

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION  
DECISION SUMMARY  
ASSAY AND INSTRUMENT COMBINATION TEMPLATE**

**A. 510(k) Number:**

k133344

**B. Purpose for Submission:**

New Device

**C. Measurand:**

Whole blood glycated hemoglobin A1c (HbA1c)

**D. Type of Test:**

Capillary Electrophoresis

**E. Applicant:**

Sebia, Inc.

**F. Proprietary and Established Names:**

MINICAP Hb A1c kit  
Hb A1c CAPILLARY Calibrators  
Hb A1c CAPILLARY Controls

**G. Regulatory Information:**

<b>Product Code</b>	<b>Classification</b>	<b>Regulation Section</b>	<b>Panel</b>
LCP	II	21 CFR 864.7470 Glycosylated hemoglobin assay	Hematology (81)
JIS	II	21 CFR 862.1150 Calibrator	Chemistry (75)
JJX	Class I, Reserved	21 CFR 862.1660 Quality control material (assayed and unassayed)	Chemistry (75)

## H. Intended Use:

1. Intended use(s):

*See Indications for Use below.*

2. Indication(s) for use:

The **MINICAP HbA1c kit** is designed for separation and quantification of the HbA1c glycosylated fraction of hemoglobin in human whole blood, by capillary electrophoresis in alkaline buffer with the MINICAP FLEX-PIERCING instrument. Measurement of hemoglobin A1c is effective in monitoring long-term glycemic control in individuals with diabetes mellitus. Results are provided in IFCC (mmol/mol) and NGSP (%Hb A1c) units. The MINICAP Hb A1c kit is designed for Professional Use Only.

For *In Vitro* Use.

The **Hb A1c CAPILLARY Controls** are designed for the quality control of human glycosylated hemoglobin A1c quantification with SEBIA capillary electrophoresis procedures using the MINICAP HbA1c kit with the MINICAP FLEX-PIERCING automated instrument.

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The Hb A1c CAPILLARY Controls are designed for Professional Use Only.

For *In Vitro* Diagnostic Use.

The **HbA1c CAPILLARY Calibrators** are designed for the calibration and migration control of human glycosylated hemoglobin A1c quantification with SEBIA capillary electrophoresis procedures using the MINICAP HbA1c kit with the MINICAP FLEX-PIERCING automated instrument.

- - The HbA1c CAPILLARY Calibrators are designed for Professional Use Only.

For *In Vitro* Diagnostic Use.

3. Special conditions for use statement(s):

For Prescription Use Only

- Should not be used for the diagnosis of diabetes mellitus
- Should not be used in monitoring daily glucose control
- Should not be used to replace daily home testing of urine and blood glucose levels.
- Should not be used for analyzing samples from patients with conditions causing shortened red cell blood cell survival such as hemolytic diseases, pregnancy and significant acute or chronic blood loss.
- Not for Point of Care Use

4. Special instrument requirements:

MINICAP Flex-Piercing Instrument

## I. Device Description:

The MINICAP Hb A1c kits, Hb A1c CAPILLARY Controls and Hb A1c CAPILLARY Calibrators are used with the MINICAP FLEX- PIERCING system. The configurations of the components are summarized:

- MINICAP Hb A1c kits in Table I.
- Hb A1c CAPILLARY Calibrators in Table II.
- Hb A1c CAPILLARY Controls in Table III.
- Reagents that are required to perform the test but are sold separately in Table IV.

**TABLE I. REAGENTS AND MATERIALS SUPPLIED IN THE MINICAP Hb A1c KIT (PN 2215)**

<b>ITEMS</b>	<b>PN 2215</b>
Buffer (ready to use)	2 vials, 250 mL each
Hemolysing solution (ready to use)	1 vial, 225 mL
Wash solution (stock solution)	1 vial, 25 mL
Reagent Cups	1 pack of 125
Filters	3 filters
Bins for used cups	4 bins
Hemolysing solution bar code labels	5 sheets of 4 labels

**TABLE II. REAGENTS AND MATERIALS SUPPLIED WITH Hb A1c CAPILLARY CALIBRATORS (PN 4755)**

<b>ITEMS</b>	<b>PN 4755</b>
Hb A1c CAPILLARY Calibrator 1 (green cap) Hb A1c CAPILLARY Calibrator 2 (red cap)	1 vial of each, 600µL each
Barcode label Hb A1c CAPILLARY Calibrator 1	1
Barcode label Hb A1c CAPILLARY Calibrator 2	1

**TABLE III. REAGENTS AND MATERIALS SUPPLIED WITH Hb A1c CAPILLARY CONTROLS (PN 4774)**

<b>ITEMS</b>	<b>PN 4744</b>
Hb A1c CAPILLARY Control 1 ( white cap ) Hb A1c CAPILLARY Control 2 ( black cap)	1 vial of each, 600µL each
Barcode label HbA1c CAPILLARY Control 1	2
Barcode label HbA1c CAPILLARY Control 2	2

Control 2	
White dilution segments*	4
Grey dilution segments*	4

**TABLE IV. REAGENTS AND MATERIALS REQUIRED BUT NOT SUPPLIED IN THE MINICAP HbA1c KIT, Hb A1c CAPILLARY CONTROLS OR Hb A1c CAPILLARY CALIBRATORS**

ITEMS	PN	COMPONENTS
CAPICLEAN	2058	1 vial, 25 mL
CAPILLARYS / MINICAP Wash Solution	2052	2 vials, 75 mL
Tubes and caps for controls	9202, 9205	200 per box, 500 per box
MINICAP Reagent Cups	2280	250 per box
Lids for bins for used reagent cups	2286	12 per box
"AUTOMATIC LOW VOLUME" bar code labels	9208	20 per box
"MANUAL LOW VOLUME" bar code labels	9209	20 per box
MINICAP FLEX-PIERCING centering rings	1612	27 per box
PHORESIS software	1110	
MINICAP FLEX-PIERCING INSTRUMENT	1232	
Update HbA1c kit for MINICAP FLEX-PIERCING	1238	

**J. Substantial Equivalence Information:**

1. Predicate device name(s):

CAPILLARYS Hb A1c kit  
 CAPILLARYS 2 FLEX-PIERCING instrument  
 Hb A1c CAPILLARY Controls  
 Hb A1c CAPILLARY Calibrators

2. Predicate K number(s):

k122101

3. Comparison with predicate:

<b>Similarities and Differences: Reagent</b>		
Item	Predicate Device: CAPILLARYS Hb A1c kit (k122101)	Candidate Device: MINICAP Hb A1c kit
Intended Use	Measurement of hemoglobin A1c for monitoring long-term glycemic control in individuals with diabetes mellitus. For Professional Use Only.	Same
Method	Free solution capillary electrophoresis	Same
Sample type	Whole blood	Same
Measuring Range (%HbA1c)	4.0-14.7%	4.8-13.8%
Collection Tubes	Tubes with K2 and K3 EDTA anticoagulant	Same
Absorbance Wavelength	415 nm	Same

<b>Similarities and Differences: Calibrators</b>		
Item	Predicate Device: Hb A1c CAPILLARY Calibrators (k122101)	Candidate Device: Hb A1c CAPILLARY Calibrators
Intended Use/Indications for Use	The <b>HbA1c CAPILLARY Calibrators</b> are designed for the calibration and migration control of human glycosylated hemoglobin A1c quantification with SEBIA electrophoresis procedure.	Same
Format	2 levels; 1 vial (0.6 mL) per level	Same
Storage Temperature	Before reconstitution, store at -30°C/-18°C (-22°F/0°F). Stable until expiration date on vial.	5 yrs between -30°C and -18°C
In Use Storage	After reconstitution, store at 2-8°C (36-46°F) up to 8 hours, up to 6 months at -22°C/-18°C (-8°F/0°F). Do not freeze and thaw more than 3 times.	<u>CAPILLARYS 2 FLEX-PIERCING:</u> After reconstitution, store at 2-8°C (36-46°F) up to 8 hours, up to 22 months at -22°C/-18°C (-8°F/0°F). Do not freeze and thaw more than 3 times. <u>MINICAP FLEX-PIERCING:</u> After reconstitution, store

<b>Similarities and Differences: Calibrators</b>		
<b>Item</b>	<b>Predicate Device: Hb A1c CAPILLARY Calibrators (k122101)</b>	<b>Candidate Device: Hb A1c CAPILLARY Calibrators</b>
		at 2-8°C (36-46°F) up to 8 hours, up to 22 months at -22°C/-18°C (-8°F/0°F). Do not freeze and thaw more than 5 times.

<b>Similarities and Differences: Controls</b>		
<b>Item</b>	<b>Predicate Device: Hb A1c CAPILLARY Controls (k122101)</b>	<b>Candidate Device: Hb A1c CAPILLARY Controls</b>
<b>Intended Use/Indications for Use</b>	The <b>HbA1c CAPILLARY Controls</b> are designed for the quality control of human glycosylated hemoglobin A1c quantification with SEBIA electrophoresis procedure.	Same
<b>Format</b>	2 levels; 1 vial (0.6mL) per level	Same
<b>Storage Temperature</b>	Before reconstitution, store refrigerated at 2-8°C (36-46°F). Stable until expiration date on vial.	Same
<b>In Use Storage</b>	After reconstitution, store at 2-8°C (36-46°F) up to 8 hours, up to 6 months at -22°C/-18°C (-8°F/0°F). Do not freeze and thaw more than 30 times.  After hemolysis with the CAPILLARYS 2 FLEX-PIERCING instrument, store the dilution segments with controls at 2-8°C (36-46°F) up to 8 hours; stable for 1 month at -22°C/-18°C (-8°F/0°F). Do not freeze and thaw a dilution segment with hemolyzed control more than 3 times.	<u>Same</u>

**K. Standard/Guidance Document Referenced (if applicable):**

- CLSI EP09-A2-IR: *Method Comparison and Bias Estimation using patient samples, Approved guidelines 2nd edition ( Interim Revision) – July 2010*
- CLSI EP6-A: *Evaluation of the linearity of Quantitative Measurement Procedures: A Statistical Approach, Approved guideline - April 2003*
- CLSI EP5-A2: *Evaluation of Precision Performance of Quantitative Measure Measurement Methods, Approved guideline 2nd edition – August 2004*
- CLSI EP7-A2: *Interference Testing in Clinical Chemistry, approved guideline 2nd edition – November 2005*
- Guidance for Industry and FDA staff- Use of Symbols on Labels and in Labeling of In Vitro Diagnostic Devices Intended for Professional Use
- Guidance for Industry and FDA staff- General Principals of Software Validation, 2002
- Guidance for Content of Premarket Submissions for Software Contained in Medical Devices, 2005

**L. Test Principle:**

The MINICAP FLEX-PIERCING instrument uses the principle of capillary electrophoresis in free solution. With this technique, charged molecules are separated by their electrophoretic mobility in an alkaline buffer with a specific pH. Separation also occurs according to the electrolyte pH and electroosmotic flow.

The MINICAP FLEX-PIERCING instrument has silica capillaries functioning in parallel allowing 2 simultaneous analyses for HbA1c quantification from whole blood sample. A sample dilution with hemolysing solution is prepared and injected by aspiration at the anodic end of the capillary. A high voltage protein separation is then performed and direct detection of the hemoglobins is made at the cathodic end of the capillary at 415 nm, which is the absorbance wave length specific to hemoglobins. Before each run, the capillaries are washed with a wash solution and prepared for the next analysis with buffer.

The high resolution of MINICAP Hb A1c procedure allows the quantification of HbA1c, even in the presence of labile HbA1c, carbamylated and acetylated hemoglobins, and major hemoglobin variants such as HbS, HbC, HbD, HbE and HbF and common interfering factors such as Triglycerides, Bilirubin, Ascorbic Acid, Urea, Rheumatoid factor and Glybenclamide as outline in the package insert labeling.

By using alkaline pH buffer, normal and abnormal (or variant) hemoglobins are detected in the following order, from cathode to anode: A2/C, E, S/D, F, A0, other Hb (including minor Hb A1) and then A1c.

**M. Performance Characteristics (if/when applicable):**

1. Analytical performance:

a. *Precision/Reproducibility:*

Reproducibility within the same capillary and between capillaries from the same instrument

Four different pooled blood samples were analyzed using the CAPILLARYS HbA1c assay in both capillaries of the same MINICAP FLEX-PIERCING instrument. The analyzed EDTA whole blood samples included a pool of HbA1c samples at the normal (~5.2%), cut-off value (~6.4%) and elevated HbA1c (~9.0 and 11.9%)

Each sample was assayed on both capillaries from the same instrument to include 2 runs per day over 20 working days. Samples were analyzed in duplicate within each run. The results are shown below:

Results in NGSP units (%HbA1c)

Sample	N	Mean (%A1c)	Within-run (%CV)	Within Capillary (%CV)	Between-run (%CV)	Between-day (%CV)	Total (%CV)
Sample No.1	80	5.2	1.1	1.4	0.3	0.0	1.1
Sample No.2	80	6.4	0.9	1.1	0.0	0.6	1.1
Sample No.3	80	9.0	0.9	0.8	0.0	0.4	1.0
Sample No.4	80	11.9	1.1	0.9	0.0	0.1	1.1

Results in IFCC units (mmol/mol)

Sample	N	Mean (mmol/mol)	Within-run (%CV)	Within Capillary (%CV)	Between-run (%CV)	Between-day (%CV)	Total (%CV)
Sample No.1	80	34	1.9	2.8	1.4	0.0	2.3
Sample No.2	80	46	1.1	1.3	0.5	0.5	1.3
Sample No.3	80	75	1.2	1.4	0.0	0.6	1.3
Sample No.4	80	106	1.2	0.9	0.0	0.2	1.2

Reproducibility between lots and instruments

Six different EDTA whole blood samples were analyzed using the CAPILLARYS HbA1c assay in both capillaries of 3 different MINICAP FLEX-PIERCING instruments and with 3 lots of MINICAP HbA1c kits. The analyzed blood samples included a sample at the normal (~5.4%), a sample at the cut-off value (~6.4%), and two elevated HbA1c samples (9.1 and 12.3%) . Two whole blood control samples were also analyzed (~5.2 and ~7.9% HbA1c).

Each EDTA whole blood sample was analyzed on both capillaries from each instrument, including 60 runs over 10 days, 2 runs per day. Samples were analyzed in duplicate. The results are shown below:

Results in NGSP units (%HbA1c)

Sample	Mean (%A1c)	Within-Run reproducibility		Total reproducibility	
		% CV min	% CV max	% CV min	% CV max
Sample No.1	5.4	0.9	2.1	0.9	2.1
Sample No.2	6.4	0.5	1.9	0.8	1.9
Sample No.3	9.1	0.0	1.1	0.0	1.1
Sample No.4	12.3	0.4	1.2	0.6	1.8
Sample No.5	5.2	0.9	2.0	0.9	2.2
Sample No.6	7.9	0.7	1.4	0.8	1.6

Results in IFCC units (mmol/mol)

Sample	Mean (mmol/mol)	Within-Run reproducibility		Total reproducibility	
		% CV min	% CV max	% CV min	% CV max
Sample No.1	36	1.1	4.0	1.2	4.0
Sample No.2	47	1.2	2.6	1.3	2.6
Sample No.3	76	0.0	1.4	0.0	1.4
Sample No.4	110	0.4	1.4	0.6	2.2
Sample No.5	33	0.9	3.5	0.9	3.5
Sample No.6	63	0.7	1.6	0.7	2.2

b. *Linearity/assay reportable range:*

The linearity study was performed according to the CLSI EP6-A guidelines.

Two EDTA whole blood samples, including a normal sample with HbA1c concentration at 4.8% HbA1c and an elevated HbA1c level sample with HbA1c concentration at 13.8% HbA1c were mixed within different proportions and the dilutions were electrophoresed with the MINICAP Hb A1c procedure for a total of 11 samples. For each dilution, samples were analyzed in duplicate. The tests were determined to be linear within the entire ranges studied for HbA1c hemoglobin fraction (between 4.8 and 13.8% of HbA1c).

NGSP units (%HbA1c)

The 1<sup>st</sup> order linear regression generated is:

$$Y = 0.08982x + 4.764, r=0.999$$

Linearity range: 4.8-13.8% Hb A1c

IFCC units (mmol/mol)

$$Y = 0.9855x + 28.41, r=0.999$$

Linearity range: 29-127 mmol/mol HbA1c

In addition, linearity of the MINICAP Hb A1c procedure performed with the MINICAP FLEX-PIERCING instrument was verified with different total

hemoglobin concentrations. 3 different EDTA whole blood samples, including a normal sample with HbA1c concentration at 5.0% HbA1c, a sample with HbA1c level close to the cut-off value at 6.3% HbA1c and an elevated HbA1c level sample with HbA1c concentration at 9.3% HbA1c, were all serially diluted in hemolysing solution and electrophoresed with the MINICAP Hb A1c procedure. The tests were determined to be linear within the entire ranges studied from 2.5 to 31.1 g/dL total hemoglobin and HbA1c fraction concentration and percentage were not affected by the hemoglobin concentration of the samples. 12 mixtures were used per sample.

Results in NGSP units (%HbA1c)

Sample	Linear Regression	95%CI
1	$Y = 0.001438x + 4.778$	0.000817 to 0.002060 4.722 to 4.834
2	$Y = 0.001671x + 6.039$	0.000960 to 0.002382 5.974 to 6.104
3	$Y = 0.00277 x + 9.004$	0.00209 to 0.00345 8.937 to 9.070

Results in IFCC units (mmol/mol)

Sample	Linear Regression	95%CI
1	$Y = 0.01698x + 28.63$	0.01036 to 0.02361 28.03 to 29.23
2	$Y = 0.01969x + 42.27$	0.01219 to 0.02719 41.58 to 42.95
3	$Y = 0.03035 x + 74.98$	0.02204 to 0.03865 74.17 to 75.80

c. *Traceability, Stability, Expected values (controls, calibrators, or methods):*

Traceability: The MINICAP HbA1c assay is certified with the National Glycohemoglobin Standardization Program (NGSP). The NGSP certification expires in one year. See NGSP website for current certification at <http://www.ngsp.org>.

Value Assignment: Calibrator and control value assignments are lot-specific. Calibrator and control values are assigned by multiple measurements using the MINICAP FLEX-PIERCING instrument and IFCC traceable calibrators.

Stability: The stability protocols and acceptance criteria were reviewed and determined to be adequate.

The expiration dates of the different components of the CAPILLARYS HbA1c kit are indicated as follows:

Kit component	Shelf-Life	On Board Stability
MINICAP HbA1c buffer:	2 years at 2-8°C (36-46°F)	20 days at 15-30°C (59-86°F)
MINICAP HbA1c hemolysing solution:	2 years at 2-30°C (36-86°F)	N/A*
MINICAP wash solution:	3 years at 15-30°C (59-86°F)	3 months at 37°C (99°F)

\* Hemolysing solution vial not on board.

The expiration date of the Hb A1c CAPILLARY Calibrators is stated as 5 years between - 30 °C and - 18 °C (-22°F/0°F). When reconstituted, the in use storage stability is 8 hours at 2-8°C (36-46°F), up to 22 months at -22°C / - 18°C (-8°F/0°F). The labeling states that the Hb A1c CAPILLARY Calibrators should not be frozen and thawed more than 5 times.

The stability of the Hb A1c CAPILLARY Controls is demonstrated to be stable for 8 hours at 2-8°C (36-46°F), up to 6 months at -22°C/-18°C (-8°F/0°F). The labeling states that the HbA1c CAPILLARYS controls should not be frozen and thawed more than 30 times.

*d. Detection limit:*

The Limit of Blank (LoB) was determined by assaying five blood samples without HbA1c. The Limit of Detection (LoD) was determined by assaying six blood samples with low HbA1c. Both LoB and LoD were tested according to CLSI guideline EP17-A . The results are as follows:  
LoB= 0.3%, LoD = 1.1%

The claimed measuring range, 4.8 – 13.8%, is based on linearity. See 1b above.

*e. Analytical specificity:*

i.) Studies were performed to assess common or known substances that could interfere with the CAPILLARYS HbA1c assay kit. The interfering substances were evaluated in whole blood samples that contained four different concentrations of A1c (~4.9%, ~6.5% , ~8.8% and ~12.1%). Samples containing various concentrations of potential interferents were tested and the results compared to those obtained from control samples containing no potential interfering substances. The sponsor's definition of non-significant interference is ≤0.3% HbA1c between the tested and the control samples.

The results are as follows:

Potential interfering substance	Concentration at which no significant interference (≤0.3%) was observed
Bilirubin	≤ 25.8 mg/dL (442 μM)

Triglycerides	≤ 3070 mg/dL (35.1 mM)
Rheumatoid Factor	≤ 2178 IU/mL
Urea	≤ 291 mg/dL (48.5 mM)
Ascorbic Acid	≤ 60 mg/dL (3.41 mM)
Glybenclamide	≤ 3 mg/dL

ii.) To study interference from Carbamylated hemoglobin, four blood samples with A1c concentrations at ~5.7%, ~6.9%, ~8.9% and 12.4% were split into two aliquots. One aliquot, at each A1c level, was spiked with 1mmol/L of Potassium Cyanate and incubated for 3 hours at 37°C. Another aliquot, at each A1c level, was incubated for 3 hours at 37°C. Samples were then analyzed on the MINICAP FLEX-PIERCING instrument using the CAPILLARYS HbA1c assay kit. Samples were analyzed in triplicate. The sponsor's definition of non-significant interference is ≤ 0.3 HbA1c% between the tested and the control samples.

The sponsor concluded that Carbamylated hemoglobin (at ≤ 8.11mg/dL (1mmol/L)) does not interfere with this assay.

iii.) To study interference from labile hemoglobin, four blood samples with A1c concentrations at ~4.7%, ~6.8%, ~8.8% and ~12.7% were split into two aliquots. One aliquot, at each A1c level, was spiked with glucose (0.5mol/L) and incubated for 3 hours at 37°C. Another aliquot, at each A1c level, was incubated for 3 hours at 37°C. Samples were then analyzed on the MINICAP FLEX-PIERCING instrument using the CAPILLARYS HbA1c assay kit. Samples were tested in triplicate. The sponsor's definition of non-significant interference is ≤ 0.3 HbA1c%.

The sponsor concluded that labile A1c (at ≤ 1800mg/dL (0.5mol/L)) does not interfere with this assay.

iv.) To study interference from acetylated hemoglobin, four blood samples with A1c concentrations at ~5.2%, ~6.6%, ~9.4%, and ~ 11.7% were split into two aliquots. One aliquot, at each A1c level, was used as the control sample and the other aliquot was spiked with acetylated hemoglobin (10 mmol/L) and incubated for 4 hours at 37°C. All aliquots were tested on the MINICAP FLEX-PIERCING instrument using the CAPILLARYS HbA1c assay kit. Samples were tested in triplicate. The sponsor's definition of non-significant interference is ≤ 0.3 HbA1c%.

The sponsor concluded that acetylated hemoglobin (at ≤180 mg/dL (10mmol/L)) does not interfere with this assay.

v) A hemoglobin variant interference study was carried out using samples known to contain Hemoglobin variants S, E, D and C. These variant samples were tested on the MINICAP FLEX-PIERCING instrument using the

CAPILLARYS HbA1c assay kit. The sponsor's definition of non-significant interference is  $\pm 10\%$  difference between the candidate method and the comparative method.

The testing results show there is no significant interference for HbS ( $\leq 40.5\%$ ), HbE ( $\leq 24.7\%$ ), HbD ( $\leq 41.0\%$ ) and HbC ( $\leq 37.0\%$ ).

vi) An additional variant interference study was carried out to study the variant interference from Hemoglobin F. The study was performed on 16 different samples with HbA1c values between 5.3 and 11.6%. The samples contained concentrations of Hb F from 2.3 to 19.7 % and were tested on the MINICAP FLEX-PIERCING instrument using the CAPILLARYS HbA1c assay kit.

The testing results show there is no significant interference for Levels of HbF  $\leq 15\%$ , where significant interference is defined by  $\pm 10\%$  difference between the candidate method and the comparative method. The following limitation regarding Hb F interference is included in the labeling:

*Levels of Hb F up to 15 % in the blood sample do not interfere with HbA1c fraction quantification, but no HbA1c result will be reported by the software when Hb F level is higher than 15 %. Samples that contain high amounts of Hb F ( $> 15\%$ ), usually found in some people with thalassemia, infants, and some pregnant women, may yield a lower than expected HbA1c result with this assay.*

f. Assay cut-off:

Not applicable.

## 2. Comparison studies:

### a. *Method comparison with predicate device:*

An internal and external method comparison study was conducted using a total of 367 EDTA whole blood samples ranging from 4.7-14.6% HbA1c. Testing was completed at three sites, with the following samples tested at each site:

Site 1 (Internal) : 101 blood samples (35 normal and 66 with elevated HbA1c)

Site 2 (external): 126 blood samples (71 normal and 55 with elevated Hb A1c and

Site 3 (external) : 140 blood samples (68 normal and 72 with elevated Hb A1c)

Normal Hb A1c was defined as  $< 6.5\%$ . No samples were spiked or diluted. Samples were analyzed in singlicate using the MINICAP HbA1c procedure on the MINICAP FLEX-PIERCING instrument (candidate device) and the CAPILLARYS 2 FLEX-PIERCING instrument (predicate device). Method comparison studies were performed according to CLSI EP9-A2 guideline. The

linear regression correlation was calculated as follows:

Site 1 (Internal):

HbA1c	Correlation Coefficient	y-intercept (95%CI)	Slope (95%CI)	HbA1c range
Percentage (%)	0.998	0.165 (0.053 to 0.276)	0.982 (0.968 to 0.996)	4.8 – 13.3
Concentration (mmol/mol)	0.998	1.262 (0.375 to 2.149)	0.985 (0.972 to 0.999)	29 - 122

Site 2:(External)

HbA1c	Correlation Coefficient	y-intercept (95%CI)	Slope (95%CI)	HbA1c range
Percentage (%)	0.998	-0.032 (-0.107 to 0.044)	0.997 (0.987 to 1.007)	4.8 – 13.6
Concentration (mmol/mol)	0.998	-0.396 (-1.027 to 0.235)	0.996 (0.986 to 1.006)	29 - 125

Site 3 (External)

HbA1c	Correlation Coefficient	y-intercept (95%CI)	Slope (95%CI)	HbA1c range
Percentage (%)	0.998	-0.057 (-0.127 to 0.013)	1.019 (1.009 to 1.029)	4.8 – 13.1
Concentration (mmol/mol)	0.998	-0.316 (-0.848 to 0.216)	1.023 (1.013 to 1.032)	29 - 119

*b. Matrix comparison:*

A total of 41 different blood samples (17 normal and 24 with elevated HbA1c) were collected in parallel on K2 EDTA and K3 EDTA tubes and tested on the MINICAP FLEX-PIERCING instrument using the CAPILLARYS HbA1s assay kit. No samples were spiked or diluted. The linear regression is presented in the table below:

Fraction	Number of Samples	Correlation Coefficient	y-intercept	Slope	Range of Hb A1c fractions % values (test)

HbA1c%	41	0.999	0.002	1.004	5.0-13.4
HbA1c concentration mmol/mol	41	0.999	0.022	1.003	31 - 123

The sponsor concluded that whole blood samples can be collected in tubes containing K2 EDTA or K3 EDTA for analysis with MINICAP Hb A1c procedure performed on MINICAP FLEX-PIERCING instrument.

3. Clinical studies:

a. *Clinical Sensitivity:*

Not applicable

b. *Clinical specificity:*

Not applicable

c. *Other clinical supportive data (when a. and b. are not applicable):*

4. Clinical cut-off:

Not applicable

5. Expected values/Reference range:

Reference Range<sup>1</sup>

	NGSP	IFCC
Increased risk for diabetes	≥6.5%	≥48mmol/mol

<sup>1</sup>American Diabetes Association. Standards of medical care in diabetes-2012. Diabetes Care. 2012 Jan;35 Suppl 1:S11-63

**N. Instrument Name:**

MINICAP FLEX-PIERCING Instrument

**O. System Descriptions:**

1. Modes of Operation:

The MINICAP FLEX-PIERCING instrument is a multiparameter instrument for hemoglobins analysis on parallel capillaries. The hemoglobins assay uses 2 capillaries to run the samples.

The sequence of automated steps is as follows:

- Bar code reading of rotating sampler and sample tubes (for up to 26 tubes);
- Mixing of blood samples before analysis;

- Sample hemolysis and dilution from primary tubes into reagent cups;
- Capillary washing;
- Injection of hemolyzed samples;
- Hemoglobin separation and direct detection of the separated hemoglobins on capillaries.

Does the applicant's device contain the ability to transmit data to a computer, webserver, or mobile device?

Yes \_\_\_\_\_ or No  X .

Does the applicant's device transmit data to a computer, webserver, or mobile device using wireless transmission?

Yes \_\_\_\_\_ or No  X .

2. Software:

FDA has reviewed applicant's Hazard Analysis and software development processes for this line of product types:

Yes  X  or No \_\_\_\_\_.

3. Specimen Identification:

Barcode reader

4. Specimen Sampling and Handling:

Use EDTA whole blood samples. Check that all the tubes contain a minimum sample of 1 mL and are closed with their corresponding caps designed for the MINICAP Hb A1c procedure with the MINICAP FLEX-PIERCING. Vortex for 5 seconds blood samples stored at 2 – 8 °C for one week or stored at – 80 °C.

5. Calibration:

6. Quality Control:

It is necessary to perform a quality control analyses with Hb A1c CAPILLARY Controls 1 or 2, after capillaries activation, after each calibration of the instrument performed with the Hb A1c CAPILLARY Calibrators, after a capillary cleaning sequence with CAPICLEAN and before starting a new analysis sequence. In addition, for high-volume testing laboratories, it is advised to analyze one of the two controls after the analysis of a complete rotating sampler, by alternating Hb A1c CAPILLARY Control 1 and Control 2.

**P. Other Supportive Instrument Performance Characteristics Data Not Covered In The “Performance Characteristics” Section above:**

Not applicable.

**Q. Proposed Labeling:**

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

**R. Conclusion:**

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.