# ETM1000 Cycle Counter operations specification
# T53 Cycle Counting

**Revision 1 – April 15th, 2025**

This document describes in detail the operation of the AKV T53 Honeywell N1/N2 Engine Cycle Counters.

The cycle counter's primary objective is to accurately monitor and record both the N1 (Gas Producer) and N2 (Power Turbine) engine cycles in accordance with the Honeywell Service Bulletin (SB) T53 0020. The cycle counter utilizes Method lll of the SB.

**WARNING:** Prior to resetting the cycle counter, a "Daily Coherence" check of the accumulated cycles must be completed by the pilot. Reference the ETM1000-T53_T55 ICA (Instructions for Continued Airworthiness) Rev C or later for the required procedure.

**ETM1000 cycle counting display model applicability:**

- Remote Display P/N ETMRD-004

There is however model specific software installed in the cycle counter due to the different penalty factors associated with each model of the T53.

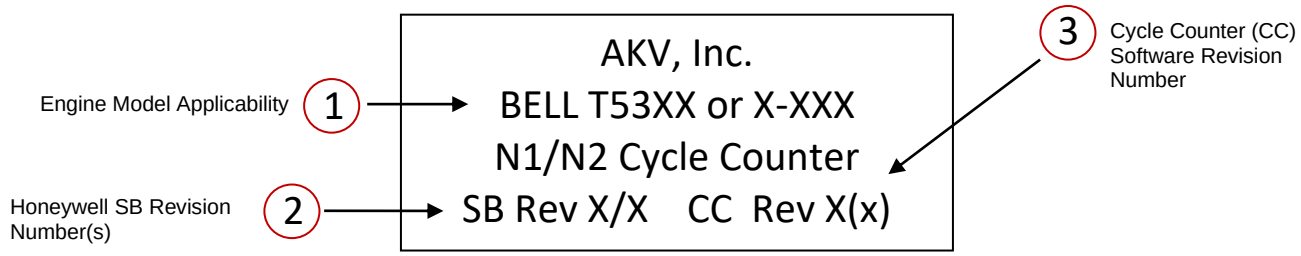
- **Software Rev 1 or later** revision is installed for the T5317BCV
- **Software Rev 1 or later** revision is installed for the T53-L-13B or T5313B
- **Software Rev 1 or later** revision is installed for the T53-L-703 or T5317

Each numbered ITEM below identifies the recorded and displayed values on the cycle counter screens. See following **Fig. 1**

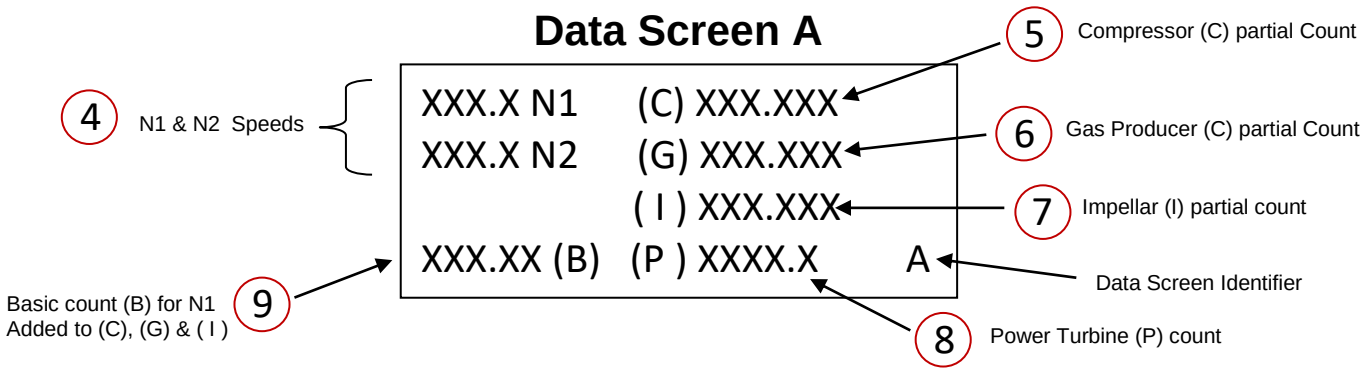
1. Engine Model Applicability
2. Honeywell SB Revision Number
3. Cycle Counter (CC) Software Version Number
4. Real time N1 & N2 engine speeds in %.
5. Compressor (C) partial count
6. Gas Producer (G) partial count
7. Impeller (I) partial count
8. Power Turbine (P) count
9. Basic Count (B) for N1
10. Compressor (C) totals
11. Gas Producer (G) totals
12. Impeller ( I ) totals
13. Power Turbine (P) total
14. N1 operations counter
15. N2 operations counter
16. Flight Time accumulation
17. Operational Time
18. Maximum N1
19. Engine Starts Counter

# Screen Layout

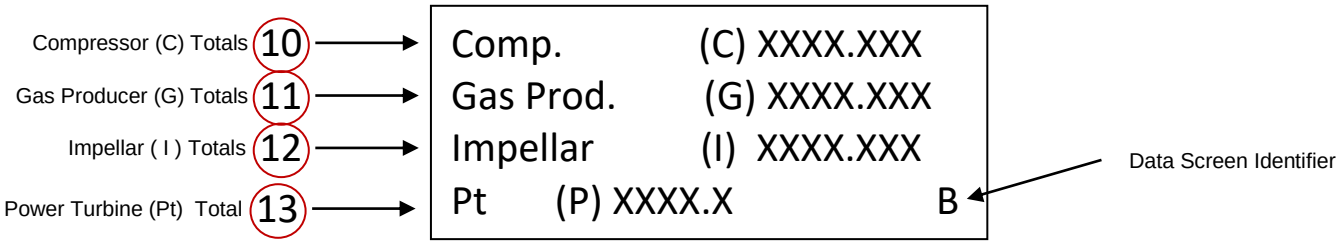
## Power Up Screen




## Data Screen A




## Data Screen B




## Data Screen C

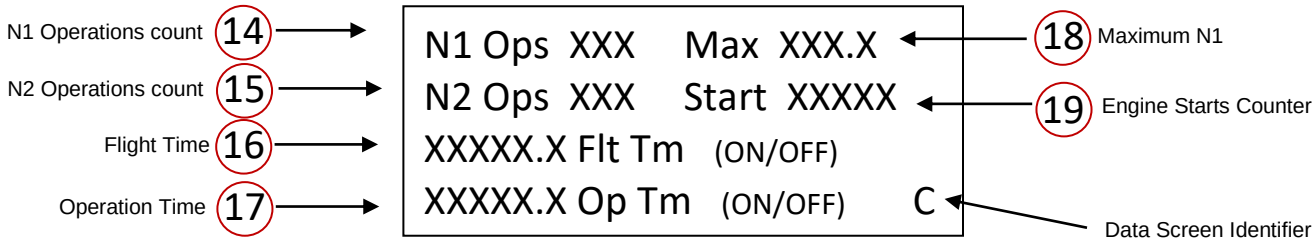



**Fig. 1**

## General notes:

1. The red “Reset” pushbutton is used to add the daily flight cycles (B, C, G, I & P) on screen A to the running totals on screen B. The daily flight cycles on screen A are then reset to zero for the next flight period. It is recommended that the operator record the screen A values in the flight log at the end of each flight day prior to resetting the cycle counter. If the operator does not reset the cycle counter, any subsequent recorded flight cycles are added to the prior values.

2. The “Reset” pushbutton is de-activated when the engine is running.

3. The graphs in Table 1 and 2 at the back of this document are an example of the T53-L-703 or T5317 engine. Although the cycle counting procedure (algorithm) is the same between T53 models, the penalty factors are different. Refer to the Honeywell Service Bulletin (SB) T53 0020 and the graphs in the back pertaining to your engine model for the penalty factors the AKV Cycle Counter uses.

4. The ETM1000 Remote Display incorporates a 4th screen after the cycle counter screen C for exceedance data information. Refer to the ETM1000-RFMS for additional information.

# Power Up Screen

During power up, a “version” screen will appear for 5 seconds and then automatically revert to indicate screen A. Pressing the black “screen” button before the 5 seconds times-out will display Screen A.

The counter has four (4) data displays controlled by pressing the black “Screen” pushbutton that cycle between screens A, B, and C indicated in the bottom right corner of each screen for the cycle counting with an exceedance data screen as the last screen.

## ITEM 1 – Engine Model Applicability

Indicates which engine model software has been installed on the cycle counter. The “T53XX or X-XXX” for example, means “T5317 or L-703”. Both civilian and military engine versions are combined in the Cycle Counter because they have the same cycle counting penalty factor.

## ITEM 2 – Honeywell Service Bulletin (SB) Revision Number

Displays what SB 0020 version is being used by the Cycle Counter. SB Rev X/X or 8/3 indicates that for the T5317 SB Rev 8 (left number) is used and for the L-703 SB Rev 3 (right number) is used.

## ITEM 3 – Cycle Counter (CC) Software Revision

The Cycle Counter (CC) Software Revision number is identified as Rev X(x) and is the AKV software revision installed in the cycle counter. Any revisions released for use and installed in the cycle counter using the programming kit P/N CC-GSE will be displayed on this screen.

Major changes in the cycle counting algorithm due to a Honeywell SB change or change in operation of the cycle counter are identified with the larger (X). Minor change requirements for basic bug fixes identified with the smaller (x)

**NOTE:** The optional Ground Support Programming Kit P/N CC-GSE allows for maintenance personnel to update the cycle counter with current engine cycles from the engine logbook, as well as installing future software updates. It is most useful when the cycle counter has been initially installed or when an engine change is made, and the cycles need to be updated.

The Programming Kit includes a serial programming cable, a USB adapter cable, and a software CD with programming instructions. It allows for specific values (items 10, 11, 12, 13, 16, 17 & 19) to be changed and can be password protected by the end-user to prevent unauthorized changes.

# Data Screen A

## ITEM 4 – Speeds

Real time engine speeds in percentage (%) for N1 and N2 that will match the tachometer indicators on the instrument panel any time the helicopter is running.

The speed signals for N1 and N2 are connected to the cycle counter microprocessor via individual 2-conductor, twisted and shielded wires. These wires are connected in parallel to the tachometer indicator signal wires located behind the instrument panel.

Each signal wire is connected to separate channels on the microprocessor. The analog speed signals from the engine are converted to a digital signal which is scaled to the same designed frequency as the tachometer generators on the engine.

When the aircraft is started, the ETM1000 waits for an MGT/EGT ≥ 400, plus an additional 1 minute delay before the speed is considered an actual engine start. After the delay, both N1 and N2 speeds are indicated, and the cycle counter is in an operational state.

The frequency is continuously monitored for change by the processor and changes linearly as the speed changes.

The cycle counter speeds correspond directly with the tachometer indicator on the instrument panel within +/– 0.5%. The operator can confirm that the cycle counter is operating correctly by observing and comparing the displayed cycle counter N1and N2 speeds with the tachometer indicators.

## ITEM 5 – Compressor (C)

This is the accumulation of the compressor cycles as the helicopter is operated. Depending on the T53 engine model and the Honeywell SB 0020 Table 2 cycle count, the cycle penalties will depend on the operating speed of the engine in relationship to Table 2. 10% speed increases are continually monitored and recorded per the Honeywell SB.

## ITEM 6 – Gas Prodcucer (G)

This is the accumulation of the Gas Producer cycles as the helicopter is operated. Depending on the T53 engine model and the Honeywell SB 0020 Table 2 cycle count, the cycle penalties will depend on the operating speed of the engine in relationship to Table 2. 10% speed increases are continually monitored and recorded per the Honeywell SB.

### ITEM 7 – Impellar (I)

This is the accumulation of the Impeller cycles as the helicopter is operated. Depending on the T53 engine model and the Honeywell SB 0020 Table 2 cycle count, the cycle penalties will depend on the operating speed of the engine in relationship to Table 2. 10% speed increases are continually monitored and recorded per the Honeywell SB.

**NOTE:** For the T5317B and BCV the impeller partial cycles are not required and are not recorded.

### ITEM 8 – Power Turbine (P)

This is the accumulation of the Power Turbine cycles as the helicopter is operated. When the helicopter is started a 1.0 is initially added and thereafter a 0.1 partial cycle when the power turbine speed goes from >95% to < 95%.

### ITEM 9 – Basic Cycles (B)

Depending on the T53 engine model and the Honeywell SB 0020 cycle count table applicable, this is a maximum one-time value related to the max N1 speed recorded during each operation. When the cycle counter is reset, the basic count value is added to each of the Compressor (C), Gas Producer (G) & Impeller (I) values and totaled on screen B. This is done even if no cycle penalties are recorded for the compressor (C) or Impeller ( I ) on screen A. This is why it is referred to as the basic count.

## Data Screen B

### ITEM 10 – Compressor (C)

This is the total accumulation of the Compressor cycles from screen A including the basic count (B) value. It is a value that can be set using the programming kit P/N CC-GSE.

### ITEM 11 – Gas Producer (G)

This is the total accumulation of the Gas Producer cycles from screen A including the basic count (B) value. It is a value that can be set using the programming kit P/N CC-GSE.

**ITEM 12 – Impeller (I)**

This is the total accumulation of the Impeller cycles from screen A including the basic count (B) value. It is a value that can be set using the programming kit P/N CC-GSE.

**NOTE:** For the T5317B and BCV, the impeller partial cycles are not required and are not recorded. However, the Basic Count is added

**ITEM 13 – Power Turbine (P)**

This is the total accumulation of the Power Turbine cycles from screen A. This DOES NOT include the basic count (B) value. It is a value that can be set using the programming kit P/N CC-GSE.

## Data Screen C

**ITEM 14 – N1 "Ops"**

The N1 "Ops" (operations) is a counter. The N1 "Ops" counter corresponds to the N1 partial operations any time a 10% N1 speed increase is recorded and increments by a value of 1. This counter is reset to zero when the red reset button is pressed. For initial takeoff a 1 is recorded.

**NOTE:** It is recommended that the operator record the daily N1 "Ops" values in the flight log at the end of each flight day prior to resetting the cycle counter for the next flight day.

**ITEM 15 – N2 "Ops"**

The N2 "Ops" (operations) is a counter. The N2 "Ops" counter corresponds to the N2 partial operations any time N2 goes from >95% to < 95% and increments by a value of 1. This counter is reset to zero when the red reset button is pressed.

**NOTE:** It is recommended that the operator record the daily N2 "Ops" values in the flight log at the end of each flight day prior to resetting the cycle counter for the next flight day.

**ITEM 16 – Flight Time**

This is a timer representing flight time which is also used for determining maintenance intervals. It accumulates time in 0.1-hour (6 minute) increments.

The flight “Flt” time starts to accumulate when the engine is running, and the collective “UP” micro switch is made ie. A/C is approaching flight. When the collective is full-down and the collective micro switch is un-made ie. A/C has landed, the timer stops counting.

Operation of the flight timer and collective up signal can be observed by noting the change from (OFF) to (ON) when the collective switch is made and from (ON) to (OFF) when the collective is full down and the switch is un-made.

**ITEM 17 – Op (Operation) Time**

This is a timer representing engine operational time. It accumulates time in 0.1 hour (6 minute) increments.

The Op time starts counting when N1 >80% and stops when <80%.

Operation of the Op timer can be observed by noting the change from (OFF) to (ON) when N1 > 80% and from (ON) to (OFF) when N1 < 80%.

**ITEM 18 – Max N1**

The “Max” N1 speed indication in percentage (%) is the maximum N1 speed seen by the cycle counter between manual resets. It is useful for determination of the Basic (B) count value accrued by the cycle counter “Flt” cycles. However, it is the max N1 between resets which could include multiple flights.

**NOTE:** It is required by the Honeywell SB that the operator record the Max N1 value in the flight log at the end of each flight day prior to resetting the cycle counter for the next flight day.

**ITEM 19 – Engine Starts**

An engine start is recorded when the N1 speed is ≥ 30% +5 sec delay. It increments by a value of 1 after each engine start. This value does not reset when the reset button is pressed but continues to accumulate all engine starts. It is a value that can be set using the programming kit P/N CC-GSE.

## End

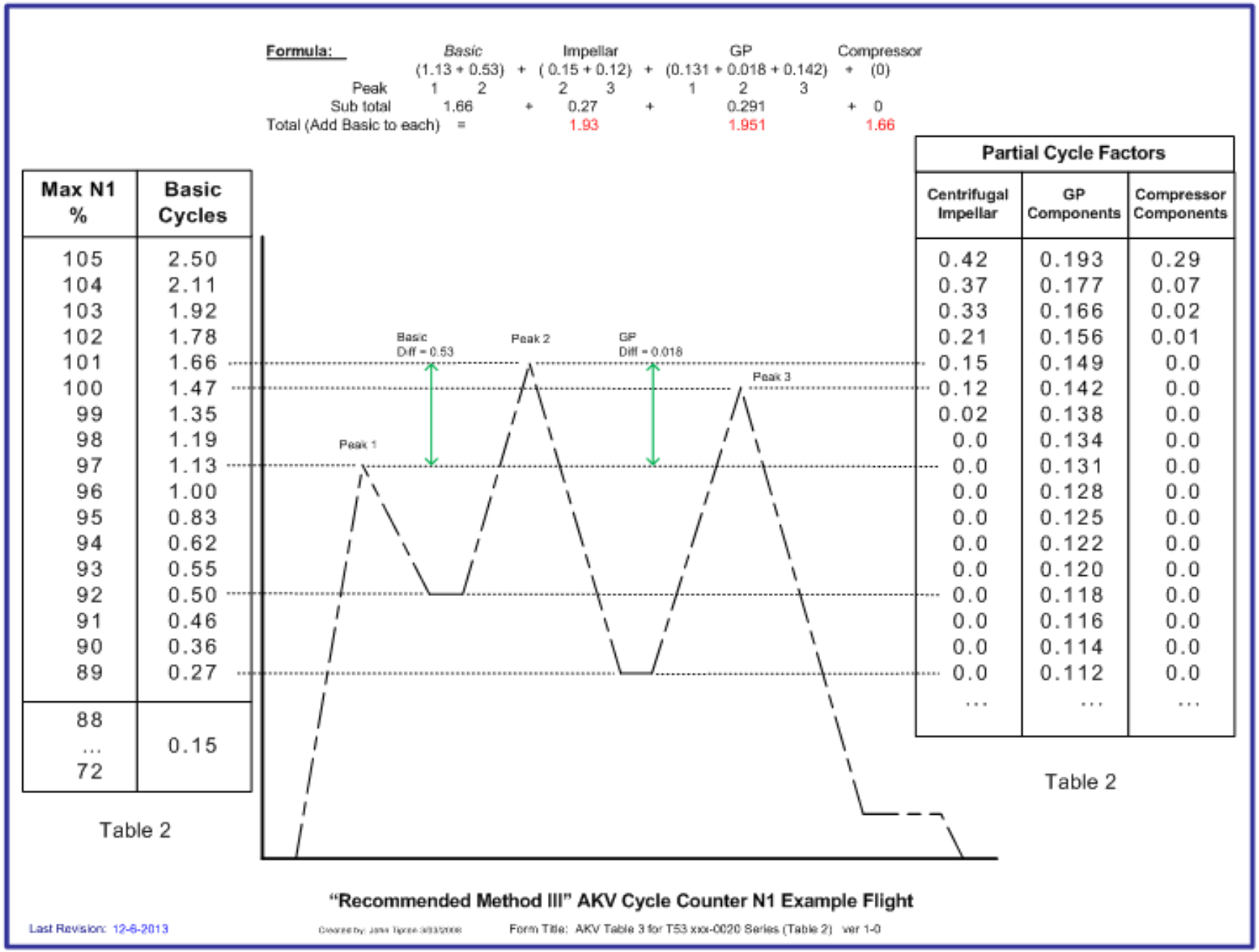



**Table 1** (Example for T53-L-703 or T5317)

**Honeywell Service Bulletin – 0020 Table 2 for T53-L-703 or T5317**

Table 2. Cycle Count Factors

| | | Partial Cycle Factors | | |
|---|---|---|---|---|
| $N_1$ Max. | Basic Cycles | Centrifugal Compressor Impeller Part No. 1–100–078–07/–08 | GP Components | Compressor Components |
| 72% | 0.15 | 0 | 0 | 0 |
| 73% | 0.15 | 0 | 0.012 | 0 |
| 74% | 0.15 | 0 | 0.024 | 0 |
| 75% | 0.15 | 0 | 0.036 | 0 |
| 76% | 0.15 | 0 | 0.048 | 0 |
| 77% | 0.15 | 0 | 0.061 | 0 |
| 78% | 0.15 | 0 | 0.073 | 0 |
| 79% | 0.15 | 0 | 0.087 | 0 |
| 80% | 0.15 | 0 | 0.093 | 0 |
| 81% | 0.15 | 0 | 0.096 | 0 |
| 82% | 0.15 | 0 | 0.098 | 0 |
| 83% | 0.15 | 0 | 0.100 | 0 |
| 84% | 0.15 | 0 | 0.102 | 0 |
| 85% | 0.15 | 0 | 0.104 | 0 |
| 86% | 0.15 | 0 | 0.106 | 0 |
| 87% | 0.15 | 0 | 0.108 | 0 |
| 88% | 0.15 | 0 | 0.110 | 0 |
| 89% | 0.27 | 0 | 0.112 | 0 |
| 90% | 0.36 | 0 | 0.114 | 0 |
| 91% | 0.46 | 0 | 0.116 | 0 |
| 92% | 0.50 | 0 | 0.118 | 0 |
| 93% | 0.55 | 0 | 0.120 | 0 |
| 94% | 0.62 | 0 | 0.122 | 0 |
| 95% | 0.83 | 0 | 0.125 | 0 |
| 96% | 1.00 | 0 | 0.128 | 0 |
| 97% | 1.13 | 0 | 0.131 | 0 |
| 98% | 1.19 | 0 | 0.134 | 0 |
| 99% | 1.35 | 0.02 | 0.138 | 0 |
| 100% | 1.47 | 0.12 | 0.142 | 0 |
| 101% | 1.66 | 0.15 | 0.149 | 0 |
| 102% | 1.78 | 0.21 | 0.156 | 0.01 |
| 103% | 1.92 | 0.33 | 0.166 | 0.02 |
| 104% | 2.11 | 0.37 | 0.177 | 0.07 |
| 105% | 2.50 | 0.42 | 0.193 | 0.29 |

**Table 2**