Honeywell

Technical Note

Vertex Response Time to Chlorine (Cl2), Fluorine (F2), Hydrogen fluoride (HF) and Phosphine (PH3)

1998-1045 Rev 2 1/23

Introduction

Honeywell has introduced 2 Vertex upgrade kits to meet the Taiwan EPA's Toxic Chemical Substances Control Act response time regulation for detecting toxic gases, issued on December 11, 2013. These kits upgrade the rack and the analyzer flow systems to enhance the time to response. Both kits are required.

- 1295K0700 Vertex Rack High Flow Kit
- 1295K0701 Vertex Analyzer High Flow Kit

Recently, we have been asked to measure the Vertex's response time to detect Chlorine (Cl2), Fluorine (F2), Hydrogen fluoride (HF), and Phosphine (PH3) to meet the Taiwan EPA's Toxic Chemical Substances Control Act response time regulation for detecting toxic gases, issued on December 11, 2013. In response to this inquiry, we performed gas testing with 10TLV gas concentration to measure the Vertex's response time at various sample lengths for Chlorine, Fluorine, and Hydrides Chemcassette tapes, with the *Vertex Rack and Analyzer High Flow Kit option.

Note: To meet the time to response requirements, there is a restriction on sample tube length that can be supported with this upgrade (330' for thick wall tube and 350' for thin wall tubing). The data provided shows results on lengths longer than can be supported.

Methodology

Test Items	Gas	Details
Gas Source	Cl2	High Pressure Gas Cylinder: 303.5ppm Cl2 balanced with N2 certified by supplier Airgas and analyzed with ion chromatography at generated concentration in mixing manifold in Honeywell Lincolnshire (Ion Chromatograph: Thermo Fisher)
	F2	High Pressure Gas Cylinder: 500ppm F2 balanced with N2 certified by supplier Airgas and analyzed with ion chromatography at generated concentration in mixing manifold in Honeywell Lincolnshire (Ion Chromatograph: Thermo Fisher)
	HF	Permeation tube: KIN-TEK Permeation tube with liquid analyte generating constant emission of vapor analyzed with ion chromatography at generated concentration in mixing manifold in Honeywell Lincolnshire (Ion Chromatograph: Thermo Fisher)
	PH3	High Pressure Gas Cylinder: 200ppm PH3 balanced with N2 certified by supplier Airgas and analyzed with FTIR in Honeywell Lincolnshire Lab (MKS Instruments; Model 2030)
Test Gas Generation (Dynamic Dilution Method)	PH3, Cl2, and F2	Gas and dilution air flow control using mass flow controllers (MKS Instruments)
	PH3, Cl2, and F2	Gas/Air flow rate calibration using calibrated bubble flow meter (Sensidyne)
Sampling Tube	PH3, Cl2 and F2	FEP: ¼ “ OD x 3/16” ID x 10ft, 200ft, 300ft, 350ft, and 400ft
Mixing Jar/Manifold	PH3 and Cl2	Glass mixing jar; opened to atmospheric condition, non-pressurized
	F2	PTFE Teflon manifold: opened to atmospheric condition, non-pressurized
Tape	Cl2	XPV Chlorine Chemcassette
	F2	Vertex F2/Ox Chemcassette
	HF	XPV Mineral Acids Chemcassette
	PH3	XPV Hydrides Chemcassette
Sample Gas Condition	PH3, Cl2, and F2	43 – 46%RH; room temperature (21-23 °C)
Instrument Environment	PH3, Cl2, and F2	17 – 55 %RH; 21 – 23 °C

Results

Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.1875 inch				
Cl2 (5.1ppm)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	20	32	46	49	54
Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.15625 inch				
Cl2 (5.1ppm)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	16	25	35	37	39

Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.1875 inch				
F2 (10.4ppm)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	24	36	50	53	58

Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.15625 inch				
F2 (10.4ppm)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	20	29	39	41	43

Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.1875 inch				
HF (19.8ppm)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	36	42	44	48	54
Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.15625 inch				
HF (19.8ppm)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	32	35	36	36	39

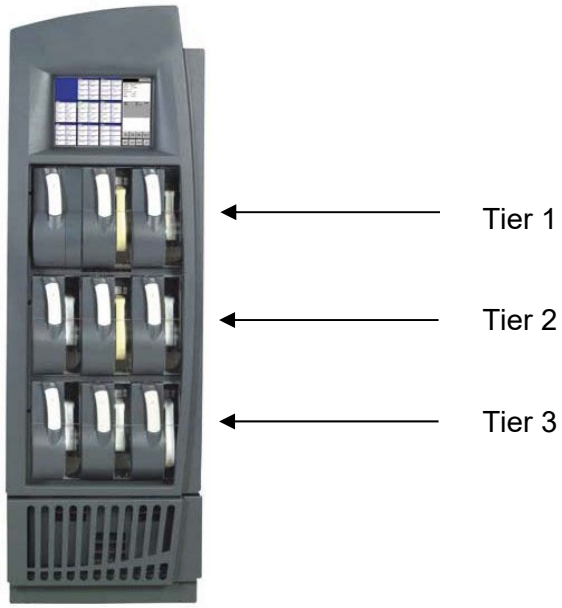
Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.1875 inch				
PH3 (3021ppb)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	20	32	46	49	54
Gas	Tube External Diameter	0.25 inch				
	Tube Internal Diameter	0.15625 inch				
PH3 (3021ppb)	Tube Length (feet)	100	200	300	328	350
	Tube Length (meter)	30	61	90	100	122
	Total Response Time (Transport + Response Time)	16	25	35	37	39

Remarks

Response time shown above is based on the Vertex using 8 points of detection from one analyzer. To meet Taiwan EPA's Toxic Chemical Substances Control Act response time regulation for detecting toxic gases, a Vertex system running 72 points of detection must not exceed the maximum length for each tier, as shown below.

Tier	Sample tubes = Thin Wall	Sample Tubes = Thick Wall
1	350 ft 106M	350 ft 106M
2	350 ft 106M	330 ft 100M
3	175 ft 53M	225 ft 68M

There are additional limitations on the number of points that exceed 175' and meet the time to response. Please contact Honeywell Service for more information.



- Vertex Rack and Analyzer High Flow Kit option for existing racks and new production units will maintain Vertex's redundant structure.
- High Flow Kit installation negates the use of the LIT option.
- The Pyrolyzer analyzer cannot be updated with the analyzer kit. It still can be used in the system, however, is excluded from the Taiwan EPA time to response.

For ordering and installation please contact your local Honeywell Gas (SST) Service representative.

1295K0700 Vertex Rack High Flow Kit
1295K0701 Vertex Analyzer High Flow Kit

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Technical Note

Find out more:
https://sps.honeywell.com/us/en/products/safety/gas-and-flame-detection

Contact Honeywell Analytics:

Europe, Middle East, Africa

Life Safety Distribution GmbH
Javastrasse 2
8604 Hegnau
Switzerland
Tel: +41 (0)44 943 4300
Fax: +41 (0)44 943 4398
gasdetection@honeywell.com
Customer Service:
Tel: 00800 333 222 44 (Freephone number)
Tel: +41 44 943 4380 (Alternative number)
Fax: 00800 333 222 55
Middle East Tel: +971 4 450 5800 (Fixed Gas Detection)
Middle East Tel: +971 4 450 5852 (Portable Gas Detection)

Americas

Honeywell Analytics Distribution Inc.
405 Barclay Blvd.
Lincolnshire, IL 60069
USA
Tel: +1 847 955 8200
Toll free: +1 800 538 0363
Fax: +1 847 955 8210
detectgas@honeywell.com

RAE Systems by Honeywell
Phone: 408.952.8200
Toll Free: 1.888.723.4800
Fax: 408.952.8480

Asia Pacific

Honeywell Industrial Safety
7F SangAm IT Tower,
434, Worldcupbuk-ro, Mapo-gu,
Seoul 03922,
Korea
Tel: +82 (0) 2 6909 0300
Fax: +82 (0) 2 2025 0328
India Tel: +91 124 4752700
China Tel: +86 10 5885 8788 3000
analytics.ap@honeywell.com

Technical Support

EMEA: gastechsupportemea@honeywell.com
Americas: is.gas.techsupport@honeywell.com
AP: gas.techsupport.apaci@honeywell.com
LATAM: SoporteTecnico.HGAS@Honeywell.com
Brazil: SuporteTecnico.HGAS@Honeywell.com