SIEMENS Healthineers

Vitamin B12 (VB12)

Current Revision and Date[a]	Rev. 02, 2019-08	
Product Name	Atellica IM Vitamin B12 (VB12)	REF 10995714 (100 tests)
		REF 10995715 (500 tests)
Abbreviated Product Name	Atellica IM VB12	
Test Name/ID	VB12	
Systems	Atellica IM Analyzer	
Materials Required but Not Provided	Atellica IM CAL C	REF 10995506 (2-pack)
		REF 10995507 (6-pack)
	Atellica IM VB12 DTT/REL	REF 10995718
	Atellica IM T3/T4/VB12 ANC	REF 10995682 (2-pack)
	Atellica IM T3/T4/VB12 ANC	REF 10995683 (6-pack)
Optional Materials	Atellica IM VB12 DIL	REF 10995716
	Atellica IM VB12 MCM	REF 10995717
Specimen Types	Serum, EDTA plasma, heparinized plasma	
Sample Volume	100 µL	
Measuring Interval	45–2000 pg/mL (33–1476 pmol/L)	

[a] A vertical bar in the page margin indicates technical content that differs from the previous version.

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Intended Use

The Atellica™ IM Vitamin B12 (VB12) assay is for *in vitro* diagnostic use in the quantitative determination of vitamin B_{12} in human serum and plasma (EDTA and heparin) using the Atellica™ IM Analyzer.

Summary and Explanation

Vitamin B_{12}, or cyanocobalamin, is a complex corrinoid compound containing 4 pyrrole rings that surround a single cobalt atom.[1] Humans obtain vitamin B_{12} exclusively from animal dietary sources, such as meat, eggs, and milk.[2] Vitamin B_{12} requires intrinsic factor, a protein secreted by the parietal cells in the gastric mucosa, for absorption. Vitamin B_{12} and intrinsic factor form a complex that attaches to receptors in the ileal mucosa, where proteins known as trans-cobalamins transport the vitamin B_{12} from the mucosal cells to the blood and tissues.[3,4] Most vitamin B_{12} is stored in the liver as well as in the bone marrow and other tissues.

Vitamin B_{12} and folate are critical to normal DNA synthesis, which in turn affects erythrocyte maturation.[3] Vitamin B_{12} is also necessary for myelin sheath formation and maintenance.[2] The body uses its B_{12} stores very economically, reabsorbing vitamin B_{12} from the ileum and returning it to the liver so that very little is excreted.[4,5]

Clinical and laboratory findings for B_{12} deficiency include neurological abnormalities, decreased serum B_{12} levels, and increased excretion of methylmalonic acid.[4,5] The impaired DNA synthesis associated with vitamin B_{12} deficiency causes macrocytic anemias. These anemias are characterized by abnormal maturation of erythrocyte precursors in the bone marrow, which results in the presence of megaloblasts and in decreased erythrocyte survival.[3,6]

Pernicious anemia is a macrocytic anemia caused by vitamin B_{12} deficiency that is due to lack of intrinsic factor. Low vitamin B_{12} intake, gastrectomy, diseases of the small intestine, malabsorption, and trans-cobalamin deficiency can also cause vitamin B_{12} deficiency.[3]

Principles of the Procedure

The Atellica IM VB12 assay is a competitive immunoassay using direct chemiluminescent technology in which vitamin B_{12} from the patient sample competes with vitamin B_{12} labeled with acridinium ester in the Lite Reagent, for a limited amount of purified intrinsic factor, which is covalently coupled to paramagnetic particles in the Solid Phase. The assay uses Releasing Agent (sodium hydroxide) and DTT to release the vitamin B_{12} from the endogenous binding proteins in the sample and cobinamide to prevent rebinding after the Solid Phase is added to the sample.

An inverse relationship exists between the amount of vitamin B_{12} present in the sample and the amount of relative light units (RLUs) detected by the system.

Reagents

Material Description	Storage	Stability[a]
Atellica IM VB12 ReadyPack® primary reagent pack **Lite Reagent** 20.0 mL/reagent pack Acridinium ester-labeled vitamin B_{12} (~3 ng/mL); buffer; sodium azide (0.1%); protein stabilizers; preservatives **Solid Phase** 20.0 mL/reagent pack Purified hog intrinsic factor (~0.025 µg/mL) covalently coupled to paramagnetic particles in buffer; cobinamide; protein stabilizers; sodium azide (0.1%); preservatives	Unopened at 2–8°C Onboard	Until expiration date on product 18 days

Material Description	Storage	Stability[a]
Atellica IM VB12 DTT/Releasing Agent[b] **DTT** 2.0 mL/vial Dithiothreitol (~210 mg/vial) **Releasing Agent** 25.0 mL/vial Sodium hydroxide (~0.30N); potassium cyanide (~1.25 mg/vial)	At 2–8°C Onboard	Until expiration date on product 108 hours[c]
Atellica IM T3/T4/VB12 ANC ReadyPack ancillary reagent pack[b] 23.6 mL/reagent pack 0.4N sodium hydroxide	At 2–8°C Onboard	Until expiration date on product 14 days
Atellica IM VB12 DIL ReadyPack ancillary reagent pack[d] 4.8 mL/reagent pack Buffered human serum albumin; sodium azide (0.2%); preservatives	Unopened at 2–8°C Onboard	Until expiration date on product 28 days

[a] Refer to *Storage and Stability*.
[b] Refer to *Materials Required but Not Provided*.
[c] Refer to *Preparing the Reagents*.
[d] Refer to *Optional Materials*.

Warnings and Precautions

For *in vitro* diagnostic use.

For Professional Use.

CAUTION

Federal (USA) law restricts this device to sale by or on the order of a licensed healthcare professional.

Safety data sheets (SDS) available on siemens.com/healthineers.

H319, H315, H290
P280, P264, P305+P351+P338, P310, P390, P501

Warning!
Causes serious eye irritation. Causes skin irritation. May be corrosive to metals.
Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. Absorb spillage to prevent material damage. Dispose of contents and container in accordance with all local, regional, and national regulations.
Contains: sodium hydroxide (in Atellica IM T3/T4/VB12 Ancillary Reagent and Atellica IM VB12 DTT/Releasing Agent)

CAUTION POTENTIAL BIOHAZARD

Contains human source material. Each donation of human blood or blood component was tested by FDA-approved methods for the presence of antibodies to human immunodeficiency virus type 1 (HIV-1) and type 2 (HIV-2), as well as for hepatitis B surface antigen (HBsAg) and antibody to hepatitis C virus (HCV). The test results were negative (not repeatedly reactive). No test offers complete assurance that these or other infectious agents are absent; this material should be handled using good laboratory practices and universal precautions.[7–9]

CAUTION

This device contains material of animal origin and should be handled as a potential carrier and transmitter of disease.

Contains sodium azide as a preservative. Sodium azide can react with copper or lead plumbing to form explosive metal azides. On disposal, flush reagents with a large volume of water to prevent buildup of azides. Disposal into drain systems must be in compliance with prevailing regulatory requirements.

Dispose of hazardous or biologically contaminated materials according to the practices of your institution. Discard all materials in a safe and acceptable manner and in compliance with prevailing regulatory requirements.

Note For information about reagent preparation, refer to *Preparing the Reagents* in the *Procedure* section.

Storage and Stability

Store reagents in an upright position. Protect the product from heat and light sources. Unopened reagents are stable until the expiration date on the product when stored at 2–8°C.

Store Atellica IM VB12 DTT/Releasing Agent in an upright position. Atellica IM VB12 DTT/Releasing Agent is stable until the expiration date on the product when stored at 2–8°C.

Store Atellica IM T3/T4/VB12 ANC in an upright position. Atellica IM T3/T4/VB12 ANC is stable until the expiration date on the product when stored at 2–8°C.

Store Atellica IM VB12 DIL in an upright position. Unopened Atellica IM VB12 DIL is stable until the expiration date on the product when stored at 2–8°C.

Do not use products beyond the expiration date printed on the product labeling.

Onboard Stability

Reagents are stable onboard the system for 18 days. Discard reagents at the end of the onboard stability interval. Do not use products beyond the expiration date printed on the product labeling.

Atellica IM VB12 DTT/Releasing Agent is stable onboard the system for 108 hours.

Atellica IM T3/T4/VB12 ANC is stable onboard the system for 14 days.

Atellica IM VB12 DIL is stable onboard the system for 28 days.

Specimen Collection and Handling

Serum and plasma (EDTA and heparinzed) are the recommended sample types for this assay.

Collecting the Specimen

- Observe universal precautions when collecting specimens. Handle all specimens as if they are capable of transmitting disease.[9]
- Follow recommended procedures for collection of diagnostic blood specimens by venipuncture.[10]

- Follow the instructions provided with your specimen collection device for use and processing.[11]
- Allow blood specimens to clot completely before centrifugation.[8]
- Keep tubes capped at all times.[8]

Storing the Specimen

- Do not use samples that have been stored at room temperature for longer than 8 hours.
- Tightly cap and refrigerate specimens at 2–8°C if the assay is not completed within 8 hours.
- Freeze samples at ≤ -20°C if the sample is not assayed within 48 hours.
- Freeze samples only 1 time and mix thoroughly after thawing.

The handling and storage information provided here is based on data or references maintained by the manufacturer. It is the responsibility of the individual laboratory to use all available references and/or its own studies when establishing alternate stability criteria to meet specific needs.

Transporting the Specimen

Package and label specimens for shipment in compliance with applicable federal and international regulations covering the transport of clinical specimens and etiological agents.

Preparing the Samples

This assay requires 100 µL of sample for a single determination. This volume does not include the unusable volume in the sample container or the additional volume required when performing duplicates or other tests on the same sample. For information about determining the minimum required volume, refer to the online help.

The sample volume required to perform onboard dilution differs from the sample volume required to perform a single determination. Refer to *Dilutions*.

Note Do not use specimens with apparent contamination.

Before placing samples on the system, ensure that samples are free of:

- Bubbles or foam.
- Fibrin or other particulate matter.

Note Remove particulates by centrifugation according to CLSI guidance and the collection device manufacturer's recommendations.[8]

Note For a complete list of appropriate sample containers, refer to the online help.

Procedure

Materials Provided

The following materials are provided:

REF	Contents	Number of Tests
10995714	1 ReadyPack primary reagent pack containing Atellica IM VB12 Lite Reagent and Solid Phase Atellica IM VB12 master curve and test definition MC TDEF	100
10995715	5 ReadyPack primary reagent packs containing Atellica IM VB12 Lite Reagent and Solid Phase Atellica IM VB12 master curve and test definition MC TDEF	500

Materials Required but Not Provided

The following materials are required to perform this assay, but are not provided:

REF	Description	
	Atellica IM Analyzer[a]	
10995506	Atellica IM CAL C (calibrator)	2 x 5.0 mL low calibrator CAL L 2 x 5.0 mL high calibrator CAL H Calibrator lot-specific value sheet CAL LOT VAL
10995507	Atellica IM CAL C (calibrator)	6 x 5.0 mL low calibrator CAL L 6 x 5.0 mL high calibrator CAL H Calibrator lot-specific value sheet CAL LOT VAL
10995718	Atellica IM VB12 DTT/REL (releasing agent)	1 x 2.0 mL/vial DTT 2 x 25.0 mL/vials Releasing Agent REL 4 empty ReadyPack ancillary reagent packs
10995682	Atellica IM T3/T4/VB12 ANC (ancillary reagent)	2 ReadyPack ancillary reagent packs containing 23.6 mL/pack ANC
10995683	Atellica IM T3/T4/VB12 ANC (ancillary reagent)	6 ReadyPack ancillary reagent packs containing 23.6 mL/pack ANC

[a] Additional system fluids are required to operate the system: Atellica IM Wash, Atellica IM Acid, Atellica IM Base, and Atellica IM Cleaner. For system fluid instructions for use, refer to the Document Library.

Optional Materials

The following materials may be used to perform this assay, but are not provided:

REF	Description	
10995716	Atellica IM VB12 DIL (diluent)	2 ReadyPack ancillary reagent packs containing 4.8 mL/pack DIL
10995717	Atellica IM VB12 MCM (master curve material)	6 x 1.0 mL levels of master curve material MCM

Assay Procedure

The system automatically performs the following steps:

1. Washes the ancillary reagent probe with 100 µL of T3/T4/VB12 Ancillary Reagent.
2. Dispenses 100 µL of sample into a cuvette.
3. Dispenses 115 µL of DTT/Releasing Agent, then incubates for 3 minutes at 37°C.
4. Dispenses 200 µL of Solid Phase, then incubates for 5 minutes at 37°C.
5. Dispenses 200 µL of Lite Reagent, then incubates for 4 minutes at 37°C.
6. Separates, aspirates, then washes the cuvette with Atellica IM Wash.
7. Dispenses 300 µL each of Atellica IM Acid and Atellica IM Base to initiate the chemiluminescent reaction.
8. Reports results.

Preparing the Reagents

Reagents are liquid and ready to use, with the exception of the Atellica IM VB12 DTT/Releasing Agent. Before loading primary reagent packs onto the system, mix them by hand and visually inspect the bottom of the reagent pack to ensure that all particles are resuspended. For information about preparing the reagents for use, refer to the online help.

Use this procedure to prepare the DTT/Releasing Agent.

Note Careful preparation of DTT/Releasing Agent is required to obtain accurate and consistent results since the absolute amount of DTT delivered for each test can affect results. Prepare the DTT/Releasing Agent immediately before using. Use the prepared DTT/Releasing Agent within 108 hours.

1. Add 300 µL DTT to 12.0 mL Releasing Agent in a test tube using a volumetric pipet.
2. Mix the DTT and Releasing Agent in the test tube. Cover the test tube with self-sealing laboratory film and invert the test tube several times to mix.
3. Remove the self-sealing laboratory film and pour the entire contents into the disposable ReadyPack ancillary reagent pack provided.
4. Place a pack seal on the disposable ancillary reagent pack. Ensure that the seal is centered over the opening of the pack, and press firmly on the adhesive portion of the seal.

Note DTT/Releasing Agent ReadyPack ancillary reagent packs are lot-number-specific. Do not use packs from one lot of DTT/Releasing Agent with any other lot of DTT/Releasing Agent.

Preparing the System

Ensure that the system has sufficient reagent packs loaded in the reagent compartment. The system automatically mixes reagent packs to maintain homogeneous suspension of the reagents. For information about loading reagent packs, refer to the online help.

For automated dilutions, ensure that Atellica IM VB12 DIL is loaded on the system.

Master Curve Definition

Before initiating calibration on each new lot of reagent, load the assay master curve and test definition values by scanning the MC TDEF 2D barcodes. For loading instructions, refer to the online help.

Performing Calibration

For calibration of the Atellica IM VB12 assay, use the Atellica IM CAL C. Use the calibrators in accordance with the calibrator instructions for use.

Calibration Frequency

Perform a calibration if one or more of the following conditions exist:

- When changing lot numbers of primary reagent packs.
- At the end of the lot calibration interval, for a specified lot of calibrated reagent on the system.
- At the end of the pack calibration interval, for calibrated reagent packs on the system.
- When indicated by quality control results.
- After major maintenance or service, if indicated by quality control results.

At the end of the onboard stability interval, replace the reagent pack on the system with a new reagent pack. Recalibration is not required, unless the lot calibration interval is exceeded.

Stability Interval	Days
Lot Calibration	30
Pack Calibration	18
Reagent Onboard Stability	18

For information about lot calibration and pack calibration intervals, refer to the online help.

Follow government regulations or accreditation requirements for calibration frequency. Individual laboratory quality control programs and procedures may require more frequent calibration.

Performing Quality Control

For quality control of the Atellica IM VB12 assay, use an appropriate quality control material of known analyte concentration with at least 2 levels (low and high) at least once during each day that samples are analyzed. Use the quality control material in accordance with the quality control instructions for use.

A satisfactory level of performance is achieved when the analyte values obtained are within the expected control range for the system or within your range, as determined by an appropriate internal laboratory quality control scheme. Follow your laboratory's quality control procedures if the results obtained do not fall within the acceptable limits. For information about entering quality control definitions, refer to the online help.

Follow government regulations or accreditation requirements for quality control frequency. Individual laboratory quality control programs and procedures may require more frequent quality control testing.

Test quality control samples after a successful calibration.

Taking Corrective Action

If the quality control results do not fall within the assigned values, do not report results. Perform corrective actions in accordance with established laboratory protocol. For suggested protocol, refer to the online help.

Results

Calculation of Results

The system determines the result using the calculation scheme described in the online help. The system reports results in pg/mL (common units) or pmol/L (SI units), depending on the units defined when setting up the assay.

Conversion formula: 1 pg/mL = 0.7378 pmol/L

For information about results outside the specified measuring interval, refer to *Measuring Interval*.

Dilutions

The assay measuring interval for serum and plasma is 45–2000 pg/mL (33–1476 pmol/L). For information about dilution options used to extend the reportable measuring interval up to 20,000 pg/mL, refer to the online help.

Samples with vitamin B_{12} levels > 2000 pg/mL (1476 pmol/L) must be diluted and retested to obtain accurate results.

For automated dilutions, ensure that Atellica IM VB12 DIL is loaded on the system. Ensure that sufficient sample volume is available to perform the dilution and that the appropriate dilution factor is selected when scheduling the test, as indicated in the table below. Enter a dilution setpoint ≤ 2000 pg/mL (≤ 1476 pmol/L).

Sample	Dilution	Sample Volume (µL)
Serum and plasma	1:2	100
Serum and plasma	1:10	25

Interpretation of Results

Results of this assay should always be interpreted in conjunction with the patient's medical history, clinical presentation, and other findings.

Limitations

The following information pertains to limitations of the assay:

- Preservatives, such as fluoride and ascorbic acid, interfere with the Atellica IM VB12 assay.
- Excessive exposure of samples to light may alter vitamin B_{12} values.

Expected Values

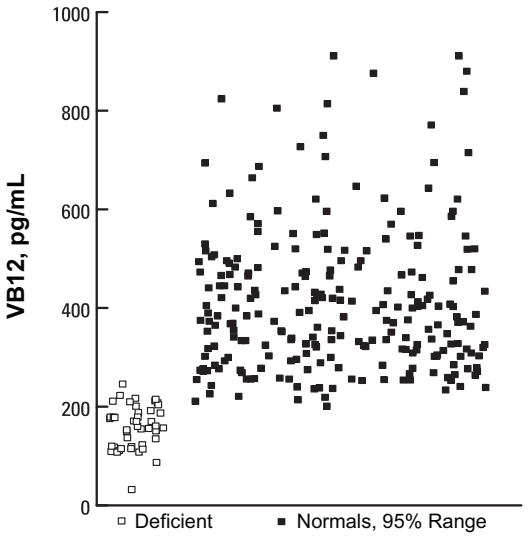
The reagent formulations used on the Atellica IM Analyzer are the same as those used on the ADVIA Centaur® and ACS:180™ systems. Expected values were established using the ACS:180 system and confirmed by assay comparison. Refer to *Assay Comparison*.

Data were obtained on 298 serum samples, including 253 samples from apparently healthy individuals and 45 samples from physician-diagnosed vitamin B_{12}-deficient patients. For the apparently healthy individuals, 95% fell in the range of 211–911 pg/mL (156–672 pmol/L).

Category	Median (pg/mL)	Range (pg/mL)	Median (pmol/L)	Range (pmol/L)
Normal	382	211–911	282	156–672
Deficient	160	32–246	118	24–181

Refer to the figure below for a scattergram of these results:

Sample Distribution



As with all *in vitro* diagnostic assays, each laboratory should determine its own reference interval for the diagnostic evaluation of patient results.[12] Consider these values as guidance only.

Performance Characteristics

The reagent formulations used on the Atellica IM Analyzer are the same as those used on the ADVIA Centaur and ACS:180 systems. Some performance characteristics for the Atellica IM assay were established using the ADVIA Centaur system.

Measuring Interval

The Atellica IM VB12 assay provides results from 45–2000 pg/mL (33–1476 pmol/L). The lower end of the measuring interval is defined by the analytical sensitivity. Report results below the measuring interval as < 45 pg/mL (33 pmol/L). When sample results exceed the measuring interval, refer to *Dilutions*.

Specificity

The cross-reactivity with cobinamide was determined by adding 20 ng/mL of cobinamide to samples containing 0, 250, and 1000 pg/mL (0, 184, and 738 pmol/L) of vitamin B_{12}. No interference was found at these levels.

Interference testing was determined according to CLSI Document EP7-P.[13]

Results were established using the ADVIA Centaur system.

Detection Capability

Detection capability was determined in accordance with CLSI Document EP17-A2.[14] The assay is designed to have analytical sensitivity of ≤ 45 pg/mL (33 pmol/L), limit of blank (LoB) ≤ 45 pg/mL (33 pmol/L) and limit of detection (LoD) ≤ 90 pg/mL (66 pmol/L).

Representative detection capability data are shown below. Assay results obtained at individual laboratories may vary from the data presented.

Analytical sensitivity is defined as the concentration of vitamin B_{12} that corresponds to the RLUs that are 2 standard deviations less than the mean RLUs of 20 replicate determinations of the vitamin B_{12} zero standard. This response is an estimate of the minimum detectable concentration with 95% confidence. The analytical sensitivity for the Atellica IM VB12 assay is 38 pg/mL (28 pmol/L).

The LoB corresponds to the highest measurement result that is likely to be observed for a blank sample. The LoB of the Atellica IM VB12 assay is 38 pg/mL (28 pmol/L).

The LoD corresponds to the lowest concentration of vitamin B_{12} that can be detected with a probability of 95%. The LoD for the Atellica IM VB12 assay is 54 pg/mL (40 pmol/L), and was determined using 147 determinations, with 75 blank and 72 low-level replicates, and an LoB of 38 pg/mL (28 pmol/L).

Precision

Precision was determined in accordance with CLSI Document EP05-A3.[15] Samples were assayed on an Atellica IM Analyzer in duplicate in 2 runs per day for 20 days. The assay was designed to have within-laboratory precision of ≤ 22 SD for samples ≤ 200 pg/mL (≤ 148 pmol/L), ≤ 10% CV for samples from 201–1350 pg/mL (148–996 pmol/L), and ≤ 12% CV for samples from 1351–2000 pg/mL (997–1476 pmol/L). The following results were obtained:

		Mean		Repeatability			Within-Laboratory Precision		
				SD[b]		CV[c]	SD		CV
Sample Type	N[a]	(pg/mL)	(pmol/L)	(pg/mL)	(pmol/L)	(%)	(pg/mL)	(pmol/L)	(%)
Lithium heparin A	80	146	108	3.7	2.7	2.5	13.4	9.9	9.2
Serum B	80	368	271	7.4	5.4	2.0	23.7	17.5	6.4
Serum C	80	486	358	11.0	8.1	2.3	27.2	20.1	5.6
Control 1	80	911	672	14.8	10.9	1.6	35.8	26.4	3.9
Control 2	80	1575	1162	22.0	16.3	1.4	50.2	37.0	3.2
Control 3	80	1778	1312	32.5	24.0	1.8	57.2	42.2	3.2

[a] Number of samples tested.
[b] Standard deviation.
[c] Coefficient of variation.

Assay results obtained at individual laboratories may vary from the data presented.

Assay Comparison

The Atellica IM VB12 assay is designed to have a correlation coefficient of ≥ 0.95 and a slope of 1.0 ±0.10 compared to the ADVIA Centaur VB12 assay. Assay comparison was determined using the weighted Deming regression model in accordance with CLSI Document EP09-A3.[16] The following results were obtained:

Specimen	Comparative Assay (x)	Regression Equation	Sample Interval	N[a]	r[b]
Serum	ADVIA Centaur VB12	y = 1.00x + 7 pg/mL (y = 1.00x + 5 pmol/L)	47.6–1936 pg/mL (35.1–1428 pmol/L)	139	0.994

[a] Number of samples tested.
[b] Correlation coefficient.

For 272 serum samples in the range of 97–1933 pg/mL (72–1426 pmol/L), the relationship between the ADVIA Centaur VB12 assay and the ACS:180 VB12 assay is described below:

Specimen	Comparative Assay (x)	Regression Equation	Sample Interval	N[a]	r[b]
Serum	ACS:180 VB12	y = 1.00x + 3 pg/mL (y = 1.00x + 2 pmol/L)	97–1933 pg/mL (72–1426 pmol/L)	272	0.99

[a] Number of samples tested.
[b] Correlation coefficient.

Agreement of the assays may vary depending on the study design, comparative assay, and sample population used. Assay results obtained at individual laboratories may vary from the data presented.

Specimen Equivalency

Specimen equivalency was determined using the Deming linear regression model in accordance with CLSI Document EP09-A3.[16] The following results were obtained:

Specimen (y)	Reference Specimen (x)	Regression Equation	Sample Interval	N[a]	r[b]
Lithium heparin	Serum	y = 1.00x + 25 pg/mL (y = 1.00x + 18.3 pmol/L)	147–1033 pg/mL (108–762 pmol/L)	104	0.96
EDTA plasma	Serum	y = 1.06x - 1 pg/mL (y = 1.06x - 0.96 pmol/L)	147–1033 pg/mL (108–762 pmol/L)	104	0.96

[a] Number of samples tested.
[b] Correlation coefficient.

Agreement of the specimen types may vary depending on the study design and sample population used. Assay results obtained at individual laboratories may vary from the data presented.

Interferences

Interference testing was performed in accordance with CLSI Document EP7-A2.[17]

Hemolysis, Icterus, and Lipemia (HIL)

Specimens that are . . .	Have an insignificant effect on the assay up to . . .
hemolyzed	150 mg/dL of hemoglobin
lipemic	3000 mg/dL of triglycerides
icteric	20 mg/dL of bilirubin

Results were established using the ADVIA Centaur system. Assay results obtained at individual laboratories may vary from the data presented.

Dilution Recovery

Five human serum samples in the range 1579.60–1995.00 pg/mL (1165.43–1471.91 pmol/L) were diluted 1:2, 1:4, 1:8, and 1:16 with VB12 DIL and assayed for recovery and parallelism. The recoveries ranged from 81.6%–123.7% with a mean of 97.3%.

Sample	Dilution	Observed (pg/mL)	Expected (pg/mL)	Observed (pmol/L)	Expected (pmol/L)	Recovery %
1	—	1820	—	1343	—	—
	1:2	899	910	663	671	98.8
	1:4	409	455	302	336	90.0
	1:8	208	228	154	168	91.5
	1:16	116	114	86	84	102.3
	Mean					95.6
2	—	1580	—	1165	—	—
	1:2	767	790	566	583	97.1
	1:4	372	395	274	291	94.2
	1:8	182	198	134	146	92.1
	1:16	107	99	79	73	108.7
	Mean					98.0
3	—	1826	—	1347	—	—
	1:2	867	913	639	674	94.9
	1:4	397	457	293	337	86.9
	1:8	186	228	137	168	81.6
	1:16	141	114	104	84	123.7
	Mean					96.8
4	—	1995	—	1472	—	—
	1:2	1000	998	738	736	100.3
	1:4	460	499	339	368	92.2
	1:8	226	249	167	184	90.5
	1:16	118	125	87	92	94.2
	Mean					94.3
5	—	1606	—	1185	—	—
	1:2	811	803	598	592	101.0
	1:4	406	401	299	296	101.1
	1:8	203	201	150	148	101.0
	1:16	104	100	77	74	103.9
	Mean					101.7
Mean						97.3

Results were established using the ADVIA Centaur system. Assay results obtained at individual laboratories may vary from the data presented.

Spiking Recovery

Varying amounts of vitamin B_{12} were added to 4 serum samples with endogenous vitamin B_{12} levels of 253–325 pg/mL (187–240 pmol/L). The recoveries ranged from 89.2%–111.8% with a mean of 101.8%.

Sample	Amount Added (pg/mL)	Observed (pg/mL)	Amount Added (pmol/L)	Observed (pmol/L)	Recovery %
1	—	253	—	187	—
	250	483	184	356	92.0
	500	770	369	568	103.4
	1000	1293	738	954	104.0
	Mean				99.8
2	—	259	—	191	—
	250	501	184	370	96.8
	500	795	369	587	107.2
	1000	1320	738	974	106.1
	Mean				103.4
3	—	259	—	191	—
	250	482	184	356	89.2
	500	742	369	547	96.6
	1000	1270	738	937	101.4
	1500	1828	1107	1349	104.6
	Mean				98.0
4	—	325	—	240	—
	250	581	184	429	102.4
	500	844	369	623	103.8
	1000	1443	738	1065	111.8
	Mean				106.0
Mean					101.8

Results were established using the ADVIA Centaur system. Assay results obtained at individual laboratories may vary from the data presented.

Standardization

The Atellica IM VB12 assay standardization is traceable to an internal standard manufactured using U.S.P. (United States Pharmacopeia) material. Assigned values for calibrators are traceable to this standardization.

Technical Assistance

For customer support, contact your local technical support provider or distributor.

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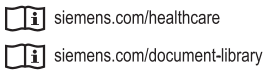
Definition of Symbols

The following symbols may appear on the product labeling:

Symbol	Symbol Title and Description
	Consult instructions for use
	Version of instructions for use
	Internet URL address to access the electronic instructions for use
	Revision
	Caution Consult instructions for use or accompanying documents for cautionary information such as warnings and precautions that cannot, for a variety of reasons, be presented on the medical device.
	Biological risks Potential biological risks are associated with the medical device.
	Corrosive
	Dangerous to environment
	Irritant Oral, dermal, or inhalation hazard
	Inhalation hazard Respiratory or internal health
	Flammable Flammable to extremely flammable
	Oxidizing
	Explosive
	Toxic
	Compressed gas
	Keep away from sunlight Prevent exposure to sunlight and heat.

Symbol	Symbol Title and Description
	Up Store in an upright position.
	Do not freeze
	Temperature limit Upper and lower limits of temperature indicators are adjacent to the upper and lower horizontal lines.
	Handheld barcode scanner
IVD	*In vitro* diagnostic medical device
	Contains sufficient for <n> tests Total number of IVD tests the system can perform with the IVD kit reagents appears adjacent to the symbol.
RxOnly	Prescription device (US only) Applies only to United States-registered IVD assays. CAUSTION: Federal (USA) law restricts this device to sale by or on the order of a licensed healthcare professional.
	Mixing of substances Mix product before use.
	Reconstitute and mix lyophilized product before use.
	Target
	Interval
	Legal Manufacturer
EC REP	Authorized Representative in the European Community
	Use-by date Use by the designated date.
LOT	Batch code
REF	Catalog number
	Recycle
	Printed with soy ink
CE	CE Mark

Symbol	Symbol Title and Description
CE 0088	CE Mark with notified body ID number Notified body ID number can vary.
YYYY-MM-DD	Date format (year-month-day)
CHECKSUM	Variable hexadecimal number that ensures the Master Curve and Calibrator definition values entered are valid.
UNITS C	Common Units
UNITS SI	International System of Units
MATERIAL	Material
MATERIAL ID	Unique material identification number
CONTROL NAME	Name of control
CONTROL TYPE	Type of control

Legal Information

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