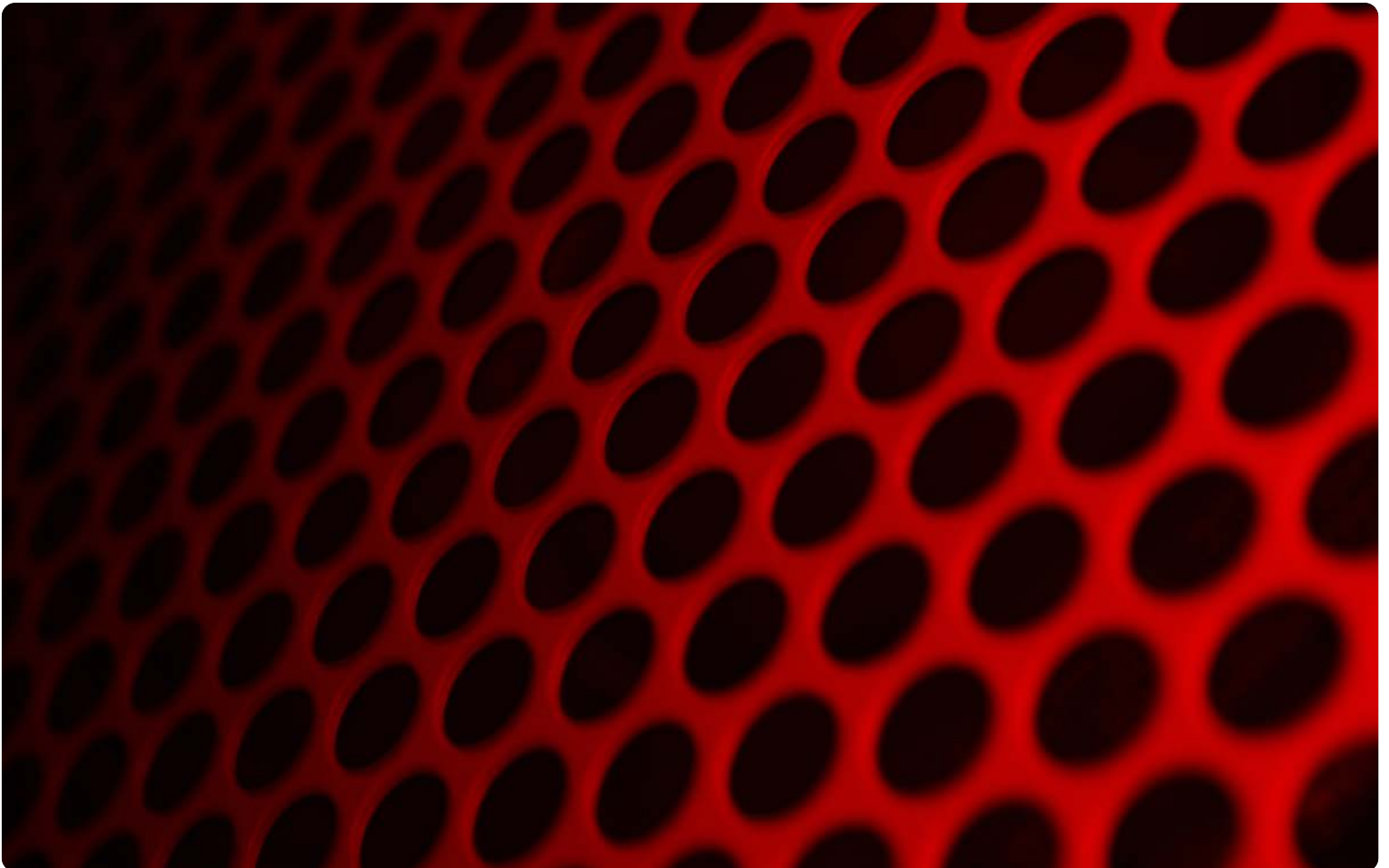


## SMART Attribute Details



## SMART Attribute Details

Provides a detailed description of SMART Attribute support and how each may be used.

### Kingston® DC1000H, DC1000B, A1000, A2000, KC1000 and KC2000 SMART Attribute Details

Byte Index	Description
0	<p><b>Critical Warning:</b> This field indicates critical warnings for the state of the controller. Each bit corresponds to a critical warning type; multiple bits may be set. If a bit is cleared to '0', then that critical warning does not apply. Critical warnings may result in an asynchronous event notification to the host. Bits in this field represent the current associated state and are not persistent.</p> <p><b>Bit Definition</b>            00: If set to '1', then the available spare space has fallen below the threshold.            01: If set to '1', then a temperature is above an over temperature threshold or below an under temperature threshold.            02: If set to '1', then the NVM subsystem reliability has been degraded due to significant media related errors or any internal error that degrades NVM subsystem reliability.            03: If set to '1', then the media has been placed in read only mode.            04: If set to '1', then the volatile memory backup device has failed. This field is only valid if the controller has a volatile memory backup solution.            07:05: Reserved</p>
2:1	<p><b>Composite Temperature:</b> Contains a value corresponding to a temperature in degrees Kelvin that represents the current composite temperature of the controller and namespace(s) associated with that controller. The manner in which this value is computed is implementation specific and may not represent the actual temperature of any physical point in the NVM subsystem. The value of this field may be used to trigger an asynchronous event.</p> <p>Warning and critical overheating composite temperature threshold values are reported by the WCTEMP and CCTEMP fields in the Identify Controller data structure.</p>
3	<p><b>Available Spare:</b> Contains a normalized percentage (0 to 100%) of the remaining spare capacity available.</p>
4	<p><b>Available Spare Threshold:</b> When the Available Spare falls below the threshold indicated in this field, an asynchronous event completion may occur. The value is indicated as a normalized percentage (0 to 100%).</p>
5	<p><b>Percentage Used:</b> Contains a vendor specific estimate of the percentage of NVM subsystem life used based on the actual usage and the manufacturer's prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the NVM subsystem has been consumed, but may not indicate an NVM subsystem failure. The value is allowed to exceed 100. Percentages greater than 254 shall be represented as 255. This value shall be updated once per power-on hour (when the controller is not in a sleep state).</p> <p>Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques</p>
31:6	Reserved
47:32	<p><b>Data Units Read:</b> Contains the number of 512 byte data units the host has read from the controller; this value does not include metadata. This value is reported in thousands (i.e., a value of 1 corresponds to 1000 units of 512 bytes read) and is rounded up. When the LBA size is a value other than 512 bytes, the controller shall convert the amount of data read to 512 byte units.</p> <p>For the NVM command set, logical blocks read as part of Compare and Read operations shall be included in this value.</p>
63:48	<p><b>Data Units Written:</b> Contains the number of 512 byte data units the host has written to the controller; this value does not include metadata. This value is reported in thousands (i.e., a value of 1 corresponds to 1000 units of 512 bytes written) and is rounded up. When the LBA size is a value other than 512 bytes, the controller shall convert the amount of data written to 512 byte units.</p> <p>For the NVM command set, logical blocks written as part of Write operations shall be included in this value. Write Uncorrectable commands shall not impact this value.</p>

Byte Index	Description
79:64	<b>Host Read Commands:</b> Contains the number of read commands completed by the controller.  For the NVM command set, this is the number of Compare and Read commands
95:80	<b>Host Write Commands:</b> Contains the number of write commands completed by the controller.  For the NVM command set, this is the number of Write commands.
111:96	<b>Controller Busy Time:</b> Contains the amount of time the controller is busy with I/O commands. The controller is busy when there is a command outstanding to an I/O Queue (specifically, a command was issued via an I/O Submission Queue Tail doorbell write and the corresponding completion queue entry has not been posted yet to the associated I/O Completion Queue). This value is reported in minutes
127:112	<b>Power Cycles:</b> Contains the number of power cycles.
143:128 *	<b>Power On Hours:</b> Contains the number of power-on hours. This may not include time that the controller was powered and in a non-operational power state.
159:144	<b>Unsafe Shutdowns:</b> Contains the number of unsafe shutdowns. This count is incremented when a shutdown notification (CC.SHN) is not received prior to loss of power.
175:160	<b>Media and Data Integrity Errors:</b> Contains the number of occurrences where the controller detected an unrecovered data integrity error. Errors such as uncorrectable ECC, CRC checksum failure, or LBA tag mismatch are included in this field.
191:176	<b>Number of Error Information Log Entries:</b> Contains the number of Error Information log entries over the life of the controller.
195:192	<b>Warning Composite Temperature Time:</b> Contains the amount of time in minutes that the controller is operational and the Composite Temperature is greater than or equal to the Warning Composite Temperature Threshold (WCTEMP) field and less than the Critical Composite Temperature Threshold (CCTEMP) field in the Identify Controller data structure.  If the value of the WCTEMP or CCTEMP field is 0h, then this field is always cleared to 0h regardless of the Composite Temperature value.
199:196	<b>Critical Composite Temperature Time:</b> Contains the amount of time in minutes that the controller is operational and the Composite Temperature is greater than the Critical Composite Temperature Threshold (CCTEMP) field in the Identify Controller data structure.  If the value of the CCTEMP field is 0h, then this field is always cleared to 0h regardless of the Composite Temperature value.
201:200	<b>Temperature Sensor 1:</b> Contains the current temperature reported by temperature sensor 1.
203:202	<b>Temperature Sensor 2:</b> Contains the current temperature reported by temperature sensor 2.
205:204	<b>Temperature Sensor 3:</b> Contains the current temperature reported by temperature sensor 3.
207:206	<b>Temperature Sensor 4:</b> Contains the current temperature reported by temperature sensor 4.
209:208	<b>Temperature Sensor 5:</b> Contains the current temperature reported by temperature sensor 5.
211:210	<b>Temperature Sensor 6:</b> Contains the current temperature reported by temperature sensor 6.
213:212	<b>Temperature Sensor 7:</b> Contains the current temperature reported by temperature sensor 7.
215:214	<b>Temperature Sensor 8:</b> Contains the current temperature reported by temperature sensor 8.

Byte Index	Description
219:216	<b>Thermal Management Temperature 1 Transition Count:</b> Contains the number of times the controller transitioned to lower power active power states or performed vendor specific thermal management actions while minimizing the impact on performance in order to attempt to reduce the Composite Temperature because of the host controlled thermal management feature (i.e., the Composite Temperature rose above the Thermal Management Temperature 1.) This counter shall not wrap once it reaches its maximum value. A value of zero, indicates that this transition has never occurred or this field is not implemented.
223:220	<b>Thermal Management Temperature 2 Transition Count:</b> Contains the number of times the controller transitioned to lower power active power states or performed vendor specific thermal management actions regardless of the impact on performance (e.g., heavy throttling) in order to attempt to reduce the Composite Temperature because of the host controlled thermal management feature (i.e., the Composite Temperature rose above the Thermal Management Temperature 2.) This counter shall not wrap once it reaches its maximum value. A value of zero, indicates that this transition has never occurred or this field is not implemented.
227:224	<b>Total Time For Thermal Management Temperature 1:</b> Contains the number of seconds that the controller had transitioned to lower power active power states or performed vendor specific thermal management actions while minimizing the impact on performance in order to attempt to reduce the Composite Temperature because of the host controlled thermal management feature. This counter shall not wrap once it reaches its maximum value. A value of zero, indicates that this transition has never occurred or this field is not implemented.
231:228	<b>Total Time For Thermal Management Temperature 2:</b> Contains the number of seconds that the controller had transitioned to lower power active power states or performed vendor specific thermal management actions regardless of the impact on performance (e.g., heavy throttling) in order to attempt to reduce the Composite Temperature because of the host controlled thermal management feature. This counter shall not wrap once it reaches its maximum value. A value of zero, indicates that this transition has never occurred or this field is not implemented.
511:232	Reserved

*\*(DC1000H, DC1000B, A1000, KC1000) Power on Hours: Contains the number of power-on hours. Power on Hours is always logging, even when in low power mode.*