510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY

I Background Information:

A 510(k) Number

K193525

B Applicant

Horiba ABX SAS

C Proprietary and Established Names

Yumizen C1200 Immunoglobulin A, Yumizen C1200 Immunoglobulin G, Yumizen C1200 Immunoglobulin M

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
CZP	Class II	21 CFR 866.5510 - Immunoglobulins A, G, M, D, And E Immunological Test System	IM - Immunology
DEW	Class II	21 CFR 866.5510 - Immunoglobulins A, G, M, D, and E immunological test system	IM - Immunology
CFN	Class II	21 CFR 866.5510 - Immunoglobulins A, G, M, D, and E immunological test system	IM - Immunology

II Submission/Device Overview:

A Purpose for Submission:

New Assays

B Measurand:

Immunoglobulin A (IgA)
Immunoglobulin G (IgG)
Immunoglobulin M (IgM)

C Type of Test:

Quantitative immunoturbidimetric assays

III Intended Use/Indications for Use:

A Intended Use(s):

See Indications for Use below.

B Indication(s) for Use:

Yumizen C1200 Immunoglobulin A reagent is intended for the quantitative in vitro diagnostic determination of Immunoglobulin A (IgA) in serum and lithium heparin plasma by immunoturbidimetry on Yumizen analyzers. Measurement of this immunoglobulin aids in the diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. This test should be used in conjunction with other laboratory and clinical findings.

Yumizen C1200 Immunoglobulin G reagent is intended for the quantitative in vitro diagnostic determination of Immunoglobulin G (IgG) in serum and lithium heparin plasma by immunoturbidimetry on Yumizen analyzers. Measurement of this immunoglobulin aids in the diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. This test should be used in conjunction with other laboratory and clinical findings.

Yumizen C1200 Immunoglobulin M reagent is intended for the quantitative in vitro diagnostic determination of Immunoglobulin M (IgM) in serum and lithium heparin plasma by immunoturbidimetry on Yumizen analyzers. Measurement of this immunoglobulin aids in the diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. This test should be used in conjunction with other laboratory and clinical findings.

C Special Conditions for Use Statement(s):

Rx - For Prescription Use Only

D Special Instrument Requirements:

For the Yumizen C1200 (K183375 and K191993) only

IV Device/System Characteristics:

A Device Description:

Yumizen C1200 IgA:

- Reagent 1: TRIS buffer solution
- Reagent 2: Goat anti-human IgA antibodies in TRIS buffer

Yumizen C1200 IgG:

- Reagent 1: TRIS buffer solution
- Reagent 2: Goat anti-human IgG antibodies in TRIS buffer

Yumizen C1200 IgM:
- Reagent 1: TRIS buffer solution
- Reagent 2: Goat anti-human IgM antibodies in TRIS buffer

All assays' calibrators and control materials are sold separately.

B Principle of Operation:

These immunoturbidimetric assays measure increasing sample turbidity caused by the formation of insoluble immune complexes when goat anti-human immunoglobulin (IgA, IgG, or IgM) antibodies are bound to the specific immunoglobulin (IgA, IgG, or IgM) in the sample. The IgA, IgG, or IgM concentration is proportional to the amount of turbidity formed.

V Substantial Equivalence Information:

A Predicate Device Name(s):

Olympus IgA Reagent, Olympus IgG Reagent, Olympus IgM Reagent

B Predicate 510(k) Number(s):

K073489, K073490, K073487

C Comparison with Predicate(s):

Yumizen C1200 IgA:

Device & Predicate Device(s):	K193525	K073489
Device Trade Name	Yumizen C1200 IgA	Olympus IgA Reagent, Model: OSR6X171
General Device Characteristic Similarities		
Intended Use/ Indications For Use	Yumizen C1200 Immunoglobulin A reagent is intended for the quantitative in vitro diagnostic determination of Immunoglobulin A (IgA) in serum and lithium heparin plasma by immunoturbidimetry on Yumizen analyzers. Measurement of this immunoglobulin aids in the	System reagent for the quantitative determination of IgA immunoglobulins in human serum and plasma on Beckman Coulter AU analyzers. The spectrum of abnormalities in serum immunoglobulin concentrations is broad.

	diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. This test should be used in conjunction with other laboratory and clinical findings.	Abnormal concentrations range from a virtual absence of one or more of the three major classes of immunoglobulin (IgG, IgA, and IgM) to polyclonal increases in one or more immunoglobulins. Measurement of these immunoglobulins aids in the diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. For in vitro diagnostic use.
Measuring Range	10–700 mg/dL	Same
Assay Type	Quantitative	Same
Reagent Format	Liquid	Same
Traceability/Standardization	DA470k/IFCC	Same
General Device Characteristic Differences		
Instrument Platform	Yumizen C1200	Beckman Coulter Olympus AU400
Assay Method	Immunoturbidimetry	Turbidimetry
Sample Matrices	Serum Li-heparin plasma	Serum Li-heparin plasma EDTA plasma
On-board reagent stability	60 days	6 weeks
Reference range	70–400 mg/dL	66–433 mg/dL

Yumizen C1200 IgG:

Device & Predicate Device(s):	K193525	K073490
Device Trade Name	Yumizen C1200 IgG	Olympus IgG Reagent, Model: OSR6X172
General Device Characteristic Similarities		
Intended Use/ Indications For Use	Yumizen C1200 Immunoglobulin G reagent is intended for the quantitative in vitro diagnostic determination of Immunoglobulin G (IgG) in	System reagent for the quantitative determination of IgG immunoglobulins in human serum and plasma on Beckman Coulter AU

	serum and lithium heparin plasma by immunoturbidimetry on Yumizen analyzers. Measurement of this immunoglobulin aids in the diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. This test should be used in conjunction with other laboratory and clinical findings.	analyzers. The measurement of IgG aids in the diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. For in vitro diagnostic use.
Measuring Range	75–3000 mg/dL	Same
Assay Type	Quantitative	Same
Reagent Format	Liquid	Same
Traceability/Standardization	DA470k/IFCC	Same
General Device Characteristic Differences		
Instrument Platform	Yumizen C1200	Beckman Coulter Olympus AU400
Assay Method	Immunoturbidimetry	Turbidimetry
Sample Matrices	Serum Li-heparin plasma	Serum Li-heparin plasma EDTA plasma
On-board reagent stability	6 weeks	90 days
Reference range	700–1600 mg/dL	635–1741 mg/dL

Yumizen C1200 IgM:

Device & Predicate Device(s):	K193525	K073487
Device Trade Name	Yumizen C1200 IgM	Olympus IgM Reagent, Model: OSR6X173
General Device Characteristic Similarities		
Intended Use/ Indications For Use	Yumizen C1200 Immunoglobulin M reagent is intended for the quantitative in vitro diagnostic determination of Immunoglobulin M (IgM) in serum and lithium heparin plasma by immunoturbidimetry on Yumizen analyzers. Measurement of this immunoglobulin aids in the diagnosis of abnormal protein metabolism and the body's lack of	System reagent for the quantitative determination of IgM immunoglobulins in human serum and plasma on Beckman Coulter AU analyzers. The spectrum of abnormalities in serum immunoglobulin concentrations is broad. Abnormal concentrations

	ability to resist infectious agents. This test should be used in conjunction with other laboratory and clinical findings.	range from a virtual absence of one or more of the three major classes of immunoglobulin (IgA, IgG, and IgM) to polyclonal increases in one or more immunoglobulins. Measurement of these immunoglobulins aids in the diagnosis of abnormal protein metabolism and the body's lack of ability to resist infectious agents. For in vitro diagnostic use.
Measuring Range	20–500 mg/dL	Same
Assay Type	Quantitative	Same
Reagent Format	Liquid	Same
Traceability/ Standardization	DA470k/IFCC	Same
General Device Characteristic Differences		
Instrument Platform	Yumizen C1200	Beckman Coulter Olympus AU400
Assay Method	Immunoturbidimetry	Turbidimetry
Sample Matrices	Serum Li-heparin plasma	Serum Li-heparin plasma EDTA plasma
On-board reagent stability	6 weeks	90 days
Reference range	40–230 mg/dL	45–281 mg/dL

VI Standards/Guidance Documents Referenced:

- **CLSI EP05-A3:** Evaluation of Precision of Quantitative Measurement Procedures– Third Edition - October 2014
- **CLSI EP17-A2:** Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures – Second Edition - June 2012
- **CLSI EP06-A:** Evaluation of the Linearity of Quantitative measurement Procedures A Statistical Approach – First Edition – April 2003
- **CLSI C28-A3:** Defining, Establishing, and Verifying Reference Intervals in the Clinical laboratory- Third Edition – November 2008
- **CLSI EP25-A**: Evaluation of Stability of In Vitro Diagnostic reagents- First Edition- September 2009

VII Performance Characteristics (if/when applicable):

A Analytical Performance:

1. Precision/Reproducibility:

Yumizen C1200 IgA:
The precision of the Yumizen C1200 IgA assay was evaluated on three Yumizen C1200 immunoassay analyzers using one reagent lot. Five human sera samples and two levels of Yumizen C1200 Protein Control were tested with two replicates per run, two runs per day for 20 days on each analyzer (n=240 per sample). The results are summarized below:

IgA		Repeatability		Between-Run		Between-Day		Between-Instrument		Total	
Sample	Mean (mg/dL)	SD	%CV	SD	%CV	SD	%CV	SD	%CV	SD	%CV
Sera 1	62	0.5	0.9	0.6	1.0	0.8	1.2	1.1	1.7	1.5	2.5
Sera 2	112	0.8	0.7	1.1	1.0	1.3	1.2	1.9	0.0	1.9	1.7
Sera 3	239	1.9	0.8	3.1	1.3	3.4	1.4	5.0	1.5	6.1	2.6
Sera 4	431	4.2	1.0	12.4	2.9	5.5	1.3	14.2	2.0	16.7	3.8
Sera 5	547	5.2	0.9	6.6	1.2	8.0	1.5	11.6	2.0	15.8	2.9
Control 1	117	0.9	0.8	3.4	2.9	0.8	0.7	2.3	2.0	4.3	3.7
Control 2	365	3.2	0.9	7.5	2.1	5.1	1.4	9.6	1.7	11.4	3.1

The lot-to-lot reproducibility of the Yumizen C1200 IgA assay was evaluated on one analyzer using three reagent lots. Five human sera samples and two levels of Yumizen C1200 Protein Control were tested in triplicates per run, two runs per day for five days on each lot (n=90 per sample). The results are summarized below:

IgA		Repeatability		Between-Day		Within-Lot		Between-Lot		Total	
Sample	Mean (mg/dL)	SD	%CV	SD	%CV	SD	%CV	SD	%CV	SD	%CV
Sera 1	63	0.7	1.0	0.3	0.5	0.7	1.2	0	0	0.7	1.2
Sera 2	113	3.4	3.0	3.2	2.8	4.7	4.1	0	0	4.7	4.1
Sera 3	243	2.5	1.0	1.4	0.6	2.9	1.2	0.8	0.3	3.0	1.2
Sera 4	434	8.5	2.0	5.9	1.4	10.4	2.4	0	0	10.4	2.4
Sera 5	563	6.9	1.2	1.4	0.2	7.0	1.2	1.9	0.3	7.3	1.3
Control 1	117	1.1	1.0	0.8	0.7	1.4	1.2	0.2	0.1	1.4	1.2
Control 2	372	4.1	1.1	0	0	4.1	1.1	0.9	0.2	4.1	1.1

Yumizen C1200 IgG:
The precision of the Yumizen C1200 IgG assay was evaluated on three Yumizen C1200 immunoassay analyzers using one reagent lot. Five human sera samples and two levels of Yumizen C1200 Protein Control were tested with two replicates per run, two runs per day for 20 days on each analyzer (n=240 per sample). The results are summarized below:

IgG		Repeatability		Between-Run		Between-Day		Between-Instrument		Total	
Sample	**Mean (mg/dL)**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**
Sera 1	314	3.3	1.1	1.5	0.5	3.6	1.1	5.6	1.8	7.5	2.4
Sera 2	541	7.4	1.4	2.6	0.5	5.5	1.0	0	0	9.6	1.8
Sera 3	1027	15.9	1.5	4.2	0.4	14.9	1.5	13.0	1.3	25.7	2.5
Sera 4	1721	29.8	1.7	4.1	0.2	24.2	1.4	15.7	0.9	41.6	2.4
Sera 5	2236	46.6	2.1	0	0	39.8	1.8	25.0	1.1	15.8	3.0
Control 1	659	7.6	1.2	5.5	0.8	12.1	1.8	11.3	1.7	19.0	2.9
Control 2	1885	34.8	1.8	8.2	0.4	43.7	2.3	26.7	1.4	62.4	3.3

The lot-to-lot reproducibility of the Yumizen C1200 IgG assay was evaluated on one analyzer using three reagent lots. Five human sera samples and two levels of Yumizen C1200 Protein Control were tested in triplicates per run, two runs per day for five days on each lot (n=90 per sample). The results are summarized below:

IgG		Repeatability		Between-Day		Within-Lot		Between-Lot		Total	
Sample	**Mean (mg/dL)**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**
Sera 1	306	3.6	1.2	5.1	1.7	6.3	2.0	3.0	1.0	7.0	2.3
Sera 2	530	6.1	1.2	4.4	0.8	7.5	1.4	4.1	0.8	8.5	1.6
Sera 3	994	10.2	1.0	7.5	0.8	12.7	1.3	9.8	1.0	16.0	1.6
Sera 4	1666	21.1	1.3	17.8	1.1	27.6	1.7	17.6	1.1	32.7	2.0
Sera 5	2184	23.6	1.1	18.6	0.9	30.0	1.4	9.5	0.4	31.5	1.4
Control 1	636	5.6	0.9	8.5	1.3	10.1	1.6	3.9	0.6	10.8	1.7
Control 2	1821	23.8	1.3	23.0	1.3	33.1	1.8	7.3	0.4	33.9	1.9

Yumizen C1200 IgM:

The precision of the Yumizen C1200 IgM assay was evaluated on three Yumizen C1200 immunoassay analyzers using one reagent lot. Five human sera samples and two levels of Yumizen C1200 Protein Control were tested with two replicates per run, two runs per day for 20 days on each analyzer (n=240 per sample). The results are summarized below:

IgM		Repeatability		Between-Run		Between-Day		Between-Instrument		Total	
Sample	**Mean (mg/dL)**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**
Sera 1	56	0.5	0.9	0.4	0.8	1.2	2.5	0.2	0.3	1.4	2.4
Sera 2	120	0.6	0.5	0.8	0.6	1.6	1.4	0.7	0.6	2.0	1.7
Sera 3	161	0.8	0.5	0.8	0.5	1.6	1.0	2.0	0.7	2.3	1.4
Sera 4	209	1.2	0.6	1.0	0.5	2.0	1.0	0.9	0.4	2.7	1.3
Sera 5	443	3.0	0.7	3.4	0.8	3.2	0.7	5.6	1.3	7.9	1.8
Control 1	88	0.5	0.6	0.7	0.9	1.5	1.8	0	0	1.8	2.1
Control 2	273	1.5	0.6	2.1	0.8	3.2	1.2	2.5	0.9	4.8	1.8

The lot-to-lot reproducibility of the Yumizen C1200 IgM assay was evaluated on one analyzer using three reagent lots. Five human sera samples and two levels of Yumizen C1200 Protein Control were tested in triplicates per run, two runs per day for five days on each lot (n=90 per sample). The results are summarized below:

IgM		Repeatability		Between Day		Within Lot		Between Lot		Total	
Sample	**Mean (mg/dL)**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**	**SD**	**%CV**
Sera 1	53	0.5	1.0	0.4	0.8	0.7	1.3	1.3	2.4	1.5	2.7
Sera 2	119	0.9	0.8	0.4	0.3	1.0	0.9	0.6	0.5	1.2	1.0
Sera 3	160	1.2	0.7	0.8	0.5	1.4	0.9	1.0	0.6	1.7	1.1
Sera 4	209	1.9	0.9	0.8	0.4	2.1	1.0	2.2	1.0	3.0	1.4
Sera 5	444	5.3	1.2	3.6	0.8	6.4	1.4	4.5	1.0	7.8	1.8
Control 1	86	0.7	0.8	0.9	1.1	1.2	1.4	0.7	0.8	1.4	1.6
Control 2	276	2.9	1.0	2.1	0.8	3.5	1.3	3.1	1.1	4.7	1.7

2. Linearity:

Yumizen C1200 IgA:

Linearity: Linearity of the Yumizen C1200 IgA assay was assessed according to CLSI EP06-A. A high concentration IgA-spiked human serum sample and an IgA-depleted serum were used to create a dilution series covering above and below the measuring range. Sample dilutions were assayed in quadruplicate within a single run and samples within the measuring range were used to determine linearity:

Dilution Range (mg/dL)	Regression Equation	Slope (95% CI)	Intercept (95% CI)	R^2
21–660	y=1.027x–0.004	1.012–1.043	-0.060–0.051	0.998

Auto-rerun validation study: An auto-rerun study was performed to evaluate the accuracy of the analyzer's auto dilution function to obtain results for IgA samples with analyte concentrations above the primary measuring range (700 mg/dL). Seven samples were used for the study, ranging from 715–1988 mg/dL. Each sample was manually diluted with a 1:3 ratio. The automatic instrument dilutions and the manual dilutions were measured in quadruplicates. The results of the auto-rerun study support the claim that samples having concentrations up to 2100 mg/dL can be run via the rerun function which uses a 1:3 dilution.

Prozone effect: The potential for a prozone effect was evaluated for the IgA assay. Testing elevated samples did not indicate a prozone effect with concentrations up to 2320 mg/dL.

Yumizen C1200 IgG:

Linearity: Linearity of the Yumizen C1200 IgG assay was assessed according to CLSI EP06-A. A high concentration IgG-spiked human serum sample and an IgG-depleted serum were used to create a dilution series covering above and below the measuring range. Sample dilutions were assayed in quadruplicate within a single run and samples within the measuring range were used to determine linearity:

Dilution Range (mg/dL)	Regression Equation	Slope (95% CI)	Intercept (95% CI)	R^2
82–2942	y=0.996x–0.254	0.985–1.008	0.070– -0.440	0.999

Auto-rerun validation study: An auto-rerun study was performed to evaluate the accuracy of the analyzer's auto dilution function to obtain results for IgG samples with analyte concentrations above the primary measuring range (3000 mg/dL). Seven samples were used for the study, ranging from 3120–8738 mg/dL. Each sample was manually diluted with a 1:3 ratio. The automatic instrument dilutions and the manual dilutions were measured in quadruplicates. The results of the auto-rerun study support the claim that samples having concentrations up to 9000 mg/dL can be run via the rerun function which uses a 1:3 dilution.

Prozone effect: The potential for a prozone effect was evaluated for the IgG assay. Testing elevated samples did not indicate a prozone effect with concentrations up to 9860 mg/dL.

Yumizen C1200 IgM:

Linearity: Linearity of the Yumizen C1200 IgM assay was assessed according to CLSI EP06-A. A high concentration IgM-spiked human serum sample and an IgM-depleted serum were used to create a dilution series covering above and below the measuring range. Sample dilutions were assayed in quadruplicate within a single run and samples within the measuring range were used to determine linearity:

Dilution Range (mg/dL)	Regression Equation	Slope (95% CI)	Intercept (95% CI)	R^2
26–416	y=1.013x–0.087	1.001–1.025	-0.115– -0.059	0.998

Auto-rerun validation study: An auto-rerun study was performed to evaluate the accuracy of the analyzer's auto dilution function to obtain results for IgM samples with analyte concentrations above the primary measuring range (500 mg/dL). Seven samples were used for the study, ranging from 557–1361 mg/dL. Each sample was manually diluted with a 1:3 ratio. The automatic instrument dilutions and the manual dilutions were measured in quadruplicates. The results of the auto-rerun study support the claim that samples having concentrations up to 1500 mg/dL can be run via the rerun function which uses a 1:3 dilution.

Prozone effect: The potential for a prozone effect was evaluated for the IgM assay. Testing elevated samples did not indicate a prozone effect with concentrations up to 5000 mg/dL.

3. Analytical Specificity/Interference:

For all three assays, the effect of the presence of endogenous and exogenous interferents in samples was evaluated by testing native unmodified serum pools at two analyte levels (normal and high) with a range of concentrations of the substances listed below. Each sample was tested at four concentrations of interferent and with an interferent-free control in four replicates each. The percent recovery for each sample spiked with the interference substance was calculated by comparing its result to that of the corresponding reference sample spiked with an equal volume of the solvent without the interference substance. No interference was observed up to the following concentration of each interference substance for each assay.

Interferent (mg/dL)	IgA	IgG	IgM
Hemoglobin	500.0	500.0	250.0
Triglycerides	531.1	456.8	520.6
Total Bilirubin	29.2	39.0	27.9
Direct Bilirubin	22.8	18.4	13.1
Ascorbic Acid	6.0	6.0	6.0
Acetylsalicylic Acid	65.2	65.2	65.2
Ibuprofen	50.1	50.1	50.1
Acetaminophen	20.0	20.0	20.0

4. Assay Reportable Range:

Yumizen C1200 IgA:
The claimed measuring range is from 10 mg/dL to 700 mg/dL.

Yumizen C1200 IgG:
The claimed measuring range is from 75 mg/dL to 3000 mg/dL.

Yumizen C1200 IgM:
The claimed measuring range is from 20 mg/dL to 500 mg/dL.

5. Traceability, Stability, Expected Values (Controls, Calibrators, or Methods):

Traceability:
All three assays are traceable to ERM-DA470k/IFCC.

Stability:
Real-time shelf-life stability testing supports a shelf-life for unopened reagents stored at the labeling recommendation (2–8°C). On-board reagent stability studies support the claims that the reagents can be stored on board the Yumizen C1200. The results are summarized below:

Stability Claims	**IgA**	**IgG**	**IgM**
Reagent Shelf-life if stored as recommended	24 months	24 months	24 months
Reagent On-board	6 weeks	6 weeks	6 weeks
Serum Sample*	8 months at 20–25°C 8 months at 2–8°C 8 months at-20°C	1 week at 20–25°C 3 months at 4–8°C >6 months at -20°C	2 months at 20–25°C 4 months at 4–8°C 6 months at -20°C
*Sample stability claims in the package insert cite published references. The package labeling states a sample should be frozen only once.			

6. Detection Limit:

The detection limits of all three assays were performed according to CLSI EP17-A2. The Limit of Blank (LoB) corresponds to the concentration below which analyte-free samples are found with a probability of 95%. The Limit of Detection (LoD) is determined based on the limit of blank and the standard deviation of low concentration samples. The limit of detection corresponds to the lowest analyte concentration which can be detected (value above the limit of blank with a probability of 95%). The Limit of Quantitation (LoQ) was defined as the lowest analyte concentration which can be quantified with a total error of ≤ 20%.

Yumizen C1200 IgA:

LoB:
The LoB of the IgA assay was determined by assaying one IgA-depleted sample in five replicates per day for four days on three Yumizen instruments. A total of 60 data points per lot were generated; two lots were tested. The LoB for each lot was calculated separately. The LoB was defined as the higher value, 0.5 mg/dL.

LoD:
The LoD of the IgA assay was determined by testing four low analyte samples in quadruplicate for four days on one instrument. A total of 64 data points per lot were generated; two lots were tested. The LoD for each lot was calculated separately. The LoD was defined as the higher value, 0.9 mg/dL.

LoQ:
The LoQ of the IgA assay was determined by testing five low native samples in quadruplicate per run, two runs per day, for five days on one instrument. A total of 360 data points per lot were generated; two lots were tested. The LoQ for each lot was calculated separately. The LoQ was defined as the higher value, 8 mg/dL.

Yumizen C1200 IgG:

LoB:
The LoB of the IgG assay was determined by assaying one IgG-depleted sample in five replicates per day for four days on three Yumizen instruments. A total of 60 data points

per lot were generated; two lots were tested. The LoB for each lot was calculated separately. The LoB was defined as the higher value, 0 mg/dL.

LoD:
The LoD of the IgG assay was determined by testing four low analyte samples in quadruplicate for four days on one instrument. A total of 64 data points per lot were generated; two lots were tested. The LoD for each lot was calculated separately. The LoD was defined as the higher value, 1 mg/dL.

LoQ:
The LoQ of the IgG assay was determined by testing five low native samples in quadruplicate per run, two runs per day, for five days on one instrument. A total of 360 data points per lot were generated; two lots were tested. The LoQ for each lot was calculated separately. The LoQ was defined as the higher value, 53 mg/dL.

Yumizen C1200 IgM:

LoB:
The LoB of the IgM assay was determined by assaying one IgM-depleted sample in five replicates per day for four days on three Yumizen instruments. A total of 60 data points per lot were generated; two lots were tested. The LoB for each lot was calculated separately. The LoB was defined as the higher value, 0.3 mg/dL.

LoD:
The LoD of the IgM assay was determined by testing four low analyte samples in quadruplicate for four days on one instrument. A total of 64 data points per lot were generated; two lots were tested. The LoD for each lot was calculated separately. The LoD was defined as the higher value, 1 mg/dL.

LoQ:
The LoQ of the IgM assay was determined by testing five low native samples in quadruplicate per run, two runs per day, for five days on one instrument. A total of 360 data points per lot were generated; two lots were tested. The LoQ for each lot was calculated separately. The LoQ was defined as the higher value, 3 mg/dL.

7. Assay Cut-Off:
Not applicable.

B Comparison Studies:

1. Method Comparison with Predicate Device:

Yumizen C1200 IgA:
The method comparison of the Yumizen C1200 IgA (candidate device) assay and the predicate device was evaluated. A total of 129 remnant serum samples collected from blood bank covering the measuring range were tested and compared using the Passing-Bablok method. The results are summarized below:

Parameter	Result
Range	11–684 mg/dL (Predicate, X) 10–691 mg/dL (Assay, Y)
Slope (95th CI)	0.9941 (0.976–1.008)
Intercept (95th CI)	0.024 (0.001–0.052)
Correlation Coefficient	0.997

Yumizen C1200 IgG:
The method comparison of the Yumizen C1200 IgG (candidate device) assay and the predicate device was evaluated. A total of 214 remnant serum samples collected from a blood bank covering the measuring range were tested and compared using the Passing-Bablok method. The results are summarized below:

Parameter	Result
Range	77–2979 mg/dL (Predicate, X) 96–2894 mg/dL (Assay, Y)
Slope (95th CI)	1.016 (1.000–1.033)
Intercept (95th CI)	-0.163 (-0.364– -0.030)
Correlation Coefficient	0.996

Yumizen C1200 IgM:
The method comparison of the Yumizen C1200 IgM (candidate device) assay and the predicate device was evaluated. A total of 153 remnant serum samples collected from a blood bank covering the measuring range were tested and compared using the Passing-Bablok method. The results are summarized below:

Parameter	Result
Range	28–448 mg/dL (Predicate, X) 25–441 mg/dL (Assay, Y)
Slope (95th CI)	1.005 (0.993–1.026)
Intercept (95th CI)	0.005 (-0.015–0.020)
Correlation Coefficient	0.997

2. Matrix Comparison:
Serum and lithium heparin are indicated for all three assays.

Yumizen C1200 IgA:
For the Yumizen C1200 IgA assay, a study comparing 62 paired serum and lithium heparin plasma samples demonstrated equivalence between the matrices:

Passing-Bablok Fit	N	Range (mg/dL)	Slope (95% CI)	Intercept (95% CI)	Pearson r
Li-heparin vs. Serum	62	23–646	0.97 (0.95–0.99)	-0.07 (-0.11– -0.04)	0.997

Yumizen C1200 IgG:
For the Yumizen C1200 IgG assay, a study comparing 52 paired serum and lithium heparin plasma samples demonstrated equivalence between the matrices:

Passing-Bablok Fit	N	Range (mg/dL)	Slope (95% CI)	Intercept (95% CI)	Pearson r
Li-heparin vs. Serum	52	205–2718	1.12 (1.08–1.15)	-0.84 (-1.28– -0.48)	0.994

Yumizen C1200 IgM:
For the Yumizen C1200 IgM assay, a study comparing 44 paired serum and lithium heparin plasma samples demonstrated equivalence between the matrices:

Passing-Bablok Fit	N	Range (mg/dL)	Slope (95% CI)	Intercept (95% CI)	Pearson r
Li-heparin vs. Serum	62	40–454	1.04 (1.02–1.06)	0 (-0.02– 0.01)	0.998

C Clinical Studies:

1. Clinical Sensitivity:

   Not applicable.

2. Clinical Specificity:

   Not applicable.

D Clinical Cut-Off:

Not applicable.

E Expected Values/Reference Range:

Yumizen C1200 IgA:

The IgA reference range cited in a reference[1] was verified. Samples (n=58, 22 female and 36 males) from a blood bank were used and the results validate a reference range of 70–400 mg/dL.

Yumizen C1200 IgG:
The IgG reference range cited in a reference[1] was verified. Samples (n=44, 16 female and 28 males) from a blood bank were used and the results validate a reference range of 700–1600 mg/dL.

Yumizen C1200 IgM:
The IgM reference ranges cited in a reference[1] was verified. Samples (n=74, 29 female and 45 males) from a blood bank were used and the results validate a reference range of 40–230 mg/dL.

VIII Proposed Labeling:

The labeling supports the finding of substantial equivalence for this device.

IX Conclusion:

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

[1] Dati F, Schumann G, Thomas L, Aguzzi F, Baudner S, Bienvenu J et al. Consensus of a group of professional societies and diagnostic companies on guidelines for interim reference ranges for 14 proteins in serum based on the standardization against the IFCC/BCR/CAP reference material (CRM470). Eur. J. Clin. Chem. Clin. Biochem. (1996) 34: 517-20.