CATALOG 2010/11

INSTRUMENTAL
THIN-LAYER CHROMATOGRAPHY

CAMAG

WORLD LEADER IN
PLANAR CHROMATOGRAPHY

EDITORIAL

Promoting instrumental TLC through innovation and state of the art applications

CAMAG has been serving customers for more than 50 years and is the market leader in instrumental TLC. The reputation and success of our company is based on innovation, customer oriented applications, and the high quality of the instruments and services that are provided.

Per year CAMAG invests about 10% of its turnover in R&D projects aiming particularly at innovations that improve separation power, reproducibility, and usability through automation of method relevant processes. CAMAG has made significant contributions to the state of the art in HPTLC.

One of the most recent innovations is the TLC-MS Interface, hyphenating TLC and mass spectrometry for easy identification of substances on the plate. Solving analytical problems for customers is the central element of our business. CAMAG Laboratory is developing and validating methods that become either customized solutions for clients, contributions to monographs of various pharmacopoeias (e.g. USP, PhEur, PhHelv) or scientific papers of general scientific interest.

Training and continuing education of customers is another major activity of the lab. Students, research scholars, and visiting scientists from many countries work under the supervision of our specialists or collaborate with them. We are supporting projects at academic institutions either financially or by donation of equipment. Individual trainings and customer courses in HPTLC are regularly conducted in our facilities or at customer's sites.

High Performance Thin-Layer Chromatography (HPTLC) is a powerful analytical technique for numerous applications. CAMAG is working hard to help increase the level of popularity and acceptance for the technique through standardization and improvements in reproducibility. Current information is available from our home page www.camag.com. Scientific information about HPTLC is offered by CAMAG Laboratory at www.camag-laboratory.com.

Together with my colleagues at CAMAG I am excited to present to you this catalog, describing our products and their applications. We would be particularly happy if we could contribute to the solution of your analytical problem.

Rolf Rolli, CEO CAMAG

What is HPTLC and how can you benefit from it?

Planar Chromatography as opposed to column chromatography (e.g. GC, HPLC) utilizes a flat (planar) stationary phase for separation. In Thin-Layer Chromatography (TLC) this stationary phase is supported by a glass plate or a foil (plastic or aluminum). Again unlike column separations, the TLC plate constitutes an open system, which passes through the individual steps of the TLC analysis in an off-line mode.

The relative independence of sample application, chromatogram development, detection, etc. in time and location makes possible the parallel analysis of many samples on the same plate. The possibilities for adjusting and combining numerous parameters in order to optimize the separation create a flexibility that is unsurpassed by any other chromatographic technique.

TLC can be performed manually in easy and inexpensive ways. Therefore it is found in almost all laboratories as a convenient tool for simple and rapid separations. As the expectations grow concerning quality and value of an analysis, there are suitable instruments available for all steps of TLC.

Instrumental Thin-Layer Chromatography above all can achieve a level of performance, wherby parameters of a method are kept constant and effects of environmental factors on the open planar separation system are limited. The uncertainty and inconvenience of manual labor are kept to a minimum.

The most advanced form of instrumental TLC is commonly called High Performance Thin-Layer Chromatography (HPTLC), but the term does not simply imply instrumental TLC on special high performance layers. HPTLC is an entire concept that includes a widely standardized methodology based on scientific facts as well as the use of validated methods for qualitative and quantitative analysis. Sophisticated instruments, controlled by an integrated software platform ensure to the highest possible degree the usefulness, reliability, and reproducibility of generated data. HPTLC is therefore the term for a method that meets all quality requirements of today's analytical labs even in a fully regulated environment.

Initial costs for an HPTLC system as well as maintenance, and cost per sample still remain comparatively low and all advantages derived from the planar separation principle are certainly maintained. The possibility of visual evaluation of separated samples on the plate is one of the most valuable aspects of TLC. It reaches a completely new dimension in HPTLC through the use of modern techniques for generating and evaluating digital images.

There are other options:

- With a special technique, Automated Multiple Development (AMD), it is possible to generate mobile phase gradients for improved separation.
- The screening for unknown substances featuring effected directed detection with bioluminescent bacteria with the BioLuminizer® can open new fields for research.
- The hyphenation of a TLC plate with a mass spectrometer has changed positive identification of substances on the plate into a routine task.

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.

Forensics

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

Cosmetics

- Identity of raw material
- Preservatives, colouring materials, etc.
- Screening for illegal substances, etc.

Food and Feed stuff

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

Environment

- Water
- Soil
- Residue analysis, etc.

Industrial applications

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

OVERVIEW / INDEX

The elements of instrumental TLC	What is important?
Sample Application	The samples are applied onto the plate either as spots or as bands. Precision of the applied volume, exact positioning and compactness of application zone determine the quality of the final result.
Chromatogram Development	The mobile phase is drawn through the stationary phase by capillary action. Samples are separated into their components which remain in their position on the layer after the mobile phase has been evaporated. Chromatography is affected by the gas phase in the chromatographic chamber.
Derivatization	Substances without chromophores or color can be visualized or made detectable through derivatization. The required reagents are transferred onto the chromatogram by spaying or immersion.
Evaluation: Detection	The chromatogram is evaluated under white or ultraviolet light. Options range from visual inspection of electronic images to quantitative determinations using video or scanning densitometry.
Evaluation: Documentation, TLC-MS, Bioluminescence	For documentation electronic images are easy to capture and to archive. They can be reproduced on screen without changes over time and thus compared with current images. TLC-MS and bioluminescence expand the capability of TLC.
Complete Systems	With TLC or HPTLC basic kits a lab can start working right away. HPTLC systems are designed for more demanding tasks and include instruments for all steps of the work flow.
Software	The winCATS software controls all instruments, collects and evaluated data and generates analysis reports.
Accessories and TLC/HPTLC plates	A wide choice of stationary phases and plate formats is available for various tasks.
CAMAG Services	CAMAG offers support with method development and proper use of instruments through application notes, courses, and individual trainings. Support is available through E-mail or over the telephone. Preventive maintenance and qualification of instruments by CAMAG specialists and CAMAG partners is available on site.

CAMAG

What is offered by CAMAG?		Where can I find it?
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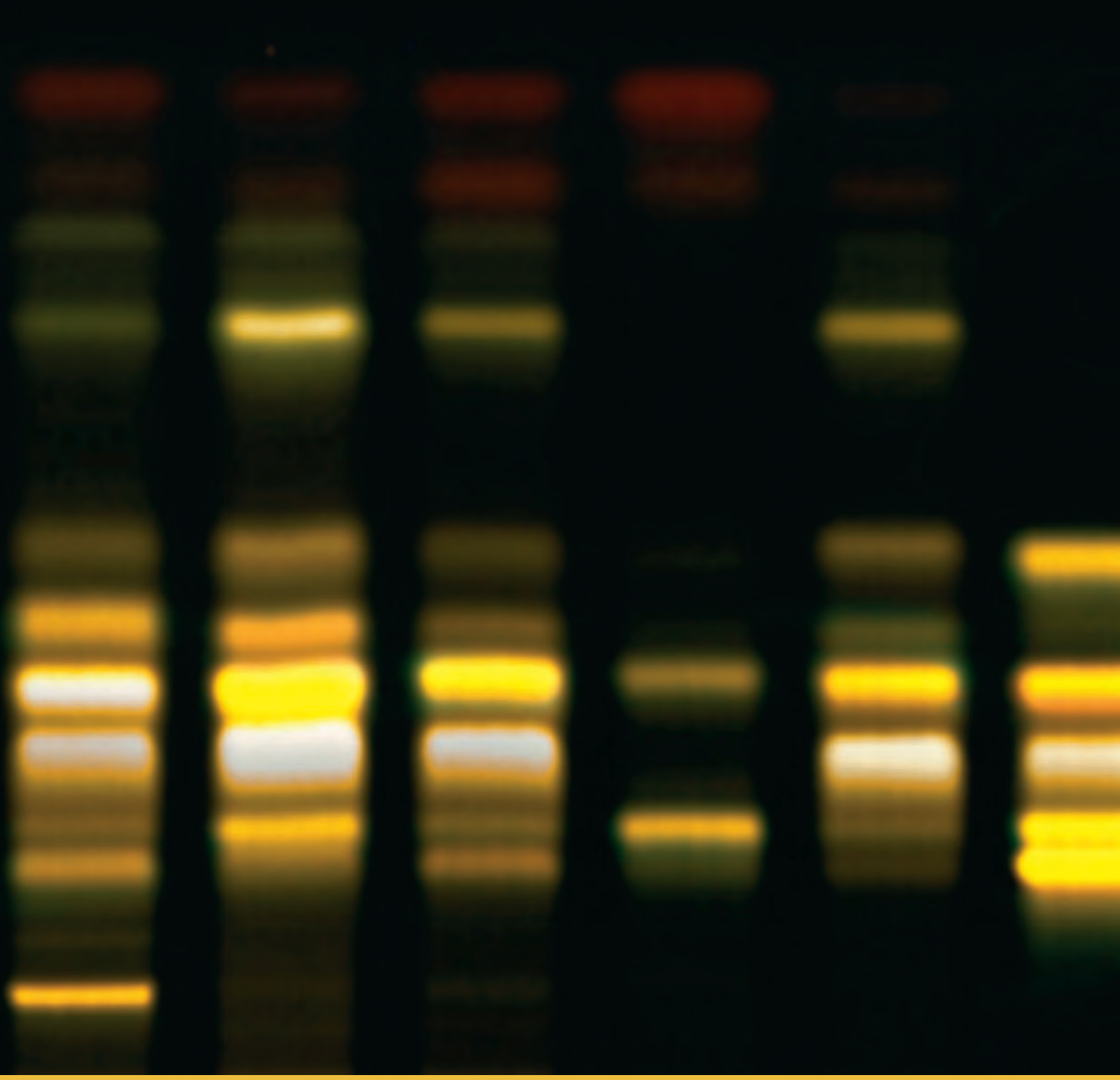
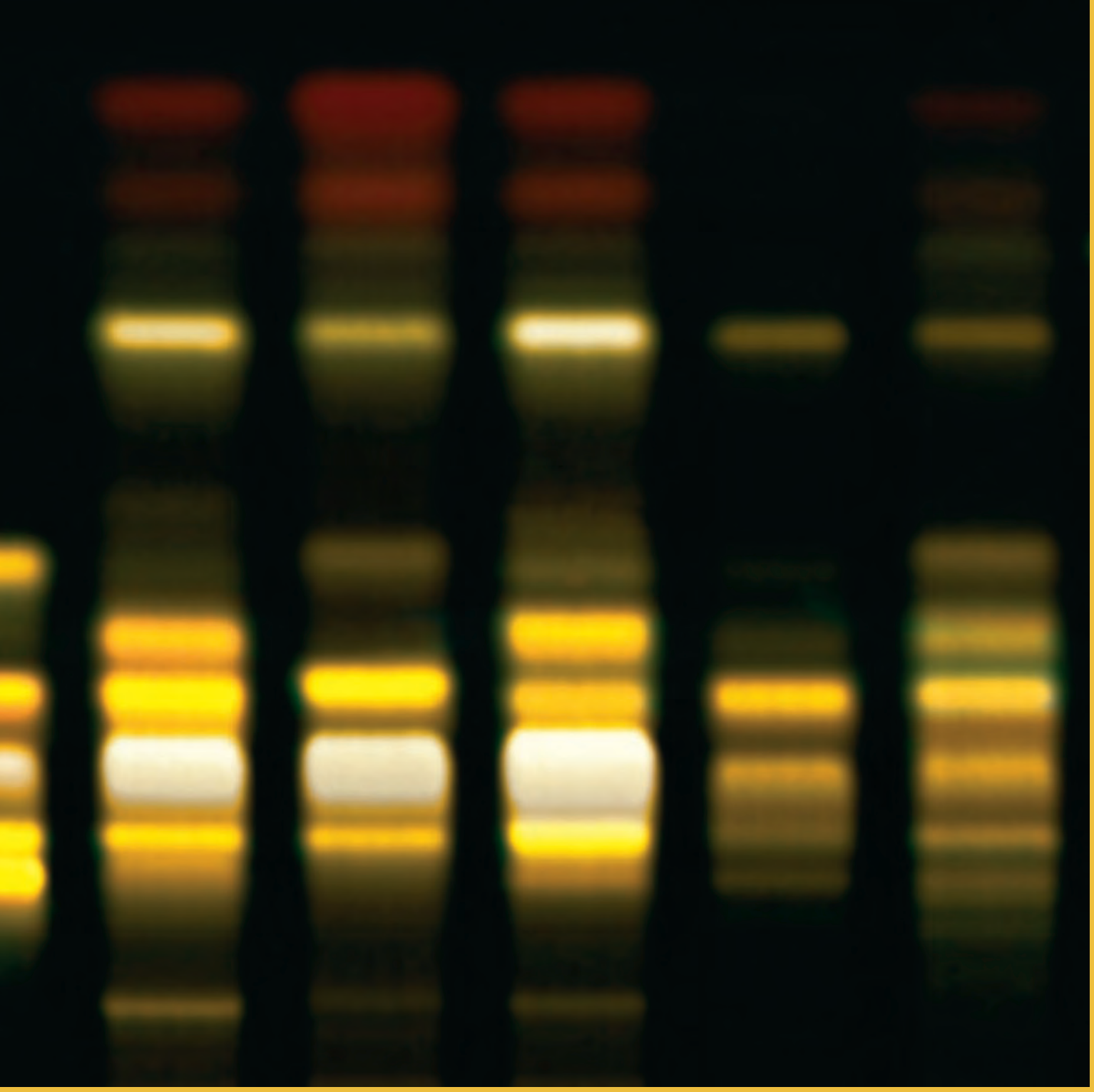


SAMPLE APPLICATION

«BASIS FOR QUALITY AND REPRODUCIBILITY
OF THE ANALYSIS»

CAMAG



SAMPLE APPLICATION

«BASIS FOR QUALITY AND REPRODUCIBILITY OF THE ANALYSIS»

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.

In Thin-Layer Chromatography manual sample application with capillaries is usually performed for simple analyses. Sample volumes of 0.5 to 5 µL can be applied as spots onto conventional layers without intermediate drying. HPTLC layers take up to 1 µL per spot.

More demanding qualitative, quantitative, and preparative analyses or separations are made possible only by instruments for bandwise application of samples using the spray-on technique. Particularly HPTLC takes full advantage of the gain in separation power and reproducibility available by precise positioning and volume dosage.

Sample application in the form of bands or rectangles

Spraying-on samples as narrow bands allows the application of significantly larger volumes. Any zone broadening that would typically be caused by chromatography during application by contact spotting can be excluded. In special cases, such as trace analysis, 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 with one short development step with a solvent of high elution strength.

ATS 4 or Linomat 5?

The Linomat 5 as a stand-alone device is the ideal instrument for sample application for instrumental and preparative Thin-Layer Chromatography. The software controlled version allows stepping up to HPTLC. Being a semi-automatic device, the Linomat 5 represents a less expensive alternative to the Automatic TLC Sampler (ATS 4) without compromising on the available quality of applied zones. The ATS 4 is commonly used if many samples have to be analyzed and if there is more demand for flexibility of the application. Whether it is switching from spot to bandwise or to rectangular application patterns, or whether changing complex application sequences from plate to plate, the ATS 4 is up to the task. That makes the ATS 4 not only the most powerful application device for the routine HPTLC facility but also for the demanding and flexible research laboratory.

In connection with the ATS 4's FreeMode software even non-TLC tasks can be performed such as applications onto nitrocellulose membranes for the production of diagnostic kits.

Heated nozzle of the ATS 4 (option)

Raising the temperature to 60 °C reduces the time for application of an aqueous sample to about one half. Especially in trace analysis the use of an ATS 4 with heated nozzle is advantageous because large volumes usually have to be applied in order to increase detection sensitivity.

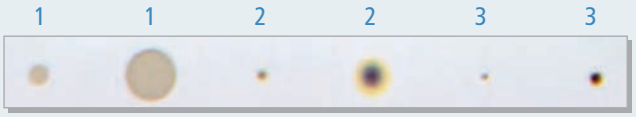
Effects of the solvent and the type of sample application on the chromatogram

i

Mobile phase: toluene
Detection: white light

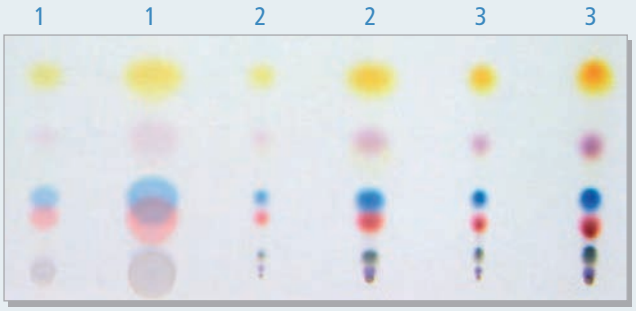
Test dye mixture (0.5 and 5 µL) dissolved in
1: methanol 2: toluene 3: hexane

a



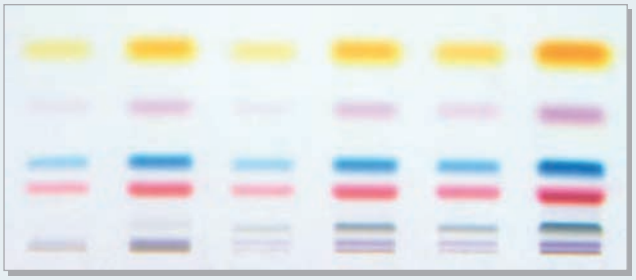
Contact application, prior to development

b



Developed plate after contact application of spots

c



Developed plate after spray-on application of bands

THE SYSTEM 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 Disposable Capillary Pipettes, which are precisely guided by the Universal Capillary Holder.

Alternative techniques for manual sample application

The tools presented here are intended for less demanding tasks in the TLC lab.

Disposable glass capillaries
Disposable glass capillaries for manual sample application of 0.5, 1, 2, 5 or 10 µL are available. They come in color-coded vials containing 100 pieces.

The capillaries are hand-held and can be positioned with the Multipurpose Spotting Guide. Manually or with the help of the Capillary Guide 022.7718 capillaries can be introduced into the Universal Capillary Holder 022.7786 and then used with the Nanomat.

Capillary Guide
The Capillary Guide 022.7718 automatically introduces the Disposable Glass Capillaries 022.7725–022.7730 into the Universal Capillary Holder 022.7786.

The Nanomat 4 is suitable for

- Conventional TLC plates including self-coated plates up to 20 x 20 cm.
- HPTLC plates 10 x 10 cm and 20 x 10 cm.
- TLC and HPTLC sheets up to 20 x 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, filled with sample solution and then placed against the applicator head of the Nanomat 4.

Ordering information

Nanomat 4 / Capillary Dispenser

022.4730 Nanomat 4, without Capillary Pipettes and Capillary Holder
022.7650 Capillary Dispenser complete: Universal Capillary Holder 022.7786, 1 Dispenser Magazine 022.7661 for 1 µL Capillaries and 1 pack of 5 x 100 Disposable Capillary Pipettes 1 µL
022.7655 Capillary Dispenser, without Capillary Pipettes
022.7786 Universal Capillary Holder

Dispenser Magazine (without Capillaries)

022.7660 0.5 µL Capillary Pipettes
022.7661 1.0 µL Capillary Pipettes
022.7662 2.0 µL Capillary Pipettes
022.7665 5.0 µL Capillary Pipettes

Disposable Capillary Pipettes (pack of 5 x 100)

022.7770 0.5 µL
022.7771 1.0 µL
022.7772 2.0 µL
022.7775 5.0 µL

Ordering information

Capillaries (vial of 100)

022.7725 0.5 µL
022.7726 1.0 µL
022.7727 2.0 µL
022.7729 5.0 µL
022.7730 10.0 µL

Miscellaneous

022.7718 Capillary Guide
022.7142 Graduated Disposable Micropipettes 5 µL, pack of 250.

LINOMAT 5

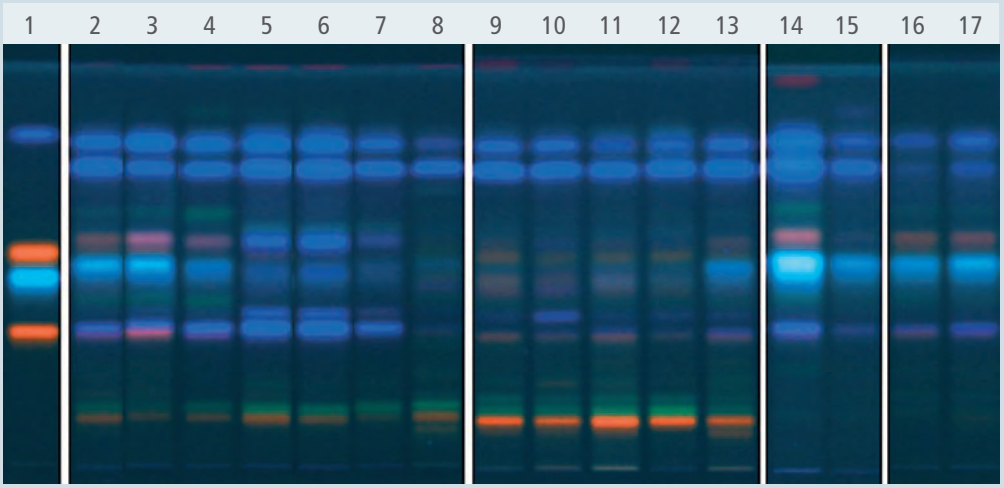
The Linomat 5 offers semi-automatic sample application for qualitative and quantitative analyses as well as for preparative separations. The instrument is suitable for routine use for medium sample throughput. In contrast to the Automatic TLC Sampler (ATS 4), changing the sample for the Linomat requires presence of an operator.

Spray-on technique

With the Linomat samples are sprayed onto the chromatographic layer in the form of narrow bands. This technique allows larger volumes to be applied than by contact transfer (spotting). During the spraying the solvent of the sample evaporates almost entirely concentrating the sample into a narrow band of selectable length. Starting zones sprayed on as narrow bands ensure the highest resolution attainable with any given Thin-Layer Chromatographic system. For qualitative and quantiative HPTLC as well as for demanding preparative separation spray-on application as bands is a necessity.

Key features

- Operation in stand alone mode or under winCATS.
- Sample application as narrow bands using the spray-on technique.
- Application of solutions onto any planar medium.
- Semi-automatic operation, only changing of sample (cleaning, filling and replacing the syringe) is performed manually.



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

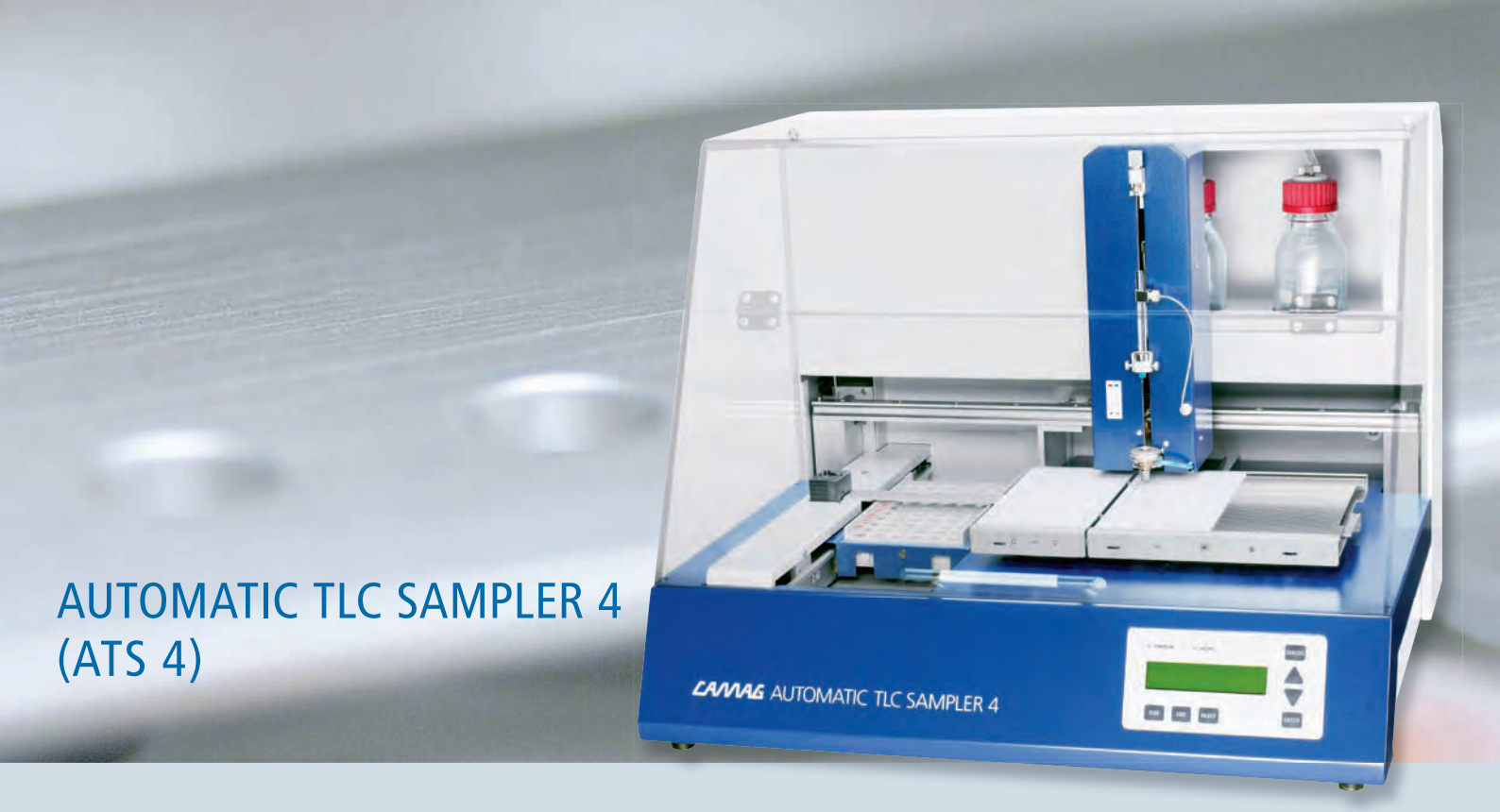
Note
for comparison tracks are taken from different plates.

Note

The Linomat 5 with winCATS is compliant with the requirements of GMP/GLP and can be IQ/OQ qualified. If you want to use the instrument in a 21 CFR Part 11 environment, the option 21 CFR Part 11 «compliance ready» is required for each winCATS workstation.

Ordering information

Ordering information can be found in the special brochure «Linomat 5» or on www.camag.com/linomat.



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.

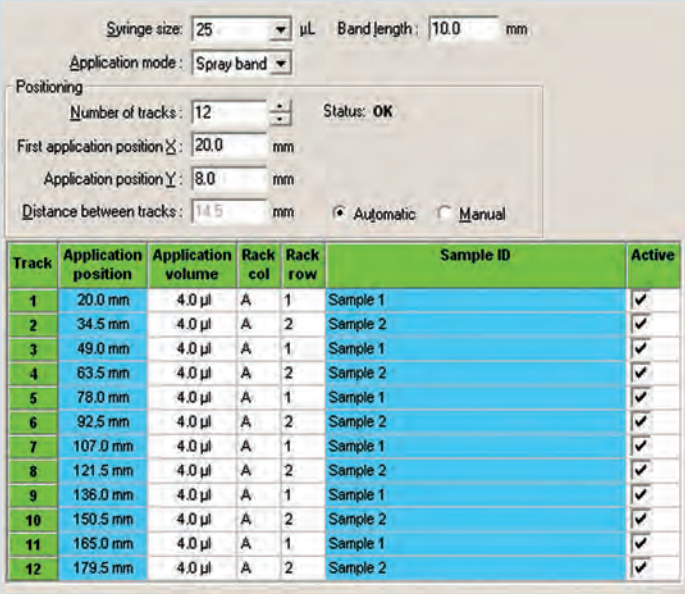
Samples are either applied as spots through contact transfer (0.1–5 µL) or as bands or rectangles (0.5 to > 50 µL) using the spray-on technique. Starting zones sprayed on as narrow bands offer the best separation attainable with a given chromatographic system. Application in the form of rectangles allows 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 prechromatographic derivatization, spiking, etc.

Key features

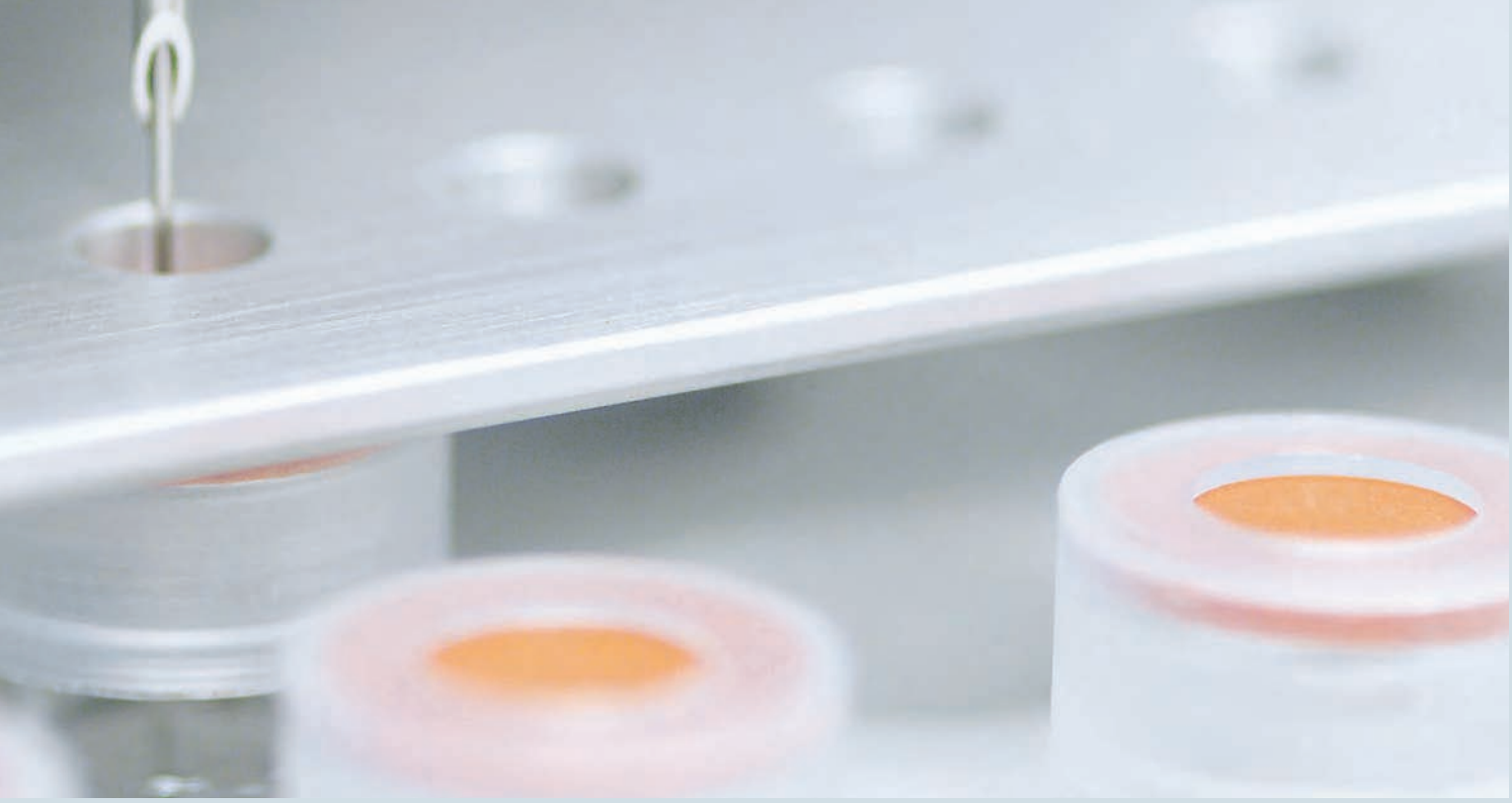
- Fully automatic sample application, suitable for routine.
- Application of spots, bands, or rectangles.
- Data input and monitoring through winCATS.
- Application of solutions onto any planar medium.
- Application of sample volumes between 0.1 and 5 µL by contact transfer.
- Spray-on application of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

Simple and convenient to use



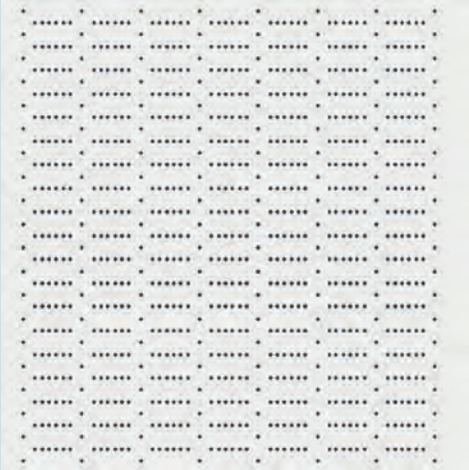
Track	Application position	Application volume	Rack col	Rack row	Sample ID	Active
1	20.0 mm	4.0 µl	A	1	Sample 1	✔
2	34.5 mm	4.0 µl	A	2	Sample 2	✔
3	49.0 mm	4.0 µl	A	1	Sample 1	✔
4	63.5 mm	4.0 µl	A	2	Sample 2	✔
5	78.0 mm	4.0 µl	A	1	Sample 1	✔
6	92.5 mm	4.0 µl	A	2	Sample 2	✔
7	107.0 mm	4.0 µl	A	1	Sample 1	✔
8	121.5 mm	4.0 µl	A	2	Sample 2	✔
9	136.0 mm	4.0 µl	A	1	Sample 1	✔
10	150.5 mm	4.0 µl	A	2	Sample 2	✔
11	165.0 mm	4.0 µl	A	1	Sample 1	✔
12	179.5 mm	4.0 µl	A	2	Sample 2	✔

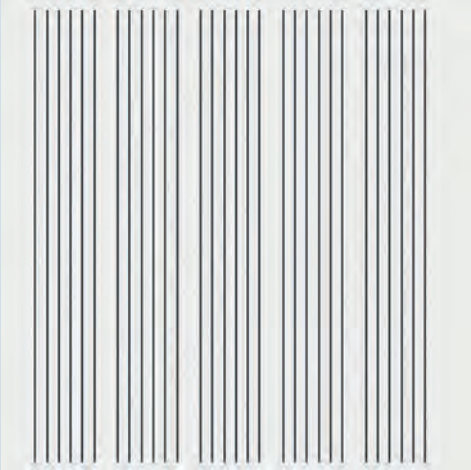
The individual tabs of winCATS offer simplified and userfriendly default settings in a clear layout.
For example: tracks can be spaced automatically over the entire plate and sample names can be selected from a drop down list.

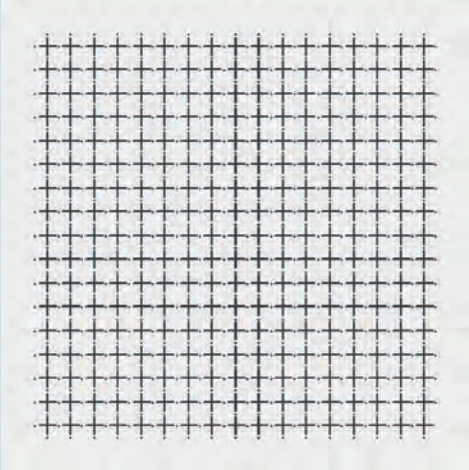


Flexiblity of the FreeMode-software

The optional FreeMode program of winCATS increases the flexibility of the ATS 4 further and allows application of solutions onto any planar medium (for instance nitro cellulose membranes) for various tasks other than Thin-Layer Chromatography.





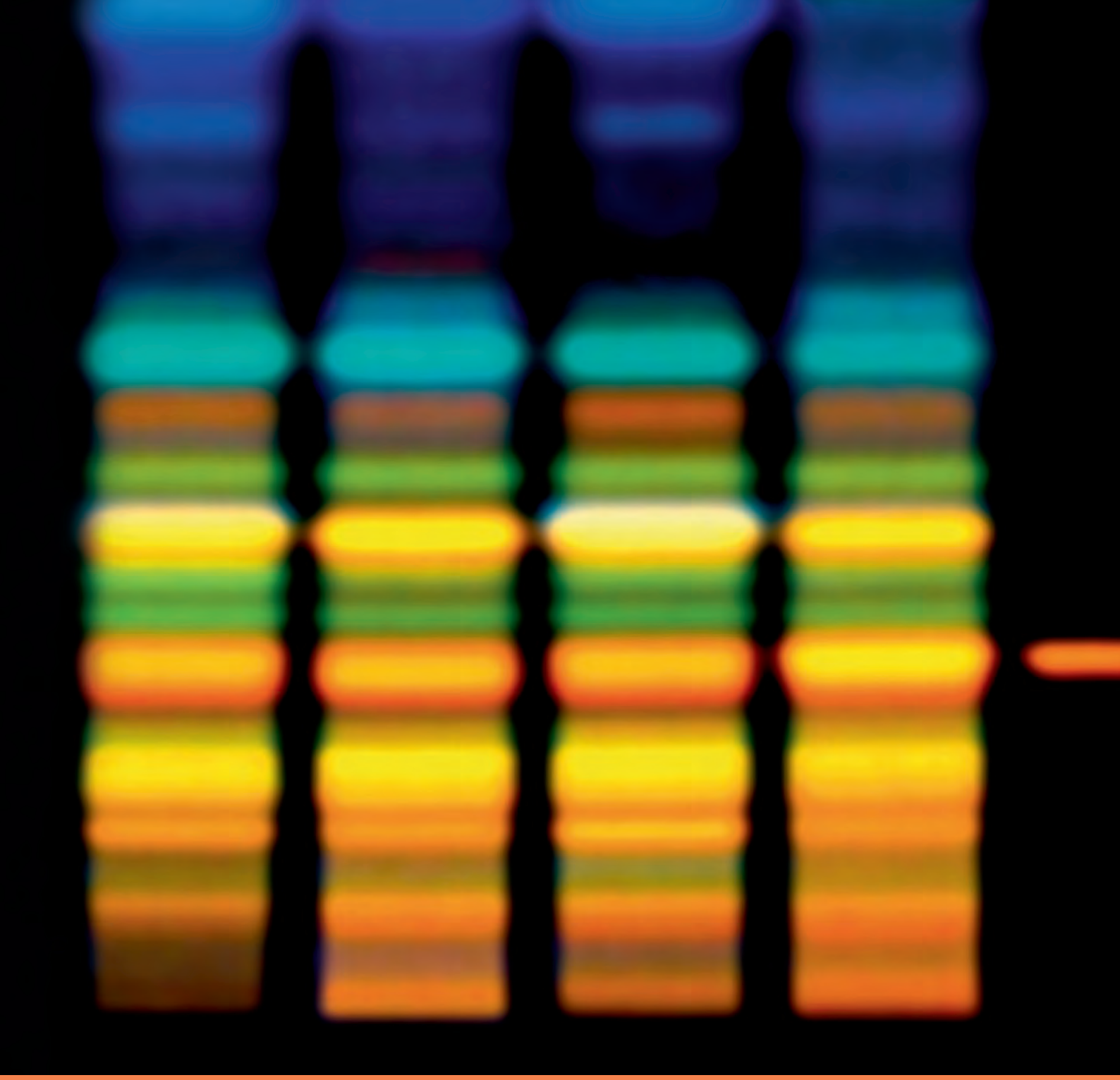


Note

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

Ordering information

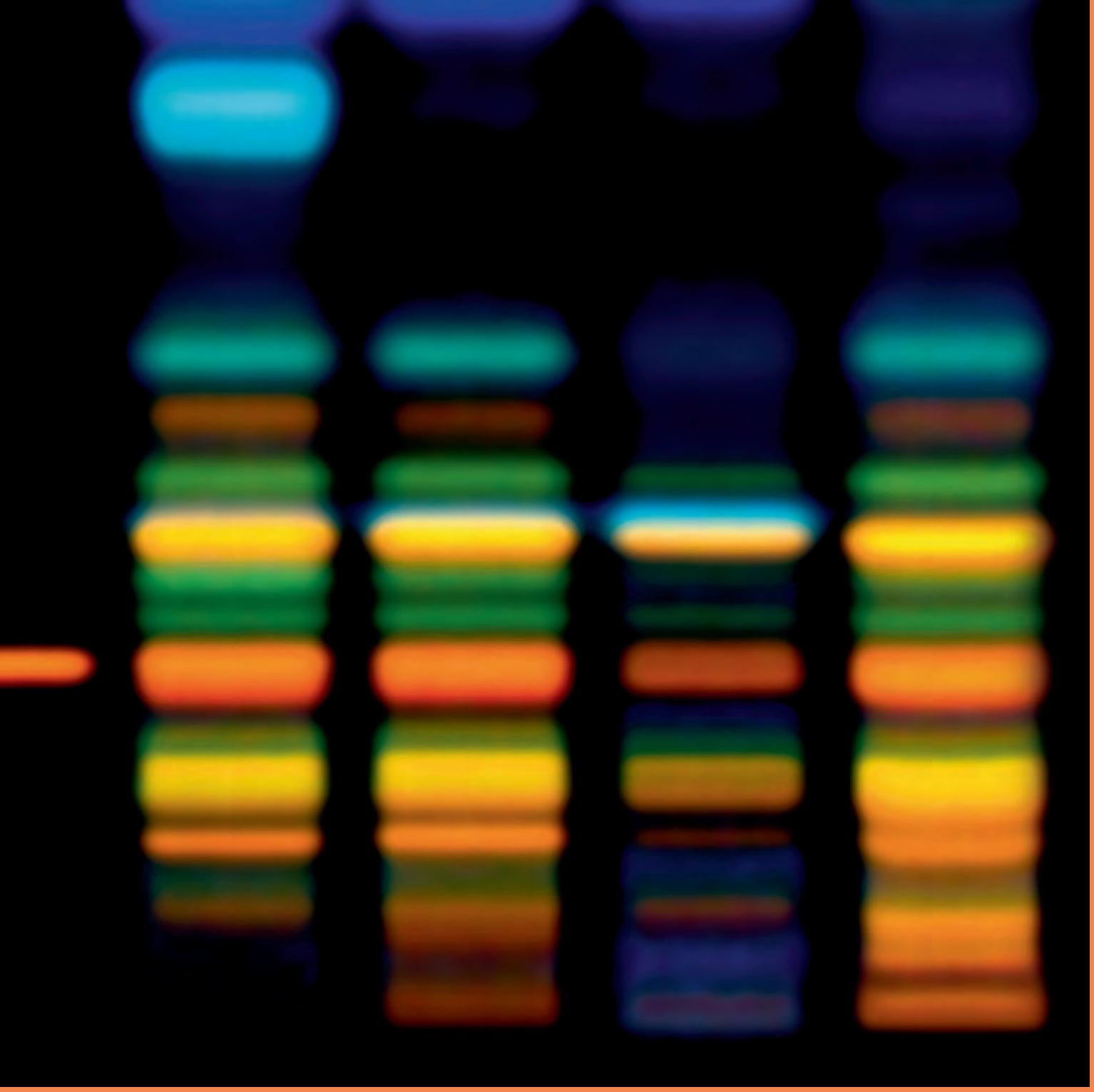
Ordering information can be found in the special brochure «Automatic TLC Sampler 4 (ATS4)» or on our website www.camag.com/ats.



CHROMATOGRAM DEVELOPMENT

«CONTROLLING THE GAS PHASE IS KEY TO REPRODUCIBLE SEPARATION»

CAMAG



CHROMATOGRAM DEVELOPMENT

«CONTROLLING THE GAS PHASE IS KEY TO REPRODUCIBLE SEPARATION»

Thin-layer chromatography differs from all other chromatographic techniques in the fact that in addition to stationary and mobile phases, a gas phase is present. This gas phase can significantly influence the result of the separation.

Processes in the Developing Chamber

The «classical» way of developing a chromatogram is to place the plate in a chamber, which contains a sufficient amount of developing solvent.

The lower end of the plate should be immersed several millimeters. Driven by capillary action the developing solvent moves up the layer until the desired running distance is reached and chromatography is stopped. The following considerations primarily concern silica gel as stationary phase and developments, which can be described as adsorption chromatography.

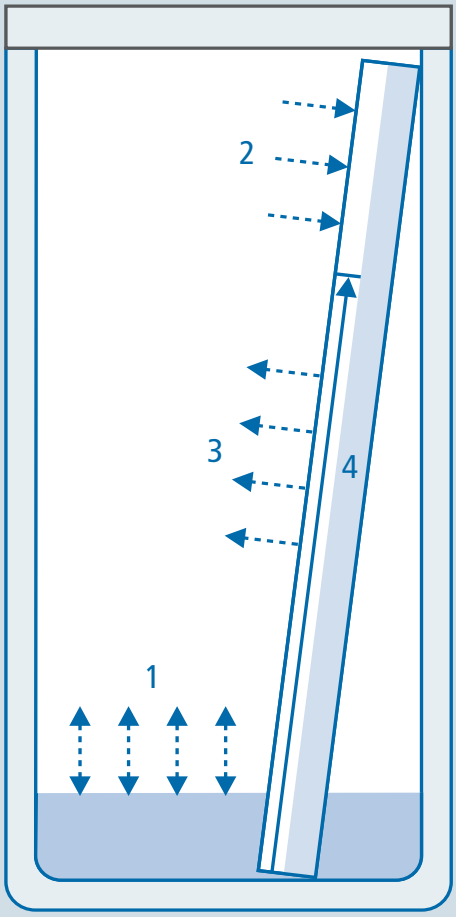
Provided the chamber is closed, four partially competing processes occur:

1 Between the components of the developing solvent and their vapor, an equilibrium will be established eventually (1). This equilibrium is called chamber saturation. Depending on the vapor pressure of the individual components the composition of the gas phase can differ significantly from that of the developing solvent.

2 While still dry, the stationary phase adsorbs molecules from the gas phase. This process, adsorptive saturation, is also approaching an equilibrium in which the polar components will be withdrawn from the gas phase and loaded onto the surface of the stationary phase (2).

3 Simultaneously the part of the layer which is already wetted with mobile phase interacts with the gas phase. Thereby especially the less polar components of the liquid are released into in the gas phase (3). Unlike (1) this process is not as much governed by vapor pressure as by adsorption forces.

4 During migration, the components of the mobile phase can be separated by the stationary phase under certain conditions, causing the formation of secondary fronts.



In connection with the development process, the following aspects should be considered:

With the exception of single component liquids (neat solvents), developing solvent and mobile phase are, strictly speaking, not the same. Their composition changes with progressing chromatography. Unfortunately the terms «developing solvent» and «mobile phase» are often used as synonyms. In the true sense only the liquid in the chamber should be called developing solvent, while the liquid moving through the layer constitutes the mobile phase. Only the composition of the developing solvent at the time when it is placed into the chamber is positively known. The processes (1) and (2) can be experimentally affected by:

- Fitting the chamber more or less completely with filter paper soaked with developing solvent.
- Waiting a certain time between the introduction of developing solvent into the chamber and the beginning of chromatography – chamber saturation.
- Allowing the plate to interact with the gas phase prior to chromatographic development, i.e. without contact to the developing solvent – preconditioning.

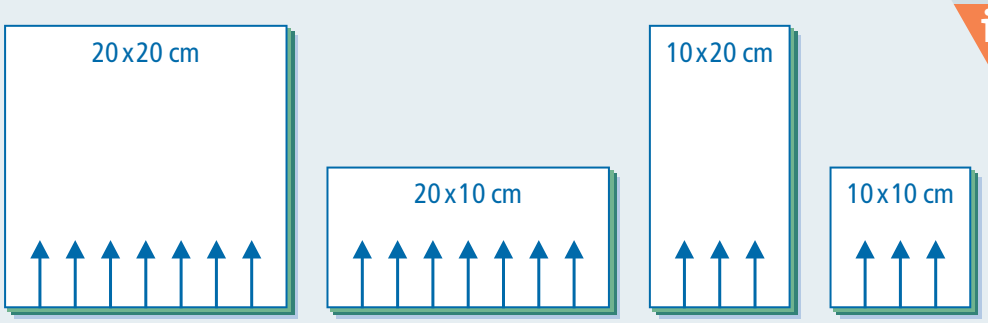
An interaction according to (2) and (3) can be effectively prevented by placing a counter plate at a distance of one or a few millimeters to the chromatographic layer. This is called «sandwich configuration». The further an equilibrium according to (1) and/or (2) has been established and the less different the components of the mobile phase are in respect to their adsorption behavior, the less pronounced is the formation of secondary fronts resulting from (4). In well-saturated chambers and on preconditioned layers secondary fronts are often not observed. In sandwich configuration and particularly in OPLC secondary fronts are very prominent.

During chromatography, components of the developing solvent, which have been loaded onto the dry layer via the gas phase according to (2), are pushed ahead of the true but invisible solvent front. Exceptions are very polar components such as water, methanol, acids, or bases. This results in R_F values being lower in saturated chambers and particularly on pre-conditioned layers, than in unsaturated chambers and sandwich configurations.

Note that due to possible demixing of the solvents and possible beta fronts, development in sandwich configuration or in an unsaturated horizontal developing chamber works best with single component solvents or multi component solvents behaving like single component solvents.

Definition of plate and chamber formats

These format definitions are used in this catalog as well as in all CAMAG literature.
Note: some plates can be developed in one direction only, e.g. plates with a concentration zone, GLP coded plates, etc. When you order plates make sure you understand the manufacturer's size definitions.



Consequences

Thin-layer Chromatography in most cases proceeds in a non-equilibrium between stationary, mobile, and gas phase. For this reason it is very difficult to correctly describe the conditions in a developing chamber.

Reproducible chromatographic results can only be expected when all parameters are kept as constant as possible. Chamber shape and saturation are playing a predominant role in this regard. Unfortunately this means that the chromatographic result is different in each chamber!

There are neither «good» nor «poor» chambers! However, in some chambers the parameters can be better controlled, i.e. reproduced, than in others.

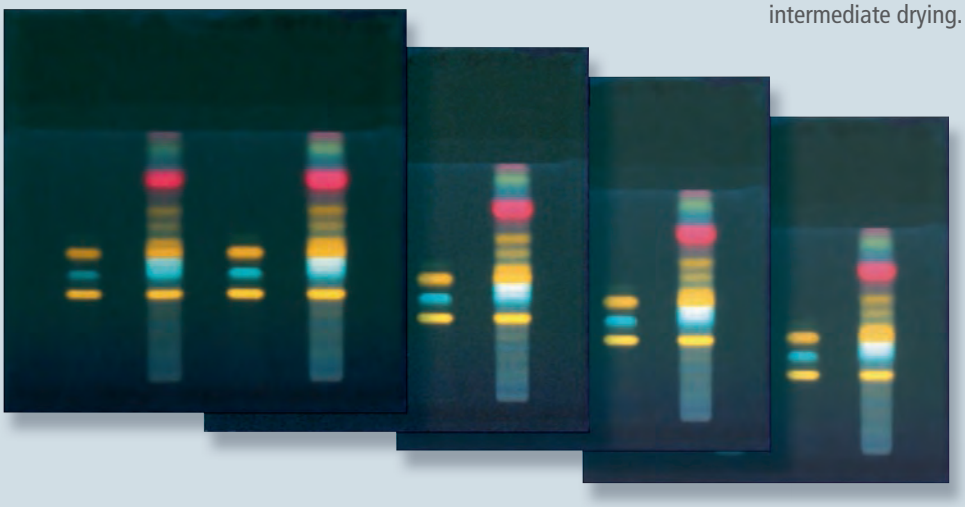
Choosing a developing chamber

Selection of the «proper» chamber is done during method development and generally follows «practical» considerations 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. However, a focus should also be on economical aspects such as time requirement and solvent consumption. A selection of glass chambers can be found on pages 20–21.

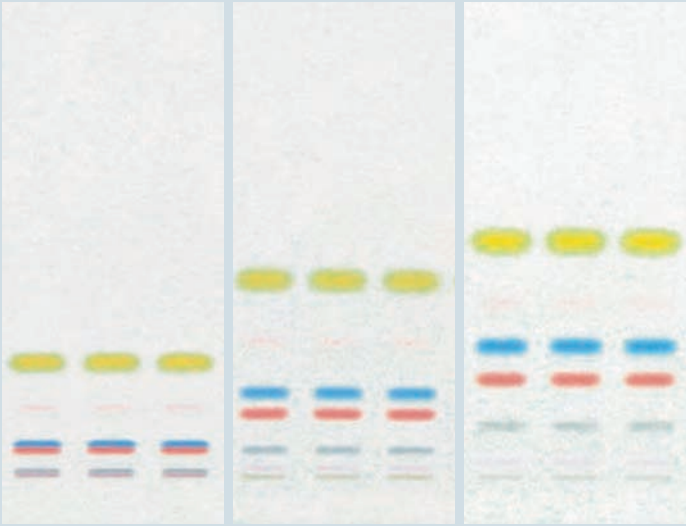
The **Horizontal Developing Chambers** (page 21) have proven to be exceptionally economical, flexible and reproducible in operation. Although designed for applications where the plate is developed from two sides, they are also suitable for single-sided developments in unsaturated, saturated and sandwich configuration as well as for preconditioning of HPTLC plates.

The **Automatic Developing Chamber (ADC 2)** is unsurpassed for reproducibility and universal applicability in HPTLC. This instrument does not only eliminate any effects of the operator when introducing the plate into a saturated chamber, but also the activity of the layer prior to start of chromatography can be set and drying of the chromatographed plate is rapid and complete. For development a conventional 20 x 10 cm Twin Trough Chamber is used. This way chamber geometry and chromatographic conditions of already existing analytical procedures can be retained, but environmental and operational effects are standardized. Read more about the ADC 2 on page 22.

In case the sample contains polar and non-polar components, which must be separated in the same analysis, the principle of **Automated Multiple Development (AMD)** can be employed. Development is performed on the basis of a solvent gradient from polar to non-polar over several steps with intermediate drying. AMD 2 see page 23.

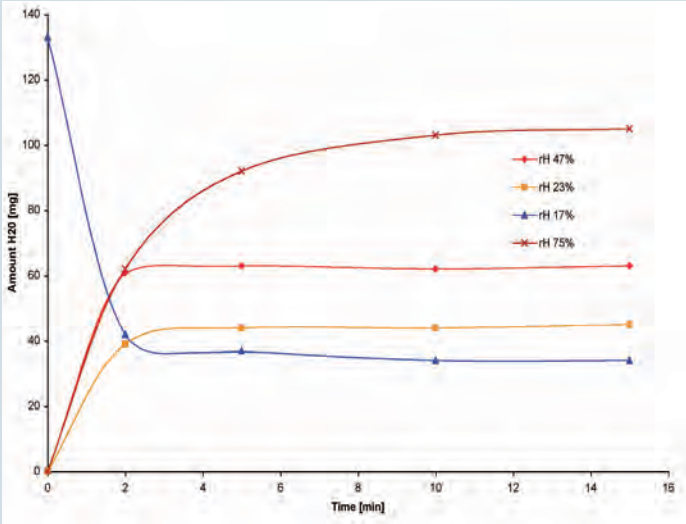


Reproducible chromatogram development, here several plates under UV 366 nm



rH 18 % *rH 47 %* *rH 75 %*

Influence of the activity of the layer (relative humidity) on the separation at equal migration distance



The desired activity is set in only a few minutes

TWIN TROUGH CHAMBER

CAMAG Twin Trough chambers offer several ways to specifically affect the TLC/HPTLC separation in order to improve it.

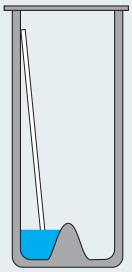
FLAT BOTTOM CHAMBER

The CAMAG Flat Bottom chamber permits the chromatogram to be developed under conditions of partial or complete saturation of the tank atmosphere with solvent vapors. The degree of layer pre-saturation can not be controlled unless additional accessories are used.

Twin Trough Chamber: Low solvent consumption

1

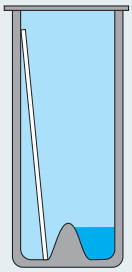
20 mL of solvent are sufficient for a 20 x 20 cm chamber, 10 mL for the 20 x 10 cm chamber and 5 mL for a 10 x 10 cm chamber. This reduced not only solvent consumption but also the desposal problem.



Reproducible pre-equilibration with solvent vapor

2

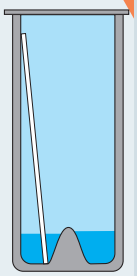
Developing solvent is placed in the through opposite to the plate. Pre-conditioning can be performed with any solvent and for any duration.



Start of development

3

Development is started only when developing solvent is introduced into the trough with the plate.



Ordering information Twin Trough Chamber

i

20 x 20 cm plates
022.5256 with stainless steel lid
022.5255 with glass lid
022.5258 without lid

20 x 10 cm plates
022.5254 with stainless steel lid
022.5253 with glass lid
022.5251 without lid

10 x 10 cm plates
022.5155 with stainless steel lid
022.5156 without lid

10 x 5 cm plates
022.5165 with stainless steel lid
022.5166 without lid

Twin Trough Chamber light-weight
022.5285 for 20 x 20 cm plates with glass lid
022.5280 for 20 x 10 cm plates with glass lid

Ordering information Flat Bottom Chamber

i

20 x 20 cm plates
022.5259 with stainless steel lid
022.5250 with glass lid
022.5257 without lid

10 x 10 cm plates
022.5150 with stainless steel lid
022.5151 without lid

Twin Trough Chamber light-weight
022.5275 for 20 x 20 cm plates, with glass lid
022.5270 for 20 x 10 cm plates, with glass lid

Ordering information Chamber lids

i

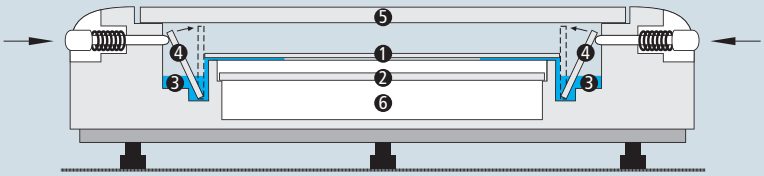
022.5265 Stainless steel lid to fit 20 x 20 cm and 20 x 10 cm chambers*
022.5102 Stainless steel lid for 10 x 10 cm chambers
022.5252 Glass lid for 20 x 20 cm and 20 x 10 cm chambers*
022.5279 Glass lid for all light-weight chambers, 20 x 20 and 20 x 10 cm

*not for light-weight chambers

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 the CAMAG Horizontal Developing Chamber, a plate can be developed in the sandwich as well as in the tank configuration. The chamber is suitable for all kinds of solvents.



1 HPTLC plate (layer facing down)

2 Glass plate for sandwich configuration

3 Reservoir for developing solvent

4 Glass strip

5 Cover plate

6 Conditioning tray

smartALERT SOLVENT FRONT MONITOR

smartALERT for dependable monitoring of TLC/HPTLC plate development in a glass development chamber.

- Guarantees that the developing distance will always be accurate and according to the method.
- Replaces the timer or stop watch.
- Works with glass chambers for plate sizes 20 x 20 cm, 20 x 10 cm and 10 x 10 cm.
- Gives acoustic and visual notice when the mobile phase has reached the desired developing distance.
- Runs on batteries: up to 1000 developments.

Ordering information

Horizontal Developing Chamber
022.8530 for 10 x 10 cm plates
022.8535 for 20 x 10 cm plates

Ordering information

smartALERT Solvent Front Monitor
022.5300 smartALERT Solvent Front Monitor

Filter carton for chamber saturation
022.5244 Saturation Pads, pack of 100

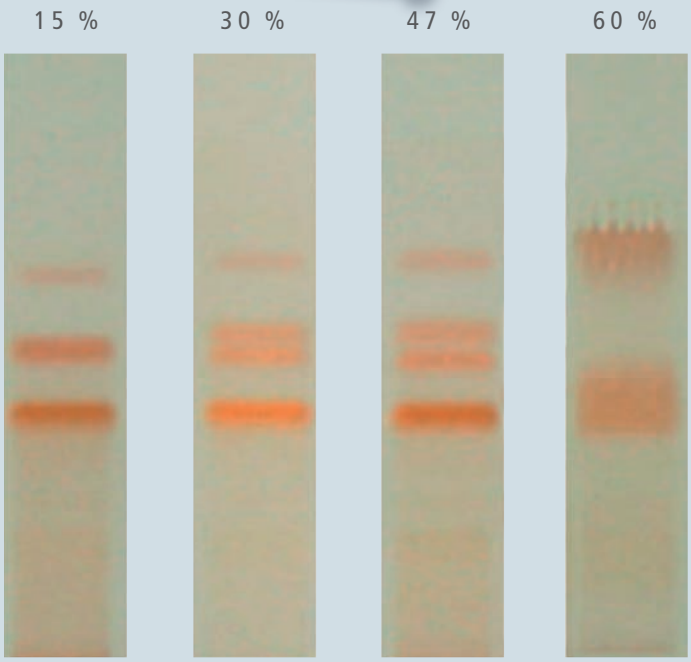
AUTOMATIC DEVELOPING CHAMBER ADC 2

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

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

Key features

- Fully automatic development of 20 x 10 cm TLC/HPTLC plates.
- A conventional 20 x 10 cm Twin Trough Chamber is used for development. This way chamber geometry and chromatographic conditions of already existing analytical procedures can be retained, but environmental and operational effects are excluded.
- Operation in stand-alone mode or under winCATS.
- The user is freed of all process monitoring responsibilities, operation is fully tracable.
- The option «Humidity Control» allows reproducible chromatography at defined activity of the layer.



Effect of relative humidity on separation of polyphenols in green tea

Mobile phase: toluene, acetone, formic acid (9:9:2)
Detection: Fast Blue Salt B

Note

The ADC 2 with winCATS is compliant with the requirements of GMP/GLP and can be IQ/OQ qualified. If you want to use the instrument in a 21 CFR Part 11 environment, the option 21 CFR Part 11 «compliance ready» is required for each winCATS workstation.

Ordering information

Ordering information can be found in the special brochure «Automatic Developing Chamber ADC 2» or on www.camag.com/adc2

THE AMD 2 SYSTEM: GRADIENT ELUTION IN THIN-LAYER CHROMATOGRAPHY

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 elution with silica gel as the stationary phase. In column liquid chromatography, gradient elution is common on reversed phases only because a silica gel column would call for a time consuming reconditioning or be irreversibly degraded, which is not acceptable in a technique depending on multiple use of the stationary phase. In Thin-Layer chromatography this is not relevant.

AMD = Automated Multiple Development

The principle of the CAMAG AMD procedure

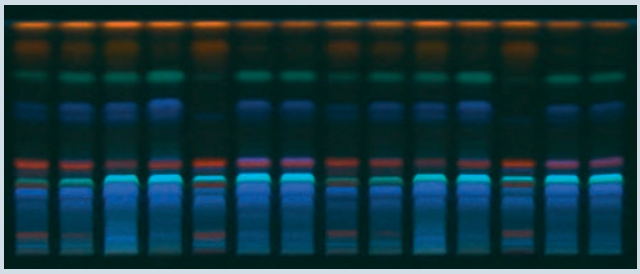
- The HPTLC plate is developed repeatedly in the same direction.
- Each successive run extends over a longer solvent migration distance than the one before.
- Between runs, the solvent is completely removed from the developing chamber and the layer is dried under vacuum.
- Each successive run uses a 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, with 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, 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 can be shown graphically for verification. Then all individual runs of the developing program are performed fully automatic and monitored by winCATS.

Key features

- Multiple development, gradient elution.
- Separation power improved over regular HPTLC by a factor 3.
- Data input and monitoring through winCATS.
- Utilizing time also after working hours.



Separation of various rhubarb samples by AMD

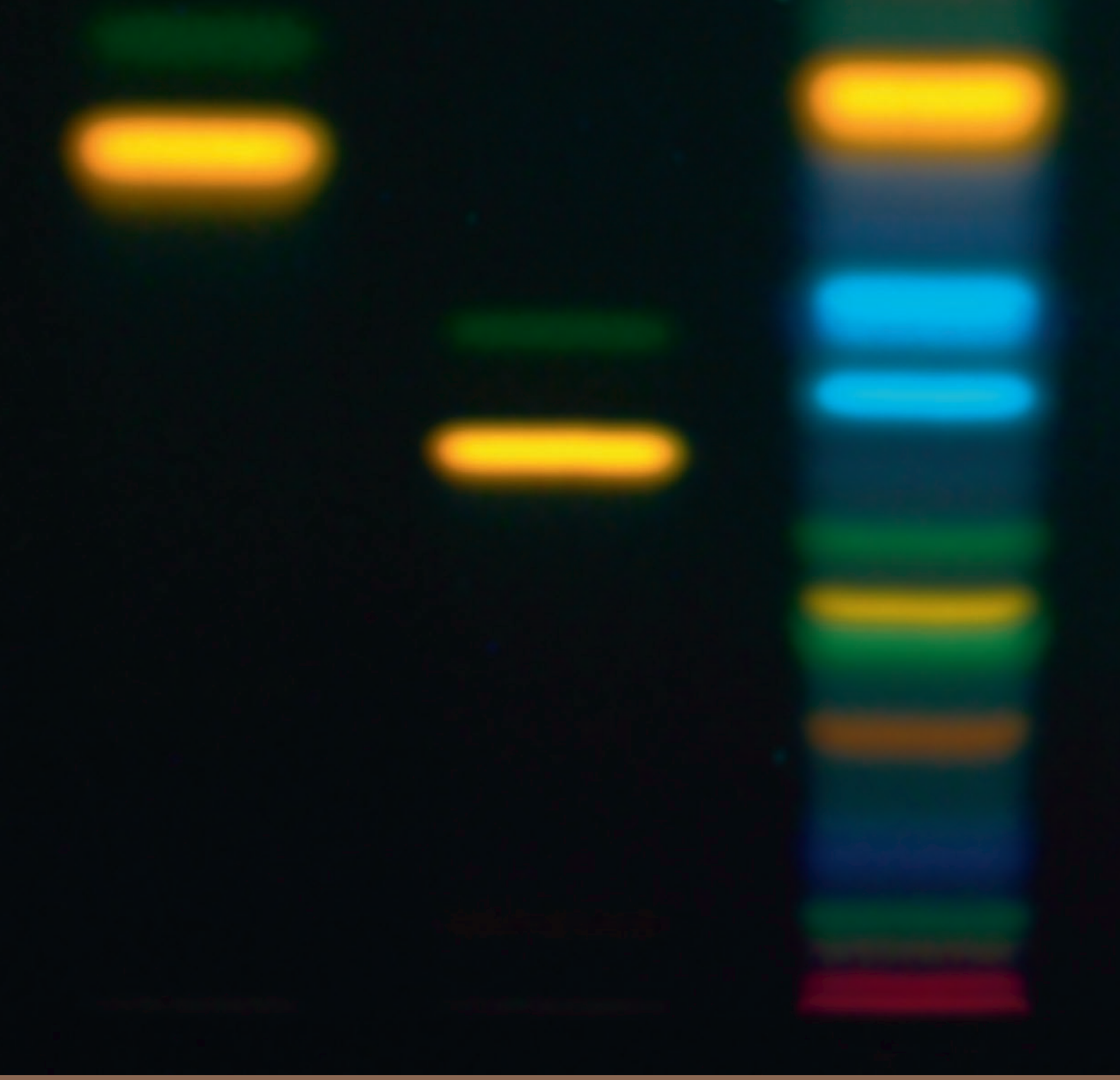
Detection: UV 366 nm
Mobile phase: gradient in 10 steps: methanol – dichloromethane (40:60) to (10:90) in 9 steps, 40 mm developing distance, then one isocratic step methanol – dichloromethane (10:90) over 70 mm developing distance

Note

The AMD 2 with winCATS is compliant with the requirements of GMP/GLP and can be IQ/OQ qualified. If you want to use the instrument in a 21 CFRPart 11 environment, the option 21 CFR Part 11 «compliance ready» is required for each winCATS workstation.

Ordering information

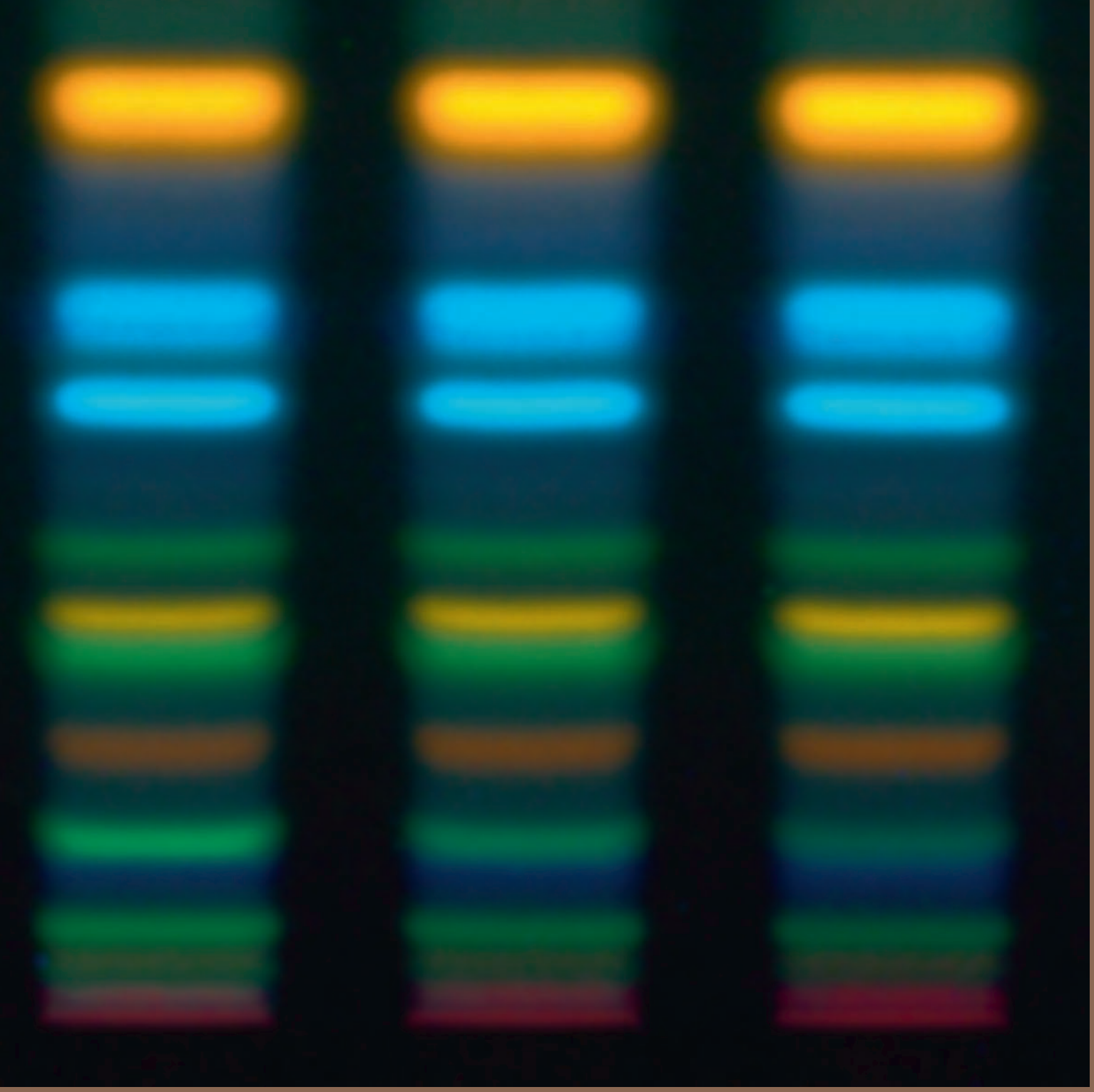
Ordering information can be found in the special brochure «AMD 2 System» or on www.camag.com/amd2.



DERIVATIZATION

«MORE INFORMATION AND BETTER DETECTION
THROUGH CHEMICAL REACTION»

CAMAG



DERIVATIZATION

«MORE INFORMATION AND BETTER DETECTION THROUGH CHEMICAL REACTION»

Postchromatographic Derivatization

It is an inherent advantage of Thin-Layer Chromatography that fractions remain stored on the plate and can be derivatized after chromatography. By derivatization 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.

1. Changing non-absorbing substances into detectable derivatives
2. Improving the detectability (lowering detection limits)
3. Detecting all sample components
4. Selectively detecting certain substances
5. Inducing fluorescence

From a technical point of view only one principal decision must be made: how to transfer the reagent to the plate? Derivatization can be achieved with gas, by liquid spraying or dipping (immersion). In any case the reagent needs to be homogenously transferred to the chromatogram.

By immersing a TLC plate into the derivatizing reagent a very homogenous reagent transfer can be achieved. Dipping and withdrawing has to be performed smoothly in order to avoid tidemarks. Using the Chromatogramm Immersion Device (page 28) the reproducibility of the derivatization step can be significantly improved compared to spraying. Furthermore, no fumes are generated during this derivatization technique and the exposure to hazardous chemicals is limited.

If the reagent is suitable, dipping should be preferred over spraying.

However, the fact is that spraying is most widely used for reagent transfer onto the TLC plate because it is simple and quick. No expensive equipment is necessary and only small volumes of reagent are needed. In addition spraying is very flexible and indispensable when reagents have to be applied in sequence. Also during method development, when searching for the most suitable reagent, spraying is more frequently mentioned.

Spraying on the other side generates substantial amounts of obnoxious and hazardous fumes, which must be carefully removed using e.g. the TLC Spray Cabinet (page 29).

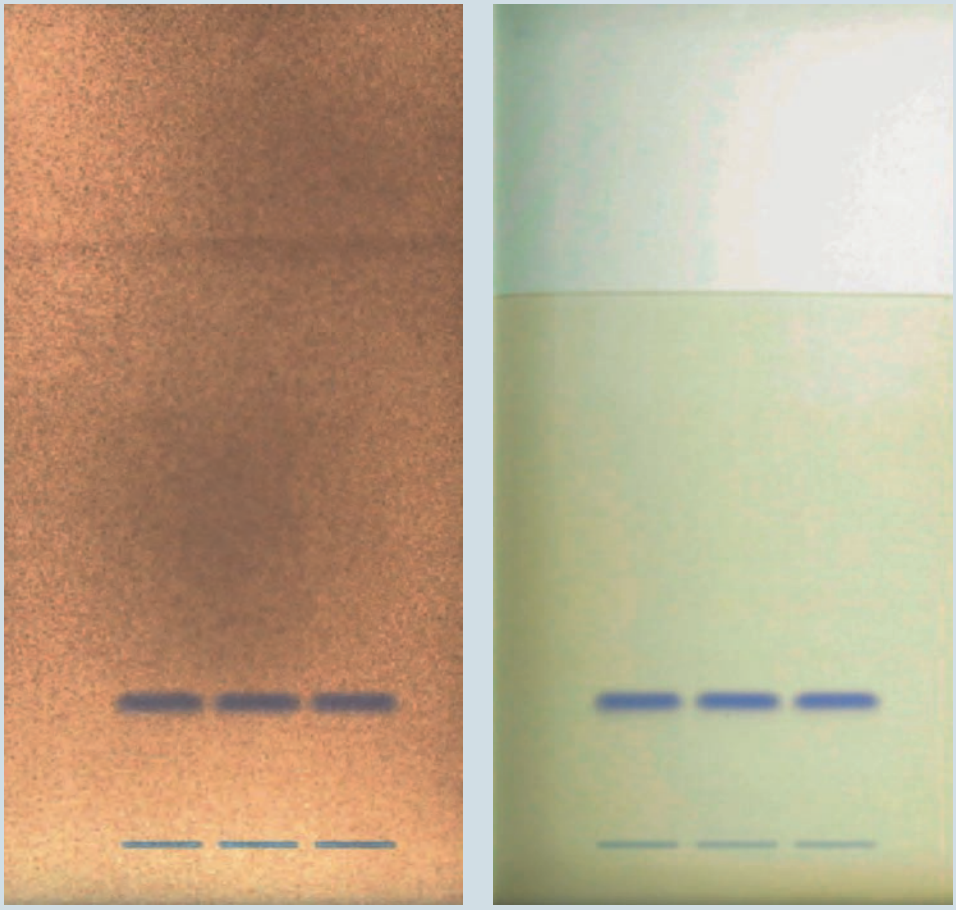
During spraying, particularly for quantitative evaluation, it must be ensured that a homogenous fine spray mist is generated. Reproducibility of derivatization by spraying is greatly dependent on the skill of the operator. Most chemical reactions used in derivatization require heating for completion. The two principal heating devices are ovens and plate heaters. Ovens have two major shortcomings: One, fumes from derivatization agents can be corrosive and two, cross contamination may become an issue. It is therefore advantageous to use a TLC Plate Heater (page 29) designed to homogenously heat the TLC plate to the selected temperature. If visualization is not required, derivatization may not be advantageous. For example, progesterone has a chromophor and absorbs UV light at 254 nm, it can thus be analyzed without derivatization. If necessary, the substance can be visualized by derivatization with sulfuric acid. The comparison of the standard deviation for the densitometric evaluation of derivatized and non-derivatized progesterone is given below.

The best results are obtained without derivatization, derivatization by spraying yields the least reproducible results across the plate.

Evaluation of Progesterone

	No derivatization	Derivatization by immersion	Derivatization by spraying
Densitometry	Abs. 254 nm	Abs. 536 nm	Abs. 536 nm
Progesterone, CV of 16 samples, 6 mm bands	1.1 %	2.4 %	2.9 %

Spraying or 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)

Note

CAMAG offers a complete selection of instruments for post chromatographic derivatization on pages 28–29.

CHROMATOGRAM IMMERSION DEVICE

For proper execution of the dipping technique, the chromatogram must be immersed and withdrawn at a controlled uniform speed. By maintaining a well defined vertical speed and immersion time, derivatization conditions can be standardized and «tide marks», which can interfere with densitometric evaluation, are avoided.

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.
- The device can be set to accommodate 10 cm and 20 cm plate height.
- Battery operated, independent of power supply.

TLC/HPTLC SPRAYER

The TLC Sprayer consists of a charger and a pump unit with two kinds of spray heads.

- Spray head type A
  is for spray solutions of normal viscosity, e.g. lower alcohol solutions.
- Spray head type B
  is for liquids of higher viscosity, e.g. sulfuric acid reagents.

Key features

- Easy to use, with electro-pneumatic spray function.
- Formation of fine aerosol with particles of 0.3 to 10 µm.
- Homogenous distribution with low reagent consumption.

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.

Ordering information

022.6606 Chromatogram Immersion Device III for plates up to 20 x 20 cm, without dip tank
022.6627 Dip tank (sintered sheet glass) for plates 20 x 20 cm, with lid
022.6628 Dip tank (sintered sheet glass) for plates 20 x 10 cm, with lid
022.6622 Lid, polyethylene, for dip tanks 20 x 20 cm and 20 x 10 cm
022.6619 Bench top rack for three dip tanks

Ordering information

TLC/HPTLC Sprayer

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

Spares and consumables

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

Reagent Sprayer

022.6100 Reagent Sprayer, all glass, with 100 mL Erlenmeyer flask

TLC SPRAY CABINET

The TLC Spray Cabinet ensures the complete removal of reagent mist while spraying TLC plates.

There is no deflection of the spray mist before it reaches the chromatogram, an effect often occurring in a normal laboratory fume hood. The TLC Spray 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 x 490 x 490 mm (width x depth x height).

TLC PLATE HEATER

The TLC Plate Heater III is designed for heating TLC plates to a given temperature, while ensuring homogenous heating across the plate.

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

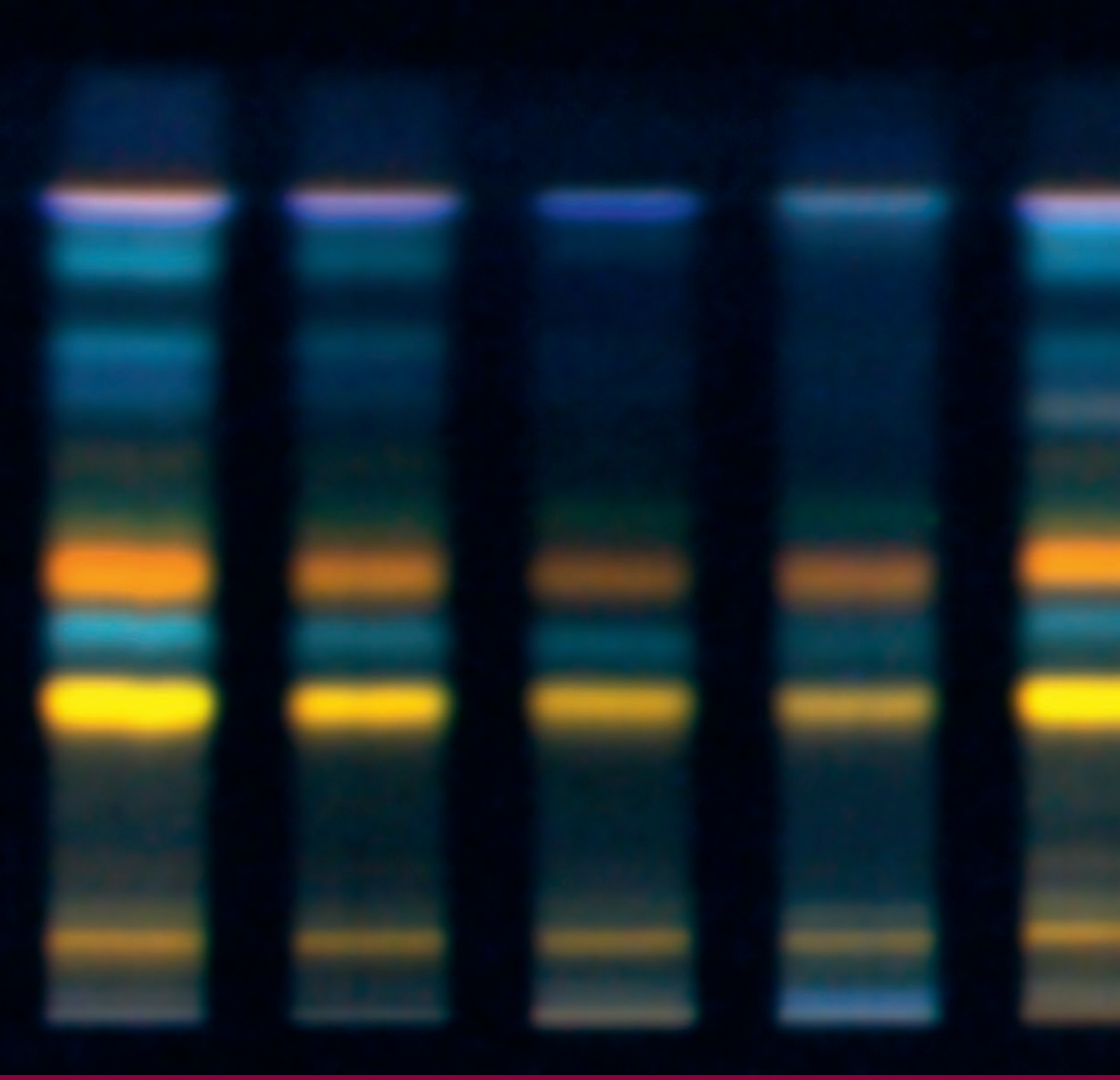
Programmed and actual temperature are digitally displayed. The temperature is selectable between 25 and 200 °C. The plate heater is protected from overheating.

Ordering information

022.6230 TLC Spray Cabinet II with blower and 1.5 m flexible exhausthose (127 mm diameter)
022.6232 TLC Spray Cabinet II without blower, with 1.5 m flexible exhaust hose (for connection to an existing exhaust duct)
022.6226 Exhaust hose extension 1.5 m with adapter

Ordering information

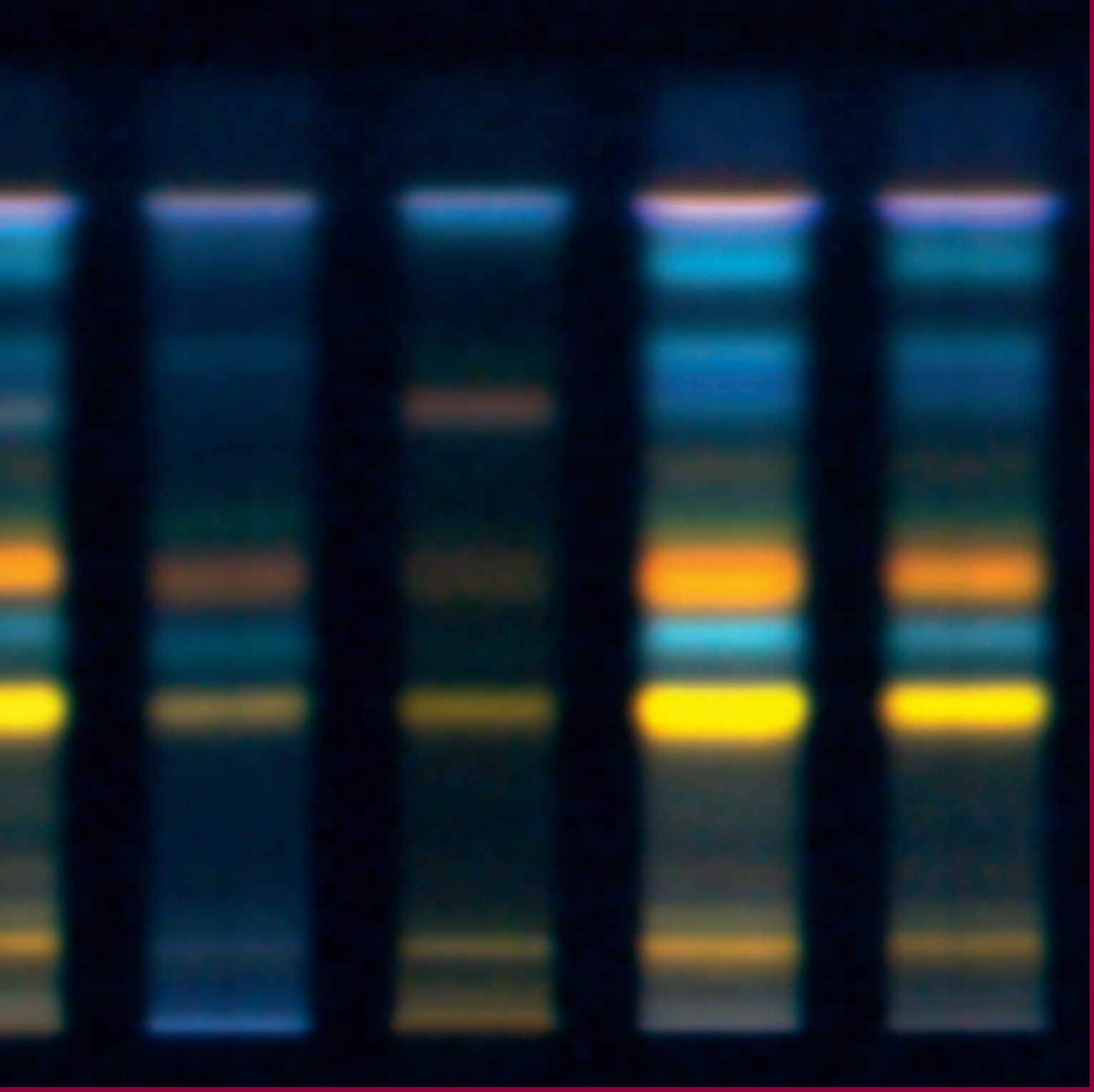
022.3306 TLC Plate Heater III



EVALUATION: DETECTION AND DOCUMENTATION

«FROM THE CHROMATOGRAM TO THE QUALITATIVE AND QUANTITATIVE RESULT»

CAMAG



EVALUATION: DETECTION AND DOCUMENTATION

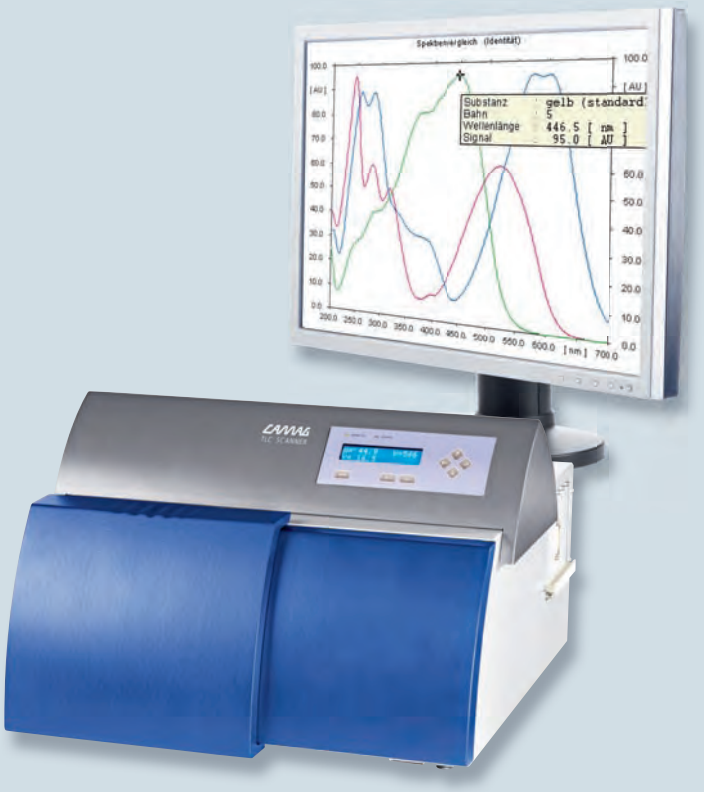
«FROM THE CHROMATOGRAM TO THE QUALITATIVE AND QUANTITATIVE RESULT»

Chromatogram evaluation with classical densitometry

A laboratory fully equipped for instrumental Thin-Layer Chromatography should be able to resort to both classical densitometry and electronic image acquisition.

Classical densitometry uses monochromatic light and a slit of selectable length and width to scan the tracks of a chromatogram, measuring the diffusely reflected light. The CAMAG TLC Scanner uses the entire spectral range from 190 to 900 nm with high spectral selectivity for data acquisition. Absorption spectra for substance identification and for selection of the most suitable measurement wavelength can be recorded within this range.

The strengths of classical densitometry are the spectral resolution of the light source and the higher reproducibility of quantitative determinations.



Chromatogram evaluation with electronic image acquisition

Electronic image acquisition uses polychromatic light (white light, UV 254 or UV 366) to illuminate the entire object and to capture an electronic image with a digital camera for the documentation of Thin-Layer Chromatograms.

Currently electronic image acquisition works only in the visible range. The UV region – exceptionally useful for Thin-Layer Chromatography – is only indirectly accessible to image acquisition. In this respect this technology exactly parallels the human eye.

The strength of the electronic image acquisition is the view of the complete image of the chromatogram. This possibility to get a «visual impression» of the chromatogram is one of the principal advantages of Thin-Layer Chromatography over all other chromatographic techniques. Chromatograms are archived for review and accessible for later verification or quantitative evaluation with separate software.

Simplified presentation of measurement quality

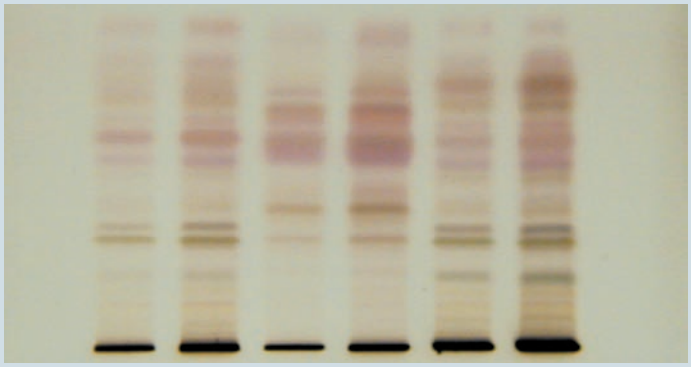
8 bit

12 bit

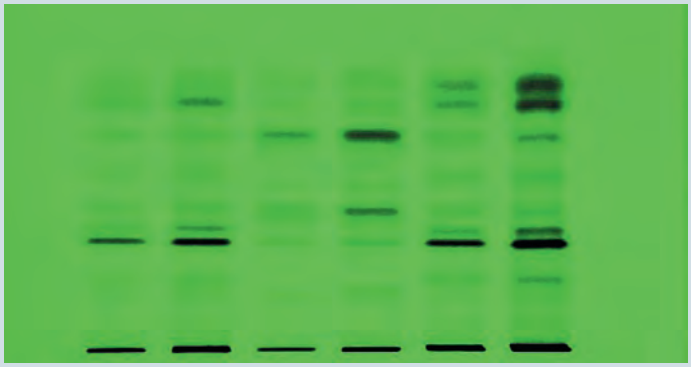
16 bit

Requirements for high precision of evaluation

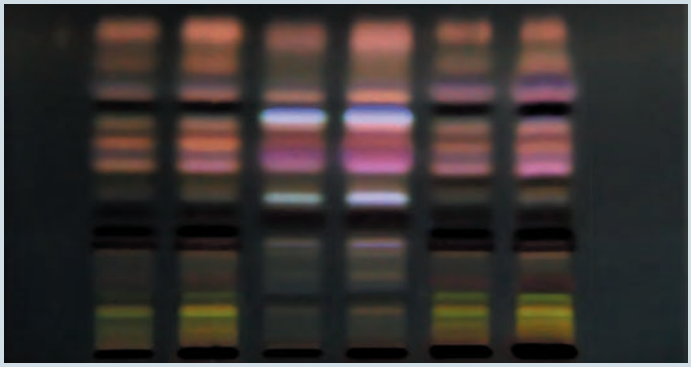
- Use of HPTLC plates. Small layer thickness, narrow particle size distribution and the homogenous packing of the HPTLC layer result in less fraction broadening and low background noise.
- Automatic spray-on sample application technique. Only by spraying the size of the starting zone does remain independent of the application volume and the sample is homogenously distributed across the application position. Data acquisition can be based on larger substance amounts.
- Use of a chamber providing good reproducibility of chamber conditions.
- Choosing a working range for calibration according to the absorption/fluorescence behavior of the substances. The evaluation software offers suitable calibration functions.
- Optimization of light and measurement parameters, such as slit dimensions, measuring wavelength, scanning speed for the substances to be analyzed.
- Suitable baseline correction to maximize the signal to noise ratio.
- Derivatization can contribute to the overall error of the determination. The more homogenous the reagent is applied the smaller the error.



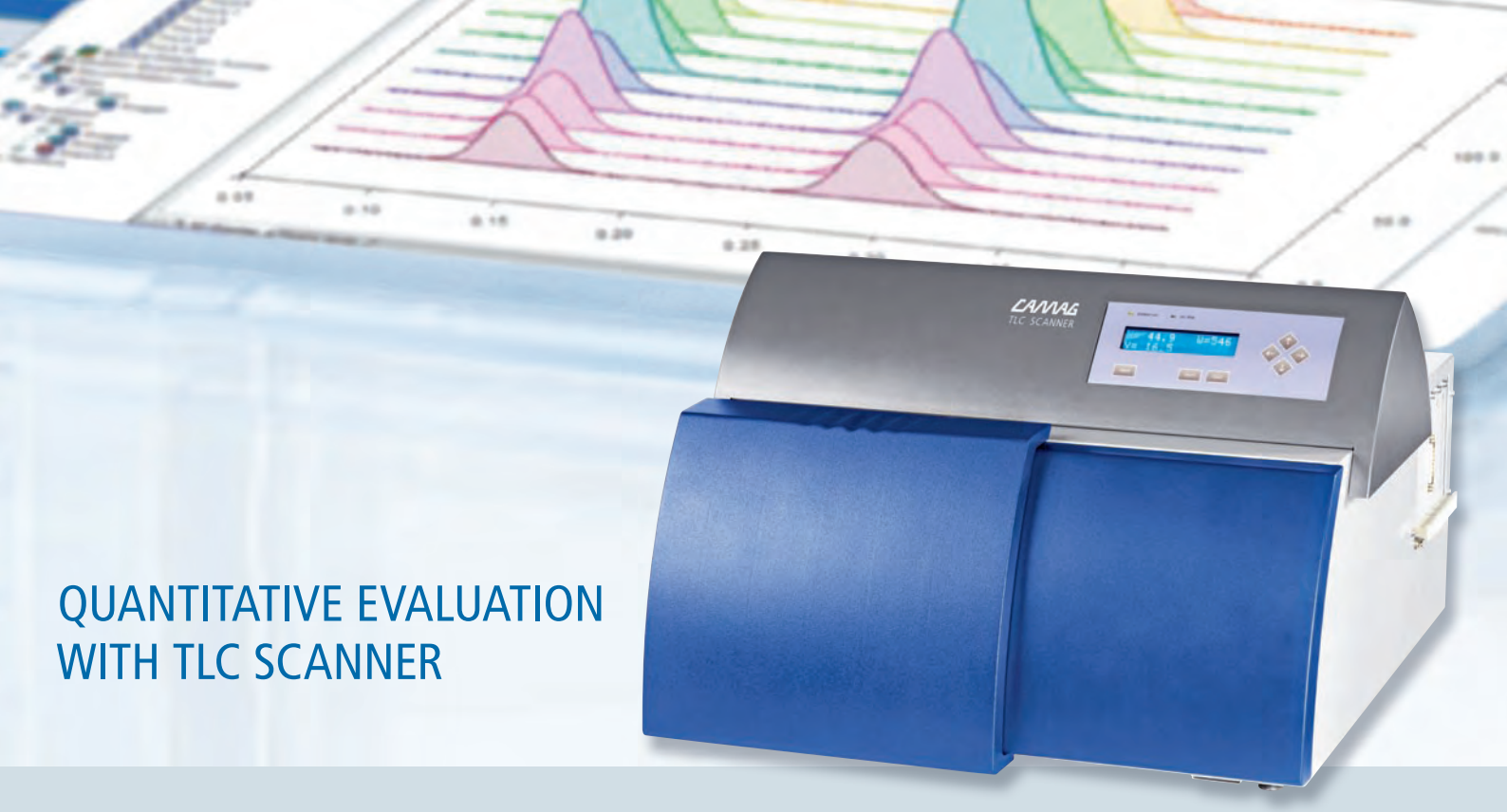
Chromatogram under white light



Chromatogram under UV 254 nm



Chromatogram under UV 366 nm



QUANTITATIVE EVALUATION WITH TLC SCANNER

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

All functions of the scanner are controlled by winCATS. Only the positioning of the object to be measured is performed manually. If desired for control/positioning of the scan start position the internal illumination can be switched on. Optimal settings of the electronic amplification are automatically selected for measurements in absorption and fluorescence mode.

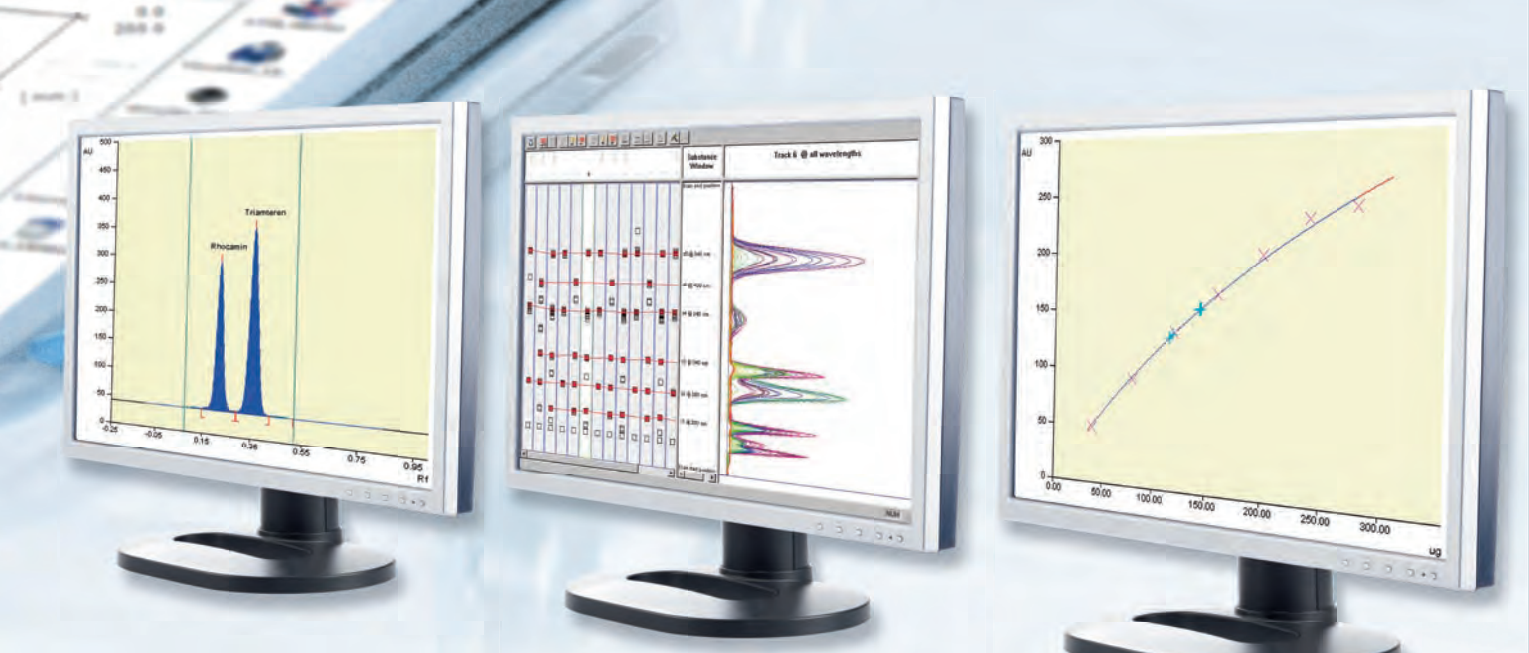
The 16 bit A/D converter ensures optimal adapted resolution of the measurement signal.

Key features

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

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

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



Display of detected peaks with substance names. In this view baseline and peak markers can be changed manually

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

Polynomial regression

Perfect evaluation with winCATS

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

The winCATS standard program for the TLC Scanner already features:

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

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

- Quantitative evaluation supports the following calibration functions: single level calibration, multi level calibration with linear or nonlinear-regression using internal or external standards. Statistics are available as relative standard deviation (cv) or confidence interval (ci).
- Sub-component evaluation (included in the option «Quantitative Evaluation») can be used to quantify unknown peaks by relating them to the main component as is prescribed by European or US pharmacopoeias («Related Compounds»).
- Dual-wavelength scan: The chromatogram is scanned at two individually selectable wavelengths. During integration the signal from the second wavelength is subtracted from that of the first wavelength to eliminate matrix effects. Dual-wavelength scanning is also useful for the quantitation of incompletely resolved peaks.
- Multi-wavelength scan: The chromatogram can be scanned automatically with up to 36 different wavelengths. This permits multiple measurements between 190 and 900 nm in order to achieve optimum selectivity. For quantitation, data from the optimum wavelength scan of each fraction can be selected. This winCATS function is unique in Thin-Layer Chromatography!
- Scanner qualification (selftest): This option offers automatic monitoring of the mechanical, optical and electronic functions of the scanner. Results are evaluated, documented and saved. If appropriate, lamp positions and monochromator alignment can be automatically adjusted.
- Track optimization: Each track of a chromatogram is scanned several times with small lateral offset. From this data the optimum track following the peak maxima is calculated and used for quantitation. This way distorted chromatograms can be correctly evaluated.
- Spectrum library: Enables the user to create his own library files. Only with this library option, spectra recorded on different plates can be compared.

Note

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

Ordering information

Can be found in the special brochure «CAMAG TLC Scanner» or on our website www.camag.com/tlc-scanner.

DOCUMENTATION AND EVALUATION WITH TLC VISUALIZER

TLC Visualizer captures images that are, without a doubt, of the best quality in the field. The system provides illumination with direct and/or transmitted white light as well as with direct UV 254 nm and UV 366 nm light. An integrated powerful 12 bit camera with highly linear CCD chip and excellent color reproduction captures the images with the whole process conveniently controlled by the software winCATS.

Key features

- Quick and intuitive operation.
- Optimized light sources for improved homogeneity of the illumination of a plate under UV 254, UV 366, white light (direct light and/or transmitted light).
- Powerful high resolution 12 bit CCD camera with outstanding linearity.
- Automatic image optimization for all illumination modes in combination with fixed capture parameters ensure highest reproducibility of images from the same plate. This provides the basis for reliable comparison of images taken from different plates.
- Saving of all images taken of the same plate in a single analysis file together with all other analytical data.
- Option «Professional Image Enhancement» provides perfect illumination based on individual measurements and corrections of each instrument, advanced clean plate correction, and built-in matrix color correction.
- Option «Image Comparison Viewer» for comparing selected tracks from multiple images / plates on the same screen.

For quantitative evaluation images captured with winCATS can be exported to the optional evaluation software «VideoScan».

Image Comparison and Professional Image Enhancement

Image comparison

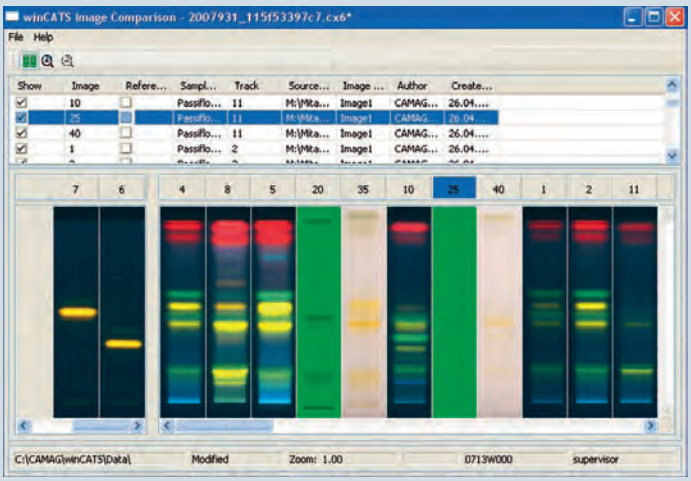
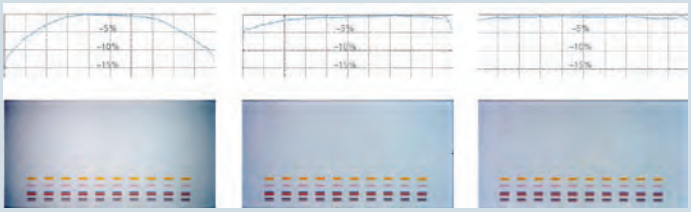
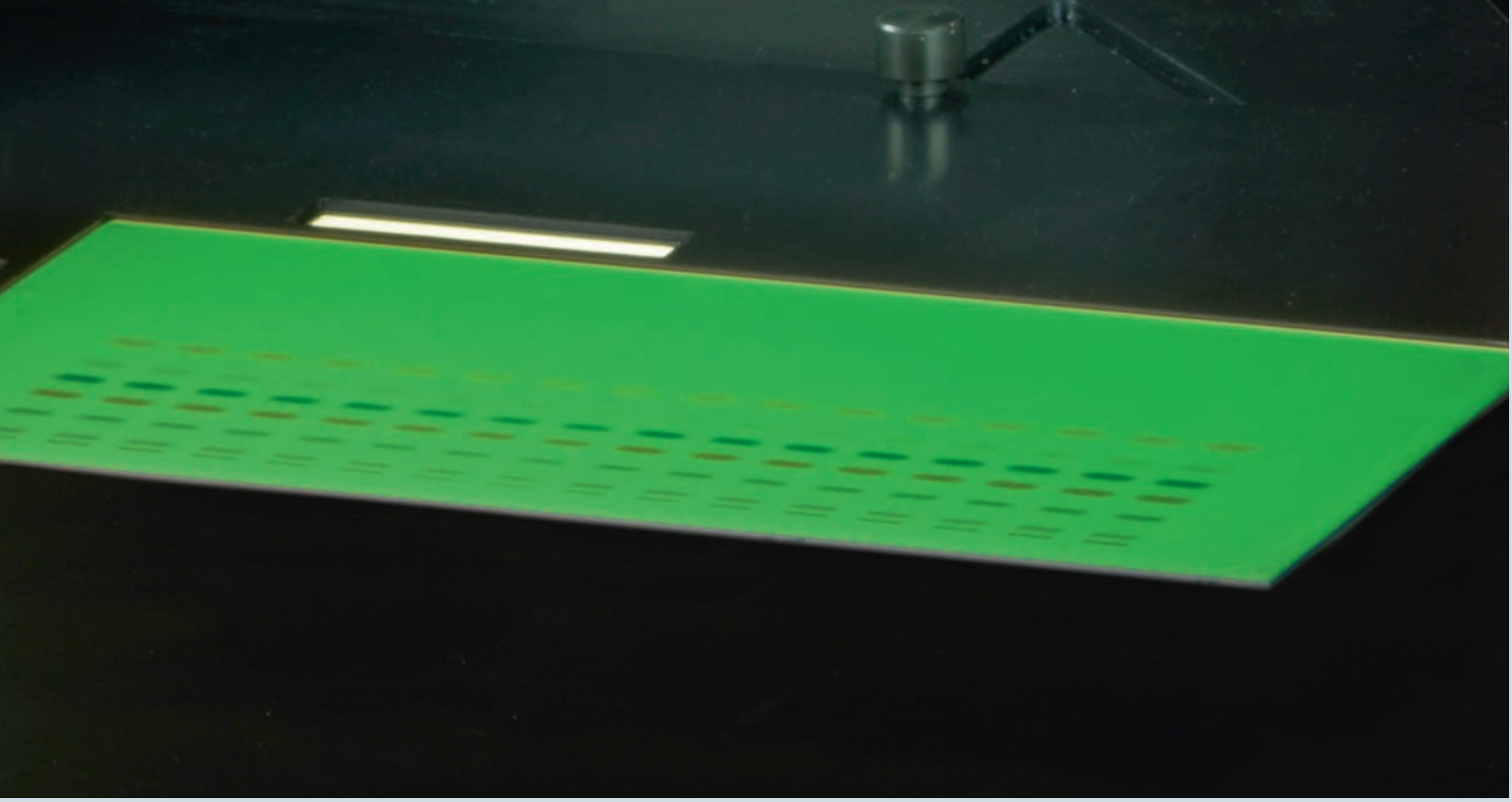


Image Comparison View: Selected tracks of images taken of the same plate under UV 254 nm (20, 25), white light (35, 40)and UV 366 nm (all other tracks) are compared

Example for white light



No Correction *Standard Correction* *Individual Correction with «Professional Image Enhancement»*



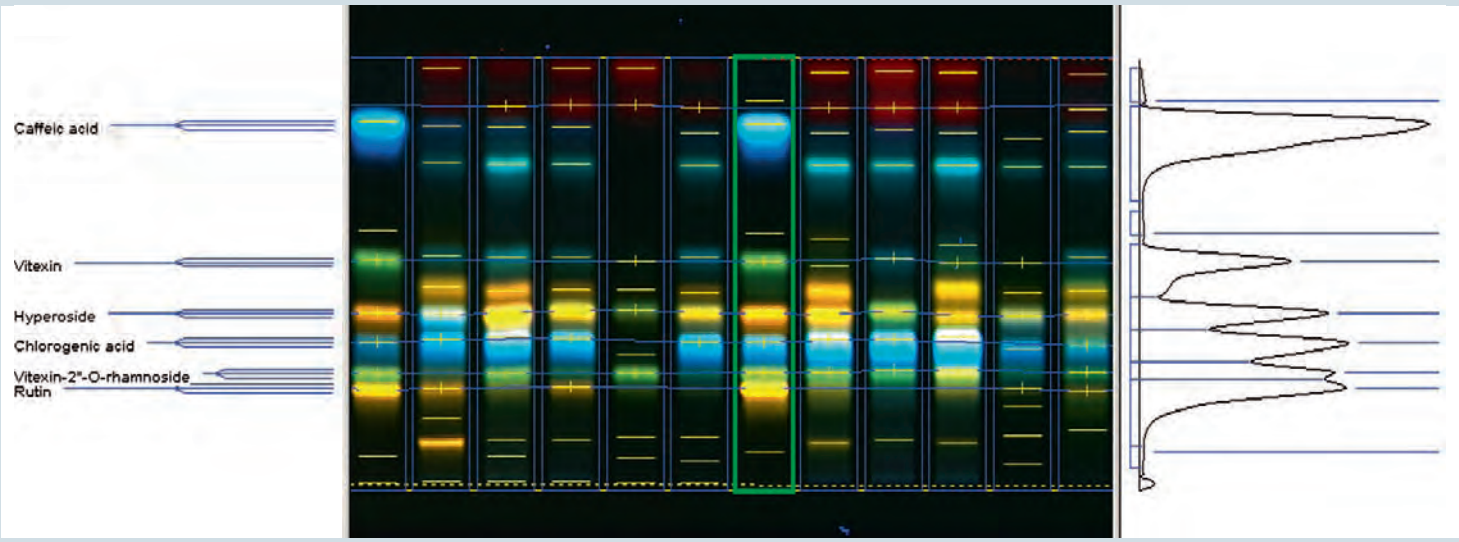
Digital Image Evaluation

The VideoScan software allows evaluation of images captured with TLC Visualizer or DigiStore 2. The program is rapid and easy to use. Flexible features such as profile comparison of tracks from several chromatograms, evaluation of tracks with variable distance, distorted tracks etc. are available. Chromatograms can be evaluated at any time, even years after capture. Quantitative evaluation can be performed via peak-area and/or peak-height. Single or multilevel calibrations (linear or polynomial regression) can be selected.

Key features

- Rapid and easy to use.
- Integration of the analog curves can be performed automatically or manually.
- Quantitative evaluation can be performed via peak-area and/or peak-height.
- Single or multi level calibration (linear or polynomial regression) can be selected. The program VideoScan complies with GMP/GLP and can be IQ/OQ qualified.

Digital image evaluation



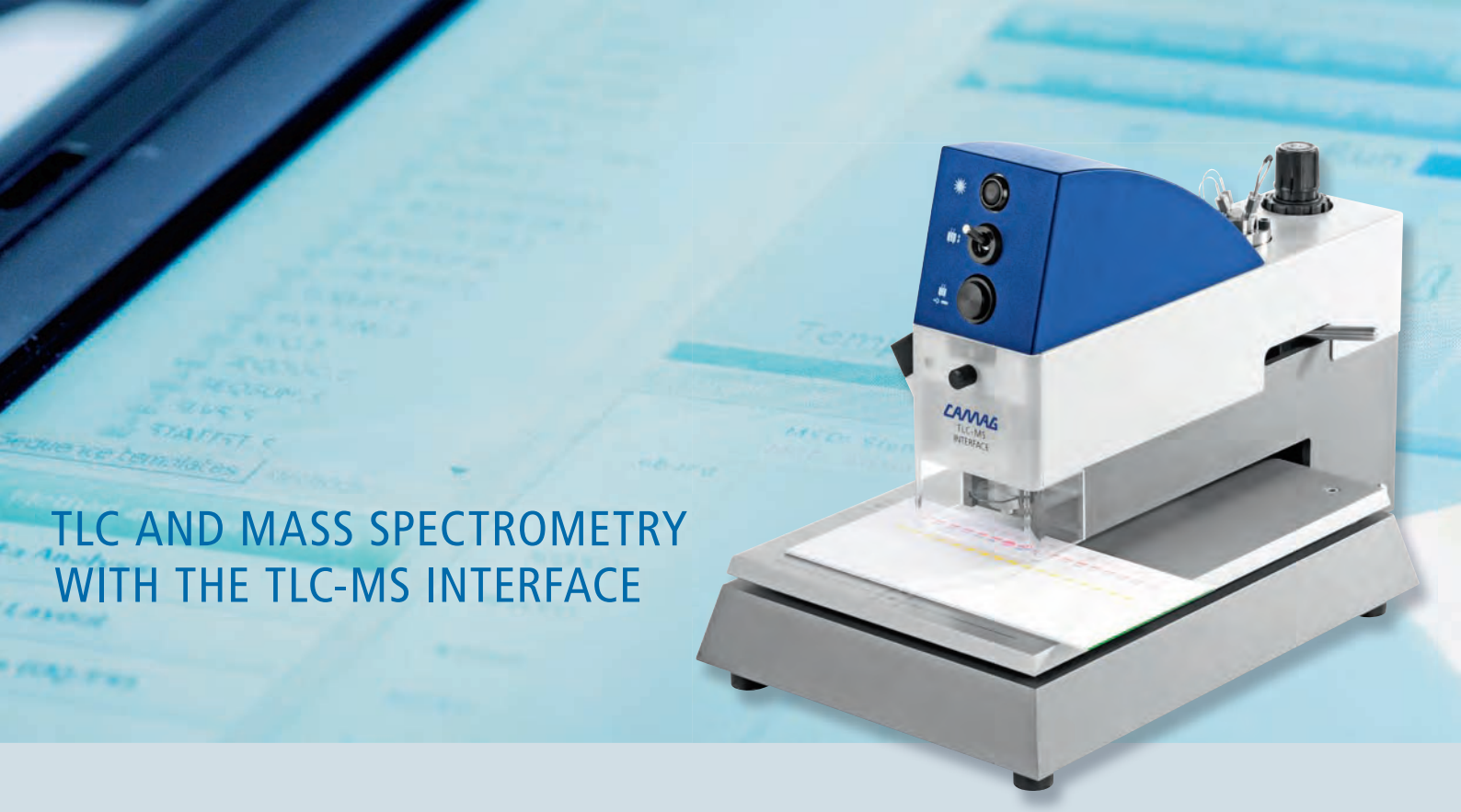
Left substance names and peak windows, in the middle the image and right the analog curve of the track marked in green

Note

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

Ordering information

Can be found in the special brochure «CAMAG TLC Visualizer» or on www.camag.com/tlcvisualizer.



TLC AND MASS SPECTROMETRY WITH THE TLC-MS INTERFACE

Identification and elucidation of unknown substances in research, forensic and environmental fields.

TLC-MS Interface

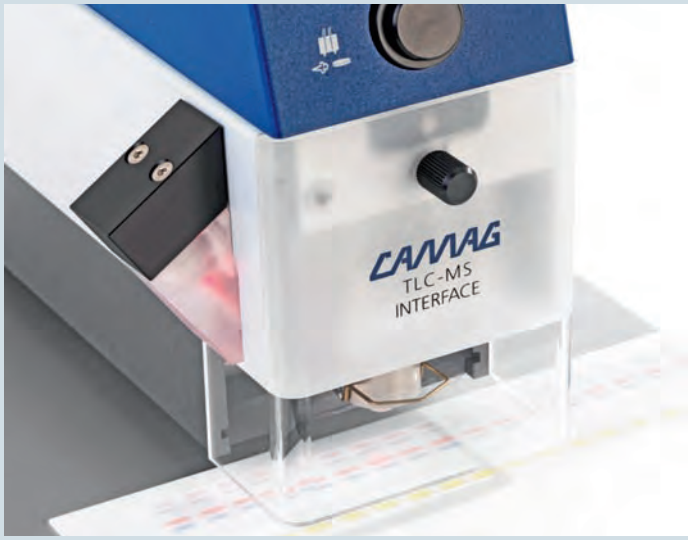
TLC-MS coupling is the powerful solution to the hyphenation of Thin-Layer Chromatography and mass spectrometry (MS) and thereby opens up new possibilities for both techniques.

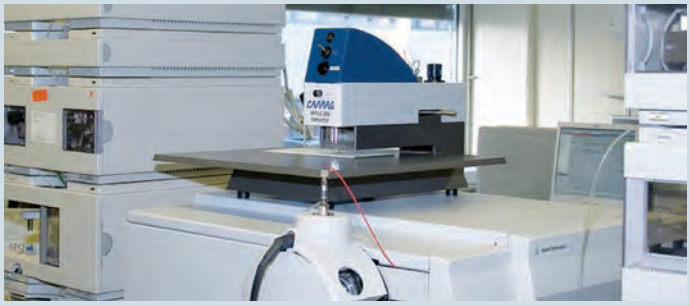
Not all samples may be processed by HPLC-MS or HPLC-DAD systems due to no or low detection of the compounds or impurities in the UV range, a heavy matrix load or a lack of MS compatible solvents, however necessary for the HPLC separation. On the other hand HPTLC is a very fast and convenient method to separate samples.

In the past unknown substances were scraped off from the TLC/HPTLC plate, eluted into a tube and transferred into the MS. Now a very convenient and universal TLC-MS Interface is available which can semi-automatically extract zones of interest and direct them online into HPLC-MS systems of various brands and techniques (APCI-MS, APPI-MS or EI-MS).

Questioned substances are directly extracted from a TLC/HPTLC plate and sensitive mass spectrometric signals are obtained within a minute per substance zone.

The instrument extracts circular zones or zones in the form of bands from a TLC/HPTLC plate, e.g. with methanol or any other appropriate solvent, using the standard flow speed of the HPLC-MS system (e.g. 0.2 mL/min). The precise positioning of the elution head is done semi-automatically with the help of a laser pointing device or according to the coordinates determined by the TLC Scanner or TLC Visualizer. After extraction the eluate is then transferred online into the mass spectrometer. After each extraction the elution head is cleaned automatically.

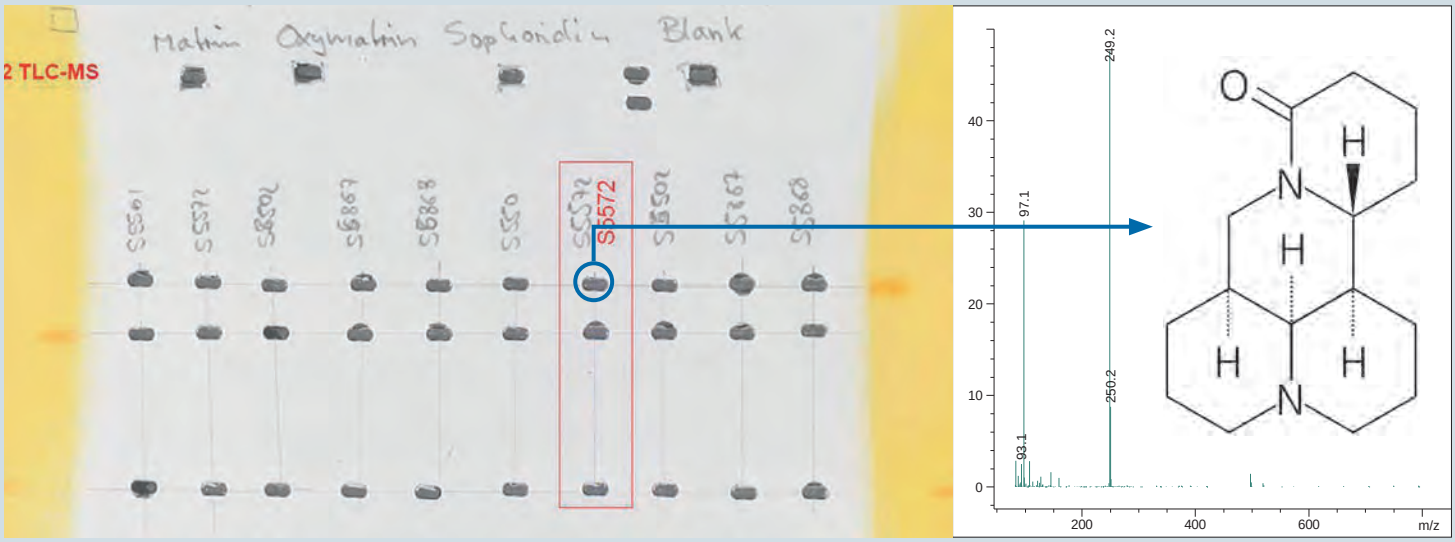




Hyphenation of TLC-MS Interface with mass spectrometer

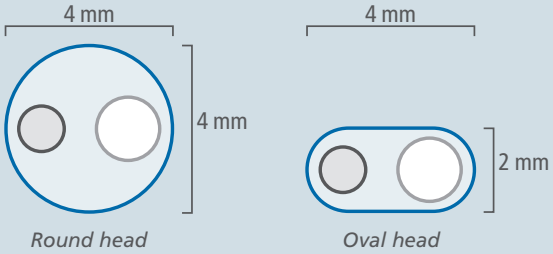
German Patent 100 36 293. 1-52

Example



Identification of alkaloids oxymatrine, sophoridine and matrine in Sophora flavescens extract. HPTLC plate after extraction of zones with the TLC-MS Interface. Confirmation of matrine, m/z 249 [M+H].

TLC MS Interface with round and oval elution head



Note

The versatile instrument to extract compounds from a TLC/HPTLC plate and feed them into a mass spectrometer for substance identification or structure elucidation. CAMAG TLC-MS Interface can be connected to any brand of LC-coupled mass spectrometer.

Ordering information

Literature notes and further details about the CAMAG TLC-MS Interface are available at www.camag.com/tlc-ms. Ordering information can be found on the same webpage as well as in the special brochure «TLC-MS Interface».

BIOLUMINIZER®: SELECTIVE DETECTION OF BIOACTIVE COMPOUNDS

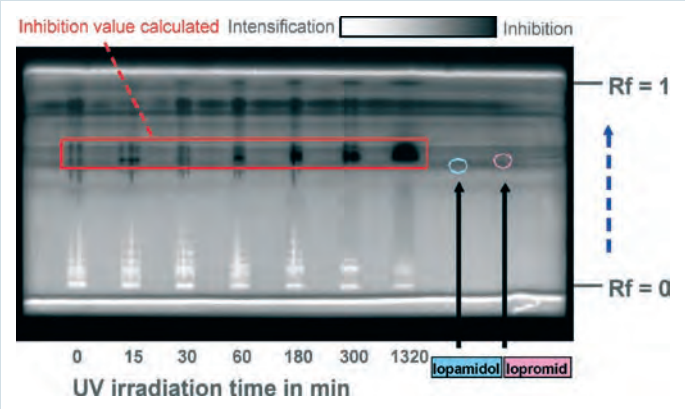
BioLuminizer® is a new detection system from CAMAG developed specifically to detect bioluminescence on HPTLC plates.

The complex sample is first separated into distinct zones of the individual components using HPTLC. The plate is subsequently immersed in the luminescent bacterial suspension.

The reaction takes place within a very short time; all zones with inhibitory or toxic effects appear as black zones on the luminescent chromatogram. This method is a fast, low-cost way of demonstrating biological activity.

Key features

- Stand-alone operation using BioLuminizer® Software.
- 16 bit cooled CCD camera with high resolution and high quantum efficiency.
- Optimized HPTLC plate compartment for prolonged stability of the plate.
- Compact in design, easy to use and clean.



Example

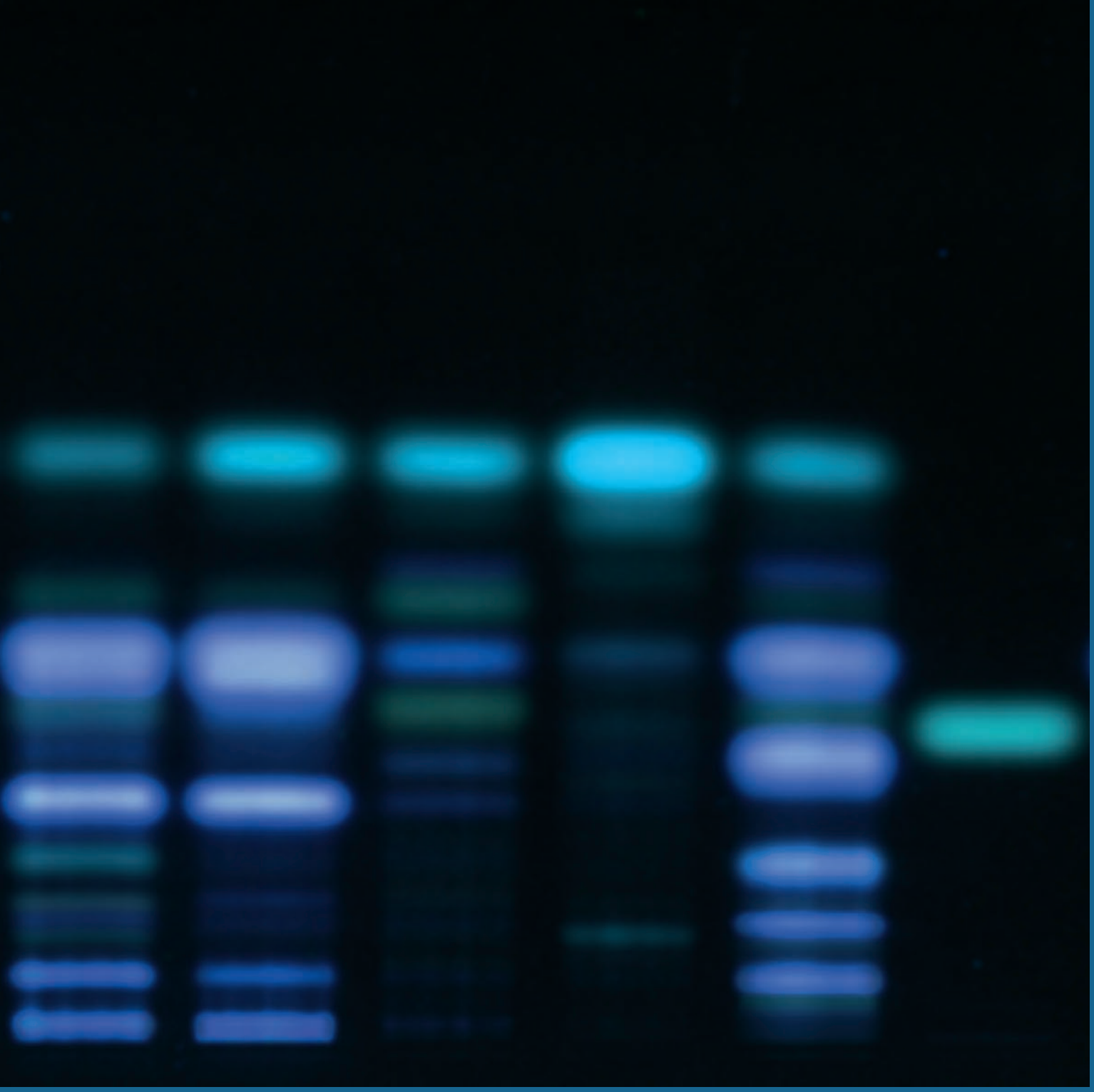
Process wastewater containing X-ray contrastmedia is frequently irradiated with UV light. The HPTLC/bioluminescence image shows the bioactive effect of the degradation products. An increase in the irradiation time generates substances with a distinctively inhibitory effect.

In a cuvette test, this inhibitory effect would have been masked by degradation products, which stimulate luminescence and are visible in the lower section of the chromatogram.

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

Ordering information

Can be found in the special brochure «CAMAG BioLuminizer®» or at www.camag.com/bioluminizer.



COMPLETE SYSTEMS AND SOFTWARE

«HPTLC TAYLORED FOR THE HIGHEST ANALYTICAL QUALITY»

COMPLETE SYSTEMS FOR THIN-LAYER CHROMATOGRAPHY

Basic kits

All CAMAG basic kits have been composed so that a lab can start working with Thin-Layer Chromatography. These assemblies are configured to allow upgrading to a complete system for quantitative TLC by adding items at any time. The transition from conventional TLC material to so-called high-performance (HPTLC) layers is straight forward. Just add the appropriate instrumentation.

Nanomat 4 and Capillary Dispenser	Twin Trough Chamber smartALERT	Reagent Sprayer (glass)	UV Cabinet with UV Lamp 254/366 nm
Manual sample application with disposable capillary pipettes	Developing chamber for improved chromatography	Easy derivatization by spraying	UV inspection, easy observation of results

022.0216 TLC Basic Kit, including UV Cabinet for qualitative TLC using conventional layers, consisting of:

	022.4730	CAMAG Nanomat 4, without capillary pipettes and holder
	022.7650	CAMAG Capillary Dispenser complete with Universal Capillary Holder 022.7786, one Dispenser Magazine for 1 µL Capillary Pipettes 022.7661 and one pack of 5 x 100 Disposable Capillary Pipettes 1 µL 022.7771
	022.7662	Dispenser Magazine for 2 µL Capillary Pipettes
	022.7665	Dispenser Magazine for 5 µL Capillary Pipettes
	022.7772	Disposable Capillary Pipettes 2 µL, pack of 5 x 100
	022.7775	Disposable Capillary Pipettes 5 µL, pack of 5 x 100
2 x	022.5256	CAMAG Twin Trough Chamber 20 x 20 cm, with stainless steel lid
	022.5300	smartALERT, solvent front monitor
	022.5244	Saturation pads, pack of 100
	022.6100	CAMAG Reagent Sprayer, all glass
	034.5715	Precoated plates MERCK Silica gel 60 F254, 20 x 20 cm, pack of 25
	032.8001	CAMAG Test Dye Mixture I, 100 mL
	022.9070	CAMAG UV Cabinet 3 consisting of 022.9120 UV Lamp dual wavelength, 254/366 nm, 8 W each

Nanomat 4 and Capillary Dispenser	Twin Trough Chamber and Horizontal Developing Chamber smartALERT	TLC/HPTLC Sprayer	UV Cabinet with UV Lamp 254/366 nm

022.0226 HPTLC Basic Kit, including UV Cabinet for qualitative analyses using 10 x 10 cm HPTLC layers, consisting of:

	022.4730	CAMAG Nanomat 4, without capillary pipettes and holder
	022.7650	CAMAG Capillary Dispenser complete with Universal Capillary Holder 022.7786, one Dispenser Magazine for 1 µL Capillaries Pipettes 022.7761 and one pack of 5 x 100 Disposable Capillary Pipettes 1 µL 022.7771
	022.7660	Dispenser Magazine for 0.5 µL capillaries
	022.7770	Disposable Capillary Pipettes 0.5 µL, pack of 5 x 100
2 x	022.5155	CAMAG Twin Trough Chamber 10 x 10 cm, with stainless steel lid
	022.5300	smartALERT, solvent front monitor
	022.8530	CAMAG Horizontal Developing Chamber 10 x 10 cm
	022.5244	Saturation pads, pack of 100
	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 3 consisting of 022.9120 UV Lamp dual wavelength, 254/366nm, 8 W each

RECOMMENDED SYSTEMS FOR MORE DEMANDING TASKS

An HPTLC system for more demanding tasks consists of at least one instrument for the steps sample application, chromatogram development, and evaluation. Other steps are covered by a basic kit (left page) and/or by other CAMAG products, depending on the task and the samples to be analyzed. Let us make some recommendations.

Linomat 5
Semi-automatic sample applicator for bandwise sample application

ADC 2
Reproducible chromatogram development

TLC Scanner
Densitometric evaluation

TLC Visualizer
Image documentation

022.0270 HPTLC-System for quantitative analyses including evaluation with TLC Scanner and image documentation, including winCATS software for control of instruments; software options according to applications, see p. 35–37, 44, 45. Suitable for laboratories dealing with few samples.

Automatic TLC Sampler ATS 4
Fully automatic sample applicator for spot and bandwise sample application

ADC 2
Reproducible chromatogram development

TLC Scanner
Densitometric evaluation

TLC Visualizer
Image documentation

022.0275 HPTLC-System for quantitative analyses including evaluation with TLC Scanner and image documentation, including winCATS software for control of instruments; software options according to applications, see p. 35–37, 44, 45. Suitable for laboratories with high sample throughput.

Linomat 5
Semi-automatic sample applicator for bandwise sample application

ADC 2
Reproducible chromatogram development

TLC Visualizer
Image documentation

VideoScan
Image evaluation

022.0280 HPTLC-System for qualitative and quantitative analyses based on image documentation and evaluation, including winCATS software for control of instruments and VideoScan; software options according to applications, see page 36, 37, 44, 45. Suitable for laboratories dealing with few samples.

Ordering information

Ordering information for these kits can be found on our website www.camag.com.

Note

Please note that disposable items such as pre-coated plates and disposable capillary pipettes as well as developing chambers only get you started.

winCATS SOFTWARE

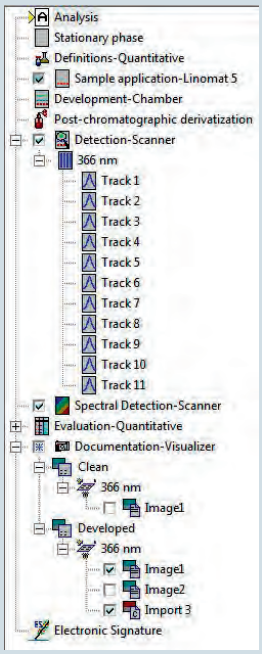
winCATS organizes the work flow of instrumenal TLC

winCATS is the name of the integrated software concept, which incorporates all steps of Instrumental Thin-Layer Chromatography. The modular design of winCATS allows to select or deselect any step of the procedure as appropriate for the given analytical task.

- Stationary phase: input of plate material and pre-treatment of the separation layer.
- Definition of samples, standards, and calibration method, if applicable.
- Sample application: selection of application device, input of control parameters and monitoring their execution (for manual devices in each step full documentation is possible).
- Chromatogram development: selection of the instrument, input of control 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.
- Quantitative evaluation: calculation and presentation of results.
- Documentation: selection of camera, input of control parameters and monitoring the image capture, simple functions such as annotation etc..
- 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 the steps used in each analysis are automatically performed and documented. For instruments that are not controlled by winCATS the user manually documents parameters through input dialogs. All data including images, which pertain to the current analysis, are finally saved by winCATS in one file and can be printed at any time.

Keeping track of TLC analyses



The structure of winCATS makes it for users very easy to work their way trough the entire TLC process.

winCATS users always know which step they are working on and which will be next.

winCATS for all steps of Instrumental Thin-Layer Chromatography

Manual Input

Definition	Sample Application	Chromatogram Development	Derivatization	Detection	Evaluation	Documentation	Report
Stationary Phase	Nanomat	Horizontal Developing Chamber	Immersion Device			Image Import	
		Developing Chamber	Spray			Image Annotation	
Samples	Automatic TLC Sampler ATS 4	Automated Multiple Development AMD 2		TLC Scanner	Quantitative Evaluation	TLC Visualizer	21 CFR Part 11 (FDA Regulation)
Standards	Linomat 5	Automatic Developing Chamber ADC 2		Scanner Selftest	Spectrum Libary	Image Enhancement	
				Dual Wavelength Scan			
				Multi Wavelength Scan			
				Track Optimization		Image Comparison	

Software Controlled

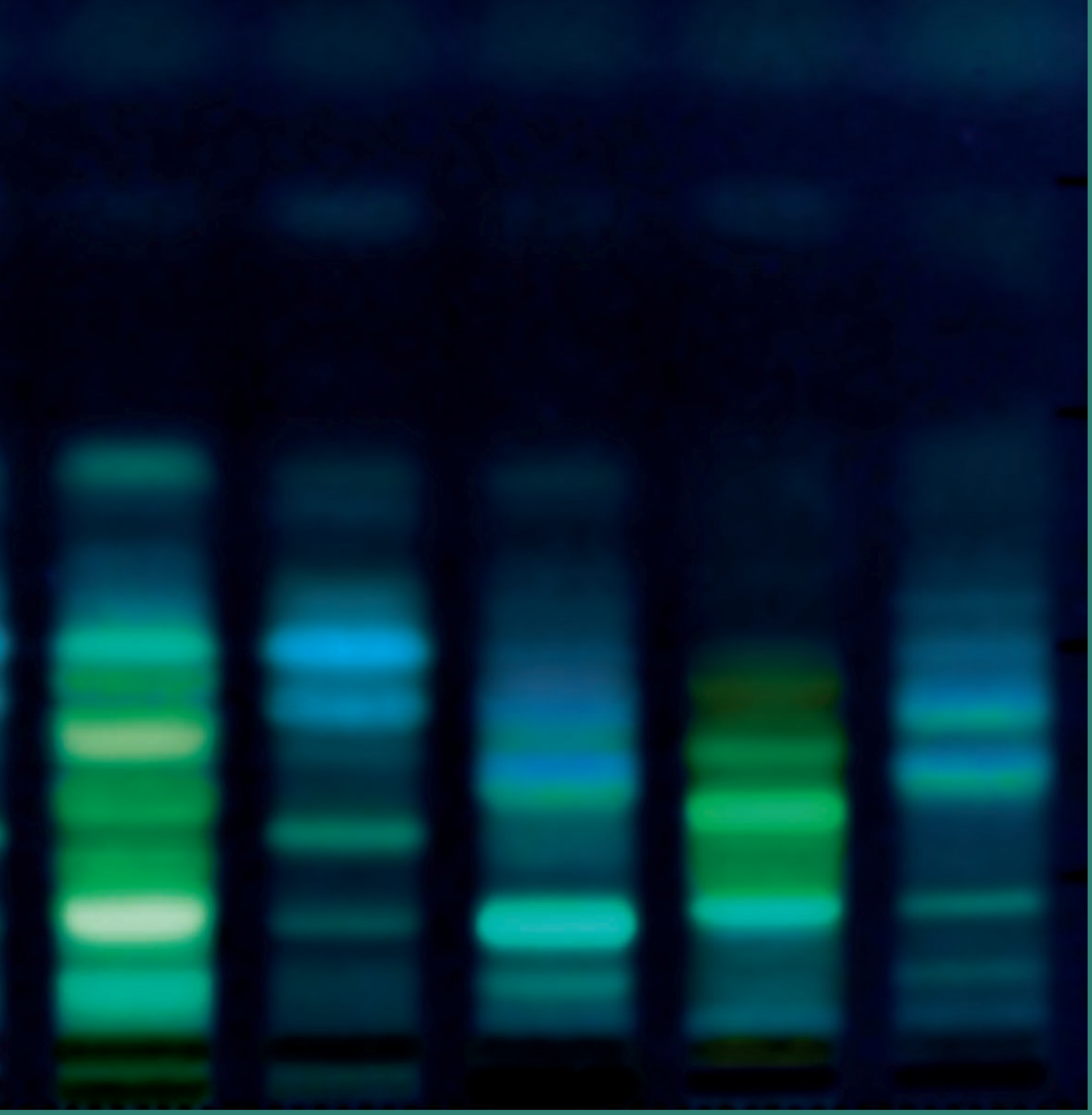
Ordering information

Can be found in the special brochure «winCATS – Planar Chromatography Manager» or on our website www.camag.com/wincats.

ACCESSORIES AND TLC/HPTLC PLATES

«HIGH QUALITY THROUGH STANDARDIZATION»

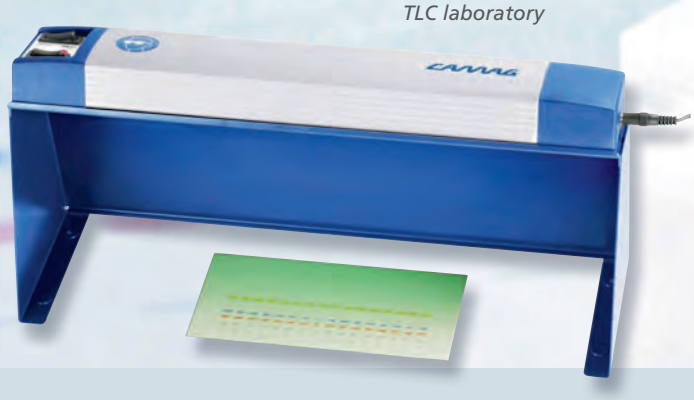
CAMAG



ACCESSORIES AND TLC/HPTLC PLATES

UV Lamp in combination with UV Viewing Box (= UV Cabinet)

The UV lamps with stand are designed for use in a TLC laboratory



UV INSPECTION UV CABINET

The UV Cabinet is suitable for inspecting Thin-Layer chromatograms and other objects in an undarkened room. The front of the box is closed with a roller shutter, which can be slid to the left or to the right as required for inserting or marking objects. A glass filter in the viewing window protects the eyes against reflected short-wave 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 untroubled viewing.

Key features

- Inspection of Thin-Layer chromatograms and other objects in an undarkened room.
- A glass filter in the viewing window protects the eyes against reflected short-wave UV light.
- Made from shock-resistant plastic.
- Base measures 400 x 260 mm inside; outer dimensions 490 x 350 x 290 mm.
- Compatible with all CAMAG UV lamps of the 022.91XX series.

UV LAMPS

The 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 illumination of the tubes at the selected wavelength as well as the absence of any «flickering». In order to reduce the user's risk of exposure to UV radiation, the lamp is equipped with a timer that automatically turns off after 10 minutes. The stand holds the lamp in a position optimized for viewing 20 x 20 cm objects. It shields off extraneous light on three sides. The lamp can be easily lifted off the stand and directed against a larger object.

Key features

- Two wavelengths, 254/366 nm, 2 light tubes 8 W each.
- Shock resistant housing: dimensions 442 x 76 x 43 mm.
- Powered with 12 V AC from the mains adapter supplied with it or via an optional connecting cable from 12 V DC.
- Instantaneous ignition without flickering and optimum light efficiency due to operation at 25–30 KHz AC.
- Automatic switch off by timer after 10 min. reduces the risk of exposure to radiation.

Important Notice

Hardly any TLC laboratory can be without the use of UV light for inspecting chromatograms.

Two types of ultra violet light are required for inspecting Thin-Layer chromatograms:

- Long-wave UV light 366 nm:
  Under long-wave UV light substances that can be excited to fluoresence appear as bright spots, often differently colored, on a dark background. The sensitivity of this detection method increases with the intensity of the UV light and also as more visible light is eliminated.
- Short-wave UV light 254nm:
  Under 254 nm UV substances absorbing at that wavelength become visible, provided the TLC layer contains a fluorescent indicator, e.g. F254. These substances appear as dark spots on a bright background.

Ordering information

022.9070	UV Cabinet consisting of: 022.9120 UV-Lamp for two wave lengths 254/366 nm (2 x 8 W), 022.9055 CAMAG Viewing Box 3
022.9055	Viewing Box 3, for all UV lamps of the 022.91XX series
022.9120	UV Lamp dual wave length, 254/366 nm, 8 W each
022.9110	UV Lamp short-wave UV, 254 nm, 2 x 8 W
022.9115	UV Lamp long-wave UV, 366 nm, 2 x 8 W
022.9145	Stand for CAMAG UV Lamps
022.9146	Adapter for operating the cigarette lighter socket of a car

Spare parts

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 UV lamps of the 022.91XX series

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

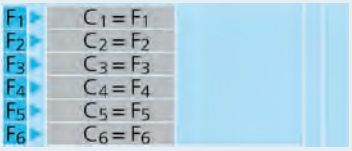
Application examples, schematic: F_1 … = developing solvents, C_1 … = conditioning liquids

1 Optimization of the developing solvent

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

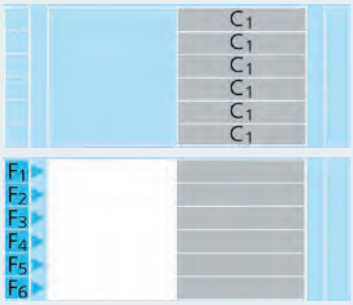
2 Optimization of the development solvent

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



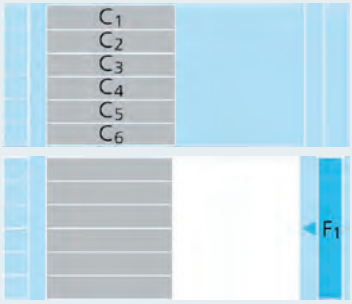
3 Optimization of the development solvent after uniform layer preconditioning

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



4 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, comprising 022.8555 HPTLC VARIO Chamber for 10 x 10 cm plates and 022.8556 HPTLC Scoring unit for the preparation of TLC/HPTLC plates

022.8558 Scoring blades for 022.8556, pack of 10

smartCUT Plate Cutter

Convenient and precise cutting of pre-coated TLC/HPTLC glass plates.

- Cuts plates with a thickness up to 3 mm
- Easy on the sensitive layer
- Desired size can be read directly from a scale
- Prevents offcuts and thus saves money
- Easy handling

Ordering information

022.4300	smartCUT Plate Cutter
115.4305	Spare cutter

Drying Rack

The Drying Rack consists of ten individual aluminum trays, 20 x 20 cm, which can be stacked quickly and conveniently. A tin box for storing the trays and two wire handles, to move the stack while hot, are supplied. The Drying Rack is convenient to use, particularly when TLC plates are prepared with the automatic plate coater in large runs. The Drying Rack also comes in handy for plates smaller than 20 x 20 cm.

Ordering information

022.3200	Drying Rack

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. When used for drying coated TLC plates, the bottom and the cover are removed to increase air circulation. The TLC Plate Box is also recommended to re-activate 20 x 20 cm pre-coated plates, e.g. after they have been pre-washed.

Ordering information

022.3250	TLC Plate Box

Adsorbents

CAMAG offers a wide range of the following TLC adsorbents.:

Ordering information

032.3562	CAMAG Cellulose, microcrystalline, DSF-0, 500 g
033.1092	MERCK Aluminum Oxide GF (type 60/E), 500 g
033.7731	MERCK Silica Gel G (type 60), 1 kg
033.7730	MERCK Silica Gel GF (type 60), 1 kg
033.7736	MERCK Silica Gel H (type 60), 1 kg
033.7739	MERCK Silica Gel HF (type 60), 1 kg
033.7741	MERCK Silica Gel HF 254 + 366 (type 60), 1 kg
033.7744	MERCK Silica Gel 60 HR «high purity», 500 g
033.8129	MERCK Silica Gel 60 G, 500 g

Nomenclature

«F» = Fluorescence indicator – excitation wavelength 254 nm
«F 254 + 366» = Fluorescence indicator – excitation wavelength 254 and 366 nm
«G» = $CaSO_4$ (gypsum) – 13 % in silica gel, 9 % aluminium oxide

For CAMAG adsorbents the last digit: «0» = 0 % = no $CaSO_4$ b binder.

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

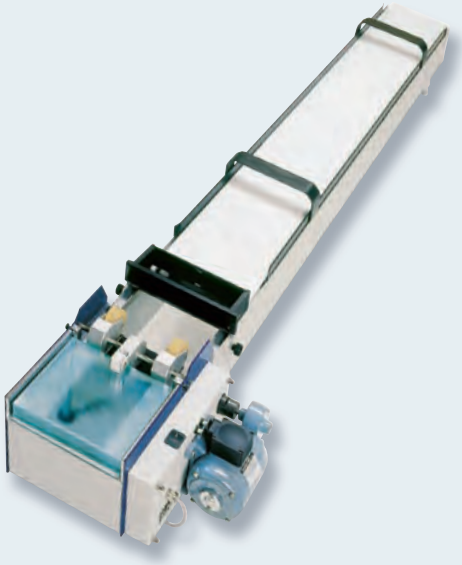
CAMAG offers three different test dye mixtures:

032.8001	Test Dye Mixture I 100 mL (preferably for silica gel) Dimethyl yellow – Oracet blue 2R – Oracet red G; solvent toluene
032.8002	Test Dye Mixture II 100 mL (preferably for aluminum oxide) Sudan black – Artisil blue – Sudan yellow – Fat orange – Fat red 7B; (Sudan black gives two zones), solvent toluene
032.8003	Test Dye Mixture III 10 mL (preferably for HPTLC– silica gel) Indophenol – Oracet violet 2R – Ariabel red 28.9 – Sudan blue II – Dimethyl yellow – Oracet red G; solvent toluene

IN-HOUSE PREPARATION OF TLC PLATES

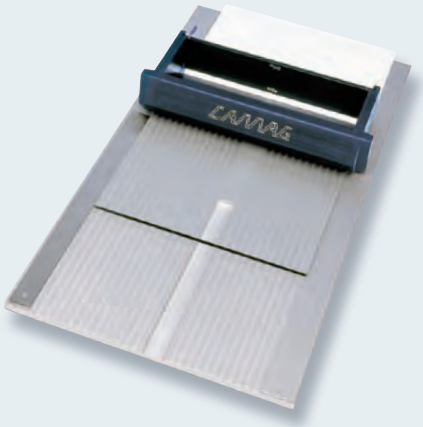
Automatic TLC Plate Coater

The glass plates to be coated are conveyed underneath a hopper filled with the adsorbent suspension. The layer thickness is determined by either a fixed gate with pre-set spacers or by a gate with adjustable distance. The plates are moved by a motorized conveying system at a uniform feeding rate of 10 cm/s, to ensure a uniform layer. The Automatic TLC Plate Coater is supplied with a fixed gate for pre-set layers of 300 and 500 microns, an adjustable gate for layer thicknesses 0–2 mm, and one 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, except with this model the plates are pushed through by hand, one after the other and lifted off on the other side. The TLC Plate Coater is shipped with a fixed gate for pre-set layers of 300 and 500 microns and an adjustable gate for layer thicknesses 0–2 mm.



Ordering information

022.1602	Automatic TLC Plate Coater
022.1612	Additional Plate Holder for 022.1602
022.1251	TLC Plate Coater, hand operated
022.1216	Fixed Gate, special, two thicknesses up to 1 mm*
022.1217	Fixed Gate, special, two thicknesses one or both 1 mm up to 2 mm*

**when ordering please specify thickness for each side*

Complete systems for in-house preparation of TLC plates

The following plate coating packages have been carefully composed so that you can immediately start in-house preparation of conventional TLC plates.

Ordering information

022.0260 CAMAG TLC Package «Plate Coating Automatic», containing:

	022.1602	CAMAG Automatic TLC Plate Coater
3 x	022.2200	Glass Plates 20 x 20 cm, pack of 10
2 x	022.3250	CAMAG TLC Plate Box
	033.1092	Aluminium Oxide MERCK GF (type 60/E), 500 g
	032.3562	Cellulose CAMAG DSF-O, 500 g
	033.7730	Silica Gel MERCK GF 254 (type 60), 1 kg

022.0265 CAMAG TLC Package «Plate Coating Manual», containing:

	022.1251	TLC Plate Coater, hand operated
2 x	022.2200	Glass Plates 20 x 20 cm, pack of 10
1 x	022.3250	CAMAG TLC Plate Box
	033.1092	Aluminium Oxide MERCK GF (type 60/E), 500 g
	032.3562	Cellulose CAMAG DSF-0, 500 g
	033.7730	Silica Gel MERCK GF 254 (type 60), 1 kg

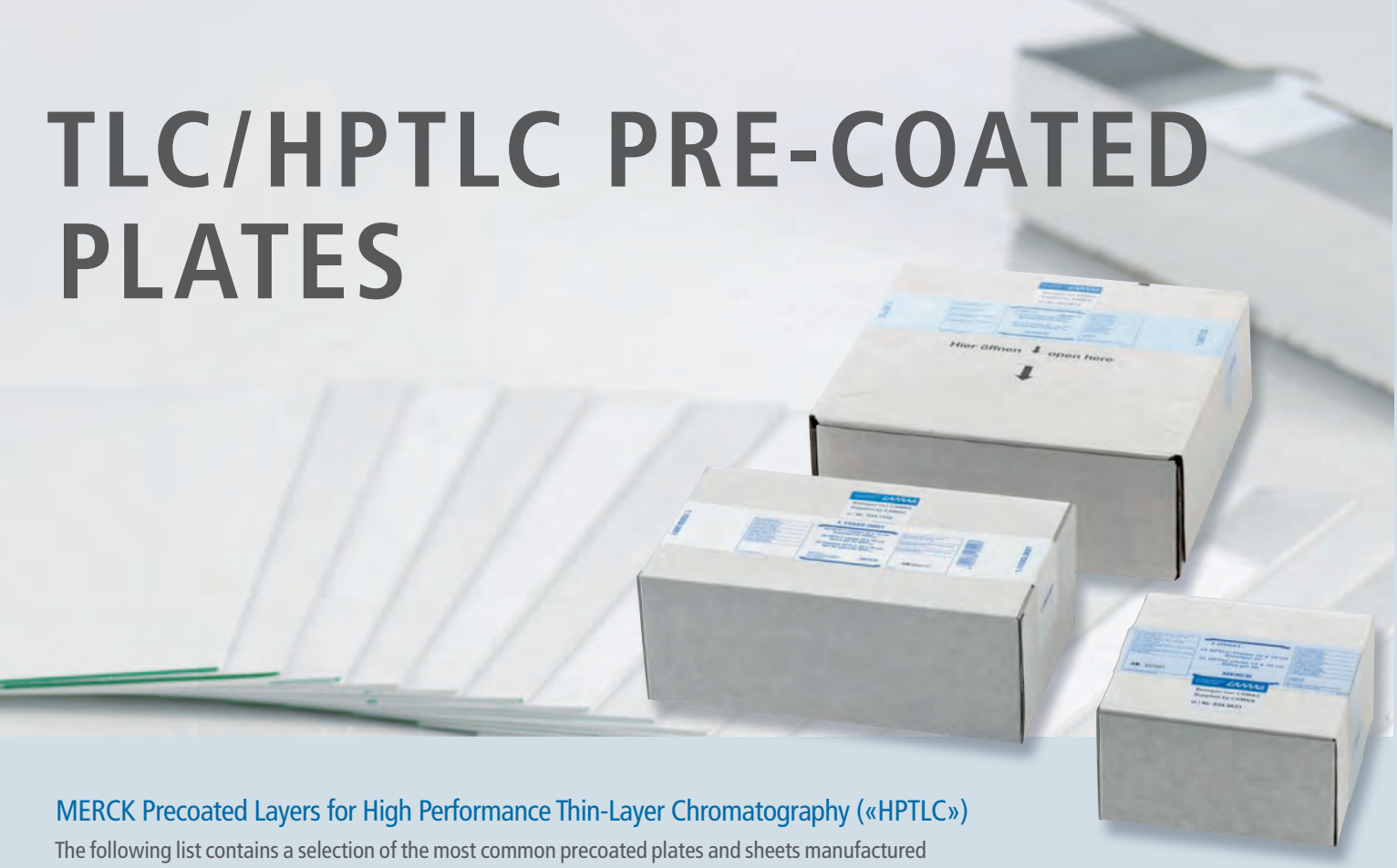
Glass plates for Thin-Layer Chromatography

Glass plates with polished edges about 4 mm thick.

Ordering information

022.2200	Glass Plates 20 x 20 cm, pack of 10
022.2100	Glass Plates 10 x 20 cm, pack of 10

TLC/HPTLC PRE-COATED PLATES



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

The following list contains a selection of the most common precoated plates and sheets manufactured by E. MERCK. However all MERCK TLC/HPTLC plates and sheets can be ordered through CAMAG.

Ordering information		layer (µm)	size (cm)	quant./pkg
034.5631	HPTLC plates silica gel 60 (without F)	200	10 x 10	25
034.5633	HPTLC plates silica gel 60 (without F)	200	10 x 10	100
034.5641	HPTLC plates silica gel 60 (without F)	200	20 x 10	50
034.5628	HPTLC plates silica gel 60 F 254	200	10 x 10	25
034.5629	HPTLC plates silica gel 60 F 254	200	10 x 10	100
034.5642	HPTLC plates silica gel 60 F 254	200	20 x 10	50
034.5648	HPTLC plates silica gel 60 F 254, ultra pure for pharmacopoeial methods	200	20 x 10	50
034.5613	HPTLC plates silica gel 60 F 254 GLP	200	20 x 10	25
034.1552	HPTLC plates silica gel 60 WR F 254s	200	20 x 10	25
034.5445	HPTLC plates LiChrospher® Si 60 F 254s	180	20 x 10	25
034.5647B	HPTLC plates LiChrospher® Si 60 WRF 254s	100	20 x 10	25
034.5547	HPTLC aluminium sheets silica gel 60 (without F)	200	20 x 20	25
034.5548	HPTLC aluminium sheets silica gel 60 F 254	200	20 x 20	25
034.3726	HPTLC plates RP-2 F 254s	200	10 x 10	25
034.3725	HPTLC plates RP-8 F 254s	200	10 x 10	25
034.3124	HPTLC plates RP-18 W F 254s	200	10 x 10	25
034.3724	HPTLC plates RP-18 F 254s	200	10 x 10	25
034.6464	HPTLC plates CN F 254s	200	10 x 10	25
034.2668	HPTLC plates Diol F 254	200	10 x 10	25
034.5647A	HPTLC plates NH2 F 254s	200	10 x 10	25

Performing Thin-Layer chromatographic separation on HPTLC layers has several advantages over those on conventional layers:

- Higher resolution of zones due to higher number of theoretical plates.
- Shorter developing times.
- Less solvent consumption.
- Less background noise due to narrow sizedistribution of particles.

However, suitable instruments are required to get the best results.

In most cases instrumental Thin-Layer Chromatography utilizes precoated layers. Not only are they more convenient, their quality is far superior to that of layers prepared from the adsorbents available for self-coating. The precoated layers have a smoother and more durable surface.

MERCK Pre-coated Layers for (conventional) TLC

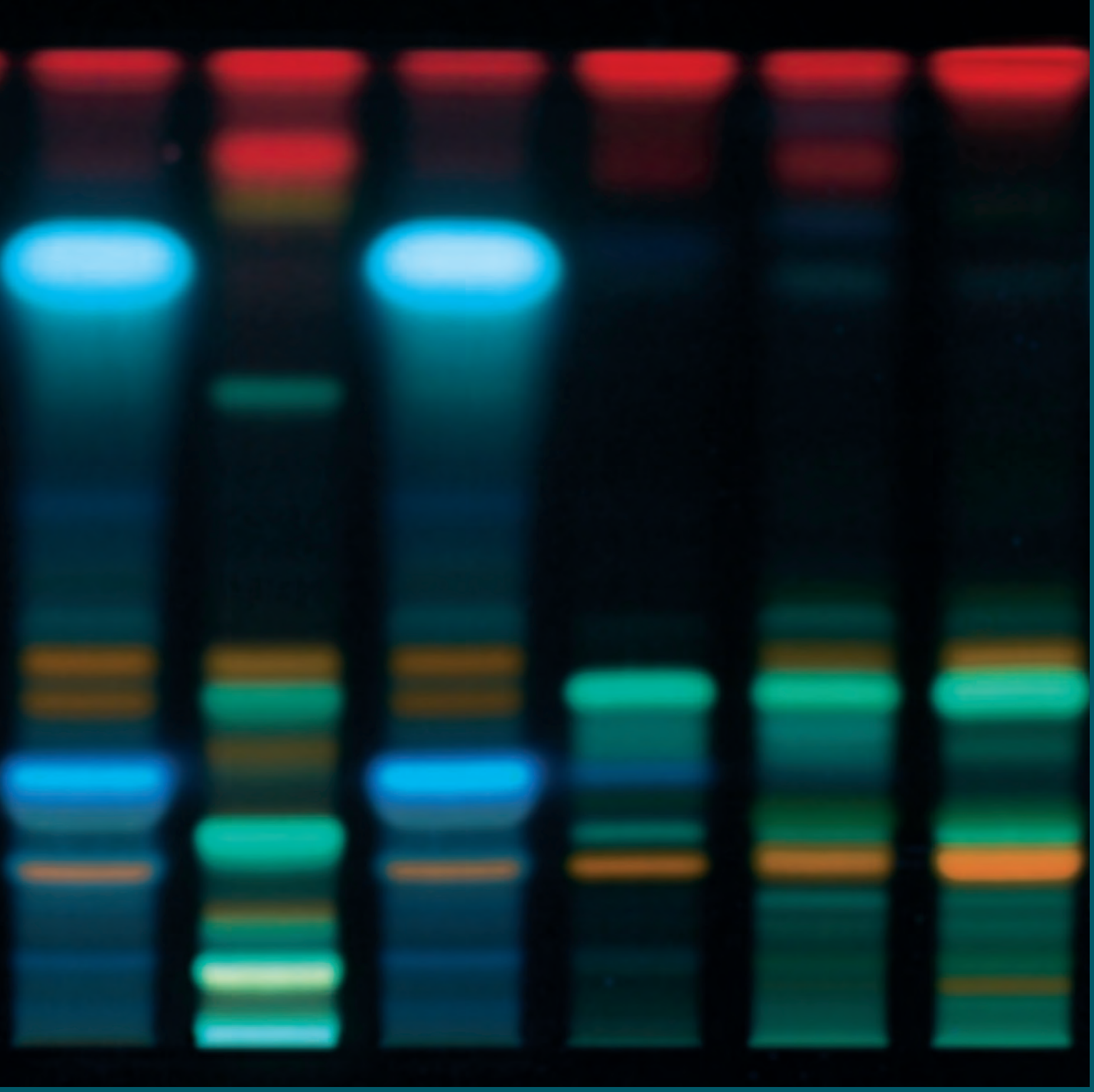
Ordering information		layer (µm)	size (cm)	quant./pkg
034.5721	TLC plates silica gel (without F)	250	20 x 20	25
034.5729	TLC plates silica gel 60 F 254	250	10 x 20	50
034.5715	TLC plates silica gel 60 F 254	250	20 x 20	25
034.1798	TLC plates silica gel 60 F 254, concentration zone	250	20 x 20	25
034.5554	TLC aluminium sheets silica gel 60 F 254	200	20 x 20	25
034.5559	TLC aluminium sheets RP-18 F 254s	200	20 x 20	20
034.5804	LuxPlate Si 60 F254	250	20 x 10	50
034.5805	LuxPlate Si 60 F254	250	20 x 20	25

Note

This selection of MERCK precoated plates represents only a selection of frequently used plates.

The complete line of MERCK precoated plates can be found at www.tlc.MERCK.de.

On request CAMAG can deliver any plate from the MERCK line.



CAMAG SERVICES

«OPTIMIZED APPLICATIONS AND
COMPETENT ADVICE»

CAMAG SERVICES

CAMAG LABORATORY SERVICES

CAMAG Laboratory offers professional HPTLC solutions for your analytical problem! The Lab has over ten years 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 samples.

Services include:

1) Method development and validation
Depending on the analytical goal qualitative and quantitative methods are developed from scratch. Existing methods can be customized or optimized.

2) Feasibility studies
Following a detailed discussion of the analytical goal the lab can evaluate whether HPTLC or TLC is a potential solution. Costs per sample and general performance of a method during routine use are estimated. Information obtained during the experimental work can be transferred to method development.

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. CAMAG Laboratory can also work according to your in-house method or employ their own validated methods. In any case an analytical report is generated for each project.

4) Consulting and training
CAMAG helps you get started! Whether it is setting up a small lab, ensuring compliance with cGMP, or 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 methodology and technology. Let us show you how to properly use your equipment, get reliable results, and develop and validate methods yourself.

5) Applied research
We provide opportunities to local[1] students, scholars, and researchers to engage in research projects at our facilities. Our non-profit projects are focused on, but are 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.

[1] *Greater Basel area*

Contact Information

Internet	www.camag.com/laboratory
Phone	+ 41 61 467 34 34
Fax	+ 41 61 461 07 02
E-mail	lab@camag.com

EDUCATION AND TRAINING

CAMAG Laboratory is also your partner when it comes to education and training in the field of Thin-Layer chromatography.

In Muttenz we offer courses on the following subjects:

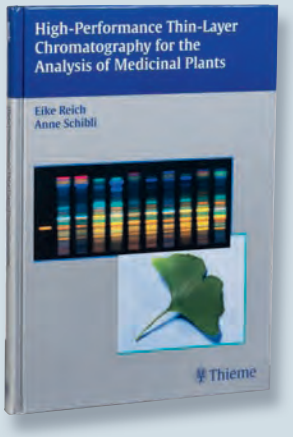
- Introduction to modern Thin-Layer chromatography.
- Method development.
- HPTLC for the analysis of botanicals.
- HPTLC for the pharmaceutical industry.
- Automated multiple development (AMD).

TEXTBOOK

A complete reference for establishing the identity and quality of botanical products

HPTLC for the Analysis of Medicinal Plants

- Practical examples provided by renowned experts help the reader gain a firm understanding of HPTLC methodologies.
- More than 300 full-color images and illustrations aid comprehension of complex concepts.
- Easy-to-reference text boxes provide summaries of key information – ideal for rapid review.
- Discussion of the developmentand validation of new HPTLCmethods.



High-Performance Thin-Layer Chromatography for the Analysis of Medicinal Plants

Eike Reich, *PhD, Head of Laboratory, CAMAG Muttenz, Switzerland, and* **Anne Schibli**, *MsPharm, Assistant Head of Quality Control, SwissCo Services AG, Sisseln, Switzerland*

2006, 344 pages / 332 illustrated, hardcover, ISBN 3-13-141601-7

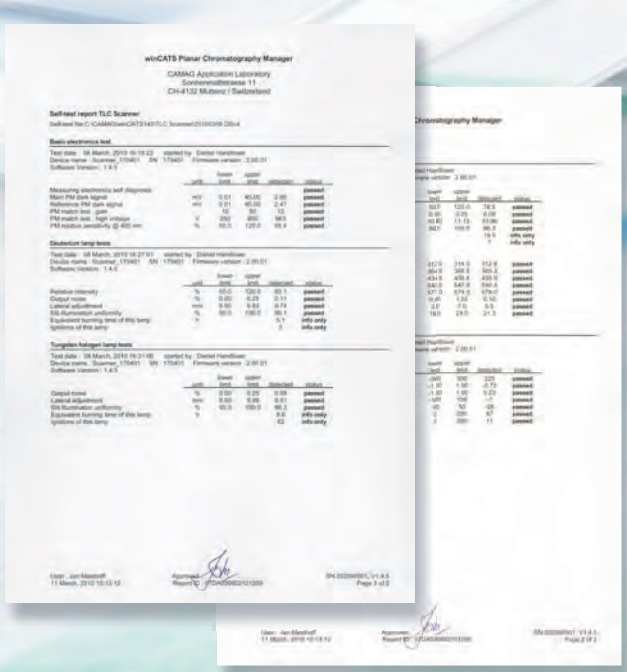
Current dates

The current course dates are available at www.camag.com/courses. For special topics as well as for instrument and software training we can arrange individual trainings for you.

Ordering information

995.0040 Book «High-Performance Thin-Layer Chromatography for the Analysis of Medicinal Plants», Reich/Schibli.

Webshop: www.camag.com



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 at the site and at the time of installation. It documents that all specifications and parameters comply with the manufacturer's specifications, environmental parameters and safety requirements.

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

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

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

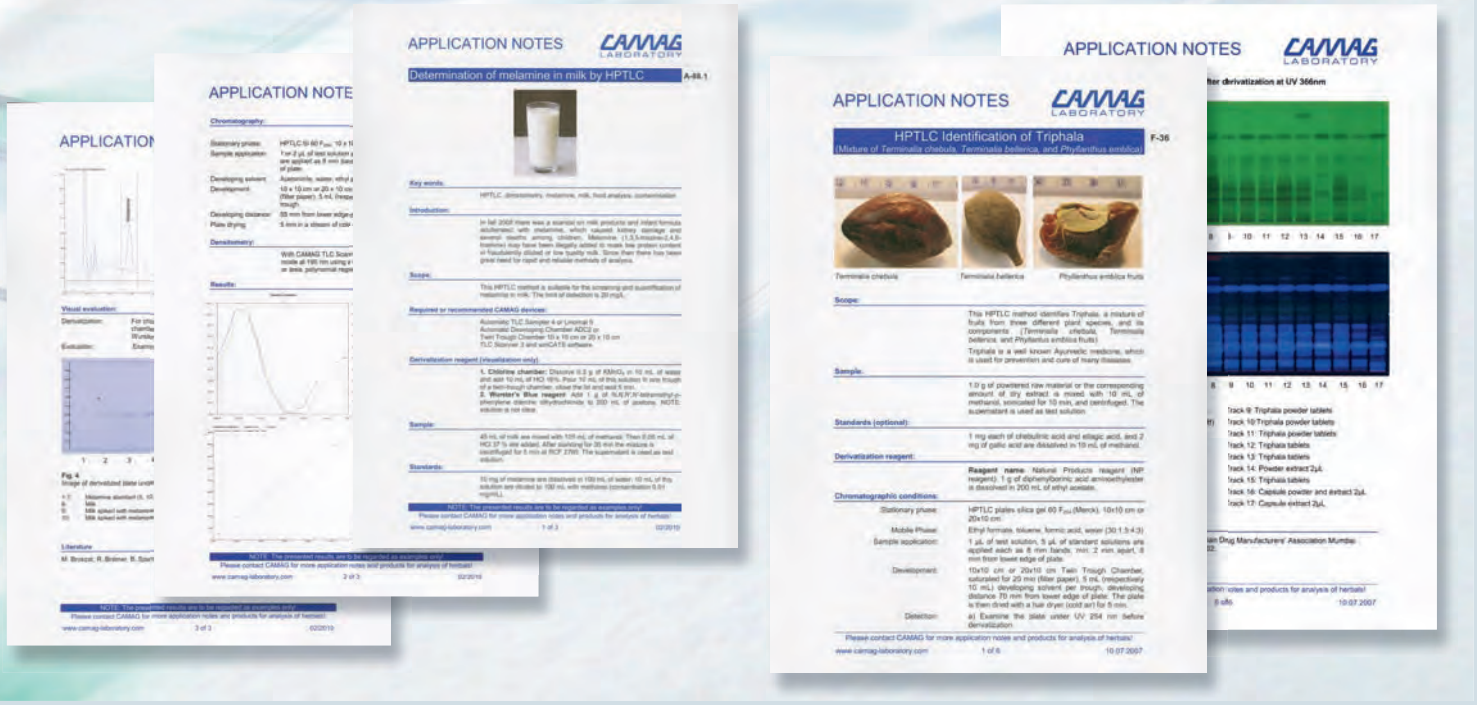
- winCATS with/without 21 CFR Part 11 «compliance ready»
- Linomat 5
- Automatic TLC Sampler ATS 4
- Automatic Developing Chamber ADC and ADC 2
- System for Automated Multiple Development AMD 2
- TLC Scanner
- TLC Scanner 3
- VideoScan
- DigiStore and Digistore 2
- TLC Visualizer

INSTRUMENT SERVICE

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

A service contract includes:

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



APPLICATION NOTES

CAMAG application notes describe complete solutions for specific analytical problems. In addition they can serve as guide towards solutions for similar tasks. To ensure the best results possible, the application notes include detailed information on:

- Scope and analytical task.
- Sample preparation.
- Sample application.
- Chromatographic conditions.
- Post chromatographic derivatization.
- Chromatogram evaluation with results.

The following applications were recently developed:

Quantitative Determinations

A-14.4 Acetylsalicylic acid, salicylic acid, and salicyl amide
A-83.1 Determination of sucralose and fructose in food and drinks
A-84.1 Determination of tetrandrin in Stephania tetrandra
A-86.1 Determination of artemisinin in Artemisia annua leaf
A-87.1 Determination of aucubin and catalpol in Plantago lanceolata
A-88.1 Determination of melamine in milk

Validated Methods

We develop and validate reliable HPTLC methods for the identification of botanical raw materials and finished products. By following our validated methods, reproducible results and comparable analyses are achieved, which guarantee an unfailing quality control. Currently ten validated methods are available with more to come. Please contact lab@camag.com for the validated methods or the validation protocol.

MOA 001 Green tea
MOA 002 Ginseng
MOA 003 Eleuthero
MOA 004 Echinacea
MOA 005 Cimicifuga
MOA 006 Licorice
MOA 007 Kava
MOA 008 Milk Thistle
MOA 009 Feverfew
MOA 010 Ginger

HPTLC FINGERPRINT ANALYSIS OF HERBALS

For reliable identification of herbal drugs we offer free of charge a large number of approved methods. On two pages each you will find information regarding sample preparation and chromatographic separation as well as images of the resulting chromatograms.

The following applications were recently developed:

HPTLC Fingerprints for the identification of…

F-21 Han fangji (Stephania tetrandra)
F-23 Chinese plants with respect to aristolochic acids
F-24A Echinacea (E. purpurea, E. pallida, E. angustifolia): Phenylpropanoids
F-24B Echinacea (E. purpurea, E. pallida, E. angustifolia): Alkylamides
F-26A Saw Palmetto (Serenoa repens): Ph.Eur.4
F-26B Saw Palmetto (Serenoa repens): Fatty oils
F-27 Plantain (Plantago lanceolata)
F-30 Eleuthero (Eleutherococcus senticosus)
F-31 Asian Ginseng (Panax ginseng)
F-32 American Ginseng (Panax quinquefolium)
F-33 Notoginseng (Panax notoginseng)
F-34 Biological acitivity of berberine containing drugs
F-35 Detection of the azo dye amaranth in Bilberry extract
F-36 Identification of the ayurvedic drug Triphala
F-37 HPTLC identification of Fatty Oils
F-38 DPPH-HPTLC Screening

Information

All methods and application notes can be found on the internet on www.camag.com/applications

CAMAG BIBLIOGRAPHY SERVICE «CBS»

CAMAG has been publishing this unique bulletin 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 in one of the common Western hemisphere languages.
- English translation of non-English title.
- Publication details.
- Brief abstract of the TLC related content with particular reference to separation systems, detection methods, quantification, results, etc..
- Key Words.

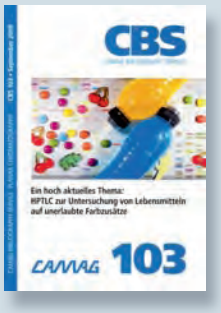
The purpose of the «CBS» is to inform readers about the existence of papers in their particular TLC field of interest. Reprints or photocopies of papers abstracted in the CBS are not available from CAMAG.

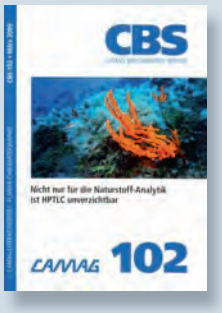
CUMULATIVE CAMAG BIBLIOGRAPHY SERVICE «CCBS»

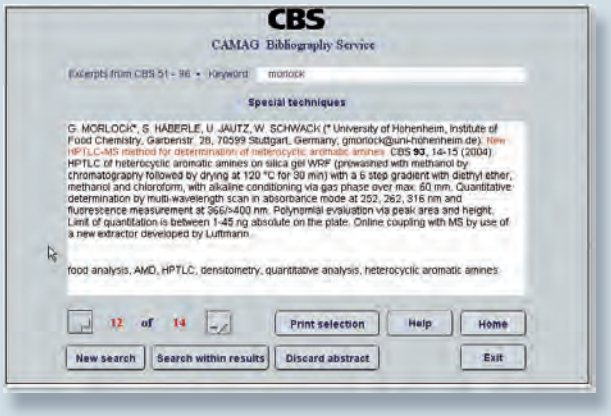
The most comprehensive compilation of TLC literature is now available as database. It includes all abstracts published since May 1983 that means TLC/HPTLC publications since 1982. It is updated after every regular CBS issue. At time of print of this catalog it contains 9600 abstracts. The most recent version of CCBS is available free of charge for download from our web site www.camag.com. Alternatively it can be requested from CAMAG on CD-ROM.

With the CCBS database you can now 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.
- From the result you can print out selected abstracts.







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Specifications are subject to change without notice.

CAMAG – GLOBAL PRESENCE

CAMAG markets its products in Switzerland directly from the head quarter, 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-year company history has profiled as a valued partner in all areas of Planar Chromatography.

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