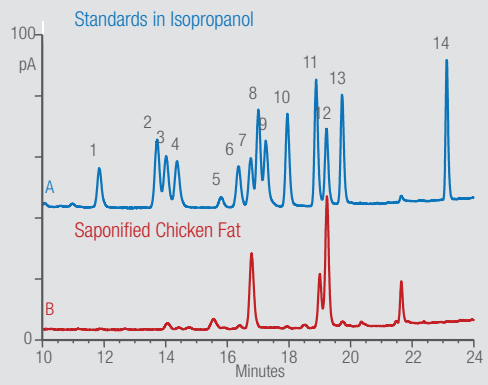
Acclaim C30 column

Thermo Scientific™ Acclaim™ C30 columns provide unique selectivity and superior separations of hydrophobic, structurally related analytes.

Separation of Omega Fatty Acids Using the Acclaim C30



Column:	Acclaim C30, 5 µm
Dimensions:	4.6 x 150 mm
LC System:	UltiMate 3000 RS, Dual Gradient
Mobile Phases:	A) Water:Formic acid:Mobile phase B 900:3.6:100 (v/v) B) Acetone:Acetonitrile:THF:Formic acid 675:225:100:4(v/v)

Gradient times (min):	0	1	13	22	24	29	32
%A	100	40	30	5	5	100	100
%B	0	60	70	95	95	0	0

Flow:	1.00 mL/min
Temperature:	30 °C
Injection:	2 µL
Detection:	Corona *ultra*, nebulizer 15 °C, filter High
Samples:	A. Standards in isopropanol B. Saponified chicken fat

Peaks:

1. SDA
2. EPA
3. ALA
4. GLA
5. DHA
6. Arach.
7. LLA
8. DPA
9. 9E, 14Z-CLA
10. ETA
11. Adrenic
12. Oleic
13. EDA
14. Erucic

Columns for Separating Hydrophobic Structurally Related Isomers

The Thermo Scientific Acclaim C30 column is designed to provide high shape selectivity for separating hydrophobic structural related isomers and unique selectivity complementary to other reversed-phase columns (e.g., C18). It is based on covalent modification of C30 alkyl silane on high-purity, spherical, porous silica gel. The combination of advanced surface modification technology and careful matching of C30 alkyl chain with the pore size of the silica substrate provides the following benefits:

- High shape selectivity
- Unique selectivity complementary to other reversed-phase columns
- Compatibility with highly aqueous mobile phases
- High-quality columns with low column bleed, high efficiency, and rugged packing

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High Shape Selectivity

The Acclaim C30 column provides significantly greater shape selectivity compared to C18 columns, making it suited to separating hydrophobic structural isomers, such as carotenoids, tocopherol, etc. Shape selectivity can be characterized by elution order of three polycyclic aromatic hydrocarbons (PAHs) in acetonitrile: benzo[*a*]pyrene (BaP), 1,2:3,4:5,6:7,8-tetrabenzonaphthalene (TBN, alternate name, dibenzo[*g,p*]chrysene), and phenanthro[*3,4-c*] phenanthrene (PhPh) described in NIST SRM 869a. A smaller $\alpha_{(TBN/BaP)}$ (= k'_{TBN}/ k'_{BaP}) value indicates higher shape selectivity. As shown in Figure 1, the Acclaim C30 column exhibits the highest shape selectivity of all Acclaim reversed-phase columns.

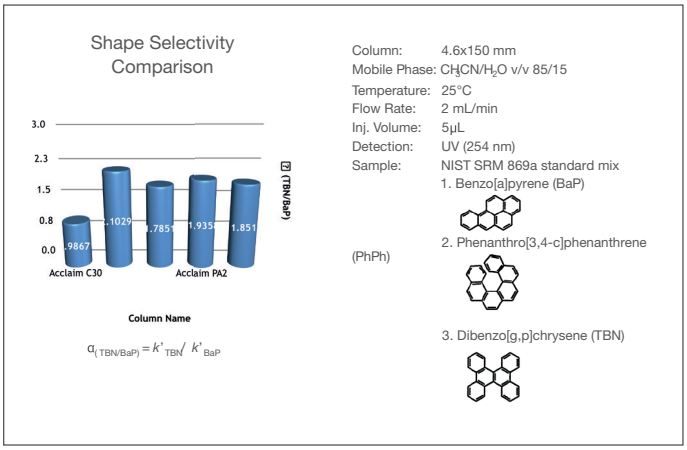


Figure 1. Shape selectivity comparison.
Note: lower (TBN/BaP) suggests higher shape selectivity.

Unique Selectivity Complementary to Other Reversed-Phase Columns

Selectivity is the key for successful separation. While C18 columns are most commonly used for small molecule separations, other reversed-phase columns with different selectivity are often needed for optimal results. Compared to other types of reversed-phase columns—including C18, polar-embedded, and phenyl phases— the Acclaim C30 demonstrates different selectivity and provides a complementary tool for method development (Figure 2).

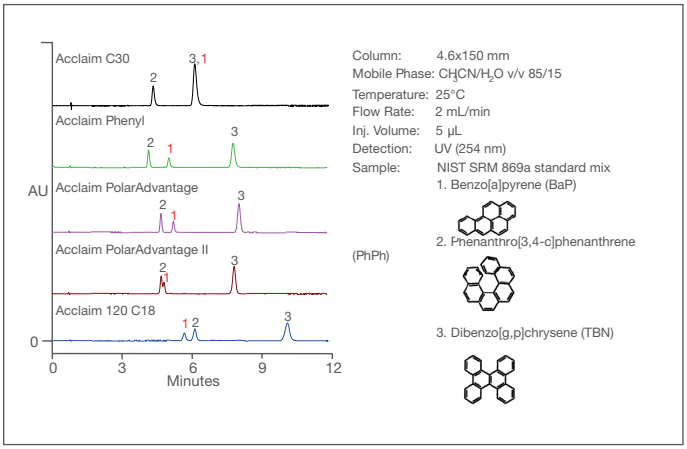


Figure 2. The unique selectivity of the Acclaim column family.

100% Aqueous Compatibility

To separate hydrophilic analytes, such as organic acids and water-soluble vitamins on a reversed-phase column, a highly aqueous mobile phase is often required to achieve adequate retention. However, most C18 columns will dewet under such condition, resulting in unreliable results. Due to a rigid and highly ordered C30 alkyl chain, along with the use of a wider pore silica substrate, Acclaim C30 columns exhibit 100% aqueous compatibility—no loss of retention was observed after 50 stop-flow cycles (see Figure 3).

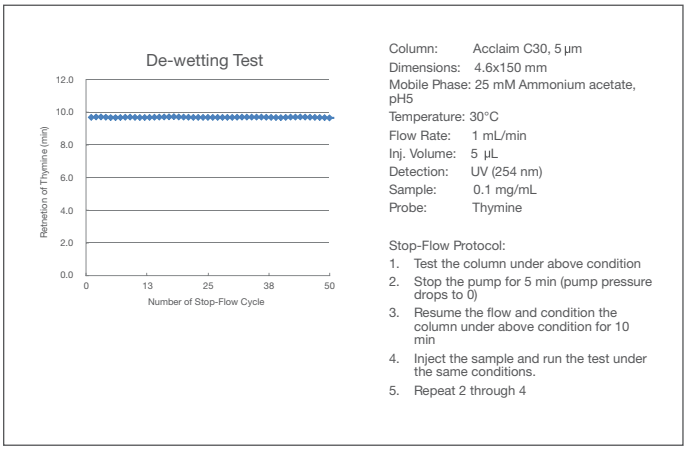


Figure 3. Aqueous compatibility of the Acclaim C30 column.

High Quality of Column Manufacturing

Low column bleed is essential for good detection limits, especially for mass spectrometer (MS) and charged aerosol detectors (CAD). The proprietary bonding process ensures the C30 bonded phase maintains good hydrolytic stability with extremely low column bleed. Our innovative packing method provides high column efficiency and robust column packing for most challenging applications. Each Acclaim column is manufactured to strict specifications to ensure column-to-column reproducibility. In addition, each column is individually tested and shipped with a qualification assurance report.

Wide Range of Applications

The Acclaim C30 column is a reversed-phase HPLC column. Like C18 columns, the Acclaim C30 can be used in a broad range of applications including food and beverage, chemical, environmental, pharmaceutical, academia, etc. The Acclaim 30 also offers several unique features that set it apart from C18 columns. First, it exhibits higher shape selectivity suited to separation of hydrophobic, long-chain, structural isomers (e.g., carotenoids, steroids, etc). Second, it is fully compatible with various aqueous buffers, resulting in a broader application range (e.g., water-soluble vitamins, organic acids, etc) and more flexibility in method development. Third, it can be a viable alternative to normal-phase columns for lipid analysis. Therefore, the Acclaim C30 be used as a general-purpose column that complements C18 columns, and also serve as a specialty column when a C18 column fails to provide satisfactory results.

Carotenoids

Carotenoids occur naturally in the chloroplasts and chromoplasts of plants, and some fungi and bacteria. They serve two key roles in plants and algae: 1) they absorb light energy for use in photosynthesis, and 2) they protect chlorophyll from photodamage. In humans, four carotenoids (beta-carotene, alpha-carotene, gamma-carotene, and beta-cryptoxanthin) have vitamin A activity, and can also act as antioxidants. As shown in Figure 4, six common carotenoids and chlorophyll are separated on the Acclaim C30 column with excellent selectivity and resolution.

Glucocorticosteriods

Glucocorticosteroids are a group of naturally occurring and synthetic hormones that moderate inflammation and other stress responses. These compounds are included on the World Anti-Doping Agency's list of substances prohibited in competition. Separation of these substances is challenging due to their structural similarity. The method of McWhinney is commonly used in clinical laboratories for monitoring of these substances. While the original method uses a C18 column, the Acclaim C30 offers improved resolution and throughput with the same elution order used the literature method. Figure 5 shows baseline separation of eight glucocorticosteroids using the Acclaim C30 column.

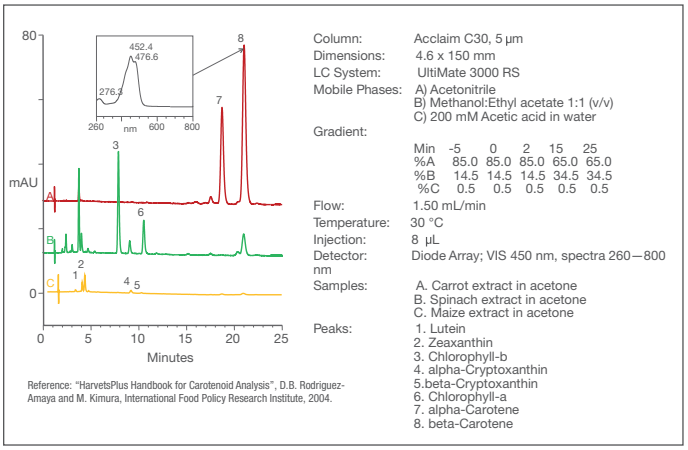


Figure 4. Carotenoids in vegetables.

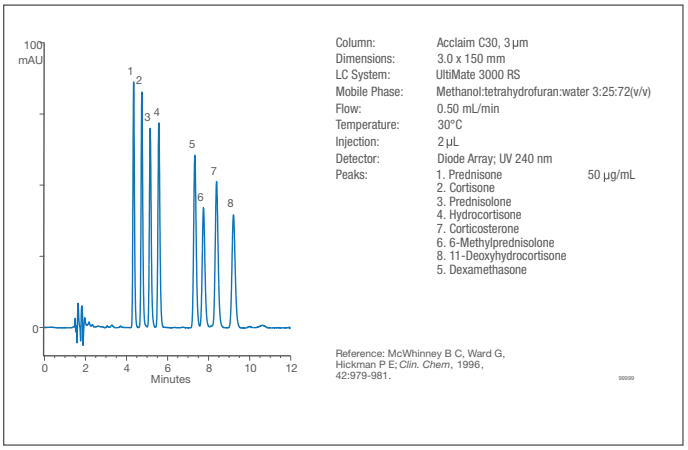


Figure 5. Glucocorticosteroids.

Water-soluble Vitamins

Water-soluble vitamins are essential nutrients. They are found naturally in foods, and they are also added to food, and formulated supplements. Chemically, they are a heterogeneous group of anions, cations, zwitterions, and neutrals. Due to the variety and complexity of matrices where vitamins are found, their analysis is often challenging. The Acclaim C30 column demonstrates both high hydrophobic retention and aqueous compatibility; this desirable combination of features enables simple reversed-phase separation of these complex analytes (Figure 6).

Triglycerides in Cooking Oils

Cooking oils are purified lipids from plants, and they are typically liquid at room temperature. These compounds contain triglycerides as major components, and small quantities of free fatty acids, mono-, and diglycerides. The composition of cooking oils is highly complex due to the wide variety of alkyl chain length, degree of unsaturation, origin, etc. While normal- phase chromatography is often used to characterize oils by their hydrophilicity, reversed-phase chromatography provides high resolution for analyzing major and minor components, and obtaining a detailed fingerprint. Due to its high shape selectivity, the Acclaim C30 provides higher resolution than the C18 column for oil analysis (Figure 7). Separations of several cooking oils are illustrated in Figure 8.

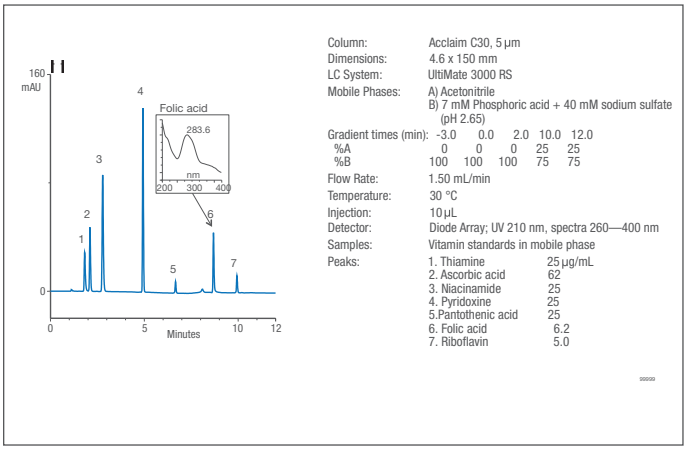
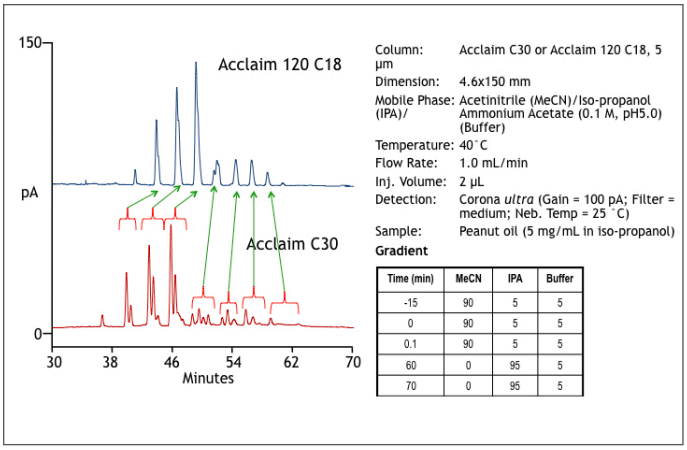
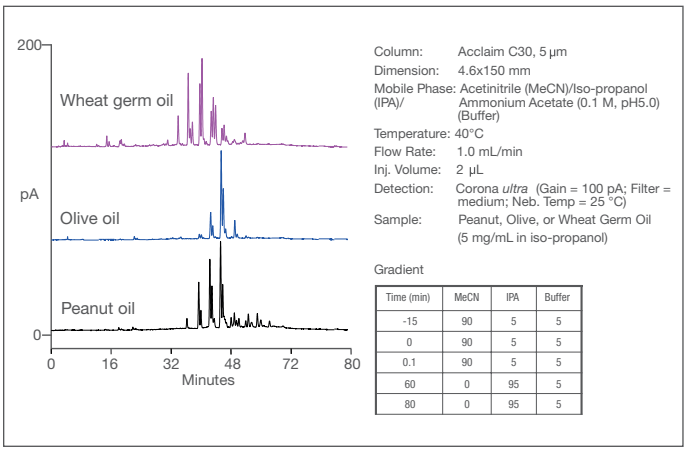


Figure 6. Water-soluble vitamins.



Time (min)	MeCN	IPA	Buffer
-15	90	5	5
0	90	5	5
0.1	90	5	5
60	0	95	5
70	0	95	5

Figure 7. Analysis of cooking oil: Acclaim C30 vs. C18.



Time (min)	MeCN	IPA	Buffer
-15	90	5	5
0	90	5	5
0.1	90	5	5
60	0	95	5
80	0	95	5

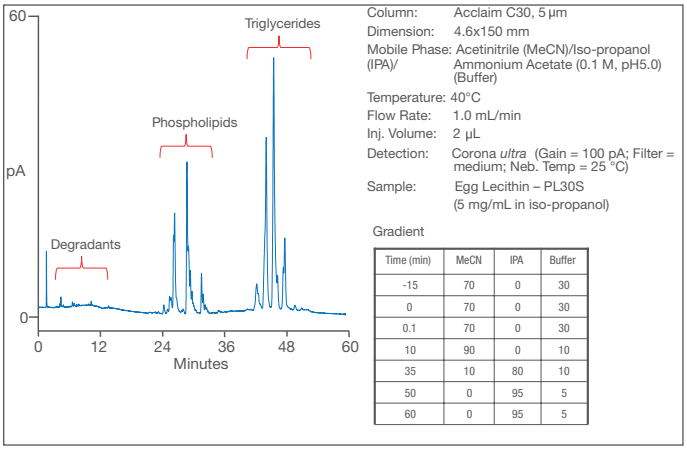
Figure 8. Analysis of cooking oils.

Phospholipids in Egg Lecithin

This class of lipids are major components of all cell membranes as they can form lipid bilayers. Most phospholipids contain a diglyceride—a phosphate group connected to a hydrophilic organic group such as choline. The first phospholipid identified in biological tissues was lecithin in the egg yolk. Analysis of phospholipids is challenging due to its complexity (hydrocarbon length, degree of saturation of diglyceride moiety, and type of the hydrophilic organic group). Figure 9 shows the profile of lecithin from egg yolk and soybean obtained using an Acclaim C30 column with a Corona *ultra*™ CAD® detector. It indicates that lecithin from egg yolk contains both phospholipids and triglycerides, with minor impurities. To obtain detailed information on phospholipid composition, a higher-resolution method can be used (Figure 10).

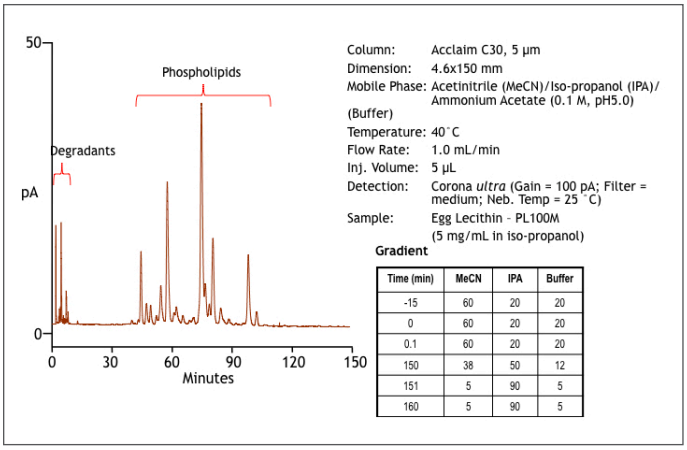
Omega Fatty Acids

Omega-3 fatty acids are a family of unsaturated fatty acids that share a final carbon–carbon double bond in the n-3 position. Omega-3 fatty acids, such as α-linolenic acid (18:3, n-3; ALA), eicosapentaenoic acid (20:5, n-3; EPA), and docosahexaenoic acid (22:6, n-3; DHA), are important in human nutrition. The biological effects of Omega-3 are largely mediated by their interactions with the Omega-6 fatty acids. Some medical research suggests that excessive levels of Omega-6 relative to Omega-3 fatty acids may increase the probability of a number of diseases and depression. As shown in Figure 11, the Acclaim C30 column exhibits excellent resolution power for a suite of closely related Omega fatty acids.



Time (min)	MeCN	IPA	Buffer
-15	70	0	30
0	70	0	30
0.1	70	0	30
10	90	0	10
35	10	80	10
50	0	95	5
60	0	95	5

Figure 9. Profile of egg lecithin.



Time (min)	MeCN	IPA	Buffer
-15	60	20	20
0	60	20	20
0.1	60	20	20
150	38	50	12
151	5	90	5
160	5	90	5

Figure 10. Phospholipids in egg lecithin.

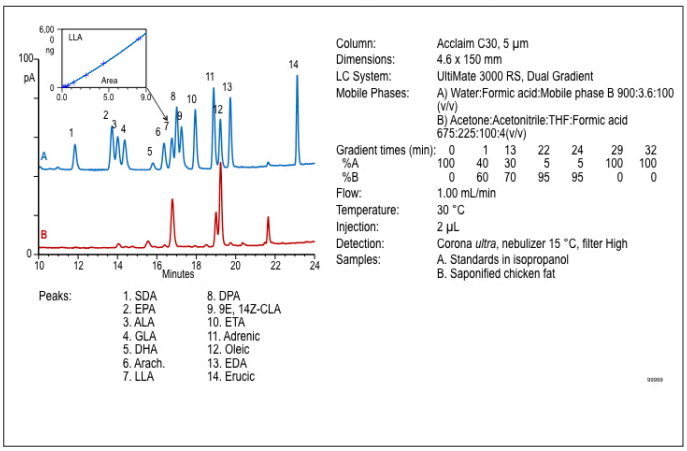


Figure 11. Omega fatty acids.

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Specifications

Column Chemistry:
C_{30} alkyl

Silica Substrate:
Spherical, high-purity
Particle sizes: 3 and 5 µm
Surface area: 200 m^2/g
Pore size: 200 Å

Operating pH range:
pH 2–8

Operating Temperature:
Up to 60 °C

Aqueous compatibility:
0 to 100%

Solvent compatibility:
0 to 100%

Operating pressure and flow rate:
See table top right

Operating Pressure and Flow Rate Specifications

Column Dimensions	Particle Size	Part Number	Maximum Pressure (psi)	Typical Flow Rate (Recommended) (mL/min)	Maximum Flow Rate (mL/min)
4.6 × 250mm	5 µm	075718	9,000	0.8–1.5	2.0
4.6 × 150mm	5 µm	075719	8,000	0.8–1.5	2.0
4.6 x 250mm	3 µm	303056	10,000	0.8–1.5	2.0
4.6 × 150mm	3 µm	075723	8,500	0.8–1.5	1.0
4.6 x 100mm	3 µm	078660	6,000	0.8–1.5	2.0
4.6 x 50mm	3 µm	078661	4,000	0.8–1.5	2.0
3.0 × 250mm	3 µm	075726	12,000	0.4–0.6	1.0
3.0 × 150mm	3 µm	075724	8,500	0.4–0.6	1.0
3.0 x 100mm	3 µm	078662	7,000	0.4–0.6	1.0
3.0 x 50mm	3 µm	078663	4,500	0.4–0.6	1.0
2.1 x 250mm	3 µm	078664	10,000	0.2–0.3	0.5
2.1 × 150mm	3 µm	075725	8,800	0.2–0.3	0.5
2.1 x 100mm	3 µm	078665	6,000	0.2–0.3	0.5
2.1 x 50mm	3 µm	078666	4,500	0.2–0.3	0.5

Ordering Information

Acclaim C30 Analytical and Guard Columns Part Number				
Acclaim C30	5 µm	Analytical	4.6 × 250mm	075718
Acclaim C30	5 µm	Analytical	4.6 × 150mm	075719
Acclaim C30	3 µm	Analytical	4.6 x 250mm	303056
Acclaim C30	3 µm	Analytical	4.6 × 150mm	075723
Acclaim C30	3 µm	Analytical	4.6 x 100mm	078660
Acclaim C30	3 µm	Analytical	4.6 x 50mm	078661
Acclaim C30	3 µm	Analytical	3.0 × 250mm	075726
Acclaim C30	3 µm	Analytical	3.0 × 150mm	075724
Acclaim C30	3 µm	Analytical	3.0 x 100mm	078662
Acclaim C30	3 µm	Analytical	3.0 x 50mm	078663
Acclaim C30	3 µm	Analytical	2.1 x 250mm	078664
Acclaim C30	3 µm	Analytical	2.1 × 150 mm	075725
Acclaim C30	3 µm	Analytical	2.1 x 100mm	078665
Acclaim C30	3 µm	Analytical	2.1 x 50mm	078666
Acclaim C30	5 µm	Guard	4.6 × 10 mm	075720
Acclaim C30	5 µm	Guard	3.0 × 10 mm	075721
Acclaim C30	5 µm	Guard	2.1 × 10 mm	075722
Accessories Part Number				
Guard Holder (V-2)				069580
Guard Holder kit V-2 (Holder V-2 and Coupler)				069707
Guard Coupler				074188

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