Quality approved by SD BIOSENSOR / For *In vitro* use only

# STANDARD F
# hs-CRP

REF F-HCRP

STANDARD™ F hs-CRP

PLEASE READ INSTRUCTIONS CAREFULLY BEFORE YOU PERFORM THE TEST

STANDARD™

## EXPLANATION AND SUMMARY

### [Introduction]

C-reactive protein (CRP) is one of the cytokine induced acute-phase proteins, the levels of which rise during a general, unspecific response to infections and non-infectious inflammatory processes. High sensitivity CRP (hs-CRP) test is able to measure the CRP more sensitive and it can detect the minor inflammatory response. The hs-CRP is used as the marker for prediction of vessel disease. There are many studies to show that high concentration of hs-CRP indicates the higher risk of stroke and myocardial infarction. The normal range of hsCRP concentration is <1 mg/L (0.1 mg/dL), and 1 mg/L - 3 mg/L (0.1 mg/dL - 0.3 mg/dL) is considered as an average risk range. >3mg/L (0.3mg/dl) is regarded as high risk group for cardiovascular disease. Especially, it is essential to manage the value of hs-CRP concentration which means the state of vascular health for patients with autoimmune disease such as rheumatoid arthritis, lupus, and spondylitis ankylopoietica since the autoimmune disease are affected by the cardiovascular and cerebrovascular condition.

### [Intended use]

STANDARD F hs-CRP is an *in vitro* diagnostic use to measures the CRP in the human serum, plasma, and whole blood sample. The measurement of CRP provides information for the detection and evaluation of infection, tissue injury, inflammatory disorders and cardiovascular diseases. STANDARD F hs-CRP should be used with the appropriate analyzer, STANDARD F Analyzers, manufactured by SD BIOSENSOR.

### [Test principle]

STANDARD F hs-CRP is based on immunoassay and reflectometry technology using colored latex particles. The specimen from human should be processed for the preparation using the components of the STANDARD F hs-CRP. When applying the sample mixture to the test device, the complex with monoclonal anti-CRP and CRP in human sample will be formed on the membrane as the result of the antigen-antibody reaction. The intensity of the reflected light is scanned and converted into an electric signal which is proportional to the intensity of reflected light produced on the membrane. STANDARD F Analyzers can analyze the CRP concentration of the clinical specimen based on a pre-programmed algorithms and display the test result on the screen.

### [Kit contents]

① Test device ② Spoit (Pink) ③ Extraction buffer ④ Instructions for use

### [Materials required but not provided]

- STANDARD™ F Analyzer

## KIT STORAGE AND STABILITY

Store the kit at 2-30°C / 36-86°F, out of direct sunlight. Kit materials are stable until expiration date printed on the outer box. Do not freeze the kit.

## WARNINGS AND PRECAUTIONS

1. STANDARD F hs-CRP is is for *in vitro* diagnostics use only.
2. Carefully follow the instructions and procedures described in this instructions before testing.
3. STANDARD F hs-CRP should be used with STANDARD F Analyzer.
4. STANDARD F hs-CRP should remain in its original sealed pouch until ready to use. Do not use the test kit if the pouch is damaged or the seal is broken.
5. STANDARD F Test device is single use only. Do not re-use it.
6. Do not use hemolyzed samples.
7. Do not use frozen whole blood sample or any artificial materials.
8. Check the latex tablet in the Spoit (Pink) if it is not contaminated or broken before testing.
9. Place the analyzer on a flat surface when in use.
10. Wash your hands in warm, soapy water. Rinse well and dry completely before testing.
11. Discard the used test kit according to the proper method.
12. Mix the blood sample and extraction buffer. And then, collect all of the mixed solution.
13. Check the expiration date printed on the pouch or package.
14. Check the volume of extraction buffer (200μL) of tube.
15. Collected sample, hs-CRP latex tablet, and extraction buffer should be mixed properly by using the Spoit (Pink). Then, immediately apply the sample to the sample well within 30 seconds.
16. Use the STANDARD F hs-CRP at 15-32°C / 59-90°F.
17. Mix Carefully to avoid bubble forming and do not put bubbles in the sample well of the test device.
18. All kit components and collected specimens are must be at room temperature at least 30 minutes before running the assay.
19. Do not write on the bar code or damage the bar code of the test device.

## SPECIMEN COLLECTION AND PREPARATION

### [Whole blood]

- **Capillary whole blood**

1. Capillary whole blood should be collected aseptically by fingertip.
2. Clean the area to be lanced with an alcohol swab.
3. Squeeze the end of the fingertip and pierce with a sterile lancet.
4. Collect the accurate volume of capillary whole blood using the Spoit (Pink) in kit for the testing.
5. The capillary whole blood must be tested immediately after collection.

- **Venous whole blood**

1. Collect the venous whole blood into the commercially available anti-coagulant tube such as heparin, EDTA by venipuncture.
2. It is recommended that collected venous whole blood samples are used immediately. If venous whole blood in an anti-coagulant tube is stored in a refrigerator at 2-8°C, the specimen can be used for testing within 8 hours after collection.
3. Do not use hemolyzed blood samples.

### [Serum]

1. Collect the whole blood into the commercially available plain tube, NOT containing anti-coagulants such as heparin, EDTA, by venipuncture and leave to settle for 30 minutes for blood coagulation and then centrifuge blood to get serum specimen of supernatant.
2. Serum in the plain tube may be stored at room temperature (15-30°C/59-86°F) for up to 8 hours and at 2-8°C/36-46°F for up to 3 days prior to testing.
3. For over 3 days storage, specimens may be frozen under -40°C/40°F for up to 3 months.
4. It should be brought to room temperature prior to use.

### [Plasma]

1. Collect the venous whole blood into the commercially available anti-coagulant tube such as heparin or EDTA by venipuncture and centrifuge blood to get plasma specimen.
2. Plasma in an anti coagulant tube may be stored at room temperature (15-30°C/59-86°F) for up to 8 hours and at 2-8°C/36-46°F for up to 3 days prior to testing.
3. For over 3 days storage, specimens may be frozen under -40°C/40°F for up to 3 months.
4. It should be brought to room temperature prior to use.

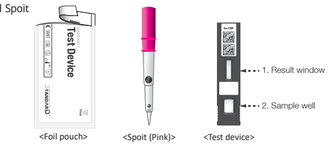
**CAUTION**
- Anticoagulants such as heparin, EDTA do not affect the test result.
- As known relevant interference, haemolytic samples, rheumatoid factors-contained samples and lipaemic, icteric samples can lead to impair the test results.

## TEST PROCEDURE

### [Preparation]

1. Allow kit components and collected sample to room temperature (15-30°C/59-86°F) at least 30 minutes before staring the test.
2. Carefully read instructions for the STANDARD F hs-CRP.
3. Check the expiry date at the back of the foil pouch. Use another lot, if expiry date has passed.

4. Open the foil pouch, and check the test device and Spoit (Pink) with a hs-CRP latex tablet in the foil pouch.




**CAUTION**
- Do not write on the bar code or damage the bar code of the test device.

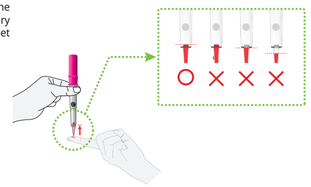
### [Test Procedure]

- **Using a STANDARD F100 Analyzer**

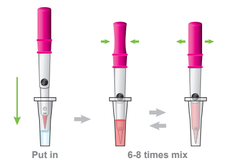
1. Prepare a STANDARD F100 Analyzer and set the 'Standard Test' mode according to the analyzer's manual.
2. Take the test device and the Spoit (Pink) out of the foil pouch.

3. Insert the test device into the Test Slot of the analyzer. The analyzer automatically reads the information of bar code on the test device and releases the test device for adding sample.
4. Select the sample type for the test. **Press the right button (►) to change the option of the sample (WB; whole blood, S/P; serum/plasma) and then press the center button to choose.**

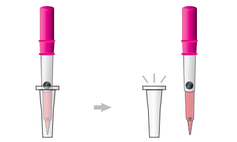
5. Collect 5μl of blood sample with the Spoit (Pink). The sample will be collected automatically by the capillary action when the tip of the Spoit (Pink) touches the droplet of the blood.



6. Put the tip of the Spoit (Pink) into an extraction buffer tube.
7. Mix the collected sample, hs-CRP latex, and extraction buffer by carefully pressing and releasing the rubber at the top of the spoit for 6-8 times. Mix carefully to avoid bubble forming.




8. Collect all the reaction mixture with the Spoit (Pink) from the tube.



9. Apply the sample mixture to the sample well of the test device.

10. **After applying the sample, immediately press the center button to start the test.**

11. The result will appear on the screen after 3 minutes.


- **Using a STANDARD F200 Analyzer**

1. Prepare a STANDARD F200 Analyzer and select the `Standard Test' on the analyzer's screen.

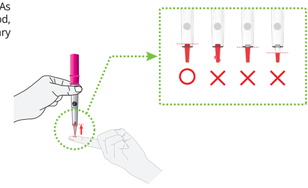

2. Enter operator ID, patient ID, and order # in sequence. If patient ID is not typed in, the analyzer will regard it as a "Guest".
3. Take the test device and Spoit (Pink) out of the foil pouch.


4. Once the 'Insert Device' is displayed on the screen, insert the test device into the Test Slot of the analyzer.

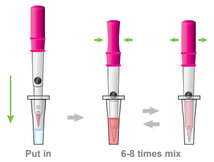
5. During "Device Checking" phase, the analyzer automatically reads information from the bar code on the test device to check whether the test is valid or not.

6. **Select the sample type (Whole blood or serum/plasma for the test on the analyzer's screen.**
7. Once the 'test procedure' is displayed on the screen, please prepare the sample as follows.

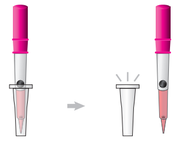

8. Collect the 5μl of blood sample with the Spoit (Pink). As soon as the tip of Spoit (Pink) touches the droplet of blood, the sample will be collected automatically by the capillary action.



9. Put the tip of the Spoit (Pink) into an extraction buffer tube.
10. Mix the collected sample, latex tablet, and extraction buffer by carefully pressing and releasing the rubber at the top of the Spoit (Pink) for 6-8 times. Mix carefully to avoid bubble forming.

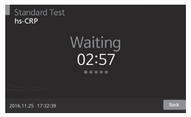



11. Collect all the reaction mixture with the Spoit (Pink) from the tube.



12. Apply the sample mixture to the sample well of the test device.
13. **After applying the sample, immediately press the start button.**

14. The analyzer will automatically display the test result after 3 minutes.




**CAUTION**
- Do not put bubbles in the sample well of the test device.
- Discard the used test kit in proper container, according to your healthcare professional's recommendation.
- If you feel the test result is inaccurate or do not agree your test result, do not change the treatment and contact your healthcare professional.

**NOTE**
- Patient's ID can be handwritten on the label of the test device. Written information will be automatically scanned and printed out by the STANDARD F200 analyzer.

## INTERPRETATION OF RESULT

STANDARD F Analyzers used with STANDARD F hs-CRP reads CRP concentration between 0.1-15mg/L. If the result is below 0.1mg/L, it will be reported as "↓0.1mg/L" and the result is above 15mg/L it will be reported as "↑15mg/L".

**CAUTION**
- Results should be considered in conjunction with the clinical history and other data available to the physician.
- If an error message appears on the analyzer's screen, refer to the analyzer's manual.

*Reference value for CVD
- Low risk: less than 1.0 mg/L
- Average risk: 1.0 to 3.0 mg/L
- High risk: above 3.0 mg/L

*Reference value for inflammation: ≥ 10mg/L

## QUALITY CONTROL

### [STANDARD F Analyzers Calibration Check]

The calibration set test of STANDARD F Analyzers should be conducted according to the analyzers' manual.

**When to use calibration set**

1. Before using the analyzer for the first time
2. When you drop the analyzer
3. Whenever you do not agree with your result
4. When you want to check the performance of an analyzer and test device

**How to use calibration set**

Calibration set test is a required function that ensures optimal performance by checking the internal analyzer optics and functions.

1. Select the 'Calibration' menu.
2. The specific calibration set is included with the analyzer.
3. Insert the CAL-1 first, and then insert the CAL-2 for UV-LED testing and the CAL-3 for RGB-LED testing in order.

### [External quality control]

Quality control testing should be run to check the performance of STANDARD F hs-CRP and STANDARD F Analyzers. STANDARD F hs-CRP Control manufactured by SD BIOSENSOR should be used for quality control testing. Control test should be conducted in accordance with the instruction of STANDARD F hs-CRP Control.

Control test should be run:

- once for each new lot.
- once for each untrained operator.
- as required by test procedures in instructions of STANDARD F hs-CRP Control and in accordance with local, state and federal regulations or accreditation requirements.

## PERFORMANCE CHARACTERISTICS

### [Precision]

Precision studies were performed according to the CLSI (Clinical and Laboratory Standards Institute) guideline EP5-A. The precision evaluation was done at 3 sites. The within-run using the 3 levels of blood samples and the Day-to-Day using the 2 levels of control materials for 20 days. The acceptance criterion is within 10% (CV) for both within-run and total-run CV.

**Within Run**

| | | Level 1 | | | Level 2 | | | Level 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Site 1 | Site 2 | Site 3 | Site 1 | Site 2 | Site 3 | Site 1 | Site 2 | Site 3 |
| Serum | N | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | Mean. Ref. | 0.6 | 0.6 | 0.6 | 6.0 | 6.1 | 5.9 | 12.5 | 12.3 | 12.7 |
| | AVG. | 0.65 | 0.65 | 0.65 | 6.31 | 6.41 | 6.22 | 12.96 | 12.63 | 13.20 |
| | CV (%) | 7.75 | 7.74 | 7.66 | 10.18 | 10.70 | 10.56 | 9.74 | 10.39 | 10.54 |
| | DIF (%) | 8.00 | 8.17 | 9.00 | 5.20 | 5.02 | 5.46 | 3.66 | 2.65 | 3.94 |
| Whole Blood | N | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | Mean. Ref. | 0.6 | 0.6 | 0.6 | 7.5 | 7.4 | 7.6 | 13.2 | 13.1 | 12.9 |
| | AVG. | 0.65 | 0.65 | 0.64 | 7.77 | 7.74 | 8.01 | 13.71 | 13.82 | 13.52 |
| | CV (%) | 7.74 | 7.73 | 7.74 | 9.56 | 9.83 | 10.21 | 10.63 | 9.46 | 10.21 |
| | DIF (%) | 8.17 | 8.33 | 7.17 | 3.56 | 4.58 | 5.41 | 3.88 | 5.46 | 4.79 |
| Plasma | N | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | Mean. Ref. | 0.6 | 0.6 | 0.6 | 5.3 | 5.2 | 5.3 | 12.2 | 11.9 | 12.1 |
| | AVG. | 0.65 | 0.66 | 0.65 | 5.63 | 5.51 | 5.49 | 12.67 | 12.52 | 12.62 |
| | CV (%) | 7.75 | 7.60 | 7.74 | 10.40 | 10.83 | 9.53 | 10.36 | 9.87 | 9.84 |
| | DIF (%) | 7.83 | 9.33 | 8.17 | 6.13 | 6.00 | 3.53 | 3.86 | 5.22 | 4.31 |

**Day to Day Study**

| | Level 1 | | | Level 2 | | | Level 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Site 1 | Site 2 | Site 3 | Site 1 | Site 2 | Site 3 | Site 1 | Site 2 | Site 3 |
| **N** | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| **Ref.** | 0.6 | 0.6 | 0.6 | 6.4 | 6.5 | 6.4 | 12.4 | 12.4 | 12.5 |
| **AVG.** | 0.65 | 0.66 | 0.65 | 6.69 | 6.81 | 6.66 | 13.07 | 12.99 | 13.06 |
| **CV (%)** | 7.63 | 7.40 | 7.63 | 8.39 | 8.16 | 7.53 | 7.80 | 8.61 | 8.06 |
| **DIF (%)** | 9.08 | 10.17 | 9.08 | 4.65 | 5.51 | 4.15 | 5.38 | 4.64 | 4.59 |

### [Accuracy (Method comparison)]

Results from two studies comparing the STANDARD F hs-CRP with an automated immunoturbidimetric method are presented at the below;

**Regression Analysis**

| | Serum | Whole Blood | Plasma |
|---|---|---|---|
| **Slope** | 0.9994 | 1.0024 | 1.0048 |
| **Y-intercept** | -0.0100 | -0.0108 | -0.0181 |
| **R** | 0.9989 | 0.9990 | 0.9992 |
| **$R^2$** | 0.9978 | 0.9980 | 0.9983 |
| **n** | 120 | 120 | 120 |

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| System Accuracy | | | |
|---|---|---|---|
| | **Serum** | **Whole Blood** | **Plasma** |
| **Below -1.96SD** | 1 / 120 (0.8%) | 3 / 120 (2.5%) | 0 / 120 (0%) |
| **Within ±1.96SD** | 117 / 120 (97.5%) | 115 / 120 (95.8%) | 118 / 120 (98.3%) |
| **Over +1.96SD** | 2 / 120 (1.7%) | 2 / 120 (1.7%) | 2 / 120 (1.7%) |

### [Interfering Substances]

The following materials with up to the indicated concentration do not interfere with the test result.

| | |
|---|---|
| **Bilirubin** | 3.0 mg/dL |
| **Triglycerides** | 63 mg/dL |
| **Cholesterol** | 35 mg/dL |
| **Rheumatoid factor** | 74 IU/mL |
| **Ascorbic acid** | 3.5 mg/dL |

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8. Dati F, Johnson AM, Whicher JT. The existing Interim Consensus Reference Ranges and the Future Approach. Clin Chem Lab Med 2001; 39(11): 1134-6.

**Product Disclaimer**
Whilst every precaution has been taken to ensure the diagnostic ability and accuracy of this product, the product is used outside of the control of the SD BIOSENSOR and distributor and the result may accordingly be affected by environmental factors and/or user error. A person who is the subject of the diagnosis should consult a doctor for further confirmation of the result.

**Warning**
The SD BIOSENSOR and distributors of this product shall not be liable for any losses, liability, claims, costs or damages whether direct or indirect of consequential arising out of or related to an incorrect diagnosis, whether positive or negative, in the use of this product.

CE IVD

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REF Reference number

IVD *In vitro* Diagnostics

Consult Instructions for Use

Contains Sufficient for <n> Tests

Caution

Do not re-use.

Use by

To indicate the temperature limitations in which the transport package has to be kept and handled.

LOT Batch code

Manufacturer

Date of manufacture

Note

Fulfill the requirements of Directive 98/79/EC on *in vitro* diagnostic medical devices