Elecsys FT3 III

cobas®

REF		Σ	SYSTEM
09005811190* 09005811214*	09005811500	300	**cobas e** 402 **cobas e** 801

* Some kits shown may not be available in all countries.

English

System information

Short name	ACN (application code number)
FT3 3	10220

Intended use

Immunoassay for the in vitro quantitative determination of free triiodothyronine in human serum and plasma.

The **e**lectro**c**hemi**l**uminescence **i**mmuno**a**ssay "ECLIA" is intended for use on **cobas e** immunoassay analyzers.

Summary

Free triiodothyronine (fT3) measurements, performed with this assay, in human serum and plasma are used as an aid in diagnosis of thyroid disorders.

The thyroid hormones triiodothyronine (T3) and thyroxine (T4) are secreted into the bloodstream by the thyroid gland and play a vital role in regulating the body's metabolic rate, influencing the cardiovascular system, growth and bone metabolism, and are important for normal development of gonadal functions and nervous system.[1]

T3 circulates in the bloodstream as an equilibrium mixture of free and serum-bound hormone. FT3 is the unbound and biologically active form, which represents only about 0.3 % of the total T3. The remaining T3 is inactive and bound to serum proteins such as thyroxine-binding globulin (TBG), thyroxine-binding prealbumin or transthyretin (TTR) and albumin.[2]

The determination of fT3 has the advantage of being independent of changes in the concentrations and binding properties of the binding proteins; additional determination of a binding parameter (T-uptake, TBG) is therefore unnecessary. FT3 is a useful tool in clinical routine diagnostics for the assessment of the thyroid status.[3] FT3 measurements support the differential diagnosis of thyroid disorders, such as to define the degree of hyperthyroidism, to distinguish overt hyperthyroidism (low serum TSH levels and high concentrations of thyroid hormones) from subclinical hyperthyroidism (low TSH levels and normal concentrations of thyroid hormones) or to identify patients with T3 thyrotoxicosis (low TSH levels, high levels T3, normal levels of T4).[2,4,5,6]

A variety of methods are available for estimating the free thyroid hormone levels.[2,3] In the Elecsys FT3 III assay a specific anti-T3 antibody labeled with a ruthenium complex[a)] is used to determine the fT3 concentration.

a) Tris(2,2'-bipyridyl)ruthenium(II)-complex ($Ru(bpy)_3^{2+}$)

Test principle

Competition principle. Total duration of assay: 18 minutes.

- 1st incubation: 9 µL of sample and a T3-specific antibody labeled with a ruthenium complex.
- 2nd incubation: After addition of biotinylated T3 and streptavidin-coated microparticles, the still-free binding sites of the labeled antibody become occupied, with formation of an antibody-hapten complex. The entire complex is 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 II 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 **cobas** link.

Reagents - working solutions

The **cobas e** pack is labeled as FT3 3.

M Streptavidin-coated microparticles, 1 bottle, 13.2 mL:
Streptavidin-coated microparticles 0.72 mg/mL; preservative.

R1 Anti-T3-Ab~$Ru(bpy)_3^{2+}$, 1 bottle, 19.7 mL:
Monoclonal anti-T3-antibody (sheep) labeled with ruthenium complex 18 ng/mL; phosphate buffer 100 mmol/L, pH 7.0; preservative.

R2 T3~biotin, 1 bottle, 19.7 mL:
Biotinylated T3 2.4 ng/mL; phosphate buffer 100 mmol/L, pH 7.0; preservative.

Precautions and warnings

For in vitro diagnostic use for health care professionals. Exercise the normal precautions required for handling all laboratory reagents.

Infectious or microbial waste:
Warning: handle waste as potentially biohazardous material. Dispose of waste according to accepted laboratory instructions and procedures.

Environmental hazards:
Apply all relevant local disposal regulations to determine the safe disposal.

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:

Warning

H317 May cause an allergic skin reaction.

Prevention:

P261 Avoid breathing mist or vapours.

P272 Contaminated work clothing should not be allowed out of the workplace.

P280 Wear protective gloves.

Response:

P333 + P313 If skin irritation or rash occurs: Get medical advice/attention.

P362 + P364 Take off contaminated clothing and wash it before reuse.

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

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

Reagent handling

The reagents in the kit have been assembled into a ready-for-use unit that cannot be separated.

All information required for correct operation is available via the **cobas** link.

Storage and stability

Store at 2-8 °C.

Do not freeze.

Store the **cobas e** pack **upright** in order to ensure complete availability of the microparticles during automatic mixing prior to use.

Elecsys FT3 III

cobas®

Stability:	
unopened at 2-8 °C	up to the stated expiration date
on the analyzers	16 weeks

Specimen collection and preparation

Only the specimens listed below were tested and found acceptable.

Undiluted serum collected using standard sampling tubes or tubes containing separating gel.

Li-heparin, K_2-EDTA and K_3-EDTA plasma.

Plasma tubes containing separating gel can be used.

Criterion: Slope 0.9-1.1 + intercept within ≤ ± 0.8 pmol/L + coefficient of correlation ≥ 0.95.

Stable for 5 days at 20-25 °C, 7 days at 2-8 °C, 30 days at -20 °C (± 5 °C). Freeze only once.

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.

Do not use heat-inactivated samples.

Do not use samples and controls stabilized with azide.

Ensure the samples and calibrators 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.

Materials required (but not provided)

- REF 09077871190, FT3 III CalSet, for 4 x 1.0 mL
- REF 11731416190, PreciControl Universal, for 4 x 3.0 mL
- General laboratory equipment
- **cobas e** analyzer

Additional materials for **cobas e** 402 and **cobas e** 801 analyzers:

- REF 06908799190, ProCell II M, 2 x 2 L system solution
- REF 04880293190, CleanCell M, 2 x 2 L measuring cell cleaning solution
- REF 07485409001, Reservoir Cup, 8 cups to supply ProCell II M and CleanCell M
- REF 06908853190, PreClean II M, 2 x 2 L wash solution
- REF 05694302001, Assay Tip/Assay Cup tray, 6 magazines x 6 magazine stacks x 105 assay tips and 105 assay cups, 3 wasteliners
- REF 07485425001, Liquid Flow Cleaning Cup, 2 adaptor cups to supply ISE Cleaning Solution/Elecsys SysClean for Liquid Flow Cleaning Detection Unit
- REF 07485433001, PreWash Liquid Flow Cleaning Cup, 1 adaptor cup to supply ISE Cleaning Solution/Elecsys SysClean for Liquid Flow Cleaning PreWash Unit
- 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.

Place the cooled (stored at 2-8 °C) **cobas e** pack on the reagent manager. Avoid foam formation. The system automatically regulates the temperature of the reagents and the opening/closing of the **cobas e** pack.

Calibration

Traceability: This method has been standardized against the FT3 assay (REF 03051986190). The FT3 assay (REF 03051986190) is traceable to the FT3 assay (REF 11731386122) which was standardized using equilibrium dialysis.[7,8]

The predefined master curve is adapted to the analyzer using the relevant CalSet.

Calibration frequency: Calibration must be performed once per reagent lot using fresh reagent (i.e. not more than 24 hours since the **cobas e** pack was registered on the analyzer).

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

Renewed calibration is recommended as follows:

- after 12 weeks when using the same reagent lot
- after 28 days when using the same **cobas e** pack on the analyzer
- as required: e.g. quality control findings outside the defined limits

Quality control

For quality control, use PreciControl Universal.

In addition, other suitable control material can be used.

Controls for the various concentration ranges should be run individually at least once every 24 hours when the test is in use, once per **cobas e** pack, 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.

If necessary, repeat the measurement of the samples concerned.

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

Calculation

The analyzer automatically calculates the analyte concentration of each sample (either in pmol/L, pg/mL or ng/dL).

Conversion factors:
pmol/L x 0.651 = pg/mL
pg/mL x 1.536 = pmol/L
pg/mL x 0.1 = ng/dL

Limitations - interference

The effect of the following endogenous substances and pharmaceutical compounds on assay performance was tested. Interferences were tested up to the listed concentrations and no impact on results was observed.

Endogenous substances

Compound	Concentration tested
Bilirubin	≤ 1128 µmol/L or ≤ 66 mg/dL
Hemoglobin	≤ 0.621 mmol/L or ≤ 1000 mg/dL
Intralipid	≤ 2000 mg/dL
Biotin	≤ 4912 nmol/L or ≤ 1200 ng/mL
Rheumatoid factors	≤ 1200 IU/mL
IgG	≤ 7 g/dL
IgA	≤ 1.6 g/dL
IgM	≤ 1 g/dL

Criterion: Recovery of ± 0.4 pmol/L of initial value ≤ 4 pmol/L and ± 10 % of initial value > 4 pmol/L.

Any influence that might affect the binding behavior of the binding proteins can alter the result of the fT3 tests (e.g. drugs, NTIs (Non-Thyroid-Illness) or patients suffering from FDH (Familial Dysalbuminemic Hyperthyroxinemia)).[9,10]

Pharmaceutical substances

In vitro tests were performed on 17 commonly used pharmaceuticals. No interference with the assay was found.

In addition, the following special thyroid drugs were tested. No interference with the assay was found.

Elecsys FT3 III

cobas®

Special thyroid drugs

Drug	Concentration tested µg/mL
Iodide	0.200
Carbimazole	30
Thiamazole	80
Propylthiouracil	60
Perchlorate	2000
Propranolol	240
Amiodarone	200
Prednisolone	100
Hydrocortisone	200
Fluocortolone	100
Octreotide	0.300

In in vitro studies the drugs furosemide, liothyronine and levothyroxine caused elevated fT3 findings at the daily therapeutic dosage level.

In rare cases, interference due to extremely high titers of antibodies to analyte-specific antibodies, streptavidin or ruthenium can occur. These effects are minimized by suitable test design.

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

Limits and ranges

Measuring range

0.6-50 pmol/L (defined by the Limit of Detection and the maximum of the master curve). Values below the Limit of Detection are reported as < 0.6 pmol/L. Values above the measuring range are reported as > 50 pmol/L.

Lower limits of measurement

Limit of Blank, Limit of Detection and Limit of Quantitation

Limit of Blank = 0.4 pmol/L

Limit of Detection = 0.6 pmol/L

Limit of Quantitation = 1.5 pmol/L

The Limit of Blank, Limit of Detection and 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 an intermediate precision CV of ≤ 20 %.

Dilution

Samples for fT3 determinations cannot be diluted, as T3 in the blood is present in free and protein-bound forms which are in equilibrium. A change in the concentration of the binding proteins alters this equilibrium.

Expected values

Euthyroid: 3.1-6.8 pmol/L (2.0-4.4 pg/mL)

These values correspond to the 2.5th and 97.5th percentiles of results obtained from a total of 5366 healthy test subjects examined.

For detailed information about reference intervals in children, adolescents and pregnant women, refer to the brochure "Reference Intervals for Children and Adults", English: REF 04640292.

This booklet also contains results of a detailed study about influencing factors on thyroid parameters in a well characterized reference group of adults. Different inclusion and exclusion criteria were applied (e.g. sonographic results (thyroid volume and density) as well as criteria according to the guidelines of the National Academy of Clinical Biochemistry - NACB).

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 Elecsys reagents, samples and controls in a protocol (EP05-A3) of the CLSI (Clinical and Laboratory Standards Institute): 2 runs per day in duplicate each for 21 days (n = 84). The following results were obtained:

cobas e 402 and **cobas e** 801 analyzers					
		Repeatability		**Intermediate precision**	
Sample	Mean pmol/L	SD pmol/L	CV %	SD pmol/L	CV %
Human serum 1	1.62	0.0854	5.3	0.0862	5.3
Human serum 2	3.59	0.0956	2.7	0.102	2.8
Human serum 3	7.22	0.140	1.9	0.140	1.9
Human serum 4	25.6	0.321	1.3	0.335	1.3
Human serum 5	48.0	0.450	0.9	0.492	1.0
PreciControl U[b)]1	5.43	0.102	1.9	0.110	2.0
PreciControl U2	22.9	0.339	1.5	0.351	1.5

b) U = Universal

Method comparison

a) A comparison of the Elecsys FT3 III assay, REF 09005811190 (**cobas e** 801 analyzer; y) with the Elecsys FT3 III assay, REF 07027362190 (**cobas e** 801 analyzer; x) gave the following correlations (pmol/L):

Number of samples measured: 175

Passing/Bablok[11]	Linear regression
y = 1.04x - 0.061	y = 1.02x + 0.146
τ = 0.981	r = 0.998

The sample concentrations were between 1.48 and 49.5 pmol/L.

b) A comparison of the Elecsys FT3 III assay, REF 09005811190 (**cobas e** 402 analyzer; y) with the Elecsys FT3 III assay, REF 09005811190 (**cobas e** 801 analyzer; x) gave the following correlations (pmol/L):

Number of samples measured: 172

Passing/Bablok[11]	Linear regression
y = 0.986x - 0.195	y = 0.994x - 0.418
τ = 0.964	r = 0.997

The sample concentrations were between 1.31 and 49.9 pmol/L.

Analytical specificity

The following cross-reactivities were found, tested with fT3 concentrations of approximately 3.30 pmol/L (2.15 pg/mL) and 13.1 pmol/L (8.53 pg/mL):

Cross-reactant	Concentration tested pg/mL	Cross-reactivity %
L-T4	300000	0.008
D-T4	625000	0.005
rT3	10000000	0.000
3-iodo-L-tyrosine	100000000	0.000

Elecsys FT3 III

cobas®

Cross-reactant	Concentration tested pg/mL	Cross-reactivity %
3,5-diiodo-L-tyrosine	100000000	0.000
3,3',5-triiodothyroacetic acid	6250	0.282
3,3',5,5'-tetraiodothyroacetic acid	1000000	0.000

References

1 Kronenberg HM, Melmed S, Polonsky KS, et al. Williams Textbook of Endocrinology. Saunders Elsevier, Philadelphia, 12th edition, 2011, chapter 10, p. 301-311.

2 Ellervik C, Halsall DJ, Nygaard B. Thyroid Disorders. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, editors. Tietz Textbook of Laboratory Medicine, Saunders Elsevier, Philadelphia, 7th edition, 2023, chapter 57, p. 806-845.e13.

3 Brent GA. Thyroid Function Testing. Springer, Berlin, 1st edition, 2010, chapter 5, p. 86-88.

4 Kahaly GJ, Bartalena L, Hegedüs L, et al. 2018 European Thyroid Association Guideline for the Management of Graves' Hyperthyroidism. Eur Thyroid J 2018 Aug;7(4):167-186. doi: 10.1159/000490384.

5 Bartalena L, Bogazzi F, Chiovato L, et al. 2018 European Thyroid Association (ETA) Guidelines for the Management of Amiodarone-Associated Thyroid Dysfunction. Eur Thyroid J 2018 Mar;7(2):55-66. doi: 10.1159/000486957.

6 Ross DS, Burch HB, Cooper DS, et al. 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. Thyroid 2016 Oct;26(10):1343-1421. doi: 10.1089/thy.2016.0229. Erratum in: Thyroid 2017 Nov;27(11):1462.

7 Ekins RP. Measurement of free hormones in blood. Endocr Rev 1990;11(1):5-46.

8 Ekins RP, Ellis SM. The radioimmunoassay of free thyroid hormones in serum. In Robbins J, Braverman LE (eds). Thyroid research, Proceedings of the Seventh International Thyroid Conference, Boston. Amsterdam, Excerpta Medica 1975:597.

9 Wada N, Chiba H, Shimizu C, et al. A novel missense mutation in codon 218 of the albumin gene in a distinct phenotype of familial dysalbuminemic hyperthyroxinemia in a Japanese kindred. J Clin Endocrinol Metab 1997;82(10):3246-3250.

10 Arevalo G. Prevalence of familial dysalbuminemic hyperthyroxinemia in serum samples received for thyroid testing. Clin Chem 1991;37(8):1430-1431.

11 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.

For further information, please refer to the appropriate operator's manual for the analyzer concerned, the respective application sheets 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.

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.

Symbols

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

CONTENT	Contents of kit
SYSTEM	Analyzers/Instruments on which reagents can be used
REAGENT	Reagent
CALIBRATOR	Calibrator
→	Volume for reconstitution
GTIN	Global Trade Item Number

CE 0123

Roche Diagnostics GmbH, Sandhofer Strasse 116, D-68305 Mannheim
www.roche.com
+800 5505 6606

Roche