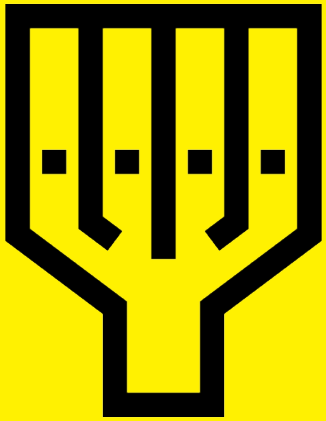
Simplifying Progress

Unisart StructSure® Membranes - The Next Generation of Lateral Flow Assays

SARTORIUS

Top Features of Unisart StructSure® Membranes



Multiplexing

- Parallel testing under identical conditions
- Detection of multiple targets from a single source simultaneously
- Running references in parallel to samples
- Every membrane type of the Unisart® CN membrane portfolio can be used

Innovative Test Designs

- Multiple reaction zones in separate lanes without cross-reaction
- More predictable and reproducible sample flow allows the creation of different flow dynamics and reaction times in separate lanes
- Setting of optimized conditions for each lane
- Semi-quantitative analysis (e.g., monitoring of treatments)
- Testing of different thresholds (e.g., drug testing)

Miniaturization

- Faster overall assay time
- Less sample required (e.g. liquor, tear drops)
- Reduced usage of antibodies and assay components leads to cost savings

Unisart StructSure® membranes are a new technology platform for multiplexing allowing to create multiparameter lateral flow assays. Sartorius has developed an innovative process to engrave nitrocellulose membranes. Barriers separate the remaining nitrocellulose membrane channels from each other, preventing any overflow of liquid or cross-reactivity between channels.
Any type of patterns with various lanes can be created, also incorporating multiple reaction zones. Unisart StructSure® membranes allow miniaturization of the test format and detection of different targets from a single source simultaneously.
Every membrane type of our Unisart® CN membrane portfolio can be used for multiplexing, giving a high degree of flexibility to create the most advanced and innovative solution.
In the following, the performance of the new 3-channel S-shape Unisart StructSure® is compared with the unstructured Unisart® CN membrane regarding capillary speed, sensitivity and the ability to separate multiple targets.

Increased Capillary Speed for Faster Overall Assay Time

The new S-shape Unisart StructSure® membrane shows increased capillary speed with water compared to a membrane strip of the same width without channels as demonstrated in Fig. 1.

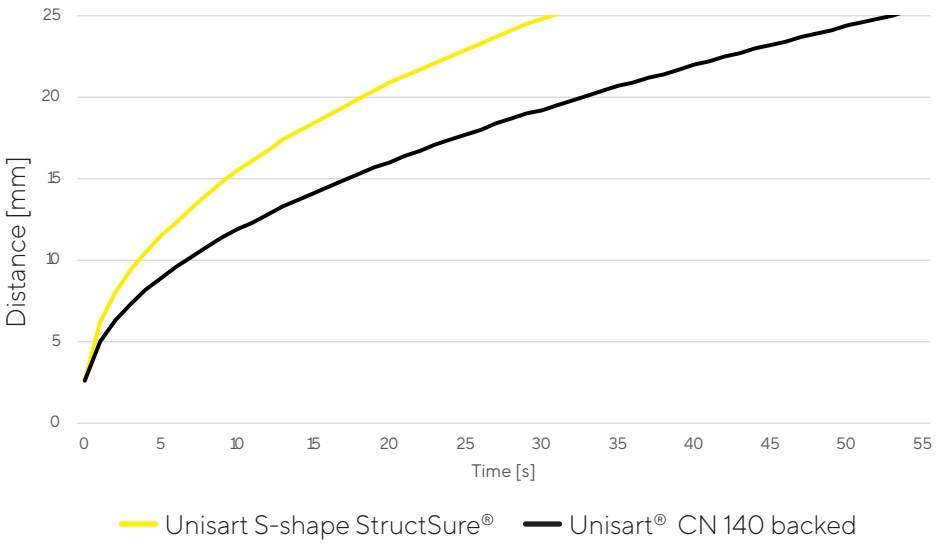


Figure 1 Comparison of capillary speed.

To determine the capillary speed of the structured membrane, the standard 3-channel S-shape StructSure® and a plane membrane strip without channels were tested. Both strips are made of Unisart® CN 140 backed and have the same width of 8 mm.

Water reaches the top of the S-shape channels after 31 sec whereas it takes 53 sec for the unstructured membranes. This is an increase of capillary speed of approximately 40 %. The same trend can be observed for plasma, which has a higher viscosity than water. With plasma an increase of about 30 % can be achieved.

Enhanced Signal Intensity Allows Saving of Capture Molecules

Unisart StructSure® membranes show increased protein signal intensity. Figure 2 shows the protein binding to Unisart® CN 140 backed and Unisart StructSure®.

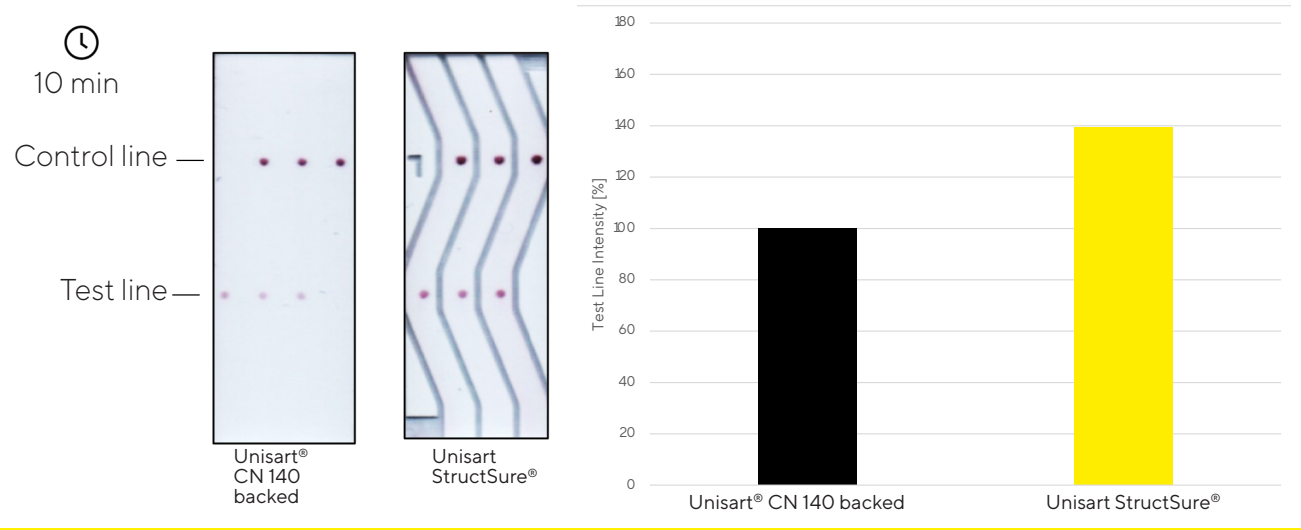


Figure 2 Comparison of protein signal intensity.

Protein concentrations of 1 mg/mL (in phosphate buffer, pH 6.4) were spotted three times on Unisart® CN 140 backed and the standard 3-channel S-shape Unisart StructSure® with a volume of 0.045 µL. The bar diagram shows the normalized test line intensity in percentage. The test line intensity of 3-channel S-shape Unisart StructSure® is depicted in relation to UniSart® CN 140 backed.

As illustrated, the protein dots for Unisart StructSure® are bold in color and the signal intensity could be increased by approximately 40% compared to the unstructured test strip.

Enhanced signal intensity in combination with increased capillary speed provide an outstanding solution for critical applications where fast and reliable results are required.

Multiple Target Determination for Higher Accuracy and Reliability of Test Results

As an example for a multiplex infectious disease assay, flu A, flu B and SARS-CoV-2 were combined in one assay (Fig. 3).

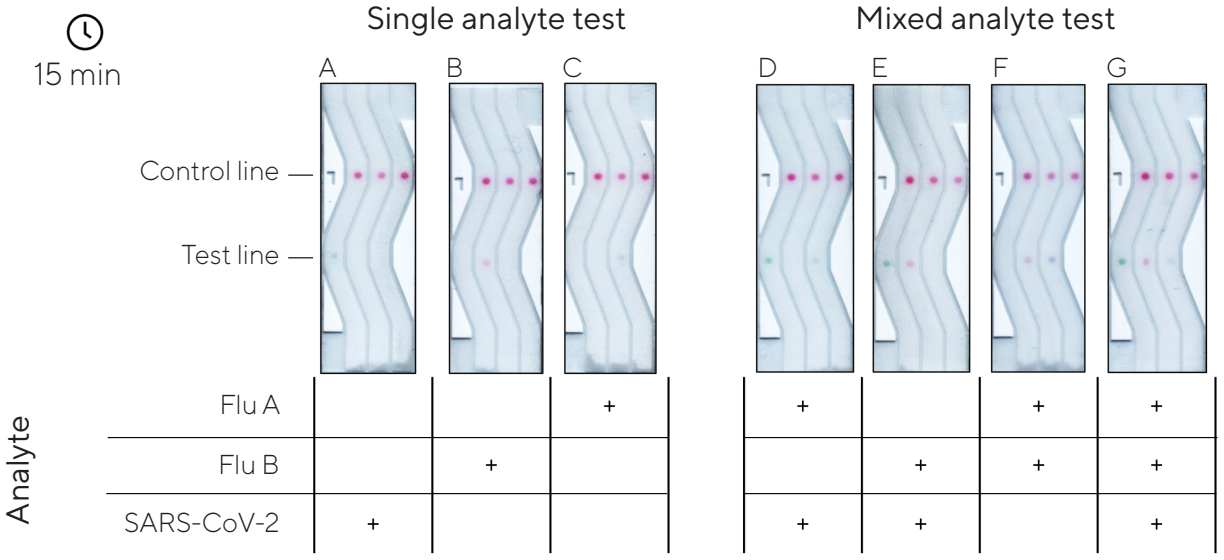


Figure 3 Test performance of a multiplex LFA.

A cocktail conjugate comprising three differently colored beads conjugated to anti-Flu A, anti-Flu B and anti-SARS-CoV-2 antibodies was subjected to a multiplexed lateral flow assay (LFA). For this, anti-flu A, anti-Flu B and anti-SARS-CoV-2 antibodies were dotted on the test line (1 mg/mL) and conjugated to NanoAct™ cellulose latex beads (green, red, and black, respectively; 330 nm). As analyte, recombinant flu A, flu B and SARS-CoV-2 nucleoproteins (100 µg/L) were used either individually (A – C) or in combination with each other (D -G). The test line signals were detected after 15 min.

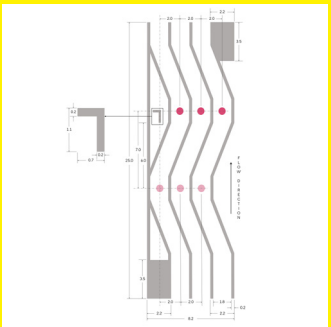
The multiplex assay with the 3-channel Unisart StructSure® membrane shows a clear and distinct separation of the different analytes. Each target is recognized individually and in combination without any cross-reactivity using one single conjugate pad comprising all target components. Therefore, there is no need for channel specific separate conjugates when using Unisart StructSure® membranes.

Unisart Structsure® Membranes Are the Perfect Tool for Multiparameter Lateral Flow Assays

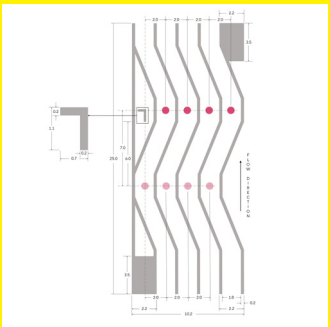
The new Unisart StructSure® membranes represent the next generation of our Unisart® CN membranes enabling parallel testing of multiple targets under identical conditions. They are the appropriate tool for multiplexing and separation of diverse analytes simultaneously using a single cocktail conjugate and a single sample source. The innovative S-shape pattern induces special flow effects resulting in more controlled mixing and efficient binding. The cutting-edge technology improves accuracy and reliability of test results making it perfectly suited for semi-quantitative analysis (e.g., monitoring of treatments) or testing of different thresholds like in drug tests.

Unisart StructSure® membranes are characterized by increased capillary speed as well as enhanced sensitivity and require only reduced sample volume. Its unparalleled capabilities make them a versatile tool to revolutionize the design of multiparameter lateral flow assays.

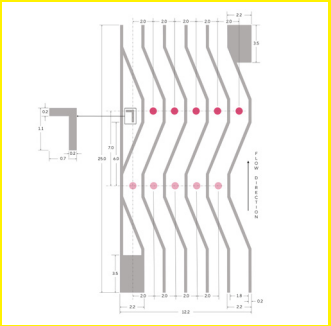
Technical Drawings



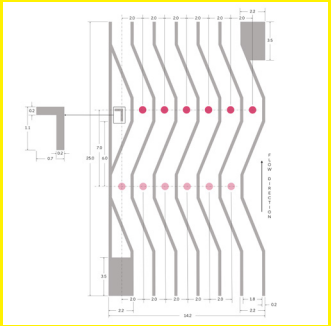
3-Channel S-shape
Unisart StructSure®



4-Channel S-shape
Unisart StructSure®



5-Channel S-shape
Unisart StructSure®



6-Channel S-shape
Unisart StructSure®

Specification Data

	3-Channel S-shape Unisart StructSure®	4-Channel S-shape Unisart StructSure®	5-Channel S-shape Unisart StructSure®	6-Channel S-shape Unisart StructSure®
				
Quantity of structures per roll	10000	8000	7000	6000
Width of channel	2 mm	2 mm	2 mm	2 mm
Length of channel	26.2 mm	26.2 mm	26.2 mm	26.2 mm
Width of structure	8 mm	10 mm	12 mm	14 mm
Roll length	approx. 85 m	approx. 85 m	approx. 85 m	approx. 85 m

Ordering Information

Unisart StructSure®	Packaging unit	Polyester backing	Roll width	Material number
3 Channel, S-Shape	1roll	100 µm clear	25 mm	3UN14ER103S01WS
3 Channel, S-Shape	5 rolls	100 µm clear	25 mm	3UN14ER103S01WSB
4 Channel, S-Shape	1roll	100 µm clear	25 mm	3UN14ER084S01WS
4 Channel, S-Shape	5 rolls	100 µm clear	25 mm	3UN14ER084S01WSB
5 Channel, S-Shape	1roll	100 µm clear	25 mm	3UN14ER075S01WS
5 Channel, S-Shape	5 rolls	100 µm clear	25 mm	3UN14ER075S01WSB
6 Channel, S-Shape	1roll	100 µm clear	25 mm	3UN14ER066S01WS
6 Channel, S-Shape	5 rolls	100 µm clear	25 mm	3UN14ER066S01WSB

Material for initial testing, customized patterns and dimensions is available on request. Take your lateral flow test design to the next level and contact us at Unisart@sartorius.com.

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