

Accuracy Comparisons Of RAE Systems Gas Detection Tubes

Introduction

Tests were done to compare the accuracy of gas detection tubes from various manufacturers. The tests were conducted by RAE Systems and by three independent laboratories: TRI/Environmental (formerly Texas Research Institute, in Austin, TX), Stanford University (Palo Alto, CA), and San Francisco City College (SFCC). The full reports from these independent studies are available on request.

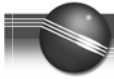
Procedures

Each type of tube was tested using the 100cc hand pump from the matching manufacturer. The pumps used were the three piston hand pumps (RAE Systems LP-1100/1200, Gastec/Sensidyne GV/100, and a Kitagawa 8014-400A) and the two bellows pumps (Dräger Accuro

and MSA Kwik-Draw). All pumps tested passed the specification of <2% leakage after 2 minutes with a sealed tube inserted. Gases were filled into a Tedlar bag from a NIST-traceable standard cylinder and used either directly or after dilution in the bag. Tubes were connected to the Tedlar bag using a short piece of Tygon tubing, and a sample volume drawn according to the manufacturer's specification. Each entry in Table 1 is the average of ≥ 3 measurements. The TRI and SSCF tests used 20 tubes at each concentration and an acceptance criterion of ≥ 19 being within the ANSI/ISEA 102-1999 standard of $\pm 25\%$. The relative standard deviation from the test gas was <10% for all tubes, and no single tube exceeded the maximum 25% deviation in any of the tests.

Table 1. Accuracy Tests with RAE Systems and Other Manufacturers' Tubes and Pumps.

Tube & Range	Test Gas	Readings	Testing Lab
RAE 103-10; 2-50 ppm	25 ppm H ₂ S	29 ppm	Stanford U.
Gastec 4LL; 2.5-60 ppm	25 ppm H ₂ S	27 ppm	Stanford U.
Kitagawa 120SD; 1-60 ppm	25 ppm H ₂ S	29 ppm	Stanford U.
Dräger H ₂ S 2/b; 2-60 ppm *	25 ppm H ₂ S	30.5 ppm	Stanford U.
MSA H ₂ S-1; 1-200 ppm *	25 ppm H ₂ S	26 ppm	Stanford U.
RAE 104-50; 1-20%	10% CO ₂	9.2 %	Stanford U.
Gastec 2H; 1-10%	10% CO ₂	9.6 %	Stanford U.
Kitagawa 126SH; 1-20%	10% CO ₂	9.8 %	Stanford U.
RAE 114-20; 10-300 ppm	100 ppm Toluene	114 ppm	RAE Systems
Gastec 122; 10-300 ppm	100 ppm Toluene	115 ppm	RAE Systems
RAE 120-20; 6-40 lbs/MMCF	10,20&30 lb/MMCF H ₂ O	9, 19 & 30 ppm	RAE Systems
Gastec 6LP; 6-40 lbs/MMCF	10,20&30 lb/MMCF H ₂ O	9, 20 & 29 ppm	RAE Systems
RAE 103-10; 2.5-60 ppm	10, 20 & 50 ppm H ₂ S	10, 20 & 46 ppm	SFCC
RAE 104-40; 0.05-1.0%	0.20, 0.50 & 0.80% CO ₂	0.17, 0.49 & 0.74%	SFCC
RAE 103-10; 2.5-60 ppm	10, 20 & 40 ppm H ₂ S	11, 22 & 43	TRI



Tube & Range	Test Gas	Readings	Testing Lab
RAE 103-30; 100-2000 ppm	200, 1000 & 2000 ppm H ₂ S	220, 1090 & 2020	TRI
RAE 104-45; 0.25-3.0%	0.52, 1.54 & 2.48 % CO ₂	0.49, 1.55 & 2.33%	TRI
RAE 102-30; 20-500 ppm	49, 203 & 412 ppm CO	50, 199 & 452 ppm	TRI

* We do not recommend interchanging piston pumps with bellows-type pumps such as those supplied by MSA or Dräger.

Conclusions

All tubes gave similar readings within 15% of the standard gas values. The results are well within the industry norm of $\pm 25\%$ accuracy. Therefore, RAE tubes give accurate results comparable to Dräger and

Gastec tubes. The TRI and SFCC reports also show that the five different RAE Systems tubes tested all meet a performance criterion of ≤ 1 failure out of 20 tubes