface 2
- UV Lamp 4
- VideoScan
- *visionCATS* HPTLC Software
- winCATS – Planar Chromatography Manager



CAMAG Bibliography Service (CBS) Planar Chromatography

CAMAG has been publishing this unique periodical on TLC/HPTLC 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/HPTLC 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/HPTLC 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)

With the CCBS Online Search, you can directly search for information within the CAMAG website. The CCBS covers more than 11'000 abstracts of TLC/HPTLC publications between 1982 and today. The database covers most relevant scientific journals in the field of Planar Chromatography including also various non-English publications in German, French, Spanish, Portuguese and Chinese. The CCBS features additional practical information for the analyst in the lab, for example details on the mobile phase or the detection. With CCBS the analyst is able to find relevant TLC/HPTLC publications which might be helpful for solving a particular analytical question.

Visit **www.camag.com/ccbs** and choose your preferred search option:

- Full text search
- Browse and search by CBS classification
- Alphabetical Search
- Search by CBS edition

Application Notes

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.

Index

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 a comprehensive web-based information offer is 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.

CAMAG (Switzerland) · Sonnenmattstrasse 11 · 4132 Muttenz
Phone +41 61 467 34 34 · Fax +41 61 461 07 02 · info@camag.com

CAMAG (Germany) · Bismarckstrasse 27-29 · 12169 Berlin
Phone +49 30 516 555 0 · Fax +49 30 795 70 73 · infoberlin@camag.com

CAMAG Scientific (USA) · 515 Cornelius Harnett Drive · Wilmington, NC 28401
Phone (800) 334 3909 · Fax (910) 343 1834 · tlc@camag.com

www.camag.com

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