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I. Performance	Company A Product	KIN-TEK FlexStream
A. Permeation Tube Oven		
<ul style="list-style-type: none"> Oven construction – high thermal mass oven with PID control 	✓	✓
<ul style="list-style-type: none"> NIST-traceable oven temperature 	✓	✓
<ul style="list-style-type: none"> Oven orientation 	horizontal	vertical (allows for use of diffusion tubes)
<ul style="list-style-type: none"> Oven setpoint digitally controlled Note: FlexStream applied setpoint must be a minimum of 5 °C above room temperature 	30 to 100 °C in 0.1 °C increments	20 to 150 °C in 0.01 °C increments
<ul style="list-style-type: none"> Oven setpoint resolution and control 	± 0.1 °C	± 0.01 °C
<ul style="list-style-type: none"> Oven temperature stability range after stabilizing on setpoint 	± 0.2 °C	± 0.1 °C (Typically ± 0.05 °C for temperatures below 100 °C)
<ul style="list-style-type: none"> Number of calibration points used for oven temperature certification in range of 30 to 100 °C 	3	6
<ul style="list-style-type: none"> Oven temperature calibration accuracy across setpoint range 	unknown	± 0.1 °C
B. Dilution Flow Rate		























<ul style="list-style-type: none"> Flow rate accuracy (\pm) 	1.5% FS	lesser of 1.5% reading and 1% FS
<ul style="list-style-type: none"> Standard primary dilution full scale sample flow rate 	500 cc/min	5000 cc/min
<ul style="list-style-type: none"> Optional primary dilution full scale sample flow rates available 	unknown	500, 1000, 10000 cc/min
<ul style="list-style-type: none"> To increase integrity of results, concentrations are continually calculated and displayed on the gas standards generator front panel from measured flow rate and measured oven temperature 		
<ul style="list-style-type: none"> Optional secondary dilution module allows concentrations to be generated over a 10,000 to 1 range (with standard calibration) up to 40,000 to 1 (with expanded calibration and select-tested flow controllers) 		
<ul style="list-style-type: none"> Standard secondary dilution flow range to 5 slpm (optional 10 slpm) 		
C. Output Pressure	10 psig (69 kPa)	20 psig (138 kPa)
D. Maximum Operating (Room) Temperature		
<ul style="list-style-type: none"> Maximum ambient (room) temperature Note: FlexStream applied setpoint must be a minimum of 5 °C above room temperature 	Max Room Temperature 30 °C	Max Room Temperature 40 °C
II. Application		
A. General		
<ul style="list-style-type: none"> Modular instrument 		
<ul style="list-style-type: none"> Tube types supported 	Disposable	Disposable, LFH, prefilled gas-fed, customer-filled gas-fed, diffusion
<ul style="list-style-type: none"> Fully automated capability across entire flow range 		
B. Permeation Tube Oven		









<ul style="list-style-type: none"> Supports disposable permeation tubes to 15 cm (6 inch) in length and 0.635 cm (0.25 inch) in diameter 		
<ul style="list-style-type: none"> Supports KIN-TEK liquid-filled high rate (LFH) permeation tubes (maximum of one per oven) Tube dimensions: 1.75 inch diameter x 6 inch height 		
<ul style="list-style-type: none"> Supports KIN-TEK 57 Series prefilled gas-fed permeation tubes (maximum of one per oven) These tubes are used when disposable and diffusion tubes cannot be used due to the high vapor pressure of the compound. Used in KIN-TEK gas standards generators to create gas standards ranging from less than 50 ppb to 5 ppm (depending on tube emission rate and dilution flow rate) for arsine and other hydride gases, as well as highly reactive gases such as HCl, HBr, O₂ and CO. Small amount of toxic material (typically less than 4 grams of pure gas under 50 psig) Factory-prefilled permeation tubes Factory-certified emission rate Tube dimensions: 1.75 inch diameter x 6 inch height + 5.5 inch height of pressure gage and protruding tubing 		
<ul style="list-style-type: none"> Supports KIN-TEK 57S and 57H customer-filled gas fed tubes (maximum of one per oven) These tubes are used when disposable and diffusion tubes cannot be used due to the high vapor pressure of the compound. Generates standard and high concentration gas standards of high vapor pressure gases such as CO, CO₂, NO, N₂O, CH₄ etc. Typical concentrations for 57S: sub-ppb to 10 ppm depending on tube emission rate, dilution flow rate and operating pressure Typical concentrations for 57H: 10 ppm to over 1,000 ppm depending on tube emission rate, dilution flow rate and operating pressure Requires KIN-TEK "GF" gas feed module for filling. Customer supplies the analyte gas. Tube dimensions: 1.75 inch diameter x 6 inch height + 2 inch height of protruding tubing 		

<ul style="list-style-type: none"> Number of disposable tubes allowed per oven 	3	8
<ul style="list-style-type: none"> Number of ovens allowed 	3	6
<ul style="list-style-type: none"> Maximum number of components per system (# of ovens times # of tubes per oven) 	9	48
<ul style="list-style-type: none"> Ovens can be switched in and out of the gas stream with hands off (i.e., no tubing change-outs or other configuration required). This allows extensive automated matrix effect tests to be conducted. 		
<ul style="list-style-type: none"> Secondary dilution availability 		
C. Tubing and Materials for Component Flow Path		
<ul style="list-style-type: none"> (standard) Component contacts only glass, Teflon® and stainless steel 	unknown	
<ul style="list-style-type: none"> (standard) Glass permeation tube holder 		
<ul style="list-style-type: none"> (optional) Teflon® permeation tube holder 		
<ul style="list-style-type: none"> (optional) Electro-polished stainless steel permeation tube holder with or without Sulfinert® coating 		
<ul style="list-style-type: none"> (optional) Monel® permeation tube holder 		
<ul style="list-style-type: none"> (standard) Suitable for reactive gases 	unknown	
<ul style="list-style-type: none"> (optional) Heated internal and external lines 	unknown	
<ul style="list-style-type: none"> (optional) Stainless steel tubing only 	unknown	
<ul style="list-style-type: none"> (optional) Electro-polished stainless steel tubing 	unknown	
<ul style="list-style-type: none"> (optional) Sulfinert®-coated stainless steel tubing 	unknown	
<ul style="list-style-type: none"> (optional) Teflon® tubing and valves only 	unknown	

D. Mass Flow Controllers		
<ul style="list-style-type: none"> A gas correction factor (GCF) can be applied for most diluent gases to auto-adjust the mass flow rate for diluent gases other than the gas used to calibrate the mass flow controller 		
III. Human Operation		
<ul style="list-style-type: none"> Ease-of-use in setting oven temperature via front panel 	up/down arrow buttons	numeric value entry (e.g., 30.0)
<ul style="list-style-type: none"> Ease-of-use in setting flow rate in span-by-flow mode via front panel 	up/down arrow buttons	numeric value entry (e.g., 500)
<ul style="list-style-type: none"> Ease-of-use in setting flow rate in span-by-concentration mode via front panel 		auto-set based on target concentration
<ul style="list-style-type: none"> Ease-of-use in setting target concentration via front panel 		numeric value entry (e.g., 1.234 ppm)
<ul style="list-style-type: none"> Concentration units (by volume) available when setting target concentration 		ppm, ppb, ppt
<ul style="list-style-type: none"> Method of defining tube properties (component, emission rate, molecular weight, certification temperature) for from 1 to 8 tubes per oven via front panel. The emission rate data is saved in nonvolatile memory of the gas standards generator for retention during power cycles 		via front panel touchscreen or external computer
<ul style="list-style-type: none"> <i>Standby mode.</i> All tube emissions are directed to the vent port with no flow to the span gas out port. This conserves diluent gas while keeping a small flow across the permeation tube(s). 		
<ul style="list-style-type: none"> <i>Zero mode.</i> All tube emissions are directed to vent port. A user-defined target zero diluent gas flow rate is directed to the span gas out port. The tubes are not removed from the oven. 		
<ul style="list-style-type: none"> <i>Span-by-flow mode.</i> The target flow rate is set via the front touch panel. The gas standard generator then sets the flow rate to the target setpoint and calculates and displays the 		

<p>resulting component concentration(s) from pre-entered tube emission rate data and actual measured flow rate. The concentrations for up to 8 tubes are continuously displayed.</p>		
<ul style="list-style-type: none"> <i>Span-by-concentration mode.</i> The target concentration for a target tube is set via the front touch panel as a numeric value (e.g., 1.234 ppm) and the “Go” button is pressed to initiate it. The gas standard generator then auto-adjusts the dilution flow rate to generate the target concentration from pre-entered tube emission rate data. The concentrations for up to 8 tubes are continuously calculated from actual measured flow rate and displayed. [vs. no compatible mode]. User-selectable concentration units by volume are ppm, ppb and ppt. 		
<ul style="list-style-type: none"> <i>Purge mode.</i> The user removes all tubes. The gas standard generator then purges the system with zero diluent gas, cycling solenoid valves if appropriate, to remove residual component gas from the lines. 		
<ul style="list-style-type: none"> Apply a gas correction factor (GCF) if gas other than calibration gas is used for the diluent gas. The gas standard generator then automatically uses the GCF to adjust the mass flow setpoints and measurements. 		
IV. External Computer Operation		
<ul style="list-style-type: none"> Setting and reading of dilution flow rate 		
<ul style="list-style-type: none"> Setting and reading of oven temperature 		
<ul style="list-style-type: none"> Setting and reading of instrument mode: standby, zero, span-by-flow, span-by-concentration, purge 		
<ul style="list-style-type: none"> Setting and reading of gas correction factor (GCF) 		
<ul style="list-style-type: none"> Setting and reading of properties for up to 8 tubes per installed oven. Properties include component name and/or tube serial number, emission rate, molecular weight and tube certification temperature 		

<ul style="list-style-type: none"> Setting and reading of alarm temperature setpoint 		
<ul style="list-style-type: none"> Auto-detection of active alarm 		
<ul style="list-style-type: none"> Lockout of front panel touchscreen 		
<ul style="list-style-type: none"> Setting of target concentration and unit and initiating concentration generation 		
<ul style="list-style-type: none"> Setting of target flow rate and concentration unit and initiating concentration generation 		
<ul style="list-style-type: none"> Reading of generated concentration values for one or more permeation components 		
<ul style="list-style-type: none"> Auto-detection of out-of-range condition on mass flow controller 		
<ul style="list-style-type: none"> Setting and reading of oven temperature multipoint calibration offsets for each installed oven 		
<ul style="list-style-type: none"> Setting and reading of mass flow controller multipoint calibration data for each installed mass flow controller. 		
V. Safety		
<ul style="list-style-type: none"> Over-temperature detection with audible alarm, oven power removal and alarm notification to front panel touchscreen and to computer interfaces. The user can set an over-temperature alarm at any temperature above the oven setpoint. 		
VI. Physical Interfaces		
<ul style="list-style-type: none"> Local human interface - color touch screen with virtual keypad 		
<ul style="list-style-type: none"> External computer interfaces 	Serial RS-485	Serial RS-232 and Ethernet

<ul style="list-style-type: none"> Optional conversion of serial interface (RS-232 or RS-485) to one of RS-422, RS-485, RS-232 or USB with optional serial converter cable. 		
VII. PC-based Software		
<ul style="list-style-type: none"> KIN-TEK FlexLink™ software CD shipped with instrument. Note that this software is not required to operate the gas standards generator. Features include oven temperature graph display, setting up permeation tube properties (tube component name, emission rate, molecular weight, etc.), upload and download of tube properties to/from gas standards generator, setting of gas standards generator mode (standby, zero, span-by-flow, span-by-concentration, and purge), logging of operational data (instrument mode, oven temperature setpoint and actual temperature, flow rate, target concentration and actual concentration(s), calibration of oven temperature and mass flow controller(s), lockout of touchscreen front panel, and over-temperature alarm notification. 		
<ul style="list-style-type: none"> Labview® Modbus driver on FlexLink™ CD. This driver makes it easy to create a LabView® program using the industry standard Modbus® RTU communications protocol for control and monitoring of the gas standards generator. 		
<ul style="list-style-type: none"> LabView®-based starter software with source available 		
VIII. CE Certification	