

EN

SO₂ Total

REF 984345

● 3 x 16 ml Reagent
● 6 x 16 ml Reagent blank

INTENDED USE

Reagent for photometric determination of total Sulfur Dioxide in homogenous liquid samples using automated Thermo Scientific™ Arena™ or Gallery™ analyzer.

METHOD

The method is based on the reaction between sulfur dioxide and 5,5'-dithiobis nitrobenzoic acid (DTNB) in basic conditions. Method is performed at 37 °C, using 405 nm filter and for side wavelength 700 or 750 nm filter.

REAGENT INFORMATION

Ready-to-use reagent		Barcode id
Reagent	3 x 16 ml	A11
Reagent blank	6 x 16 ml	A12

Note: High range application (typically for wines) uses only three Reagent Blank bottles, and the rest are needed for Low range application (typically for beers).

Note: Labels of reagent vials have two barcodes.

For Arena analyzers, turn the short barcode to the barcode reader.

For Gallery analyzers, turn the long barcode to the barcode reader.

Concentrations

Reagent	Buffer	pH ≥ 7.0
	DTNB	< 0.2 mM
Reagent blank	Buffer	pH ≥ 7.0

Precautions

Take the necessary precautions for the use of laboratory reagents.

Preparation

The reagents are ready-to-use.

Note: Check that there are no bubbles on the surface of the reagent when you insert vials into the analyzer.

Storage and Stability

Reagents in unopened vials are stable at 2...8 °C until the expiry date printed on the label. Do not freeze the reagents.

Refer to the Application Notes of your analyzer for the on board stability of reagents.

SAMPLES

Sample Type

Food and other sample material e.g wine and beer.

Sample concentration and Arena/Gallery application

All method related details are in the separate application note.

Sample preparation

If the sample has substances interfering the measurement, please handle it according to the following suitable preparation procedure:

Note: Polyvinylpyrrolidone (PVP) cannot be used with this reagent because of the inhibition of color forming.

- Use clear, colorless and practically neutral liquid samples directly.
- Filter or centrifuge turbid solutions.

TEST PROCEDURE

See the separate Arena or Gallery System Application note for an automated procedure. Due to the differences in sample matrixes, all performance should be evaluated by the user.

Manual test procedure

- Wavelength: 405 nm (400-425 nm)
- Pathlength: 1 cm
- Reading: against air or distilled water
- Temperature: 37°C
- Method: end-point
- Reaction: 5 minutes
- Linearity: up to 200 mg/l of SO₂
- Sample/reagents: 1/40

Let reagents reach the working temperature before using.

	S	SB	ST	RB
Reagent	1000 µl	-	1000 µl	1000 µl
Reagent Blank	-	1000 µl	-	-
Distilled water	-	-	-	25 µl
Standard	-	-	25 µl	-
Sample	25 µl	25 µl	-	-

Mix and incubate for about 5 minutes at 37°C. Measure the absorbance.

Mix and wait 5 min at 37°C.

Read the absorbances of the sample (S), sample blank (SB), standard (ST) and reagent blank (RB).

The color is stable for 30 minutes.

Use the following general formula to calculate the concentration:

SO₂ Total (mg/l) =

$$[(A(S) - A(SB)) \times \text{Standard value (mg/l)}] / [A(ST) - A(RB)]$$

Materials required but not provided

Distilled water (aseptic and free of heavy metals) and general laboratory equipment.

Calibration

Diluent A:

Dissolve 2.5 g of citric acid and 400 µl of acetaldehyde to 500 ml of distilled water.

Weigh precisely 0.0303 g of sodium metabisulfite (Na₂S₂O₅ MW = 190.11 g/mol, purity ≥ 98 %) into a 100 ml volumetric flask and fill up to mark with diluent A. The solution has a sulfur dioxide concentration of 200 mg/l. The standard must be used fresh.

Quality Control

Use quality control samples at least once a day and after each calibration and every time a new bottle of reagent is used. It is recommended to use two level of controls. The control intervals and limits must be adapted to the individual laboratory requirements. The results of the quality control sample(s) should fall within the limits pre-set by the laboratory.

CALCULATION OF RESULTS

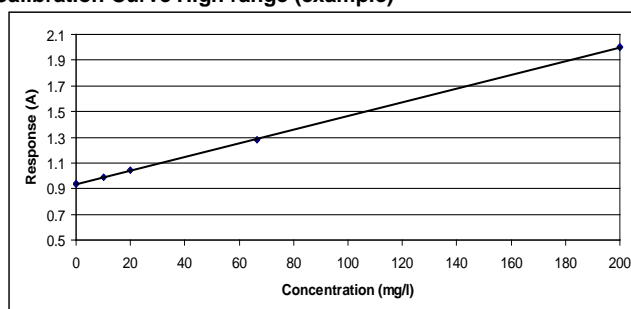
The results are calculated automatically by the analyzer using a calibration curve.

Conversion factors:

$$\text{mmol/l} \times 64.054 = \text{mg/l}$$

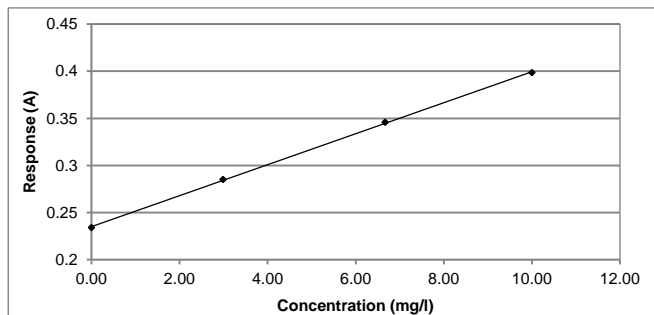
$$\text{mg/l} \times 0.0156 = \text{mmol/l}$$

Calibration Curve High range (example)



Calibrator	Response (A)	Conc. (mg/l)
Water	0.943	0
SO ₂ TOT	0.990	10
SO ₂ TOT	1.046	20
SO ₂ TOT	1.281	67
SO ₂ TOT	1.998	200

Note that the calibration curve is lot dependent. This calibration curve is performed by Gallery analyzer.

Calibration Curve Low range (example)

Calibrator	Response (A)	Conc. (mg/l)
Water	0.234	0.00
SO2TOT	0.285	2.99
SO2TOT	0.346	6.67
SO2TOT	0.398	10.00

Note that the calibration curve is lot dependent. This calibration curve is performed by Gallery analyzer.

LIMITATIONS OF THE PROCEDURE**Interference**

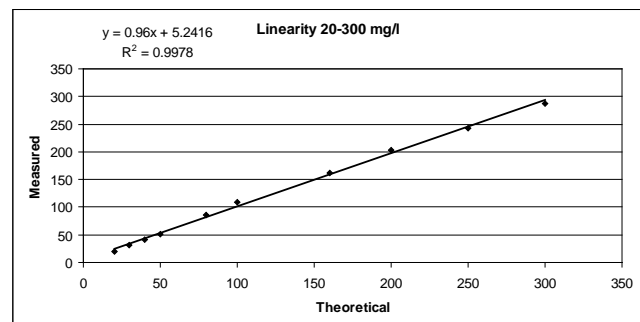
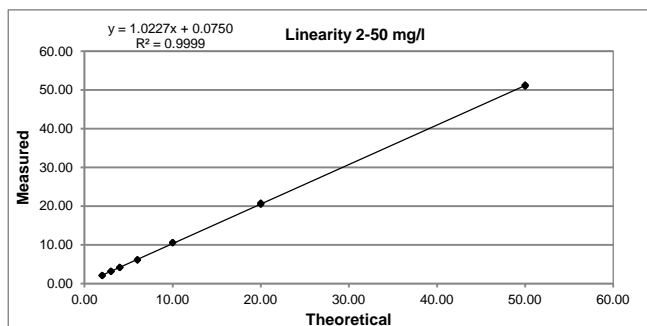
The determination is specific for total sulfur dioxide. No interference was observed.

MEASURING RANGE

The test has been developed to determine total sulfur dioxide concentrations within a measuring range from 2 to 50 mg/l (low range) and 20 to 300 mg/l (high range).

PERFORMANCE CHARACTERISTICS

The results obtained in individual laboratories may differ from the performance data given. Linearity testing has been performed with water based solutions. Different matrixes may change the linearity limits of the test.

**Determination limit (=Test limit low)**

The determination limit is the lowest concentration that can be measured quantitatively. The determination limit for this method is 5 mg/l.

**Precision
Gallery analyzer**

	Beer sample 9.5 mg/l n=30		Wine sample 48.3 mg/l n=50		Wine sample 66.0 mg/l n=50	
	SD	CV %	SD	CV %	SD	CV %
Within run	0.671	7.0	1.181	2.4	1.253	1.9
Between run	0.222	2.3	1.166	2.4	2.370	3.6
Total	0.707	7.4	1.659	3.4	2.681	4.1

A precision study was performed using the Gallery analyzer.

Method Comparison

Table below shows the correlation of beer samples measured according to p-Rosaniline method (EBC Method 9.25.3) and the Gallery system SO2 Total method. Cider samples were analyzed with High-application due to higher concentrations.

Sample	SO2 Total (mg/l)	Ref. value (mg/l)	Bias (mg/l)
Beer 1	9.1	10.0	-0.9
Beer 2	4.8	5.0	-0.2
Beer 3	7.9	8.0	-0.1
Beer 4	3.6	2.0	1.6
Beer 5	2.4	2.0	0.4
Beer 6	2.8	2.3	0.5
Beer 7	2.9	1.9	1.0
Beer 8	5.3	4.4	0.9
Beer 9	3.5	2.7	0.8
Beer 10	5.1	3.8	1.3
Beer 11	1.2	0.8	0.4
Beer 12	5.4	5.7	-0.3
Cider 1	54.7	57	-2.3
Cider 2	76.3	80	-3.7

OTHER REMARKS

Note that the application performance has been verified with pure chemicals dissolved in deionized water. The results obtained in individual laboratories may differ from the given performance data due to e.g. sample matrix, concentrations or analysis environment. Each laboratory is responsible to verify the method to prove the analysis performance.

WASTE MANAGEMENT

Please refer to local legal requirements. It is recommended to empty the analyzer cuvette waste bin and waste water daily. Emptying should be done immediately after the analysis when using hazardous reagents/solutions.

Note: If using reagents/solutions that react with each other, cuvette waste bin and waste water should be emptied and washed between use of these reagents.

ADDITIONAL MATERIAL

Certificate of analysis, SDS, and Applications for Gallery and Arena automated analyzers are available upon request from the local sales representative. Information in the Application note can change without prior notice

MANUFACTURER

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CONTACT INFORMATION

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2013-09-09

Changes from previous version

Reagent information changed.