

IRON2

Iron Gen.2

Order information

REF	CONTENT	System-ID	Analyzers on which cobas c pack can be used
03183696 122	Iron Gen.2 (200 tests)	System-ID 07 6596 1	COBAS INTEGRA 400 plus COBAS INTEGRA 800
10759350 190	Calibrator f.a.s. (12 x 3 mL)	System-ID 07 3718 6	
10759350 360	Calibrator f.a.s. (12 x 3 mL, for USA)	System-ID 07 3718 6	
12149435 122	Precinorm U plus (10 x 3 mL)	System-ID 07 7999 7	
12149435 160	Precinorm U plus (10 x 3 mL, for USA)	System-ID 07 7999 7	
12149443 122	Precipath U plus (10 x 3 mL)	System-ID 07 8000 6	
12149443 160	Precipath U plus (10 x 3 mL, for USA)	System-ID 07 8000 6	
10171743 122	Precinorm U (20 x 5 mL)	System-ID 07 7997 0	
10171735 122	Precinorm U (4 x 5 mL)	System-ID 07 7997 0	
10171778 122	Precipath U (20 x 5 mL)	System-ID 07 7998 9	
10171760 122	Precipath U (4 x 5 mL)	System-ID 07 7998 9	
05117003 190	PreciControl ClinChem Multi 1 (20 x 5 mL)	System-ID 07 7469 3	
05947626 190	PreciControl ClinChem Multi 1 (4 x 5 mL)	System-ID 07 7469 3	
05117216 190	PreciControl ClinChem Multi 2 (20 x 5 mL)	System-ID 07 7470 7	
05947774 190	PreciControl ClinChem Multi 2 (4 x 5 mL)	System-ID 07 7470 7	

English

System information

Test IRON2, test ID 0-596

Intended use

In vitro test for the quantitative determination of iron in human serum and plasma on COBAS INTEGRA systems.

Summary^{1,2,3,4,5}

Ingested iron is mainly absorbed in the form of Fe^{2+} in the duodenum and upper jejunum. The trivalent form and the heme-bound Fe^{3+} -component of iron in food has to be reduced by vitamin C. About 1 mg of iron is assimilated daily. Upon reaching the mucosal cells, Fe^{2+} ions become bound to transport substances. Before passing into the plasma, these are oxidized by ceruloplasmin to Fe^{3+} and bound to transferrin in this form. The transport of Fe ions in blood plasma takes place via transferrin-iron complexes. A maximum of 2 Fe^{3+} ions per protein molecule can be transported. Serum iron is almost completely bound to transferrin.

Iron (non-heme) measurements are used in the diagnosis and treatment of diseases such as iron deficiency anemia, hemochromatosis (a disease associated with widespread deposit in the tissue of the two iron-containing pigments, hemosiderin and hemofuscin, and characterized by pigmentation of the skin), and chronic renal disease.

Iron determinations are performed for the diagnosis and monitoring of microcytic anemia (e.g. due to iron metabolism disorders and hemoglobinopathy), macrocytic anemia (e.g. due to vitamin B12 deficiency, folic acid deficiency and drug-induced metabolic disorders of unknown origin) as well as normocytic anemias such as renal anemia (erythropoietin deficiency), hemolytic anemia, hemoglobinopathy, bone marrow disease and toxic bone marrow damage.

Numerous photometric methods have been described for the determination of iron. All have the following in common:

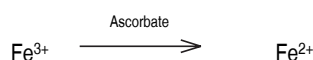
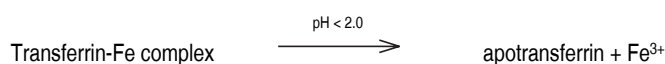
- Liberation of Fe^{3+} ions from the transferrin complex using acids or detergents.
- Reduction of Fe^{3+} ions to Fe^{2+} ions.
- Reaction of the Fe^{2+} ions to give a colored complex.

The method described here is based on the FerroZine method without deproteinization.

Test principle

FerroZine method

Under acidic conditions, iron is liberated from transferrin. Lipemic samples are clarified by the detergent. Ascorbate reduces the released Fe^{3+} ions to Fe^{2+} ions which then react with FerroZine to form a colored complex.



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

Reagents - working solutions

R1 Citric acid: 200 mmol/L; thiourea: 115 mmol/L; nonreactive surfactant

SR/R2^{a)} Sodium ascorbate: 150 mmol/L; FerroZine: 6 mmol/L; preservative

a) COBAS INTEGRA 400 plus analyzer: SR; COBAS INTEGRA 800 analyzer: R2
R1 is in position A and SR/R2 is in position B.

Precautions and warnings

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

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

1-[1,3-bis(hydroxymethyl)-2,5-dioximidazolidin-4-yl]-1,3-bis(hydroxymethyl) urea

EUH 208 May produce an allergic reaction.



Danger

H314 Causes severe skin burns and eye damage.

H412 Harmful to aquatic life with long lasting effects.

Prevention:

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P303 + P361 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
+ P310 Immediately call a POISON CENTER or doctor/physician.

P305 + P351 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
+ P338 Continue rinsing.

Product safety labeling primarily follows EU GHS guidance.

Contact phone: all countries: +49-621-7590

Reagent handling

Ready for use

Storage and stability

Shelf life at 2-8 °C See expiration date on
cobas c pack label

COBAS INTEGRA 400 plus system

On-board in use at 10-15 °C 6 weeks

COBAS INTEGRA 800 system

On-board in use at 8 °C 6 weeks

When removing the **cobas c** pack during use from the instrument, please immediately store at 2-8 °C.

Do not shake the **cobas c** pack to avoid foaming.

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 (free from hemolysis)

Plasma (free from hemolysis): Li-heparin plasma

Do not use EDTA or oxalate plasma.

Separate serum or plasma from the clot or cells within 1 hour.

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 before performing the assay.

Stability:⁶ 7 days at 15-25 °C
3 weeks at 2-8 °C
several years 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	49/55
Unit	µmol/L

Pipetting parameters

		Diluent (H ₂ O)
R1	100 µL	
Sample	8.5 µL	11.5 µL
SR	20 µL	20 µL
Total volume	160 µL	

COBAS INTEGRA 800 test definition

Measuring mode	Absorbance
Abs. calculation mode	Endpoint
Reaction mode	R1-S-R2 (late)
Reaction direction	Increase
Wavelength A/B	552/659 nm
Calc. first/last	103/113
Unit	µmol/L

Pipetting parameters

		Diluent (H ₂ O)
R1	100 µL	
Sample	8.5 µL	11.5 µL
SR	20 µL	20 µL
Total volume	160 µL	

Calibration

Calibrator	Calibrator f.a.s. Use deionized water as zero calibrator.
Calibration mode	Linear regression
Calibration replicate	Duplicate recommended
Calibration interval	Each cobas c pack and every 7 days and as required following quality control procedures.

Traceability:⁷ This method has been standardized against an internal method traceable to a primary reference material (SRM937).

Quality control

Reference range	Precinorm U or Precinorm U plus or PreciControl ClinChem Multi 1
Pathological range	Precipath U or Precipath U plus 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: $\mu\text{mol/L} \times 5.59 = \mu\text{g/dL}$

Limitations - interference

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

Icterus:⁸ 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:⁸ No significant interference up to an H index of 200 (approximate hemoglobin concentration: 124 $\mu\text{mol/L}$ or 200 mg/dL).

Lipemia (Intralipid):⁸ No significant interference up to an L index of 2000. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration.

γ -Globulin: No significant interference up to an γ -globulin concentration of 4 g/dL.

Anticoagulants: Complexing anticoagulants such as EDTA, oxalate, and citrate must not be used.

Drugs: No interference was found at therapeutic concentrations using common drug panels.^{9, 10}

In patients treated with iron supplements or metal-binding drugs, the drug-bound iron may not properly react in the test, resulting in falsely low results.

In the presence of high ferritin concentrations $> 1200 \mu\text{g/L}$ the assumption that serum iron is almost completely bound to transferrin is not valid anymore. Therefore, such iron results should not be used to calculate Total Iron Binding Capacity (TIBC) or percent transferrin saturation (% SAT).¹¹

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.¹²

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**

0.9-179 $\mu\text{mol/L}$ (5-1000 $\mu\text{g/dL}$)

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:

0.9 $\mu\text{mol/L}$ (5.00 $\mu\text{g/dL}$)

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 the lowest standard (standard 1 + 3 SD, repeatability, $n = 21$).

Expected values

Adults: 5.83-34.5 $\mu\text{mol/L}$ (33-193 $\mu\text{g/dL}$)¹³

The concentration of iron in serum/plasma is dependent on ingestion of iron and is subject to circadian variations.¹⁴

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 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 $\mu\text{mol/L}$ ($\mu\text{g/dL}$)	SD $\mu\text{mol/L}$ ($\mu\text{g/dL}$)	CV %
Precinorm U	19.6 (110)	0.2 (1)	0.9
Precipath U	30.4 (170)	0.2 (1)	0.5
Serum low	18.2 (102)	0.2 (1)	1.0

Intermediate precision	Mean $\mu\text{mol/L}$ ($\mu\text{g/dL}$)	SD $\mu\text{mol/L}$ ($\mu\text{g/dL}$)	CV %
Precinorm U	19.9 (111)	0.3 (1)	1.3
Precipath U	30.7 (172)	0.4 (2)	1.3
Serum low	11.2 (62.6)	0.3 (1.4)	2.3

Method comparison

Iron values for human serum and plasma samples obtained on a COBAS INTEGRA 700 analyzer with the COBAS INTEGRA Iron Gen.2 reagent (y) were compared with those determined using the same reagent on a Roche/Hitachi 917 analyzer (x) and with the previous IRON reagent on a COBAS INTEGRA 700 analyzer (x).

Roche/Hitachi 917 analyzer

Sample size (n) = 60

Passing/Bablok¹⁵

Linear regression

$y = 1.019x - 0.094 \mu\text{mol/L}$

$y = 1.027x - 0.256 \mu\text{mol/L}$

$r = 0.988$

$r = 1.00$

SD (md 95) = 0.714

$Sy.x = 0.320$

The sample concentrations were between 2.00 and 173 $\mu\text{mol/L}$ (11.2 and 967 $\mu\text{g/dL}$).

COBAS INTEGRA 700 analyzer

Sample size (n) = 59

Passing/Bablok¹⁵

Linear regression

$y = 0.997x + 0.134 \mu\text{mol/L}$

$y = 1.041x - 0.559 \mu\text{mol/L}$

$r = 0.980$

$r = 0.999$

SD (md 95) = 3.86

$Sy.x = 1.47$

The sample concentrations were between 1.81 and 144 $\mu\text{mol/L}$ (10.1 and 805 $\mu\text{g/dL}$).

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.

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

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