respons®920

Creatinine FS*

Order Information

Cat. No.	Kit size
1 1711 99 10 920	Σ 800 (4 x 200)
1 1711 99 10 921	Σ 200 (4 x 50)

Intended Use

Diagnostic reagent for quantitative in vitro determination of creatinine in human serum, heparin plasma or urine on automated DiaSys respons®920.

Summary

Creatinine is a waste product excreted by the kidneys mainly by glomerular filtration. The concentration of creatinine in plasma of a healthy individual is fairly constant, independent from water intake, exercise and rate of urine production. Therefore, increased plasma creatinine values always indicate decreased excretion, i.e. impaired kidney function. Creatinine clearance is a good indicator for the glomerular filtration rate (GFR) which allows better detection of kidney diseases and monitoring of renal function. For this purpose, creatinine is measured simultaneously in serum and urine collected over a defined time period. [1,2]

Method

Kinetic test without deproteinization according to the Jaffé method

Creatinine forms a colored orange-red complex in an alkaline picrate solution. The difference in absorbance at fixed times during conversion is proportional to the concentration of creatinine in the sample.

Creatinine + Picric acid ⟶ Creatinine picrate complex

Reagents

Components and Concentrations

R1:	Sodium hydroxide	0.2 mol/L
R2:	Picric acid	20 mmol/L

Storage and Stability

Reagents are stable up to the date of expiry indicated on the kit, if stored at 2 - 25°C and contamination is avoided. Do not freeze and protect from light.

The in-use stability of the reagent is 18 months.

Warnings and Precautions

1. Components contained in Creatinine FS are classified according to EC regulation 1272//2008 (CLP) as follows:

⚠ Reagent 1: Warning. H290 May be corrosive to metals. H315 Causes skin irritation. H319 Causes serious eye irritation. P234 Keep only in original packaging. P264 Wash hands and face thoroughly after handling. P280 Wear protective gloves/protective clothing/eye protection. P302+P352 IF ON SKIN: Wash with plenty of water/soap. P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P332+P313 If skin irritation occurs: Get medical advice/attention. P337+P313 If eye irritation persists: Get medical advice/attention. P390 Absorb spillage to prevent material damage

⚠ Reagent 2: Warning. H290 May be corrosive to metals. P234 Keep only in original packaging. P280 Wear protective gloves/protective clothing/eye protection. P390 Absorb spillage to prevent material damage.

2. High homogentisic acid concentrations in urine samples lead to false results.
3. In very rare cases, samples of patients with gammopathy might give falsified results [3].
4. Eltrombopag medication leads to falsely low or high results in patient samples.
5. To avoid carryover interference, please take care of efficient washing especially after use of interfering reagents. Please refer to the DiaSys respons®920 Carryover Pair Table. Carryover pairs and automated washing steps with the recommended cleaning solution can be specified in the system software. Please refer to the user manual.
6. In case of product malfunction or altered appearance that could affect the performance, contact the manufacturer.
7. Any serious incident related to the product must be reported to the manufacturer and the competent authority of the Member State where the user and/or patient is located.
8. Please refer to the safety data sheets (SDS) and take the necessary precautions for the use of laboratory reagents. For diagnostic purposes, the results should always be assessed with the patient's medical history, clinical examinations and other findings.
9. For professional use only.

Waste Management

Refer to local legal requirements for chemical disposal regulations as stated in the relevant SDS to determine the safe disposal.

Warning: Handle waste as potentially biohazardous material. Dispose of waste according to accepted laboratory instructions and procedures.

Reagent Preparation

The reagents are ready to use. The bottles are placed directly into the reagent rotor.

Materials Required

General laboratory equipment

Specimen

Human serum, heparin plasma or urine

Only use suitable tubes or collection containers for specimen collection and preparation.

When using primary tubes, follow the manufacturer's instructions.

Stability in serum/plasma [4]:		
7 days	at	4 – 25°C
3 months	at	–20°C

Stability in urine [4]:		
2 days	at	20 – 25°C
6 days	at	4 – 8°C
6 months	at	–20°C

TruLab Urine controls must be prediluted the same way as patient samples.

Only freeze once. Discard contaminated specimens.

Calibrators and Controls

DiaSys TruCal U is recommended for calibration. Calibrator values for the compensated method have been made traceable to the NIST (National Institute for Standardization) Standard Reference Material SRM 967 using level 1 and 2 and, therefore, to GC-IDMS (gas chromatography - isotope dilution mass spectrometry). Use DiaSys TruLab N and P or TruLab Urine Level 1 and Level 2 controls for internal quality control. Quality control must be performed after calibration. Control intervals and limits have to be adapted to the individual requirements of each laboratory. Results must be within the defined ranges. Follow the relevant legal requirements and guidelines. Each laboratory should establish corrective action in case of deviations in control recovery.

	Cat. No.	Kit size
TruCal U	5 9100 99 10 063	20 x 3 mL
	5 9100 99 10 064	6 x 3 mL
TruLab N	5 9000 99 10 062	20 x 5 mL
	5 9000 99 10 061	6 x 5 mL
TruLab P	5 9050 99 10 062	20 x 5 mL
	5 9050 99 10 061	6 x 5 mL
TruLab Urine Level 1	5 9170 99 10 062	20 x 5 mL
	5 9170 99 10 061	6 x 5 mL
TruLab Urine Level 2	5 9180 99 10 062	20 x 5 mL
	5 9180 99 10 061	6 x 5 mL

Calculation

Creatinine Clearance [mL/min/1.73 m^2] [5]

$$= \frac{\text{mg Creatinine/ 100 mL Urine x mL Urine}}{\text{mg Creatinine/ 100 mL Serum x min Urine collection time}}$$

The calculated creatinine clearance refers to the average body surface of an adult (1.73 m^2).

Compensated Method

Picric acid which forms the colored complex reacts unspecifically with interfering serum components, so-called pseudo-creatinines. This leads to falsely elevated creatinine values in serum and plasma samples especially in the low measuring range. To compensate these interferences, the calibrator value for the compensated method indicated in the value sheet of TruCal U has to be used for calculation. Additionally, 0.3 mg/dL has to be subtracted from the calculated creatinine value [6,7]. For use of the compensated method, calibration with the calibrator TruCal U is strictly recommended. The method is applicable only for serum and plasma samples. The compensated method is traceable to GC-IDMS.

Performance Characteristics

Exemplary data mentioned below may slightly differ in case of deviating measurement conditions.

Measuring range up to 15 mg/dL in serum and from 18 to 600 mg/dL in urine. In case of higher concentrations re-measure samples after manual dilution with NaCl solution (9 g/L) or use rerun function.

Limit of detection**	0.1 mg/dL
Onboard stability	4 days
Calibration stability	1 day

Interfering substance	**Interferences ≤ 10% up to**
Ascorbic acid	30 mg/dL
Bilirubin	3 mg/dL
Hemoglobin	500 mg/dL
Lipemia (triglycerides)	1800 mg/dL

For further information on interfering substances, refer to the literature [8-10].

Precision in serum			
Within run (n=20)	**Sample 1**	**Sample 2**	**Sample 3**
Mean [mg/dL]	0.81	1.26	7.03
CV [%]	3.16	0.98	1.19
Between day (n=20)	**Sample 1**	**Sample 2**	**Sample 3**
Mean [mg/dL]	0.80	1.22	6.63
CV [%]	3.64	3.23	2.97

Method comparison in serum (n=110)	
Test x	DiaSys Creatinine FS (Hitachi 917)
Test y	DiaSys Creatinine FS (respons®920)
Slope	1.04
Intercept	–0.052 mg/dL
Coefficient of correlation	0.999

Precision in urine			
Within run (n=20)	**Sample 1**	**Sample 2**	**Sample 3**
Mean [mg/dL]	39.5	173	270
CV [%]	6.63	3.00	3.43
Between day (n=20)	**Sample 1**	**Sample 2**	**Sample 3**
Mean [mg/dL]	31.8	133	221
CV [%]	7.56	5.19	4.81

Method comparison in urine (n=109)	
Test x	DiaSys Creatinine FS (BioMajesty 6010)
Test y	DiaSys Creatinine FS (respons®920)
Slope	1.04
Intercept	0.924 mg/dL
Coefficient of correlation	0.999

** lowest measurable concentration which can be distinguished from zero; mean + 3 SD (n = 20) of an analyte free specimen.

Conversion Factor
Creatinine [mg/dL] x 88.4 = Creatinine [µmol/L]
Creatinine [mg/dL] x 0.0884 = Creatinine [mmol/L]

Reference Range

Serum/Plasma, Jaffé-method not compensated

	mg/dL	**µmol/L**
Adults [1]		
Women	0.6 – 1.1	53 – 97
Men	0.7 – 1.3	62 – 115
Children [2,11]		
Neonate	0.5 – 1.2	44 – 106
Infant	0.4 – 0.7	35 – 62
Child	0.5 – 1.2	44 – 106

Serum/Plasma, Jaffé-method compensated

	mg/dL	**µmol/L**
Adults [6]		
Women	0.5 – 0.9	44 – 80
Men	0.7 – 1.2	62 – 106
Children [12]		
Neonate	0.24 – 1.04	21 – 92
Infant	0.17 – 0.42	15 – 37
Child	0.24 – 0.87	21 – 77

24h urine [1]

Women	11 – 20 mg/kg/24h	97 – 177 µmol/kg/24h
Men	14 – 26 mg/kg/24h	124 – 230 µmol/kg/24h

Albumin/creatinine ratio (early morning urine) [13]:
< 30 mg/g Creatinine

Creatinine clearance [2]

Women	95 – 160 mL/min/1.73 m^2
Men	98 – 156 mL/min/1.73 m^2

Each laboratory should check if the reference ranges are transferable to its own patient population and determine own reference ranges if necessary.

Literature

1. Newman DJ, Price CP. Renal function and nitrogen metabolites. In: Burtis CA, Ashwood ER, editors. Tietz Textbook of Clinical Chemistry. 3rd ed. Philadelphia: W.B Saunders Company; 1999. p. 1204-1270.
2. Thomas L. Clinical Laboratory Diagnostics. 1st ed. Frankfurt: TH-Books Verlagsgesellschaft; 1998. p. 366-74.
3. Bakker AJ, Mücke M. Gammopathy interference in clinical chemistry assays: mechanisms, detection and prevention. ClinChemLabMed 2007;45(9):1240-1243.
4. Guder WG, Zawta B. Recommendations of the Working group on Preanalytical Quality of the German Society for Clinical Chemistry and the German Society for Laboratory Medicine: The Quality of Diagnostic Samples. 1st ed Darmstadt: GIT Verlag 2001; p. 24-5,50-1.
5. Junge W, Wilke B, Halabi A, Klein G. Determination of reference intervals for serum creatinine, creatinine excretion and creatinine clearance with an enzymatic and a modified Jaffé method. Clin Chim Acta 2004; 344: 137-148.
6. Mazzachi BC, Peake MJ, Ehrhardt V. Reference Range and Method Comparison Studies for Enzymatic and Jaffé Creatine Assays in Plasma and Serum and Early Morning Urine. Clin. Lab. 2000; 46: 53-55.
7. Swanson AF, Swartzentruber M, Nolen PA et al. Multicenter Evaluation of the Boehringer Mannheim Compensated, Rate-Blanked Creatinine/Jaffe Application on BM/Hitachi Systems. Advances in Clinical Diagnostics. 1993. Boehringer Mannheim Corporation.

8. Young DS. Effects of Drugs on Clinical Laboratory Tests. 5th ed. Vol. 1 and 2. Washington, DC: The American Association for Clinical Chemistry Press 2000.
9. Young DS. Effects on Clinical Laboratory Tests - Drugs Disease, Herbs & Natural Products, https://clinfx.wiley.com/aaccweb/aacc/, accessed in January 2021. Published by AACC Press and John Wiley and Sons, Inc.
10. Sonntag O, Scholer A. Drug interference in clinical chemistry: recommendation of drugs and their concentrations to be used in drug interference studies. Ann Clin Biochem. 2001 Jul;38:376-85.
11. Soldin SJ, Brugnara C, Wong EC, eds. Pediatric Reference Intervals. 6th ed. AACC Press, 2007: p. 77-78.
12. Schlebusch H, Liappis N, Klein G. Ultrasensitive CRP and Creatinine: Reference intervals from infancy to childhood. Clin Chem Lab Med. 2001; 39 Special supplement pp S1-S448; May 2001. PO-T042.
13. Dati F, Metzmann E. Proteins-Laboratory testing and clinical use. 1st ed. Holzheim: DiaSys Diagnostic Systems; 2005: p. 93.

Additions and/or changes in the document are highlighted in grey. For deletions, please refer to the customer information for the corresponding edition number of the package inserts.

IVD CE

DiaSys Diagnostic Systems GmbH
Alte Strasse 9 65558 Holzheim
Germany
www.diasys-diagnostics.com

* Fluid Stable

respons®920

Creatinine FS

Application for serum and plasma (uncompensated method)

Test Details			Test Volumes			Reference Ranges		
Test	:	CREA				Auto Rerun		☐
Report Name	:	Creatinine				Online Calibration		☐
Unit	:	mg/dL	Decimal Places	:	2	Cuvette Wash		☐
Wavelength-Primary	:	505	Secondary	:	578	Total Reagents	:	2
Assay Type	:	RATE - A	Curve Type	:	Linear	Reagent R1	:	CREA R1
M1 Start	:	0	M1 End	:	0	Reagent R2	:	CREA R2
M2 Start	:	19	M2 End	:	25			
Sample Replicates	:	1	Standard Replicates	:	3	Consumables/Calibrators:		
Control Replicates	:	1	Control Interval	:	0	Blank /Level 0		0
Reaction Direction	:	Increasing	React. Abs. Limit	:	0.90	Calibrator 1		*
Prozone Limit %	:	0	Prozone Check	:	Lower			
Linearity Limit %	:	0	Delta Abs./Min.	:	0.00			
Technical Minimum	:	0.10	Technical Maximum	:	15.00			
Y = aX + b a=	:	1.00	b=	:	0			

* Enter calibrator value.

Test Details			Test Volumes	Reference Ranges
Test	:	CREA		
Sample Type	:	Serum		

Sample Volumes

Normal	:	12.00 µL	Dilution Ratio	:	1	X
Increase	:	24.00 µL	Dilution Ratio	:	1	X
Decrease	:	2.00 µL	Dilution Ratio	:	1	X
Standard Volume	:	12.00 µL				

Reagent Volumes and Stirrer Speed

RGT-1 Volume	:	160 µL	R1 Stirrer Speed	:	Medium
RGT-2 Volume	:	40 µL	R2 Stirrer Speed	:	High

Sample Types

- ☑ Serum
- ☐ Urine
- ☐ CSF
- ☑ Plasma
- ☐ Whole Blood
- ☐ Other

Test Details			Test Volumes	Reference Ranges
Test	:	CREA		
Sample Type	:	Serum		
Reference Range	:	DEFAULT		
Category	:	Male		

Reference Range

		Lower Limit (mg/dL)	Upper Limit (mg/dL)
Normal	:	0.90	1.30
Panic	:	0.00	0.00

Sample Types

- ☑ Serum
- ☐ Urine
- ☐ CSF
- ☑ Plasma
- ☐ Whole Blood
- ☐ Other

respons®920

Creatinine FS

Application for urine (uncompensated method)

Test Details			Test Volumes			Reference Ranges		
Test	:	CREA				Auto Rerun		☐
Report Name	:	Creatinine in urine				Online Calibration		☐
Unit	:	mg/dL	Decimal Places	:	2	Cuvette Wash		☐
Wavelength-Primary	:	505	Secondary	:	578	Total Reagents	:	2
Assay Type	:	RATE - A	Curve Type	:	Linear	Reagent R1	:	CREA R1
M1 Start	:	0	M1 End	:	0	Reagent R2	:	CREA R2
M2 Start	:	19	M2 End	:	25			
Sample Replicates	:	1	Standard Replicates	:	3	Consumables/Calibrators:		
Control Replicates	:	1	Control Interval	:	0	Blank/Level 0		0
Reaction Direction	:	Increasing	React. Abs. Limit	:	0.90	Calibrator 1		*
Prozone Limit %	:	0	Prozone Check	:	Lower			
Linearity Limit %	:	0	Delta Abs./Min.	:	0.00			
Technical Minimum	:	18	Technical Maximum	:	600			
Y = aX + b a=	:	1.00	b=	:	0			

* Enter calibrator value.

Test Details			Test Volumes	Reference Ranges
Test	:	CREA		
Sample Type	:	Urine		

Sample Volumes

Normal	:	12.00 µL	Dilution Ratio	:	50	X
Increase	:	12.00 µL	Dilution Ratio	:	10	X
Decrease	:	12.00 µL	Dilution Ratio	:	100	X
Standard Volume	:	12.00 µL				

Reagent Volumes and Stirrer Speed

RGT-1 Volume	:	160 µL	R1 Stirrer Speed	:	Medium
RGT-2 Volume	:	40 µL	R2 Stirrer Speed	:	High

Sample Types

- ☐ Serum
- ☑ Urine
- ☐ CSF
- ☐ Plasma
- ☐ Whole Blood
- ☐ Other

Test Details			Test Volumes	Reference Ranges
Test	:	CREA		
Sample Type	:	Urine		
Reference Range	:	DEFAULT		
Category	:	Male		

Reference Range

		Lower Limit (mg/dL)	Upper Limit (mg/dL)
Normal	:	39	259
Panic	:	0.00	0.00

Sample Types

- ☐ Serum
- ☑ Urine
- ☐ CSF
- ☐ Plasma
- ☐ Whole Blood
- ☐ Other