

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY AND INSTRUMENT COMBINATION TEMPLATE**

A. 510(k) Number:

k061846

B. Purpose for Submission:

New device for combination with Analyticon CombiScreen 11SYS Urine test strips (k023885)

C. Measurand:

Ascorbic acid, bilirubin, blood, glucose, ketones, leukocytes, nitrite, pH, protein, specific gravity, and urobilinogen in urine

D. Type of Test:

Qualitative / Semi-quantitative

E. Applicant:

Analyticon Biotechnologies AG

F. Proprietary and Established Names:

Combi Scan 100

G. Regulatory Information:

1. Regulation section:

21CFR§862.1340 Urinary glucose (nonquant.) test system

21CFR§862.6550 Occult blood test

21CFR§862.1095 Ascorbic acid test

21CFR§862.1115 Urinary bilirubin and its conjugates (nonquant.) test system

21CFR§862.1435 Ketones (nonquant.) test system

21CFR§862.1510 Nitrite (nonquant.) test system

21CFR§862.1550 Urinary ph (nonquant.) test system

21CFR§862.1645 Urinary protein or albumin (nonquant.) test system

21CFR§862.1785 Urinary urobilinogen (nonquant.) test system

21CFR§862.7675 Leukocyte peroxidase (nonquant.) test system

21CFR§862.2900 Automated Urine Analyzer

2. Classification:

Class II

3. Product code:
 - JIL - method, enzymatic, glucose (urinary, non-quantitative)
 - JIO - blood, occult, colorimetric in urine
 - JMA - acid, ascorbic, 2,4-dinitrophenylhydrazine (spectrophotometric)
 - JJB - azo-dyes, colorimetric, bilirubin & its conjugates (urinary, non-quant.)
 - JIN - nitroprusside, ketones (urinary, non-quant.)
 - JMT - diazo (colorimetric), nitrite (urinary, non-quant.)
 - CEN - dye-indicator, ph (urinary, non-quant.)
 - JIR - indicator method, protein or albumin (urinary, non-quant.)
 - CDM - diazonium colorimetry, urobilinogen (urinary, non-quant.)
 - LJX - test, urine leukocyte
 - KQO - automated urinalysis system
4. Panel:
 - 75 - Clinical chemistry

H. Intended Use:

1. Intended use(s):

See Indication(s) for use below.
2. Indication(s) for use:

The Combi Scan 100 is for use with Combi Screen test strips to determine the following parameters from urine: ascorbic acid, bilirubin, blood, glucose, ketones, leucocytes, nitrite, pH, protein, specific gravity, urobilinogen. These measurements are used in the evaluation of diabetes, liver diseases, haemolytic diseases, urogenital and kidney disorders or metabolic abnormalities. For professional use only, not for self testing!
3. Special conditions for use statement(s):

For prescription use
4. Special instrument requirements:

Analyticon Combi Scan 100

I. Device Description:

The device is a small benchtop instrument designed to read the Combi Screen® 11SYS reagent strips. The Combi Scan® 100 urine analyzer supports test data management and report generation by offering data storage and computerised data processing features. The operator places the moisturized strip on the strip holder and presses the start button. The reading and printing is done by the device.

J. Substantial Equivalence Information:

1. Predicate device name(s):
Bayer Clinitek 50 Urine Chemistry Analyzer
2. Predicate 510(k) number(s):
k960546
3. Comparison with predicate:

Feature	Combi Scan 100	Clinitek 50
Intended use	Instrument for measurement of urine test strips Combi Screen for in-vitro determination of Ascorbic acid, Bilirubin, Blood, Glucose, Ketones, Leukocytes, Nitrite, pH, Protein, Specific Gravity, and Urobilinogen from urine. For professional use only, not for self testing.	The Clinitek 50 urine chemistry analyser is for use with Bayer reagent strips for the determination of glucose, bilirubin, ketone, blood, protein, urobilinogen, nitrite and leucocytes in urine, urine pH, specific gravity and colour.
General design	Bench-top instrument	Bench-top instrument
Energy source	Power transformer Input: 100 - 240 V, 50/60 Hz Output. 7,5V, 3,0 A	Power transformer Input: 100 - 250 V, 50/60 Hz Output. 9V, 2,78 A
Measurement technology	The instrument measures the color of the light that is reflected from the test pads on the strip (reflectometric measurement). These data are converted into test results.	The instrument measures the color and amount of light that is reflected from the test pads on the strip (reflectometric measurement). It then converts these measurements to test results.
Measuring operation	The test strip is dipped into the urine and placed on the black strip holder, which moves the strip into the instrument. The instrument controls the incubation time and does the measurement.	The test strip is dipped into the urine and placed on the strip holder in front of the instrument. Then, the strip holder is moved into the instrument, which controls the incubation time and does the measurement.
Analytes	Test strip Combi Screen 11SYS: Ascorbic acid, Bilirubin, Blood, Glucose, Ketones, Leukocytes, Nitrite, pH, Protein, Specific Gravity, and Urobilinogen from urine.	Test strip Multistix 10SG: Bilirubin, Blood, Glucose, Ketones, Leukocytes, Nitrite, pH, Protein, Specific Gravity, and Urobilinogen from urine.

Feature	Combi Scan 100	Clinitex 50
Controlling of the system	LCD-Display, buttons below the display to control the instrument.	LCD-Display, buttons below the display to control the instrument.
Individual adjustments	SI/Conventional/Arbitrary units Date and time test sequence in printout	SI/Conventional/Arbitrary units Date and time
Storage of results	Storage of 500 measurements possible	Storage of measurements possible
Printing of results	Printout with results, date & time on thermal paper by internal printer	Printout with results, date & time on thermal paper by internal printer
Operating range	15 - 30 °C <85% rel. humidity	18 - 30 °C 20 - 85% rel. humidity

K. Standard/Guidance Document Referenced (if applicable):

CLSI Guideline EP12A, User Protocol for Evaluation of Qualitative Test Performance.

L. Test Principle:

When a strip is moved into the measuring position under the optical unit, the test strip is illuminated by white light and the reflected light from the reagent strip is detected by a colour CCD sensor. The picture, which has been taken by the CCD camera, is evaluated and the result is divided into values for the red, green and blue colour for each test pad. Afterwards, these RGB-values are used in mathematical algorithms to transform them into a meaningful concentration for the user.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

To evaluate the performance of the system, the following evaluations were carried out:

- precision within-series (20 measurements with one LOT/one instrument)
- precision LOT-to-LOT (10 measurements with three LOTs/one instrument)
- precision instrument-to-instrument (10 measurements with three instruments/one LOT)

The precision was evaluated by using the urine dipstick control materials by Quantimetrix.

It is available as a 2 level set (level 1: normal, level 2: abnormal). The Quantimetrix dipstick control does not contain ascorbic acid. Therefore, the ascorbic acid test pad performance was evaluated by using human pool urine: a) negative, b) positive=spiked with 20 mg/dl ascorbic acid. The results are presented below:

Precision within series

ASC*	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

* determined with human pool urine

BIL	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

BLD	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

GLU	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

KET	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

LEU	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

NIT	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

PRO	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

UBG	Reference			total
	positive	negative		
Combi	positive	20	0	20
Scan 100	negative	0	20	20
	total	20	20	40

pH	5	6	7	8	9
Level 1	20	-	-	-	-
Level 2	-	-	20	-	-

SG	1.000	1.005	1.010	1.015	1.020	1.025	1.030
Level 1	-	-	-	-	20	-	-
Level 2	-	20	-	-	-	-	-

Precision LOT-to-LOT

ASC*	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

* determined with human pool urine

BIL	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

BLD	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

GLU	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

KET	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

LEU	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

NIT	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

PRO	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

UBG	Reference			
		positive	negative	total
Combi Scan 100	positive	30	0	30
	negative	0	30	30
	total	30	30	60

pH	5	6	7	8	9
Level 1	30	-	-	-	-
Level 2	-	-	30	-	-

SG	1.000	1.005	1.010	1.015	1.020	1.025	1.030
Level 1	-	-	-	3	27	-	-
Level 2	-	30	-	-	-	-	-

Precision instrument-to-instrument

ASC*	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

* determined with human pool urine

BIL	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

BLD	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

GLU	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

KET	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

LEU	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

NIT	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

PRO	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

UBG	Reference			total
	positive	negative	total	
Combi	30	0	30	
Scan 100	0	30	30	
total	30	30	60	

pH	5	6	7	8	9
Level 1	30	-	-	-	-
Level 2	-	-	29	1	-

SG	1.000	1.005	1.010	1.015	1.020	1.025	1.030
Level 1	-	-	-	-	30	-	-
Level 2	-	30	-	-	-	-	-

b. Linearity/assay reportable range:

The reportable range for each analyte is shown below:

- Ascorbic acid: neg-20-40 mg/dL
- Bilirubin: neg-1-2-4 mg/dL
- Blood: neg-10-50-300 erythrocytes/uL
- Glucose: norm-50-100-250-500-1000 mg/dL
- Ketones: neg-10-25-100-300 mg/dL
- Leucocytes: neg-25-75-500 leucocytes/uL
- Nitrite: neg-pos
- pH: 5-6-7-8-9
- Protein: neg-30-100-500 mg/dL
- Specific gravity: 1.000-1.005-1.010-1.015-1.020-1.025-1.030
- Urobilinogen: norm-2-4-8-12-mg/dL

- c. *Traceability, Stability, Expected values (controls, calibrators, or methods):*

No information on traceability was provided.

Stability:

Test strips: The shelf life of the unopened test strips is 24 months. Investigations were done with three lots at an age of 24, 25 and 26 months using Quantimetrix “the dipper”, human urine spiked with ascorbic acid. The performance data were verified to support the stability claim.

- d. *Detection limit:*

The detection limit was established at concentrations where at least 50% of the observed results were positive when assayed using the Combi Scan 100. The table below presents the detection limits for each analyte on the Combi Scan 100 using the Combi-Screen 11 SYS urine test strips.

Parameter	Detection Limit Combi Scan 100
Ascorbic acid	15 mg/dL
Bilirubin	0,6 mg/dL
Blood	6-8 Ery/ μ L (as Hb.)
Glucose	40 - 50 mg/dL
Ketones	4 - 6 mg/dL
Leucocytes	15 Leu/uL
Nitrite	0,1 mg/dL
Protein	20 - 30 mg/dL
Urobilinogen	1,5 mg/dL

- e. *Analytical specificity:*

The interference from ascorbic acid was determined using 5 patient urine samples and ascorbic acid concentrations of 0, 20, 40 and 80 mg/dL. The following were observed:

Bilirubin at 1 mg/dL and 2 mg/dL:

False low or negative results were observed at 80 mg/dL of vitamin C.

Blood:

When testing solutions with 25 Ery/uL (as Hb) and 50 Ery/uL (as Hb), no negative results were observed with ascorbic acid concentrations up to 80

mg/dL. When testing at 10 Ery/uL (as Hb), 1 negative result out of 5 was observed with an ascorbic acid concentration of 20 mg/dL, zero out of 5 were negative with an ascorbic acid concentration of 40 mg/dL and 2 out of 5 were negative with an ascorbic acid concentration of 80 mg/dL.

Glucose:

When testing glucose at 100 mg/dL with an ascorbic acid concentration of 20 mg/dL 5 out of 5 results showed 1+ rather than 2+. At 40 and 80 mg/dL of ascorbic acid, glucose values for 50 and 100 mg/dL were falsely low or negative.

Nitrite:

At 80mg/dL of ascorbic acid nitrite results were negative rather than positive..

f. Assay cut-off:

Not applicable

2. Comparison studies:

a. Method comparison with predicate device:

The Combi Scan 100 was compared to the Clinitek 50 and Mditron by using 112 human urine samples. The ascorbic acid test pad is not present at the predicative devices. For that reason, the ascorbic acid test was compared to a photometric determination of ascorbic acid.

The data were evaluated by using contingency tables. In some cases, the concentration levels are not exactly the same for the Combi Scan 100, Clinitek 50 and Mditron. In these cases, the lower and higher concentrations, which are close to the mentioned concentration, were used as “same colour block”. The colour blocks besides these blocks were evaluated as “+/- 1 colour block”. The following agreements were observed:

Center	Center 1: Agreement to Clinitek 50 (Bayer)		Center 1: Agreement to Midityron junior (Criterion II, Roche)		Center 2: Agreement to Midityron (Roche)		Laboratory: Agreement to Clinitek 50 (Bayer)	
	Same colour block	+/-1 colour block	Same colour block	+/-1 colour block	Same colour block	+/-1 colour block	Same colour block	+/-1 colour block
Ascorbic acid	76,8%*	100% *	76,8%*	100% *	-	-	100%	100%
Bilirubin	85,7%	100%	94,6%	100%	90,3%	99,1%	91,0%	100%
Blood	92,9%	100%	97,3%	100%	88,5%	100%	99,2%	100%
Glucose	65,8%	97,3%	81,3%	97,3%	88,5%	96,5%	85,6%	100%
Ketones	86,6%	99,1%	93,8%	99,1%	93,4%	98,2%	99,2%	100%
Leucocytes	84,8%	97,3%	92,0%	99,1%	84,5%	96,9%	99,2%	100%
Nitrite	95,5%	100%	95,5%	100%	96,5%	100%	100%	100%
pH	84,8%	100%	53,6%	93,8%	64,2%	100%	99,0%	100%
Protein	85,7%	100%	93,8%	100%	79,6%	98,7%	97,6%	100%
Spec. gravity	65,2%	90,2%	40,2%	90,2%	24,8%	75,2%	95,3%	100%
Urobilinogen	89,2%	96,0	75,0%	100%	90,7%	98,2%	90,4%*	100%*

* comparison to photometric method

b. Matrix comparison:

Not applicable

3. Clinical studies:

a. Clinical Sensitivity:

Not applicable

b. Clinical specificity:

Not applicable

c. Other clinical supportive data (when a. and b. are not applicable):

Not applicable

4. Clinical cut-off:
Not applicable
5. Expected values/Reference range:
The expected values are provided in the strip labeling from literature.

N. Instrument Name:

Combi Scan 100

O. System Descriptions:

1. Modes of Operation:
Single step or continuous testing
2. Software:
FDA has reviewed applicant's Hazard Analysis and software development processes for this line of product types:
Yes or No
3. Specimen Identification:
The patient ID is entered manually by internal numpad, external keyboard, or external barcode reader.
4. Specimen Sampling and Handling:
The test strip is dipped into the urine manually and placed on the conveyor belt for a reading by the instrument.
5. Calibration:
There is no special calibration procedure to be carried out by the user.
6. Quality Control:
In the labeling the applicant recommends the use of external urine dipstick controls (normal + abnormal) regularly to ensure the performance of the instrument. The recommendation in the labeling states that users are to follow federal, state and local requirements for testing external quality control materials.

P. Other Supportive Instrument Performance Characteristics Data Not Covered In The "Performance Characteristics" Section above:

Q. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

R. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.