

## SARS-CoV-2 Total Antibody assay (CV2T)

For Use Under Emergency Use Authorization Only.

For *in vitro* diagnostic use.

For Prescription Use Only.

Current Revision and Date <sup>a</sup>	Rev. 02, 2020-07	
Product Name	Dimension EXL SARS-CoV-2 Total antibody assay (CV2T)	<b>REF</b> RF812 11417412
Abbreviated Product Name	Dimension EXL CV2T	
Test Name/ID	CV2T	
Systems	Dimension EXL with LOCI Module Dimension EXL 200	
Materials Required but Not Provided	SARS-CoV-2 Total antibody calibrator (COV2T CAL/CV2T CAL)	<b>REF</b> KC813 11417413
	SARS-CoV-2 Total antibody Quality Control (COV2T/CV2T) Pos/Neg	<b>REF</b> KC815 11417415
	Dimension CHK Flex reagent cartridge	<b>REF</b> DF179 10481507
Specimen Types	Serum, dipotassium EDTA plasma, lithium heparin plasma	
Sample Volume	10 µL	
Measuring Interval	The assay reports results as positive or negative	

<sup>a</sup> A vertical bar in the page margin indicates technical content that differs from the previous version.

## Intended Use

The Dimension® EXL™ SARS-CoV-2 Total antibody assay (CV2T) is for *in vitro* diagnostic use in the qualitative detection of total antibodies (including IgG and IgM) to SARS-CoV-2 in human serum and plasma (dipotassium EDTA and lithium heparin) using the Dimension® EXL™ integrated chemistry system with LOCI® Module.

This assay is intended as an aid in identifying individuals with an adaptive immune response to SARS-CoV-2, indicating recent or prior infection. At this time, it is unknown for how long antibodies persist following infection and if the presence of antibodies confers protective immunity. The Dimension® EXL™ SARS-CoV-2 Total antibody assay (CV2T) should not be used to diagnose acute SARS-CoV-2 infection.

Testing is limited to laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C 263a, to perform moderate or high complexity tests.

Results are for the detection of SARS-CoV-2 antibodies. Antibodies to SARS-CoV-2 are generally detectable in blood several days after initial infection, although the duration of time antibodies are present post-infection is not well characterized. Individuals may have detectable virus present for several weeks following seroconversion.

Laboratories within the United States and its territories are required to report all positive results to the appropriate public health authorities.

The sensitivity of the Dimension® EXL™ SARS-CoV-2 Total antibody assay (CV2T) early after infection is unknown. Negative results do not preclude acute SARS-CoV-2 infection. If acute infection is suspected, direct testing for SARS-CoV-2 is necessary.

False positive results for the Dimension® EXL™ SARS-CoV-2 Total antibody assay (CV2T) may occur due to cross-reactivity from pre-existing antibodies or other possible causes.

The Dimension® EXL™ SARS-CoV-2 Total antibody assay (CV2T) is only for use under the Food and Drug Administration's Emergency Use Authorization.

## Summary and Explanation

The Dimension EXL CV2T assay is a chemiluminescent immunoassay used for the detection of total antibodies to SARS-CoV-2 in human serum and plasma from patients who may have been exposed to coronavirus disease (COVID-19).

COVID-19 (coronavirus disease 2019) is the illness resulting from infection with SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) virus.<sup>1-5</sup> The virus spreads readily from person-to-person or possibly from environmental exposure.<sup>6</sup> Evidence supports spread by both asymptomatic and symptomatic individuals.<sup>7</sup> About 20% of infections identified to date produce severe disease, principally the Acute Respiratory Distress Syndrome (ARDS) requiring intensive care unit treatment.<sup>4,8,9</sup> Differentiating COVID-19 from other respiratory pathogens is essential for implementing infection control measures, such as isolation and contact tracing, as well as clinical monitoring and support.

Diagnosis of current infection with SARS-CoV-2 relies primarily on molecular testing for the viral RNA using a swab collection for sputum or throat/nasal secretions.<sup>10,11</sup> SARS-CoV-2 RNA testing is recommended as the most sensitive diagnostic test for early infection, as viral RNA can be detected prior to antibody seroconversion.<sup>12,13</sup> Production of antibodies to the virus (such as IgM and IgG) occur within 15 days in most patients, and seroconversion can be coincident with the continued detection of viral RNA.<sup>13-16</sup>

Serology testing is essential for disease surveillance. This is particularly true for understanding viral prevalence, as most infections cause mild or no symptoms. Assessment of antibodies to SARS-CoV-2 virus in the population aids in the understanding of disease spread (both current and recovered) and may support the assessment of immunity should the presence of antibodies prove to be protective.

## Principles of the Procedure

The Dimension EXL CV2T assay is a homogeneous, sandwich chemiluminescent immunoassay based on LOCI technology. The LOCI reagents include two synthetic bead reagents and a biotinylated S1 RBD antigen. The first bead reagent (Sensibeads) is coated with streptavidin and contains photosensitizer dye. The second bead reagent (Chemibeads) is coated with anti-FITC (Fluorescein isothiocyanate) antibody and contains chemiluminescent dye. For this assay the anti-FITC antibody coated-Chemibeads are predecorated with fluoresceinated S1 RBD antigen. Sample is incubated with Chemibeads. After 1 minute the biotinylated antigen is added to form bead-CoV-2 antibody-biotinylated antigen sandwiches. After incubation, Sensibeads are added and bind to the biotin to form bead-pair immunocomplexes. Illumination of the complex at 680 nm generates singlet oxygen from Sensibeads which diffuses into the Chemibeads, triggering a chemiluminescent reaction. The resulting signal is measured at 612 nm and is a direct function of the concentration in the sample.<sup>17-19</sup>

## Reagents

Material Description	Storage	Stability <sup>a</sup>
<b>Dimension EXL CV2T</b>	Unopened at 2–8°C	Until expiration date on product
Wells 1–2 <sup>c</sup>		
Liquid Chemibeads (200 µg/mL, recombinant S1 RBD antigen); bovine serum albumin; mouse IgG	Onboard <sup>b</sup> Open well	30 days 3 days
Wells 3–4		
Liquid biotinylated antigen (2.0 µg/mL, recombinant S1 RBD); mouse IgG; bovine serum albumin; bovine gamma globulin; goat serum <sup>d</sup>		
Wells 5–6		
Liquid Sensibeads (650 µg/mL); bovine serum albumin		
Wells 7–8		
Assay buffer; bovine serum albumin; bovine gamma globulin; goat serum <sup>d</sup>		

<sup>a</sup> Refer to *Storage and Stability*.

<sup>b</sup> *Onboard Stability*

<sup>c</sup> Wells are numbered consecutively from the wide end of the cartridge.

<sup>d</sup> Goat serum contains sodium azide (0.00062%).

## Warnings and Precautions

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Safety data sheets (SDS) available on [siemens-healthineers.com](https://www.siemens-healthineers.com).

This test has not been FDA cleared or approved; the test has been authorized by FDA under an Emergency Use Authorization (EUA) for use by laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C 263a, to perform moderate or high complexity tests.

This test has been authorized only for detecting the presence of antibodies against SARS-CoV-2, not for any other viruses or pathogens.

This test is only authorized for the duration of the declaration that circumstances exist justifying the authorization of emergency use of *in vitro* diagnostic tests for detection and/or diagnosis of COVID-19 under Section 564(b)(1) of the Act, 21 U.S.C. § 360bbb-3(b)(1), unless the authorization is terminated or revoked sooner.



H317, H412  
P280, P273,  
P302+P352,  
P333+P313,  
P362+P364, P501

### Warning!

May cause an allergic skin reaction. Harmful to aquatic life with long lasting effects.

Wear protective gloves/protective clothing/eye protection/face protection. Avoid release to the environment. IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. Dispose of contents and container in accordance with all local, regional, and national regulations.

**Contains:** reaction mass of 5-chloro-2-methyl-2H-isothiazol-3-one and 2-methyl-2H-isothiazol-3-one (3:1); (Dimension EXL CV2T)

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**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.

## Storage and Stability

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

For details about product onboard stability, refer to *Reagents*.

## Onboard Stability

Discard products at the end of the onboard stability interval.

For details about product onboard stability, refer to *Reagents*.

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

## Specimen Collection and Handling

Serum, dipotassium EDTA plasma, and lithium heparin plasma are the recommended specimen types for this assay. Do not use heat-inactivated specimens.

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.

## Collecting the Specimen

- Observe universal precautions when collecting specimens. Handle all specimens as if they are capable of transmitting disease.<sup>20</sup>
- Follow recommended procedures for collection of diagnostic blood specimens by venipuncture.<sup>21</sup>
- Follow the instructions provided with your specimen collection device for use and processing.<sup>22</sup>
- Specimens with high turbidity or particulates should be centrifuged before analysis.
- Allow blood specimens to clot completely before centrifugation.<sup>23</sup>
- Keep tubes capped at all times.<sup>23</sup>

## Storing the Specimen

Test specimens as soon as possible after collecting. Store specimens at 2–8°C if not tested immediately within 16 hours.<sup>24</sup>

Separated specimens in the primary collection device are stable for up to 7 days at 2–8°C.<sup>24</sup>

Separated specimens may be frozen for up to 1 month at  $\leq -20^{\circ}\text{C}$ . Avoid more than 1 freeze-thaw cycle.<sup>24</sup> Do not store in a frost-free freezer. Thoroughly mix thawed specimens and centrifuge before using.

## 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.

Store samples capped and upright at 2–8°C upon arrival. If shipment is expected to exceed 7 days, ship specimens frozen.

## Preparing the Samples

This assay requires 10 µL of serum or plasma 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 system operating instructions.

Do not use samples with apparent contamination.

Remove particulates by centrifugation according to CLSI guidance and the collection device manufacturer's recommendations.<sup>23</sup>

For a complete list of appropriate sample containers, refer to the system operating instructions.

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

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

## Procedure

### Materials Provided

The following materials are provided:

REF	Contents	Number of Tests
RF812 11417412	Dimension EXL CV2T Flex Reagent Cartridge	8 x 40

### Materials Required but Not Provided

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

REF	Description	
	Dimension EXL with LOCI Module Dimension EXL 200	
KC813 11417413	SARS-CoV-2 Total antibody calibrator (COV2T CAL/CV2T CAL)	3 x 1.0 mL calibrator level 1/A 3 x 1.0 mL calibrator level 2/B
KC815 11417415	SARS-CoV-2 Total antibody Quality Control (COV2T/CV2T) Pos/Neg	6 x 1 mL positive quality control 6 x 1 mL negative quality control
DF179 10481507	Dimension CHK Flex reagent cartridge	

## Assay Procedure

**Note** In software version 10.4.3 or higher, reagent carryover mitigations have been implemented and the next section may be skipped.

**CAUTION (Software version 10.4.2)**

In Reagent carryover mitigations have not been determined for this assay and potential for interactions cannot be excluded.

Process the Dimension EXL CV2T assay separately from other assays.

Prior to processing the Dimension EXL CV2T assay for patient samples, QC, and calibration, allow all other tests to complete. Ensure that no other assays are submitted for processing until all Dimension EXL CV2T testing is complete and the analyzer is in Standby.

1. Select **F4: System Prep>System Check**, then **F1:Start**.
2. Schedule the batch of Dimension EXL CV2T assays either by manual entry or via LIS download.  
Ensure that QC is included if your laboratory procedure requires it.
3. Once the Dimension EXL CV2T testing is complete and the instrument returns to **STANDBY**, repeat Step 1 to complete the batch testing process.
4. Resume testing of other assays.

**Note** Assign requests for Dimension EXL CV2T to a separate sample ID.

The system automatically performs the following steps:

1. For serum or plasma, deliver 20 µL of antigen-coated Chemibeads to the reaction vessel.
2. The system adds 10 µL of sample to the reaction vessel.
3. Dispenses 20 µL of the biotin antigen reagent into the reaction vessel.
4. Briefly mix and incubate for 12 minutes at 37°C.
5. Dispenses 20 µL of the Sensibead into a reaction vessel.
6. Incubates the mixture at 37°C.
7. Dispense 100 µL of the Assay Buffer.
8. Illumination of the complex at 680 nm generates singlet oxygen from the Sensibeads which diffuses into the Chemibeads, triggering a chemiluminescent reaction. The resulting signal is measured at 612 nm and is a direct function of the total SARS-CoV-2 antibody concentration in the sample.
9. Reports results.

Test Duration: approximately 16 minutes

## Preparing the Reagents

All reagents are liquid and ready to use.

## Preparing the System

For information about loading reagents, refer to the system operating instructions.

## Performing Calibration

For calibration of the Dimension EXL CV2T assay, use SARS-CoV-2 Total antibody calibrator (COV2T CAL/CV2T CAL). Use the calibrators in accordance with the calibrator instructions for use.

## Calibration Procedure

1. Enter the following calibrator information in the fields on the **Enter Data** screen:
  - **Position:** Segment letter and position number of CAL 2
  - **Patient Name:** Enter Calibrator name
  - **Sample No.:** Enter Calibrator Lot No.
  - **Location:** Leave blank
  - **Tests:** Request three tests for the Dimension EXL CV2T assay
  - **Mode:** Select **F7: Next Mode**, change field to **Sample Cup**
  - **Priority:** Select **F4: Next Priority**, change field to **QC**
  - **Fluid:** Select **F8: Next Fluid**, change field to **Serum QC3**

### WARNING

When processing Dimension EXL CV2T, **Serum QC3** is reserved for the calibrator. An erroneous calibration of the assay could occur if any other fluid designation or material is used.

2. Add a minimum of 0.1 mL of the SARS-CoV-2 Total antibody calibrator (COV2T CAL/CV2T CAL) level 2 to a 1.5 mL sample cup.
3. Place the sample cup into the segment position entered on the **Enter Sample Data** screen.
4. Select **F2: Process Single**.

The following message will appear:

**This fluid (Serum QC 3) will calibrate a CV2T method. Continue? (y/n)**
5. Select **y** to begin the calibration.
6. When calibration is completed, run the SARS-CoV-2 Total antibody Quality Control (COV2T/ CV2T) Pos/Neg.

## Calibration Frequency

**I** Calibrate the assay every 14 days.

In addition, perform a calibration:

- At the end of the calibration interval.
- When changing lot numbers of reagents.
- When indicated by quality control results.
- After major maintenance or service.

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 Dimension EXL CV2T, use the SARS CoV 2 Total antibody Quality Control (COV2T/CV2T Pos/Neg) or an equivalent product at least once during each day that samples are analyzed. Additional quality control material can be used at the discretion of the laboratory. Use the quality control material in accordance with the quality control instructions for use.

In addition, perform quality control:

- Following a valid calibration.
- With use of a new lot of reagent.
- When troubleshooting test results that do not match clinical conditions or symptoms.

Follow government regulations or accreditation requirements for quality control frequency.

Acceptable performance is achieved when the analyte values obtained are within the expected control interval for the system, as indicated by the manufacturer of the control material or within the interval determined by an appropriate internal laboratory quality control scheme.

Individual laboratory quality control programs and procedures may require more frequent quality control testing. For information about entering quality control definitions, refer to the system operating instructions.

## Taking Corrective Action

If the quality control results do not fall within the expected control interval, do not report results. Perform corrective actions in accordance with established laboratory protocol. For suggested protocol, refer to the system operating instructions.

## Results

### Calculation of Results

The system determines the result using the calculation scheme described in the system operating instructions. The system reports the results as "POS" or "NEG" relative to the assay cutoff. Refer to *Interpretation of Results*.

### Interpretation of Results

The Dimension EXL CV2T assay cutoff analyte value is 1000 QUAL units and is used to distinguish between positive and negative.

- **Positive Results:** A specimen that gives an analyte value greater than or equal to 1000 QUAL units is interpreted as "positive".
- **Negative Results:** A specimen that gives analyte values less than 1000 QUAL units is interpreted as "negative". Either the specimen does not contain detectable antibodies or antibodies are present in concentrations below the cutoff value for this assay.

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:

- The test should not be used to diagnose or exclude active infection. Results are not intended to be used as the sole basis for patient management decisions. Test results should be interpreted in conjunction with clinical observations, patient history, epidemiological information and other laboratory findings.
- The performance of the assay has not been established with cord blood, neonatal specimens, cadaver specimens, or body fluids other than serum or plasma.
- A positive test result does not exclude past or present infection by other coronaviruses, such as SARS-CoV-1, MERS-CoV, HKU1, 229E, NL63, or OC43.
- Patient specimens may be negative if collected during the early (pre-seroconversion) phase of illness or due to a decline in titer over time. In addition, the immune response may be depressed in elderly, immunocompromised or immunosuppressed patients.



- It is not known at this time if the presence of antibodies to SARS-CoV-2 confers immunity to re-infection.
- This test should not be used for donor screening.

## Conditions of Authorization for the Laboratory

The Dimension EXL CV2T assay Letter of Authorization, along with the authorized Fact Sheet for Healthcare Providers, the authorized Fact Sheet for Patients, and authorized labeling are available on the FDA website:

<https://www.fda.gov/medical-devices/emergency-situations-medical-devices/emergency-use-authorizations#covid19ivd>

However, to assist clinical laboratories using the Dimension EXL CV2T assay, the relevant Conditions of Authorization are listed below:

- Authorized laboratories<sup>a</sup> using the Dimension EXL CV2T assay will include with test result reports, all authorized Fact Sheets. Under exigent circumstances, other appropriate methods for disseminating these Fact Sheets may be used, which may include mass media.
- Authorized laboratories using the Dimension EXL CV2T assay will use the product as outlined in the Instructions for Use. Deviations from the authorized procedures, including the authorized instruments, authorized clinical specimen types, authorized control materials, authorized other ancillary reagents and authorized materials required to use the Dimension EXL CV2T assay are not permitted.
- Authorized laboratories that receive the Dimension EXL CV2T assay will notify the relevant public health authorities of their intent to run the assay prior to initiating testing.
- Authorized laboratories using the Dimension EXL CV2T assay will have a process in place for reporting test results to healthcare providers and relevant public health authorities, as appropriate.
- Authorized laboratories will collect information on the performance of the Dimension EXL CV2T assay and report to DMD/OHT7-OIR/OPEQ/CDRH (via email: CDRH EUA Reporting@fda.hhs.gov) and Siemens Healthineers Technical Support (tel: +1 (800) 441-9250) any suspected occurrence of false positive or false negative results and significant deviations from the established performance characteristics of the assay of which they become aware.
- All laboratory personnel using the Dimension EXL CV2T assay must be appropriately trained in automated immunoassay techniques and use appropriate laboratory and personal protective equipment when handling this kit, and use the Dimension EXL CV2T assay in accordance with the authorized labeling. All laboratory personnel using the assay must also be trained in and be familiar with the interpretation of results of the Dimension EXL CV2T assay.
- Siemens Healthineers, authorized distributors, and authorized laboratories using the Dimension EXL CV2T assay will ensure that any records associated with this EUA are maintained until otherwise notified by FDA. Such records will be made available to FDA for inspection upon request.

<sup>a</sup> The letter of authorization refers to, "Laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C. §263a, to perform moderate or high complexity tests" as "authorized laboratories".

## Performance Characteristics

### Measuring Interval

The Dimension EXL CV2T assay reports results as positive or negative.

**Note** Results indicated above assay range may be reported as positive.

### Seroconversion Sensitivity

Up to 17 serial draws from 9 SARS CoV 2 PCR positive patients from the United States were collected and evaluated using the Dimension EXL CV2T assay. All samples were tested in singlicate. The following results were obtained.

Panel ID	Bleed Number	Days Post PCR Positive	QUAL Units	Result Interpretation
Panel 1	1	4	269	Negative
	2	7	10,719	Positive
	3	24	> 30,000	Positive
	4	25	> 30,000	Positive
	5	26	> 30,000	Positive
	6	27	> 30,000	Positive
	7	28	> 30,000	Positive
	8	29	> 30,000	Positive
	9	30	> 30,000	Positive
	10	31	> 30,000	Positive
Panel 2	1	7	7460	Positive
	2	10	14,048	Positive
	3	22	18,035	Positive
	4	24	24,114	Positive
Panel 3	1	4	14,792	Positive
	2	5	> 30,000	Positive
	3	6	> 30,000	Positive
	4	7	> 30,000	Positive
Panel 4	1	1	4883	Positive
	2	3	17,959	Positive
	3	4	22,785	Positive
Panel 5	1	2	24,997	Positive
	2	3	> 30,000	Positive

Panel ID	Bleed Number	Days Post PCR Positive	QUAL Units	Result Interpretation
Panel 6	1	10	> 30,000	Positive
	2	11	> 30,000	Positive
	3	12	> 30,000	Positive
	4	13	> 30,000	Positive
	5	14	> 30,000	Positive
	6	16	> 30,000	Positive
	7	16	> 30,000	Positive
Panel 7	1	8	> 30,000	Positive
	2	9	> 30,000	Positive
	3	9	> 30,000	Positive
	4	10	> 30,000	Positive
	5	11	> 30,000	Positive
	6	12	> 30,000	Positive
	7	13	> 30,000	Positive
	8	14	> 30,000	Positive
	9	15	> 30,000	Positive
	10	16	> 30,000	Positive
	11	17	> 30,000	Positive
	12	18	> 30,000	Positive
	13	19	> 30,000	Positive
	14	20	> 30,000	Positive
	15	21	> 30,000	Positive
	16	22	> 30,000	Positive
	17	23	> 30,000	Positive
Panel 8	1	22	19,281	Positive
	2	23	18,381	Positive
	3	24	16,753	Positive
	4	25	16,138	Positive
	5	26	15,603	Positive
	6	26	14,949	Positive
	7	27	14,515	Positive

Panel ID	Bleed Number	Days Post PCR Positive	QUAL Units	Result Interpretation
Panel 9	1	7	17,313	Positive
	2	10	> 30,000	Positive
	3	11	> 30,000	Positive
	4	15	> 30,000	Positive
	5	16	> 30,000	Positive
	6	17	> 30,000	Positive
	7	18	> 30,000	Positive
	8	19	> 30,000	Positive

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

## Clinical Agreement

Positive percent agreement and negative percent agreement were determined in accordance with CLSI Document EP12-A2.<sup>25</sup> The performance of the Dimension EXL CV2T assay was determined by testing a total of 1735 samples using the Dimension EXL system.

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

### Positive Percent Agreement

Positive percent agreement was determined by testing 206 samples from individuals with a clinical diagnosis of COVID-19 based on a positive polymerase chain reaction (PCR) method and days post symptom onset. The results are shown in the table below:

Days Post PCR Positive	N <sup>a</sup>	Positive	Negative	Positive Percent Agreement (95% CI) <sup>b</sup>
0–6	96	66	30	68.75% (59.65%–77.15%)
7–13	38	37	1	97.37% (94.72%–99.53%)
≥ 14	72	72	0	100.00% (95.83%–100.00%)

<sup>a</sup> Number of samples tested.

<sup>b</sup> Confidence Interval.

Days Post Symptom Onset	N <sup>a</sup>	Positive	Negative	Positive Percent Agreement (95% CI) <sup>b</sup>
0–6	81	54	27	66.67% (56.44%–75.97%)
7–13	46	42	4	91.30% (85.08%–96.57%)
≥ 14	79	79	0	100.00% (96.20%–100.00%)

<sup>a</sup> Number of samples tested.

<sup>b</sup> Confidence Interval.

## Negative Percent Agreement

Negative percent agreement was determined by testing 1529 samples collected prior to the COVID-19 outbreak (before mid-December 2019) from apparently healthy individuals and apparently healthy pregnant women in the United States. The results are shown in the table below:

Group	N <sup>a</sup>	Negative	Positive	Negative Percent Agreement (95% CI) <sup>b</sup>
Apparently Healthy	1462	1460	2	99.86% (99.76%–99.96%)
Apparently Healthy Pregnant Women	67	67	0	100.00% (99.80%–100.00%)
<b>Total</b>	<b>1529</b>	<b>1527</b>	<b>2</b>	<b>99.87%</b> <b>(99.77%–99.96%)</b>

<sup>a</sup> Number of samples tested.

<sup>b</sup> Confidence Interval.

## Precision

The assay was designed to have the following precision.

Concentration Interval	Precision	
	Repeatability (Within-Run)	Within-Laboratory (Total Precision)
800–2000	≤ 10.0% CV	≤ 12.0% CV
> 2000	≤ 12.0% CV	≤ 15.0% CV

Precision was determined in accordance with CLSI Document EP05-A3.<sup>26</sup> Samples were assayed on the Dimension EXL in duplicate in 2 runs per day for 20 days.

The following results were obtained:

### Qualitative Analysis

Specimen Type	N <sup>a</sup>	Mean QUAL	Repeatability		Within-Laboratory Precision	
			SD <sup>b</sup> QUAL	CV <sup>c</sup> (%)	SD QUAL	CV (%)
Serum A	80	855	18.7	2.2	25.8	3.0
Serum B	80	2360	62.8	2.7	74.5	3.2
Control 1 <sup>d</sup>	80	42	2.0	N/A <sup>e</sup>	2.4	N/A
Control 2 <sup>f</sup>	80	1540	38.4	2.5	60.0	3.9

<sup>a</sup> Number of results.

<sup>b</sup> Standard deviation.

<sup>c</sup> Coefficient of variation.

<sup>d</sup> Negative.

<sup>e</sup> Not applicable.

<sup>f</sup> Positive.

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

## Specimen Equivalency

The assay is designed to have a slope of 0.90–1.10 for alternate tube types versus serum.

Forty-five native matched samples (serum, lithium heparin, K<sub>2</sub>EDTA) with PCR positive results from an FDA authorized device were tested n=1 on the Dimension Vista COV2T device.

Specimen equivalency was determined using the Deming linear regression model using the Dimension EXL 200 in accordance with CLSI Document EP09-A3.<sup>27</sup> The following results were obtained:

Specimen (y)	N <sup>a</sup>	Sample Interval	Slope	r <sup>b</sup>
Potassium EDTA	45	1323–41,894	1.01	0.999
Lithium Heparin	45	1323–41,894	0.99	0.999

<sup>a</sup> Number of samples tested.

<sup>b</sup> 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

### Hemolysis, Icterus, and Lipemia (HIL)

Bias is the difference in the results between the control sample (does not contain the interferent) and the test sample (contains the interferent) expressed in percent. The Dimension EXL CV2T assay is designed to have ≤ 10% interference from hemoglobin, bilirubin, and intralipid. Bias > 10% is considered interference. Analyte results should not be corrected based on this bias.

Interfering testing was performed in accordance with CLSI Document EP07-ED3.<sup>28</sup> The following results were obtained:

Substance	Substance Concentration Conventional Units (SI Units)	Analyte Concentration QUAL Units	Bias %
Hemoglobin	1000 mg/dL (0.625 mmol/L)	55 1250	-7.7 0.0
Bilirubin, conjugated	40 mg/dL (475 µmol/L)	46 1271	1.3 -5.8
Bilirubin, unconjugated	40 mg/dL (684 µmol/L)	46 1267	-3.2 -3.5
Lipemia (Intralipid) <sup>a</sup>	1500 mg/dL (16.95 mmol/L)	49 1200	-5.9 -0.5

<sup>a</sup> SI units calculated as triolein.

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

## Interfering Substances

Interference testing was performed in accordance with CLSI Document EP07-ED3.<sup>28</sup>

Biotin interference was measured by the paired difference approach for biotin concentrations of 1200 ng/mL and 600 ng/mL spiked into one negative patient pool and 3 positive patient samples (one low positive, one mid-range positive and one high positive). The qualitative patient results were not impacted up to 1200 ng/mL of biotin. Due to the nature of the interference, the specificity of the assay is not impacted by biotin. Negative patient results are unlikely to be misinterpreted as positive results as a consequence of biotin interference. The following results were obtained:

		Biotin Conc. ng/mL	
		600	1200
Negative Pool	QUAL Units	47	44
	% Bias	1	-5
	Result	Negative	Negative
Low Positive	QUAL Units	2381	1782
	% Bias	-9	-32
	Result	Positive	Positive
Mid-Range Positive	QUAL Units	20,815	14,965
	% Bias	-5	-32
	Result	Positive	Positive
High Positive	QUAL Units	46,963	34,746
	% Bias	-7	-31
	Result	Positive	Positive

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

## Cross-Reactivity

Cross-reactivity was determined in accordance with CLSI Document EP07-ED3.<sup>28</sup> The assay was evaluated for potential cross-reactivity in specimens with other viral and microbial antibodies and other disease states. No false positive results were observed with the potential cross-reactants listed in the following table:

Clinical Category	Number Tested	Number Positive with Dimension EXL CV2T Assay
Anti-Influenza A	7	0
Anti-Influenza B	10	0
Anti-HBV	10	0
Antinuclear antibody (ANA)	10	0
Hepatitis B core antigen (anti-HBc) IgM	16	0
Hepatitis B surface antigen (HBs Ag)	10	0
Hepatitis C virus (HCV) antibody	10	0
Human immunodeficiency virus (HIV) antibody	10	0
Influenza antibody	10	0
Anti-Respiratory Syncytial Virus	9	0
Toxoplasma IgG	9	0
<b>Total</b>	<b>111</b>	<b>0</b>

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

## Standardization

Values assigned to the SARS-CoV-2 Total antibody calibrator (COV2T CAL/COV2T CAL) are traceable to the established SARS-CoV-2 cutoff through the Dimension EXL and patient sample concordance testing.

Currently no reference standard is available for this assay.

## Technical Assistance

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

[siemens.com/healthineers](https://www.siemens.com/healthineers)

## References

1. Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR.. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *Int J Antimicrob Agents*. 2020;55(3):105924.
2. Guo YR, Cao QD, Hong ZS, Tan YY, Chen SD, Jin HJ, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. *Mil Med Res*. 2020;7(1):11.
3. Li H, Liu SM, Yu XH, Tang SL, Tang CK. Coronavirus disease 2019 (COVID-19): current status and future perspectives. *Int J Antimicrob Agents*. 2020;29:105951.














































4. Wu Z and McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases From the Chinese Center for Disease Control and Prevention . *JAMA* 2020;323(13):2648.
5. Pan A, Liu L, Wang C, Guo H, Hao X, Wang Q, et al. Association of Public Health Interventions With the Epidemiology of the COVID-19 Outbreak in Wuhan, China. *JAMA*. 2020;6130.
6. Rothan HA and Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun*. 2020;109:102433.
7. Lai CC, Liu YH, Wang CY, Wang YH, Hsueh SC, Yen MY, et al. Asymptomatic carrier state, acute respiratory disease, and pneumonia due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): Facts and myths. *J Microbiol Immunol Infect*. 2020;pii: S1684-1182;(20):30040-2.
8. Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu S, et al. Risk Factors Associated With Acute Respiratory Distress Syndrome and Death in Patients With Coronavirus Disease 2019 Pneumonia in Wuhan, China. *JAMA Intern Med*. 2020;10:1001.
9. Rodriguez-Morales AJ, Cardona-Ospina JA, Gutiérrez-Ocampo E, Villamizar-Peña R, Holguin-Rivera Y, Escalera-Antezana JP, et al. Clinical, laboratory and imaging features of COVID-19: A systematic review and meta-analysis. *Travel Med Infect Dis*. 2020;13:101623.
10. Centers for Disease Control and Prevention (CDC). Coronovirus Disease 2019: Evaluation and Testing page. <https://www.cdc.gov/coronavirus/2019-nCoV/hcp/clinical-criteria.html>. Accessed April 27, 2020.
11. World Health Organization. Coronavirus disease (COVID-19) technical guidance: Laboratory testing for 2019-nCoV in humans page. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/laboratory-guidance>. Accessed April 27, 2020.
12. Jin YH, Cai L, Cheng ZS, Cheng H, Deng T, Fan YP, et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (COVID-19) infected pneumonia (standard version). *Mil Med Res*. 2020;7(1):4.
13. Zhao, J, Yuan Q, Wang H, Liu W, Liao X, Su Y, et al. Antibody responses to SARS-CoV-2 in patients of novel coronavirus disease 2019. *Clin Infect Dis*. 2020;pii:344.
14. Li Z, Yi Y, Luo X, Xiong N, Liu Y, Li S, et al. Development and clinical application of a rapid IgM-IgG combined antibody test for SARS-CoV-2 infection diagnosis. *J Med Virol*. 2020;10.1002:25727.
15. Yang JR, Deng DT, Wu N, Yang B, Li HJ, and Pan XB. Persistent viral RNA positivity during recovery period of a patient with SARS-CoV-2 infection. *J Med Virol*. 2020;10.1002:25940.
16. Wu F, Wang A, Liu M, Wang Q, Chen J, Xia S, et al. Neutralizing antibody responses to SARS-CoV-2 in a COVID-19 recovered patient cohort and their implications. medRxiv; <https://doi.org/10.1101/2020.03.30.20047365>. Accessed April 30, 2020.
17. Ullman EF, Kirakossian H, Switchenko AC, Ishkanian J, Ericson M, Wartchow CA, et al. Luminescent oxygen channeling assay (LOCI®): sensitive, broadly applicable homogenous immunoassay method. *Clin Chem* 1996;42(9):1518–1526.
18. Ullman EF, Kirakossian H, Singh S, Wu ZP, Irvin BR, Pease JS, et al. Luminescent oxygen channeling immunoassay: Measurement of particle binding kinetics by chemiluminescence. *Proc. Natl. Acad. Sci. USA*, 1994;91:5426-5430.
19. Ullman EF, Homogenous Immunoassays. In: Wild D, ed. *The Immunoassay Handbook*, 2nd ed. London, UK: Nature Publishing Group 2001:192-194.
20. Clinical and Laboratory Standards Institute. *Protection of Laboratory Workers From Occupationally Acquired Infections; Approved Guideline—Fourth Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2014. CLSI Document M29-A4.

21. Clinical and Laboratory Standards Institute. *Procedures for the Collection of Diagnostic Blood Specimens by Venipuncture; Approved Standard—Sixth Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2007. CLSI Document GP41-A6.
22. Clinical and Laboratory Standards Institute. *Tubes and Additives for Venous and Capillary Blood Specimen Collection; Approved Standard—Sixth Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2010. CLSI Document GP39-A6.
23. Clinical and Laboratory Standards Institute. *Procedures for the Handling and Processing of Blood Specimens for Common Laboratory Tests; Approved Guideline—Fourth Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2010. CLSI Document GP44-A4.
24. Data on file at Siemens Healthcare Diagnostics.
25. Clinical and Laboratory Standards Institute. *User Protocol for Evaluation of Qualitative Test Performance; Approved Guideline—Second Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2008. CLSI Document EP12-A2.
26. Clinical and Laboratory Standards Institute. *Evaluation of Precision of Quantitative Measurement Procedures; Approved Guideline—Third Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2014. CLSI Document EP05-A3.
27. Clinical and Laboratory Standards Institute. *Measurement Procedure Comparison and Bias Estimation Using Patient Samples; Approved Guideline—Third Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2013. CLSI Document EP09-A3.
28. Clinical and Laboratory Standards Institute. *Interference Testing in Clinical Chemistry; Approved Guideline—Third Edition*. Wayne, PA: Clinical and Laboratory Standards Institute; 2018. CLSI Document EP07-ED3.

## Definition of Symbols

The following symbols may appear on the product labeling:

Symbol	Symbol Title	Symbol	Symbol Title
	Legal Manufacturer		Authorized Representative in the European Community
	Use-by Date		Batch Code
	Catalog Number		Contains sufficient for <n> tests
	Consult Instruction for Use	 Rev. XX	Version of Instruction for Use
 <a href="https://www.siemens.com/eifu">siemens.com/eifu</a>	Internet URL address to access the electronic instructions for use	<b>Rev.</b> 	Revision
	<i>In vitro</i> diagnostic medical device		Unique Device Identification (UDI) barcode
<b>RxOnly</b>	Prescription device (US only)		CE Marking
	CE Marking with Notified Body		Keep away from sunlight and/or heat
	Temperature Limit		Lower Limit of Temperature

Symbol	Symbol Title	Symbol	Symbol Title
	Upper Limit of Temperature		Do not freeze
	Do not re-use		This way up
	Recycle		Caution / Warning
	Biological Risk		Explosive (GHS)
	Flammable (GHS)		Oxidizing (GHS)
	Corrosive (GHS)		Toxic (GHS)
	Irritant (GHS)		Respiratory / Internal Health (GHS)
	Environmental (GHS)		Common Units
	International System of Units		Date format (year-month-day)
	Date format (year-month)		Printed with soy ink
	Mixing of substances		Non-sterile
	Contents		Reconstitution volume
	Level		Scalers

## Legal Information

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