

# BILD2

## Bilirubin Direct Gen.2 (Doumas standardization)

### Order information

REF	CONTENT	Analyzer(s) on which <b>cobas c</b> pack(s) can be used
05168384 119	Bilirubin Direct Gen.2 500 tests	System-ID 03 7479 0 Roche/Hitachi <b>cobas c</b> 701/702
10759350 360	Calibrator f.a.s. (12 x 3 mL)	Code 401
10171743 160	Precinorm U (20 x 5 mL)	Code 300
10171735 160	Precinorm U (4 x 5 mL)	Code 300
10171778 122	Precipath U (20 x 5 mL)	Code 301
10171760 122	Precipath U (4 x 5 mL)	Code 301
12149435 122	Precinorm U plus (10 x 3 mL)	Code 300
12149443 122	Precipath U plus (10 x 3 mL)	Code 301
05117003 190	PreciControl ClinChem Multi 1 (20 x 5 mL)	Code 391
05947626 190	PreciControl ClinChem Multi 1 (4 x 5 mL)	Code 391
05117216 190	PreciControl ClinChem Multi 2 (20 x 5 mL)	Code 392
05947774 190	PreciControl ClinChem Multi 2 (4 x 5 mL)	Code 392
10158046 122	Precibil (4 x 2 mL)	Code 306

### English

#### System information

DBIL2: ACN 8735

#### Intended use

In vitro test for the quantitative determination of direct bilirubin in serum and plasma on Roche/Hitachi **cobas c** systems.

#### Summary<sup>1</sup>

Bilirubin is formed in the reticuloendothelial system during the degradation of aged erythrocytes. The heme portion from hemoglobin and from other heme-containing proteins is removed, metabolized to bilirubin, and transported as a complex with serum albumin to the liver. In the liver, bilirubin is conjugated with glucuronic acid for solubilization and subsequent transport through the bile duct and elimination via the digestive tract. Diseases or conditions which, through hemolytic processes, produce bilirubin faster than the liver can metabolize it, cause the levels of unconjugated (indirect) bilirubin to increase in the circulation. Liver immaturity and several other diseases in which the bilirubin conjugation mechanism is impaired cause similar elevations of circulating unconjugated bilirubin. Bile duct obstruction or damage to hepatocellular structure causes increases in the levels of both conjugated (direct) and unconjugated (indirect) bilirubin in the circulation.

#### Test principle

Diazo method.<sup>2</sup>

Conjugated bilirubin and  $\delta$ -bilirubin (direct bilirubin) react directly with 3,5 Dichlorophenyl diazonium salt in acid buffer to form the red-colored azobilirubin.



The color intensity of the red azo dye formed is directly proportional to the direct (conjugated) bilirubin concentration and can be determined photometrically.

Remark: Under the influence of blue light, e.g. during phototherapy of newborn children, unconjugated bilirubin is partly transformed into a water-soluble isomer called photobilirubin, a substrate for direct bilirubin tests. This fraction is detected by BILD2 and may lead to above-normal results in healthy children.

#### Reagents - working solutions

**R1** Phosphoric acid: 85 mmol/L; HEDTA: 4.0 mmol/L; NaCl 50 mmol/L; detergent; pH 1.9

**R2** 3,5 Dichlorophenyl diazonium: 1.5 mmol/L; pH 1.3

R1 is in position B and R2 is in position C.

#### Precautions and warnings

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

Disposal of all waste material should be in accordance with local guidelines. 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:



#### Danger

H314 Causes severe skin burns and eye damage.

#### Prevention:

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

#### Response:

P301 + P330 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. + P331

P303 + P361 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. + P353

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

P305 + P351 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. + P338 + P310

#### Disposal:

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

Product safety labeling primarily follows EU GHS guidance.

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

#### Reagent handling

Ready for use

#### Storage and stability

BILD2

Shelf life at 2-8 °C:

See expiration date on **cobas c** pack label

## Bilirubin Direct Gen.2 (Doumas standardization)

On-board in use and refrigerated on the analyzer: 6 weeks  
 On-board on the Reagent Manager: 24 hours

### 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: Collect serum using standard sample tubes.

Plasma: Li-heparin, K<sub>2</sub>-, K<sub>3</sub>-EDTA plasma.

Protect specimens from exposure to light.

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:<sup>a),3,4</sup>  
 2 days at 20-25 °C  
 7 days at 4-8 °C  
 6 months at -20 °C

a) If care is taken to prevent exposure to light

### Materials provided

See "Reagents – working solutions" section for reagents.

### Materials required (but not provided)

- See "Order information" section
- General laboratory equipment

### 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.

The performance of applications not validated by Roche is not warranted and must be defined by the user.

### Application for serum and plasma

#### cobas c 701/702 test definition

Assay type	2-Point End		
Reaction time / Assay points	10 / 7-9		
Wavelength (sub/main)	800/546 nm		
Reaction direction	Increase		
Units	µmol/L (mg/dL, mg/L)		
Reagent pipetting	Diluent (H <sub>2</sub> O)		
R1	120 µL	–	
R2	24 µL	–	

Sample volumes	Sample	Sample dilution	
		Sample	Diluent (H <sub>2</sub> O)
Normal	6.7 µL	–	–
Decreased	3.4 µL	–	–
Increased	6.7 µL	–	–

### Calibration

Calibrator S1: H<sub>2</sub>O  
 S2: Calibrator f.a.s.  
 Calibration mode Linear regression

Calibration frequency 2-point calibration  
 - after reagent lot change  
 - as required following quality control procedures

Traceability: This method has been standardized against the manual test performance using the Doumas method.<sup>5</sup>

### Quality control

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

Roche/Hitachi **cobas c** systems automatically calculate the analyte concentration of each sample.

Conversion factors: µmol/L x 0.0585 = mg/dL  
 mg/dL x 10 = mg/L  
 mg/dL x 17.1 = µmol/L

### Limitations - interference

Criterion: Recovery within ± 10 % of initial values at a direct bilirubin concentration of 34.2 µmol/L (2.0 mg/dL).

Hemolysis:<sup>6</sup> No significant interference up to an H index of 25 (approximate hemoglobin concentration: 15.5 µmol/L or 25 mg/dL).

Lipemia (Intralipid):<sup>6</sup> No significant interference up to an L index of 750. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration.

Drugs: No interference was found at therapeutic concentrations using common drug panels.<sup>7,8</sup>

Exception: Phenylbutazone causes artificially low bilirubin results.

Samples containing indocyanine green must not be measured.

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.<sup>9</sup>

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

In certain cases specimens may give a direct bilirubin result slightly greater than the total bilirubin result. This is observed in patient samples when nearly all the reacting bilirubin is in the direct form. In such cases the result for the total bilirubin should be reported for both direct bilirubin and total bilirubin values.

### ACTION REQUIRED

**Special Wash Programming:** The use of special wash steps is mandatory when certain test combinations are run together on Roche/Hitachi **cobas c** systems. All special wash programming necessary for avoiding carry-over is available via the **cobas** link, manual input is not required. The latest version of the carry-over evasion list can also be found with the NaOHD/SMS/SmpCln1+2/SCCS Method Sheet and for further instructions refer to the operator's manual.

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

### Limits and ranges

#### Measuring range

1.2-236 µmol/L (0.07-13.8 mg/dL)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:2 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 2.

### Lower limits of measurement

Limit of Blank, Limit of Detection and Limit of Quantitation

Limit of Blank = 0.8 µmol/L (0.05 mg/dL)

## Bilirubin Direct Gen.2 (Doumas standardization)

Limit of Detection = 1.2 µmol/L (0.07 mg/dL)

Limit of Quantitation = 1.2 µmol/L (0.07 mg/dL)

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 95<sup>th</sup> percentile value from  $n \geq 60$  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 precision of 20 % CV. It has been determined using low concentration direct bilirubin samples.

### Expected values

Direct bilirubin  $\leq 3.4$  µmol/L ( $\leq 0.20$  mg/dL)<sup>1</sup>

An upper limit of 10 µmol/L (0.59 mg/dL) direct bilirubin for neonates has been cited in the literature, although this has not been confirmed by internal data.<sup>10</sup>

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 accordance with the CLSI (Clinical and Laboratory Standards Institute) EP5 requirements with repeatability ( $n = 21$ ) and intermediate precision (2 aliquots per run, 2 runs per day, 21 days). The following results were obtained:

Repeatability	Mean	SD	CV
	µmol/L (mg/dL)	µmol/L (mg/dL)	%
Precinorm U	12.7 (0.74)	0.1 (0.01)	0.9
Precipath U	34.2 (2.0)	0.1 (0.01)	0.3
Human serum 1	4.0 (0.23)	0.1 (0.00)	1.9
Human serum 2	152 (8.9)	0.3 (0.02)	0.2
Human serum 3	231 (13.5)	0.6 (0.04)	0.3

Intermediate precision	Mean	SD	CV
	µmol/L (mg/dL)	µmol/L (mg/dL)	%
Precinorm U	12.0 (0.70)	0.3 (0.02)	2.6
Precipath U	31.4 (1.8)	0.4 (0.02)	1.4
Human serum 1	1.5 (0.09)	0.2 (0.01)	10.0
Human serum 2	145 (8.5)	2.1 (0.12)	1.5
Human serum 3	211 (12.3)	3.2 (0.19)	1.5

Results for intermediate precision were obtained on the master system **cobas c 501** analyzer.

### Method comparison

Bilirubin values for human serum and plasma samples using with the Roche BILD2 reagent (ACN 735) on a Roche/Hitachi **cobas c 501** analyzer (x) were compared to those determined with the same reagent on a Roche/Hitachi **cobas c 701** analyzer (y).

Sample size (n) = 67

Passing/Bablok<sup>11</sup> Linear regression  
 $y = 1.018x + 0.45$  µmol/L  $y = 1.018x + 0.45$  µmol/L

$\tau = 0.970$

$r = 1.000$

The sample concentrations were between 3.0 and 208 µmol/L (0.18 and 12.2 mg/dL).

### References

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- 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.

### 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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### Note

Please note that the catalogue number appearing on the package insert retains only the first 8 digits of the licensed 11-digit Catalogue Number: 05168384190 for the Bilirubin Direct Gen 2. The last 3 digits -190 have been replaced by -119 for logistic purposes.