

# Elecsys Anti-HBs II

Antibody to hepatitis B surface antigen (anti-HBs)

**cobas**<sup>®</sup>

REF		SYSTEM
05894816 190	100	MODULAR ANALYTICS E170 <b>cobas e 411</b> <b>cobas e 601</b> <b>cobas e 602</b>

## English

### Intended use

Immunoassay for the in vitro quantitative determination of human antibodies to the hepatitis B surface antigen (HBsAg) in human serum and plasma.

The electrochemiluminescence immunoassay "ECLIA" is intended for use on Elecsys and **cobas e** immunoassay analyzers.

### Summary

Anti-HBs is a specific (generally IgG) antibody that is directed against the hepatitis B surface antigen (HBsAg).<sup>1,2</sup> Anti-HBs can be detected several weeks after the disappearance of hepatitis B surface antigen.<sup>3,4</sup> Anti-HBs can be formed following a hepatitis B infection or after hepatitis B vaccination.<sup>3,4</sup> Antibodies are formed against the HBsAg determinant a, which is common to all subtypes, and against subtype-specific determinants.<sup>1,5,6</sup>

Anti-HBs assays are used within the scope of hepatitis B vaccination to check the necessity and success of vaccination.<sup>2,4,7</sup> In addition, anti-HBs assays are used to monitor the course of disease following acute hepatitis B infection.<sup>3</sup>

The Elecsys Anti-HBs II assay uses a mixture of purified antigens from human serum (HBsAg subtype ad), and recombinant HBsAg subtype ay from CHO (Chinese Hamster Ovary) cells.

### Test principle

Sandwich principle. Total duration of assay: 18 minutes.

- 1st incubation: Anti-HBs in the sample (40 µL), biotinylated HBsAg (ad/ay), and HBsAg (ad/ay) labeled with a ruthenium complex<sup>a)</sup> react to form a sandwich complex.
- 2nd incubation: After addition of streptavidin-coated microparticles, the complex becomes bound to the solid phase via interaction of biotin and streptavidin.
- The reaction mixture is aspirated into the measuring cell where the microparticles are magnetically captured onto the surface of the electrode. Unbound substances are then removed with ProCell/ProCell M. Application of a voltage to the electrode then induces chemiluminescent emission which is measured by a photomultiplier.
- Results are determined via a calibration curve which is instrument-specifically generated by 2-point calibration and a master curve provided via the reagent barcode.

a) Tris(2,2'-bipyridyl)ruthenium(II)-complex (Ru(bpy)<sub>3</sub>)<sup>2+</sup>

### Reagents - working solutions

The reagent rackpack (M, R1, R2) is labeled as A-HBSII.

- M Streptavidin-coated microparticles (transparent cap), 1 bottle, 6.5 mL:  
Streptavidin-coated microparticles 0.72 mg/mL; preservative.
- R1 HBsAg~biotin (gray cap), 1 bottle, 10 mL:  
Biotinylated HBsAg (ad/ay) human/recombinant, > 0.5 mg/L; MES<sup>b)</sup> buffer 85 mmol/L, pH 6.5; preservative.
- R2 HBsAg~Ru(bpy)<sub>3</sub><sup>2+</sup> (black cap), 1 bottle, 8 mL:  
HBsAg (ad/ay) human/recombinant, labeled with ruthenium complex > 0.3 mg/L; MES buffer 85 mmol/L, pH 6.5; preservative.

b) MES = 2-morpholino-ethane sulfonic acid

- A-HBSII Cal1 Calibrator 1 (white cap), 2 bottles of 1.3 mL each:  
Anti-HBs (human) in human serum; preservative.
- A-HBSII Cal2 Calibrator 2 (black cap), 2 bottles of 1.3 mL each:  
Anti-HBs (human) in human serum; preservative.

### Precautions and warnings

For in vitro diagnostic use.

Exercise the normal precautions required for handling all laboratory reagents.

Disposal of all waste material should be in accordance with local guidelines. Safety data sheet available for professional user on request.

This kit contains components classified as follows in accordance with the Regulation (EC) No. 1272/2008:

n-Octyl-N,N-dimethyl-3-ammonio-1-propanesulfonate

EUH 208 May produce an allergic reaction.

Product safety labeling primarily follows EU GHS guidance.

All human material should be considered potentially infectious. The calibrators (A-HBS II Cal1 and A-HBS II Cal2) have been prepared exclusively from the blood of donors tested individually and shown to be free from HBsAg and antibodies to HCV and HIV. The testing methods applied were FDA-approved or cleared in compliance with the European Directive 98/79/EC, Annex II, List A.

The HBsAg starting material used was inactivated prior to labeling with biotin or ruthenium by heating to 60 °C for 15 hours. In addition, any virus particles remaining were removed by ultracentrifugation.

However, as no inactivation or testing method can rule out the potential risk of infection with absolute certainty, the material should be handled with the same level of care as a patient specimen. In the event of exposure, the directives of the responsible health authorities should be followed.<sup>8,9</sup>

Avoid foam formation in all reagents and sample types (specimens, calibrators and controls).

### Reagent handling

The reagents in the kit are ready for use and are supplied in bottles compatible with the system.

**cobas e 411** analyzer: The calibrators should only be left on the analyzers during calibration at 20-25 °C. After use, close the bottles as soon as possible and store upright at 2-8 °C.

Due to possible evaporation effects, not more than 5 calibration procedures per bottle set should be performed.

MODULAR ANALYTICS E170, **cobas e 601** and **cobas e 602** analyzers: Unless the entire volume is necessary for calibration on the analyzers, transfer aliquots of the ready-for-use calibrators into empty snap-cap bottles (CalSet Vials). Attach the supplied labels to these additional bottles. Store the aliquots at 2-8 °C for later use.

Perform **only one** calibration procedure per aliquot.

All information required for correct operation is read in from the respective reagent barcodes.

*Please note:* Both the vial labels, and the additional labels (if available) contain 2 different barcodes. The barcode between the yellow markers is for **cobas** 8000 systems only. If using a **cobas** 8000 system, please turn the vial cap 180° into the correct position so the barcode can be read by the system. Place the vial on the instrument as usual.

### Storage and stability

Store at 2-8 °C.

Do not freeze.

Store the Elecsys reagent kit **upright** in order to ensure complete availability of the microparticles during automatic mixing prior to use.

Stability of the reagent rackpack	
unopened at 2-8 °C	up to the stated expiration date
after opening at 2-8 °C	8 weeks
on the analyzers	8 weeks

# Elecsys Anti-HBs II

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Stability of the calibrators	
unopened at 2-8 °C	up to the stated expiration date
after opening at 2-8 °C	8 weeks
on <b>cobas e 411</b> at 20-25 °C	up to 5 hours
on MODULAR ANALYTICS E170, <b>cobas e 601</b> and <b>cobas e 602</b> at 20-25 °C	use only once

Store calibrators **upright** in order to prevent the calibrator solution from adhering to the snap-cap.

## Specimen collection and preparation

Only the specimens listed below were tested in a sufficient number and found acceptable.

Serum collected using standard sampling tubes or tubes containing separating gel.

K<sub>2</sub>-EDTA and K<sub>3</sub>-EDTA plasma.

Criterion plasma: slope  $1.00 \pm 0.15$  + intercept  $0 \pm 2$  IU/L + bias at 10 IU/L:  $\leq 30\%$ .

Stable for 3 days at 20-25 °C, 6 days at 2-8 °C, 3 months at -20 °C. The samples may be frozen 5 times.

For plasma treated with lithium heparin, lithium heparin with gel or sodium heparin, the values found were on average up to 20 % lower than those obtained in serum. For plasma treated with sodium citrate, the values found were on average up to 30 % lower than those obtained in serum.

The sample types listed were tested with a selection of sample collection tubes that were commercially available at the time of testing, i.e. not all available tubes of all manufacturers were tested. Sample collection systems from various manufacturers may contain differing materials which could affect the test results in some cases. When processing samples in primary tubes (sample collection systems), follow the instructions of the tube manufacturer.

Centrifuge samples containing precipitates and frozen samples before performing the assay.

Do not use heat-inactivated samples.

Do not use samples and controls stabilized with azide.

Ensure the samples, calibrators and controls are at 20-25 °C prior to measurement.

Due to possible evaporation effects, samples and calibrators on the analyzers should be analyzed/measured within 2 hours.

## Materials provided

See "Reagents – working solutions" section for reagents.

- 2 x 6 bottle labels

## Materials required (but not provided)

- [REF] 11876317122, PreciControl Anti-HBs, for 8 x 1.3 mL
- [REF] 11732277122, Diluent Universal, 2 x 16 mL sample diluent or [REF] 03183971122, Diluent Universal, 2 x 36 mL sample diluent
- [REF] 11776576322, CalSet Vials, 2 x 56 empty snap-cap bottles
- General laboratory equipment
- MODULAR ANALYTICS E170 or **cobas e** analyzer

Accessories for **cobas e 411** analyzer:

- [REF] 11662988122, ProCell, 6 x 380 mL system buffer
- [REF] 11662970122, CleanCell, 6 x 380 mL measuring cell cleaning solution
- [REF] 11930346122, Elecsys SysWash, 1 x 500 mL washwater additive
- [REF] 11933159001, Adapter for SysClean
- [REF] 11706802001, Elecsys 2010 AssayCup, 60 x 60 reaction vessels
- [REF] 11706799001, Elecsys 2010 AssayTip, 30 x 120 pipette tips

Accessories for MODULAR ANALYTICS E170, **cobas e 601** and **cobas e 602** analyzers:

- [REF] 04880340190, ProCell M, 2 x 2 L system buffer

- [REF] 04880293190, CleanCell M, 2 x 2 L measuring cell cleaning solution
- [REF] 03023141001, PC/CC-Cups, 12 cups to prewarm ProCell M and CleanCell M before use
- [REF] 03005712190, ProbeWash M, 12 x 70 mL cleaning solution for run finalization and rinsing during reagent change
- [REF] 12102137001, AssayTip/AssayCup Combimagazine M, 48 magazines x 84 reaction vessels or pipette tips, waste bags
- [REF] 03023150001, WasteLiner, waste bags
- [REF] 03027651001, SysClean Adapter M

Accessories for all analyzers:

- [REF] 11298500316, ISE Cleaning Solution/Elecsys SysClean, 5 x 100 mL system cleaning solution

## Assay

For optimum performance of the assay follow the directions given in this document for the analyzer concerned. Refer to the appropriate operator's manual for analyzer-specific assay instructions.

Resuspension of the microparticles takes place automatically prior to use. Read in the test-specific parameters via the reagent barcode. If in exceptional cases the barcode cannot be read, enter the 15-digit sequence of numbers.

Bring the cooled reagents to approximately 20 °C and place on the reagent disk (20 °C) of the analyzer. Avoid foam formation. The system automatically regulates the temperature of the reagents and the opening/closing of the bottles.

Place the calibrators in the sample zone.

All the information necessary for calibrating the assay is automatically read into the analyzer.

After calibration has been performed, store the calibrators at 2-8 °C or discard (MODULAR ANALYTICS E170, **cobas e 601** and **cobas e 602** analyzers).

## Calibration

Traceability: This method has been standardized against the 1<sup>st</sup> WHO Reference Standard 1977.

Every Elecsys Anti-HBs II reagent set has a barcoded label containing specific information for calibration of the particular reagent lot. The predefined master curve is adapted to the analyzer using A-HBSII Cal1 and A-HBSII Cal2.

**Calibration frequency:** Calibration must be performed once per reagent lot using A-HBSII Cal1, A-HBSII Cal2 and fresh reagent (i.e. not more than 24 hours since the reagent kit was registered on the analyzer).

Renewed calibration is recommended as follows:

- after 1 month (28 days) when using the same reagent lot
- after 7 days (when using the same reagent kit on the analyzer)
- as required: e.g. quality control findings with PreciControl Anti-HBs outside the defined limits

Range (in IU/L) for the calibrators: 4-15 for calibrator 1 (A-HBSII Cal1) and 200-700 for calibrator 2 (A-HBSII Cal2).

## Quality control

For quality control, use PreciControl Anti-HBs.

Controls for the various concentration ranges should be run individually at least once every 24 hours when the test is in use, once per reagent kit, and following each calibration.

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

## Calculation

The analyzer automatically calculates the analyte concentration of each sample in IU/L.

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## Limitations - interference

The assay is unaffected by icterus (bilirubin  $\leq 513 \mu\text{mol/L}$  or  $\leq 30 \text{ mg/dL}$ ), hemolysis (Hb  $\leq 0.62 \text{ mmol/L}$  or  $\leq 1.00 \text{ g/dL}$ ), lipemia (Intralipid  $\leq 1500 \text{ mg/dL}$ ) and biotin ( $\leq 32.7 \text{ nmol/L}$  or  $\leq 8 \text{ ng/mL}$ ).

Criterion: Recovery for samples from LoD to 10:  $\leq \pm 2 \text{ IU/L}$  or samples  $> 10 \text{ IU/L}$ :  $\leq \pm 20 \%$  of initial value.

Samples should not be taken from patients receiving therapy with high biotin doses (i.e.  $> 5 \text{ mg/day}$ ) until at least 8 hours following the last biotin administration.

No interference was observed from rheumatoid factors up to a concentration of 1200 IU/mL.

There is no indication for a significant loss in sensitivity or specificity with samples having elevated levels of IgM up to 1 g/dL, IgA up to 1.6 g/dL and IgG up to 7 g/dL.

No significant interfering effects of 24 commonly used and special therapeutic drugs could be detected. Special drugs tested: adefovir, telbivudine, tenofovir, lamivudine, entecavir, pegylated interferon alfa-2a, pegylated interferon alfa-2b.

Due to high-dose hook effect<sup>c)</sup>, results from anti-HBs concentrations of  $> 200000 \text{ IU/L}$  may be found below the upper limit of the measuring range of 1000 IU/L. In rare cases, a high-dose hook effect from anti HBs concentrations of  $< 200000 \text{ IU/L}$  cannot be excluded. Therefore in case of any unexpected low result the sample should be diluted 1:100 (refer to chapter "Dilution") and tested again.

In rare cases, interference due to extremely high titers of antibodies to streptavidin and ruthenium can occur. The test contains additives which minimize these effects.

MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers: Make sure that in the Special Wash List (Screen → Utility → Special Wash → Immune) the Elecsys Anti-HBs II assay is combined with all assays performed on the analyzer:

From test	Step	To test	Step 0	Step 1	Step 2
Elecsys Anti-HBs II	1	each other assay	X	X	X

If new tests are installed make sure that the Special Wash List is updated accordingly. For the Elecsys HBsAg II assay make sure that the assay is combined with all assays performed on the analyzer:

From test	Step	To test	Step 0	Step 1	Step 2
Elecsys HBsAg II	1	each other assay	X	X	X

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

c) High-dose hook effect: A sample with a true concentration clearly above the measuring range, but found within the measuring range.

## Limits and ranges

### Measuring range

2.00-1000 IU/L (defined by the Limit of Detection and the maximum of the master curve). Values below the Limit of Detection are reported as  $< 2.00 \text{ IU/L}$ . Values above the measuring range are reported as  $> 1000 \text{ IU/L}$  (or up to 100000 IU/L for 100-fold diluted samples).

### Dilution

Samples with anti-HBs concentrations above the measuring range can be diluted with Diluent Universal. The recommended dilution is 1:100 (either automatically by the MODULAR ANALYTICS E170 and cobas e analyzers or manually). The concentration of the diluted sample must be  $> 10 \text{ IU/L}$ .

After manual dilution, multiply the result by the dilution factor.

After dilution by the analyzers, the MODULAR ANALYTICS E170 and cobas e software automatically takes the dilution into account when calculating the sample concentration.

Manual dilution can also be made with negative human serum.

Note: Antibodies to HBsAg are heterogeneous. In some isolated cases, this may lead to non-linear dilution behavior.

## Expected values

### Interpretation of the results

Result	Result message	Interpretation
$< 10 \text{ IU/L}$	Non-reactive	Negative for anti-HBs
$\geq 10 \text{ IU/L}$	Reactive	Positive for anti-HBs

Note: Due to the diversity of the antibodies, the measured anti-HBs value can vary depending on the testing procedure used. Results obtained from a single sample using tests from different manufacturers can therefore differ by up to a factor of 4 (or even a factor of 10 in rare cases).<sup>10</sup> If there is a change in the assay procedure used during the monitoring of vaccination protection, then the anti-HBs values obtained upon changing over to the new procedure must be confirmed by parallel measurements with both methods.

Vaccination strategies in certain risk groups are based on the measured anti-HBs concentration.<sup>11</sup> Respective recommendations are given by national or regional guidelines.

## Specific performance data

Representative performance data on the analyzers are given below. Results obtained in individual laboratories may differ.

## Precision

Precision was determined using Elecsys reagents, human sera and controls.

cobas e 411 analyzer					
		Repeatability <sup>d)</sup>		Intermediate precision <sup>e)</sup>	
Sample	Mean IU/L	SD IU/L	CV %	SD IU/L	CV %
Human serum 1	$< 2.00$	-	-	-	-
Human serum 2	11.0	0.406	3.7	0.732	6.6
Human serum 3	508	14.1	2.8	22.7	4.5
PreciControl A-HBS1	$< 2.00$	-	-	-	-
PreciControl A-HBS2	98.8	2.22	2.2	4.30	4.4

d) Repeatability = within-run precision (n = 21)

e) Intermediate precision = between-run (n = 21)

MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers					
		Repeatability <sup>f)</sup>		Intermediate precision <sup>g)</sup>	
Sample	Mean IU/L	SD IU/L	CV %	SD IU/L	CV %
Human serum 1	$< 2.00$	-	-	-	-
Human serum 2	10.2	0.248	2.4	0.288	2.8
Human serum 3	507	6.41	1.3	9.23	1.8
PreciControl A-HBS1	$< 2.00$	-	-	-	-
PreciControl A-HBS2	81.8	0.814	1.0	1.58	1.9

f) Repeatability = within-run precision (n = 21)

g) Intermediate precision = within-laboratory (modified protocol (EP5-A) of the CLSI (Clinical and Laboratory Standards Institute): 6 times daily for 10 days (n = 60))

## Analytical specificity

No cross-reactions with HAV, HCV, HEV, CMV, EBV, HIV, Rubella, Toxoplasma gondii, Treponema pallidum, rheumatoid arthritis, autoimmune response or alcoholic liver disease were observed.

Measurements were performed on each of the pathogens listed above using  $\geq 8$  serum or plasma samples which were positive for antibodies to the above-mentioned pathogens.

## Relative sensitivity

Performance of the Elecsys Anti-HBs II assay has been assessed by testing a total of 669 samples at two different study sites. 296 samples from vaccinated persons and 373 samples from patients recovered from a hepatitis B infection have been measured with the Elecsys Anti-HBs II assay and another commercially available fully automated anti-HBs assay.

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Discrepant samples were tested with additional anti-HBs assays to achieve a consensus.

Characterization of samples	N	Elecsys Anti-HBs II reactive	Anti-HBs comparison test reactive	Sensitivity %
Anti-HBs positive: vaccinees	296	296	296	100
Anti-HBs positive: recovered from a hepatitis B infection	373	373	373	100
Total	669	669	669	100

## Relative specificity

Performance of the Elecsys Anti-HBs II assay has been assessed by testing 2673 samples from blood donors negative for anti-HBs at two different study sites and 1623 anti-HBs negative samples from laboratory routine at three different study sites. Discrepant samples were tested with additional anti-HBs assays to achieve a consensus.

Characterization of samples	N	Elecsys Anti-HBs II false positive	Specificity %
Anti-HBs negative: blood donors	2673	6	99.78
Anti-HBs negative: routine samples	1623	9	99.45

## References

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For further information, please refer to the appropriate operator's manual for the analyzer concerned, the respective application sheets, the product information and the Method Sheets of all necessary components (if available in your country).

A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

## Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard.

	Contents of kit
	Analyzers/Instruments on which reagents can be used
	Reagent
	Calibrator
	Volume after reconstitution or mixing
	Global Trade Item Number

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