

REF	CONTENT	Analyzer(s) on which cobas c pack(s) can be used
03183734 190	Total Protein Gen.2 (300 tests)	System-ID 07 6827 8 COBAS INTEGRA 400 plus COBAS INTEGRA 800
10759350 190	Calibrator f.a.s. (12 × 3 mL)	System-ID 07 3718 6
10759350 360	Calibrator f.a.s. (12 × 3 mL, for USA)	System-ID 07 3718 6
12149435 122	Precinorm U plus (10 × 3 mL)	System-ID 07 7999 7
12149435 160	Precinorm U plus (10 × 3 mL, for USA)	System-ID 07 7999 7
12149443 122	Precipath U plus (10 × 3 mL)	System-ID 07 8000 6
12149443 160	Precipath U plus (10 × 3 mL, for USA)	System-ID 07 8000 6
10171743 122	Precinorm U (20 × 5 mL)	System-ID 07 7997 0
10171735 122	Precinorm U (4 × 5 mL)	System-ID 07 7997 0
10171778 122	Precipath U (20 × 5 mL)	System-ID 07 7998 9
10171760 122	Precipath U (4 × 5 mL)	System-ID 07 7998 9
10557897 122	Precinorm Protein (3 × 1 mL)	System-ID 07 9105 9
10557897 160	Precinorm Protein (3 × 1 mL, for USA)	System-ID 07 9105 9
11333127 122	Precipath Protein (3 × 1 mL)	System-ID 07 9106 7
11333127 160	Precipath Protein (3 × 1 mL, for USA)	System-ID 07 9106 7
05117003 190	PreciControl ClinChem Multi 1 (20 × 5 mL)	System-ID 07 7469 3
05947626 190	PreciControl ClinChem Multi 1 (4 × 5 mL)	System-ID 07 7469 3
05947626 160	PreciControl ClinChem Multi 1 (4 × 5 mL, for USA)	System-ID 07 7469 3
05117216 190	PreciControl ClinChem Multi 2 (20 × 5 mL)	System-ID 07 7470 7
05947774 190	PreciControl ClinChem Multi 2 (4 × 5 mL)	System-ID 07 7470 7
05947774 160	PreciControl ClinChem Multi 2 (4 × 5 mL, for USA)	System-ID 07 7470 7

English

System information

Test TP2, test ID 0-027

Intended use

In vitro test for the quantitative determination of the total protein concentration in serum and plasma on COBAS INTEGRA systems.

Summary¹

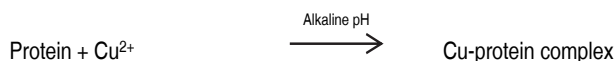
Plasma proteins are synthesized predominantly in the liver, plasma cells, lymph nodes, the spleen and in bone marrow. In the course of disease the total protein concentration and also the percentage represented by individual fractions can significantly deviate from normal values. Hypoproteinemia can be caused by diseases and disorders such as loss of blood, sprue, nephrotic syndrome, severe burns, salt retention syndrome and Kwashiorkor (acute protein deficiency).

Hyperproteinemia can be observed in cases of severe dehydration and illnesses such as multiple myeloma. Changes in the relative percentage of plasma proteins can be due to a change in the percentage of one plasma protein fraction. Often in such cases the amount of total protein does not change. The A/G ratio is commonly used as an index of the distribution of albumin and globulin fractions. Marked changes in this ratio can be observed in cirrhosis of the liver, glomerulonephritis, nephrotic syndrome, acute hepatitis, lupus erythematosus as well as in certain acute and chronic inflammations. Total protein measurements are used in the diagnosis and treatment of a variety of diseases involving the liver, kidney, or bone marrow, as well as other metabolic or nutritional disorders.

Test principle²

Colorimetric assay

Divalent copper reacts in alkaline solution with protein peptide bonds to form the characteristic purple-colored biuret complex. Sodium potassium tartrate prevents the precipitation of copper hydroxide and potassium iodide prevents autoreduction of copper.



The color intensity is directly proportional to the protein concentration. It is determined by measuring the increase in absorbance at 552 nm.

Reagents - working solutions

R1 Sodium hydroxide: 400 mmol/L; sodium potassium tartrate: 89 mmol/L; pH: 13.4

SR Sodium hydroxide: 400 mmol/L; sodium potassium tartrate: 89 mmol/L; potassium iodide: 61 mmol/L; cupric sulfate: 24.3 mmol/L; pH: 13.2

R1 is in position B and SR is in position C.

Precautions and warnings

Pay attention to all precautions and warnings listed in Section 1 / Introduction of this Method Manual.

For USA: Caution: Federal law restricts this device to sale by or on the order of a physician.

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



Warning

H290 May be corrosive to metals.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

H411 Toxic to aquatic life with long lasting effects.

Prevention:

P273 Avoid release to the environment.

P280 Wear protective gloves/ eye protection/ face protection.



Response

P337 + P313 If eye irritation persists: Get medical advice/attention.

P390 Absorb spillage to prevent material damage.

P391 Collect spillage.

Disposal:

P501 Dispose of contents/container to an approved waste disposal plant.

Product safety labeling follows EU GHS guidance.

Contact phone: all countries: +49-621-7590, USA: 1-800-428-2336

Reagent handling

Ready for use

Storage and stabilityShelf life at 15-25 °C See expiration date on
cobas c pack label

COBAS INTEGRA 400 plus system

On-board in use at 10-15 °C 4 weeks

COBAS INTEGRA 800 system

On-board in use at 8 °C 4 weeks

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:

Serum

Plasma: Li-heparin or K₃-EDTA plasma.The total protein concentration is by 0.4-0.8 g/dL lower when the sample is collected from a patient situated in the recumbent position rather than upright.³

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.

In rare cases, even correctly handled heparin plasma primary tubes may contain cell aggregates which lead to a specific absorption increase at the secondary wavelength 659 nm and thus to false-low TP results. This interference may be prevented by either transferring the sample supernatant into a secondary tube or, in case of gel tubes, by gently mixing the sample by inverting prior to the analysis.

Centrifuge samples containing precipitates before performing the assay.

Stability:^{4,5,6} 1 month at 2-8 °C
6 months at (-15)-(-25) °C**Materials provided**

See "Reagents – working solutions" section for reagents.

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.

Application for serum and plasma**COBAS INTEGRA 400 plus test definition**

Measuring mode	Absorbance
Abs. calculation mode	Endpoint
Reaction mode	R1-S-SR
Reaction direction	Increase
Wavelength A/B	552/659 nm

Calc. first/last	33/52
Unit	g/L

Pipetting parameters

		Diluent (H ₂ O)
R1	90 µL	0 µL
Sample	2 µL	28 µL
SR	32 µL	0 µL
Total volume	152 µL	

COBAS INTEGRA 800 test definition

Measuring mode	Absorbance
Abs. calculation mode	Endpoint
Reaction mode	R1-S-SR
Reaction direction	Increase
Wavelength A/B	552/659 nm
Calc. first/last	44/78
Unit	g/L

Pipetting parameters

		Diluent (H ₂ O)
R1	90 µL	0 µL
Sample	2 µL	28 µL
SR	32 µL	0 µL
Total volume	152 µL	

Calibration

Calibrator	Calibrator f.a.s. Use deionized water as zero calibrator.
Calibration mode	Linear regression
Calibration replicate	Duplicate recommended
Calibration interval	Each lot and as required following quality control procedures

Calibration interval may be extended based on acceptable verification of calibration by the laboratory.

Traceability: This method has been standardized against SRM 927.

Quality control

Reference range	Precinorm U, Precinorm U plus, Precinorm Protein or PreciControl ClinChem Multi 1
Pathological range	Precipath U, Precipath U plus, Precipath Protein or PreciControl ClinChem Multi 2
Control interval	24 hours recommended
Control sequence	User defined
Control after calibration	Recommended

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

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

COBAS INTEGRA analyzers automatically calculate the analyte concentration of each sample. For more details, please refer to Data Analysis in the Online Help (COBAS INTEGRA 400 plus/800 analyzers).

Conversion factor: $\text{g/L} \times 0.1 = \text{g/dL}$

Limitations - interference

Criterion: Recovery within $\pm 10\%$ of initial value.

Serum/plasma

Icterus:⁷ No significant interference up to an I index of 60 for conjugated and unconjugated bilirubin (approximate conjugated and unconjugated bilirubin concentration: 1026 $\mu\text{mol/L}$ or 60 mg/dL).

Hemolysis:⁷ No significant interference up to an H index of 500 (approximate hemoglobin concentration: 310 $\mu\text{mol/L}$ or 500 mg/dL).

Lipemia (Intralipid):⁷ No significant interference up to an L index of 2000. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration.

Dextran: No significant interference up to concentrations of 30 mg/mL .

Drugs: No interference was found at therapeutic concentrations using common drug panels.^{8,9}

Low recovery may be caused by the formation of cell aggregates in some heparin plasma samples.

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.¹⁰

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 INTEGRA analyzers. Refer to the CLEAN Method Sheet for further instructions and for the latest version of the Extra wash cycle list.

Where required, special wash/carry-over evasion programming must be implemented prior to reporting results with this test.

Limits and ranges**Measuring range**

2-120 g/L (0.2-12 g/dL)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:5 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 5.

Lower limits of measurement

Lower detection limit of the test:
2 g/L (0.2 g/dL)

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying 3 standard deviations above that of a zero sample (zero sample + 3 SD, repeatability, $n = 30$).

Expected values

Expected values according to Josephson¹¹

Adults 6.6-8.7 g/dL (66-87 g/L)

Expected values according to Tietz¹²

Umbilical cord 4.8-8.0 g/dL

Premature 3.6-6.0 g/dL

Newborn 4.6-7.0 g/dL

1 week 4.4-7.6 g/dL

7 months-1 year 5.1-7.3 g/dL

1-2 years 5.6-7.5 g/dL

> 3 years 6.0-8.0 g/dL

Adults (ambulatory) 6.4-8.3 g/dL

Expected values

according to Australasian Association of Clinical Biochemists¹³

Adults 60-80 g/L (6.0-8.0 g/dL)

Roche has not evaluated reference ranges in a pediatric population.

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference ranges.

Specific performance data

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

Precision

Precision was determined using human samples and controls in an internal protocol with repeatability ($n = 21$) and intermediate precision (1 aliquot per run, 1 run per day, 21 days). The following results were obtained:

Repeatability	Mean g/L	SD g/L	CV %
Human serum 1	70.1	0.8	1.1
Human serum 2	84.2	0.4	0.5
Precinorm U	48.0	0.2	0.5
Precipath U	51.7	0.3	0.5

Intermediate precision	Mean g/L	SD g/L	CV %
Human serum 1	65.4	1.4	2.2
Human serum 2	92.0	1.4	1.5
Precinorm U	52.6	0.5	1.0
Precipath U	51.2	0.9	1.7

Method comparison

Total protein values for human serum samples obtained on a COBAS INTEGRA 700 using the COBAS INTEGRA Total Protein Gen.2 reagent (y) were compared with those determined using the corresponding reagent on a Roche/Hitachi 917 analyzer (x) and with those determined using the previous reagent (TP) on a COBAS INTEGRA 700 analyzer (x).

Roche/Hitachi 917 analyzer

Sample size (n) = 114

Passing/Bablok¹⁴

$y = 0.979x + 0.249 \text{ g/L}$

$r = 0.947$

SD (md 95) = 1.54

Linear regression

$y = 0.978x + 0.452 \text{ g/L}$

$r = 0.998$

$Sy.x = 0.732$

The sample concentrations were between 32 and 100 g/L (3.2 and 10.0 g/dL).

COBAS INTEGRA 700 analyzer

Sample size (n) = 60

Passing/Bablok¹⁴

$y = 1.033x - 0.541 \text{ g/L}$

$r = 0.972$

SD (md 95) = 0.984

Linear regression

$y = 1.031x - 0.372 \text{ g/L}$

$r = 0.999$

$Sy.x = 0.467$

The sample concentrations were between 24 and 113 g/L (2.4 and 11.3 g/dL).

References




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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 (for USA: see <https://usdiagnostics.roche.com> for definition of symbols used):

	Contents of kit
	Volume after reconstitution or mixing
	Global Trade Item Number

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