

Datakey DFX vs. SD Card Destructive Testing Video Fact Sheet



Product Background

A TEK Access Technologies' Datakey brand has been producing ruggedized portable memory products since 1976. One of the more popular product lines in the Datakey stable is the RUGGEDrive™ line. The RUGGEDrive line delivers USB flash drive or SD card functionality in a more robust and secure form factor. Instead of using the standard form factors, like the familiar SD card, the RUGGEDrive line uses a proprietary form factor that features:

- Solid over-molded construction using engineered composite materials
- Redundant electrical contacts (so users can't insert the device upside down)
- High cycle-life receptacles (50,000 cycles vs. 1,500 for most USB 2.0 receptacles)
- IP-rated (IP65 and IP67) and EM emission-reducing receptacles

Video Background

The [Datakey video](#)¹ compares the amount of force it takes to make a series of SD cards non-functional. Three different brands of SD cards are compared, SanDisk, Samsung and Delkin Devices. Then a Datakey DFX RUGGEDrive memory token is put through the same test. The DFX memory token is functionally equivalent to an SD card, it simply comes in the more robust form factor.

Delkin Devices inspired this testing and video, as they produced a [similar video](#)² that compared its rugged Black SD card against other SD cards.



Testing Criteria

The [Datakey video](#)¹ applied increasing force to the SD card or DFX RUGGEDrive memory token to the point where an audible click could be heard. The presumption was that the click would be the sound of the enclosed IC cracking. After hearing the click, each device was tested to confirm that it was no longer functional. Specifically, it was inserted into the SD card slot of a Windows 7 laptop. To be considered functional, the card had to be recognized as a removable drive and had to be capable of having data written to it and read from it. If it was unable to do any of these three tasks, it was considered a failure.

Test Equipment

Ametek Model ML-3339 Test Stand with AccuForce 500 Force Gage, shown right

Testing

For all three SD cards, each was placed in approximately the same position on top of the vice clamp, with each side of the card being supported by the vice, but with the middle part of the card unsupported. The cards were positioned so the probe from the force gauge would be approximately in the center of the card widthwise and slightly more towards the front (just behind the write-protect switch) lengthwise. This same positioning was used for all three cards, but it turned out that this consistency likely favored the SanDisk and Samsung cards, as the internal integrated circuit (IC) was smaller on these two cards compared to the Delkin Black card so the force was not applied directly above the IC for these two cards.

For the Datakey DFX RUGGEDrive memory token, the vice clamp was left in the same position and the DFX token was positioned such that the IC was directly under the force being applied by the force gauge.



¹ https://youtu.be/_zEdwaNmuTU (Datakey video)

² <https://youtu.be/nyfaB8BQYYk> (Delkin video)

Test Results: SanDisk

Manufacturer: SanDisk
Model Number: SDSDB-004G
Capacity: 4 GB
Force to Disable: 37.4 lbf (166.4 N)



After cracking open the SanDisk SD card, it was apparent that the probe was not positioned over the IC. The video shows that the probe from the force gauge makes a significant depression in the SD card's outer shell before the click is heard.

The image above shows the actual SanDisk card that was used in the test. With the card cracked open, it is apparent that the IC is located in the front third of the card; the rest of the card is empty. Contact from the force gauge probe was just behind the IC.

Test Results: Samsung

Manufacturer: Samsung
Model Number: MB-SPBGB
Capacity: 32 GB
Force to Disable: 38.5 lbf (171.3 N)



After cracking open the Samsung card, it was clear that its IC was larger than that of the IC in the SanDisk 4 GB card, but it did not even occupy the front half of the card. Based on the video, it appears that the probe from the force gauge was very near or over the bottom edge of the IC.

Although this card has a brushed metal exterior on the top side of the card, both halves of the SD card shell are indeed made of plastic. The brushed metal finish is simply a label and likely contributes little toward the strength of the card.

Test Results: Delkin

Manufacturer: Delkin Devices
Model Number: DDSDBLK-32GB
Capacity: 32 GB
Force to Disable: 18.1 lbf (80.5 N)



Of the three SD cards tested, the Delkin Black SD card is the only one that claims to be more rugged than a standard SD card. Of the three SD cards tested, the Delkin Black card definitely had the most rugged case. It was by far the hardest to crack open. So why did it require the least amount of force to crack the IC?

The answer is that the Delkin Black SD card has the largest IC of the three cards tested, taking up nearly two-thirds of the card. This put the probe from the force gauge directly over the IC. The other two cards benefited from not taking a direct hit.

Test Results: Datakey DFX RUGGEDrive Memory Token

Manufacturer: ATEK Access Technologies
Model Number: DFX4GB
Capacity: 4 GB
Force to Disable: 294.1 lbf (1308.2 N)

In testing the DFX RUGGEDrive memory token, there were several times where a pop or cracking sound was heard. Each time a sound was heard the applied force was removed and the memory token was tested. Unlike the SD cards, each time the DFX proved to still be functional. It took nearly 300 pounds of force for the DFX memory token to finally succumb. The attempts that resulted in a sound being heard, but did not affect the functionality of the DFX memory token were not shown in the video. Only the final attempt that ultimately resulted in the device failing was shown.

Conclusion

When confined by the shape and physical dimensions of the standard SD card form factor, it is difficult, if not impossible, to make the card truly rugged. For an SD product to achieve maximum ruggedness, the standard SD form factor must be abandoned and a more robust form factor chosen, one that utilizes robust construction and materials. That was the approach taken with the Datakey DFX RUGGEDrive memory token. To learn more about the DFX and the RUGGEDrive product line, please visit www.RUGGEDrive.com.

About Datakey

ATEK Access Technologies' Datakey product line features portable memory devices that utilize solid over-molded construction, industrial-temperature electronics, redundant electrical contacts and harsh-environment, high cycle-life receptacles. Additionally, Datakey products have a proven history of long-term availability that consumer memory products, like USB flash drives and SD cards, lack. Since 1976, Datakey products have been the preferred portable memory solution by many of the world's largest defense, medical and commercial OEMs. For more information, visit www.datakey.com.

ATEK Access Technologies is a member of the SD Card Association.