

# CenterGuide™ Septa Technical Note



**BTO** - High temperature, low bleed, long life

**Marathon** - Ideal for autosampler use; good for most applications

**Advanced Green 3** - Good for general-purpose use; low sticking for a green septum

CenterGuide™ precision-molded septa assure consistent performance. Each batch must pass:

- Bleed test for low contamination
- Stick test for low injection port adhesion
- Durometer within limits, for consistent softness

The unique CenterGuide chamfer offers several benefits over traditional septa: lower coring, easier penetration, a reduced chance of needle bending, and improved injection life in some applications.

## Design Features

CenterGuide septa are individually molded for a more accurate fit in the injection port than inferior stamped septa. The proprietary cleaning process after molding is used to provide very low bleed. A small recess, the “CenterGuide”, is added in the center of the disk, as well as a small indentation around the outside diameter. The CenterGuide focuses the needle to the same point for each injection, minimizing coring.

## Septum Failure Mechanisms

Septa used in high-temperature GC injection ports fail by two primary mechanisms: needle abrasion and coring. Typically a combination of these mechanisms determine the average lifetime for a particular brand of septa. Failure limited to abrasion leads to greater consistency in average lifetime, and so reliability, than failure by coring. CenterGuide septa show the preferred abrasion failure mechanism, and the chamfer virtually eliminates coring.

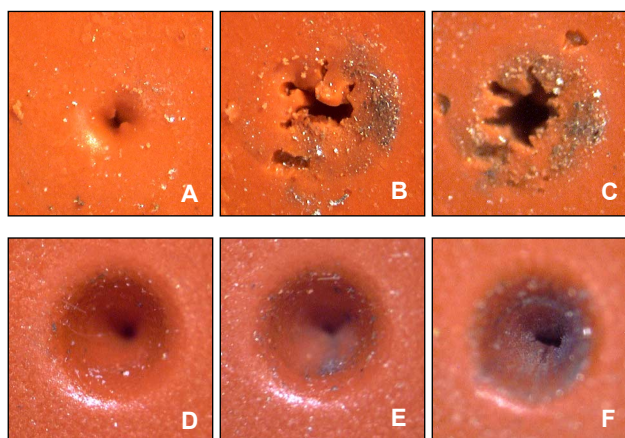
## Coring

This is a severe problem with beveled (sharp) point needles, typically used with manual injections. Beveled needles easily cut silicone, causing leakage. Even with rounded tip syringes typically used with autosamplers, however, coring can be a significant problem.

Cores typically form as a result of the syringe

needle entering the septum at slightly different locations. Chunks of septum material between closely spaced channels can fall or be pushed into the liner by subsequent injections. See Figure 1, A - C.

Different silicone formulations have different resistances to coring. For example, BTO has much lower bleed than competitive green or red septa, but it nonetheless has longer life than these when tested in the traditional, non-CenterGuide form. Because the longer life cannot be attributed to lubrication from bleed, the BTO silicone is considered to have greater resistance to coring.

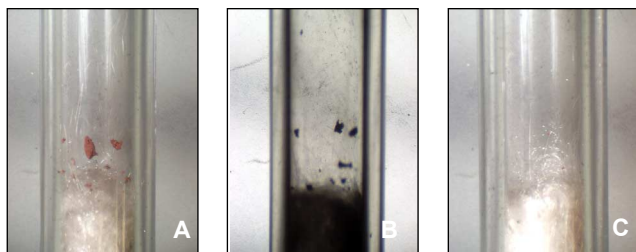


**Figure 1.** Needle entry variation leading to core formation in septa with and without the CenterGuide™ chamfer. A - C, BTO without CenterGuide. A. First piercing. B. After 100 piercings. C. After 700 piercings. D - F, BTO with CenterGuide, after the first piercing, 100 piercings and 700 piercings. Magnification 30x. Dual-gauge Agilent-style syringe.

Along with superior silicone formulations, the CenterGuide chamfer literally guides the sampling needle to the same point at each injection, so only one channel path is formed. This virtually eliminates the possibility of coring by disruption of contiguous needle channels. See Figure 1, D - F.

## Abrasion

Abrasion appears to occur at a linear rate, with the rate depending on the particular silicone, roughness of the needle, temperature, and tightness of compression by the septum nut. Septa failing primarily by abrasion should have a more predictable average injection lifetime than one failing by coring. Also, the small particles generated by abrasion tend to stick to the underside of the septum, rather than fall into the liner. See Figure 2.



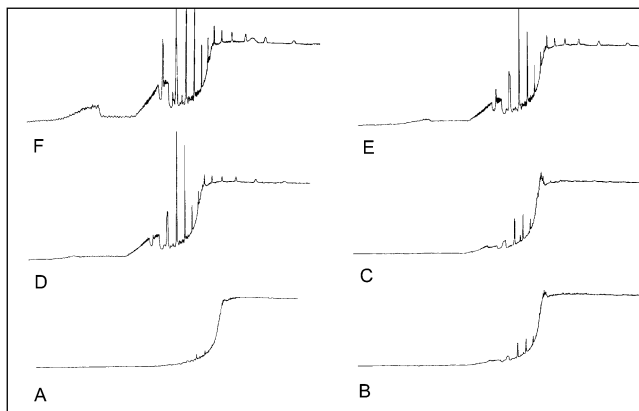
**Figure 2.** Cores vs. abrasion particles collected during injection life tests. A. Competitive red septum, failure before 100 injections. B. Competitive green septum, failure after 400 injections. C. BTO septum with CenterGuide, failure after 1000 injections. Dual-gauge autosampler syringe. Magnification 3x.

## Sticking and Hardening

Sticking occurs when septa are left too long in a hot injection port. Sticking after a relatively short time is a sign of poor-quality silicone, although lack of sticking does not necessarily indicate high quality. Some septa do not stick because they harden quickly, and with increasing brittleness there is less tendency to stick. Each lot of CenterGuide premium septa is tested for low sticking in an actual injection port set at 400°C.

## Bleed

Each lot of CenterGuide premium septa are tested for bleed, by inserting a known-size sample directly into the GC injection port liner. Volatile matter is collected on the front of the column, then eluted under a ramped temperature program and detected by FID. Results of typical chromatograms are shown in Figure 3.



**Figure 3.** Bleed from different septa. A) System blank. B) CenterGuide BTO. C) competitive septum 1 D) competitive septum 2. E) competitive septum 3. F) competitive septum 4.

## Injection Life

An injection life test is used to rate competitive septa in conditions close to actual use. The test septum is installed in an injection port set at 400 deg. C. under controlled head pressure and conditioned for one hour. It is pierced 100 times with a 26/23 dual-gauge autosampler syringe, using a syringe guide. Helium leakage through the septum is measured with a digital flowmeter. The septum is again pierced one hundred times and leakage measured. This is repeated until failure or 1000 piercings total. Failure is defined as a leak rate of 1.0 cc/min helium. Septa BTO and Marathon have longer average injection lifetimes than any other septa we have tested.

## CenterGuide™ Septa

Description	Cat. No.
<b>BTO, 50/pack</b>	
5 mm BTO for HP OCI Port, CenterGuide™	298787
9 mm BTO for Varian, CenterGuide™	298713
7/16" (11 mm) BTO, CenterGuide™	298717
11.5 mm BTO for Varian, CenterGuide™	298777
<b>Marathon, 25/pack</b>	
5 mm Marathon for HP OCI Port, CenterGuide™	239587
9 mm Marathon for Varian, CenterGuide™	239778
7/16" (11 mm) Marathon CenterGuide™	239287
11.5 mm Marathon for Varian, CenterGuide™	239787
<b>Marathon, 50/pack</b>	
5 mm Marathon for HP OCI Port, CenterGuide™	239597
9 mm Marathon for Varian, CenterGuide™	239779
7/16" (11 mm) Marathon CenterGuide™	239297
11.5 mm Marathon for Varian, CenterGuide™	239798
<b>Advanced Green 3, 50/pack</b>	
5 mm AG3 for HP OCI Port, CenterGuide™	246525
9 mm AG3 for Varian, CenterGuide™	246713
7/16" (11 mm) AG3, CenterGuide™	246225
11.5 mm AG3 for Varian, CenterGuide™	246725

Premium Septa are available in these sizes without CenterGuide:

<b>BTO, 50/pack</b>	
3/8" (9.5 mm) BTO	298705
10 mm BTO	298745
1/2" (12.7 mm) BTO	298725
17 mm BTO	298815
Septa BTO for Shimadzu	298735
<b>Marathon, 25/pack</b>	
3/8" (9.5 mm) Marathon	239188
1/2" (12.7 mm) Marathon	239388
17 mm Marathon	239688
Marathon for Shimadzu	239488
<b>Marathon, 50/pack</b>	
3/8" (9.5 mm) Marathon	239198
1/2" (12.7 mm) Marathon	239398
17 mm Marathon	239698
Marathon for Shimadzu	239498
<b>Advanced Green 3, 50/pack</b>	
3/8" (9.5 mm) AG3	246124
1/2" (12.7 mm) AG3	246324
17 mm AG3	246624
Advanced Green 3 for Shimadzu	246424



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