Na Electrode

cobas®

Sodium

Order information

REF	CONTENT	Analyzer(s) on which the electrode can be used
10825468001	Na Electrode 1 (electrode)	**cobas c** 311 analyzer **cobas** 6000 analyzer series: **cobas c** 501 module **cobas** 8000 modular analyzer series: **cobas** 8000 ISE 900 / 1800 module **cobas pure** integrated solutions: **cobas c** 303 analytical unit **cobas pro** integrated solutions: **cobas pro** ISE analytical unit, **cobas** ISE neo 900 analytical unit, **cobas** ISE neo 1800 analytical unit

Materials required (but not provided):

03149501001	REF Electrode (1 electrode)	
11360981216	ISE Reference Electrolyte (5 x 300 mL) ①②	
10820652216	ISE Reference Electrolyte (1 x 500 mL) ③④	
08392013190	ISE Reference Electrolyte (2 x 2000 mL) ⑤⑥	
04522320190	ISE Internal Standard Gen.2 (5 x 600 mL) ①②	
04880455190	ISE Internal Standard Gen.2 (2 x 2000 mL) ③④⑤	
09137742190	ISE Internal Standard Gen.2 conc. (1 x 510 mL) ⑥	
05979854190	Internal Standard Insert - ISE (Set of 20) ①②	
04522630190	ISE Diluent Gen.2 (5 x 300 mL) ①②	
04880480190	ISE Diluent Gen.2 (2 x 2000 mL) ③④⑤	
11298500316	ISE Cleaning Solution (5 x 100 mL)	
20763071122	ISE Deproteinizer (6 x 21 mL) ④⑤⑥	
03110435180	Deproteinizer (1 x 125 mL) ⑥	
04663632190	Activator (9 x 12 mL)	
11183974216	ISE Standard Low (10 x 3 mL)	Code 20502
11183982216	ISE Standard High (10 x 3 mL)	Codes 20503, 20763
12149435122	Precinorm U Plus (10 x 3 mL)	Code 20300
12149443122	Precipath U Plus (10 x 3 mL)	Code 20301
05117003190	PreciControl ClinChem Multi 1 (20 x 5 mL)	Code 20391
05947626190	PreciControl ClinChem Multi 1 (4 x 5 mL)	Code 20391
05117216190	PreciControl ClinChem Multi 2 (20 x 5 mL)	Code 20392
05947774190	PreciControl ClinChem Multi 2 (4 x 5 mL)	Code 20392

ISE reagents on:

① **cobas c** 311 analyzer

② **cobas** 6000 analyzer series: **cobas c** 501 module

③ **cobas** 8000 modular analyzer series: **cobas** 8000 ISE 900 / 1800 module

④ **cobas pure** integrated solutions: **cobas c** 303 analytical unit

⑤ **cobas pro** integrated solutions: **cobas pro** ISE analytical unit

⑥ **cobas pro** integrated solutions: **cobas** ISE neo 900 analytical unit, **cobas** ISE neo 1800 analytical unit

English

System information

	ACN (Serum/ plasma)	ACN (Urine)	ACN (Plasma)	ACN (Serum)
	ISE NA	**ISE NA-U**	**ISE NA-P**	**ISE NA-S**
cobas c 311 analyzer, **cobas c** 501 module, **cobas** 8000 ISE 900 / 1800 module	989	989	---	---

	ACN (Serum/ plasma)	ACN (Urine)	ACN (Plasma)	ACN (Serum)
	ISE NA	**ISE NA-U**	**ISE NA-P**	**ISE NA-S**
cobas c 303 analytical unit, **cobas pro** ISE analytical unit	29070	29071	29072	29073

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Sodium

	ACN (Serum/ plasma)	ACN (Urine)	ACN (Plasma)	ACN (Serum)
	NA	**NA-U**	**NA-P**	**NA-S**
cobas ISE neo 900 analytical unit, **cobas** ISE neo 1800 analytical unit	29230	29231	29232	29233

Intended use

The Na Electrode is a device intended for the in-vitro quantitative determination of sodium in human origin serum, plasma and urine.

Summary[1]

Electrolytes are involved in most major metabolic functions in the body.

Sodium is the major extracellular cation and functions to maintain fluid distribution and osmotic pressure.

Some causes of decreased levels of sodium include prolonged vomiting or diarrhea, diminished reabsorption in the kidney and excessive fluid retention. Common causes of increased sodium include excessive fluid loss, high salt intake, and increased kidney reabsorption.

Test principle

Ion-selective electrode, using automatically diluted serum/plasma or urine specimens. The sodium electrode is based on a neutral carrier.[2,3]

Calculation

The equation given below is used for the calculation of sample and/or QC results:

$$C_S = C_{IS} \times 10^{\frac{E_S - E_{IS}}{\pm S}}$$

Where:

C_S	concentration of the ion in the sample
C_{IS}	concentration of the ion in the ISE Internal Standard
E_S	EMF of the sample
E_{IS}	EMF of the ISE Internal Standard
S	Slope of the electrode

The complete measurement system for a particular ion includes the ISE, a reference electrode and electronic circuits to measure and process the EMF to give the test ion concentration.

Precautions and warnings

For in vitro diagnostic use for trained laboratory technicians.

Warning

- Samples containing material of human origin are potentially infectious. Wear personal protective equipment when replacing or installing electrodes at analyzers. If any biohazardous material is spilled, wipe it up immediately and apply a disinfectant.
- If sample or waste contacts with your skin, wash the affected area immediately with soap and water, then apply a disinfectant. Consult a physician.
- When disposing of used electrodes, treat them as biohazardous.

Caution

- Do not use electrodes after the shelf life or on-board stability period has expired. Otherwise, it may lead to unstable sodium, potassium, and chloride results due to the unstable potential reading of electrodes.
- In case of lower or higher concentration of sodium results (hypo- or hypernatremia) caused by altered lipid and/or protein content of patients' samples, rerun and/or sample checking may be necessary. Altered lipid and/or protein levels in human blood may falsely shift sodium results into the opposite direction.
- Perform electrode flow path cleaning as stated in the Instructions for Use for applicable analyzers, at the end of a daily sample run. Improper electrode flow path cleaning may cause unstable reading of electrodes and it results in calibration failures.

As with any diagnostic test procedure, results should be interpreted taking all other test results and the clinical status of the patient into consideration.

In addition, pay attention to all precautions and warnings listed in the operator's manual of the analyzer.

NOTE: Boric acid (CAS Registry No. 10043-35-3) is contained in the gel solution inside the electrode at 0.2 % of the total weight as a preservative.

Storage and stability

Store at 7-40 °C.

See labels for expiration dates.

On-board stability

After installation the electrode is stable for the following time period:
2 months or 9000 tests, whichever comes first.

The electrodes should be replaced after this time period has expired. For replacement refer to instructions in the operator's manual of the applicable analyzers.

NOTE: When replacing the electrode in **cobas pro** or **cobas pure**, the user should scan the barcode affixed on the rear side of the package instead of the barcode placed on the product's label.

Slope range 50 to 68 mV/dec

NOTE: The slope ranges for newly installed electrodes should be in the upper half of the recommended electrode slope range.

Specimen collection and preparation

For specimen collection and preparation only use suitable tubes or collection containers.

Only the specimens listed below were tested and found acceptable.

It is important to follow tube manufacturers recommended procedures at and after blood collection.

Separate from cells if analysis is not performed within 4 hours.[4]

Serum

For sodium determinations, serum is the specimen of choice.

CAUTION: Serum separator tubes have to be used in accordance with the tube manufacturer's recommended procedures. If these procedures are not considered, it is possible to coat the sample probe with gel (interfering with proper sample level detection), or even to aspirate gel into the ISE system (resulting in a clogged system).

Plasma: Lithium heparin plasma

CAUTION: Inadequate mixing of plasma tubes can cause introduction of fibrin microclots into and subsequent clogging of the ISE.

NOTE: It is strongly recommended to avoid silicone-type gels, due to risk of silicon oil contaminations. In addition, tubes that exhibit a layer of clear liquid, which rises to the top of the serum after centrifugation, should not be used, in order to prevent coating the sample probes and interfering with ISE system. It is possible to clog the sample probes or the ISE tubing with gel or clots if these precautions are not taken.

Urine: Collect 24-hour urine without addition of preservatives and/or stabilizers. Store refrigerated during collection.

NOTE: Each laboratory should establish guidelines for determining acceptability of specimens and the corrective action to be taken if a specimen is considered unacceptable. Compile a laboratory-specific guideline.

Sample stability (serum, plasma): [5]

14 days at 15-25 °C

14 days at 2-8 °C

stable at (-15)-(-25) °C

up to 10 freeze-thaw cycles possible.[6]

Sample stability (urine): [5,7]

14 days at 15-25 °C

stable at (-15)-(-25) °C

up to 6 freeze-thaw cycles possible.[8]

See the limitations and interferences section for details about possible sample interferences.

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Sample stability claims were established by experimental data by the manufacturer or based on reference literature[5] and only for the temperatures/time frames as stated in the method sheet. It is the responsibility of the individual laboratory to use all available references and/or its own studies to determine specific stability for its laboratory.

Materials provided

See “Order information” section

Materials required (but not provided)

See “Order information” section

General laboratory equipment

Application for serum, plasma and urine

Test definition

Serum/plasma

	Sample dilution	
Sample volume	*Sample*	*Diluent*
cobas c 311 analyzer, cobas c 501 module		
Normal	9.7 µL	291 µL / ISE Diluent
cobas 8000 ISE 900 / 1800 module, cobas c 303 analytical unit, cobas pro ISE analytical unit		
Normal	15 µL	450 µL / ISE Diluent
cobas ISE neo 900 analytical unit, cobas ISE neo 1800 analytical unit		
Normal	15 µL	450 µL / System Water

Measuring range on *cobas c 311 analyzer, cobas c 501 module, cobas 8000 ISE 900 / 1800 module, cobas c 303 analytical unit, cobas pro ISE analytical unit, cobas ISE neo 900 analytical unit, cobas ISE neo 1800 analytical unit:* 80-180 mmol/L

Analysis of sodium on ISE analytical units listed with serum and plasma specimens should yield a linear relationship from 80-180 mmol/L with a deviation from the linear line of less than 5 %.

The sample volumes given above under “Normal” are for samples, calibrators, and quality controls.

Urine

	Sample dilution	
Sample volume	*Sample*	*Diluent*
cobas c 311 analyzer, cobas c 501 module		
Normal	9.7 µL	291 µL / ISE Diluent
Decreased	6.5 µL	291 µL / ISE Diluent
cobas 8000 ISE 900 / 1800 module		
Normal	10 µL	450 µL / ISE Diluent
Increased	15 µL	450 µL / ISE Diluent
cobas c 303 analytical unit, cobas pro ISE analytical unit		
Normal	15 µL	450 µL / ISE Diluent
Decreased	10 µL	450 µL / ISE Diluent
cobas ISE neo 900 analytical unit, cobas ISE neo 1800 analytical unit		
Normal	15 µL	450 µL / System Water
Decreased	10 µL	450 µL / System Water

Measuring range on *cobas c 311 analyzer, cobas c 501 module, cobas c 303 analytical unit, cobas pro ISE analytical unit, cobas ISE neo 900 analytical unit, cobas ISE neo 1800 analytical unit:* 20-250 mmol/L

Analysis of sodium on ISE analytical units listed with urine specimens should yield a linear relationship from 20-250 mmol/L with a deviation from the linear line of less than 10 %.

Determine samples having higher concentrations via the rerun function. Dilution of samples via rerun function is a 1:46 dilution. Results from samples diluted using the rerun function are automatically multiplied by the dilution factor.

Measuring range on *cobas c 311 analyzer, cobas c 501 module, cobas c 303 analytical unit, cobas pro ISE analytical unit, cobas ISE neo 900 analytical unit, cobas ISE neo 1800 analytical unit* for urine samples with decreased sample volume (Rerun): 251-375 mmol/L.

Analysis of sodium on ISE analytical units listed with urine specimens should yield a linear relationship from 251-375 mmol/L with a deviation from the linear line of less than 10 %.

The sample volumes given above under “Normal” are for samples, calibrators, and quality controls.

Measuring range on *cobas 8000 ISE 900 / 1800 module:* 60-350 mmol/L

Analysis of sodium on **cobas** 8000 ISE 900 / 1800 module with urine specimens should yield a linear relationship from 60-350 mmol/L with a deviation from the linear line of less than 10 %.

Determine samples having lower concentrations via the rerun function. Dilution of samples via rerun function is a 1:31 dilution. Results from samples diluted using the rerun function are automatically multiplied by the dilution factor.

Measuring range on *cobas 8000 ISE 900 / 1800 module* for urine samples with increased sample volume (Rerun): 20-59.9 mmol/L

Analysis of sodium on **cobas** 8000 ISE 900 / 1800 module with urine specimens should yield a linear relationship from 20-59.9 mmol/L with a deviation from the linear line of less than 10 %.

The sample volumes given above under “Normal” are for samples and quality controls.

For further information about the assay test definitions refer to the application parameters setting screen of the corresponding analyzer and assay.

Lower limits of measurement

Limit of Blank, Limit of Detection and Limit of Quantitation

Limit of Blank	= 10 mmol/L
Limit of Detection	= 10 mmol/L
Limit of Quantitation	= 20 mmol/L

The Limit of Blank, the Limit of Detection and the Limit of Quantitation were determined in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP17-A2 requirements.

The Limit of Blank is the 95th percentile value from n ≥ 60 measurements of analyte-free samples over several independent series. The Limit of Blank corresponds to the concentration below which analyte-free samples are found with a probability of 95 %.

The Limit of Detection is determined based on the Limit of Blank and the standard deviation of low concentration samples.

The Limit of Detection corresponds to the lowest analyte concentration which can be detected (value above the Limit of Blank with a probability of 95 %).

The Limit of Quantitation is the lowest analyte concentration that can be reproducibly measured with a total error of 30 %. It has been determined using low concentration sodium samples.

Values below Limit of Quantitation are not reliable due to possible higher uncertainty.

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.

Calibration

Calibration requires the following calibrators: ISE Standard Low (S1), ISE Standard High (S2), and ISE Standard High (S3).

The slope of the calibration curve is calculated from Standards 1 and 2. ISE Internal Standard / ISE Internal Standard conc. is measured to provide E_{IS} for all measurements. Refer to the operator’s manual of the analyzer for detailed calibration instructions.

Traceability: ISE Standard Low and ISE Standard High are prepared gravimetrically from highly purified inorganic salts.

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Purity of these salts has been certified by argentometric titration, acidimetric titration or perchloric acid titration.

Calibration frequency

Calibration

- every 24 hours
- after ISE washing and maintenance
- after changing the reagent bottle ①
- after changing ISE Reference Electrolyte and/or Internal Standard conc. (depending on AutoCal settings) ②
- after replacing any electrode
- as required following quality control procedures

ISE reagents on:

① **cobas c** 311 analyzer, **cobas c** 501 module, **cobas** 8000 ISE 900 / 1800 module, **cobas c** 303 analytical unit, **cobas pro** ISE analytical unit

② **cobas** ISE neo 900 analytical unit, **cobas** ISE neo 1800 analytical unit

Refer to the operator's manual for a detailed description of the Calibration/AutoCal function.

Quality control

For quality control, use control materials as listed in the "Order information" section. In addition, other suitable control material can be used.

Serum/plasma:	PreciControl ClinChem Multi 1, PreciControl ClinChem Multi 2
	Precinorm U Plus, Precipath U Plus
Urine:	Quantitative urine controls are recommended for routine quality control.

Quality controls should be performed daily and after every additional 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.

Refer to appropriate value sheets/package inserts for additional information.

Traceability: Each Roche Diagnostics control listed above has been standardized against ISE Standard Low and ISE Standard High.

Limitations - interference

Criterion: Recovery within ± 10 % of initial value.

Hemolysis - serum/plasma

Hemolysis:[9] No significant interference up to an H index of 1000 (approximate hemoglobin concentration: 621 µmol/L or 1000 mg/dL).

Hemolysis - urine

Hemolysis:[9] No significant interference up to a hemoglobin concentration of 621 µmol/L or 1000 mg/dL.

Icterus - serum/plasma

Icterus:[9] No significant interference up to an I index of 60 for conjugated and unconjugated bilirubin (approximate conjugated and unconjugated bilirubin concentration: 1026 µmol/L or 60 mg/dL).

Lipemia - serum/plasma

Lipemia (Intralipid, SMOFlipid):[9] No significant interference up to an L index of 2000. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration. Pseudohyponatremia may be seen with lipemic specimens as a result of fluid displacement.[10]

Altered protein-/lipid levels may falsely shift sodium results into the opposite direction; i.e. elevated protein level = pseudohyponatremia, decreased protein level = pseudohypernatremia.[11,12]

NOTE: Gross lipemia causes pseudohyponatremia. Grossly lipemic specimens should be cleared by ultracentrifugation.[10]

Drugs

The following drugs have been tested and caused no significant interference when added to aliquots of pooled normal human serum up to the indicated concentration.

Serum/plasma

Acetaminophen (Paracetamol)	200 mg/L
Acetylsalicylic acid	1000 mg/L
Ampicillin-Na	1000 mg/L
Ascorbic acid	300 mg/L
Cefoxitin	2500 mg/L
Cyclosporine	5 mg/L
Doxycyclin	50 mg/L
Heparin	5000 IU/L
Ibuprofen	500 mg/L
Intralipid	10000 mg/L
Levodopa	20 mg/L
Methyldopa	20 mg/L
Metronidazole	200 mg/L
N-Acetylcysteine	1660 mg/L
Phenylbutazone	400 mg/L
Rifampicin	60 mg/L
Theophylline	100 mg/L

Urine

Acetaminophen (Paracetamol)	3000 mg/L
Ascorbic acid	4000 mg/L
Cefoxitin	12000 mg/L
Gentamycine sulfate	400 mg/L
Ibuprofen	4000 mg/L
Levodopa	1000 mg/L
Methyldopa	2000 mg/L
N-Acetylcysteine	10 mg/L
Ofloxacine	900 mg/L
Phenazopyridine	300 mg/L
Salicyluric acid	6000 mg/L
Tetracycline	300 mg/L

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

ACTION REQUIRED

Special Wash Programming: The use of special wash steps is mandatory when certain test combinations are run together on **cobas c** systems. All special wash programming necessary for avoiding carry-over is available via the **cobas** link. The latest version of the carry-over evasion list can be found with the NaOHD/SMS/SCCS Method Sheet. For further instructions, refer to the operator's manual.

Expected values[13]

Serum, Plasma	Infant	139-146 mmol/L
	Child	138-145 mmol/L
	Adult	136-145 mmol/L
	>90 y	132-146 mmol/L
Urine 24 h	6-10 y, M	41-115 mmol/24 h
	6-10 y, F	20-69 mmol/24 h
	10-14 y, M	63-177 mmol/24 h

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10-14 y, F	48-168 mmol/24 h
Adult, M	40-220 mmol/24 h
Adult, F	27-287 mmol/24 h

The urinary excretion of sodium varies significantly with dietary intake. The values given here are typical of people on an average diet.

NOTE: It is recommended that each laboratory establishes and maintains its own reference ranges. The values given here are only to be used as a guideline.

Precision

see precision data of the following analyzers in "Appendix 1: Precision":

cobas c 311 analyzer

cobas 6000 analyzer series: **cobas c** 501 module

cobas 8000 modular analyzer series: **cobas** 8000 ISE 900 / 1800 module

cobas pure integrated solutions: **cobas c** 303 analytical unit

cobas pro integrated solutions: **cobas pro** ISE analytical unit, **cobas** ISE neo 900 analytical unit, **cobas** ISE neo 1800 analytical unit

Method comparison

see method comparison data of the following analyzers in "Appendix 2: Method comparison":

cobas c 311 analyzer

cobas 6000 analyzer series: **cobas c** 501 module

cobas 8000 modular analyzer series: **cobas** 8000 ISE 900 / 1800 module

cobas pure integrated solutions: **cobas c** 303 analytical unit

cobas pro integrated solutions: **cobas pro** ISE analytical unit, **cobas** ISE neo 900 analytical unit, **cobas** ISE neo 1800 analytical unit

Maintenance

ISE washing procedure for cobas c 311 analyzer, cobas c 501 module, cobas 8000 ISE 900 / 1800 module, cobas c 303 and cobas pro ISE analytical unit.

The system maintenance procedures and frequencies stated in the operator's manual of the respective analyzer must be performed each day at the end of the daily sample run or after an elevated sample throughput.

cobas c 311:	The specially designated positions on the sample disk are used.
Position W1:	ISE Cleaning Solution
Position W2:	Activator

The ISE Wash procedure has to be manually selected out of maintenance items.

cobas c 501:	The specially labeled wash rack (green) is used.
Position 1:	Multiclean (not necessary when only the ISE is cleaned)
Position 2:	ISE Cleaning Solution
Position 3:	Activator

The system recognizes the wash rack and switches automatically to cleaning mode.

cobas 8000 ISE:	The specially labeled wash rack (green) is used.
Position 1:	Cell Cleaning Solution (not necessary when only the ISE is cleaned)
Position 2:	ISE Cleaning Solution
Position 3:	Activator

The system recognizes the wash rack and switches automatically to cleaning mode.

cobas c 303, cobas pro ISE:	The specially labeled wash rack (green) is used.
Position 1:	ISE Cleaning Solution (used for weekly wash rack)
Position 2:	ISE Cleaning Solution (used for daily wash rack)
Position 3:	Activator

The system recognizes the wash rack and switches automatically to cleaning mode.

The ISE systems require conditioning after cleaning and prior to calibration.

NOTE: Always use fresh solutions for cleaning.

ISE washing procedure for cobas ISE neo analytical unit

cobas ISE neo:	The ISE system wash tube holder is used.
Position CS:	ISE Cleaning Solution
Position A:	Activator

The maintenance task "ISE system wash" is scheduled and initiated automatically. For detailed description, refer to the operator's manual.

On-board stability of auxiliary reagents: ISE Cleaning Solution 4 days, Activator 4 days.

NOTE: Always exchange the tubes on the ISE tube holder, using new tubes for fresh reagents. **You must not refill them**, as this will lead to deterioration of the ISE measuring unit(s). Refer to the operator's manual for further information.

Appendix 1: Precision

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

cobas c 311 analyzer

The data obtained on **cobas c** 501 analyzer(s) are representative for **cobas c** 311 analyzer(s).

cobas 6000 analyzer series: cobas c 501 module

Repeatability and intermediate precision were determined using human samples and controls in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP5 requirements (2 aliquots per run, 2 runs per day, 21 days). The following results were obtained:

	Repeatability			Intermediate precision		
Sample (on a **cobas c** 501)	Mean mmol/L	SD mmol/L	CV %	Mean mmol/L	SD mmol/L	CV %
Plasma low	84.8	0.2	0.3	84.8	1	1.1
Plasma medium	121.4	0.3	0.3	121.4	0.8	0.6
Plasma high	176.7	0.3	0.2	176.7	0.6	0.4
Precinorm U	126	0.2	0.2	126.0	0.7	0.6
Precipath U	148.2	0.3	0.2	148.2	0.5	0.4
Urine low	30.6	0.1	0.2	30.6	0.9	3.0
Urine medium	131.7	0.2	0.2	131.7	0.6	0.5
Urine high	236.7	0.4	0.2	236.7	1.3	0.6
Liquichek 1	81.6	0.2	0.2	81.6	1.3	1.6
Liquichek 2	172.3	0.2	0.1	172.3	2.6	1.5

cobas 8000 modular analyzer series: cobas 8000 ISE 900 / 1800 module

Repeatability and intermediate precision were determined using human samples and controls in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP5 requirements (2 aliquots per run, 2 runs per day, 21 days). The following results were obtained:

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	Repeatability			Intermediate precision		
Sample (on a **cobas** 8000)	Mean mmol/L	SD mmol/L	CV %	Mean mmol/L	SD mmol/L	CV %
Plasma low	88.7	0.3	0.4	88.7	0.9	1.1
Plasma medium	120.6	0.4	0.3	120.6	0.9	0.7
Plasma high	175.8	0.6	0.3	175.8	1.0	0.6
Precinorm U	112.0	0.4	0.4	112.0	0.9	0.8
Precipath U	144.0	0.4	0.3	144.0	0.8	0.5
Urine low[1)]	24.7	0.2	0.9	24.7	0.9	3.7
Urine medium[2)]	174.5	0.5	0.3	174.5	1.1	0.7
Urine high[2)]	347.2	0.9	0.3	347.2	2.8	0.8
Liquichek 1[2)]	83.4	0.3	0.3	83.4	1.3	1.6
Liquichek 2[2)]	175.6	1.3	0.8	175.6	1.7	1.0

1) Data obtained with urine rerun function.

2) Data obtained with default urine mode.

cobas pure integrated solutions: cobas c 303 analytical unit

The data obtained on **cobas pro** analyzer(s) are representative for **cobas c** 303 analyzer(s).

cobas pro integrated solutions: cobas pro ISE analytical unit

Precision was determined using human samples and controls in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP05-A3 requirements with repeatability (n = 84) and intermediate precision (2 aliquots per run, 2 runs per day, 21 days). Results for repeatability and intermediate precision were obtained on the **cobas pro** ISE analytical unit.

	Repeatability			Intermediate precision		
Sample (on a **cobas pro** ISE analytical unit)	Mean mmol/L	SD mmol/L	CV %	Mean mmol/L	SD mmol/L	CV %
PCCC1[a)]	111	0.36	0.3	111	0.97	0.9
PCCC2[b)]	134	0.40	0.3	134	0.90	0.7
Human plasma 1	84.7	0.28	0.3	84.7	1.25	1.5
Human plasma 2	129	0.45	0.3	129	0.88	0.7
Human plasma 3	135	0.52	0.4	135	0.93	0.7
Human plasma 4	149	0.52	0.3	149	0.82	0.6
Human plasma 5	174	0.62	0.4	174	0.95	0.5
Human serum 1	83.0	0.29	0.3	83.0	1.38	1.7
Human serum 2	131	0.52	0.4	131	0.93	0.7
Human serum 3	135	0.47	0.3	135	1.02	0.8
Human serum 4	150	0.52	0.3	150	0.80	0.5
Human serum 5	173	0.63	0.4	173	0.95	0.5
Liquichek 1	78.1	0.34	0.4	78.1	1.06	1.4
Liquichek 2	175	0.71	0.4	175	1.05	0.6
Human urine 1	24.8	0.25	1.0	24.8	1.19	4.8
Human urine 2	136	0.47	0.3	136	0.94	0.7
Human urine 3	111	0.38	0.3	111	0.94	0.8
Human urine 4	204	0.96	0.5	204	1.23	0.6
Human urine 5	241	0.95	0.4	241	1.63	0.7

a) PreciControl ClinChem Multi 1

b) PreciControl ClinChem Multi 2

cobas pro integrated solutions: *cobas ISE neo 900 analytical unit, cobas ISE neo 1800 analytical unit*

Precision was determined using human samples and controls in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP05-A3 requirements with repeatability (n = 84) and intermediate precision (2 aliquots per run, 2 runs per day, 21 days). Results for repeatability and intermediate precision were obtained on the **cobas ISE neo** analytical unit.

	Repeatability			Intermediate precision		
Sample (on a **cobas** ISE neo analytical unit)	Mean mmol/L	SD mmol/L	CV %	Mean mmol/L	SD mmol/L	CV %
PCCC1[a)]	116	0.71	0.6	116	1.40	1.2
PCCC2[b)]	139	0.83	0.6	140	1.41	1.0
Human serum 1	87.0	0.40	0.5	86.5	1.49	1.7
Human serum 2	132	0.82	0.6	132	1.07	0.8
Human serum 3	136	0.79	0.6	137	0.98	0.7
Human serum 4	159	0.80	0.5	159	1.24	0.8
Human serum 5	176	0.81	0.5	175	1.30	0.7
Human plasma 1	88.1	0.39	0.4	87.8	1.52	1.7
Human plasma 2	131	0.82	0.6	131	1.36	1.0
Human plasma 3	136	0.73	0.5	136	1.21	0.9
Human plasma 4	156	0.74	0.5	157	1.38	0.9
Human plasma 5	173	0.82	0.5	173	1.57	0.9
Liquichek 1	81.1	0.38	0.5	81.1	1.17	1.4
Liquichek 2	171	0.95	0.6	171	1.72	1.0
Human urine 1	27.0	0.30	1.1	26.1	1.20	4.6
Human urine 2	135	0.49	0.4	135	1.33	1.0
Human urine 3	111	0.43	0.4	111	1.02	0.9
Human urine 4	198	0.85	0.4	198	2.04	1.0
Human urine 5	237	1.02	0.4	237	2.84	1.2

a) PreciControl ClinChem Multi 1

b) PreciControl ClinChem Multi 2

Appendix 2: Method comparison

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

cobas c 311 analyzer

The data obtained on **cobas c** 501 analyzer(s) are representative for **cobas c** 311 analyzer(s).

cobas 6000 analyzer series: cobas c 501 module

ISE values for human plasma and urine samples obtained on **cobas c** 501 analyzers (y) using ISE Standard High (compensated) as S3 Calibrator, were compared to those determined with the corresponding reference method (x) and with a **cobas c** 501 analyzer using ISE Compensator as S3 Calibrator.

The reference method used was: Flame Photometer IL 943 for sodium.

Instruments	Sample Type/ N	Min.x	Max.x	P/B Regression[14]	Coeff. (r)
x: flame photom. y: **cobas c** 501 (S3 = ISE Standard High)	Plasma / 103	86.7	178	y = 1.000x + 0.300	0.999
Bias at 135 mmol/L = 0.03 (0.2 %) Bias at 150 mmol/L = 0.03 (0.2 %)					

Na Electrode

Sodium

x: **cobas c** 501 (S3 = ISE Compensator) y: **cobas c** 501 (S3 = ISE Standard High)	Plasma / 103	87.6	176	y = 1.014x - 1.176	1.000
Bias at 135 mmol/L = 0.714 (0.5 %) Bias at 150 mmol/L = 0.924 (0.6 %)					
x: flame photom. y: **cobas c** 501 (S3 = ISE Standard High)	Urine / 100	23.5	250	y = 0.964x + 4.032	1.000
Bias at 20 mmol/L = 3.312 (16.6 %) Bias at 220 mmol/L = -3.888 (-1.8 %)					
x: **cobas c** 501 (S3 = ISE Compensator) y: **cobas c** 501 (S3 = ISE Standard High)	Urine / 100	25.1	245	y = 0.995x + 0.687	1.000
Bias at 20 mmol/L = 0.587 (2.9 %) Bias at 220 mmol/L = -0.413 (-0.2 %)					

Bias at the medical decision level (MDL) was calculated as follows:

Bias [mmol/L] = intercept + (slope x MDL) - MDL

Bias [%] = (Bias [mmol/L] x 100) / MDL

cobas 8000 modular analyzer series:cobas 8000 ISE 900 / 1800 module

ISE values for human plasma and urine samples obtained on a **cobas** 8000 analyzer (y) using ISE Standard High as S3 Calibrator, were compared with those determined using the corresponding reference method (x) and with **cobas c** 501 (x) using ISE Standard High as S3 Calibrator.

Instruments	Sample Type/ N	Min.x	Max.x	P/B Regression[14]	Coeff. (r)
x: flame photom. y: **cobas** 8000 (S3 = ISE Standard High)	Plasma / 100	85.6	180.6	y = 1.015x - 3.553	0.9943
Bias at 135 mmol/L = -1.528 (-1.1 %) Bias at 150 mmol/L = -1.303 (-0.9 %)					
x: **cobas c** 501 (S3 = ISE Standard High) y: **cobas** 8000 (S3 = ISE Standard High)	Plasma / 100	81.5	181.9	y = 0.969x + 3.381	0.9984
Bias at 135 mmol/L = -0.804 (-0.6 %) Bias at 150 mmol/L = -1.269 (-0.8 %)					
x: flame photom. y: **cobas** 8000 (S3 = ISE Standard High)	Urine[2] / 105	69.2	337.4	y = 0.996x + 1.248	0.9995
Bias at 60 mmol/L = 1.008 (1.7 %) Bias at 220 mmol/L = 0.368 (0.2 %)					
x: **cobas c** 501 (S3 = ISE Standard High) y: **cobas** 8000 (S3 = ISE Standard High)	Urine[2] / 105	68.3	349.5	y = 0.969x + 8.259	0.9998
Bias at 60 mmol/L = 6.339 (10.7 %) Bias at 220 mmol/L = 1.439 (0.7 %)					
x: flame photom. y: **cobas** 8000 (S3 = ISE Standard High)	Urine[1] / 92	22.2	58.7	y = 0.943x + 3.149	0.9991
Bias at 30 mmol/L = 1.439 (4.8 %)					
x: **cobas c** 501 (S3 = ISE Standard High) y: **cobas** 8000 (S3 = ISE Standard High)	Urine[1] / 92	24.2	59.8	y = 0.962x + 1.110	0.9995
Bias at 30 mmol/L = - 0.03 (-0.1 %)					

1) Data obtained with urine rerun function.

2) Data obtained with default urine mode.

Bias at the medical decision level (MDL) was calculated as follows:

Bias [mmol/L] = intercept + (slope x MDL) - MDL

Bias [%] = (Bias [mmol/L] x 100) / MDL

cobas pure integrated solutions: cobas c 303 analytical unit

ISE values for human plasma and serum samples obtained on a **cobas c** 303 ISE unit (y) were compared with those determined using the corresponding reference method (x) (sodium only), with a **cobas pro** ISE analytical unit (x) and with a **cobas c** 501 analyzer (x).

ISE values for human urine samples obtained on a **cobas c** 303 ISE unit (y) were compared with those determined using the corresponding reference method (x) (sodium only), with a **cobas pro** ISE analytical unit (x) and with a **cobas c** 501 analyzer (x).

The reference method used was: Flame Photometer FP 8400 for sodium.

Instruments	Sample Type/ N	Min.x	Max.x	P/B Regression[14]	Coeff. (r)
x: flame photom. y: **cobas c** 303 ISE	Plasma / 118	81.6	176	y = 0.985x + 1.38	0.994
Bias at 135 mmol/L = -0.581 (-0.4 %) Bias at 155 mmol/L = -0.871 (-0.6 %)					
x: **cobas pro** ISE y: **cobas c** 303 ISE	Plasma / 119	84.5	174	y = 0.980x + 2.38	0.999
Bias at 135 mmol/L = -0.256 (-0.2 %) Bias at 155 mmol/L = -0.647 (-0.4 %)					
x: **cobas c** 501 y: **cobas c** 303 ISE	Plasma / 119	85.8	175	y = 1.000x - 1.20	0.999

Na Electrode

Sodium

Bias at 135 mmol/L = -1.20 (-0.9 %) Bias at 155 mmol/L = -1.20 (-0.8 %)					
x: flame photom. y: **cobas c** 303 ISE	Serum / 120	81.5	182	y = 1.007x - 1.19	0.996
Bias at 135 mmol/L = -0.307 (-0.2 %) Bias at 155 mmol/L = -0.176 (-0.1 %)					
x: **cobas pro** ISE y: **cobas c** 303 ISE	Serum / 120	81.6	178	y = 0.984x + 1.23	1.000
Bias at 135 mmol/L = -0.998 (-0.7 %) Bias at 155 mmol/L = -1.32 (-0.8 %)					
x: **cobas c** 501 y: **cobas c** 303 ISE	Serum / 120	82.9	178	y = 1.000x - 1.50	1.000
Bias at 135 mmol/L = -1.50 (-1.1 %) Bias at 155 mmol/L = -1.50 (-1.0 %)					
x: flame photom. y: **cobas c** 303 ISE	Urine / 105	24.9	256	y = 0.973x + 1.97	0.999
x: **cobas pro** ISE y: **cobas c** 303 ISE	Urine / 119	19.9	246	y = 0.997x + 0.355	1.000
x: **cobas c** 501 y: **cobas c** 303 ISE	Urine / 113	22.2	237	y = 0.990x + 3.11	1.000

Bias at the medical decision level (MDL) was calculated as follows:

Bias [mmol/L] = intercept + (slope x MDL) - MDL

Bias [%] = (Bias [mmol/L] x 100) / MDL

cobas pro integrated solutions: cobas pro ISE analytical unit

ISE values for human plasma samples obtained on a **cobas pro** ISE analytical unit (y) were compared with those determined using the corresponding reference method (x) (sodium only) and with a **cobas c** 501 analyzer (x).

ISE values for human urine samples obtained on a **cobas pro** ISE analytical unit (y) were compared with those determined using the corresponding reference method (x) (sodium only) and with a **cobas c** 501 analyzer (x).

The reference method used was: Flame Photometer FP 8400 for sodium.

Instruments	Sample Type/ N	Min.x	Max.x	P/B Regression[14]	Coeff. (r)
x: flame photom. y: **cobas pro** ISE	Plasma / 118	80.4	175	y = 1.031x - 4.12	0.997
Bias at 135 mmol/L = 0.037 (0.0 %) Bias at 155 mmol/L = 0.652 (0.4 %)					
x: **cobas c** 501 y: **cobas pro** ISE	Plasma / 120	84.2	177	y = 1.003x - 1.72	1.000
Bias at 135 mmol/L = -1.33 (-1.0 %) Bias at 155 mmol/L = -1.27 (-0.8 %)					
x: flame photom. y: **cobas pro** ISE	Serum / 120	81.3	174	y = 1.016x - 1.11	0.996
Bias at 135 mmol/L = 1.09 (0.8 %) Bias at 155 mmol/L = 1.41 (0.9 %)					
x: **cobas c** 501 y: **cobas pro** ISE	Serum / 120	84.4	175	y = 1.027x - 4.38	1.000
Bias at 135 mmol/L = -0.766 (-0.6 %) Bias at 155 mmol/L = -0.230 (-0.1 %)					
x: flame photom. y: **cobas pro** ISE	Urine / 120	22.5	249	y = 0.993x - 2.46	1.000
x: **cobas c** 501 y: **cobas pro** ISE	Urine / 120	25.5	241	y = 1.019x - 2.90	1.000

Bias at the medical decision level (MDL) was calculated as follows:

Bias [mmol/L] = intercept + (slope x MDL) - MDL

Bias [%] = (Bias [mmol/L] x 100) / MDL

cobas pro integrated solutions: cobas ISE neo 900 analytical unit, cobas ISE neo 1800 analytical unit

ISE values for human plasma and serum samples obtained on a **cobas** ISE neo analytical unit (y) were compared with those determined using the corresponding reference method (x), with a **cobas c** 501 analyzer (x) and with a **cobas pro** ISE analytical unit (x).

ISE values for human urine samples obtained on a **cobas** ISE neo analytical unit (y) were compared with those determined using the corresponding reference method (x), with a **cobas c** 501 analyzer (x) and with a **cobas pro** ISE analytical unit (x).

The reference method used was: Flame Photometer (FP 8400).

Instruments	Sample Type/ N	Min.x	Max.x	P/B Regression[14]	Coeff. (r)
x: flame photom. y: **cobas** ISE neo	Serum / 117	85.4	182	y = 0.950x + 5.83	0.989
Bias at 135 mmol/L = -0.888 (-0.7 %) Bias at 155 mmol/L = -1.88 (-1.2 %)					
x: **cobas c** 501 y: **cobas** ISE neo	Serum / 120	80.8	178	y = 1.009x - 1.31	0.999
Bias at 135 mmol/L = -0.112 (-0.1 %) Bias at 155 mmol/L = 0.0658 (0.0 %)					

Na Electrode

cobas®

Sodium

x: **cobas pro** ISE y: **cobas** ISE neo	Serum / 119	80.7	178	y = 1.002x + 0.393	0.999
Bias at 135 mmol/L = 0.699 (0.5 %) Bias at 155 mmol/L = 0.744 (0.5 %)					
x: flame photom. y: **cobas** ISE neo	Plasma / 118	79.5	177	y = 0.967x + 5.07	0.987
Bias at 135 mmol/L = 0.591 (0.4 %) Bias at 155 mmol/L = -0.073 (0.0 %)					
x: **cobas c** 501 y: **cobas** ISE neo	Plasma / 118	85.0	176	y = 0.987x + 1.60	0.999
Bias at 135 mmol/L = -0.123 (-0.1 %) Bias at 155 mmol/L = -0.377 (-0.2 %)					
x: **cobas pro** ISE y: **cobas** ISE neo	Plasma / 119	80.5	176	y = 1.000x + 0.500	0.999
Bias at 135 mmol/L = 0.500 (0.4 %) Bias at 155 mmol/L = 0.500 (0.3 %)					
x: flame photom. y: **cobas** ISE neo	Urine / 100	25.4	238	y = 1.009x + 0.529	0.999
x: **cobas c** 501 y: **cobas** ISE neo	Urine / 116	24.1	238	y = 1.003x + 0.262	1.000
x: **cobas pro** ISE y: **cobas** ISE neo	Urine / 118	20.9	239	y = 1.010x - 0.555	1.000

Bias at the medical decision level (MDL) was calculated as follows:

Bias [mmol/L] = intercept + (slope x MDL) - MDL

Bias [%] = (Bias [mmol/L] x 100) / MDL

References

1 Tietz NW. Fundamentals of Clinical Chemistry, 5th ed. Burtis CA, Ashwood ER, eds. WB Saunders Co 2001:970,1004,1009.

2 Shono T, Okahara M, Ikeda I, et al. Sodium-selective PVC Membrane Electrodes Based on Bis(12-crown-4)s. J Electroanal Chem 1982;132:99-105.

3 Shibata Y, Maruizume T, Miyage H. Journal of the Chemical Society of Japan. Chemistry and Industrial Chemistry 1992;9:961-967.

4 Guder WG, Narayanan S, Wisser H, et al. Samples: From the Patient to the Laboratory; Wiley-Liss, 3rd. Ed., p 53.

5 Young DS. Effects of Preanalytical Variables on Clinical Laboratory Tests, 3rd ed. Washington DC: AACC Press 2007;819-822.

6 Gislefoss RE. Effect of multiple freeze-thaw cycles on selected biochemical serum components. Clin Chem Lab Med 2017; 55(7):967-973.

7 Remer T, Montenegro-Bethancourt G, Shi L. Long-term urine biobanking: storage stability of clinical chemistry parameters under moderate freezing conditions without use of preservatives. Clin Biochem 2014;47(18):307-311.

8 Zhang Y, Luo Y, Lu H, et al. Effect of freeze/thaw cycles on several biomarkers in urine from patients with kidney disease. Biopreserv Biobank 2015;13(2):144-146.

9 Glick MR, Ryder KW, Jackson SA. Graphical Comparisons of Interferences in Clinical Chemistry Instrumentation. Clin Chem 1986;32:470-475.

10 Tietz NW. Fundamentals of Clinical Chemistry, 5th ed. Burtis CA, Ashwood ER, eds. WB Saunders Co 2001:726-728.

11 Virk MS, Dean NP, Wong ECC. Severe Underestimation of Serum Na following IVIG Treatment. Laboratory Medicine 2018;49:4:372-376.

12 Stove V, Slabbinck A, Vanoverschelde L, et al. How to Solve the Underestimated Problem of Overestimated Sodium Results in the Hypoproteinemic Patient. Crit Care Med 2016;44 (2):e83-e88.

13 Tietz NW. Textbook of Clinical Chemistry And Molecular Diagnostics. 5th Ed; Elsevier 2012; p 2168.

14 Bablok W, Passing H, Bender R, et al. A general regression procedure for method transformation. Application of linear regression procedures for method comparison studies in clinical chemistry, Part III. J Clin Chem Clin Biochem 1988 Nov;26(11):783-790.

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.

Any serious incident that has occurred in relation to the device shall be reported to the manufacturer and the competent authority of the Member State in which the user and/or the patient is established.

The Summary of Safety & Performance Report can be found here: https://ec.europa.eu/tools/eudamed

Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard (for USA: see navifyportal.roche.com for definition of symbols used):

Cont.	Quantity contained in the package
CONTENT	Quantity contained in the package
GTIN	Global Trade Item Number
INSTALL BEFORE	Latest date by which the electrode has to be installed on the analyzer
RoHS	Directive for the restriction of the use of certain hazardous substances in electrical and electronic equipment

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Roche Diagnostics warrants that this product will meet the specifications stated in the labeling when used in accordance with such labeling and will be free from defects in material and workmanship until the expiration date printed on the label. THIS LIMITED WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. IN NO EVENT SHALL ROCHE DIAGNOSTICS BE LIABLE FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES.

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Na Electrode

Sodium

CE 0123

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