DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
10903 New Hampshire Avenue
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Silver Spring, MD 20993-0002

December 26, 2016

Siemens Healthcare Diagnostics Products GmbH
Ms. Donna Noeh
Regulatory Affairs Manager
Emil-von-Behring Strasse 76
35041 Marburg, Germany

Re: K162688
Trade/Device Name: Sysmex® CS-2100i
Coagulation Factor V Deficient Plasma
Coagulation Factor II, VII and X Deficient Plasmas
Protein C Reagent
Berichrom® Protein C
Regulation Number: 21 CFR 864.5425
Regulation Name: Multipurpose system for in vitro coagulation studies
Regulatory Class: Class II
Product Code: JPA, GGP, GJT
Dated: September 26, 2016
Received: September 27, 2016

Dear Ms. Noeh:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Parts 801 and 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please contact the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely,

Leonthena R. Carrington -S

Leonthena R. Carrington, MS, MBA, MT(ASCP)
Director
Division of Immunology and Hematology Devices
Office of In Vitro Diagnostics and Radiological Health
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: January 31, 2017
See PRA Statement below.

510(k) Number *(if known)*
K162688

Device Name

Sysmex® CS-2100i, Coagulation Factor V Deficient Plasma, Coagulation Factor II, VII, and X Deficient Plasmas, Protein C Reagent, Berichrom® Protein C

Indications for Use *(Describe)*

For Sysmex® CS-2100i:
The Sysmex CS-2100i is a fully automated blood coagulation analyzer intended for in vitro diagnostic use using plasma collected from venous blood samples in 3.2% sodium citrate tubes to analyze clotting, chromogenic and immunoassay methods in the clinical laboratory.
For determination of:

- Prothrombin Time (PT) seconds and PT INR with Dade® Innovin®
- Activated Partial Thromboplastin Time (APTT) with Dade® Actin® FSL
- Fibrinogen (Fbg) with Dade® Thrombin Reagent
- Coagulation Factor V with Dade® Innovin®
- Coagulation Factor VII with Dade® Innovin®
- Protein C with Protein C Reagent
- Antithrombin (AT) with INNOVANCE® Antithrombin
- Protein C with Berichrom® Protein C
- D-dimer with INNOVANCE® D-Dimer

The performance of this device has not been established in neonate and pediatric patient populations.

For Coagulation Factor V Deficient Plasma:
Intended Use
In vitro diagnostic reagent for the determination of the activity of coagulation factor V in human plasma.

For Coagulation Factor VII Deficient Plasma:
Intended Use
In vitro diagnostic reagents for the determination of the activity of coagulation factor II (prothrombin), coagulation factor VII and coagulation factor X in human plasma by coagulometric methods.

For Protein C Reagent:
Intended Use
Protein C Reagent is a coagulation test for the quantitative determination of protein C activity in human plasma.

For Berichrom® Protein C:
Intended Use
For the quantitative determination of functionally active protein C using a chromogenic substrate as an aid in the diagnosis of inherited and acquired deficiencies.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

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510(k) Summary

This summary of 510(k) safety and effectiveness information is submitted in accordance with the requirements of 21 CFR §807.92 and follows the FDA guidance 'The 510(k) Program: Evaluating Substantial Equivalence in Premarket Notifications [510(k)]', issued July 28, 2014.

1 Submitter

Siemens Healthcare Diagnostics Products GmbH

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Date Prepared:	November 18, 2016

2 Device

Name of Device:	Sysmex® Automated Blood Coagulation Analyzer CS-2100i
Common or Usual Name:	Sysmex® CS-2100i; CS-2100i
Classification Name:	Multipurpose system for in vitro coagulation studies (21 CFR 864.5425)
Regulatory Class:	II
Product Code:	JPA
510(k) Review Panel	Hematology

3 Predicate Device

Name of Device:	Sysmex® Automated Blood Coagulation Analyzer CA-1500 (K011235)
Common or Usual Name:	Sysmex® CA-1500
Classification Name:	Multipurpose system for in vitro coagulation studies (21 CFR 864.5425)
Regulatory Class:	II
Product Code:	JPA
510(k) Review Panel	Hematology

The predicate has not been subject to a design-related recall for any of the applications associated with this premarket notification. No reference devices were used in this submission.

Reagent Applications that are the subject of this 510(k) notification:

Reagent Name	K number	Regulation Number	Regulatory Class	Product Code	Panel
Factor V with Dade® Innovin®	K993299	864.7290	2	GJT	Hematology
Factor VII with Dade® Innovin®	K993299	864.7290	2	GJT	Hematology
Protein C with Protein C Reagent	K000649	864.7290	2	GGP	Hematology
Protein C with Berichrom® Protein C	K001645	864.7290	2	GGP	Hematology

4 Device Description / Test Principle

The Sysmex® CS-2100i is an automated blood coagulation instrument which can analyze samples using clotting, chromogenic and immunoassay methods. Analysis results are displayed on the Information Processing Unit (IPU) screen. They can be printed on external printers or transmitted to a host computer. Sold separately from the instrument are the associated

- Reagents
- Controls
- Calibrators
- Consumable materials

The subject of this 510(k) notification are reagent applications which perform the coagulation tests Coagulation Factor V with Dade® Innovin®, Coagulation Factor VII with Dade® Innovin®, Protein C with Protein C Reagent and Protein C with Berichrom® Protein C.

The analysis principles used on the instrument are reflected by the reagent application testing provided in this 510(k) notification and is described in the below table.

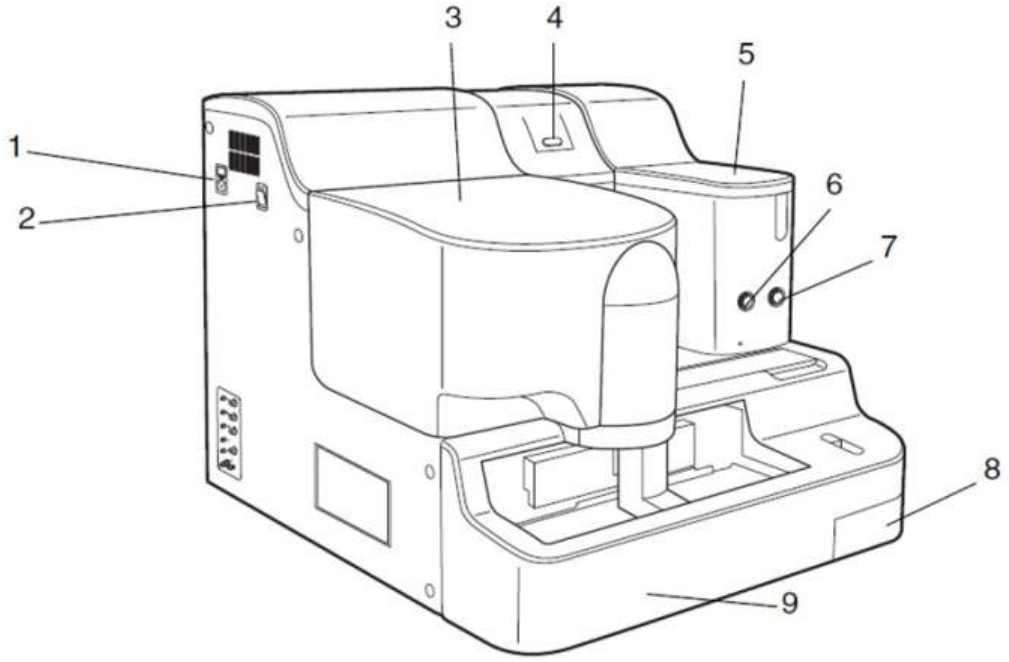
Table of Sysmex® CS-2100i Analysis Principles		
Reagent	**Application**	**Methodology**
Dade® Innovin® with Coagulation Factor V Deficient Plasma	Coagulation Factor V with Dade® Innovin®	Clotting (extrinsic pathway)

Dade® Innovin® with Coagulation Factor VII Deficient Plasma	Coagulation Factor VII with Dade® Innovin®	Clotting (extrinsic pathway)
Protein C Reagent	Protein C with Protein C Reagent	Clotting
Berichrom® Protein C	Protein C with Berichrom® Protein C	Chromogenic

The intended Environment of Use is a clinical central/hospital laboratory.

Instrument (main unit)

Figure 1: Front View of the Sysmex CS-2100i (main unit)



(1) Power connector: Connected to the power cable.

(2) Power Switch: Turns the power ON and OFF.

(3) Light shield lid: Open this cover to set reagents and perform maintenance.

(4) Alarm indicator LED: This displays alarms affecting the instrument.

(5) Cuvette hopper: Holds cuvettes and automatically supplies them to the instrument.

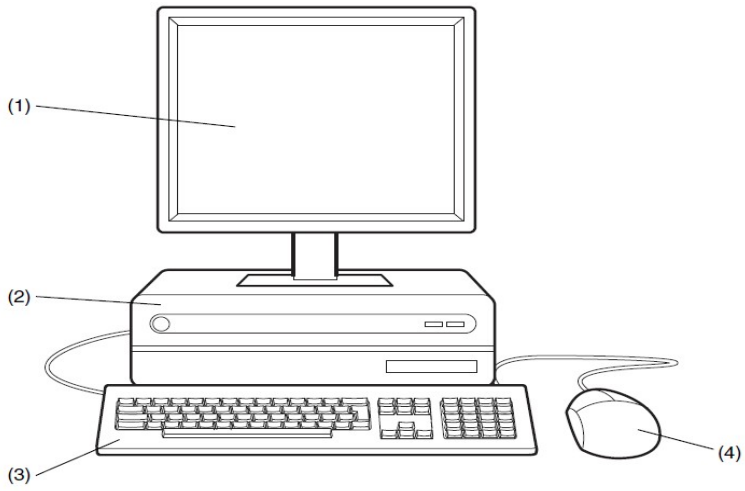
(6) Start button: This is the same as the Start button on the IPU screen.

(7) Mechanical stop switch: Press this switch to immediately stop the instrument's mechanical movement.

(8) Cuvette trash tray: Used cuvettes are discarded here.

(9) Sampler: The sampler automatically transports samples that are set in the sample rack to the aspiration position.

Figure 2: Informational Processing Unit (IPU) Sysmex CS-2100i



(1) Touch panel display: Displays the IPU screen. It can also be used as a touch panel.

(2) IPU Main Unit: This is the Main Unit of IPU.

(3) Keyboard: Used to operate the IPU together with the touch panel.

(4) Mouse: Used to operate the IPU together with the touch panel.

The instrument is capable of measuring in the following analysis modes:

(1) Normal mode: Samples for all the analyses including re-analyses are taken into the instrument at the same time and analyzed. Automatic re-analysis can also be performed.

(2) Micro-sample mode: The sample volume from samples set in the sampler or STAT holder is taken into the instrument for each analysis through dispensing sample probe and analyzed. This analysis mode can also be performed with less sample volume than normal mode; however, automatic re-analysis cannot be performed.

5 Intended Use / Indications for Use

The Sysmex® CS-2100i is a fully automated blood coagulation analyzer intended for in vitro diagnostic use using plasma collected from venous blood samples in 3.2% sodium citrate tubes to analyze clotting, chromogenic and immunoassay methods in the clinical laboratory.

For determination of:

- Prothrombin Time (PT) seconds and PT INR with Dade® Innovin®
- Activated Partial Thromboplastin Time (APTT) with Dade® Actin® FSL
- Fibrinogen (Fbg) with Dade® Thrombin Reagent
- Coagulation Factor V with Dade® Innovin®
- Coagulation Factor VII with Dade® Innovin®
- Protein C with Protein C Reagent
- Antithrombin (AT) with INNOVANCE® Antithrombin
- Protein C with Berichrom® Protein C
- D-dimer with INNOVANCE® D-Dimer

The performance of this device has not been established in neonate and pediatric patient populations.

Coagulation Factor V with Dade® Innovin®

In vitro diagnostic reagent for the determination of the activity of factor V in human plasma.

Coagulation Factor VII with Dade® Innovin® Plasma

In vitro diagnostic reagent for the determination of the activity of coagulation factor VII (prothrombin), coagulation factor VII and coagulation factor X in human plasma by coagulometric methods.

Protein C with Protein C Reagent

Protein C Reagent is a coagulation test for the quantitative determination of protein C activity in human plasma.

Protein C with Berichrom® Protein C

For the quantitative determination of functionally active protein C using a chromogenic substrate as an aid in the diagnosis of inherited and acquired deficiencies.

6 Comparison of Technological Characteristics with the Predicate Device

Both the subject and predicate instruments employ the same technological characteristics in that they automatically analyze various clotting tests using reagents, calibrators and controls previously cleared for automated coagulation analyzers. The reagents perform at least equally well on both the subject and predicate instruments. At a high level, the devices have the following same technological elements:

Similarities between CS-2100i and CA-1500

Similarities between CS-2100i and CA-1500		
Analyzer Component	**Proposed Device** Sysmex® CS-2100i	**Predicate Device** Sysmex® CA-1500
Regulatory Classification	JPA, Class II System, Multipurpose for in vitro coagulation studies	Same
Intended Use Statement	The Sysmex® CS-2100i is a fully automated blood coagulation analyzer intended for in vitro diagnostic use using plasma collected from venous blood samples in 3.2% sodium citrate tubes to analyze clotting, chromogenic and immunoassay methods in the clinical laboratory. For determination of: • Prothrombin Time (PT) seconds and PT INR with Dade® Innovin® • Activated Partial Thromboplastin Time (APTT) with Dade® Actin® FSL • Fibrinogen (Fbg) with Dade® Thrombin Reagent • Coagulation Factor V with Dade® Innovin® • Coagulation Factor VII with Dade® Innovin® • Protein C with Protein C Reagent • Antithrombin (AT) with INNOVANCE® Antithrombin • Protein C with Berichrom® Protein C • D-dimer with INNOVANCE® D-Dimer The performance of this device has not been established in neonate and pediatric patient populations.	The intended use of the Sysmex® CA-1500 is as a fully automated, computerized blood plasma coagulation analyzer for in vitro diagnostic use in clinical laboratories. The instrument uses citrated human plasma to perform the following parameters and calculated parameters: Clotting Analysis Parameters: Prothrombin Time (PT); Activated Partial Thromboplastin Time (APTT); Fibrinogen (Clauss); Batroxobin Time; Extrinsic Factors (II, V, VII, X); Intrinsic Factors (VIII, IX, XI, XII); Protein C. Chromogenic Analysis Parameters: Antithrombin III; Factor VIII; Plasminogen; Heparin; Protein C; α2-Antiplasmin. Immunologic Analysis Parameters: D-dimer. Calculated Parameters: PT Ratio; PT INR; PT %; Derived Fibrinogen; Factor Assays % Activity.
Sample Type	Human plasma 3.2% sodium citrate	Same

Similarities between CS-2100i and CA-1500		
Analyzer Component	**Proposed Device** Sysmex® CS-2100i	**Predicate Device** Sysmex® CA-1500
Application type	**Clotting Applications:** Prothrombin Time (PT) with Dade® Innovin®; Activated Partial Thromboplastin Time (APTT) with Dade® Actin® FSL; Fibrinogen (Clauss) with Dade® Thrombin Reagent; Coagulation Factor V with Dade® Innovin® Coagulation Factor VII with Dade® Innovin® Protein C with Protein C Reagent	Same
	Chromogenic Application: Antithrombin with INNOVANCE® Antithrombin; Protein C with Berichrom® Protein C	Same
	Immuno-Chemical Application: D-dimer with INNOVANCE® D-Dimer	Same
	Calculated Application: PT INR with Dade® Innovin®	Same
Clinical Reportable Range	Fibrinogen with Dade® Thrombin Reagent 50 to 860 mg/dL; Antithrombin with INNOVANCE® Antithrombin 9.0 to 128% of norm; D-dimer with INNOVANCE® D-dimer 0.19 to 35.2 mg/L FEU; Coagulation Factor V with Dade® Innovin® 6.0 to 149.0% of norm; Coagulation Factor VII with Dade® Innovin® 6.0 to 149.0% of norm; Protein C with Protein C Reagent 10.1 to 131.0% of norm	Same
Specimen Processing	Automatic Pipetting and Dilution	Same

Similarities between CS-2100i and CA-1500		
Analyzer Component	**Proposed Device** Sysmex® CS-2100i	**Predicate Device** Sysmex® CA-1500
Random Access	Yes	Same
Liquid Level Sensing	Yes – reagent and sample	Same
Bar Code Reader	Sample and reagent	Same
STAT Testing	Yes	Same
Sampling Capabilities	Normal and Micro Mode	Same
Sample Volumes (Plasma)	PT with Dade® Innovin® (50 µL) APTT with Dade® Actin® FSL (50 µL) Fibrinogen with Dade® Thrombin Reagent (10 µL) Coagulation Factor V with Dade® Innovin® (5 µL) Coagulation Factor VII with Dade® Innovin® (5 µL) Protein C with Protein C Reagent (5 µL) Protein C with Berichrom® Protein C (15 µL)	Same

Similarities between CS-2100i and CA-1500		
Analyzer Component	**Proposed Device** Sysmex® CS-2100i	**Predicate Device** Sysmex® CA-1500
Sample Volumes in Micro Mode (Plasma)	PT with Dade® Innovin® (50 µL) APTT with Dade® Actin® FSL (50 µL) Fibrinogen with Dade® Thrombin Reagent (10 µL) Coagulation Factor V with Dade® Innovin® (5 µL) Coagulation Factor VII with Dade® Innovin® (5 µL) Protein C with Protein C Reagent (5 µL) Protein C with Berichrom® Protein C (15 µL)	Same
Rinse & Buffer Solutions On-board External	 CA-CLEAN I CA-CLEAN II Dade® Owren's Buffer Water	 Same
Light Source Chromogenic Immuno-chemical	 Halogen Lamp Halogen Lamp	 Same Same
Probes	1 Sample probe; 1 Reagent probe	Same
Wavelengths used in Analysis	Antithrombin with INNOVANCE® Antithrombin (405 nm) Coagulation Factor V with Dade® Innovin® (Default = 660 nm; sub-wavelength = none) Coagulation Factor VII with Dade® Innovin® (Default = 660 nm; Sub-wavelength= none) Protein C with Protein C Reagent (Default = 660 nm; Sub-wavelength=	Same

Similarities between CS-2100i and CA-1500		
Analyzer Component	**Proposed Device** Sysmex® CS-2100i	**Predicate Device** Sysmex® CA-1500
	none) Protein C with Berichrom® Protein C (Default = 405 nm; Sub-wavelength= none)	
Temperature Control	Sample incubation well: 37 °C ± 1.0 °C	Same

Differences between Sysmex® CS-2100i and Sysmex® CA-1500

Differences between CS-2100i and CA-1500		
Analyzer Component	**Proposed Device** Sysmex® CS-2100i	**Predicate Device** Sysmex® CA-1500
Clinical Reportable Range	Protein C with Berichrom® Protein C 10.0 to 138% of norm	5.0 to 138% of norm
Operating Principle	Clotting: Transmitted Light Detection (Absorbance) at 340, 405, 575, 660 or 800 nm. Wavelengths 340, 405 and 575 are technically available but not validated in combination with the intended applications. Chromogenic: Transmitted Light Detection (Absorbance) at 340, 405, 575, 660, 800 nm. Wavelengths 340, 575, 660, and 800 are technically available but not validated in combination with the intended applications. Immunochemical: Transmitted Light Detection (Absorbance) at 340, 405, 575, 660 or 800 nm. Wavelengths 340, 405, 575, and 800 are technically available but not validated in combination with the intended applications.	Scattered Light Detection at 660 nm Transmitted Light Detection (Absorbance) at 405, 575, 800 nm Transmitted Light Detection (Absorbance) at 405, 575, or 800 nm
Wavelengths* used in Analysis *The default wavelength is normally used to generate the reported value of the measurement. The sub-wavelength is run in parallel. If a light intensity error occurs by using the default wavelength the value from the sub-wavelength is used automatically.	PT (seconds) Dade® Innovin® (Default = 660 nm; Sub- Wavelength= 800 nm) PT (INR) with Dade® Innovin® (Default = 660 nm; Sub-Wavelength= 800 nm) APTT with Dade® Actin® FSL Activated PTT Reagent (Default = 660 nm; Sub-Wavelength= 800 nm)	PT (seconds) with Dade® Innovin® Default = 660 nm; Sub-Wavelength= none) PT (INR) with Dade® Innovin® (Default = 660 nm; Sub-Wavelength= none) APTT with Dade® Actin® FSL Activated PTT Reagent (Default = 660 nm; Sub-Wavelength= none)

Differences between CS-2100i and CA-1500		
Analyzer Component	**Proposed Device** Sysmex® CS-2100i	**Predicate Device** Sysmex® CA-1500
Light Source Clotting	Halogen Lamp	Light Emitting Diode
Cap Piercing	Cap Piercer only	Both Cap Piercer model and Non-Cap Piercer models are available
Temperature Control	Detector: 37 ± 0.5 ºC Reagent probe: 37.5 ± 0.5 ºC	Detector: 37 ± 1.0 °C Reagent probe: 37 ± 1.0 °C
Reagent Cooling	10 ± 2 °C, when ambient temperature is 20 – 28 °C. During operation 4 – 15 °C, when ambient temperature is 15 – 30 °C	15 ± 2 °C, when ambient temperature is 15 – 30 °C
Pipetting Capabilities	Reagent probe: 20 – 200 µL Sample probe: 4 – 270 µL	Reagent probe: 3 – 200 µL Sample probe: 5 – 450 µL
Sample Volumes (Plasma)	Antithrombin with INNOVANCE® Antithrombin (14 µL) D-dimer with INNOVANCE® D-Dimer (15 µL)	Antithrombin with INNOVANCE® Antithrombin (10 µL) D-dimer with INNOVANCE® D-Dimer (13 µL)

The above described differences do not raise new questions as to safety and effectiveness of the new device.

7 Performance Data

The following performance data were provided in support of the substantial equivalence determination.

7.1 Method comparison

Method comparison studies designed according to EP09-A3 CLSI Guideline 'Measurement Procedure Comparison and Bias Estimation Using Patient Samples' were conducted at four external sites in the United States, all sites using the same protocol.

Samples were measured on both the predicate device (Sysmex® CA-1500) as well as the new device (Sysmex® CS-2100i), in random order to eliminate any inherent bias. Results were compared by Passing-Bablok regression analysis as well as Bland-Altman plots. Results from each application met the predetermined acceptance criteria. The following summary of Passing-Bablok regression from the multi-center study shows that the proposed and predicate devices provide equivalent results when used in a clinical setting.

Application	N	Sample range (% of norm)	r	Slope (95% CI)	Intercept (95% CI)
Factor V with Dade® Innovin®	589	7.2 - 145.1	0.983	0.990 (0.977, 1.003)	1.861 (1.025, 2.784)
Factor VII with Dade® Innovin®	492	6.2 - 148.8	0.991	1.039 (1.028, 1.051)	0.636 (-0.135, 1.104)
Protein C with Protein C Reagent	584	10.3 - 129.3	0.977	0.966 (0.952, 0.981)	-0.372 (-1.207, 0.470)
Protein C with Berichrom® Protein C	507	11.3 - 134.7	0.994	0.942 (0.934, 0.951)	-0.292 (-1.037, 0.399)

7.2 Reproducibility Studies

Twenty-day precision studies were performed at two external sites in Germany and one external site in the United States. Testing followed the scheme of two runs per day, with two replicates per run, at each of the three sites according to CLSI EP05-A2 'Evaluation of Precision Performance of Quantitative Measurement Methods'. The order of the analysis of parameter, samples and quality control samples for each run and day varied to avoid an inherent bias to the study. One calibration curve of each calibrated application was used in the study. Within Run, Between Run, Between Day, and Total (within site) were calculated. The data is summarized in the following tables.

Sysmex® CS-2100i: Reproducibility Summary Table, Within Run				
Application (measuring interval)	**1st Site *Within Run* (%CV)**	**2nd Site *Within Run* (%CV)**	**3rd Site *Within Run* (%CV)**	**Sites Combined (%CV)**
Coagulation Factor V with Dade® Innovin® (6.0 - 149.0% of norm)	4.07 – 7.40	2.07 – 3.34	2.70 – 6.09	3.16 – 5.01
Coagulation Factor VII with Dade® Innovin® (6.0 - 149.0% of norm)	1.74 – 2.38	1.71 – 2.87	1.99 – 2.59	1.85 – 2.63
Protein C with Protein C Reagent (10.1 - 131.0% of norm)	2.26 – 3.75	2.08 – 2.68	2.43 – 7.02	2.46 – 4.78
Protein C with Berichrom® Protein C (10.0 - 138.0% of norm)	1.02 – 5.34	1.00 – 4.56	1.20 – 5.26	1.15 – 4.63

Sysmex® CS-2100i: Reproducibility Summary Table, Between Run				
Application (measuring interval)	**1st Site *Between Run* (%CV)**	**2nd Site *Between Run* (%CV)**	**3rd Site *Between Run* (%CV)**	**Sites Combined (%CV)**
Coagulation Factor V with Dade® Innovin® (6.0 - 149.0% of norm)	0.00 – 2.80	0.00 – 3.87	0.00 – 3.36	1.76 – 2.55
Coagulation Factor VII with Dade® Innovin® (6.0 - 149.0% of norm)	0.65 – 1.41	0.00 – 1.35	0.00 – 2.32	0.00 – 1.72
Protein C with Protein C Reagent (10.1 - 131.0% of norm)	0.00 – 1.65	0.85 – 2.70	0.00 – 2.50	0.56 – 1.95
Protein C with Berichrom® Protein C (10.0 - 138.0% of norm)	0.54 – 2.51	0.32 – 2.23	0.00 – 1.20	0.84 – 1.66

Sysmex® CS-2100i: Reproducibility Summary Table, Between Day				
Application (measuring interval)	**1st Site *Between Day* (%CV)**	**2nd Site *Between Day* (%CV)**	**3rd Site *Between Day* (%CV)**	**Sites Combined (%CV)**
Coagulation Factor V with Dade® Innovin® (6.0 - 149.0% of norm)	0.00 – 1.55	0.00 – 2.56	0.00 – 2.81	0.00 – 1.64
Coagulation Factor VII with Dade® Innovin® (6.0 - 149.0% of norm)	0.00 – 1.02	1.48 – 2.68	0.00 – 1.92	0.89 – 1.67
Protein C with Protein C Reagent (10.1 - 131.0% of norm)	0.00 – 2.41	0.00 – 1.20	0.00 – 2.60	0.00 – 2.17
Protein C with Berichrom® Protein C (10.0 - 138.0% of norm)	0.00 – 0.57	0.00 – 1.02	0.00 – 2.36	0.00 – 1.40

CS-2100i: Reproducibility Summary Table, Total CV (Within Site and Sites Combined)				
Application (measuring interval)	**1st Site Total CV *Within Site* (%CV)**	**2nd Site Total CV *Within Site* (%CV)**	**3rd Site Total CV *Within Site* (%CV)**	**Total CV *Sites Combined* (%CV)**
Coagulation Factor V with Dade® Innovin® (6.0 - 149.0% of norm)	4.64 – 7.40	3.37 – 5.12	3.85 – 6.95	4.78 – 10.43
Coagulation Factor VII with Dade® Innovin® (6.0 - 149.0% of norm)	2.01 – 2.81	2.58 – 3.56	2.23 – 3.31	2.57 – 3.59
Protein C with Protein C Reagent (10.1 - 131.0% of norm)	2.78 – 4.55	2.36 – 3.83	3.47 – 7.49	3.47 – 5.85
Protein C with Berichrom® Protein C (10.0 - 138.0% of norm)	1.40 – 5.91	1.40 – 5.18	1.70 – 5.26	2.19 – 5.69

7.3 Detection Capability Results

Detection capability studies were measured for the calibrated assays on the Sysmex® CS-2100i: Coagulation Factor V with Dade® Innovin®, Coagulation Factor VII with Dade® Innovin®, Protein C with Protein C Reagent, and Protein C with Berichrom® Protein C. Studies were conducted following the CLSI document EP17-A2 'Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures'. Data for all tested reagents met the predetermined acceptance criteria and support the lower limit of the clinically reportable range claim.

Sysmex® CS-2100i: Summary of Limit of Quantitation Studies			
Application	**Lower Limit of Clinically Reportable Range (% of norm)**	**Measured Limit of Quantitation based on predicate (% of norm)**	**Maximum Total Error (% of norm)**
Coagulation Factor V with Dade® Innovin®	6.0	4.80	2.04
Coagulation Factor VII with Dade® Innovin®	6.0	3.39	0.21
Protein C with Protein C Reagent	10.1	9.35	3.62
Protein C with Berichrom® Protein C	10.0	8.32	2.07

7.4 Linearity & Measuring Range

Linearity studies were performed for the calibrated assays on the Sysmex® CS-2100i: Coagulation Factor V with Dade® Innovin®, Coagulation Factor VII with Dade® Innovin®, Protein C with Protein C Reagent, and Protein C with Berichrom® Protein C. All reagents met the predetermined acceptance criteria and support the clinically reportable range claim. Studies were conducted as described in CLSI EP6-A 'Evaluation of the Linearity of Quantitative Measurement Procedures: A Statistical Approach'.

Sysmex® CS-2100i: Linearity and Measuring Range Summary		
Application	**Measured Linear Range**	**Clinically Reportable Range**
Coagulation Factor V with Dade® Innovin®	3.4 – 180.7% of norm	6.0 – 149.0% of norm
Coagulation Factor VII with Dade® Innovin®	4.3 – 179.5% of norm	6.0 – 149.0% of norm
Protein C with Protein C Reagent	7.0 – 187.7% of norm	10.1 – 131.0% of norm
Protein C with Berichrom® Protein C	7.1 – 181.3% of norm	10.0 – 138.0% of norm

7.5 Reference Interval

Reference interval studies were conducted at three clinical study sites in the United States following the guidance of CLSI document EP28-A3c '*Defining, Establishing, and Verifying Reference Intervals in the Clinical Laboratory*'. The summary is provided below. The study population did not include neonate and pediatric sample populations.

Sysmex® CS-2100i: Reference Interval Summary Table		
Application	**N**	**Sysmex® CS-2100i Reference Interval** (5^{th} Percentile of norm)
Coagulation Factor V with Dade® Innovin®	193	79.8%
Coagulation Factor VII with Dade® Innovin®	193	65.6%
Protein C with Protein C Reagent	193	75.6%
Protein C with Berichrom® Protein C	191	84.9%

8 Conclusions

Because the predicate device was cleared based in part on the results of clinical studies, and because clinical settings are required for a well-validated device, clinical testing was required to support substantial equivalence.

The non-clinical data support the safety of the device.

The clinical data demonstrate that the Sysmex® CS-2100i performs comparably to the predicate device that is currently marketed for the same intended use.

The data submitted for this premarket notification demonstrates that the device raises no new concerns as to safety and effectiveness when compared to the predicate device, and is substantially equivalent to the predicate device.