510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION MEMORANDUM

A. 510(k) Number:

K160588

B. Purpose for Submission:

To expand the indications for use of a previously cleared control material (XN CHECK BF™, K141957) with additional application for use with Sysmex® XN-L hematology analyzer

C. Measurand:

Assayed hematology parameters: WBC-BF (10^3/μL), RBC-BF (10^6/μL), MN# (10^3/μL), PMN# (10^3/μL), MN% (%), PMN% (%), TC-BF# (10^3/μL)

D. Type of Test:

Quantitative

E. Applicant:

Streck, Inc.

F. Proprietary and Established Names:

XN CHECK BF™

G. Regulatory Information:

1. Regulation section:

   21 CFR § 864.8625, Hematology quality control mixture

2. Classification:

   Class II

3. Product code:

   JPK, Mixture, hematology quality control

4. Panel:

   Hematology (81)

H. Intended Use:

1. Intended use(s):

   XN CHECK BF™ is used for control and calibration verification of Sysmex XN series (XN-10, XN-11, XN-20, XN-21, XN-L) analyzers. It is not, however, intended for actual calibration of these analyzers. Assayed parameters include:

   WBC-BF ($10^3/\mu L$), RBC-BF ($10^6/\mu L$), MN# ($10^3/\mu L$), PMN# ($10^3/\mu L$), MN(%), PMN(%), TC-BF# ($10^3/\mu L$)

2. Indication(s) for use:

   Same as intended use

3. Special conditions for use statement(s):

   For prescription use only

4. Special instrument requirements:

   Sysmex XN (XN-10, XN-11, XN-20, XN-21, XN-L) hematology analyzers

I. Device Description:

XN CHECK BF™ is an in-vitro diagnostic, two level, assayed hematology control that contains the following: stabilized red blood cell component(s) and stabilized white blood cell component(s) in a preservative medium. The product is packaged in polypropylene plastic vials with screw caps with a 3 mL fill. The vials will be packaged in four-welled vacuum formed clamshell container with the Instructions for Use / assay sheet. The product storage temperature is 2 – 8° C.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   XN CHECK BF™

2. Predicate 510(k) number(s):

   K141957

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Open-vial stability	30 days	Same
Closed-vial stability	84 days	Same
Reagents	XN CHECK BF™ contains the following: stabilized red blood cell component(s) and stabilized white blood cell component(s) in a preservative medium.	Same
Reagent Configuration	Two levels	Same
Storage conditions	2 – 8° C	Same

Differences		
Item	Device	Predicate
Intended Use	XN CHECK BF™ is used for control and calibration verification of Sysmex XN series (XN-10, XN-11, XN-20, XN-21, XN-L) analyzers. It is not, however, intended for actual calibration of these analyzers. Assayed parameters include: WBC-BF ($10^3/\mu L$), RBC-BF ($10^6/\mu L$), MN# ($10^3/\mu L$), PMN# ($10^3/\mu L$), MN(%), PMN(%), TC-BF# ($10^3/\mu L$)	XN CHECK BF™ is used for control and calibration verification of Sysmex XN series (XN-10, XN-11, XN-20, XN-21) analyzers. It is not, however, intended for actual calibration of these analyzers. Assayed parameters include: WBC-BF ($10^3/\mu L$), RBC-BF ($10^6/\mu L$), MN# ($10^3/\mu L$), PMN# ($10^3/\mu L$), MN (%), PMN (%), TC-BF# ($10^3/\mu L$)

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

CLSI H26 - A2, Validation, Verification, and Quality Assurance of Automated Hematology Analyzers; Approved Standard-Second Edition

CLSI EP05 - A3, Evaluation of Precision Performance of Quantitative Measurement Methods; Approved Guideline-Third Edition

L. Test Principle:

Bi-level XN CHECK™ BF was designed to evaluate the accuracy and precision of the Sysmex XN series (XN-10, XN-11, XN-20, XN-21, XN-L) instruments.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Repeatability (Single-site precision)

A single-site precision study was conducted on three lots of XN CHECK BF™, in which a single instrument was used at Streck with a single operator. Testing was performed with two runs per day and two replicates per run for 20 days on three lots of control materials. The single-site precision study was combined with the closed-vial stability study following the CLSI EP05-A3 guideline for the study and data analysis. The data of within-run, between-run, between-lot, between-day, and total precision of each level were calculated for all three lots combined and summarized in table below.

SINGLE SITE PRECISION ANALYSIS (Combined Lots)													
				Repeatability		Between-Run		Between-Day		Between-Lot		Reproducibility	
Sample	Level	N	Mean	SD	%CV	SD	%CV	SD	%CV	SD	%CV	SD	%CV
WBC-BF	Level 1	240	0.084	0.003	4.1	0.002	1.9	0.000	0.0	0.002	1.9	0.004	4.5
	Level 2	240	0.344	0.007	2.2	0.002	0.6	0.002	0.7	0.006	1.8	0.008	2.3
RBC-BF	Level 1	240	0.025	0.001	4.0	0.000	0.0	0.000	1.1	0.001	5.7	0.001	4.1
	Level 2	240	0.077	0.001	1.5	0.000	0.0	0.001	0.8	0.000	0.2	0.001	1.7
MN#	Level 1	240	0.028	0.002	7.9	0.001	3.2	0.001	3.0	0.001	2.1	0.003	9.0
	Level 2	240	0.118	0.005	4.6	0.001	0.9	0.004	3.1	0.004	3.5	0.007	5.6
PMN#	Level 1	240	0.056	0.003	5.4	0.001	2.1	0.001	1.6	0.001	2.1	0.003	6.0
	Level 2	240	0.225	0.007	2.9	0.002	1.1	0.004	1.6	0.005	2.4	0.008	3.5
MN%	Level 1	240	33.8	2.3	6.9	0.7	2.2	1.2	3.5	0.4	1.2	2.7	8.0
	Level 2	240	1.4	4.0	0.5	1.5	1.0	2.9	1.0	2.8	1.8	5.1	1.4
PMN%	Level 1	240	66.2	2.3	3.5	0.7	1.1	1.2	1.8	0.4	0.6	2.7	4.1
	Level 2	240	65.6	1.4	2.1	0.5	0.8	1.0	1.5	1.0	1.5	1.8	2.7
TC-BF#	Level 1	240	0.084	0.003	4.1	0.002	1.9	0.000	0.0	0.002	1.9	0.004	4.5
	Level 2	240	0.344	0.007	2.2	0.002	0.6	0.002	0.7	0.006	1.8	0.008	2.3

b. Reproducibility (Multi-site precision):

A multi-site reproducibility study was conducted at three separate sites (Streck, Sysmex-Buffalo Grove, and Sysmex-Mundelein) on XN-L analyzer with each level of three lots of control for 5 days with 2 runs per day and 3 replicates per run. The data of within-run, between-run, between-lot, between-day, and total precision of each level were calculated following the CLSI EP05-A3 guidelines for all three sites combined and summarized in table below.

MULTI-SITE PRECISION ANALYSIS (Lot 6123)													
				Repeatability		Between-Run		Between-Day		Between-Site		Reproducibility	
Sample	Level	N	Mean	SD	%CV	SD	%CV	SD	%CV	SD	%CV	SD	%CV
WBC-BF	Level 1	90	0.081	0.003	4.1	0.001	0.7	0.002	2.2	0.004	4.7	0.004	4.7
	Level 2	90	0.321	0.008	2.5	0.003	1.0	0.005	1.5	0.010	3.1	0.011	3.4
RBC-BF	Level 1	90	0.029	0.001	3.5	0.000	0.0	0.001	2.0	0.001	4.0	0.001	4.2
	Level 2	90	0.083	0.001	1.7	0.000	0.0	0.001	0.7	0.002	1.8	0.002	2.6
MN#	Level 1	90	0.019	0.002	9.0	0.000	0.0	0.000	2.1	0.002	9.3	0.004	20.0
	Level 2	90	0.087	0.005	5.4	0.001	1.5	0.002	2.5	0.005	6.1	0.006	6.5
PMN#	Level 1	90	0.062	0.003	5.1	0.000	0.0	0.001	2.3	0.003	5.6	0.005	7.8
	Level 2	90	0.234	0.008	3.3	0.003	1.2	0.004	1.8	0.009	3.9	0.011	4.9
MN%	Level 1	90	23.5	2.1	8.8	0.1	0.6	0.0	0.0	2.1	8.9	4.7	19.9
	Level 2	90	27.0	1.4	5.1	0.3	1.3	0.6	2.3	1.6	5.7	1.9	6.9
PMN%	Level 1	90	76.5	2.1	2.7	0.1	0.2	0.0	0.0	2.1	2.7	4.7	6.1
	Level 2	90	73.0	1.4	1.9	0.3	0.5	0.6	0.8	1.6	2.1	1.9	2.6
TC-BF#	Level 1	90	0.081	0.003	4.1	0.001	0.7	0.002	2.2	0.004	4.7	0.004	4.7
	Level 2	90	0.321	0.008	2.5	0.003	1.0	0.005	1.5	0.010	3.1	0.011	3.4

MULTI-SITE PRECISION ANALYSIS (Lot 6179)													
				Repeatability		Between Run		Between Day		Between-Site		Reproducibility	
Sample	Level	N	Mean	SD	%CV	SD	%CV	SD	%CV	SD	%CV	SD	%CV
WBC-BF	Level 1	90	0.076	0.003	3.5	0.002	2.1	0.000	0.5	0.003	4.1	0.004	4.7
	Level 2	90	0.309	0.007	2.1	0.006	1.8	0.002	0.6	0.009	2.9	0.009	3.0
RBC-BF	Level 1	90	0.027	0.001	3.8	0.000	0.0	0.000	0.0	0.001	3.8	0.001	3.8
	Level 2	90	0.080	0.001	1.2	0.001	1.4	0.001	0.7	0.002	2.0	0.002	2.2
MN#	Level 1	90	0.021	0.002	8.2	0.001	3.8	0.000	0.0	0.002	9.0	0.002	9.1
	Level 2	90	0.089	0.004	4.2	0.001	1.5	0.000	0.5	0.004	4.5	0.004	4.9
PMN#	Level 1	90	0.055	0.003	4.8	0.001	1.8	0.000	0.0	0.003	5.2	0.003	6.1
	Level 2	90	0.220	0.005	2.4	0.004	2.0	0.002	0.9	0.007	3.2	0.007	3.3
MN%	Level 1	90	27.9	2.1	7.7	0.5	1.8	0.0	0.0	2.2	7.9	2.3	8.3
	Level 2	90	28.8	1.0	3.3	0.1	0.5	0.2	0.7	1.0	3.4	1.0	3.6
PMN%	Level 1	90	72.1	2.1	3.0	0.5	0.7	0.0	0.0	2.2	3.0	2.3	3.2
	Level 2	90	71.2	1.0	1.3	0.1	0.2	0.2	0.3	1.0	1.4	1.0	1.5
TC-BF#	Level 1	90	0.076	0.003	3.5	0.002	2.1	0.000	0.5	0.003	4.1	0.004	4.7
	Level 2	90	0.309	0.007	2.1	0.006	1.8	0.002	0.6	0.009	2.9	0.009	3.0

MULTI-SITE PRECISION ANALYSIS (Lot 6193)													
				Repeatability		Between Run		Between Day		Between-Site		Reproducibility	
Sample	Level	N	Mean	SD	%CV	SD	%CV	SD	%CV	SD	%CV	SD	%CV
WBC-BF	Level 1	90	0.078	0.004	4.8	0.000	0.0	0.000	0.0	0.004	4.8	0.004	4.8
	Level 2	90	0.317	0.006	2.0	0.002	0.6	0.003	0.8	0.007	2.3	0.008	2.5
RBC-BF	Level 1	90	0.026	0.001	3.9	0.000	0.0	0.000	0.0	0.001	3.9	0.001	3.9
	Level 2	90	0.077	0.001	1.8	0.000	0.0	0.000	0.5	0.001	1.9	0.002	2.2
MN#	Level 1	90	0.022	0.002	8.0	0.001	3.8	0.000	0.0	0.002	8.8	0.002	9.2
	Level 2	90	0.091	0.003	3.5	0.001	1.4	0.001	0.8	0.003	3.8	0.004	3.9
PMN#	Level 1	90	0.056	0.003	5.9	0.000	0.0	0.000	0.0	0.003	5.9	0.003	5.9
	Level 2	90	0.226	0.006	2.5	0.001	0.3	0.002	0.7	0.006	2.6	0.006	2.8
MN%	Level 1	90	27.9	1.846	6.6	0.848	3.0	0.382	1.4	2.067	7.4	2.144	7.7
	Level 2	90	28.8	0.920	3.2	0.255	0.9	0.000	0.0	0.955	3.3	0.955	3.3
PMN%	Level 1	90	72.1	1.846	2.6	0.848	1.2	0.382	0.5	2.067	2.9	2.144	3.0
	Level 2	90	71.2	0.920	1.3	0.255	0.4	0.000	0.0	0.955	1.3	0.955	1.3
TC-BF#	Level 1	90	0.078	0.004	4.8	0.000	0.0	0.000	0.0	0.004	4.8	0.004	4.8
	Level 2	90	0.317	0.006	2.0	0.002	0.6	0.003	0.8	0.007	2.3	0.008	2.5

c. Linearity/assay reportable range:

Not applicable

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

i. Value assignment:

Value assignment for XN CHECK BF™ was based on data collected across three XN-L instruments conducted at three separate sites (Streck, Sysmex-Buffalo Grove, and Sysmex-Mundelein) with three different operators. Three separately manufactured lots of XN CHECK BF™ were tested on each analyzer. Each site was instructed to run each lot and level of control for 5 days with 2 runs per day and 3 replicates per run. The final dataset of each lot resulted in a total of 90 measurements per level (level 1 and level 2). Standard deviation from the multi-site total

reproducibility was used to determine the range of each parameter of XN CHECK BF™. Future control lots will be value assigned at one site by a minimum of one operator. Five repeat measurements will be taken from two separate vials of control material and assayed in a single run on each of 2 days. The average of the 20 individual results will be used for value assignment.

ii. Open-vial stability:

The open-vial stability claim was verified on the XN-L instrument at Streck. Open-vial stability testing was performed in real-time with three lots of control for the 30-day open-vial stability claim throughout the stated product life. One vial of control per level from each lot was analyzed four times at 0, 15, 30 and 31 days. Day 0 is the baseline value that was observed on the first day of the study. Day 31 was collected one day after the stated open-vial stability claim to ensure that the open-vial stability claim was fully encompassed. Throughout the collection of the open-vial stability data each vial of control was stored between 2° to 8° C and removed from the refrigerator for testing. After testing, the vial was returned to the refrigerator until the next testing event.

Stability performance of each control lot was assessed in terms of parameter drift over time (for each parameter), as described in CLSI EP25-A – *"Evaluation of Stability of In Vitro Diagnostic Agents; Approved Guideline."* Values associated with each parameter, for each lot/level, at each time point were within the acceptable value range, supportive of a 30-day open-vial stability claim.

iii. Closed-vial stability:

The 84-day closed-vial stability claim was verified on the XN-L instrument with all three lots of control. Two vials of control per level from each lot were used at each testing interval for this study. A minimum of four data points were collected at each testing event over the 84-day period. Data was collected internally with one operator. Day 0 is the baseline value that was observed on the first day of the study. One data point was collected after the stated closed-vial stability claim to ensure that the closed vial stability claim was fully encompassed.

Results of the closed-vial stability testing were assessed for each lot and level in terms of measurand drift as described in CLSI EP25-A – *"Evaluation of Stability of In Vitro Diagnostic Agents; Approved Guideline"*.

e. Detection limit:

Not applicable

f. Analytical specificity:

Not applicable

g. Assay cut-off:

Not applicable

2. Comparison studies:

a. Method comparison with predicate device:

Not applicable

b. Matrix comparison:

Not applicable

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):

Not applicable

4. Clinical cut-off:

Not applicable

5. Expected values/Reference range:

The end-user is instructed to refer to the product assay sheet accompanying the product information sheet.

N. Proposed Labeling:

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

O. Conclusion:

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