

# REVELERIS<sup>®</sup> X2

## FLASH Chromatography System

The Next Generation in Innovation

*Confidence*

*Flexibility*



*Simplicity*

- Flash System
- Flash Cartridges
- Service and Support

# GRACE

Materials Technologies

Discovery Sciences

## Changing the Game

Grace revolutionized flash chromatography in 2009 with the introduction of the Reveleris® flash chromatography system, the first system with integrated ELSD detection. This allowed synthetic chemists to see everything in their sample, helped improve productivity and increased the purity of their target molecules. The impact on the flash marketplace has been profound. The Reveleris® flash chromatography system received several major industry accolades including an R&D 100 award and an IBO Industrial Design award. In 2012, we were granted four U.S. Patents for the innovative technology in the Reveleris® flash systems, further confirming our technological leadership in the field of flash chromatography. We have applied our expertise and innovative patented and patent pending technologies to develop the **NEW** next generation Reveleris® X2 Flash Chromatography System.



### A Complete Solution for Flash Chromatography

#### Flash System

- Collect synchronized fractions from up to four integrated UV and ELSD detector signals
- Selectable sensitivity isolates more compounds from complex mixtures from low mg to kg levels
- Purify products faster with simple setup and operation

Unique and powerful RevealX™ detection technology lets you see components that up until now may have been invisible, helping to result in maximum purity and recovery in minimum time.

#### Flash Cartridges

- Increased loading capacity
- Durable 200psi\* design
- Superior resolution with ultra-pure 40µm silica
- Available in silica and multiple bonded phases

Reveleris® flash cartridges are the only cartridge designed by a silica expert for ideal chromatographic results. For maximum performance, use Reveleris® flash cartridges with the Reveleris® X2 flash system.

#### On-site Service and Support

- Preventative maintenance program
- On-site personalized service
- Service contract options
- Global infrastructure, local expertise

Our global team of knowledgeable and experienced technical support specialists deliver best-in-class customer care. In order to help ensure the on-going performance of your instrument and to maximize the value of your investment, Grace provides a comprehensive range of maintenance and repair options, including service plans.

# Reveleris® Flash Cartridges

Get the most out of your flash purifications by choosing Grace® Reveleris® Flash cartridges, the only flash cartridges designed by a silica expert for optimal chromatographic performance.

- Auto-recognition on the Reveleris® X2 flash system
- Silica optimized for flash applications
- High capacity cartridges improve results and reduce costs

The silica packed in Reveleris® flash cartridges is specifically designed to increase cartridge efficiency and therefore resolution of closely eluting compounds, in some cases greater than two times better resolving power over typical packings. Greater efficiency enables more peaks to be baseline resolved and results in increased sample purity as well as decreased fraction volumes. Additionally, by increasing sample loads on a given cartridge size with elevated pressure capability, sample throughputs and yields increase and overall purification costs are lowered.

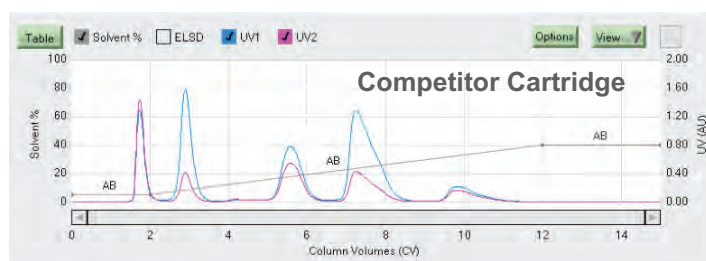
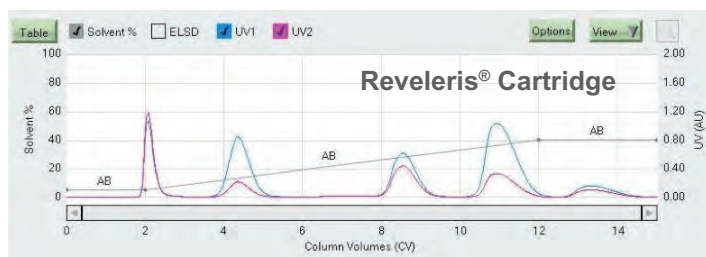


For maximum performance use Reveleris® flash cartridges with the Reveleris® X2 flash system.

## Better Performance with Reveleris® Flash Cartridges

While silica is the most popular choice for flash applications, other chemistries bring unique separation capabilities that can help resolve complex samples.

**Reveleris® cartridges resolve five components in an aniline text mixture better than a competitor's premium cartridge.**



The Reveleris® cartridge's silica selectivity and optimized packing techniques result in higher purity fractions and higher loading capacity, reducing the overall cost per sample.

Chemistry	Ideal For
Silica	Conventional applications, polar compounds
Reversed-Phase (C18)	Non-polar compounds
Amino	Better peak shapes with polar and basic compounds; ideal for carbohydrates
Diol	Alternate selectivity for a variety of polarity types; ideal for lipids

### Reveleris® Silica Cartridges (up to 200psig\*)

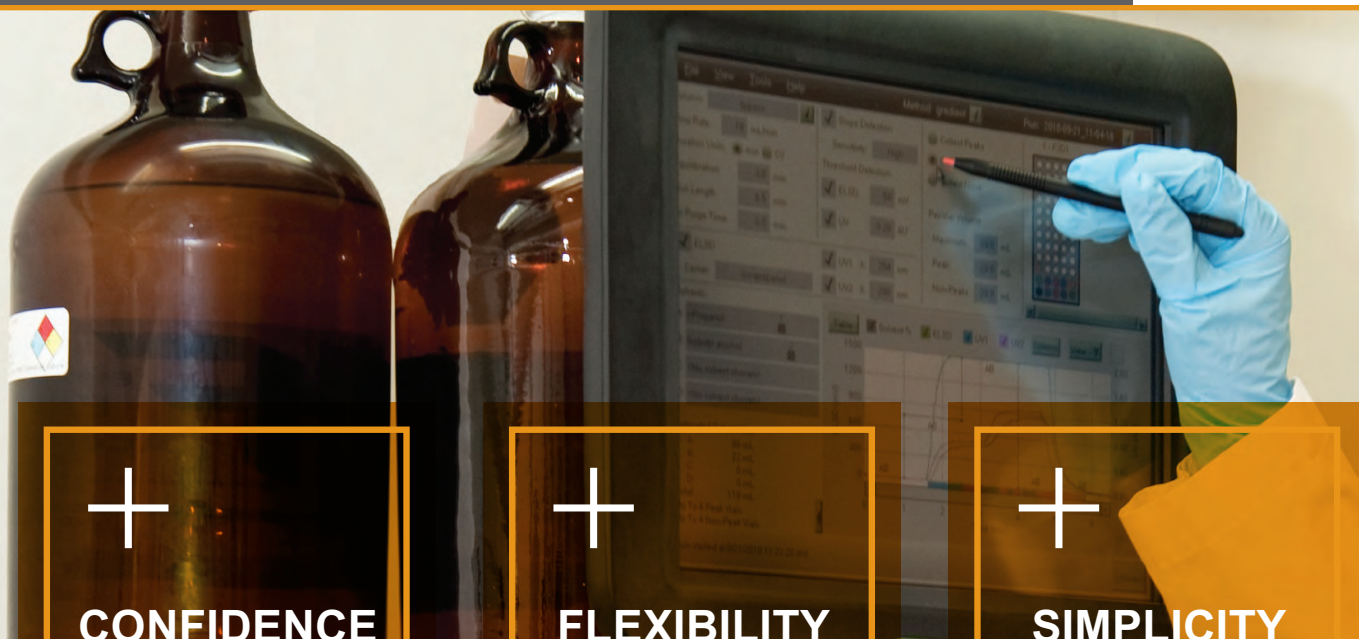
Cartridge Size	Qty.	Part No.
Silica 4g	20	5146130
Silica 12g	20	5146131
Silica 24g	15	5165730
Silica 40g	15	5146132
Silica 80g	12	5146133
Silica 120g	10	5146134
Silica 220g*	6	5165750
Silica 330g*	4	5146135

### Reveleris® Bonded Flash Cartridges (up to 200psig\*)

Cartridge Size	Qty.	Amino Part No.	Diol Part No.	C18 Part No.
4g	ea	5157330	5157335	5152990
12g	ea	5157331	5157336	5152103
40g	ea	5157332	5157337	5152104
80g	ea	5157333	5157338	5152105
120g	ea	5157334	5157339	5152991
330g*	ea	—	—	5164430

\*220g and 330g cartridges have a pressure rating of 100 psi.

# Reveleris® X2 Flash Chromatography System



**CONFIDENCE**



**FLEXIBILITY**



**SIMPLICITY**

## 1 Maximize purity and recovery of your target with RevealX™ Detection Technology

- Synchronized detection and fraction collection from up to four detector signals (ELSD/UV/Vis)
- Detects the widest range of compounds
- Maximizes recoveries by directing only 50ul/min or less of your sample to ELSD

## 2 Purify a broad range of sample types with selectable high/low detection sensitivity

- Detect chromophores, nonchromophores, and visible sample components from mg to kg quantities
- Purify complex samples from discovery through process R&D
- Easily switch between normal phase and reversed-phase applications

## 3 One-screen programming and run control with intuitive Windows® interface, accelerates system set-up

- Quickly modify run parameters on a large 12" touch screen display
- Edit gradients in real time, using click and drag or table
- Auto-recognition of cartridges and trays reduces set-up time, and the risk of potential errors

### RevealX™ Detection Technology

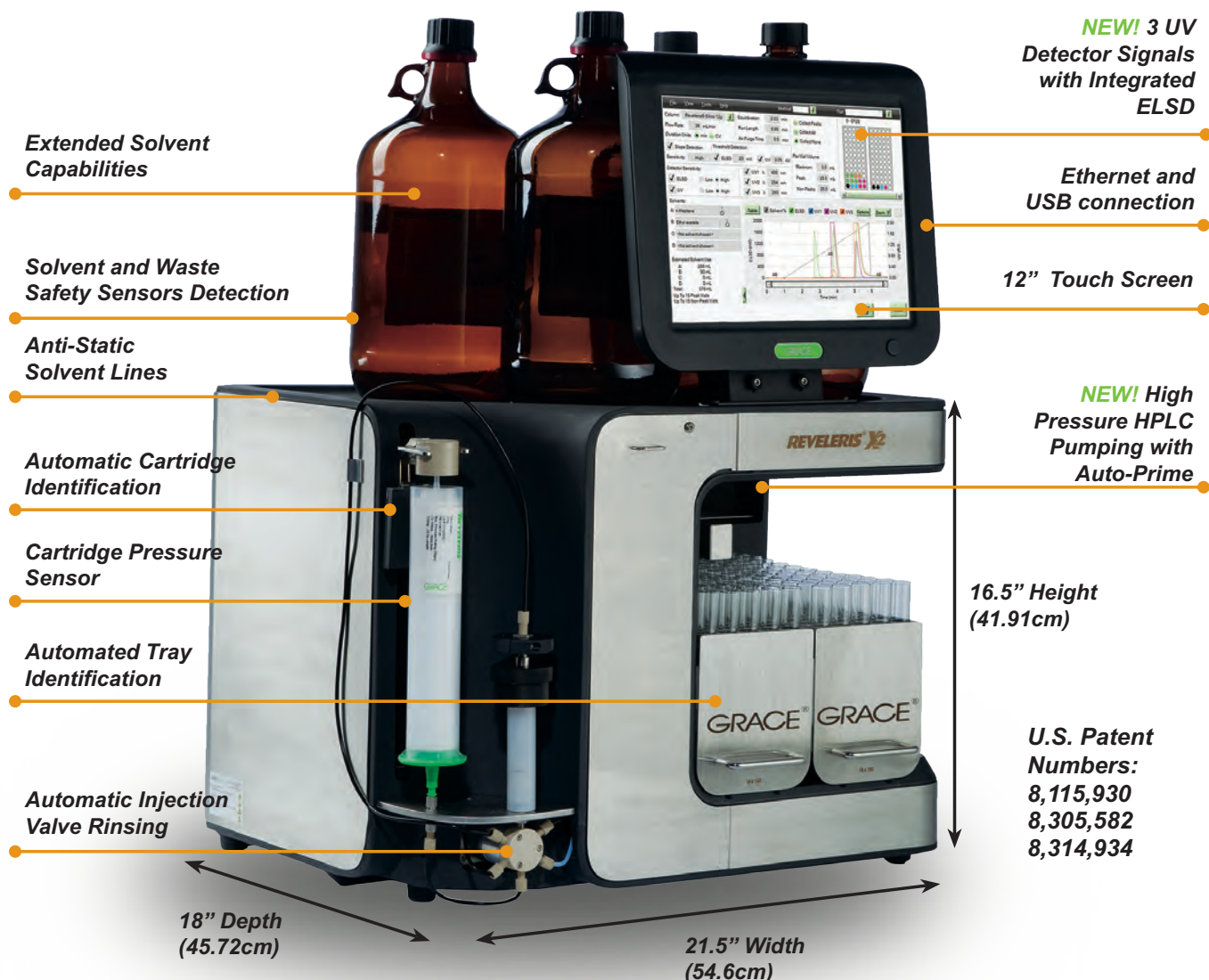
- Simplifies Fraction Collection
- Reduces Post Purification Work
- Maximizes Recovery of Target Molecules

The patented RevealX™ detection technology combines multiple detector signals to optimize the timing of fraction collection. It synchronizes the signals from up to four different detectors, including ELSD, optimizing the number of fractions and ensuring maximum purity. The integrated detector signals and advanced signal processing recognize peaks and collect previously undetected compounds.



RevealX™ detection technology identifies more and enables combined fraction triggering.

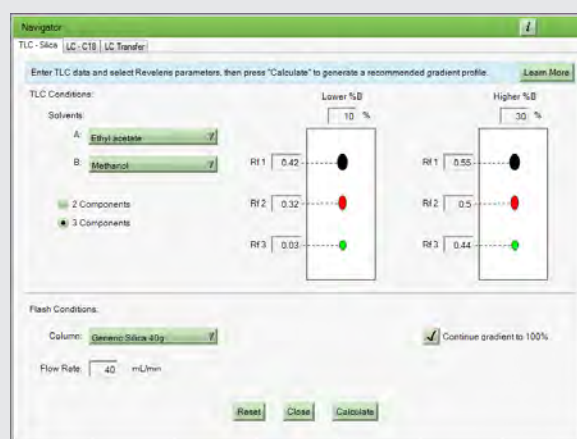
# The Next Generation Flash System



## Reveleris® X2 Navigator™ Software

The powerful Reveleris® X2 Navigator™ software improves efficiency and productivity by simplifying method optimization taking the guesswork out of interpreting your TLC or HPLC scouting runs. The patent pending algorithm lets you choose to optimize for fastest run time or highest recovery, and also warns if your compound will be difficult to separate with the selected solvents.

The Reveleris® X2 Navigator™ software is an optional feature designed to enhance your Reveleris® X2 System. Please contact us for information about including the software with your original purchase, or adding it to your system later.



The Reveleris® X2 Navigator™ software simplifies method optimization, improving efficiency and productivity.

# Reveleris® X2 System Ordering Information

## Included with the system

- (2) 18x150mm Fraction collection trays
- (1) 3g Adjustable solid loader plunger
- (1) 3g Filled solid loader
- All required solvent tubing, filters and accessories
- Installation hardware
- Performance documents

Description	Part No.
Reveleris® X2 Flash Chromatography System	5164931
Reveleris® X2 Flash Chromatography System UV/Vis Optional Upgrade	5167301
Reveleris® X2 Navigator™ Software Optional Upgrade	5156620

Contact Us to Request a Demo or for More Information



## Reveleris® X2 System Accessories

### Fraction Collection Trays

Description	Qty.	Part No.
12x75mm	2	5148872
13x100mm	2	5148874
16x150mm	2	5148875
18x150mm	2	5148885
25x150mm	2	5148886
For French Square Bottles	ea	5148873

### Fraction Tubes

Description	Qty.	Part No.
12x75mm	1000	8623413
13x100mm	1000	8623414
16x150mm	1000	8623416
18x150mm	1000	8623410
25x150mm	500	8623411
480ml French Square Bottles	24	8623412

### Method Development TLC Plates

Description	Size	Qty.	Part No.
Silica	20 x 20cm	25	8621250
Reversed-Phase C18	10 x 20cm	25	8625320
Silica Aluminum-backed (UV254)	20 x 20cm	25	8628490
Silica Aluminum-backed (no UV)	20 x 20cm	25	8628492

### NEW Solid Loaders

Description	Qty.	Part No.
<b>Empty Solid Loaders</b>		
Empty 3g	100	5142050
Empty 15g	100	5142051
Empty 40g	50	5147808
<b>Filled Solid Loaders</b>		
Silica 3g	20	5152371
Silica 15g	16	5142034
Silica 40g	12	5147772
<b>Adjustable Solid Loader Plungers</b>		
Adjustable 3g Plunger	ea	5167302
Adjustable 15g Plunger	ea	5168541
Adjustable 40g Plunger	ea	5168534
3g Frit Insertion Rod	ea	5162931
15g Frit Insertion Rod	ea	5162902
40g Frit Insertion Rod	ea	5162901

### Reveleris® C18 Scout Columns\*

Description	Size	Qty.	Part No.
C18 HPLC Column	4.6 x 50mm	3	5156381
C18 HPLC Column	4.6 x 150mm	3	5156382
C18 HPLC Column	4.6 x 250mm	3	5156383

\*For use with Reveleris® X2 Navigator™ Software

## Reveleris® X2 Flash System Specifications

<b>Display</b>	Windows® based graphical LCD touchscreen with full on-screen QWERTY keyboard
<b>Data Entry</b>	Touchscreen or USB connection to mouse/keyboard
<b>Solvent Delivery System</b>	High pressure pumps (HPLC). 4 Independent channels with up to four solvents in a single run. Auto-switches lines when solvent levels run low. Normal phase and reversed phase solvent compatible
<b>Pump Flow Rate</b>	4-200mL/min. Accuracy +/- 3%, Precision +/- 0.5%. Auto flow reduction at high pressure
<b>Maximum Pressure</b>	200psig
<b>Gradients</b>	Linear, step, isocratic. 4 solvent binary. On-screen mid-run gradient adjustment, isocratic hold, pause
<b>Sample Injection</b>	Liquid or Solid Sample Modes, Solid Injection: up to 75g
<b>Sample Loader Plunger</b>	3 sizes fitting 15mL, 75mL, 150mL solid loaders
<b>Detector Sensitivity</b>	Selectable sensitivity control high or low based on concentration of target compound
<b>UV Wavelength Range</b>	200-500 nm; up to 3 signals. Optional extension to visible wavelengths, UV-Vis 200-850nm
<b>Accommodates Cartridge Sizes</b>	4-330g luer type; up to 1500g with adapter
<b>Triggers</b>	Combination of up to 3 UV signals plus ELSD with slope and/or threshold detection
<b>Fraction Collection Trays</b>	Holds 5"x12" trays; Auto-tray recognition
<b>Power Options</b>	120/240V, 50/60Hz, 10A
<b>Instrument Dimensions</b>	16.5" H x 21.5" W x 18.0" D (41.91cm H x 54.6cm W x 45.72cm D)
<b>Instrument Weight</b>	60 lbs (27kg)
<b>Certifications</b>	CE, TÜV®, ISO® 9001
<b>Warranty</b>	One year limited warranty coverage of parts and labor from date of installation. Additional warranty and service options are available. Contact your local sales representative for more information.

Grace is a leading global supplier of catalysts, engineered and packaging materials specialty construction chemicals and building materials. The company's three industry leading business segments—Grace Catalysts Technologies, Grace Materials Technologies and Grace Construction Products—provide innovative products, technologies and services that enhance the quality of life.

# GRACE

[www.grace.com](http://www.grace.com)

### Global Headquarters

W. R. Grace & Co.-Conn  
7500 Grace Drive  
Columbia, Maryland 21044 USA

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Contact us today for more information, or to request a demo:

### Australia

Rowville  
Tel: +61 3.9237.6100  
[discoverysciences.AU@grace.com](mailto:discoverysciences.AU@grace.com)

### China

Shanghai  
Tel: +86 21.5467.4678  
[dsbiz.asia@grace.com](mailto:dsbiz.asia@grace.com)

### India

Pune  
Tel: +91 20.6644.9900  
[pune@grace.com](mailto:pune@grace.com)

### Latin America

Sorocaba, Brazil  
Tel: +55 15.3235.4705  
[discoverysciences.BR@grace.com](mailto:discoverysciences.BR@grace.com)

### Europe

Lokeren, Belgium  
Tel: +32 (0)9.340.65.65  
[discoverysciences.EU@grace.com](mailto:discoverysciences.EU@grace.com)

### North America

Deerfield, Illinois  
Tel: +1 847.948.8600  
[discoverysciences@grace.com](mailto:discoverysciences@grace.com)

Grace revolutionized flash chromatography in 2009 with the introduction of the Reveleris<sup>®</sup> flash chromatography system, the first flash system with integrated ELSD detection. Since its introduction, the Reveleris<sup>®</sup> system received major industry awards and four U.S. Patents. These patented and patent pending technologies position the Reveleris<sup>®</sup> X2 flash system as one of the most innovative flash available today.

### The Reveleris<sup>®</sup> X2 Flash System is the *Only* System That Offers:

- **RevealIX™ detection technology** that triggers simultaneous fraction collection with advanced signal processing from up to four detector signals - *ELSD/UV/Vis (U.S. Patent# 8,115,930)*
- **Collection of fractions using the ELSD signal** when a chromophoric mobile phase obscures the sample signal on the UV/Vis detector (*U.S. Patent# 8,305,582*)
- **Active control of the integrated, optimized ELSD** including flow-splitter operation (*U.S. Patent# 8,305,581*)
- Software **selectable ELSD and UV detector sensitivity** that actively controls the amount of sample being split to the ELSD (*Patent Pending*)
- **Three variable UV detector channels plus integrated ELSD detection** that can selectively be used to trigger fraction collection (UV-Vis upgrade optional)
- **Sample recoveries greater than 99.9%** under most circumstances by directing 50ul/min or less of your sample to ELSD (*Patent Pending*)
- Eluent split to ELSD delivered using a gas stream, so **no additional pump or solvent is needed** (*Patent Pending*)
- **No optimization of ELSD** operating parameters required (*Patent Pending*)
- **Reveleris<sup>®</sup> Navigator™ software feature** to optimize performance with data from TLC analysis or HPLC columns, saving time and solvent consumption (optional upgrade) (*Patent Pending*)
- **Auto-priming of all pumps** before a run to help prevent sample loss (*Patent Pending*)
- Large **12" Touch Screen** for single screen control and monitoring
- **Upward solvent flow** through cartridge for better purging of air during equilibration



8,115,930  
8,305,581  
8,305,582  
U.S. Patents Nos. 8,314,917

### Reveleris<sup>®</sup> X2 Flash Chromatography System

#### Additional Patent Pending Technologies

Flexible, High-recovery fraction collection with multiple detector signals

Specialty Silica for Increased Sample Loading and Resolution

Automatic, Accurate Cartridge and Fraction Collection Tray Identification

Solvent Feed System for Improved Method Performance and Flexibility to Use up to Four Solvents in a Run

Benefits	
<b>Set-Up and Control:</b>	<ul style="list-style-type: none"> <li>Automated solvent line priming</li> <li>Auto recognition of Reveleris® cartridges and trays</li> <li>Single click run gradient adjustment and hold</li> <li>Fraction collection triggering based on slope and/or threshold</li> <li>User control of the fraction collection tray with manual advance</li> <li>Automated software allows fast switching from normal phase to reversed phase</li> <li>Color-coded user guidance, status prompts and alerts</li> </ul>
<b>System Safeguards:</b>	<ul style="list-style-type: none"> <li>Auto run extension on peak detection</li> <li>Automatic flow reduction and pressure monitoring cut off</li> <li>Use same solvents in multiple reservoirs with rapid auto line switching for extended capacity</li> <li>Air purging of used cartridges to help ensure safe disposal</li> </ul>
<b>Solvent Options:</b>	<ul style="list-style-type: none"> <li>Four independent solvent channels offering use of up to four solvents at any time during a run</li> <li>No carrier solvent for ELSD required</li> <li>High pressure (200psi) precision HPLC pumping</li> </ul>

#### Included with the system:

- (2) 18x150 Fraction Collection Trays
- (1) 3g Adjustable Solid Loader Plunger
- (1) 3g Filled Solid Loader
- Solvent tubing, filters and accessories required for installation
- Installation Hardware
- Performance Documents

Description	Part No.
<b>Reveleris® X2 Flash Chromatography System</b>	5164931
<b>Reveleris® X2 Flash Chromatography System with UV/Vis</b>	5167301
<b>Reveleris® X2 Navigator™ Software Optional Upgrade</b>	5156620

An optional system enhancement available with the purchase of your system or can be added on later.

Specifications	
<b>Display:</b>	12" Windows® based graphical LCD touch screen with full onscreen QWERTY keyboard
<b>Data Entry:</b>	Touchscreen or USB connection to mouse/keyboard
<b>Software:</b>	RevealX™ detection technology with advanced signal processing to recognize peaks and collect previously undetected compounds
<b>Solvent Delivery System:</b>	High pressure pumps (HPLC); Four independent channels with up to four solvents in a single run. Auto-switches lines when solvent levels run low. Normal phase and reversed phase solvent compatible
<b>Pump Flow Rate:</b>	4–200mL/min. Accuracy +/- 3%, Precision +/- 0.5%. Auto flow reduction at high pressure
<b>Maximum Pressure:</b>	200psig
<b>Gradients:</b>	Linear, step, isocratic. Four solvent binary. On-screen mid-run gradient adjustment, isocratic hold, pause
<b>Sample Injection:</b>	Liquid or solid sample modes, solid injection: up to ~75g
<b>Sample Loader Plunger :</b>	Three sizes, fitting into 15mL, 75mL and 150mL solid loaders
<b>Detector Sensitivity:</b>	Selectable sensitivity control high or low, based on concentration of target compound
<b>UV Wavelength Range:</b>	200–500 nm; up to three signals. Optional extension to visible wavelengths, UV-Vis 200–850nm
<b>Accommodates Cartridge Sizes:</b>	4g–330g luer type; up to 1500g with adapter
<b>Triggers:</b>	Combination of up to 3 UV signals plus ELSD with slope and/or threshold detection
<b>Fraction Collection Trays :</b>	Holds two 5"x12" trays; Auto-tray recognition
<b>Power Options:</b>	120/240V, 50/60Hz, 10A
<b>Instrument Dimensions:</b>	16.5" H x 21.5" W x 18.0" D (41.91cm H x 54.6cm W x 45.72cm D)
<b>Instrument Weight:</b>	60lbs (27kg)
<b>Certifications:</b>	CE, TÜV®, ISO® 9001

Please contact your local sales representative to request a quote or for more information.

**Americas**  
Deerfield, Illinois  
Tel: +1 847.282.2049  
discoverysciences@grace.com

**Europe**  
Lokeren, Belgium  
Tel: +32 (0)9.340.6564  
discoverysciences.EU@grace.com

**India**  
Pune  
Tel: +91 20.6644.9900  
pune@grace.com

**China**  
Shanghai  
Tel: +86 21.5467.4678  
dsbiz.asia@grace.com

**Australia**  
Rowville  
Tel: +61 3.9237.6100  
discoverysciences.AU@grace.com



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# Determination of Sample Loss on the Reveleris® X2 Flash Chromatography System

## Introduction

The Reveleris® X2 system uses patented\* RevealX™ Detection Technology to collect fractions from chromophoric and non-chromophoric compounds. This is done by advanced fluidics and signal processing in order to integrate multiple detector signals. This technology involves a proprietary flow splitting design between the UV and ELS detectors within the system. Analysts familiar with ELSD know this is a destructive detector. So the question of sample being lost during this split can be a concern. We tested this for the fractions collected as detected by the ELSD.

## Experimental Conditions

Tocopherol was chosen as a difficult test probe, as it generally presents poor peak shape by normal phase flash chromatography, making difficult fraction collection. 2mL of tocopherol was loaded using a 10mL syringe on a Reveleris® 40g cartridge. The sample concentration was 500mg/mL, so there was a total of 1g on column. The flowrate was 40mL/min and the gradient used was 35% to 100% ethyl acetate in 6 minutes (remaining balance of hexane).

The tubes used to collect the fractions were weighed before collection. After fraction collection, the samples were dried down and the dry tubes were weighed.

## Results and Discussion

There were four tubes that contained fractions collected from detection by ELSD. The original tare weight of each empty tube was subtracted from the dry weight of the same tube used after the fraction was dried down. The weights from these four tubes were then added together to determine the total weight of fractions collected. This was a sum of 1.0669g.

The data shows that there was no sample loss based on the weight recovered from the four

dried down fractions. There was actually a slight gain in weight. Additional weight gain can be accounted for by injection syringe accuracy and fraction tube handling.

## Conclusion

As the results show, there was no sample loss from the fractions collected as detected by the ELSD detector. This shows that the split to the ELSD does not contribute to significant sample loss. The sophisticated proprietary fluidic and splitting design of the Reveleris® X2 system enables flash chromatographers to detect previously undetectable non-chromophoric compounds. Sample loss is not a concern.



U.S. Patents Nos.  
8,115,930  
8,305,581  
8,305,582  
8,314,917

### Figure 1 Conditions

<b>Sample</b>	
<b>Concentration:</b>	500mg/mL Tocopherol
<b>Cartridge:</b>	Reveleris® 40 grams
<b>Injection Volume:</b>	2mL using 10mL Syringe
<b>Mobile Phase:</b>	<b>A:</b> Hexane <b>B:</b> Ethyl Acetate
<b>Gradient:</b>	(Time, %) (0, 35), (6, 100)

Figure 1



### ELSD Collection Only

Fraction #	2	3	4	5
<b>Tare Weight</b>	18.4179g	18.4795g	18.416g	18.4501g
<b>Dry Weight</b>	18.4652g	19.22g	18.6946g	18.4506g
<b>Dry Weight - Tare Weight</b>	0.0473g	0.7405g	0.2786g	0.0005g
<b>Total Weight</b>				1.0669g

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**W. R. Grace & Co.-Conn.**  
7500 Grace Drive, Columbia, MD 21044

**AUSTRALIA:**  
Rowville  
Tel: +61 3.9237.6100  
Email: [discoverysciences.AU@grace.com](mailto:discoverysciences.AU@grace.com)

**BRAZIL:**  
Sorocaba  
Tel: +55 15.3235.4705  
Email: [discoverysciences.BR@grace.com](mailto:discoverysciences.BR@grace.com)

**CHINA:**  
Shanghai  
Tel: 86 21 5467 4678  
Email: [dsb.asia@grace.com](mailto:dsb.asia@grace.com)

**EUROPE:**  
Lokeren, Belgium  
Tel: +32 (0)9.340.65 65  
Email: [discoverysciences.EU@grace.com](mailto:discoverysciences.EU@grace.com)

**INDIA:**  
Pune  
Tel: +91 20.6644.9900  
Email: [pune@grace.com](mailto:pune@grace.com)

**NORTH AMERICA:**  
Deerfield, Illinois  
Tel: 1.847.948.8600  
Email: [discoverysciences@grace.com](mailto:discoverysciences@grace.com)

[www.discoverysciences.com](http://www.discoverysciences.com)

# Limit of Collection Determination for ELSD in the Reveleris® Flash System

## Introduction

The Reveleris® system uses patented\* RevealX™ Detection Technology to collect fractions from non-chromophoric compounds using an ELSD. The minimum threshold value for the ELSD to detect these compounds is 3mV. We ran tests to determine the minimum sample concentration needed for detection in order to trigger the fractions to be collected.

## Experimental Conditions

Dilutions of 1mg/mL concentration of cholesterol acetate were made to 0.75mg/mL, 0.5mg/mL, and 0.25mg/mL concentrations. 1mL of each of these resulting concentrations, as well as 1 mg/mL, were loaded using a 10 mL syringe on a Reveleris® 4g cartridge in four separate runs. The resulting concentrations loaded were 1mg, 0.75mg, 0.50mg, and 0.25mg on the column.

The flowrate was 18mL/min and the method was isocratic using 95% hexane: 5% ethyl acetate. Each run was 2 minutes long.

## Results

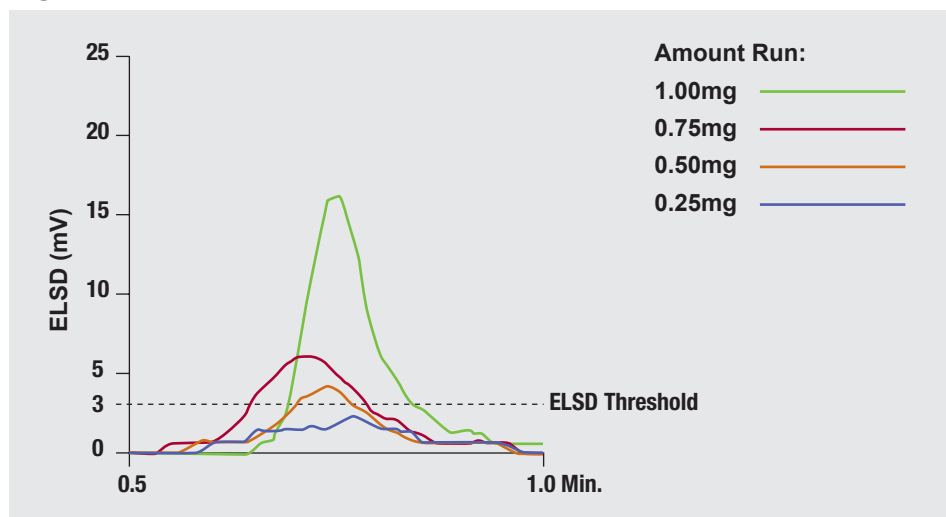
As shown in the data in Figure 1, the ELSD detected and collected cholesterol acetate at 1mg, 0.75mg and 0.5mg. The sample was detected at a concentration of 0.25mg, but this did not meet the threshold of 3mV to trigger collection.

## Conclusion

Although the signal response by ELSD can vary according to the type of compound, cholesterol acetate was used to determine the minimum concentration of sample required to be detected and trigger fraction collection. The ELSD easily detected cholesterol acetate at concentrations of 1mg and 0.75mg. The minimum concentration for cholesterol acetate that was detected by ELSD in order to trigger collection was 0.5mg on column.



Figure 1



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**W. R. Grace & Co.-Conn.**  
7500 Grace Drive, Columbia, MD 21044

Grace Discovery Sciences Regional Headquarters:

**IN THE AMERICAS:**  
2051 Waukegan Road  
Deerfield, IL 60015-1899  
Tel: 1 847 948 8600  
Fax: 1 847 948 1078  
Email: [discoverysciences@grace.com](mailto:discoverysciences@grace.com)

**IN EUROPE:**  
Brandstraat 12  
B-9160 Lokeren, Belgium  
Tel: +32 (0)9-340-65 65  
Fax: +32 (0)9 340 65 60  
Email: [discoverysciences.EU@grace.com](mailto:discoverysciences.EU@grace.com)

**IN ASIA:**  
19th Floor, K.Wah Center  
1010 Huai Hai Zhong Road  
Shanghai, 200031 PRC  
Tel: 86 21 5467 4678  
Fax: 86 21 5405 1500  
Email: [dsbiz.asia@grace.com](mailto:dsbiz.asia@grace.com)

**IN INDIA:**  
17 Commerce Center  
Opposite Krishna Hospital, Paud Road  
Pune, 411038 India  
Tel: +91 20 6644 9900  
Fax: +91 20 2544 1740  
Email: [pune@grace.com](mailto:pune@grace.com)

**IN AUSTRALIA/NEW ZEALAND:**  
2 Kerr Court  
Rowville, 3178  
Victoria, Australia  
Tel: +61 3 9237 6100  
Fax: +61 3 9237 6101  
Email: [discoverysciences.AU@grace.com](mailto:discoverysciences.AU@grace.com)

**GRACE**

# Reveleris® X2 Navigator™ Software Improves Purification Efficiency and Productivity

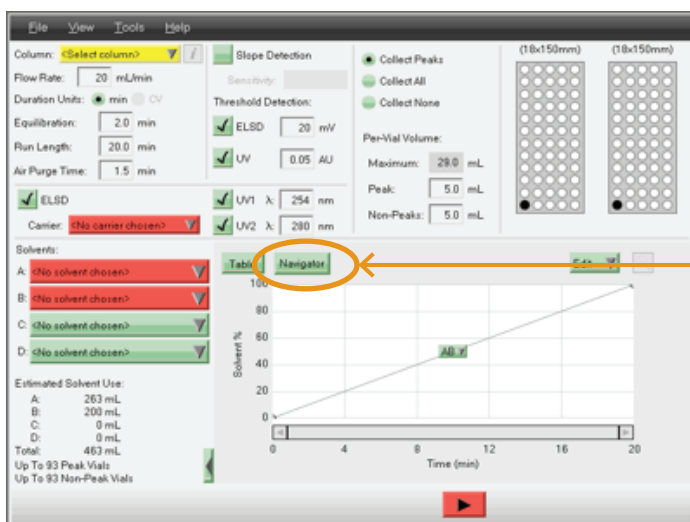
## Introduction

The Reveleris® X2 Navigator™ software module is a unique and powerful software tool that enables chemists to optimize purification of their target compounds by delivering fast, high quality separations at minimal cost.

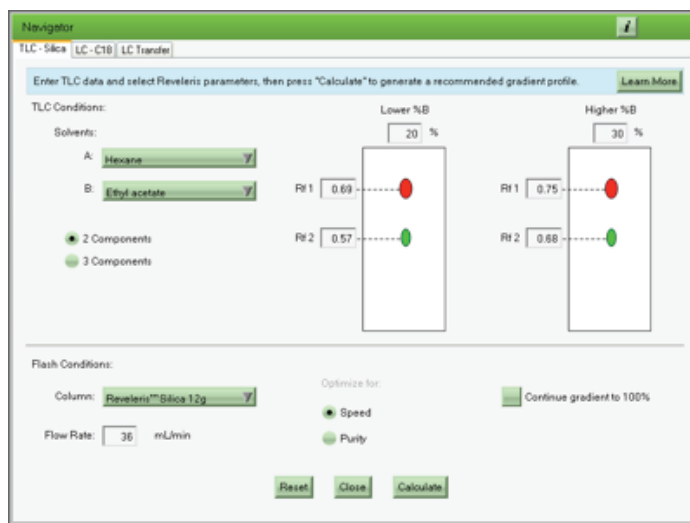
Flexible and intuitive, the Reveleris® X2 Navigator™ software is essential for multi-user and environmentally conscience labs seeking first-time purification success, increased throughput, and lower operating costs.

Users can quickly build high quality methods that help prevent sample loss and rework, detrimental to any research program. Use of the Reveleris® X2 Navigator™ software puts the focus on discovery and not on chromatography.

To access the Reveleris® X2 Navigator™ software, press the Reveleris® X2 Navigator™ software button located above the gradient display. The Reveleris® X2 Navigator™ method options are selected and the TLC Rf inputs are entered in the appropriate fields for both the target and neighboring impurities.



Accessing the Reveleris® X2 Navigator™ Software



Reveleris® X2 Navigator™ TLC Input Screen

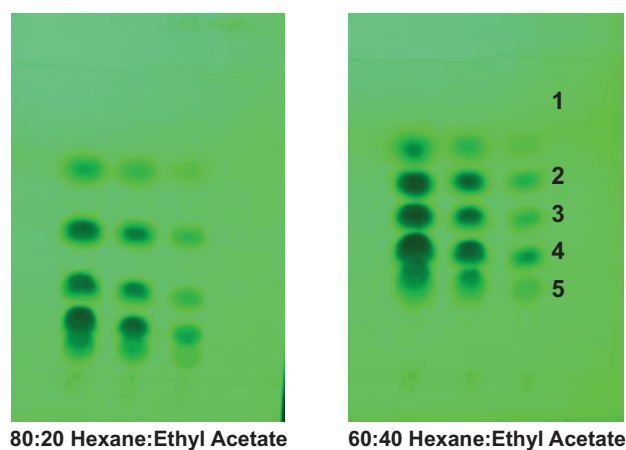
## Experimental

A 5-component test mixture was prepared to evaluate the performance of the Reveleris® X2 Navigator™ software based on

TLC Rf value input. The standards (**Table 1**) were purchased from Sigma Aldrich, St. Louis, MO.

Five grams of each component was dissolved in 50mL of acetone and then 50mL of hexane was added to give a total concentration of 50mg/mL for each component. 50g of dry silica was added to the solution and the solvent was evaporated resulting in the crude sample adsorbed onto the silica surface (approximately 75g total mass). Drying crude sample solutions onto silica allows low solubility samples to be loaded onto flash columns without affecting the chromatography with strong dissolution solvents, typical of liquid loading. In this application 1g of pre-adsorbed silica (corresponding to 333mg actual sample mixture) was loaded onto the cartridges.

TLC analysis was performed using two different ratios of hexane/ethyl acetate (80:20 and 60:40). Resulting Rf values were used as inputs in the Reveleris® X2 Navigator™ software to predict the gradient conditions. The TLC plates, visualized under UV 254nm, are shown below:



**Figure 1: Test mixture sample analysis by thin layer chromatography**

## Results and Discussion

In flash purification, it is important that target compounds and any contaminants are detected and well separated. Relying on traditional optimization techniques comes with the risks of failed fraction triggering, excessive run times, and reduced recoveries.

Component	g	mg/mL	Rf 80:20	Rf 60:40
Napthalene	5	50	0.66	0.72
1-nitronapthalene	5	50	0.46	0.60
2-nitroaniline	5	50	0.26	0.48
3-nitroaniline	5	50	0.16	0.38
4-nitroaniline	5	50	0.10	0.27

**Table 1: 5-component test mix**

Three different Reveleris® X2 Navigator™ methods were evaluated to determine how the options of optimizing on speed and/or purity, and number of closely eluting spots (choice of 1 or 2), affect the success of the purification using the 5-component test mixture:

**Method A:** Optimized using SPEED; 2 COMPONENTS - spot 3 (target compound) and spot 4 (impurity)

**Method B:** Optimized using PURITY; 3 COMPONENTS - spot 3 (target compound) and spots 2 & 4 (impurities)

**Method C:** Optimized using PURITY; 2 COMPONENTS - spot 3 (target compound) and spot 2 (impurity)

The Reveleris® X2 Navigator™ software significantly improves flash separations by delivering both high purity and maximum quantity of promising target compounds by allowing selective optimization on speed or purity. Simple inputs from two TLC plate analyses are all that is needed for the patent-pending algorithm of the Reveleris® X2 Navigator™ software to predict purification run success.

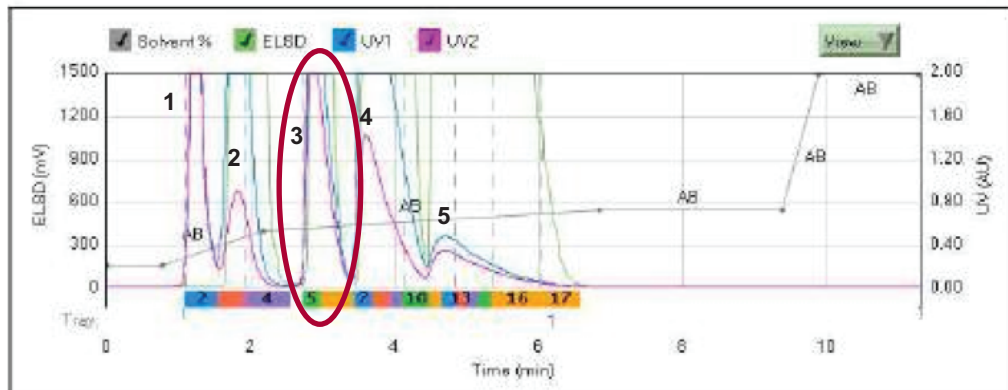
## Method A

Typically in the SPEED option, as shown in Method A, the chemist may be isolating an intermediate and therefore may not be as concerned about maximizing purity or yield. The SPEED

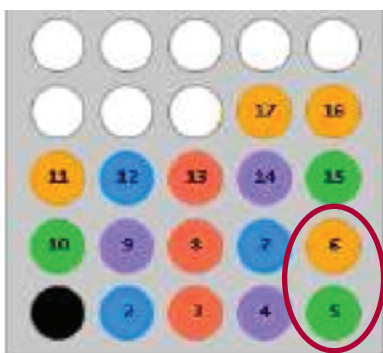
option allows chemists to quickly isolate and access their target intermediate required for the next synthetic conversion. The SPEED option can also help reduce solvent consumption.

### Method A: Optimized using SPEED; 2 COMPONENTS - spot 3 (target compound) and spot 4 (impurity)

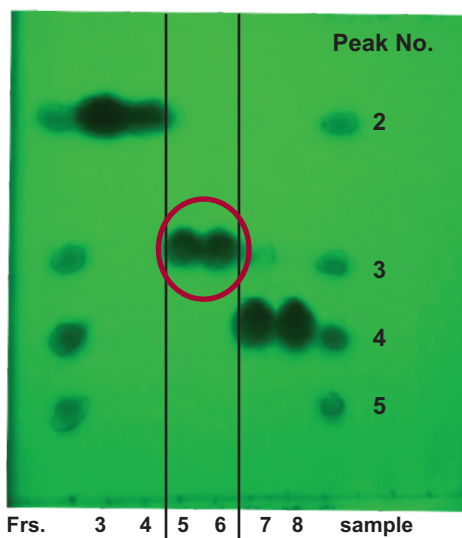
Gradient Method			
Step	Min	Solvents	%B
1	0.0	AB	10
2	0.8	AB	10
3	1.4	AB	26
4	4.7	AB	36
5	2.6	AB	36
6	0.5	AB	100
7	1.4	AB	100



Flash Purification of 5-component Crude mixture using Method A



Method A collected fractions



Method A Fraction Analysis by TLC

In Method A, peak 3 (target) is adequately resolved from neighboring peaks (impurities) in about 6 minutes. Excellent separation is observed between peak 2 and peak 3. Peak 3

was collected in fractions 5 and 6 and appears to be pure by TLC analysis. A small amount of peak 3 remains in fraction 7 due to incomplete baseline separation.

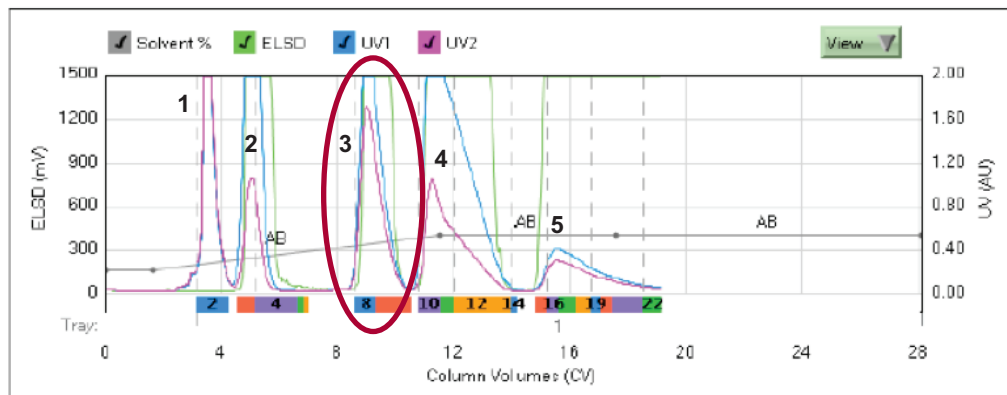
## Method B

If purity and yield are most important, then the PURITY method option can be used to maximize resolution. Optimizing resolution

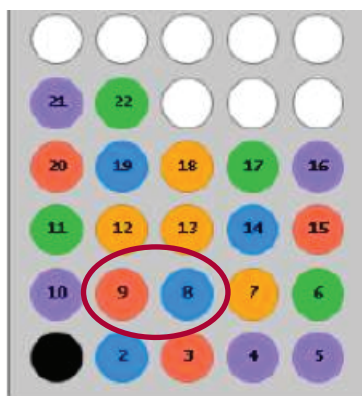
of the target compound from all nearby impurities can be accomplished using the 3-COMPONENT option.

### Method B: Optimized using PURITY; 3 COMPONENTS - spot 3 (target compound) and spots 2 & 4 (impurities)

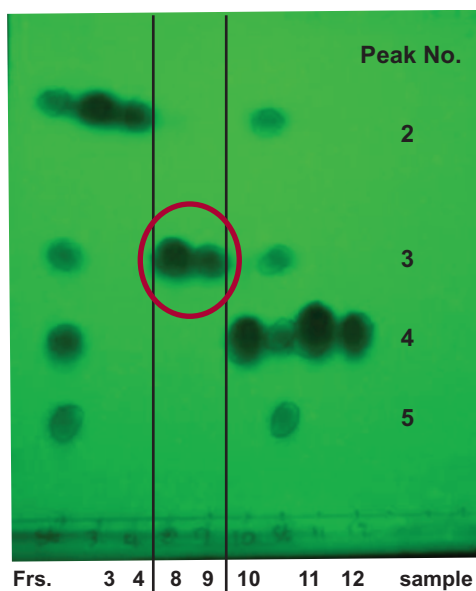
Gradient Method			
Step	Min	Solvents	%B
1	0.0	AB	10
2	1.6	AB	10
3	10.0	AB	26
4	6.1	AB	26
5	10.6	AB	26



Flash Purification of 5-component Crude mixture using Method B



Method B collected fractions



Method B Fraction Analysis by TLC

With the PURITY/3-COMPONENT method options, peak 3 (target) is fully resolved from neighboring impurities (peaks 2 & 4). The run is longer but baseline separation is fully achieved between peak 3 and peak 4, resulting in no loss of yield for

peak 3. Based on the Rf input values and method choice, the Reveleris® Navigator™ held the gradient at 26% B, rather than increasing it to 36% B as it did in the SPEED option.

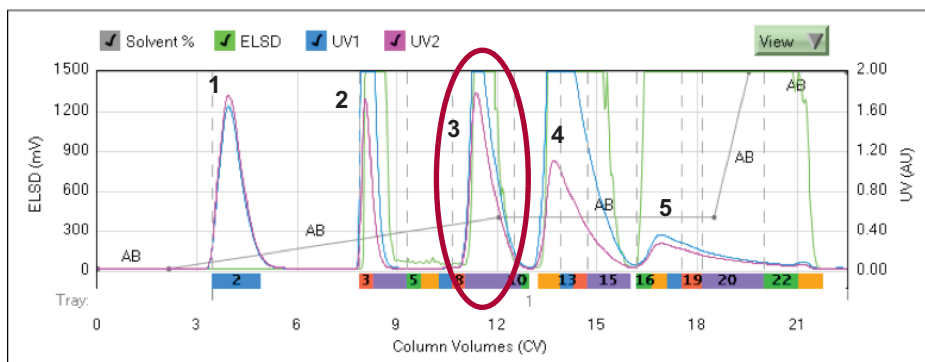
## Method C

Maximum purity and yield can also be achieved using the PURITY/2-COMPONENT method option. Optimizing the resolution of the target compound from the closest eluting

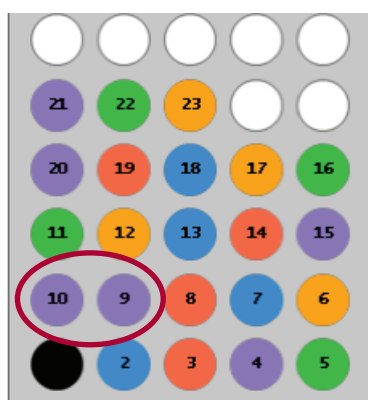
impurity can be accomplished using the 2-COMPONENT option. Increasing the gradient to 100% B at the end of the separation ensures that all components are eluted from the column.

### Method C: Optimized using PURITY; 2 COMPONENTS - spot 3 (target compound) and spot 2 (impurity)

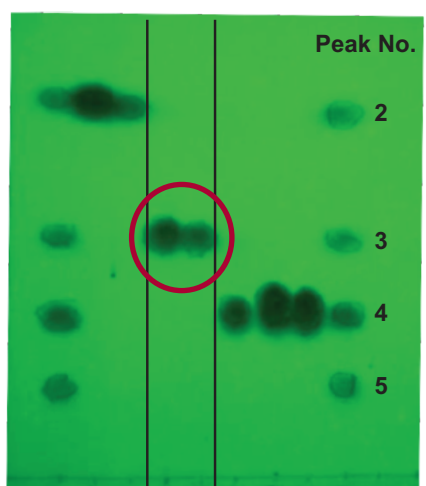
Gradient Method			
Step	Min	Solvents	%B
1	0.0	AB	10
2	2.1	AB	10
3	10.0	AB	26
4	6.5	AB	26
5	1.1	AB	100
6	3.0	AB	100



Flash Purification of 5-component Crude mixture using Method C



Method C collected fractions



Method C Fraction Analysis by TLC

With the PURITY/2-COMPONENT method option, peak 3 (target) is fully resolved from neighboring impurities (peaks 2 & 4). The run is the longest of the three because the gradient started at a lower %B and the option to continue the gradient to 100% at the end of the run was chosen to ensure all components

were eluted from the cartridge. As a result, peak 3 (target) was retained longer and is better resolved from the earlier impurities (peaks 1 & 2). This strategy can be helpful in situations where higher loads may be needed.

## Conclusion

As demonstrated above, the predictive power of the Reveleris® X2 Navigator™ software improves efficiency and productivity by simplifying method optimization, improving purity and recovery, and reducing run times and solvent use.

The Reveleris® X2 Navigator™ software can quickly determine the optimal method to meet the goals of the purification, preventing sample loss and rework.

**Americas**  
Deerfield, Illinois  
Tel: +1 847.948.8600  
discoverysciences@grace.com

**Europe**  
Lokeren, Belgium  
Tel: +32 (0)9.340.65.65  
discoverysciences.EU@grace.com

**India**  
Pune  
Tel: +91 20.6644.9900  
pune@grace.com

**China**  
Shanghai  
Tel: +86 21.5467.4678  
dsbiz.asia@grace.com

**Australia**  
Rowville  
Tel: +61 3.9237.6100  
discoverysciences.AU@grace.com

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# REVELERIS<sup>®</sup> X2

## FLASH Chromatography System

### Reveleris<sup>®</sup> Dry Air Supply

Grace Discovery Sciences

#### ELSD Gas Requirements

**Gas:** Clean, Dry Air or Nitrogen  
**Pressure:** 50 psig (3.45 bar) minimum  
**Flow:** 5 L/min (0.18ft<sup>3</sup>/min) maximum

The Reveleris<sup>®</sup> X2 flash chromatography system was designed so the integrated ELSD only needs a supply of clean, dry air without the need for special nitrogen generators or cylinders. In most cases, the air and nitrogen supplies already available in most laboratories are sufficient for the Reveleris<sup>®</sup> X2 flash system.

If your laboratory does not have a suitable air or nitrogen supply available, you will need a portable air compressor, filter and dryer while operating the Reveleris<sup>®</sup> X2 flash chromatography system.

The **Reveleris<sup>®</sup> Dry Air Supply** is a compact unit that provides the required air supply required for operation of the Reveleris<sup>®</sup> X2 flash chromatography system. The Reveleris<sup>®</sup> Dry Air Supply also includes an integrated filter and dryer to remove moisture from the air stream, to help ensure the Reveleris<sup>®</sup> X2 flash system is working at optimum performance. No additional filters or dryers are required\*.



Reveleris<sup>®</sup> Dry Air Supply

#### Key Features and Benefits:

- The Dry Air Supply unit plugs into and is powered by the Reveleris<sup>®</sup> X2 flash system, so it only runs when needed
- Quiet operation and compact design allows convenient placement adjacent to or behind the Reveleris<sup>®</sup> X2 system
- Small drain tube sends the moisture removed from the air stream to a convenient waste vessel or drain
- No routine maintenance required\*

Reveleris <sup>®</sup> Dry Air Supply Specifications and Ordering Information	
Dimension:	7" W x 7" D x 7" H (17.8cm W x 17.8cm D x 17.8cm H)
Weight:	7.4 lbs (3.4kg)
Air Delivery at atm Pressure:	15 L/min
Max. Operating Pressure:	105 psi (7 bar)
DC Motor:	12 V
Operating Current:	5.2 A
Operating Temperature:	-10°C to 52°C
Air Filtration:	0.01µm
Air in temp 20°C, Air in dew point 20°C:	Air out Dew Point -6.7°C
Reveleris <sup>®</sup> X2 Dry Air Supply	Grace Part No. 5168621
Coalescing Filter	Grace Part No. 2127782

\*We recommend changing the coalescing filter annually or every 1000 hour of operation

**Americas**  
Deerfield, Illinois  
Tel: +1 847.282.2049  
discoverysciences@grace.com

**Europe**  
Lokeren, Belgium  
Tel: +32 (0)9.340.6565  
discoverysciences.EU@grace.com

**India**  
Pune  
Tel: +91 20.6644.9900  
pune@grace.com

**China**  
Shanghai  
Tel: +86 21.5467.4678  
dsbiz.asia@grace.com

**Australia**  
Rowville  
Tel: +61 3.9237.6100  
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## FLASH Chromatography System

### Beko® Technologies Membrane Plus Dryer

#### ELSD Gas Requirements

**Gas:** Clean, Dry Air or Nitrogen  
**Pressure:** 50 psig (3.45 bar) minimum  
**Flow:** 5 L/min (0.18ft<sup>3</sup>/min) maximum

The Reveleris® X2 flash chromatography system was designed so the integrated ELSD only needs a supply of clean, dry air without the need for special nitrogen generators or cylinders. In most cases, the air and nitrogen supplies already available in most laboratories are sufficient for the Reveleris® X2 flash system.

If your laboratory already has a suitable air supply available, we strongly recommend installing a membrane dryer and filter on the supply line to the Reveleris® X2 flash System. This will remove any moisture from the air supply line, to help ensure the Reveleris® X2 flash system is working at optimum performance.

We recommend using the Beko® Technologies Membrane Plus Dryer with the Reveleris® X2 flash chromatography system.\*



Beko® Technologies Membrane Plus Dryer.

### Key Benefits of Using the Beko® Technologies Membrane Plus Dryer:

- Optimal performance of the Reveleris® X2 system
- Complete filtration and drying solution in one small efficient unit
- Reduces maintenance of the Reveleris® X2 system
- Recommended model is optimized for the flow requirements of the Reveleris® X2 system

Beko® Technologies Membrane Plus Dryer Specifications and Ordering Information	
Model Number:	DM08N19KB-N Integrated super-fine particulate filter
Connection:	1/4" NPT
Dimensions:	265mm L x 46mm W
Beko® Technologies Membrane Plus Dryer and Mounting Bracket	Grace Part No. 5169203
Swagelock® 1/8" tube to 1/4" NPT Brass adapter fittings (2 needed)	Grace Part No 8606661.

\*The Beko® Membrane Plus Dryer is not required when using the Reveleris® Dry Air Supply.

**Americas**  
 Deerfield, Illinois  
 Tel: +1 847.282.2049  
 discoveriesciences@grace.com

**Europe**  
 Lokeren, Belgium  
 Tel: +32 (0)9.340.6565  
 discoveriesciences.EU@grace.com

**India**  
 Pune  
 Tel: +91 20.6644.9900  
 pune@grace.com

**China**  
 Shanghai  
 Tel: +86 21.5467.4678  
 dsbiz.asia@grace.com

**Australia**  
 Rowville  
 Tel: +61 3.9237.6100  
 discoveriesciences.AU@grace.com



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