

# SIEMENS

## Topic: Compact Flash cards

### 1. Question:

Why does Siemens qualify own Compact Flash cards for SINUMERIK and does not release third-party cards ?

### 1. Answer:

Some general technical details regarding the Compact Flash technology:

In general, Compact Flash memory cards are memory media without moving parts, contrary to hard disks or CD/DVD drives. Information is permanently stored on a rewritable Flash memory.

Flash memories are memory chips of the "EEPROM" class, more exactly Flash-EEPROMs. In contrast to "normal" EEPROM memories, bytes cannot be deleted individually with new Flash-EEPROMs, but only in larger units, so-called blocks being changed according to the Flash size.

In general, two major NAND technologies (NAND = commonly used Flash memory technology) are being marketed: SLC (Single Level Cell) and the significantly cheaper MLC (Multi Level Cell) technology.

As a general rule, the SLC technology is still the state-of-the-art CF card technology for industrial applications.

Some advantages provided by the Flash technology:

- Data retained with missing supply voltage (nonvolatile memory)
- Energy consumption reduced during operation
- Heat development reduced during operation
- Resistant towards vibrations and magnetic fields
- Compact design
- Reduced weight
- Silent
- Very high data density
- Compared to hard disks, extremely short read access times
- Increased data durability due to lack of moving parts
- No sensitivity to air humidity
- Greater temperature range compared to hard disks

Some disadvantages of the Flash technology:

- In contrast to hard disks on which sectors can be directly written at any time, the related blocks must first be deleted on the Flash memory before new data can be stored. If data have already been stored on the block, these must first be recopied to a free block. However, relating algorithms ensure that the user is not affected by this process, only some very long write accesses may occur temporarily.
- Relatively complex write/read control (Memory Controller required)
- Limited number of write cycles (increasing unreliability already when approaching this limit, which can, however, be eliminated for long periods by using known correction procedures and spare block management)
- Driven by the consumer market, such CF models are often only available during a short period and must always be replaced by successor models

In addition, Compact Flash cards for the consumer market are often based on battery-powered systems. Batterie-powered systems such as notebooks, digital cameras, etc. mean that abrupt voltage drops do generally not occur. This is not the case with industrial applications without UPS.

At the same time, most CF cards perform active "wear leveling" in order to distribute the memory wear evenly on the card.

If a voltage drop occurs during critical write phases, faults up to total failures may occur on many Compact Flash cards.

For this reason, great value is placed on the Power OFF ruggedness when selecting CF cards.

## What does this mean for industrial applications ?

- You must use cards having an extremely long lifetime (suitable for continuous operation on machine tools) – this can only be achieved with SLC memories (increased signal-to-noise ratio, high-speed operation, increased lifetime)
- You must use cards with a wear leveling that has been matched for the individual industrial application (maximum lifetime)
- Cards with reduced block sizes are preferred
- Correct and efficient card error correction is a basic prerequisite
- Superior spare block algorithm to further increase the card lifetime
- Not every card can be used for applications subject to license

Depending on the basic unit used (e.g. card reader), three different CF card operating modes are used. SINUMERIK units always use the true-IDE mode. Further, various speed-influencing operating modes are possible – from the PIO mode through to diverse DMA modes. The relevant basic module defines the maximum possible operating mode. Not every operating mode that is possible for the respective card may be released.

The different modules are thoroughly tested. Finally, we use cards that have the appropriate properties to be largely used in SINUMERIK systems.

Systematic tests are performed regarding the compatibility with various operating systems such as Windows and Linux and the usual file systems (FAT16/32 resp. ext3).

SINUMERIK cards are subjected to various lifetime tests and are only used if they endure at least 1 million write cycles without error.

All these features are provided by the SINUMERIK Compact Flash memory media which have been optimized for maximum lifetime, stable behavior within the integrated network and use under difficult conditions. They have been thoroughly tested before being released for SINUMERIK and provide long-term availability.

In general, this information is valid for all SINUMERIK systems using CF cards (at present, 802D/802D sl/810D/840Di/840D/840Di sl/840D sl).

**2. Question:** I want to use a third-party card anyway. What are the minimum requirements resp. must be inquired from the supplier?

### **2. Answer:**

- Only use CF type I versions
- Use a highly stable metal housing – the card shall not “burst“ when being inserted and must have superior interference deduction capability
- Min. Compact Flash Standard 2.0 must be complied with
- Ensure SLC Flash type in industrial applications
- As far as possible, only use released memory sizes
- The unit must be approved for 60°C mode – better 70°C
- 10% operating voltage fluctuation permissible
- At least 1 million write cycles
- Certified CF compliance test passed
- FAT16 partitioning is mandatory for use with PCU 20
- For use with 802D sl we recommend that you only use SINUMERIK Compact Flash memory media

Please be aware of the fact, that these informations are not a release of 3<sup>rd</sup>-party Compact Flash Cards for use with SINUMERIK. They are technical tips for minimal requirements on 3<sup>rd</sup>-party Compact Flash Cards. These technical advices are not complete technical requirements, but solely meant to help limit/minimize the risk using 3<sup>rd</sup>-party Compact Flash Cards. Please be aware of, that even when following these advices there are risks of damage by using 3<sup>rd</sup>-party Compact Flash Cards. A use of 3<sup>rd</sup>-party Compact Flash Cards is against approval/release of Siemens and on your own risk and liability. Generally released with SINUMERIK are only SINUMERIK Compact Flash Cards. A Liability of Siemens for Correctness and Completeness of these technical advices and for losses or damages, which are based on the use of 3<sup>rd</sup>-party Compact Flash Cards is excluded.