



# HYDROGEN SULFIDE CONCENTRATION

In many areas hydrogen sulfide is found by itself or in association with hydrocarbons, especially gas. Hydrogen sulfide gas (H<sub>2</sub>S) is not only very lethal but also extremely corrosive. Therefore, when H<sub>2</sub>S is encountered in the mud it must be reduced to acceptable levels so that it does not pose a health hazard or create drill string failure.

## METHOD ONE, HACH KIT

### TEST PROCEDURE

Hach Model HS-7 Hydrogen sulfide kit

1. Fill the sample vial to the 25 mL mark with recently filter pressed filtrate from the mud to be tested. (If 25 mL are not available use a known amount of filtrate and dilute to 25 mL using distilled water; five or more milliliters of filtrate are recommended).

NOTE: For most accurate results, the test should be performed using a recently obtained mud sample. If the sample has been aerated or allowed to stand for some time, much if not all, of the hydrogen sulfide gas will be lost by aeration or oxidation.

2. Place a circle of hydrogen sulfide test paper (lead acetate paper) inside the cap of the sample vial.
3. Add an alka seltzer tablet to the sample and IMMEDIATELY snap the cap containing the test paper onto the vial.
4. After allowing ample time for the tablet to dissolve, remove the cap and test paper.
5. Compare the color of the test paper with the color chart and record the amount of H<sub>2</sub>S gas present.

### CALCULATIONS

H<sub>2</sub>S present = 25 x H<sub>2</sub>S recorded / mL filtrate used

## METHOD TWO, GARRETT GAS TRAIN

### EQUIPMENT & CHEMICALS

Equipment	Product Code
1. Garrett Gas with H <sub>2</sub> S Dräger tubes & floating ball flow meter	EX1360
2. Hydrogen sulfide (Hach), paper disks as alternative to Dräger tubes (for more qualitative test)	EX1080
3. Sulfuric acid (5N)	EY1210
4. Dropper bottle with octanol defoamer or equivalent	EY1050
5. Hypodermic syringe (10 mL with 21 gauge needle)	EN3334

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## TEST PROCEDURE

1. Be sure the gas train is clean, dry and on a level surface. **NOTE:** Moisture in the flow metre can cause the ball to float erratically.
2. With the regulator T- handle backed off, install and puncture a CO<sub>2</sub> gas cartridge.
3. Add 20 mL distilled water to chamber No. 1. (The chambers are numbered beginning at the regulator).
4. Add 5 drops of octanol defoamer to chamber No. 1.
5. Measure the sample into chamber No. 1 according to the following table:

Dräger Tube Identification			
Sulfide Range mg/L	Sample Volume cm <sup>3</sup>	Dräger Tube Identification	Tube Factor
1.2 - 24	10.0	H <sub>2</sub> S 100/a	0.12*
2.4 - 48	5.0		
4.8 - 96	2.5		
30 - 1050	10.0	H <sub>2</sub> S 0.2% o/a	1500**
60 - 2100	5.0		
120 - 4200	2.5		

\*Tube factor applies to new tubes, H<sub>2</sub>S 100/a with scale 100 to 2000. Old tubes use the tube factor 12.

\*\*Tube factor applies to new tubes, H<sub>2</sub>S 0.2% o/a with scale 0.2 to 7.0. Old tube factor 600 times ratio: "batch factor"/0.40.

6. Select the proper Dräger tube in accordance with the table above. Break the tips from each end of the tube and apply Lubriseal to each end.
7. Install the tube with the arrow pointing downward into the bored receptacle. Likewise, install the flow meter with the word "TOP" upward. (Be sure O-rings seal around the body of each tube).
8. Install the top on the gas train and evenly hand tighten to seal all O-rings.
9. Attach the flexible tubing from the regulator onto the dispersion tube of chamber No. 1 and from the outlet tube of chamber No. 3 to the Dräger tube.
10. Adjust the dispersion tube of chamber No. 1 to within 5 mm from the bottom.
11. Flow CO<sub>2</sub> gas gently through train form 10 seconds to purge system of air. Stop gas flow.
12. Slowly inject 10 mL sulfuric acid solution into chamber No. 1 through the septum using the syringe and needle.
13. Immediately restart CO<sub>2</sub> flow. Using the regulator, adjust the flow so that the ball remains between the two lines on the flow metre tube. **NOTE:** One CO<sub>2</sub> cartridge should provide 15-20 minutes flow at this rate.
14. Observe a color change on the Dräger tube if H<sub>2</sub>S is present. In the units marked on the tube, note and record the maximum darkened length before the front starts to smear. Continue flow for 15 minutes although the front may attain a diffuse, feathery colouration. On the high range tube an orange color may appear ahead of the black front if sulfites are present. The orange region should be ignored when recording the darkened length.

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## CALCULATION

mg/L sulfides = tube factor x tube stain length / mL sample volume

## CARE AND CLEANING

To clean the gas train, remove the flexible tubing and gas train top. Take the Dräger tube and flow meter out of the receptacles and plug the holes with stoppers to keep them dry. Wash out the chambers using a brush with warm water and mild detergent. Use a pipe cleaner to clean the passages between the chambers. Wash, rinse and then blow out the dispersion tube with air or CO<sub>2</sub> gas. Rinse the unit with distilled water and allow to drain dry.

**NOTE:** A lead acetate paper disc (Hach) fitted below the O-ring of chamber No. 3 can be substituted for the Dräger tube in the gas train. The lead acetate paper, although not preferred for quantitative work, will show the presence of sulfides.

**WARNING:** The reagents in this kit may be hazardous to the health and safety of the user if inappropriately handled. Please read all warnings before performing the test and use appropriate safety equipment.