MERCK

Thin-Layer Chromatography

TLC, HPTLC, TLC-MS, PLC, Accessories and Devices

The Life Science business of Merck operates as MilliporeSigma in the U.S. and Canada.

Supelco®
Analytical Products

content

Thin-Layer Chromatography (TLC)

Thin-layer chromatography (TLC) is a fast, easy-to-use, and highly versatile separation technique for qualitative and quantitative analysis, it is ideal for rapid identification of ingredients, screening and reaction monitoring. Its high matrix tolerance and the possibility to separate many samples in parallel makes TLC highly cost-efficient. In addition, multiple detection methods including visualization (derivatizations) and hyphenation to Mass Spectrometry (MS) enables a safe and precise identification of known and unknown compounds.

Some benefits of TLC:

- Disposable plates ensure simplified sample preparation
- Direct visualization of results by UV or derivatization
- Analysis of many samples under identical conditions simultaneously
- Easy two-dimensional separations
- Suitable for many applications, such as screening, rapid identity tests in drug synthesis, monitoring and easy upscaling for flash and preparative chromatography, and for quantitative analysis.
- Couple to MS or bioassays

Typical application fields for TLC include organic synthesis as well as fast identity testing in quality control.

In addition, TLC is an efficient tool for:

- Rapid analysis of ingredients in matrix-rich samples (e.g. QC in food or cosmetics)
- Fast screening of very complex samples (e.g. herbs or nutrition such as phytopharmaceuticals or forensics)
- A complementary method to verify correct results (e.g. cross-checking HPLC-results in pharmaceutical drug development or cosmetics)
- Rapid and high throughput pre-screening prior to HPLC

Furthermore TLC/HPTLC is well suited for:

- Full quantification of results using instrumental TLC/HPTLC
- Sample preparation for HPLC and other analytical methods
- Combination with mass spectrometry
- 2-dimensional chromatography
- Selective identification of compounds including biological activities

With our Company's extensive history, expertise, and know-how, we are the market leader of highest quality, reliable TLC & HPTLC plates and accessories. Our high-quality products have set standards of performance and utility. We are committed to quality providing exquisite accuracy. Every time. Besides, we make continuous attempts in having a sustainable production process. We are glad to offer you our quality plates, with significantly improved surface homogeneity and robustness.

Visit **SigmaAldrich.com/tlc** for further information.

Production at Headquarters in Darmstadt, Germany.

Key Applications

Simple and Quick

Sucralose in Food

In food analysis, we are often interested in only one or a few target compounds. But these compounds are present in many different samples, requiring different pre-treatments for their quantitative analysis. TLC is an ideal method for rapid quantification of one or few target compounds from complex and matrix-rich samples of different nature. The target compound needs only to be clearly separated from all matrix of the sample and quantified using a standard compound.

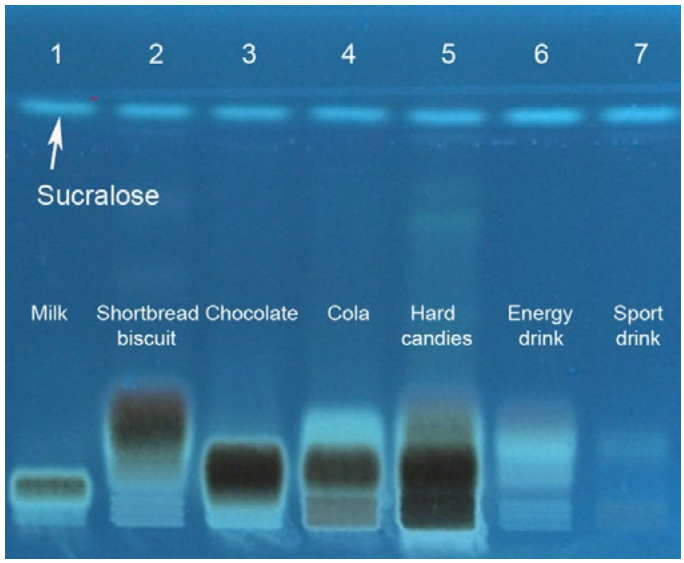
For the quantification of sucralose from different food samples, HPTLC was used without post-chromatographic derivatization. Forty-six chromatographic runs were performed in 40 minutes, with a separation time per sample of less than 1 minute.

Application Data

Chromatography	Plate	HPTLC Silica gel 60 NH_2 F_{254s} (20x10 cm)
	Sample preparation	The cake and biscuit samples were extracted with 70% aqueous methanol.
	Sample application	ATS 4 sample applicator (CAMAG®), 6 mm bandwidth
	Application volume	2-4 µL
	Mobile phase	Acetonitrile / Water 17:3 (v/v)
	Migration distance	5 cm
	Migration time	1.8 min / 2.8 min
Detection	Documentation equipment	DigiStore2 (CAMAG®)
	Wavelength	scan under UV-light at 366/>400 nm with TLC scanner 3 (CAMAG®)
	Staining	none

Ordering Information

Description	Cat. No.
HPTLC Silica gel 60 NH_2 F_{254s}, 20x10 cm	**1.13192.0001**
Acetonitrile - gradient grade for liquid chromatography LiChrosolv® Reag. Ph Eur	**1.00030**
Water for chromatography (LC-MS Grade) LiChrosolv®	**1.15333**



G. Morlock, M. Vega, J. Planar Chromatogr. 20 (2007), 411-417

Fast and sensitive

Lactose in Milk with HPTLC-MS

Food intolerances are of increasing importance. In particular, lactose intolerance has recently gained a lot of attention not only in Asian countries, but also in Europe and North America.

Foodstuff with a lactose content of less than 100 mg/100 g could be labeled as “lactose-free”. Traditionally, an analysis is carried out using photometric measurements in single cuvettes, or in 96-well plates by using an enzymatic test kit.

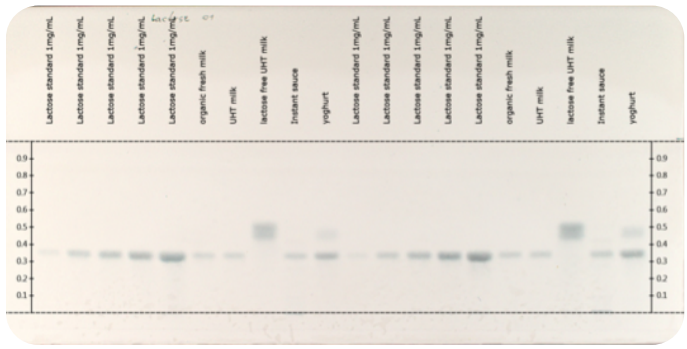
HPTLC coupled to MS enables a much simpler and faster identification and quantification. Lactose in different samples like milk, yoghurt and an instant sauce can be analyzed in parallel without complex sample preparation.

Application Data

Chromatography	Plate	HPTLC Silica gel 60 F_{254} MS-grade, 20x10 cm
	Sample preparation	Milk: 2 x 5 min centrifuged, then 1mL diluted in 50 mL water Yoghurt: 1 g diluted in 10 mL water, afterwards 1 x centrifuged rpm = 6000 Instant sauce: sauce cooked as directed, 1 g sauce diluted in 10 mL water, afterwards 1 x 5 min centrifuged
	Sample application	ATS 4 sample applicator (CAMAG®), 6 mm bandwidth
	Application volume	0.1 - 4 µL
	Mobile phase	Acetonitrile / Water 3/1 (v/v) + 0.1% Trifluoroacetic acid
	Migration distance	5 cm
	Migration time	12 min
Extraction	Extraction equipment	“TLC-MS Interface” from CAMAG®
	Extraction solvent	Acetonitrile / Water 95/5 (v/v) + 0.1% Formic acid
	Extraction flow	0.2 mL/min
Detection	Documentation equipment	TLC Visualizer (CAMAG®)
	Wavelength	scan at white light
	Staining	Aniline-diphenylamine-phosphoric acid reagent heated 10 min at 120 °C
	MS equipment	single-quadrupole mass spectrometer expression CMS (Advion)
	MS detection	ESI (+) mode (m/z 50 - 1200)

Ordering Information

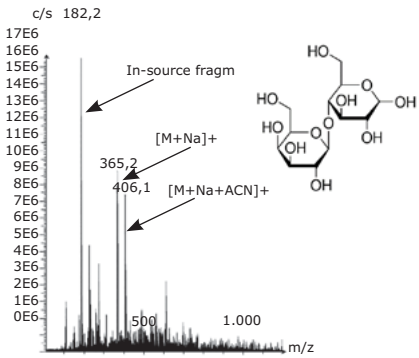
Description	Cat. No.
HPTLC Silica gel 60 F_{254} MS-grade, 20x10 cm	**1.00934**
Acetonitrile hypergrade for LC-MS LiChrosolv®	**1.00029**
Trifluoroacetic acid for spectroscopy Uvasol®	**1.08262**
Diphenylamine for synthesis	**8.20528**
Aniline for analysis EMSURE®	**1.01261**
Ortho-Phosphoric acid for analysis EMSURE®	**1.00573**



Chromatogram (derivatized with Aniline-di-phenylamine-phosphoric acid reagent) under white light.

Determinded Lactose values

Organic fresh milk	4.68 g/100 g
UHT milk	4.36 g/100 g
Lactose free UHT milk	< 100 mg/100 g
Instant sauce	1.64 g/100 g
Yoghurt	5.49 g/100 g



Lactose

M = 342.3 g/mol

Mass spectrum of lactose-zone from yoghurt sample, eluted directly from the TLC plate

Robust and Accurate

UV Filter in Sun Cream using HPTLC-MS

Analytical verification of cosmetic products can be a challenging task. Formulations like creams, balms or lotions are complex matrices for chromatography, and so a quick and simple sample preparation with a direct analysis method is appreciated. Thin-layer chromatography-mass spectrometry (TLC-MS) is such an analytical technique which allows the analysis of these complex samples with minimum sample preparation.

Application Data

Chromatography	Plate	HPTLC RP-18 F_{254S} MS-grade, 20x10 cm
	Sample preparation	1 g Sun Cream stirred in 10 mL 2-propanol, filtration
	Sample application	ATS 4 sample applicator (CAMAG®) 6 mm bandwidth
	Application volume	0.5 - 5 µL
	Mobile phase	Methanol / Acetonitrile 9/1 (v/v)
	Migration distance	5 cm
	Migration time	11 min
Extraction	Extraction equipment	"TLC-MS Interface" from CAMAG®
	Extraction solvent	Acetonitrile / Water 95/5 (v/v) + 0.1% Formic acid
	Extraction flow	0.2 mL/min
Detection	Documentation equipment	Documentation unit Reprostar / Digistore (CAMAG®)
	Wavelength	Scan under UV-light at 254 nm and 366 nm
	Staining	None
	MS equipment	ACQUITY Qda Detector, Single-Quadrupole Mass Spectrometer
	MS detection	ESI (+/-) mode MS (m/z 50-350)

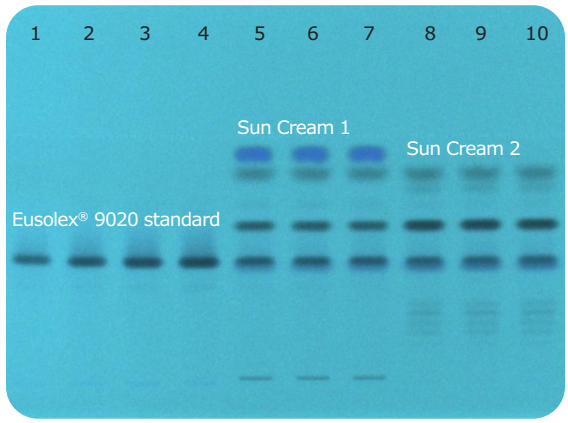


Figure 2: Developed plate at 254 nm

Chromatographic Data

Track	Compound	Concentration (mg/mL)	Application volume (µL)	hR_f	Detected mass m/z
1-4	Eusolex® 9020 Standard	0.1	2, 3, 4, 5	50	311.2
5-7	Sun Cream#1	0.1	0.5	50	311.2
8-10	Sun Cream#2	0.1	0.5	50	311.2

Ordering Information

Description	Cat. No.
HPTLC RP-18 F_{254S} MS-grade, 20x10 cm	**1.51161**
Acetonitrile hypergrade for LC-MS LiChrosolv®	**1.00029**
2-Propanol gradient grade for liquid chromatography LiChrosolv®	**1.01040**
Methanol for LC-MS LiChrosolv®	**1.06035**
Formic acid for analysis EMSURE®	**1.00264**
Water for chromatography (LC-MS Grade) LiChrosolv®	**1.15333**
Millex®-FH filter, 0.45 um hydrophobic, 25 mm, non sterile	**SLFH025NS**

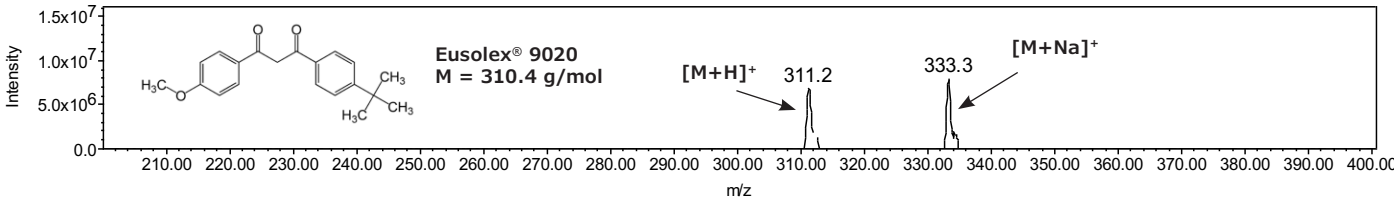


Figure 1: Mass spectrum and structure of Eusolex® 9020, recorded at hR_f value of 50 at track **5.**

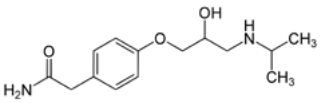
Meet Regulations in Pharma

Identification Test for Atenolol and Chlorthalidone in Tablets following European Pharmacopeia Monograph

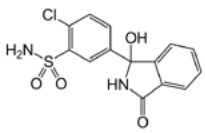
Atenolol is a selective β1 receptor antagonist, belonging to the group of beta blockers, a class of drugs used primarily in cardiovascular diseases.

Chlorthalidone is a diuretic drug used to treat hypertension, originally marketed as Hygroton in the USA. It is described as a thiazide diuretic, and is often used in the management of hypertension and edema.

This application note illustrates the suitable use of silica gel G F_{254} plates for the analysis of Atenolol and Chlorthalidone in a combination drug following the experimental conditions per the European Pharmacopeia identification TLC test for Atenolol (version 9.0).

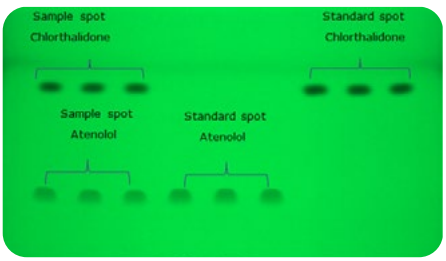


Atenolol



Chlorthalidone

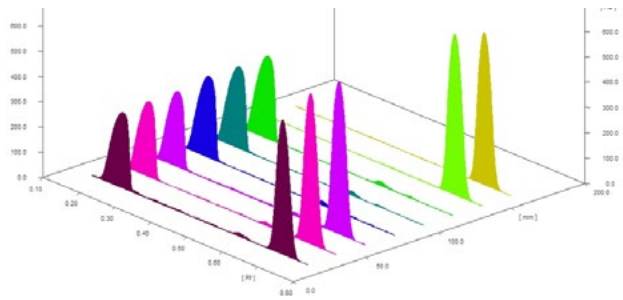
Experimental Condition	
TLC plate	Silica Gel 60 G F_{254}, 20x20 cm
Application volume	5 µL of each solution
Detection	UV @ 254 nm
Mobile phase	18 M Ammonia and n-butanol 30:150 (v/v)
Plate development	Line the walls of chromatographic tank with filter paper. Pour a sufficient quantity of mobile phase into the chromatographic tank. Saturate the chromatographic tank, replace the lid and allow to stand at 20-25°C for 1 hr. Apply the prescribed volume of the solutions in sufficiently small portions to obtain bands at an appropriate distance from the lower edge.
Migration distance	15 cm
Drying	in air
Standard	1.0 % (w/v) of Atenolol in 0.25 % (w/v) of Chlorthalidone in methanol
Sample	Remove any film coating on the tablet powder and shake the quantity of powered tablet containing 0.1 g of atenolol with 10 mL of methanol for 15 minutes and filter.



TLC Plate Development

Ordering Information

Description	Cat. No.
TLC Silica gel 60 G F_{254} 20x20 cm, glass plate, Pk.25	**1.00390**
1-Butanol for liquid chromatography LiChrosolv®	**1.01988**
Ammonia solution 25% Suprapur®	**1.05428**
Methanol gradient grade for liquid chromatography LiChrosolv® Reag. Ph Eur.	**1.06007**
Atenolol European Pharmacopoeia (EP) Reference Standard	**A1340000**
Atenolol Pharmaceutical Secondary Standard; Certified Reference Material	**PHR1909**
Chlorthalidone European Pharmacopoeia (EP) Reference Standard	**C1950000**



Regulated Method: Food & Beverage

Piperine in Black Pepper

Piperine is the active component of the spice black pepper, able to influence drug metabolism.

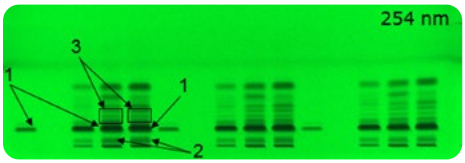
With a regulated method, one must follow the monograph instead of keeping the sample at the center of the decision making, so that it purely follows the instructions in the monograph. In this application, we have chosen powdered black pepper as an example, and have tested it according to the United States Pharmacopeia (USP) guidelines (USP 40-NF35).

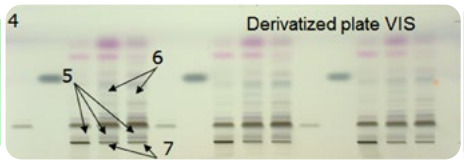
Application Data

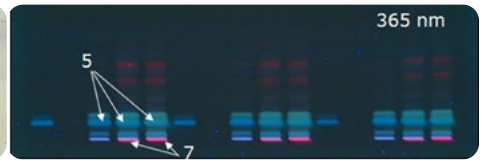
Chromatography	**Plate**	HPTLC Silica gel 60 F_{254} (20x10 cm)
	Sample preparation	Add about 0.5 g of powdered black pepper to 5 mL methanol, sonicate for 10 minutes, centrifuge, and use the supernatant
	Sample application	ATS 4 sample applicator (CAMAG®), 8 mm bandwidth
	Mobile phase	n-Hexane / Ethylacetate 5:3
	Migration distance	5 cm
Detection	**Wavelength**	scan under visible light, UV-light at 254 nm and 366 with TLC Scanner 3 (CAMAG®)
	Staining / Derivatization	A mixture of 17 mL of ice-cooled methanol, 2 mL of acetic acid, 1 mL of sulfuric acid and 0.1 mL of anisaldehyde

Featured Products

Description	Cat. No.
TLC & HPLC	
HPLC glass plates Si 60 F_{254}, 20x10 cm	**1.05642**
Purospher® STAR RP-18 endcapped (5 µm) Hibar® RT 250-4.6	**1.51456**
Solvents & reagents	
Ethyl acetate for liquid chromatography LiChrosolv®	**1.00868**
n-Hexane for liquid chromatography LiChrosolv®	**1.04391**
Water for chromatography (LC-MS Grade) LiChrosolv®	**1.15333**
Acetonitrile - gradient grade for liquid chromatography LiChrosolv®, Reag. Ph Eur	**1.00030**
Methanol - gradient grade for liquid chromatography LiChrosolv®, Reag. Ph Eur	**1.06007**
Potassium dihydrogen phosphate anhydrous for HPLC LiChrosolv®	**5.43841**
ortho-Phosphoric acid 85% for HPLC LiChrosolv®	**5.43828**
Filtration	
Millex® syringe filter units, disposable, Durapore® PVDF, Pk. 1000	**SLHVX13NK**
Standards	
Piperine - United States Pharmacopoeia (USP) Reference Standard, 20 mg	**1.543200**
Powdered Black Pepper Extract - United States Pharmacopoeia (USP) Reference Standard, 1 g	**1.509019**







- Track 1: 3 µL standard solution A, USP reference standard (RS) of 0.9 mg/mL piperine in methanol.
- Track 2: 3 µL standard solution B, a 2 mg/mL borneol standard in methanol.
- Track 3: 15 µL standard solution C, USP powdered black pepper extract RS 5 mg/mL in methanol, sonicated, centrifuged, and the supernatant is used.
- Track 4 & 5: 7 µL two different commercial pepper samples of the same concentration taken through the same sample preparation steps. (add about 0.5 g of powdered black pepper to 5 mL of methanol, sonicate for 10 minutes, and then use the supernatant).

Application Results

1. Under 254 nm, the chromatogram of the sample solution exhibits an intense quenching band at R_f of about 0.15 corresponding to the piperine band in the chromatogram of standard solution A
2. A quenching band at R_f of about 0.02
3. Three quenching bands of similar intensity equally spaced located between
4. Under white light, the derivatized chromatogram of the sample solution exhibits main bands similar in position and color to the main bands in the chromatogram of Standard solution C
5. These bands include a dark green band of the same color and R_f as the piperine band in Standard solution A (R_f of about 0.15)
6. A weak violet band at R_f of about 0.47 below the position of the band due to borneol in Standard solution B
7. A greenish band in the lower part of the chromatogram at R_f of about 0.07

General Information

TLC Plates to Fit Your Needs

As leading supplier of thin-layer chromatography consumables, we offer an extensive portfolio of plates, reagents and accessories for TLC, preparative TLC, and high performance TLC (HPTLC). In addition, we also offer special MS-grade TLC and HPTLC plates for a perfect combination with mass spectrometry. Each of our high-quality product is setting new standards in quality, performance and utility.

Pick your plate

Glass, aluminum or plastic? You have the choice with our classical silica TLC plates. Each is available in a broad range of sizes from 20x20 cm down to 2.5x7.5 cm. They offer a layer thickness of 250 µm for glass plates and 200 µm for aluminum or plastic, with a mean particle size of 10-12 µm. Special plates with a thinner or thicker layer are available, ideal for TLC-MS for example.

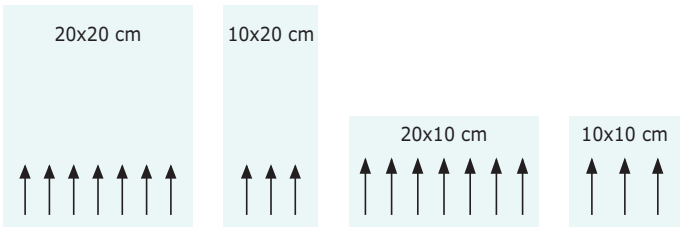
Plate Backing or Support

Classical silica TLC plates are available with glass, aluminum or plastic backings.
The flexible aluminum or plastic sheets can be easily cut with scissors to suit individual separation requirements.

Support/Backing	Advantages	Disadvantages
Glass	Rigid	Fragile
	Transparent	Cannot be easily cut into desired size
	Economical (reusable)	Heavy – high transport costs
	High chemical resistance	Thick (>1.0 mm) – about 5x more shelf space than aluminum or plastic-backed plates
	Most commonly used support	
	Good heat stability for charring	Backing highly susceptible to breakage (potential safety issue)
Aluminum Foil	Easy to handle/safe – resistant to breakage	Backing is not reusable
	Can be easily cut to desired dimensions with scissors	Not as chemically resistant as glass to reagents such as mineral acids and concentrated ammonia
	Thin (~0.15 mm) – minimal storage space	
	Lightweight – lower shipping costs	
	Solvent resistance	
	Strong adsorbent layer adherence – good for use with eluents containing high concentrations of water	
	Good heat stability	
	Can be stored in lab notebook	
Plastic (Polyester – PET)	Easy to handle/safe – resistant to breakage	Backing is not reusable
	Can be easily cut to desired dimensions with scissors	Lower heat stability – charring must be done at lower temperatures than with glass
	Thin (~0.2 mm) – minimal storage space	
	Lightweight – lower shipping costs	Flexible – adsorbent layer may be more susceptible to cracking
	Solvent resistance	
	Can be stored in lab notebook	

Format and Plate Dimensions

TLC and HPTLC plates are available in several different dimensions. The plates dimension (size) are given in cm (e.g., 20x20 cm). Here the first number indicates the plate width and the second the plate length. The migration direction is indicated below:



Glass plates	Aluminum sheets	Plastic sheets
20×20 cm	20×20 cm	20×20 cm
10×20 cm (TLC)	5×20 cm	500×20 cm
20×10 cm (HPTLC)	5×7.5 cm	
5×20 cm	500×20 cm	
5×10 cm		
2.5×7.5 cm		

Multiformat Plates

Multiformat glass plates are pre-scored so that they can be easily snapped by hand into smaller sizes. The plates utilize the same proven silica gel coating as the corresponding non-scored TLC or HPTLC plate, delivering chromatograms of equally high-quality.

The number of possible plates depends on the scoring. For example, for a 20×20 cm plate scored in sections of 5×10, up to seven different formats are possible:

- 5 cm × 10 cm
- 5 cm × 20 cm
- 10 cm × 10 cm
- 10 cm × 15 cm
- 10 cm × 20 cm
- 15 cm × 20 cm
- 20 cm × 20 cm

Features and Benefits

- Simply snap to desired sizes
- Same high-quality as classical non-scored TLC and HPTLC plates
- Up to 7 formats in one plate

How to use Multiformat TLC and HPTLC Plates

Note: To prevent the glass backing from breaking in an uncontrolled and irregular manner, avoid putting plates directly on hot metal plates, drying cabinets or plate heaters after development and/or staining. When heat drying is necessary, please use distance holders of low thermal conductivity between the glass and the hot metal plate, i.e. glass rods or similar.

Adsorbent / Layers

Our glass, aluminum foil and plastic PET (polyester) TLC and HPTLC plates are available with a variety of adsorbent coatings, with and without fluorescent indicator.

- Silica gel (unmodified, modified/bonded, and high purity) is the most common TLC sorbent.
- The pore size of the silical gel particles are usually 60 Angstrom.
- Aluminum oxide which exhibits similar selectivity, although slightly different, to silica is the second most common TLC sorbent.
- Cellulose – available as either microcrystalline or fibrous cellulose. Spots are generally more compact when separated on layers of microcrystalline cellulose than when separated on layers of fibrous cellulose.
- Kieselgur is a natural diatomaceous earth that can be used for the separation of polar or moderately polar compounds.

Layer Thickness

The layer thickness of our glass TLC plates is 250 µm, and 200 µm for aluminum or plastic, with a mean particle size of 10–12 µm.

For HPTLC, we use an optimized silica 60 sorbent with a significantly smaller particle size: just 5–6 µm compared to 10–12 µm used for classical TLC. This enables a higher packing density and hence a smoother surface. Band diffusion is also reduced, producing very compact sample bands or spots. These features and the thinner layer (200 µm or 100 µm) ultimately leads to highly increased sensitivity and faster analysis.

Binder

Polymeric (organic) binder:

Our unique binder technology ensures a uniform and hard surface of the TLC plate that will not crack or blister. Traditional silica plates contain a polymeric (organic) binder of high molecular weight acrylic acid polymers for the most rugged plates, making sample handling and application easier. They also permit the use of higher water content in the developing solvent. They are generally recommended for all TLC applications and in many applications outstanding suitability with no negative influence on the chromatographic result has been proven.

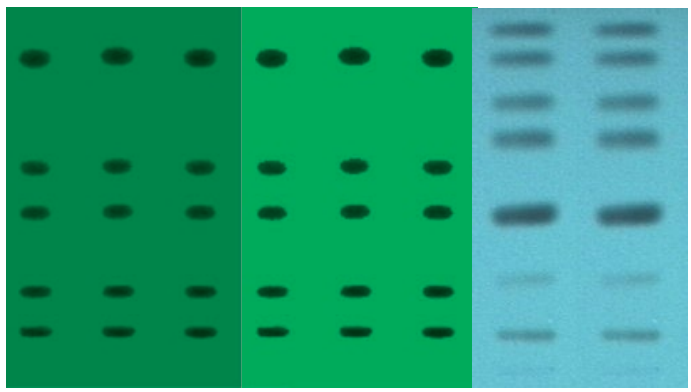
Gypsum:

Gypsum as a binder is recommended for TLC users in QA/QC labs following older Ph. Eur. monograph methods, which require TLC plates with gypsum binder, and who do not wish to switch to classical TLC plates with organic binders. Our TLC silica gel 60 G plates are best suited for this approach.

Binder in cellulose plates: The binder we use for our cellulose plates is Carboxymethylcellulose.

Indicators

We also provide two kinds of inorganic fluorescent indicators for UV detection of colorless substances: the green fluorescing F_{254} or the blue fluorescing, acid-stable F_{254s}, both of which fluoresce in UV light at an excitation wavelength of 254 nm. Samples which absorb shortwave UV at 254 nm are detected due to fluorescence quenching. For superior identification of separated substances, our exceptional high-fluorescent LuxPlates™ contain a higher amount of fluorescent indicator.



F_{254} LuxPlate™ F_{254s}

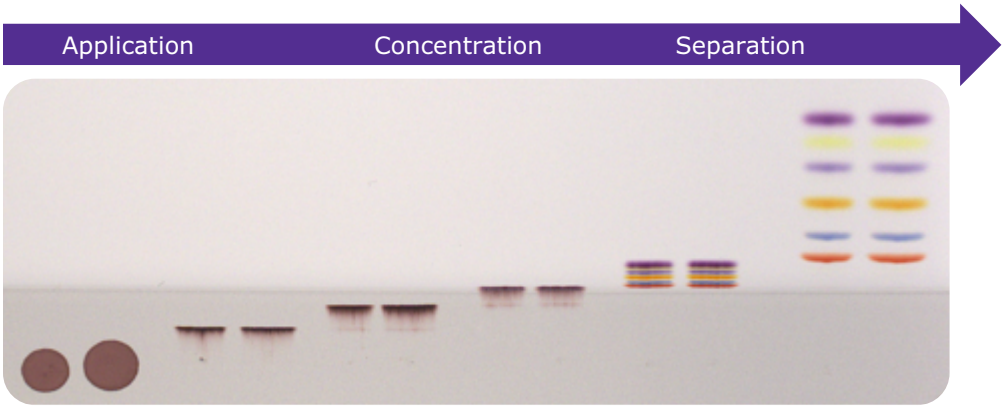
TLC and HPTLC Plates with Concentrating Zone

Quick and Easy Application of Large Sample Volumes

Our concentrating zone plates are based on the different properties of two silica adsorbents: an inert, large-pore concentrating adsorbent where the samples are applied; and a selective separation layer. Independent of the shape, size or position of the spots, the sample always concentrates within seconds as a narrow band at the interface of the two adsorbents. In addition, the concentrating zone can serve as a clean-up step for analytes in complex matrices, such as oils and cosmetics. Suitable for TLC, HPTLC and PLC, these plates allow easy application of large volumes of diluted samples. The concentrating zone is 2.5 cm for our analytical TLC and HPTLC plates, and 4 cm in length for our PLC plates.

Features and Benefits

- Quick and easy sample application
- Highly facilitated sample loading
- Better resolution due to focused bands
- Includes purification and concentration steps



GLP-Plates

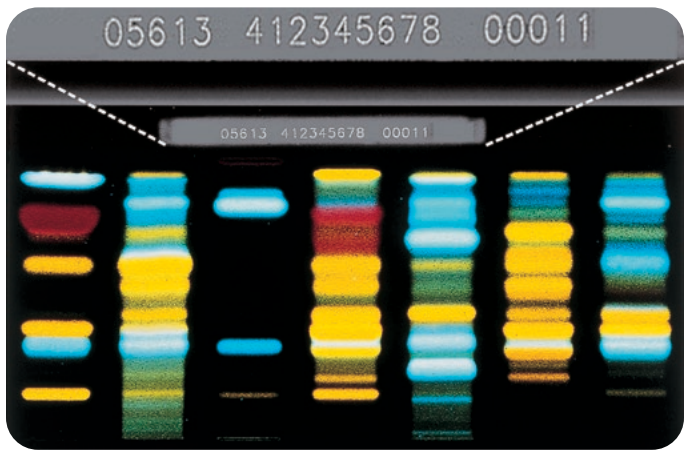
With Individual Laser Coding for Secure Documentation

Based on our proven high-quality silica gel 60 production technology, the GLP plates deliver the same unsurpassed separation performance as the corresponding TLC or HPTLC plates. The only difference is that each of our laser-coded GLP plates is marked with an item, batch, and individual plate number.

This allows you to easily record and archive every plate you use. Our GLP plates are available as TLC or HPTLC grade in various formats, with or without the fluorescence indicator F_{254}, which is stimulated to green emission at 254 nm.

Features and Benefits

- Convenient back tracing of article, batch, and individual plate number
- Easy documentation and archiving of every plate
- Same reliable performance as TLC and HPTLC plates manufactured



Practical Tips & Tricks

The TLC working principle

Figure 1 illustrates the complete thin-layer chromatography process. It depicts numerous steps and the various precautions to be considered. Since the gas phase also influences the TLC process, it is a crucial prerequisite to maintain controlled gas and humidity conditions to obtain reproducible and precise TLC performance results. The following figure shows some of the important aspects to be considered during different steps.

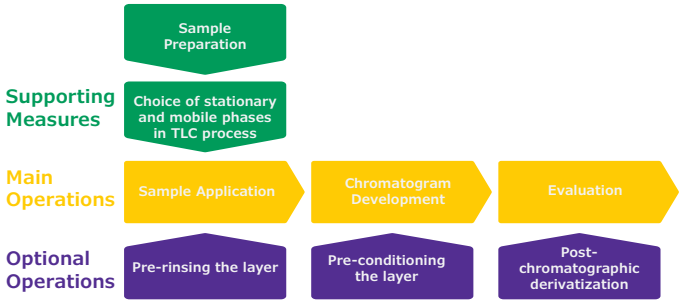


Figure 1. TLC process

Storage and handling

TLC layers are highly active materials and can adsorb moisture and contaminations from the lab environment. Therefore, storage of plates in a clean and dry environment is recommended. If possible, wrap the plates in aluminum foil. Also, keep the plates away from chemical fumes and vapor.

Pre-rinsing (washing) and activation of the layer

Contaminants and moisture from the environment can alter plate performance. In addition, the plates may have impurities from binders, packaging, or previous handling. These components should be removed by pre-rinsing the layer. This is performed either by dipping (once or twice, 1-7 minutes) or by running a blank chromatography of the TLC plate, e.g., with methanol. Mind the chromatographic direction because impurities concentrate at the top edge of the plate.

To remove bonded water at the polar sites, it is advised to heat the plate for 20 – 30 min at 120 °C (in a clean oven) for a proper plate activation.

Sample preparation

Thin-layer chromatography plates are single-use products with no cross-contamination between the plates. So, sample preparation is less time-consuming compared to HPLC. Sample crushing and extraction with an appropriate diluent is recommended, followed by filtration and concentration steps.

Choice of stationary phases

The choice of the TLC stationary phase is very crucial, as it determines the selectivity. There is a broad range of options available, such as silica, aluminum oxide, or cellulose, modified or non-modified plates. The choice should be based on the properties of your sample and your application goals. Similar to HPLC, TLC can also be run in two modes, normal and reversed phase. In normal phase (NP) TLC, the mobile phase is less polar than the stationary phase, whereas in reversed phase (RP) TLC, the mobile phase is more polar than the stationary phase. More than 80% of all TLC separations are done with silica gel as the stationary phase.

Choice of mobile phases (solvent system)

The choice of the mobile phase is critical for efficient separation results. The solvent dissolves the sample components from the sorbent layer and moves them across the plate. Ideal mobile phases transport all components off the baseline, having final R_f values between 0.15 and 0.85 (ideally 0.2 – 0.6). When starting a method from scratch, typically a mixture of a polar and non-polar solvent is used as a starting point. To increase R_f values in NP TLC, an increase of the polarity of the mobile phase is needed. In case a reduction in R_f is required, a decrease of polarity is recommended. A very common mobile phase system in NP TLC contains hexane and 10 – 50% EtOAc. Other prominent systems include methanol with dichloromethanes and toluene with acetone. In RP TLC, the solvent systems are usually mixtures based on e.g., water, methanol, acetonitrile, or aqueous buffers.

The addition of a certain modifier (basic, acidic) might increase separation result.

A detailed systematic approach to finding the ideal solvent systems can be followed according to published data.[1] Please consider that all solvents should have adequate purity and stability, low viscosity, low vapor pressure and low toxicity if possible.

Sample application

Samples can be applied as spots or bands by contact or spraying. Sample application by spraying in a band enables an improved separation result and is the preferred method with a larger sample volume. There is special equipment available to spray sample solutions onto the plate. This method avoids direct contact with the TLC layer and is typically used for band application.

The polarity of the diluent is a factor to consider. In NP TLC, non-polar diluents are used, like e.g., n-hexane, and substances remain at the application point. However, with more polar diluents (toluene,

dichloromethane, methanol), the substances are transported toward the edge of the "wet zone" and typically form a circular chromatogram at the starting area. After chromatographic development, peaks with an almost Gaussian distribution are achieved with increasing polarity of the diluent (**Figure 2**).

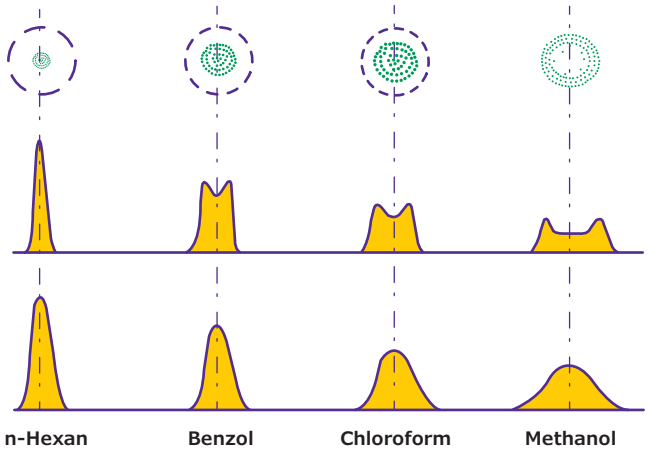


Figure 2. Substance distribution in TLC as a function of the solvent

Based on the number of samples being analyzed, select a suitable plate size or cut a larger plate of the needed dimensions. Mark the application zone with a pencil by drawing lines across the plate. Take care not to damage the layer surface, as this can lead to errors. Be careful not to apply the sample too close to the bottom edge of the plate (8 mm from the lower edge), as this can cause the starting point to spread into the mobile phase. The sample volume depends on the aim of the analysis and the concentration of the sample solutions. A sample volume of 0.5-2.0 µL is recommended for identity tests and a maximum of 10 µl for purity testing. The higher the sample volume, the more volatile and non polar the diluent should be, and the slower the application should be carried out.

Drying plates prior to development

After the sample is applied on the plate, the diluent must be completely removed by carefully drying the plates prior to development. Avoid contamination with fumes during drying and choose an appropriate temperature in order not to cause sample diffusion or loss.

Preconditioning the layer/ humidity control

Unless special precautions are taken during sample application, humidity in the laboratory can diminish the activity of the TLC layer within minutes, as equilibrium is reached between the lab atmosphere and the sorbent. Preconditioning of TLC plates helps prevent their deterioration. Therefore, condition plates (after sample application) for 45 min over a saturated salt solution in a closed chamber. Depending on the relative humidity you need to reach, several saturated salt solutions are recommended. A relative humidity of 33% is considered moderate and can be maintained using a saturated $MgCl_2$ solution. Ensure that undissolved salt remains in the saturated solution. Additionally, it is crucial to develop the plate immediately after conditioning.

Chromatogram development

The development of the TLC plates can be done through various techniques, such as one-dimensional one-dimensional or two-dimensional or via forced flow processes. One-dimensional can be single or multiple developments, whereas single developments are run vertically, horizontally, or circularly. In most cases, the separation is done vertically in a development chamber.

Insert the freshly prepared mobile phase in the development chamber to a level of max. 0.5 cm (immersion line). Before starting the development process, an equilibrium of the mobile phase between solvent and gas phase is needed and can be reached by a chamber saturation. Add a saturating pad or filter paper inside the chamber for 20 min (keep the chamber sealed). After chamber saturation, place the plate inside the chamber. As soon as the mobile phase has travelled two-thirds of the plate dimension (max. up to 1 cm from the top), remove the plate and mark the solvent front. After development, plate should be properly dried to remove residual solvents before visualization.

Derivatization

When separated compounds are colorless, or do not respond to UV radiation, and do not fluoresce, derivatization is used to enhance detection. The detection reagent may be used with the solvent system (*in situ* derivatization) before development (pre-chromatographic derivatization) or after development (post-chromatographic derivatization).

A detection reagent is applied to the plate (by spraying or dipping) to enable chemical visualization. The advantages of spraying include high flexibility and requiring fewer reagents when manual spraying does not enable sufficient reproducibility.

Dipping based derivatization allows a more homogeneous and reproducible derivatization but needs more reagents. Additionally, background coloration may occur. The backside of the plate must be carefully wiped after derivatization.

Performing TLC in a proper way will deliver you reproducible and precise results, both for qualitative and quantitative analysis.

Reference:

1. Snyder, L. R., J. Chromatogr., Sci.16 (1978), 223

Ordering Information

Classical Silica Plates for TLC

Unmodified silica is the most widely used sorbent in TLC. There's a good reason for this: when combined with a suitable mobile phase, it allows you to analyze almost any substance. The smooth and extremely dense plate coating ensures narrow bands and maximum separation efficiency with lowest background noise. Our silica plates offer all these advantages and more. They utilize our well-established silica gel 60 together with a unique polymeric binder, which results in a uniform, hard surface that will not crack or blister.

- Highest quality
- Most reliable batch-to-batch consistency
- Unsurpassed robustness

Reliable routine analysis of a broad range of substances

Unmodified silica gel covers nearly 80% of both adsorption and partition TLC applications. It enables separation of a large range of diverse substances, such as alkaloids, anabolics, carbohydrates, fatty acids, glycosides, lipids, mycotoxins, nucleotides, peptides, pesticides, steroids, sulfonamides, surfactants, tetracyclines and many others. This makes it suitable for:

- In-process control in drug synthesis
- Identity and stability testing of drugs
- Quality control of pharmaceuticals, food and environmental samples
- Residue analysis of food and environmental samples

Unmodified silica gel 60 TLC plates

Description	Layer Sorbent/Coating Material	Layer Thickness/ µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ content	Cat. No.
TLC Silica gel 60	Silica gel 60	250	20 x 20	glass	25 plates	**1.05721.0001**
TLC Silica gel 60	Silica gel 60	250	10 x 20	glass	50 plates	**1.05626.0001**
TLC Silica gel 60	Silica gel 60	250	5 x 20	glass	100 plates	**1.05724.0001**
TLC Silica gel 60	Silica gel 60	250	2.5 x 7.5	glass	100 plates	**1.15326.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	20 x 20	glass	25 plates	**1.05715.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	10 x 20	glass	50 plates	**1.05729.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	5 x 20	glass	100 plates	**1.05714.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	5 x 20	glass	25 plates	**1.05808.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	5 x 10	glass	200 plates	**1.05719.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	5 x 10	glass	25 plates	**1.05789.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	2.5 x 7.5	glass*3	100 plates	**1.05794.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	2.5 x 7.5	glass*4	100 plates	**1.15327.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	250	2.5 x 7.5	glass	500 plates	**1.15341.0001**
TLC Silica Gel 60 W F_{254S}	Silica Gel 60 W F_{254s}*2	250	20 x 20	glass	25 plates	**1.16485.0001**
LuxPlate™ silica gel 60 F_{254s}	LuxPlate® silica gel 60 F_{254}*1	250	20 x 20	glass	25 plates	**1.05805.0001**
LuxPlate™ silica gel 60 F_{254}	LuxPlate® silica gel 60 F_{254}*1	250	10 x 20	glass	50 plates	**1.05804.0001**
LuxPlate™ silica gel 60 F_{254}	LuxPlate® silica gel 60 F_{254}*1	250	5 x 10	glass	25 plates	**1.05802.0001**
LuxPlate™ silica gel 60 F_{254}	LuxPlate® silica gel 60 F_{254}*1	250	2.5 x 7.5	glass	100 plates	**1.05801.0001**
TLC Silica gel 60	Silica gel 60	200	20 x 20	aluminum	25 sheets	**1.05553.0001**
TLC Silica gel 60	Silica gel 60	200	5 x 10	aluminum	50 sheets	**1.16835.0001**
TLC Silica gel 60 W	Silica gel 60 W*5	200	20 x 20	aluminum	25 sheets	**1.16487.0001**
TLC Silica gel 60 $_{254}$	Silica gel 60 F_{254}*1	200	20 x 20	aluminum	25 sheets	**1.05554.0001**
TLC Silica gel 60 $_{254}$	Silica gel 60 F_{254}*1	200	10 x 20	aluminum	25 sheets	**1.05570.0001**
TLC Silica gel 60 $_{254}$	Silica gel 60 F_{254}*1	200	5 x 20	aluminum	100 sheets	**1.05534.0001**
TLC Silica gel 60 $_{254}$	Silica gel 60 F_{254}*1	200	10 x 10	aluminum	100 sheets	**1.16717.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	200	5 x 10	aluminum	50 sheets	**1.16834.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	200	5 x 7.5	aluminum	20 sheets	**1.05549.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	200	500 x 20	aluminum	1 roll	**1.05562.0001**
TLC Silica Gel 60 W $F_{254\ s}$*2	Silica Gel 60 W*5 F_{254s}*2	200	20 x 20	aluminum	25 sheets	**1.16484.0001**
TLC Silica gel 60	Silica gel 60	200	20 x 20	plastic	25 sheets	**1.05748.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	200	20 x 20	plastic	25 sheets	**1.05735.0001**
TLC Silica gel 60 F_{254}	Silica gel 60 F_{254}*1	200	4 x 8	plastic	50 sheets	**1.05750.0001**

*1 F_{254} Fluorescent indicator *2 F_{254s} Fluorescent indicator, acid stable *3 paper box *4 plastic box *5 W: water-resistant

Silica 60 TLC plates with concentrating zone

Description	Layer Sorbent/ Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
TLC Silica gel 60 concentrating zone 2.5 x 20 cm	Silica gel 60	250	20 x 20	glass	25 plates	**1.11845.0001**
TLC Silica gel 60 concentrating zone 2.5 x 10 cm	Silica gel 60	250	10 x 20	glass	50 plates	**1.11844.0001**
TLC Silica gel 60 concentrating zone 2.5 x 20 cm	Silica gel 60	200	20 x 20	aluminum	25 sheets	**1.05582.0001**
TLC Silica gel 60 F_{254}[*1] concentrating zone 2.5 x 20 cm	Silica gel 60 F_{254}[*1]	250	20 x 20	glass	25 plates	**1.11798.0001**
TLC Silica gel 60 F_{254}[*1]concentrating zone 2.5 x 10 cm	Silica gel 60 F_{254} [*1]	250	10 x 20	glass	50 plates	**1.11846.0001**
TLC Silica gel 60 F_{254}[*1] concentrating zone 2.5 x 20 cm	Silica gel 60 F_{254} [*1]	200	20 x 20	aluminum	25 sheets	**1.05583.0001**

[*1]F_{254} Fluorescent indicator

Silica 60 TLC plates with GLP code

Description	Layer Sorbent/ Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
TLC silica gel 60 F_{254} GLP	Silica gel 60 F_{254}[*1]	250	20 x 20	glass	25 plates	**1.05566.0001**

[*1]F_{254} Fluorescent indicator

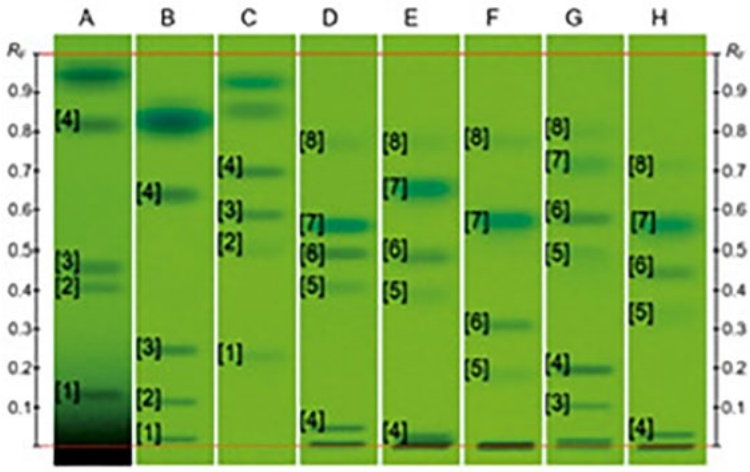
Universal HPTLC Mix for system suitability test

Discover more about our universal HPTLC mix (UHM) which provides laboratories with a single solution and it's applicable for HPTLC system suitability tests (SST) for a wide range of chromatographic systems.

This product is recommended for HPTLC performed in conjunction with CAMAG® instruments and their software visionCATS.

Find out more at **SigmaAldrich.com/uhm**

Developing solvents



Illumination under UV 254 nm prior to derivatization

TLC Silica Gel 60 G Plates

Fully compliant with international pharmacopoeia

Traditionally, TLC monographs in pharmacopoeia refer to products using silica G, containing gypsum as binder, or silica H with no binder. There are about 200 monograph methods in the European Pharmacopoeia (Ph. Eur.) referring to these plates*.

** The United States Pharmacopeia (USP) does not distinguish between TLC plates with gypsum or organic binder, thus our standard plates can always be used.*

These new TLC silica gel 60 G plates are recommended for customers in QA/QC labs using older Ph. Eur. monograph methods, which require TLC plates with gypsum binder, and who do not wish to switch to classical TLC plates with organic binders.

Our classical TLC plates fulfill the performance test requirements of Ph. Eur. for G plates with gypsum, even though they use modern organic binders. Today, many customers routinely use these classical TLC plates in place of gypsum plates, and indeed several monographs have been updated to officially confirm this change.**

In addtition to our high standard QC control, the TLC silica 60 G plates are also tested using TLC performance test described by Ph. Eur.

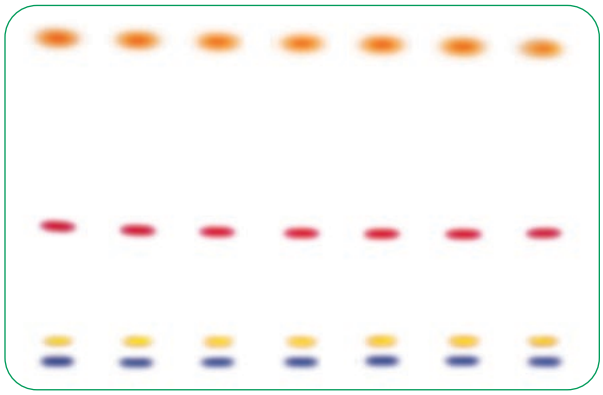
Description: Chromatographic separation. Apply an appropriate volume (10 µl for a normal TLC plate and 1 µl to 2 µl for a fine particle size plate) of TLC performance test solution R (Reagent 1116600) to the plate. Develop over a path length of two-thirds of the plate height, using a mixture of 20 volumes of methanol R and 80 volumes of toluene R.

The plate is not satisfactory unless the chromatogram shows four clearly separated spots, the spot of bromocresol green with an R_f value less than 0.15, the spot of methyl orange with an R_f value in the range of 0.1 to 0.25, the spot of methyl red with an R_f value in the range of 0.35 to 0.55 and the spot of Sudan red G with an R_f value in the range of 0.75 to 0.98.

***The following publications (German only) feature monographs of Ph. Eur. on pre-coated TLC plates:*

P. Pachaly: DC-Atlas-Dünnschicht-Chromatographie in der Apotheke, Wissenschaftliche Verlagsgesellschaft Stuttgart 1999, ISBN 3-8047-1623-7. Includes many documented monographs of Ph. Eur. using TLC plates from Merck KGaA, Darmstadt Germany.

Jürgen Wolf: Mikro-DC, PZ-Schriftenreihe: Vorschriften auf Basis des Ph Eur, DAB und DAC. Govi-Verlag, Eschborn 1999, ISBN 3-7741-0736-X. This book features a broad range of monographs of the Ph. Eur. evaluated on Merck KGaA, Darmstadt, Germany TLC aluminum sheets Si 60



The chromatogram shows four clearly separated spots according to Ph. Eur. test conditions and fulfils Ph. Eur. requirements.

Parameter	Specification	Typical value
	hRf, values	
Separation	4 clearly separated spots	passed
Bromocresol green	<15	5
Methyl orange	10 - 25	10
Methyl red	35 - 55	38
Sudan red	75 - 98	82

Silica gel 60 G TLC plates

Description	Layer Sorbent/ Coating Material*2	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
TLC Silica gel 60 G F_{254}	TLC Silica gel 60 G F_{254}*1	250	20 x 20	glass	25 plates	**1.00390.0001**
TLC Silica gel 60 G	TLC Silica gel 60 G	250	20 x 20	glass	25 plates	**1.00384.0001**

*1 F_{254} fluorescent indicator

*2 Both plates have similar separation performance to our classical TLC plates; the only difference is that gypsum is used as binder.

Modified Silica TLC Plates for Enhanced Selectivity

Modified silica TLC plates provide additional selectivity and significantly broaden thin-layer chromatography applications. Hence, they are well suited for demanding TLC separations, and as a pilot technique for HPLC. RP-2, RP-8, and RP-18 plates are based on silica gel 60, modified with aliphatic hydrocarbons. Amino-modified NH_2 silica plates provide weakly basic ion-exchange characteristics with extraordinary selectivity for charged compounds. The CN and Diol modified silica plates are moderately polar and are suitable for both normal phase and reversed phase systems.

Free choice of solvent system for special separations and as pilot method for HPLC

When separation challenges cannot be adequately resolved with standard silica, you can count on our modified silica plates to facilitate your application. This system offers a free choice of solvents, so you can be sure that they meet your particular separation requirements.

RP-modified silica plates

RP-2, RP-8 and RP-18 are based on silica gel 60 modified with aliphatic hydrocarbons. The chain length, in combination with the degree of modification, defines the ability to tolerate the water of the solvent system and strongly affects retention. Migration time increases in the order RP-2, RP-8, RP-18 using the same solvent composition. The HPTLC RP-2 sorbent exhibits higher polarity and high affinity for aqueous solutions, tolerating up to 80% water, while the longer carbon chains RP-8 and R-18 can be run with up to 60% water in the solvent system.

NH2 modified silica plates

The amino modified NH_2 plate provides weakly basic ion exchange characteristics with special selectivity for charged compounds. For many applications, it offers an alternative to PEI cellulose.

Since most substances separated on modified plates are colorless, the majority of our modified silica plates contain the blue fluorescent, acid-stable UV indicator F_{254s}. Samples which absorb shortwave UV at 254 nm are detected due to fluorescence quenching.

Your benefits

- Results less dependent on atmospheric humidity
- Allows use of aqueous solvent systems
- RP-modified silica provides ready correlation with HPLC/LPLC
- No catalytic activity for unstable substances (e.g. oxidative degradation)
- Modified silica TLC plates provide additional selectivity and significantly broaden TLC applications

RP-modified and NH_2-modified silica 60 TLC plates

Description	Layer Sorbent/ Coating Material/ Modification	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
TLC Silica gel 60 RP-2 (silanized)	Silica gel 60 RP-2 (silanized)	250	20 x 20	glass	25 plates	**1.05746.0001**
TLC Silica gel 60 RP-2 F_{254}*1 (silanized)	Silica gel 60 RP-2 F_{254}*1 (silanized)	250	20 x 20	glass	25 plates	**1.05747.0001**
TLC Silica gel 60 RP-8 F_{254s}*2	Silica gel 60 RP-8 F_{254s}*2	250	20 x 20	glass	25 plates	**1.15388.0001**
TLC Silica gel 60 RP-8 F_{254s}*2	Silica gel 60 RP-8 F_{254s}*2	250	10 x 20	glass	50 plates	**1.15424.0001**
TLC Silica gel 60 RP-8 F_{254s}*2	Silica gel 60 RP-8 F_{254s}*2	250	5 x 10	glass	25 plates	**1.15684.0001**
TLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	250	20 x 20	glass	25 plates	**1.15389.0001**
TLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	250	10 x 20	glass	50 plates	**1.15423.0001**
TLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	250	5 x 20	glass	50 plates	**1.15683.0001**
TLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	250	5 x 10	glass	25 plates	**1.15685.0001**
TLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	200	20 x 20	aluminum	20 sheets	**1.05559.0001**
TLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	200	5 x 7.5	aluminum	20 sheets	**1.05560.0001**
TLC Silica gel 60 NH_2 F_{254s}*2	Silica gel 60 NH_2 F_{254s}*2	200	20 x 20	aluminum	20 sheets	**1.05533.0001**

*1F_{254} Fluorescent indicator *2F_{254s} Fluorescent indicator, acid stable

Aluminum Oxide TLC Plates

Excellent Separations of Basic and Neutral Compounds

Our aluminum oxide (alox) plates for thin-layer chromatography offer distinct advantages with regard to pH. Under aqueous conditions, basic compounds can be best separated on basic alox plates, while neutral alox plates are most suitable for neutral compounds. These plates achieve excellent separations for a wide variety of applications, thanks to neutral and basic aluminum oxides with 60 Å pore sizes.

Aluminum oxide 60 TLC plates

Description	Layer Sorbent/Coating Material	Layer Thickness/ µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
TLC Aluminum oxide 60 F_{254}*1, basic	Aluminum oxide 60 F_{254}*1 basic	250	20 x 20	glass	25 plates	**1.05713.0001**
TLC Aluminum oxide 60 F_{254}*1, basic	Aluminum oxide 60 F_{254}*1 basic	250	5 x 20	glass	100 plates	**1.05731.0001**
TLC Aluminum oxide 60 F_{254}*1, neutral	Aluminum oxide 60 F_{254}*1 neutral	200	20 x 20	aluminum	25 sheets	**1.05550.0001**
TLC Aluminum oxide 60 F_{254}*1, neutral	Aluminum oxide 60 F_{254}*1 neutral	200	20 x 20	plastic	25 sheets	**1.05581.0001**

*1F_{254} Fluorescent indicator

Kieselgur and Mixed Layer Plates

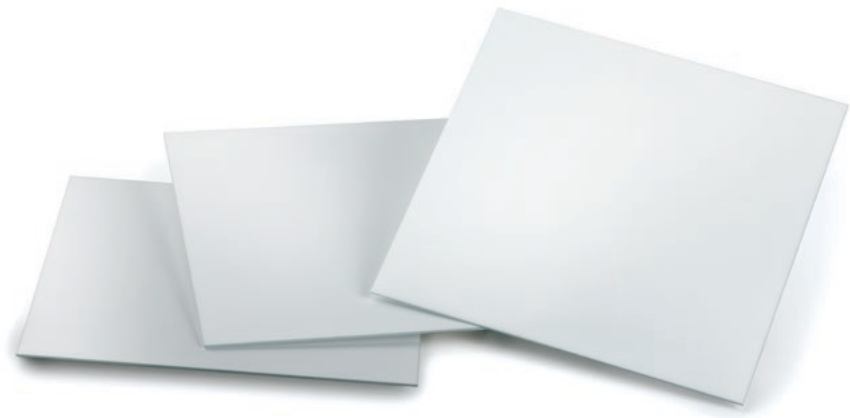
For specific applications

Kieselgur is a natural diatomaceous earth that can be used for the separation of polar or moderately polar compounds. For the mixed layer plates a combination of classical silica gel 60 and kieselgur is used, providing favorable properties for certain applications such as separation of inorganic ions, herbicides or steroids.

Kieselgur and silica gel/kieselgur TLC plates

Description	Layer Sorbent/Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
TLC Kieselgur F_{254}	Kieselgur F_{254}*1	200	20 x 20	glass	25 plates	**1.05738.0001**
TLC Kieselgur F_{254}	Kieselgur F_{254}*1	200	20 x 20	aluminum	25 sheets	**1.05568.0001**
Silica gel 60/Kieselgur F_{254}	Silica gel 60 / Kieselgur F_{254}*1	200	20 x 20	aluminum	25 sheets	**1.05567.0001**

*1F_{254} Fluorescent indicator



Cellulose TLC and HPTLC Plates

Precise Analysis of Polar Substances

Organic sorbent cellulose is particularly suitable for the separation of hydrophilic substances by partition chromatography and we offer cellulose plates for demanding high-performance separations. Based on microcrystalline cellulose, these TLC plates are ideal for standard separations and our HPTLC plates use high-purity, rod-shaped microcrystalline cellulose, resulting in a highly reduced diffusion of analytes for demanding, high-performance separations.

We also provide special PEI cellulose plates (polyethylenimine-modified cellulose), which act as strong basic anion exchangers. This makes them the best choice for analyzing substances with exchange-active ionic groups, such as amino acids, peptides, nucleotides and nucleosides.

Cellulose plates are available with or without fluorescent indicators. They utilize a special fluorescent pigment that is stimulated to intense blue fluorescent emission by long-wave UV light of 366 nm and by short-wave UV light at 254 nm.

Typical applications of cellulose plates include the analysis of amino acids, carbohydrates, phosphates, nucleic acids and nucleic acid derivatives for:

- Detection of amino acids in clinical laboratories
- 2-dimensional separations such as amino acid “fingerprints”
- Metabolic studies

Cellulose plates (TLC and HPTLC)

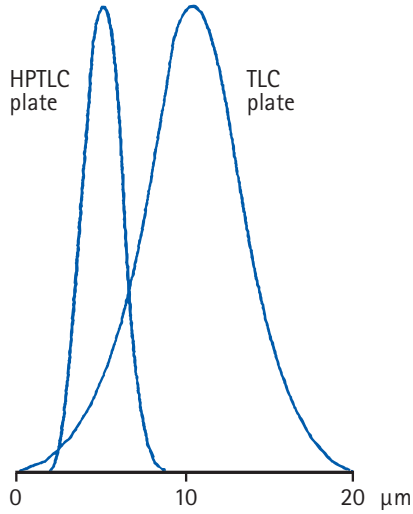
Description	Layer Sorbent/ Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
TLC Cellulose	Cellulose	80 - 120	20 x 20	glass	25 plates	**1.05716.0001**
TLC Cellulose	Cellulose	80 - 120	10 x 20	glass	50 plates	**1.05730.0001**
TLC Cellulose	Cellulose	80 - 120	10 x 10	glass	100 plates	**1.05632.0001**
TLC Cellulose F	Cellulose F[*1]	80 - 120	20 x 20	glass	25 plates	**1.05718.0001**
TLC Cellulose F	Cellulose F[*1]	80 - 120	10 x 20	glass	50 plates	**1.05728.0001**
TLC Cellulose	Cellulose	70 - 110	20 x 20	aluminum	25 sheets	**1.05552.0001**
TLC Cellulose F	Cellulose F[*1]	70 - 110	20 x 20	aluminum	25 sheets	**1.05574.0001**
TLC Cellulose	Cellulose	70 - 110	20 x 20	plastic	25 sheets	**1.05577.0001**
TLC Cellulose F	Cellulose F	70 - 110	20 x 20	plastic	25 sheets	**1.05565.0001**
HPTLC Cellulose	HPTLC Cellulose	60 - 110	20 x 10	glass	50 plates	**1.05786.0001**
HPTLC Cellulose	HPTLC Cellulose	60 - 110	10 x 10	glass	25 plates	**1.05787.0001**
HPTLC Cellulose F	HPTLC Cellulose F[*1]	60 - 110	20 x 10	glass	50 plates	**1.15036.0001**
HPTLC Cellulose F	HPTLC Cellulose F[*1]	60 - 110	10 x 10	glass	25 plates	**1.15035.0001**
HPTLC Cellulose	HPTLC Cellulose	70 - 110	20 x 20	aluminum	25 sheets	**1.16092.0001**
TLC PEI Cellulose F	PEI[*2] Cellulose F[*1]	80 - 120	20 x 20	glass	25 plates	**1.05725.0001**
TLC PEI Cellulose F	PEI[*2] Cellulose F[*1]	80 - 120	20 x 20	plastic	25 sheets	**1.05579.0001**

[*1] Fluorescent indicator wavelength 254/366 nm.

[*2] PEI cellulose plates should be stored cold (0-4 °C) and dry to reduce deterioration. As plates become old they might get yellow colorations. This does not influence chromatographic performance. A wash step with Methanol is recommended.

High Performance Silica Plates (HPTLC)

Our high performance thin-layer chromatography (HPTLC) plates are the perfect choice for quantitative separations using instrumental HPTLC. The optimized, smaller particles enable significantly higher speed, more efficiency and better sensitivity than classical TLC plates. The parallel separation of many samples per plate and an extremely high matrix-tolerance enables a separation time of 20 seconds (or less) per sample with almost no need for sample preparation, which makes HPTLC outstanding in cost-efficiency.



Features and Benefits

- Faster analysis, only 3–20 min for optimum separations
- 5–10 fold higher sensitivity than classical TLC
- Highly reproducible, focused bands for quantitative analysis
- Gold standard for instrumental automation

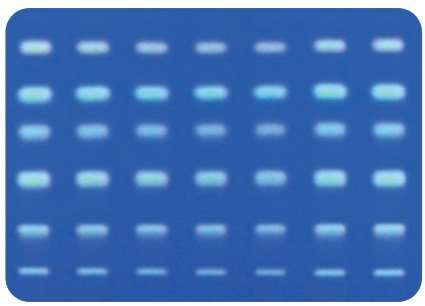
Smaller Particles for Advanced Separations

Our HPTLC plates use an optimized silica gel 60 sorbent with a particle size of only 5-6 µm, compared to the 10-12 µm used in classical TLC. This enables a higher packing density and smoother surface. What's more, band diffusion is reduced, yielding especially compact sample zones or spots. The smaller particle size and thinner layer (200 µm or 100 µm) results in significantly higher sensitivity and faster analysis.

Features of HPTLC versus classical TLC	HPTLC	Classical TLC
Mean particle size	5 – 6 µm	10 – 12 µm
Particle size distribution	4 – 8 µm	5 – 20 µm
Layer thickness	200 µm (100 µm)	250 µm
Plate height	12 µm	30 µm
Typical migration distance	3 – 6 cm	10 – 15 cm
Typical separation time	3 – 20 min	20 – 200 min
Number of samples per plate	< 36 (72)	< 10
Sample volume	0.1 – 0.5 µL	1 – 5 µL
Detection limits: absorption	100 – 500 pg	1 – 5 ng
Detection limits: emission (fluorescence)	5 – 10 pg	50 – 100 pg

Comparison of classical TLC plates versus HPTLC plates

Sample	Conditions	TLC	HPTLC
N-alpha-dansyl-L-asparagine	Mobile phase	Ethyl acetate / methanol /propionic acid	Ethyl acetate / methanol /propionic acid
α-Dansyl-L-arginine		(20/10/3)	(20/10/3)
Dansyl-L-cysteic acid	Detection	UV 366 nm	UV 366 nm
N-dansyl-L-serine	Sample volume	4 µL	0.3 µL
Dansyl-glycine	Migration distance	10 cm	5 cm
N-N Dansyl-L-tyrosine	Analysis time	42 min	13 min 45 sec


A classical TLC silica 60 plate


HPTLC silica gel 60 plate

Application Areas

HPTLC plates are ideal for highly demanding quantitative analyses, such as:

- Identity testing in the analysis of herbal medicines
- Highly sophisticated quantitative separations of pharmaceutical drugs using instrumental analysis
- Quality control or purity testing of complex samples in pharmaceutical drugs
- Trace analysis of contaminants in food
- Higher speed and sensitivity

Classical Silica HPTLC Plates

Our classical silica HPTLC plates are available with glass or aluminum backing in a variety of formats to suit your requirements. Fluorescent indicators are also available: green fluorescent F_{254}, or blue fluorescent acid-stable F_{254s}. Both indicators fluoresce in UV light at an excitation wavelength of 254 nm.

Our classical silica HPTLC plates enable fast and quantitative analyses of complex samples for manual or instrumental use. These plates offer higher speed and sensitivity than conventional TLC plates–making them the best choice for sophisticated separations.

Premium Purity HPTLC Plates

Premium purity HPTLC plates are optimized for high-performance, completely contamination-free separations, such as demanding pharmacopoeia applications. The plates are wrapped in plastic-coated aluminum foil, which prevents deposition of plasticizers that could appear as unknown extra zones when using medium-polar solvent systems.

AMD HPTLC plates

With an extra-thin layer of only 100 µm, AMD HPTLC plates are designed for even more demanding automated multiple development (AMD) applications. The technique combines repeated development of the plate in the same direction with reproducible gradient elution. AMD HPTLC plates provide extremely narrow bands, allowing the complete resolution of up to 40 components over a distance of only 60 mm. The special properties of AMD HPTLC plates are highly beneficial for complex investigations, like the qualitative and quantitative analysis of pesticides.

Unmodified HPTLC Silica gel 60 plates

Description	Layer Sorbent/Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
HPTLC silica gel 60	HPTLC silica gel 60	200	20 x 10	glass	50 plates	**1.05641.0001**
HPTLC silica gel 60	HPTLC silica gel 60	200	10 x 10	glass	25 plates	**1.05631.0001**
HPTLC silica gel 60	HPTLC silica gel 60	200	10 x 10	glass	100 plates	**1.05633.0001**
HPTLC silica gel 60 F_{254s}	HPTLC silica gel 60 F_{254s} *2 *5	200	20 x 10	glass	25 plates	**1.15696.0001**
HPTLC silica gel 60 F_{254}	HPTLC silica gel 60 F_{254} *1	200	20 x 10	glass	50 plates	**1.05642.0001**
HPTLC silica gel 60 F_{254}	HPTLC silica gel 60 F_{254} *1	200	10 x 10	glass	25 plates	**1.05628.0001**
HPTLC silica gel 60 F_{254}	HPTLC silica gel 60 F_{254} *1	200	20 x 20	glass	25 plates	**1.15534.0001**
HPTLC silica gel 60 F_{254}	HPTLC silica gel 60 F_{254} *1	200	10 x 10	glass	100 plates	**1.05629.0001**
HPTLC silica gel 60 F_{254}	HPTLC silica gel 60 F_{254} *1	200	5 x 10	glass	25 plates	**1.05616.0001**
HPTLC silica gel 60	HPTLC silica gel 60	200	20 x 20	aluminum	25 sheets	**1.05547.0001**
HPTLC silica gel 60 F_{254}	HPTLC silica gel 60 F_{254} *1	200	20 x 20	aluminum	25 sheets	**1.05548.0001**
HPTLC silica gel 60 F_{254}	HPTLC silica gel 60 F_{254} *1	200	5 x 7.5	aluminum	20 sheets	**1.05556.0001**
HPTLC silica gel 60 WR F_{254s}	HPTLC silica gel 60 WR*3 F_{254s} *2	200	20 x 10	glass	25 plates	**1.15552.0001**
HPTLC silica gel 60 F_{254} AMD, extra thin	HPTLC silica gel 60 F_{254} *1, AMD*4	100	20 x 10	glass	25 plates	**1.11764.0001**
HPTLC silica gel 60 WR F_{254s} AMD, extra thin	HPTLC silica gel 60 WR*3 F_{254s} *2, AMD*4	100	20 x 10	glass	25 plates	**1.12363.0001**
HPTLC silica gel 60 F_{254} premium purity	HPTLC silica gel 60 F_{254} *1 premium purity	200	20 x 10	glass	25 plates	**1.05648.0001**

*1 F_{254} Fluorescent indicator *2 F_{254s} Fluorescent indicator, acid stable *3 WR: Water-Resistant
*4AMD: According to DIN 38407-F11 *5 F_{254s} wettable plate

Silica 60 HPTLC plates with concentrating zone

Description	Layer Sorbent / Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
HPTLC Silica gel 60 concentrating zone 2.5 x 10 cm	Silica gel 60	150 - 200	10 x 10	glass	25 plates	**1.13748.0001**
HPTLC Silica gel 60 F_{254} concentrating zone 2.5 x 20 cm	Silica gel 60 F_{254} *1	150 - 200	20 x 10	glass	50 plates	**1.13728.0001**
HPTLC Silica gel 60 F_{254} concentrating zone 2.5 x 10 cm	Silica gel 60 F_{254} *1	150 - 200	10 x 10	glass	25 plates	**1.13727.0001**
HPTLC Silica gel 60 F_{254} concentrating zone 2.5 x 5 cm	Silica gel 60 F_{254} *1	150 - 200	5 x 10	glass	25 plates	**1.13187.0001**
HPTLC Silica gel 60 RP-18 F_{254s} concentrating zone 2.5 x 20 cm	Silica gel 60 RP-18 F_{254s} *2	150 - 200	20 x 10	glass	25 plates	**1.15498.0001**

*1 F_{254} Fluorescent indicator *2 F_{254s} Fluorescent indicator, acid stable

Silica 60 HPTLC plates with GLP code

Description	Layer Sorbent/Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size /Content	Cat. No.
HPTLC silica gel 60 F_{254} GLP	Silica gel 60 F_{254} *1	200	20 x 10	glass	25 plates	**1.05613.0001**
HPTLC silica gel 60 F_{254} GLP	Silica gel 60 F_{254} *1	200	10 x 10	glass	25 plates	**1.05564.0001**

*1 F_{254} Fluorescent indicator

Modified Silica HPTLC Plates

Reversed-Phase (RP) Modified Silica HPTLC Plates

Overcome Challenging HPTLC Separations

Reversed-phase (RP) modified silica HPTLC plates provide additional selectivity to significantly broaden thin-layer chromatography applications. Hence, they are well suited for demanding HPTLC separations, and as a pilot technique for HPLC. RP-2 (C-2) , RP-8 (C-8), and RP-18 (C-18) plates are based on silica gel 60, modified with aliphatic hydrocarbons. The chain length, combined with the degree of modification, defines the plate's ability to tolerate the water of the solvent system, and strongly affects retention. Using the same solvent system, migration time increases in the order: RP-2, RP-8, RP-18.

RP-2 HPTLC sorbents exhibit higher polarity and a high affinity to aqueous solutions, tolerating up to 80% water. In contrast, the longer carbon chains, RP-8 and RP-18, can be run with up to 60% water in the solvent system. The specially developed RP-18W HPTLC plate offers a lower degree of surface modification, hence it can be used even with 100% water in the solvent system.

Reversed-phase-(RP) modified silica 60 HPTLC plates

Description	Layer Sorbent/Coating Material/Modification	Layer Thickness/µm	Format/ cm (Width x Length	Support/ Backing	Pack size/ Content	Cat. No.
HPTLC Silica gel 60 RP-2 F_{254s}*2	Silica gel 60 RP-2 F_{254s}*2	200	10 x 10	glass	25 plates	**1.13726.0001**
HPTLC Silica gel 60 RP-8 F_{254s}*2	Silica gel 60 RP-8 F_{254s}*2	200	10 x 10	glass	25 plates	**1.13725.0001**
HPTLC Silica gel 60 RP-18	Silica gel 60 RP-18	200	20 x 10	glass	25 plates	**1.05914.0001**
HPTLC Silica gel 60 RP-18 W	Silica gel 60 RP-18 W*3	200	20 x 10	glass	25 plates	**1.14296.0001**
HPTLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	200	20 x 10	glass	25 plates	**1.16225.0001**
HPTLC Silica gel 60 RP-18 F_{254s}*2	Silica gel 60 RP-18 F_{254s}*2	200	10 x 10	glass	25 plates	**1.13724.0001**
HPTLC Silica gel 60 RP-18 W F_{254s}*2	Silica gel 60 RP-18 W*3 F_{254s}*2	200	10 x 10	glass	25 plates	**1.13124.0001**

*1F_{254} Fluorescent indicator *2F_{254s} Fluorescent indicator, acid stable *3W: wettable with water

CN and Diol-Modified Plates

Normal-Phase and Reversed-Phase Separations

CN and Diol-modified silica plates are moderately polar, and suitable for both normal-phase and reversed-phase systems. The CN-modified plate is based on silica gel 60 modified with a cyanopropyl group, while the Diol-modified plate utilizes a silica surface modified by a vicinal diol alkyl ether. The dual characteristic of the CN plate enables unique two-dimensional separations by using the normal-phase mechanism in the first direction, followed by the reversed-phase mechanism in the second direction.

NH2-Modified Plates

Excellent Separation of Charged Compounds

Amino-modified NH_2 plates provide weakly basic ion-exchange characteristics with extraordinary selectivity for charged compounds. These unique features enable the separation of compounds such as nucleotides, purines, pyrimidines, phenols and sulfonic acids using simple eluent mixtures. For many applications, NH_2-modified silica plates offer an alternative to PEI cellulose. In addition, they allow reagent-free detection of certain compounds (e.g. carbohydrates) by thermochemical fluorescence activation.

CN-, Diol- and NH_2- modified silica 60 HPTLC plates

Description	Layer Sorbent/Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
HPTLC silica gel 60 CN F_{254s}	HPTLC silica gel 60 CN F_{254s}*1	200	10 x 10	glass	25 plates	**1.16464.0001**
HPTLC silica gel 60 Diol F_{254s}*2	HPTLC silica gel 60 Diol F_{254s}*1	200	10 x 10	glass	25 plates	**1.12668.0001**
HPTLC silica gel 60 Diol F_{254s}*2	HPTLC silica gel 60 Diol F_{254s}*1	200	20 x 10	glass	25 plates	**1.05636.0001**
HPTLC silica gel 60 NH_2 F_{254s}	HPTLC silica gel 60 NH_2 F_{254s}*1	200	20 x 10	glass	25 plates	**1.13192.0001**
HPTLC silica gel 60 NH_2 F_{254s}	HPTLC silica gel 60 NH_2 F_{254s}*1	200	10 x 10	glass	25 plates	**1.15647.0001**

*1 Fluorescent indicator, acid stable *2 Expiry date is 12 months

LiChrospher® HPTLC plates

Optimized for High-Throughput Separations

Our unique LiChrospher® HPTLC plates are the first thin-layer chromatography plates based on spherical silica particles. Compared to standard HPTLC plates, they offer maximum performance and speed, thus enabling high-throughput analyses of complex samples.

Improved Detection Limits

LiChrospher® HPTLC plates are based on spherical silica 60 with a particle size of 7 µm, and a narrow particle-size distribution similar to that used in HPLC. While LiChrospher® plates possess a broad selectivity very similar to that of the corresponding HPTLC plates, the plate height, separation numbers and velocity constants have been further improved. This results in shorter analysis times and improved detection limits.

Features and Benefits

- Reduced running times in comparison to HPTLC
- Highly compact spots or zones for higher detection sensitivity
- Low detection limits

Application Areas

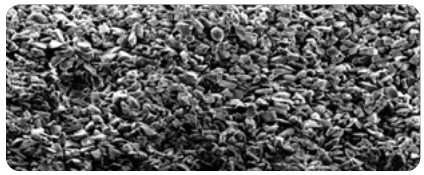
- LiChrospher® HPTLC plates are especially suitable for separations of highly complex, low concentration samples, such as:
  - Trace analysis of pesticide mixtures
  - Assay of pharmaceutical compounds

LiChrospher® Si 60 F_{254s} HPTLC Plates versus conventional Si 60 F_{254} HPTLC Plates

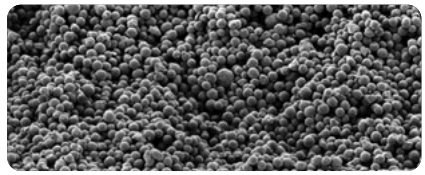
Compounds	Visual		Spectrophotochemical	
	HPTLC Silica gel 60 F_{254}/ng	LiChrospher® Si 60 F_{254s}/ng	HPTLC Silica gel 60 F_{254}/ng	LiChrospher® Si 60 F_{254s}/ng
Ascorbic acid	100	100	100	25
Cortisone	50	25	25	10
Atrazine	50	25	10	5
Prometryn	25	10	10	5
Theophylline	50	25	25	10
o-Aminophenol	50	25	25	5
m-Aminophenol	10	5	10	5
p-Aminophenol	100	50	50	25

Scanning electron images of the cross-sections of:

A. Classical silica TLC plate



B. High-performance silica HPTLC plate



C. LiChrospher® silica HPTLC plate

Unmodified LiChrospher® silica gel 60 HPTLC plates

Description	Layer Sorbent/Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
LiChrospher® HPTLC silica gel 60 F_{254s}	LiChrospher® silica gel 60 F_{254s} *1	200	20 x 10	glass	25 plates	**1.15445.0001**
LiChrospher® HPTLC silica gel 60 F_{254s}	LiChrospher® silica gel 60 F_{254s} *1	200	20 x 20	aluminum	25 sheets	**1.05586.0001**

*1 F_{254s} Fluorescent indicator, acid stable

RP-modified LiChrospher® silica gel 60 HPTLC plate

Description	Layer Sorbent/Coating Material	Layer Thickness/µm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
LiChrospher® HPTLC Silica gel 60 RP-18 WF_{254s}	LiChrospher®Silica gel 60 RP-18 W*2 F_{254s} *1	200	20 x 10	glass	25 plates	**1.05646.0001**

*1 F_{254s} Fluorescent indicator, acid stable *2 W: wettable with water

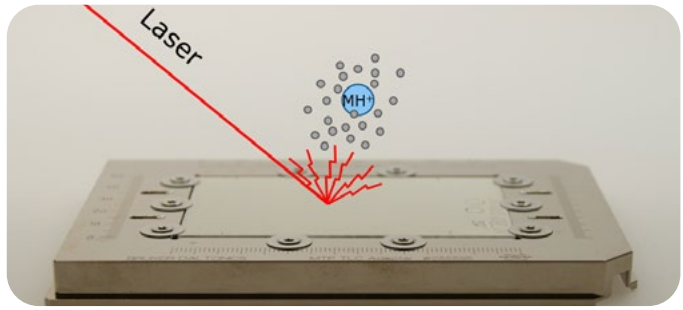
TLC and HPTLC MS-Grade Plates

Exceptional Sensitivity with Extremely Low Background Signal

Coupling TLC plates with mass spectrometry (TLC-MS) is a field of high interest in planar chromatography. One particular advantage of TLC-MS is the flexibility it offers in the choice of mobile phases for separations. In comparison, HPLC-MS coupling does not allow the use of certain mobile phases, such as inorganic buffers.

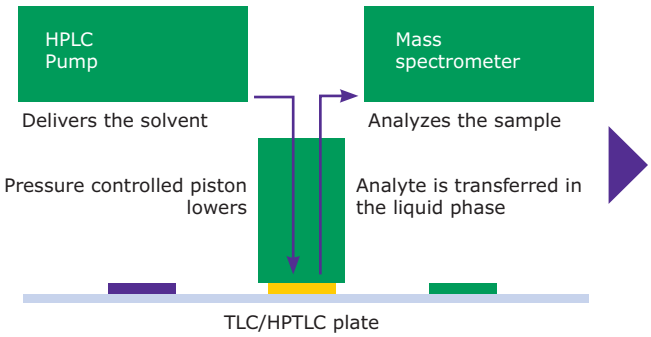
TLC-MS Coupling Techniques

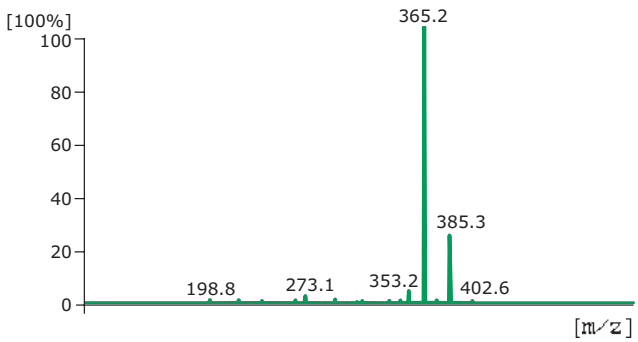
The techniques for coupling TLC with mass spectrometry can be divided into elution-based, or desorption-based. Both approaches are offline, and are performed after the separation is completed and the plate has dried. Sample transfer to the mass spectrometer is fast and typically takes less than one minute.

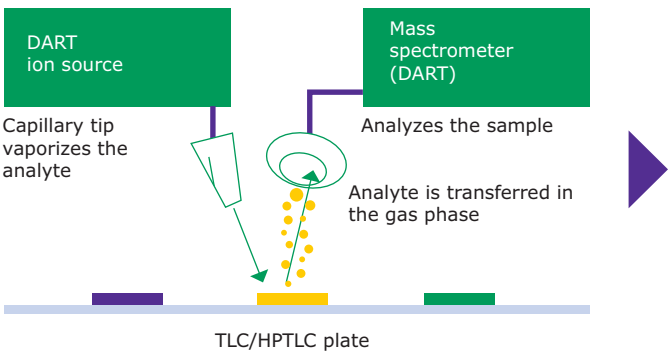


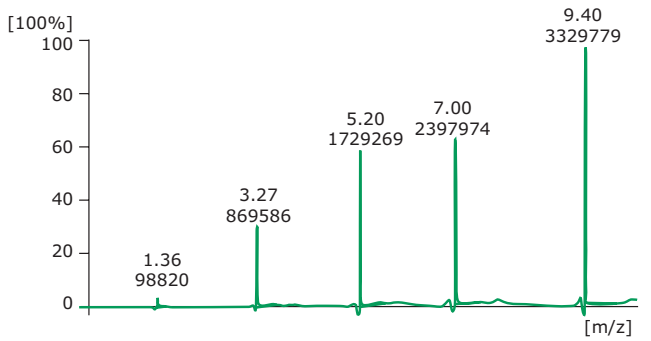
Elution-based TLC-MS

The analyte on the silica plate is dissolved in a solvent and transferred to the mass spectrometer in the liquid phase.









Desorption-based TLC-MS

The analyte is vaporized from the silica, and transferred to the mass spectrometer in the gas phase. Vaporization techniques include gas beam, ion bombardment, and MALDI (matrix-assisted laser desorption/ionization).

TLC-MALDI-MS

Matrix-assisted laser desorption/ionization (MALDI) is an ionization technique that uses a laser energy absorbing matrix to create ions from large molecules with minimal fragmentation. It has been applied to the analysis of biomolecules and large organic molecules and other macromolecules which tend to be fragile and fragment when ionized using more conventional ionization methods.

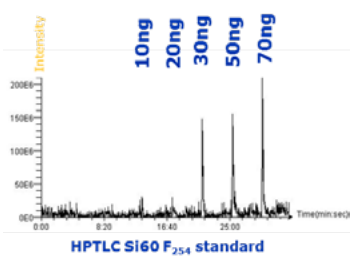
DART

DART (Direct Analysis in Real Time) is an atmospheric pressure ion source that instantaneously ionizes gases, liquids and solids in open air under ambient conditions.

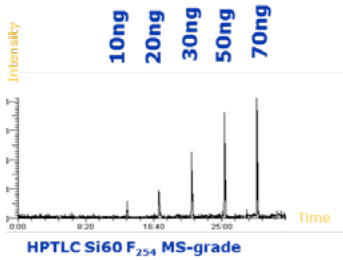
MS-Grade Plates from a Leader in TLC

We have introduced the first pre-coated plates in the market. We were also the first to offer glass plates for coupling planar chromatography with mass spectrometry. Our most recent developments in this field are our MS-grade TLC and HPTLC plates. The separation performance of these products is equivalent to our standard TLC and HPTLC plates. The only difference is that the new plates are much cleaner, and allow trace analysis in the nanogram range. Furthermore, our MS-grade plates offer exceptional sensitivity with extremely low background, hence a better signal-to-noise ratio, as verified by the experiments below.

High sensitivity - Guaranteed constant high quality



HPTLC Si60 F_{254} standard



HPTLC Si60 F_{254} MS-grade

Caffeine [ng]	Signal intensity on HPTLC Si60 F_{254} standard plates	Signal intensity on HPTLC Si60 F_{254} MS-grade plates
10 ng	-	60 × 10^6
20 ng	-	100 × 10^6
30 ng	140 × 10^6	220 × 10^6
50 ng	150 × 10^6	360 × 10^6
70 ng	210 × 10^6	420 × 10^6

TLC-MS plates

Description	Layer Sorbent/ Coating Material	Sorbent modification	Layer Thickness/ µm	Format/ cm (Width x Length)	Support Material/ Backing	Pack size/ Content	Cat. No.
TLC silica gel 60 F_{254} MS-grade	Silica gel 60 F_{254} *1	no	200	20 x 20	glass	25 plates	**1.00933.0001**
TLC silica gel 60 F_{254} MS-grade	Silica gel 60 F_{254} *1	no	100	5 x 7.5	aluminum	20 sheets	**1.51022.0001**
TLC silica gel 60 RP-18 F_{254s} MS-grade	Silica gel 60 F_{254s} *2 modified	RP-18 modified (aliphatic hydrocarbons)	100	5 x 7.5	aluminum	20 plates	**1.51015.0001**

*1 F_{254} Fluorescent indicator *2 F_{254s} Fluoresent indicator, acid resistant *3 suitable for TLC-MALDI-MS

HPTLC-MS plates

Description	Layer Sorbent/ Coating Material	Sorbent modification	Layer Thickness /µm	Format/ cm (Width x Length)	Support Material/ Backing	Pack size/ Content	Cat. No.
HPTLC silica gel 60 F_{254} MS-grade	Silica gel 60 F_{254} *1	no	100	20 x 10	glass	20 plates	**1.00934.0001**
HPTLC silica gel 60 $_{F254}$ MS-grade for MALDI*3	Silica gel 60 F_{254} *1	no	100	5 x 7.5	aluminum	20 sheets	**1.51160.0001**
HPTLC silica gel 60 RP-18 F_{254s} MS-grade	Silica gel 60 F_{254s} *2 modified	RP-18 modified (aliphatic hydrocarbons)	100	20 x 10	glass	20 plates	**1.51161.0001**

*1 F_{254} Fluorescent indicator *2 F_{254s} Fluorescent indicator, acid resistant *3 suitable for TLC-MALDI-MS

PLC Plates for Separations from Milligrams to Grams

Our preparative layer (PLC) plates allow separation and purification of samples varying in quantity - from milligrams to grams. Samples are typically applied as a band across the width of the glass plate and analyzed by UV detection. To isolate the substance by extraction, it is simply scraped from the PLC plate. We offer PLC plates with both unmodified and modified layers, in a variety of thicknesses (0.5 mm to 2 mm), and with or without fluorescent indicators.

Features and Benefits

- Separation and purification from milligram to gram quantities
- Thicker layers for high sample loading
- Same proven silica-binder technology as our analytical TLC plates

Silica gel 60 PLC plates

Description	Layer Sorbent /Coating Material	Layer Thickness/mm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
PLC Silica gel 60, 0.5 mm	Silica gel 60	0.5	20 x 20	glass	20 plates	**1.13894.0001**
PLC silica gel 60, 2mm	Silica gel 60	2	20 x 20	glass	12 plates	**1.05745.0001**
PLC Silica gel 60 F_{254}, 0.5 mm	Silica gel 60 F_{254}*1	0.5	20 x 20	glass	20 plates	**1.05744.0001**
PLC Silica gel 60 F_{254}, 1 mm	Silica gel 60 F_{254}*1	1	20 x 20	glass	15 plates	**1.13895.0001**
PLC Silica gel 60 F_{254}, 2 mm	Silica gel 60 F_{254}*1	2	20 x 20	glass	12 plates	**1.05717.0001**
PLC Silica gel 60 RP-18 F_{254s}, 1 mm	Silica RP-18 F_{254s}*3	1	20 x 20	glass	15 plates	**1.05434.0001**

*1 F_{254} Fluorescent indicator *2 F_{254s} Fluorescent indicator, acid stable

PLC concentrating zone plates, glass-backed

Description	Layer Sorbent/ Coating Material	Layer Thickness/mm	Format/ cm (Width x Length)	Support/ Backing	Pack size/ Content	Cat. No.
PLC Silical gel 60 F_{254} 0.5 mm with concentration zone 4 X20 cm	Silica gel 60 F_{254}*1, 0.5 mm with concentrating zone 4 x 20 cm	0.5	20 x 20	glass	20 plates	**1.13794.0001**
PLC Silical gel 60 F_{254} 1 mm with concentration zone 4 X20 cm	Silica gel 60 F_{254}*1, 1 mm with concentrating zone 4 x 20 cm	1	20 x 20	glass	15 plates	**1.13792.0001**
PLC Silical gel 60 F_{254} 2 mm with concentration zone 4 X20 cm	Silica gel 60 F_{254}*1, 2 mm with concentrating zone 4 x 20 cm	2	20 x 20	glass	12 plates	**1.13793.0001**

*1 F_{254} Fluorescent indicator

Silica 60 TLC and HPTLC Multiformat plates

Description	Layer Sorbent / Coating Material	Format/ cm (Width x Length)	Scored/ cm	Pack size/ Content	Number of plates possible	Cat. No.
TLC Silica gel 60 F_{254} Multiformat pre-scored 5 x 10 cm	Multiformat silica gel 60 F_{254}*1	20 x 20	5 x 10	25 plates	200	**1.05620.0001**
TLC Silica gel 60 F_{254} Multiformat pre-scored 5 x 20 cm	Multiformat silica gel 60 F_{254}*1	20 x 20	5 x 20	20 plates	80	**1.05608.0001**
HPTLC Silica gel 60 Multiformat pre-scored 5 x 5 cm	Multiformat silica gel 60 F_{254}*1	10 x 10	5 x 5	25 plates	100	**1.05635.0001**
HPTLC Silica gel 60 Multiformat pre-scored 5 x 5 cm	Multiformat silica gel 60	10 x 10	5 x 5	100 plates	400	**1.05644.0001**

*1 F_{254} Fluorescent indicator

Layer thickness: TLC plates: 250 µm; HPTLC plates 200 µm

TLC Adsorbents: Broad Range for All Requirements

We offer a comprehensive portfolio of sorbents for the preparation of TLC plates.
All sorbents are standardized to ensure reliable results in thin-layer chromatography.

Features and Benefits

- Broad portfolio to suit different TLC and PLC applications
- Standardized quality for reliable results
- Depending on the TLC plate you need to prepare, you can choose from a variety of sorbent materials, grades and particle sizes, which are available with or without binders and fluorescent indicators.

Loose sorbents for TLC plates (particle size 5-40 µm)

Description	Sorbent / Coating Material	Comment	Package Material	Pack size/ Content	Cat. No.
Silica gel 60 G	Silica gel 60 G	Classical TLC	Plastic	1 kg	**1.07731.1000**
Silica gel 60 G	Silica gel 60 G	Classical TLC	Tin	5 kg	**1.07731.5000**
Silica gel 60 G F_{254}	Silica gel 60 G F_{254} *1	Classical TLC, with Gypsum	Plastic	1 kg	**1.07730.1000**
Silica gel 60 H	Silica gel 60 H*3	TLC	Plastic	1 kg	**1.07736.1000**
Silica gel 60 H	Silica gel 60 H*3	TLC	Tin	2.5 kg	**1.07736.2500**
Silica gel 60 H	Silica gel 60 H*3	TLC	Plastic	1 kg	**1.11695.1000**
Silica gel 60 H F_{254}	Silica gel 60 H*3 F_{254} *1	TLC	Plastic	1 kg	**1.07739.1000**
Silica gel 60 P F_{254}	Silica gel 60 P F_{254} *1	PLC, for preparative work	Tin	2.5 kg	**1.07747.2500**
Silica gel 60 P F_{254}	Silica gel 60 P F_{254} *1	PLC, for preparative work	Tin	2.5 kg	**1.07748.2500**
Silica gel 60 P F_{254}	Silica gel 60 P F_{254} *1	PLC, for preparative work	Tin	2.5 kg	**1.07749.2500**
Kieselgur	Kieselgur	PLC, for preparative work	Plastic	250 g	**1.07910.0250**
Kieselgur	Kieselgur	PLC, for preparative work	Plastic	1 kg	**1.07910.1000**
Kieselgur	Kieselgur	PLC, for preparative work	Plastic	25 kg	**1.07910.9025**

*1 F_{254} Fluorescent indicator *2 $F_{254+366}$ Fluorescent indicator *3 without foreingn binder

Aluminum oxides for TLC and PLC (particle size 5-40 µm)

Description	Material	Comment	pH of 10% aqueous suspension	Package Material	Pack size/ Content	Cat. No.
Aluminum oxide 60 G, neutral (type E)	Aluminum oxide 60 G, neutral	TLC, with Gypsum	7.5	Plastic	2.5 kg	**1.01090.2500**
Aluminum oxide 60 G F_{254} neutral (type E)	Aluminum oxide 60 G F_{254} *1 neutral	TLC, with Gypsum	7.5	Plastic	500 g	**1.01092.0500**

*1 F_{254} Fluorescent indicator

Other sorbents for TLC

Description	Particle size	Package Material	Pack size/ Content	Cat. No.
Cellulose microcrystalline	20 - 40 µm	Plastic	500 g	**1.02330.0500**

New Instrumental Solution for Reliable TLC Plate Analysis - TLC Explorer

Thin-layer chromatography (TLC) is an easy, cost-effective, and flexible technique for quick chromatographic analysis.

The TLC Explorer provides a digitalized solution to enhance the efficiency and accuracy of quantitative analysis for more consistent and easily shareable data interpretation (**Figure 1**). Whether you want a quick visual check or a software-based analysis and quantification, this device can analyze one or multiple plates. In addition, the device uses three LED light sources—white light (VIS), UV-A (366 nm), and UV-C (254 nm) to illuminate the plates from above in direct-light mode and identify distinct substances.

Figure 1: TLC Explorer Documentation System

Key Features and Benefits

- Rapid, accurate analysis of TLC, HPTLC, and PLC plates
- Easy WiFi or QR code connection; plug-and-play setup
- Software analyzes plates in under 2 minutes; auto-track recognition; 20 x 20 cm area
- Easily integrates with lab systems; auto-image rotation; noise reduction
- Uses sustainable LED modules; ensures UV exposure safety with Drawer Unit
- Glove-compatible touch sensors; easy maintenance; simple lamp replacement

User-Friendly Design and Operation

Connecting to the system is easy via WiFi or QR code scan for smartphones, laptops, or desktop operation **(Figure 2)**. This plug-and-play setup requires no technical support. The instrument can also use a power bank (sold separately) for added portability.

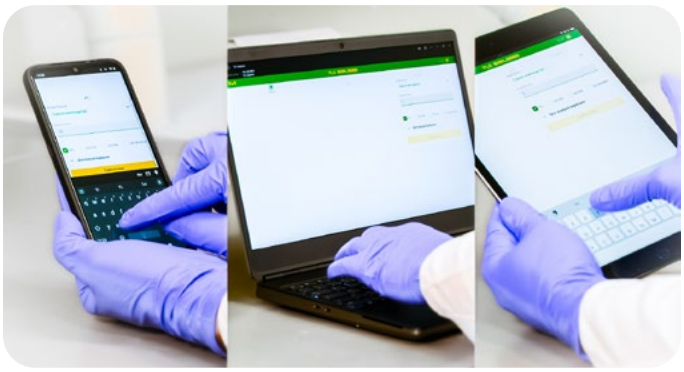


Figure 2. Seamless operation of the TLC Explorer on a phone, laptop, and a tablet.

Accurate, reproducible, efficient Software

The software enables TLC plate analysis in less than 2 minutes, with automated track recognition and simultaneous measurement of multiple plates across a 20 x 20 cm area. It includes features like auto-image rotation for misaligned plates, background noise reduction filters, and automatic detection of the starting line and solvent front, with manual adjustment options. Annotations can be added for extra clarity, and the software supports both comparative and quantitative examinations of plates.

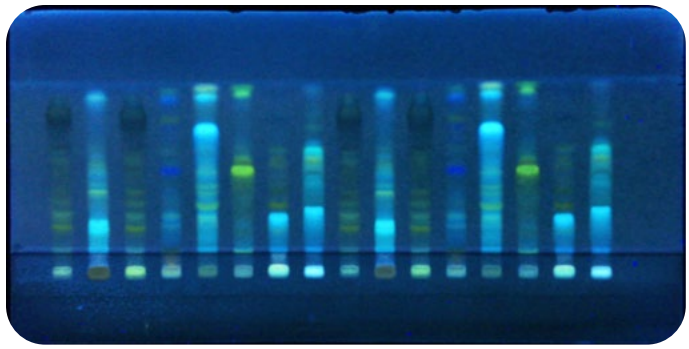


Figure 3. Screening of plant extracts. Chromatograms illuminated under UV-A 366 nm.

Ergonomic Visual Plate Analysis

The TLC Explorer features an inspection window for safe and quick examination of the plate. A manual shutter slider controls light entry, allowing the user to adjust visibility and minimize stray light. It provides three types of excitation sources, easily switched on with a tap on the touch-sensitive buttons, indicating their wavelengths. However, only one light source can be active at a time.

Safety And Sustainability

The device features a safety setup that prevents UV exposure by ensuring the analytical process only begins when the plates are secured and closed in the Drawer Unit. A “Drawer Open” light indicates that the drawer has not been closed properly. The instrument also uses energy-efficient LED modules instead of traditional mercury lamps for its light source, providing a more sustainable and durable option.

Easy Maintenance And Lamp Change

The exterior of the TLC device is easy to clean with commonly used solvents. Regular service maintenance is not required. Replacing the lamp unit can be done with minimal effort. Replacement parts and accessories can be ordered separately online.

Order Information:

Article Nr.	Description	Additional Comment
1.52610.0001	TLC Explorer	**What is included:** • TLC Explorer device with software • Illumination unit with three different LED light sources: white light (VIS), UV-A (366 nm) and UV-C (254 nm) • Power plugs for worldwide connection • Instruction Manual • “How to start” instruction guide • QR code sticker for quick connection • Baseplate • Dust cover
1.52611.0001	Power Bank*1	For remote use up to 30 hours
1.52612.0001	Baseplate	Accelerate workflow by preparing additional baseplate while other is being analyzed
1.52613.0001	Illumination Unit	Replacement part
1.52618.0001	Dust Cover	Replacement part
1.52614.0001	Electronic Unit	Replacement part
1.52616.0001	Front Unit	Replacement part
1.52615.0001	Drawer Unit	Replacement part
1.52619.0001	Antenna Set	Replacement part

*1 not available in all countries. Please contact your local TechService for further support.

Frequently Asked Questions (FAQs)

Can the software perform quantification or semi-quantitate analyses?

Yes, it can. The software can calculate concentrations by comparing the spot on a track with corresponding spots on reference tracks that have known concentrations.

Is the software tool GMP-compliant?

No, the software is not fully GMP-compliant but we fulfil requirement in terms of data integrity according to MD5 message digest algorithm.

Can the instrument analyze plate formats other than 20 x 20 cm and those with backings other than glass?

Yes, the instrument accommodates a variety of plate sizes and thicknesses for added versatility. It supports aluminum- or plastic-backed TLC, HPTLC or PLC plates with different formats and shapes, up to 20 x 20 cm.

How many different plates can be analyzed in parallel?

You can load several plates or sheets on the base plate, which has an area of 20 x 20 cm at the top of the drawer. The software can analyze multiple plates in parallel, accurately distinguishing between each one during the measurements.

Can I also analyze HPTLC plates?

Yes, the instrument (including software) allows a highly reliable analysis of HPTLC, TLC, and PLC plates.

Can I run a wavelength scan?

No, unfortunately, this feature is not available. You can carry out excitations at 254 nm, 366 nm, and VIS wavelengths.

Is there a warranty included?

Yes, we offer a one-year warranty. And in case you encounter any technical issues, please contact your local representative for further advice.

What is the expected lifetime of the lamp?

The lamp unit is equipped with three LEDs, which have a significantly longer lifetime and are more sustainable than mercury lamps. The LEDs can last 2-7 years, depending on the hours of usage.

TLC Accessories

In addition to our diverse offering of TLC plates, we also provide other products to support your entire TLC workflow, including products for plate spotting and development, visualization, sample recovery and storage.

Description	Content of 1 package/ additional information	Cat. No.
Application		
Hirschmann® microcapillary pipette, volume 1 - 5 µL	250 capillaries	**Z611239-250EA**
Hirschmann® microcapillary pipette, volume 20 µL	250 capillaries	**Z611247-250EA**
Developing		
TLC developing tank, rectangular; complete	1 piece (L x H x W 17.5 cm x 16.0 cm x 8.2 cm)	**Z204153-1EA**
TLC developing tank, rectangular; complete	1 piece (L x H x W 27.0 cm x 26.5 cm x 7.0 cm)	**Z126195-1EA**
TLC developing tank, rectangular; complete	1 piece (L x H x W 12.1 cm x 10.8 cm x 8.3 cm)	**Z146226-1EA**
TLC developing tank, rectangular; complete	1 piece (L x H x W 17.5 cm x 11.0 cm x 6.2 cm)	**Z204188-1EA**
TLC developing tank, rectangular; complete	1 piece (L x H x W 7.5 cm x 15.5 cm x 8.0 cm)	**Z204226-1EA**
TLC developing tank, rectangular; complete	1 piece (L x H x W 17.5 cm x 16.0 cm x 6.2 cm)	**Z204161-1EA**
TLC developing glass tank, cylindrical	1 piece (6.5 cm x 10.5 cm)	**Z243906-1EA**
TLC developing glass tank, cylindrical	6 piece (6.5 cm x 10.5 cm)	**Z243906-6x1EA**
Replacement lid for cylindric TLC developing tank	1 piece	**Z407259-1EA**
Latch-lid™ TLC developing chambers	1 piece, for use with 10 x 10 cm plates	**Z266019-1EA**
TLC saturation pads	for use with 20 cm x 10 cm plates	**Z265225-1Pak**
TLC saturation pads	for use with 10 cm x 20 cm plates	**Z265233-1Pak**
Plate Storage		
Aluminum multi-plate racks	for use with 10 cm x 10 cm plates	**Z266043-1EA**
Aluminum multi-plate racks	for use with 20 cm x 20 cm plates	**Z266035-1EA**
PTFE multi-plate racks	for use with 20 cm x 20 cm plates	**Z266051-1EA**
TLC plate storage racks	for use with 20 cm x 20 cm plates; for 10 plates	**Z266094-1EA**
UV/ VIS Detection		
UV lamp 254 nm	1 unit	**1.12537.0001**
UV lamp 366 nm	1 unit	**1.13203.0001**
UV Detection*		
Spectroline® E-series UV lamp	output 4 W, AC/DC 115 V AC	**Z169595-1EA**
Spectroline® E-series UV lamp	output 4 W, AC/DC 230 V AC	**Z169609-1EA**
Spectroline® E-series UV lamp	output 6 W, AC/DC 120 V AC	**Z169617-1EA**
Spectroline® E-series UV lamp	output 6 W, AC/DC 230 V AC	**Z169625-1EA**
Spectroline® E-series UV lamp	output 8 W, AC/DC 115 V AC	**Z169633-1EA**
Spectroline® E-series UV lamp	output 8 W, AC/DC 230 V AC	**Z169641-1EA**
Spectroline® CM UV-viewing cabinet	Cabinet CM-26, AC/DC input 115 V AC, 60 Hz	**Z169439-1EA**
Spectroline® CM UV-viewing cabinet	Cabinet CM-26, AC/DC input 230 V AC, 50 Hz, European 2-pin plug	**Z169447-1EA**
Spectroline® filter assembly for CX TM UV-viewing cabinet	Longwave	**Z169579-1EA**
Spectroline® E-Series lamp bulb	shortwave output 4 W	**Z169412-1EA**
Spectroline® E-Series lamp bulb	longwave output 6 W	**Z169455-1EA**
Spectroline® E-Series lamp bulb	shortwave output 6 W	**Z169463-1EA**
Spectroline® E-Series lamp bulb	shortwave output 8 W	**Z169552-1EA**
Derivatization/ Visualization		

TLC Accessories continued

Description	Content of 1 package/ additional information	Cat. No.
Dragendorff's reagent spray solution	Acetic acid/ethyl acetate/water, 100 mL	**1.02035.0100**
Molybdatophosphoric acid	2-propanol, 100 mL	**1.00480.0100**
Ninhydrin spray solution	2-propanol, 100 mL	**1.06705.0100**
Iodoplatinate	100 mL	**I9157**
Molybdenum	100 mL	**M1942**
Sprayer / Spray box		
TLC spray box	5 piece with size appr. 14 X 14 inc.	**S1509-5EA**
TLC sprayer	1 unit with two spray heads	**1.08540.0001**
Reagent sprayer for TLC plates	1 piece, volume 250 mL	**58005**
Spray nozzles (heads) for TLC sprayer	5 pieces (0.8 mm) + 1 piece (1.25 mm)	**1.08541.0001**
Tube-type sprayer	capacity 50 mL	**Z126292-1SET**
Bottle-type sprayer	capacity 240 mL	**Z126306-1SET**
Flask-type sprayer	size 250 mL	**Z129178-1EA**
Flask-type sprayer	size 75 mL	**Z190373-1EA**
Chromatography sprayer	size 10 mL (flask- type)	**Z529710-1EA**
Chromatography sprayer	size 50 mL (flask- type)	**Z529729-1EA**
Chromatography sprayer	size 125 mL (flask- type)	**Z529737-1EA**
Chromatography sprayer	size 250 mL (flask- type)	**Z529745-1EA**
Others		
HPTLC calibration mix	Methanol solution containing mix of 9-fluorenol, guanosine, octrizole, paracetamol, phthalimide, sulisobenzone, thioxanthone, thymidine.	**91816**

*Short wave: 254 nm Long wave: 365 nm

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