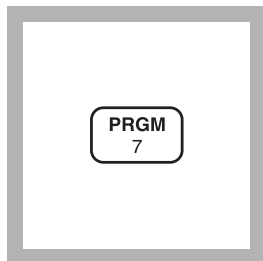


SILICA, Low Range (0 to 1.60 mg/L)

For water and seawater

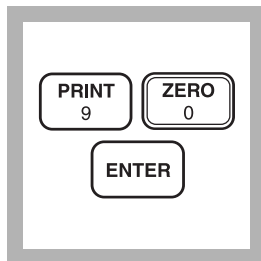
Heteropoly Blue Method*

1. Enter the stored program number for low range silica (SiO_2).

Press: **PRGM**

The display will show:

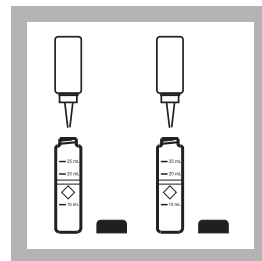
PRGM ?



2. Press: **90 ENTER**
The display will show **mg/L, SiO_2** and the **ZERO** icon.

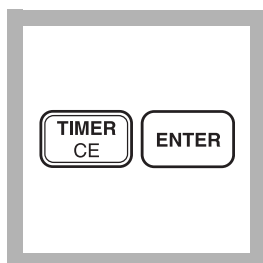


3. Fill two sample cells to the 10-mL line with sample.



4. Add 15 drops of Molybdate 3 Reagent to each sample cell. Swirl to mix.

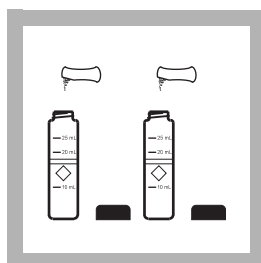
Note: For greatest accuracy, hold dropping bottle vertical.



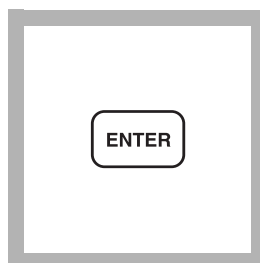
5. Press:
TIMER ENTER

A 4-minute reaction period will begin.

Note: Reaction time given is for samples at 20 °C (68 °F). If the sample temperature is 10 °C (50 °F), wait 8 minutes. If the sample temperature is 30 °C (86 °F), wait 2 minutes.



6. After the timer beeps, add the contents of one Citric Acid Reagent Powder Pillow to each sample cell. Swirl to mix.



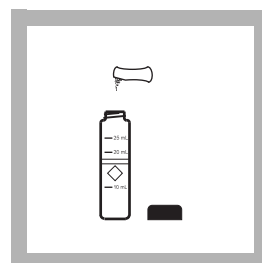
7. The display will show:

1:00 TIMER 2

Press: **ENTER**

A 1-minute reaction period will begin. Phosphate interference is eliminated during this period.

Note: The time given is for samples at 20 °C (68 °F). If the sample temperature is 10 °C (50 °F), wait two minutes. If the sample is 30 °C (86 °F), wait 30 seconds.



8. After the timer beeps, add the contents of one Amino Acid F Reagent Powder Pillow to one of the sample cells (the prepared sample). Invert to mix.

Note: The sample cell without the Amino Acid F Reagent is the blank.

* Adapted from *Standard Methods for the Examination of Water and Wastewater*.

SILICA, Low Range, continued



ENTER

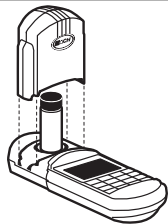
9. The display will show:

2:00 TIMER 3

Press: **ENTER**

A 2-minute reaction period will begin.

***Note:** A blue color will develop if silica is present.*



10. After the timer beeps, place the blank (solution without Amino Acid F Reagent) into the cell holder. Tightly cover the sample cell with the instrument cap.

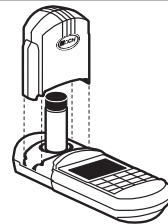


ZERO
0

11. Press: **ZERO**

The cursor will move to the right, then the display will show:

0.00 mg/L SiO₂



12. Place the sample into the cell holder. Tightly cover the sample cell with the instrument cap.



READ
• +
-

13. Press: **READ**

The cursor will move to the right, then the result in mg/L SiO₂ will be displayed.

***Note:** Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

Sampling and Storage

Collect samples in clean plastic bottles. Analyze samples as soon as possible after collection. If prompt analysis is not possible, store samples for up to 28 days by cooling to 4 °C (39 °F) or below. Warm samples to room temperature before analysis.

Accuracy Check

Standard Additions Method

- a) Open a Silica Standard Solution Bottle, 25 mg/L SiO₂.
- b) Using the TenSette Pipet, add 0.1, 0.2, and 0.3 mL of standard to three 10-mL samples. Mix thoroughly.
- c) Analyze each sample as described above. The silica concentration should increase 0.25 mg/L for each 0.1 mL of standard added.
- d) If these increases do not occur, see *Standard Additions* in *Section 1* for more information.

Standard Adjust

To adjust the calibration curve using the reading obtained with the

1.00-mg/L Standard Solution (see *Optional Reagents*), press the **SETUP** key and scroll (using the arrow keys) to the STD setup option. Press **ENTER** to activate the standard adjust option. Then enter **1.00** to edit the standard concentration to match that of the standard used. Press **ENTER** to complete the adjustment. See *Section 1, Standard Curve Adjustment* for more information.

Method Performance

Precision

In a single laboratory, using standard solutions of 1.00 mg/L silica and two representative lots of reagent and a instrument, a single operator obtained a standard deviation of ± 0.025 mg/L silica.

Estimated Detection Limit (EDL)

The estimated detection limit for program 90 is 0.020 mg/L SiO₂. For more information on the estimated detection limit, see *Section 1*. If testing for very low levels of silica, use the ultra-low range silica method on the Hach DR/2010 or DR/4000 Spectrophotometers.

SILICA, Low Range, continued

Interferences

Interfering Substance	Interference Levels and Treatments
Color	Eliminated by zeroing the instrument with the original sample.
Phosphate	Phosphate does not interfere at levels less than 50 mg/L PO_4 . At 60 mg/L PO_4 , an interference of -2% occurs. At 75 mg/L PO_4 the interference is -11%.
Iron	Large amounts of iron interfere.
Slow reacting forms of silica	Occasionally a sample contains silica which reacts very slowly with molybdate. The nature of these "molybdate-unreactive" forms is not known. A pretreatment with sodium bicarbonate, then sulfuric acid will make these forms reactive to molybdate. The pretreatment is given in <i>Standard Methods for the Examination of Water and Wastewater</i> under Silica-Digestion with Sodium Bicarbonate. A longer reaction time with the sample and the molybdate and acid reagents (before adding citric acid) may help in lieu of the bicarbonate pretreatment.
Sulfides	Interfere at all levels
Turbidity	Eliminated by zeroing the instrument with the original sample.

Reagent Preparation

To prepare Amino Acid F Reagent Solution, dissolve 11.4 grams of Amino Acid F Reagent Powder in 100 mL of 1.0 N Sodium Hydroxide Solution. The solution is stable for at least one month if stored in a plastic bottle.

Summary of Method

Silica and phosphate in the sample react with molybdate ion under acidic conditions to form yellow silicomolybdic acid complexes and phosphomolybdic acid complexes. Acid reduces the yellow silicomolybdic acid to an intense blue color, which is proportional to the silica concentration.

SILICA, Low Range, continued

REQUIRED REAGENTS

	Cat. No.
Low Range Silica Reagent Set, 10 mL sample (100 tests)	24593-00
Includes: (1) 22540-69, (1) 21062-69 (2) 1995-26	

Description	Quantity Required		Units	Cat. No.
	Per Test			
Amino Acid F Reagent Powder Pillows	1 pillow.....	100/pkg	22540-69	
Citric Acid Powder Pillows	2 pillows	100/pkg	21062-69	
Molybdate 3 Reagent	28 drops	50 mL SCDB	1995-26	

REQUIRED APPARATUS

Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06
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OPTIONAL REAGENTS

Silica Standard Solution, 1.00 mg/L SiO ₂	500 mL	1106-49
Silica Standard Solution, 25 mg/L SiO ₂	236 mL	21225-31
Sodium Bicarbonate, ACS	454 g	776-01
Sodium Hydroxide Standard Solution, 1.000 N.....	900 mL	1045-53
Sulfuric Acid Standard Solution, 1.0 N	1000 mL	1270-53

OPTIONAL APPARATUS

Bottle, 118 mL, polyethylene, oblong.....	6/pkg	23184-06
Dropper, 0.5- & 1.0-mL marks.....	6/pkg	23185-06
Pipet, serological, 2 mL, poly	each	2106-36
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 Pipet	1000/pkg	21856-28
<i>Standard Methods for the Examination of Water and Wastewater</i>	each	22708-00
Thermometer, - 20 to 110 °C, Non-Mercury	each	26357-02

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.