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

June 15, 2015

SIEMENS HEALTHCARE DIAGNOSTICS
HELEN LEE
REGULATORY TECHNICAL SPECIALIST
500 GBC DRIVE M/S 514
NEWARK DE 19714

Re: K140790
Trade/Device Name: Dimension Vista® Chemistry 1 Calibrator (CHEM 1 CAL)
Dimension Vista® Magnesium Flex® Reagent Cartridge (MG)
Regulation Number: 21 CFR 862.1150
Regulation Name: Calibrator, Multi-Analyte Mixture
Regulatory Class: II
Product Code: JIX, JGJ
Dated: May 4, 2015
Received: May 5, 2015

Dear Ms. Helen Lee:

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 regulations (21 CFR Parts 801 and 809), 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" (21 CFR 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 yours,

Courtney H. Lias -S

Courtney H. Lias, Ph.D.
Director
Division of Chemistry and Toxicology 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)*
k140790

Device Name
Dimension Vista® Magnesium Flex® reagent cartridge (MG)
Dimension Vista® Chemistry 1 Calibrator (CHEM 1 CAL)

Indications for Use *(Describe)*
The Dimension Vista® Magnesium Flex® reagent cartridge (MG) method is an in vitro diagnostic test for the quantitative measurement of magnesium in human serum, plasma and urine on the Dimension Vista® System. Magnesium measurements are used in the diagnosis and treatment of hypomagnesemia (abnormally low plasma levels of magnesium) and hypermagnesemia (abnormally high plasma levels of magnesium).

The Dimension Vista® Chemistry 1 Calibrator (CHEM 1 CAL) is an in vitro diagnostic product for the calibration of Blood Urea Nitrogen (BUN),Calcium (CA), Cholesterol (CHOL), Creatinine (CRENCRE2), Glucose (GLU), Lactic Acid (LA), Magnesium (MG), Thyroxine (T4), Thyronine Uptake (TU) and Uric Acid (URCA) methods on the Dimension Vista® System.

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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5.0 510 (k) Summary

5.1 Description

Dimension Vista® Chemistry 1 Calibrator (CHEM 1 CAL) / Class II
Dimension Vista® Magnesium Flex® reagent cartridge (MG) /Class I

This summary of 510(k) safety and effectiveness information is submitted in accordance with the requirements of SMDA 1990 and 21 CFR §807.92.

5.2 Assigned 510(k) number

The assigned 510(k) number is: k140790

5.3 Applicant and Date

Applicant: Helen M. Lee
Siemens Healthcare Diagnostics
500 GBC Drive
Mailstop 514
Newark, DE 19714-6101

Date: June 11, 2015

5.4 Proprietary and Established Names

Dimension Vista® Chemistry 1 Calibrator (CHEM 1 CAL)
Dimension Vista® Magnesium Flex® reagent cartridge (MG)

5.5 Regulatory Information

Dimension Vista® Chemistry 1 Calibrator (CHEM 1 CAL)

Classification Name:	Calibrator, Multi-Analyte
Regulation Section:	862.1150 - Calibrator
Classification;	Class II
Product Code:	JIX
Panel:	Clinical Chemistry

Dimension Vista® Magnesium Flex®reagent cartridge (MG)

Classification Name:	Photometric method, Magnesium, secondary
Regulation Section:	862.1495 - Magnesium test system
Classification;	Class 1
Product Code:	JGJ
Panel:	Clinical Chemistry

5.6 Predicate Devices

Dimension® Chemistry 1 Calibrator (CHEM 1 CAL) – k061838
Dimension® Magnesium Flex® reagent cartridge (MG) - k061655

5.7 Device Description(s)/Test Principle:

CHEM 1 CAL is a liquid, frozen multi-analyte, bovine serum albumin based product used to calibrate blood urea nitrogen, calcium, cholesterol, creatinine, glucose, lactic acid, magnesium, thyroxine, thyronine uptake and uric acid. The kit consists of six vials, three vials of Calibrator A and three vials of Calibrator B.

The Dimension Vista® MG Flex® reagent cartridge uses a modified methylthymol blue (MTB) complexometric technique. MTB forms a blue complex with magnesium. Calcium interference is minimized by forming a complex between calcium and Ba-EGTA (chelating agent). The amount of MG-MTB complex formed is proportional to the magnesium concentration and is measured using a bichromatic (600 and 510 nm) endpoint technique.

5.8 Device Intended Use:

The CHEM 1 CAL is an in vitro diagnostic product for the calibration of Blood Urea Nitrogen (BUN) Calcium (CA), Cholesterol (CHOL), Creatinine (CREA/CRE2), Glucose (GLU), Lactic Acid (LA), Magnesium (MG), Thyroxine (T4), Thyronine Uptake (TU) and Uric Acid (URCA) methods on the Dimension Vista® System.

The MG method is an *in vitro* diagnostic test for the quantitative measurement of magnesium in human serum, plasma and urine on the Dimension Vista® System. Magnesium measurements are used in the diagnosis and treatment of hypomagnesemia (abnormally low plasma levels of magnesium) and hypermagnesemia (abnormally high plasma levels of magnesium).

5.9 Indications for Use

The Dimension Vista® Chemistry 1 Calibrator (CHEM 1 CAL) is an in vitro diagnostic product for the calibration of Blood Urea Nitrogen (BUN) Calcium (CA), Cholesterol (CHOL), Creatinine (CRENCRE2), Glucose (GLU), Lactic Acid (LA), Magnesium (MG), Thyroxine (T4), Thyronine Uptake (TU) and Uric Acid (URCA) methods on the Dimension Vista® System.

The Dimension Vista® Magnesium Flex® reagent cartridge (MG) is an *in vitro* diagnostic test for the quantitative measurement of magnesium in human serum, plasma and urine on the Dimension Vista® System. Magnesium measurements are used in the diagnosis and treatment of hypomagnesemia (abnormally low plasma levels of magnesium) and hypermagnesemia (abnormally high plasma levels of magnesium).

5.10 Substantial Equivalence Information:

The proposed Siemens Healthcare Diagnostics Dimension Vista® CHEM 1 CAL (KC110B) and the predicate Dimension Vista® CHEM 1 CAL (k061838) are the exact same products with the same formulation. They are both in vitro diagnostics products for the calibration of Blood Urea Nitrogen, Calcium, Cholesterol, Creatinine, Glucose, Lactic Acid, Magnesium, Thyroxine, Thyronine Uptake and Uric Acid methods on the Dimension Vista® System. The modification described in this 510(k) submission is a change to use System Water instead of Dimension Vista® CHEM 1 CAL Level 1(CAL A), when calibrating the Dimension Vista® Magnesium method.

A comparison summary of the features of both products is included in the table on the following page.

A comparison of the similarities and differences between the Dimension Vista® Magnesium Flex® reagent cartridge (MG) (proposed device) and the Dimension® Magnesium Flex® reagent cartridge (MG) - k061655 is also included in the following tables.

Similarities between the Proposed and Predicate Magnesium Devices

Feature	**Proposed Device** **Dimension Vista® Magnesium Flex® reagent cartridge (MG)**	**Predicate Device** **Dimension® Magnesium Flex® reagent cartridge (MG)**
Intended Use	The MG method is an *in vitro* diagnostic test for the quantitative measurement of magnesium in human serum, plasma and urine on the Dimension Vista® System. Magnesium measurements are used in the diagnosis and treatment of hypomagnesemia (abnormally low plasma levels of magnesium) and hypermagnesemia (abnormally high plasma levels of magnesium).	The MG method used on the Dimension® clinical chemistry system is an *in vitro* diagnostic test intended for the quantitative determination of magnesium in human serum, heparinized plasma and urine.

Differences Between the Proposed and Predicate Magnesium Devices

Feature	**Proposed Device** **Dimension Vista® Magnesium Flex® reagent cartridge (MG)**	**Predicate Device** **Dimension® Magnesium Flex® reagent cartridge (MG)**
Methodology	Methylthymol blue (MTB)	Methylthymol blue (MTB)
Calibration Interval	90 days	90 days
Limit of Blank/Analytical Sensitivity	0.2 mg/dL (LoB)	0.0 mg/dL (Analytical Sensitivity)
Measuring Range – Serum/Plasma	0.3-10.0 mg/dL	0.0-20.0 mg/dL
Measuring Range – Urine	0.3-10.0 mg/dL	0.0-20.0 mg/dL
Detection Conditions	Bichromatic 600 and 510 nm	Bichromatic 600 and 510 nm
Expected Values – Serum/Plasma	1.6-2.6 mg/dL	1.8-2.4 mg/dL

Similarities between the Proposed and Predicate Calibrators

Feature	Proposed Device Dimension Vista® CHEM 1 CAL	Predicate Device Dimension Vista® CHEM 1 CAL (KC110B)
Intended Use	Same	The CHEM 1 CAL is an in vitro diagnostic product for the calibration of Calcium (CA), Cholesterol (CHOL), Creatinine (CREA), Glucose (GLU), Lactic Acid (LA), Magnesium (MG), Thyroxine (T4), Thyroxine Uptake (TU), Blood Urea Nitrogen (BUN) and Uric Acid (URCA) methods on the Dimension Vista® System.
Traceability	Same	MG - NIST SRM 929
Form	Same	Frozen Liquid

Differences between the Proposed and the Predicate Calibrators

Feature	Proposed Device Dimension Vista® CHEM 1 CAL	Predicate Device Dimension Vista® CHEM 1 CAL
Catalog # /REF	KC110B	KC110B
Typical Calibration Levels for the MG Method	Level 1: 0.0 mg/dL [0.00 mmol/L] will be used for Level 1 (not Calibrator A) Level 2 (Calibrator B): same as the predicate	Level 1(Calibrator A): 0.3 mg/dL [0.12 mmol/L] Level 2 (Calibrator B): 21.1 mg/dL [8.68 mmol/L]

5.11 Standards/Guidance Document References

- Stability Testing of In Vitro Diagnostic Reagents (CEN 13640)
- Interference Testing of Clinical Chemistry; Approved Guideline (EP07-A2)
- Method Comparison and Bias Estimation Using Patient Samples; Approved Guideline (EP09-A2)
- Evaluation of the Linearity of Quantitative Measurement; Approved Guideline (EP06-A)
- Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures (EP17-A2)
- Evaluation of Precision Performance of Quantitative Measurement Methods; Approved Guideline (EP05-A2)
- Defining, Establishing, and Verifying Reference Intervals in the Clinical Laboratory; Approved Guideline Third Edition (EP28-A3c)

5.12 Performance Characteristics

The following data represent typical method performance. Data were collected on the Dimension Vista® 1500 System.

5.12.1 Method Comparison

Testing was conducted internally by Siemens Healthcare Diagnostics R&D personnel. The technicians conducting the studies had training similar to personnel who would perform testing in a hospital laboratory setting. Technicians were trained on the operation of both the proposed device and the predicate device. A split sample method comparison study, following EP09-A2, demonstrated good agreement between the Dimension Vista® MG Flex® reagent cartridge versus the Beckman AU Magnesium assay (K981743).

A combined total of 239 serum and plasma samples were tested on the Dimension Vista® MG Flex® reagent cartridge and the Beckman AU Magnesium assay. In an additional study, 99 urine samples were tested using the Dimension Vista® MG Flex® reagent cartridge versus the Beckman AU Magnesium assay. All samples were run in duplicate however; only the first result was used for analysis.

Comparative Method	Sample Type	Range (mg/dL)	Slope	Intercept (mg/dL)	Correlation Coefficient	N
Vista MG method vs Beckman AU MG method	Serum	0.6-7.7	1.10	-0.15	1.00	114
	Lithium heparin plasma	0.8-7.5	1.05	-0.01	0.994	125
	Urine	1.5 - 9.3	1.05	0.09	0.995	99

5.12.2 Precision

Precision testing was performed in accordance with CLSI EP05-A2 Evaluation of Precision Performance of Quantitative Measurement Methods; Approved Guideline- Second Edition.

Samples consisted of two serum pools, three levels of Multiqual QC material, one level of Liquichek Urine QC material and one urine pool.

Testing was performed over 20 days, two separate runs with two test samples for each test material. Analysis of variance (ANOVA) was used to evaluate the data consistent with the recommendations of EP05-A2. The following table is a summary of the data.

	Mean (mg/dL) [mmol/ dL]	**Standard Deviation (%CV)**	
		Repeatability	**Within-Lab**
Multiqual® Unassayed Control			
Level 1	1.1 [0.45]	0.1 [0.04] (4.8)	0.1 [0.04] (5.1)
Level 2	2.5 [1.03]	0.1 [0.04] (2.9)	0.1 [0.04] (2.9)
Level 3	4.0 [1.60]	0.1 [0.04] (1.9)	0.1 [0.04] (2.4)
Serum Pool 1	1.9 [0.78]	0.1 [0.04] (3.4)	0.1 [0.04] (3.7)
Serum Pool 2	4.5 [1.85]	0.1 [0.04] (1.8)	0.1 [0.04] (2.1)
Liquichek™ Urine Chemistry Control			
Level 1	7.0 [2.88]	0.1 [0.04] (1.2)	0.1 [0.04] (1.5)
Urine Pool 1	7.3 [3.00]	0.1 [0.04] (1.0)	0.1 [0.04] (1.3)

5.12.3 Limit of Blank and Limit of Detection

Serum:

The Limit of Detection (LoD) for MG, using serum samples, is 0.2 mg/dL [0.08 mmol/L], determined consistent with CLSI guideline EP17-A2 and with proportions of false positives (α) less than 5% and false negatives (β) less than 5%; based on 96 determinations, with 4 blank and 4 low level samples.

Dimension Vista® Magnesium Limit of Detection with Serum		
Test	**Protocol**	**Value**
LoB	Four samples with no analyte were tested (n=5) for three days, one run/day, using two reagent lots	0.002 mg/dL
LoD	Four low serum samples were tested (n=5) for three days one run/day, using two reagent lots	0.1 mg/dL

The nonparametric approach described in CLSI EP17-A2 was followed to determine the Limit of Detection.

LoB=Mean of Blank Measurement + 1.645 X Standard Deviation of Blank Measurements

LoD=Limit of Blank + C_pSD_s

C_p is a correction factor for the 95% CI normal variate to account for bias in the SD_s estimate

SD_s is an estimate of imprecision pooled from replicates of the low level samples

The LoB was determined to be 0.002 mg/dL in serum samples with no analyte and is consistent with the claim of 0.2 mg/dL.

The LoD was determined to be 0.1 mg/dL in serum samples and is consistent with the claim of 0.3 mg/dL.

Urine:

The Limit of Detection (LoD) for MG, using urine samples, is 0.3 mg/dL, determined consistent with CLSI guideline EP17-A2 and with proportions of false positives (α) less than 5% and false negatives (β) less than 5%; based on 96 determinations, with 4 blank and 4 low level samples.

Dimension Vista® Magnesium Limit of Detection with Urine		
Test	**Protocol**	**Value**
LoB	Five diluted urine samples were tested (n=5) for three days, one run/day, using two reagent lots	0.2 mg/dL
LoD	Five low concentration urine samples were tested (n=5) for three days one run/day, using two reagent lots	0.3 mg/dL

The nonparametric approach described in CLSI EP17-A2 was followed to determine the Limit of Detection.

LoB=Mean of Blank Measurement + 1.645 X Standard Deviation of Blank Measurements

LoD=Limit of Blank + C_pSD_s

C_p is a correction factor for the 95% CI normal variate to account for bias in the SD_s estimate

SD_s is an estimate of imprecision pooled from replicates of the low level samples

The LoB was determined to be 0.2 mg/dL in urine samples with no analyte and is consistent with the claim of 0.2 mg/dL.

The LoD was determined to be 0.3 mg/dL in urine samples and is consistent with the claim of 0.3 mg/dL.

5.12.4 Limit of Quantitation

Testing involved running six serum samples and six urine samples with magnesium levels at the trial LoQ concentration of approximately 0.3 mg/dL. Five replicates (n=5) of each sample were run with two different reagent lots, on three days, to produce a total of 90 replicates for each lot. A LoQ concentration was calculated for each lot, and the larger LoQ from the 2 lots was taken as the final LoQ result.

TE = Total Error = |Bias| + 2 x sd

The calculated TE for all serum samples, for each reagent lot tested, met the goal of TE ≤ 0.2 mg/dL, therefore, the serum LoQ criterion was deemed to be met. The lowest serum sample concentration that met the goal for both reagent lots: 13361BA and 14196AA, was 0.2 mg/dL. The results support the MG LoQ claim of 0.3 mg/dL.

TE = Total Error = |Bias| + 2 x sd

The calculated TE for all urine samples, for each reagent lot tested, met the goal of TE ≤ 0.2 mg/dL, therefore, the urine LoQ criterion was deemed to be met. The lowest urine sample concentration that met the goal for both reagent lots: 14196AA and 14303BA was 0.3 mg/dL. The results support the MG LoQ claim of 0.3 mg/dL.

The LoQ for the MG assay is 0.3 mg/dL, determined consistent with the guidelines in CLSI document EP17-A2, based on 180 determinations; and a Total Error goal of 0.2 mg/dL calculated using the Westgard model.

5.12.5 Linearity

Linearity was evaluated using a series of manually prepared dilutions of serum and urine samples that spanned the assay range. The individual samples were prepared by blending samples with high and low magnesium concentrations across the measurement range as described in CLSI Evaluation of the Linearity of Quantitative Measurement Procedures (EP06-A).

Regression Statistics

Sample	Range	Units	Slope	Intercept	Corr Coef	n
Serum	0.4 – 11.4	mg/dL	1.0109	-0.0089	0.9998	9
Urine	0.3 – 11.4	mg/dL	0.9997	0.0583	0.9986	9

5.13 Conclusion

The Dimension Vista® Chemistry 1 Calibrator (KC110B) is substantially equivalent in design, formulation, packaging and intended use to the Dimension Vista® Chemistry 1 Calibrator previously cleared under k061838.

The modification described in this 510(k) submission is a change to use System Water instead of Dimension Vista® CHEM 1 CAL Level 1 (CAL A) when calibrating the Dimension Vista® Magnesium method. The Dimension Vista® Magnesium Flex® reagent cartridge (MG, K3057), with the truncated assay range, is substantially equivalent to the Beckman magnesium assay cleared under k981743