



**2019-nCoV High Sensitivity  
S1 Protein ELISA Kit**

**Instruction Manual**

**Catalog No. C19S1-876**

**For the measurement of 2019-nCoV Spike Protein in complex biological samples**

*This assay kit is for research use only – NOT intended for use in diagnostic or therapeutic procedures.*

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# INTRODUCTION

## Background

The severe acute respiratory syndrome related novel coronavirus SARS-CoV-2 has caused the pandemic of the respiratory diseases (COVID-19) around the world in 2020. Researchers worldwide are racing to develop potential vaccines and drugs to fight the new coronavirus, 2019-nCoV acute respiratory disease.

For the detection of pathogens, RT-PCR method is the earliest method that can be applied. Real-time fluorescent RT-PCR positive is used as one of the confirmed diagnosis of new coronavirus infection. Due to the problems associated with the diagnosis of nucleic acid detection, such as false negatives, equipment and lab personnel expertise requirements and long detection time, additional CT scans and other clinical symptom indicators are needed for a proper diagnosis of COVID-19. The patient's serological indicators being positive for the specific IgM or IgG antibodies against 2019-nCoV emerges as the second diagnostic method. Antibody detection is based on the human immune response to foreign pathogens. If pathogen-specific IgM is detected in the serum, it indicates that infection has recently occurred. Usually after 20 days, specific IgG antibodies against pathogens can be detected. It can be used as an auxiliary diagnostic method when the nucleic acid test is negative. The FDA's 2019-nCoV testing guidelines have clearly stated that antibody testing cannot be used alone for the diagnosis of COVID-19, and cannot exclude infection or indicate the status of infection.

SignalChem 2019-nCoV High Sensitivity S1 Protein ELISA kit provides an option to detect the pathogen at early stage of disease infection. The spike glycoprotein (S) of coronavirus belongs to the type I transmembrane protein, which contains two subunits, S1 and S2, which is also known to be the key component to bind with host cells through the interaction with angiotensin-converting enzyme 2 (ACE2). A receptor binding domain (RBD) of S1 can recognize the cell surface receptor and the mutation of RBD could cause higher motility rate. Though the coronavirus uses many different proteins to replicate and invade cells, the spike protein is the major surface protein that it uses to bind to a receptor – another protein that acts like a doorway into a human cell. This ELISA kit is designed to detect and measure nCoV Spike protein in complex biological samples such as saliva, pharyngeal swabs, serum or other samples.

## About this assay

This 2019-nCoV High Sensitivity S1 Protein ELISA Kit v2.0 is a sandwich enzyme-linked immunosorbent assay for the quantitative measurement of 2019-nCoV Coronavirus Spike protein. The S1 Protein ELISA employs a capture anti-S1 protein antibody coated on a 96-well plate. Calibrators and samples are pipetted into the wells; the target protein in the calibrators and samples binds to the immobilized capture antibody. The wells are washed and the HRP-labeled Detection antibody is then added. After washing away the unbound HRP-antibodies, a colorimetric substrate solution (TMB) is pipetted to the wells. The absorbance of the color at 450 nm is measured. The intensity of color development in the wells is proportional to the amount of target protein bound.

# GENERAL INFORMATION

## Materials supplied

<b>Part #</b>	<b>Part</b>	<b>Quantity / Size</b>
C19S1-HS61DH	Anti-nCoV S1 Detection Antibody, HS-1X	1 vial x 10 mL
CP06-642HL	Anti-2019-nCoV Spike Protein Coated Plate	1 plate
CS02-506	One Step TMB Substrate	1 vial x 10 mL
E01-09	nCoV ELISA Sample Dilution Buffer	2 vials x 10 mL
SS01-09	Stop Solution	1 vial x 6 mL
C19SD-CAL50	Calibrator: 50 ng/ml	1 vial x 1 mL
WB20-09	Wash Buffer, 20X	2 vials x 15 mL

## Additional materials required

1. Micro plate cover
2. Milli-Q water or other source of pure water
3. Pipettes, or multichannel pipettes
4. Incubator for 37°C incubation
5. Microplate reader capable of reading absorbance at 450 nm

## Storage/Stability

The entire kit may be stored at 4°C for up to 6 months. The coated plate is provided as a multistrip assay plate in the kit, allowing the user to select the appropriate number of strips for each experiment. The remaining unused strips should be stored sealed and used within 1 month after opening.

# ASSAY WORKFLOW

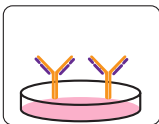
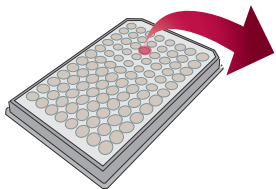
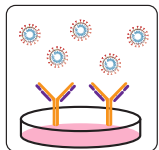
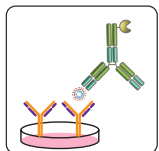


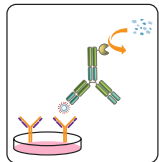
Plate pre-coated with  
Anti-2019-nCoV Spike Protein  
capture antibody



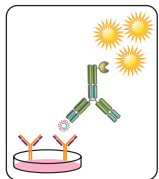
Add sample



Wash plate & add detection antibody



Wash plate & add TMB substrate



Add stop solution & read plate

## LEGEND



Capture Antibody



Spike Protein



Detection Antibody



TMB Substrate



Oxidized TMB

# PROTOCOLS

## Reagent preparation

The materials supplied in this kit are sufficient for 100 ELISA assays using the provided protocol. Users may adjust the amounts of the reagents prepared according to number of assays needed and store unused reagents at appropriate conditions as indicated.

### 1. Wash Buffer, 1X

Add 570 mL of Milli-Q water to 30 mL of the 20X Wash Buffer. The diluted wash buffer can be stored at 4°C for up to a week. For future use, store at 20°C.

### 2. Sample dilution

The samples can be diluted with the nCoV ELISA Sample Dilution Buffer provided in the kit. The dilution required may be different depending on the property of the biological samples. It is recommended that several dilutions of samples be performed to determine the optimal concentration.

## Assay procedure

Bring all the kit reagents to room temperature before use. Unused microwell strips should be returned to the original re-sealable bag containing the desiccant pack, stored at 4°C, and used within one month of opening.

1. Place the required number of pre-coated strips onto an ELISA plate frame.
2. Dilute the calibrator with sample dilution buffer to 0 ng/mL (blank), 0.8 ng/mL, 2 ng/mL, and 5 ng/mL.
3. Add 100  $\mu$ L of each diluted samples and calibrators per well in duplicate or triplicate.
4. Cover plate and incubate at 37°C for 30 minutes.
5. Decant solution from the plate. Wash the wells 4 times with 300  $\mu$ L wash buffer. Invert the plate and blot dry after last wash.
6. Add 100  $\mu$ L of the HRP-anti-nCoV S1 Detection Antibody.
7. Cover plate and incubate at 37°C for 30 minutes.
8. Repeat Step 5 as described.
9. Add 100  $\mu$ L one-step TMB to each well. Cover plate and incubate at room temperature for 5 minutes, protected from light.
10. Add 50  $\mu$ L stop solution to each well. The color in the wells should change from blue to yellow. If the color change does not appear uniform, gently tap the plate to ensure thorough mixing.
11. Within 30 minutes, read the optical density (O.D.) of all assay wells at 450nm in a microplate reader.

# DATA ANALYSIS

## Calculation of Spike protein concentration

The 2019-nCoV Spike protein concentration of a biological sample may be calculated using the Calibrator by generating a standard curve that correlates the measured O.D. values.

1. Subtract the average OD value of the 0 ng/mL (blank) calibrator wells from the values of those wells that have samples or Calibrators.
2. Generate a standard curve by plotting the known Calibrator amounts (x-axis) versus O.D. value (Y-axis) as log<sub>10</sub> values or using a logarithmic scale. Determine the linear regression equation for the data and ensure that the R<sup>2</sup> value is close to 1 (see Figure 1).
3. Using the to the OD value of a sample (after background subtraction) use the linear regression equation from the standard curve to calculate the concentration of the sample, ensuring that the sample OD is within the range of the standard curve. Correct for the sample dilution to determine the actual sample concentration.

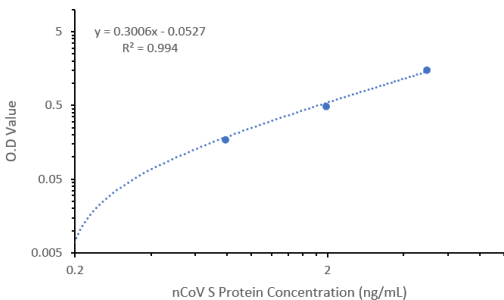


Figure 1. Typical calibration curve of the supplied Calibration standards. Data was analyzed using MS Excel® software.

## Limitations:

1. The Calibrator provided in this kit is prepared by using recombinant 2019-nCoV Spike protein RBD in the sample dilution buffer, instead of native SARS-CoV-2 Spike protein. The real concentration of Spike protein will be different from the calculated concentration.
2. In native biological samples, there are various interfering substances that affect the accuracy of the test results. Thus, the results of this test can only be used for research purpose and not for diagnosis and therapy application.

## RESOURCES

### References

1. Zhou P, et al: A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*. 2020, 579:270-89.
2. Xiao X, et al: The SARS-CoV S glycoprotein. *Cell Mol Life Sci*. 2004, 61 (19-20): 2428-30.
3. Lan J, et al: Crystal structure of the 2019-nCoV Spike receptor-binding domain bound with the ACE2 receptor. *bioRxiv*. doi: <https://doi.org/10.1101/2020.02.19.956235>.

### Related products

Catalog Number	Name	Species	Tag	Sequence
C19SD-G241H / F	2019-nCoV Spike protein RBD, HIS or Fc Tag	SARS-CoV-2	HIS / Fc	319-541
C19S1-G241H / F	2019-nCoV Spike protein S1, HIS or Fc Tag	SARS-CoV-2	HIS / Fc	16-685
C19S2-G241F	2019-nCoV Spike protein S2	SARS-CoV-2	Fc	686-1212
C19S1-61MH	Anti 2019-nCoV Spike Protein mIgG Antibody	Human Fab / Mouse IgG Fc		Monoclonal
C19S1-60DH	Anti-2019-nCoV Spike protein hIgG Antibody	Human, IgG	HRP	Monoclonal
C19S1-P877	2019-nCoV S1 Human IgG-IgA-IgM ELISA Kit			
C19NS1-P877	2019-nCoV N-S1 Human IgG-IgA-IgM ELISA Kit			
C19SD-N887	2019-nCoV Neutralization ELISA Kit			