

FlexStream™ Automated Permeation Tube System

Description

The new *FlexStream™* automated Perm Tube System offers total flexibility for creating precision gas mixtures. Mixtures are produced by diluting the miniscule flow emitted from Trace Source™ permeation (or diffusion) tubes with a much larger flow of inert matrix gas, typically nitrogen or zero air. The *FlexStream™* is ideally suited for creating trace concentration – ppm, ppb, and ppt – mixtures. *The FlexStream™ Base Permeation Unit* is small, easily transportable and easily combined with other *FlexStream™* modules to form integrated gas mixing systems.

Operation

The FlexStream™ is built around a microprocessor-controlled, stand-alone Base Permeation Tube System. This unit provides a temperature controlled permeation tube oven, dilution flow controls and front panel touch-screen interface. The FlexStream™ can use all Trace Source™ permeation and diffusion tubes. Mixtures containing up to 8 components are possible using disposable permeation tubes in the stand-alone FlexStream™ unit. Concentrations from below 1 ppb to over 1000 ppm are possible using disposable permeation tubes in the stand-alone FlexStream™ unit. Concentrations from below 1 ppb to over 1000 ppm are possible using appropriate permeation tubes. Concentration from each tube can be varied over a 20:1 range by adjusting dilution flow.

Three output modes are possible: **Standby**, where the permeation tube is held at operating conditions with the permeate flowing to vent, **Zero**, where only the dilution flow is emitted to verify zero response, and **Span**, where the permeation tube output is added to the zero flow to create a known concentration Span mixture.

An internal microprocessor with touch screen interface is used to control the operating mode and adjust dilution flow to achieve desired concentrations. The FlexStream™ can also be controlled remotely by a PC or process computer using Modbus® connectivity. Combining the Base Unit with other FlexStream™ modules allows the system to create complex gas mixtures



FEATURES

- Complete, integrated, ready-to-use turnkey system
- Automated operation with direct readout of concentration
- Modes of Operation: standby, zero, span and purge
- Touch-screen interface for local setup and manual control
- Modbus connectivity for integration with existing systems
- Designed for expandability
- Flow path designed for maximum flexibility with minimum error
- Flow path suitable for reactive gases - mixture contacts only glass, Teflon® and stainless steel (other materials available)
- Accepts disposable permeation tubes, diffusion tubes, ultra-high rate liquid filled tubes, wafer tubes, and prefilled gas fed permeation tubes
- Accepts up to 8 disposable tubes with maximum 6 inch length x 1 1/4 inch diameter (KIN-TEK HRT, SRT and EL tubes)
- Accepts one of KIN-TEK refillable LFH, ULED and 57 Series tubes
- High mass oven with electronic PID control
- Temperature Control Range: 5 °C above ambient from 20 to 150 °C (heat only)
- Temperature Setpoint Resolution: 0.01 °C across control range
- Temperature Display Resolution: 0.01 °C on front panel touch screen
- Standard Flow Range: 0.25-5.0 liter per minute
- Optional Flow Ranges: 0.1-0.5, 0.1-1.0, 0.5-10.0 liter per minute
- Flow Control over Calibrated Range: $\leq \pm 1.5\%$ of reading
- Flow Change - 0 to Full Scale: < 10 sec (2 time constants) at ambient pressure
- Mode Change - Zero at 1 lpm to Span at 1 lpm: < 5 sec (2 time constants) at ambient pressure
- Output Concentration Range: below 1 ppb to over 1000 ppm depending on emission rate and dilution flow rate
- Local Interface: color touch screen display with virtual keypad
- Remote Interfaces: RS-232 and Ethernet
- Communication Protocol: Modbus RTU
- Power Requirements: Standard: 115 VAC, 2 A
- Power Requirements: Optional (specified at time of purchase): 230 VAC, 1 A
- Dimensions: 7.5 inch Width x 13.5 inch Height x 20 inch Depth (add 3.5 inch to Depth for front panel inlet filter clearance)
- Weight: Approximately 30 lbs

BENEFITS

TECHNICAL

- Trace concentration mixtures for reactive compounds
- Applicable to a wide range of compounds (over 500)
- PPM and PPB mixtures with single step dilution
- Calibration even for some reactive mixtures
- Dynamic blending + immediate use eliminates storage degradation
- Simplifies complex mixture preparation
- Concentrations traceable to NIST (through physical variables)

OPERATIONAL

- Simple operation
- Automated calibrations

ECONOMIC

- Save space – one unit replaces many gas cylinders
- Reduce cost of multi-point calibration

SAFETY

- Replaces high pressure gas mixture
- User deals with only very small quantities of analyte compounds

Represented by:



KIN-TEK 

The Calibration Specialists

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3176 Acenaphthalene	3085 1,2-Butadiene	4033 2-Chlorophenol
3025 Acetaldehyde	3011 1,3-Butadiene	4049 Chloropicrin
2033 Acetamide	3009 n-Butane	4082 2-Chloropropane
3039 Acetic acid	3053 n-Butanol	3070 m-Cresol
3026 Acetone	3048 tert-Butanol	3106 o-Cresol
2014 Acetonitrile	3029 2-Butanone	3107 p-Cresol
3184 Acetophenone	3013 1-Butene	3065 Crotonaldehyde
3004 Acetylene	3014 cis-2-Butene	3180 Cumene
3033 Acrolein ▼	3015 trans-2-Butene	2037 3-Cyanopyridine
3202 Acrolein dimethyl acetal	3043 n-Butyl acetate	3105 Cyclohexane
3068 Acrylic acid	3100 Butyl acrylate	3117 Cyclohexanol
2009 Acrylonitrile	3092 Butyl cellosolve	3035 Cyclohexanone
2009D Acrylonitrile-d3	4087 Butyl chloride	3131 Cyclopentane
3008 Allene	4055 tert-Butyl chloride	3162 p-Cymene
4052 Allyl chloride	3139 tert-Butyl ethyl ether	3062 Decane
2060 2'-Aminoacetophenone	1022 2-Butyl mercaptan	3144 Diacetone alcohol
2070 4,-Aminobiphenyl	1015 n-Butyl mercaptan	2048 1,4-Diaminocyclohexane
2060 2'-Aminoacetophenone	1019 tert-Butyl mercaptan	2074 2,4-Diaminotoluene
2003 Ammonia	3138 tert-Butyl methyl ether	4078 1,4-Dichloro-2-butene
3198 Amyl acetate	2061 Butylamine	4027 1,2-Dichlorobenzene
3199 Amyl alcohol	3179 Butylbenzene	4072 1,3-Dichlorobenzene
1042 tert-Amyl mercaptan	3143 4-tert-Butyltoluene	4073 1,4-Dichlorobenzene
2028 Aniline	3034 Butyraldehyde	4048 1,1-Dichloroethane
2072 o-Anisidine	3073 Butyric acid	4031 1,2-Dichloroethane
3127 Anthracene	3124 γ-Butyrolactone	4067 cs-1,2-Dichloroethylene
5005 Argon	2029 Butyronitrile	4101 1,1,1-Dichlorofluoroethane
4089 Arsenic trichloride	5002 Carbon dioxide	4043 1,2-Dichloropropane
5014 Arsine	1005 Carbon disulfide ▼	4070 cs-1,3-Dichloropropene
3061 Benzaldehyde	5001 Carbon monoxide	4071 tr-1,3-Dichloropropene
3018 Benzene	4009 Carbon tetrachloride	4061 Dichlorosilane ▼
3018D Benzene-d6	4014 Carbonyl fluoride	5029 Dicyclohexylmethylphosphonate
3128 2,3-Benzofuran	1003 Carbonyl sulfide ▼	3140 Dicyclopentadiene
3194 Benzoic acid	3153 3-Carene	3028 Diethyl ether
3108 Benzyl alcohol	3204 Catechol	5035 Diethyl ethylphosphonate
4069 Benzyl chloride	3091 Cellosolve	5033 Diethyl methylphosphonate
1043 Benzyl mercaptan	3049 Cellosolve acetate	5038 Diethyl phosphite
3177 Bibenzyl	4001 Chlorine ▼ <i>m</i>	2044 Diethylamine
3190 Bicyclo(2.2.1)hepta-2,5-diene	4095 1-Chloro-2-methylpropane	3165 1,2-Diethylbenzene
3178 Biphenyl	4038 Chlorobenzene	5028 Diethyldimethylphosphoramidate
4022 Boron trifluoride	4085D Chlorobenzene-d5	2018 Diethylenetriamine
4004 Bromine ▼	4102 Chlorodibromomethane	2062 Diethylethanolamine
4086 1-Bromo-4-fluorobenzene	4100 1,1,1-Chlorodifluoroethane	1031 Diethylmethylphosphonothioate
4059 1-Bromobutane	4093 2-Chloroethanol	2088 3,5-Difluoroaniline
4083 Bromochloromethane	1027 2-Chloroethyl ethylsulfide	4090 1,3-Difluorobenzene
4103 Bromodichloromethane	1038 2-Chlorethyl methyl sulfide	4084 1,4-Difluorobenzene
4096 Bromoform	4051 bis-2-Chloroethylether	2008 Diisopropylamine
4106 Bromonitromethane	4012 Chloroform	2051 2-(Diisopropylamino)ethanol
4098 1-Bromopropane	4104 Chloroiodomethane	3167 1,4-Diisopropylbenzene
4081 2-Bromopropane	4079 Chloromethyl methyl ether	5016 Diisopropyl methylphosphonate

2045 2,6-Diisopropylphenyl isocyanate	3041 Ethylbenzene	4006 Hydrogen fluoride ▼ <i>m</i>
3119 Dimethoxymethane	3041D Ethylbenzene-d10	1002 Hydrogen sulfide ▼
1007 Dimethyl disulfide	2065 Ethyldiethanolamine	3192 p-Hydroxybenzaldehyde
3027 Dimethyl ether	3003 Ethylene	3181 Indan
5024 Dimethyl ethoxysilane	4054 Ethylene dibromide	3182 Indene
2021 Dimethyl formamide	3078 Ethylene glycol	4042 Iodine
5036 Dimethyl mercury	3023 Ethylene oxide ▼	4105 Iodoethane
5017 Dimethyl methylphosphonate	2020 Ethylenediamine	3115 Isoamyl acetate
5030 Dimethyl phosphite	2049 Ethyleneimine	3010 Isobutane
1011 Dimethyl sulfate	3031 2-Ethylhexanol	3055 Isobutanol
1006 Dimethyl sulfide	3101 2-Ethylhexyl acrylate	3058 Isobutyl acetate
1025 Dimethyl sulfone	2036 2-Ethylimidazole	3191 Isobutyl acrylate
1039 Dimethyl sulfoxide	3173 2-Ethyltoluene	4094 Isobutyl chloroformate
3189 2,3-Dimethyl-2-butene	4058 Fluorobenzene	1016 Isobutyl mercaptan
2042 Dimethylacetamide	3024 Formaldehyde *	3183 Isobutylbenzene
2005 Dimethylamine	2032 Formamide	3012 Isobutylene
2071 N,N-Dimethylaniline	3038 Formic acid	3063 Isobutyraldehyde
3133 2,2-Dimethylbutane	4025 Freon 11	3077 Isooctane
2067 Dimethylethanolamine	4050 Freon 113	3120 Isopentane
2016 1,1-Dimethylhydrazine ▼	4056 Freon 114	3059 Isoprene
3166 1,2-Dimethylnaphthalene	4023 Freon 116	3022 Isopropanol
3172 2,3-Dimethylphenol	4040 Freon 12	3111 Isopropyl acetate
2068 2,4-Dinitrotoluene	4024 Freon 13	3052 Isopropyl ether
3045 Dioxane	4037 Freon 21	1018 Isopropyl mercaptan
3125 Dipropylene glycol methyl ether	4026 Freon 22	3064 Isovaleraldehyde
5025 Disilane	3104 Furan	5010 Krypton
1030 1,4-Dithiane	5015 Germane	3083 d-Limonene
3145 Dodecane	5008 Helium	3051 Maleic anhydride
3103 Dowtherm	3126 Heptane	3160 Menthol
4039 Epichlorohydrin	2056 Heptanenitrile	3037 Mesitylene
3163 1,2-Epoxybutane	3142 2-Heptanone	3066 Methacrolein
3002 Ethane	2057 Heptyl cyanide	3001 Methane
1026 1,2-Ethanedithiol	4032 Hexachloro-1,3-butadiene	3020 Methanol
3021 Ethanol	4076 Hexachlorobenzene	3090 1-Methoxy-2-propanol
3030 Ethyl acetate	3130 Hexadecane	3123 2-(2-Methoxyethoxy)ethanol
3086 Ethyl acetylene	3185 Hexaldehyde	3081 2-Methoxyethyl ether
3097 Ethyl acrylate	5031 Hexamethylcyclotrisiloxane	3116 Methyl acetate
2075 Ethyl carbamate	5020 Hexamethyldisilazane	3007 Methyl acetylene
4017 Ethyl chloride	5026 Hexamethyldisiloxane	3113 Methyl acrylate
1017 Ethyl disulfide	2080 Hexamethylene-1,6-diisocyanate	3082 Methyl benzoate
3141 Ethyl lactate	3017 Hexane	4015 Methyl bromide
1010 Ethyl mercaptan	2055 Hexanenitrile	3095 Methyl cellosolve
1013 Ethyl methyl sulfide	3156 2-Hexanone	3096 Methyl cellosolve acetate
2046 Ethyl morpholine	3109 n-Hexene	4003 Methyl chloride
2035 Ethyl pyrazine	2013 Hydrazine ▼	4029 Methyl chloroform
2026 3-Ethyl pyridine	5009 Hydrogen	3135 Methyl cyclopentane
1012 Ethyl sulfide	4007 Hydrogen bromide <i>m</i>	2017 Methyl hydrazine ▼
2006 Ethylamine	4002 Hydrogen chloride <i>m</i>	4041 Methyl iodide
2064 2-(Ethylamino)ethanol	2010 Hydrogen cyanide	3044 Methyl isobutyl ketone

TRACE SOURCE™ PERMEATION TUBES

3118 Methyl isopropyl ketone	3016 Pentane	5012 Tetramethylsilane
2050 Methyl isothiocyanate	2059 Pentanenitrile	1029 Thiodiglycol
1004 Methyl mercaptan ▼	3157 2-Pentanone	1021 Thiophene
3114 Methyl methacrylate	3132 1-Pentene	1035 1,4-Thioxane
3134 2-Methyl pentane	2053 Perfluorotributylamine	3186 m-Tolualdehyde
4057 Methyl phosphonic dichloride	3069 Phenol	3019 Toluene
2034 2-Methyl pyrazine	4013 Phosgene ▼	2011 Toluene -2,4-diisocyanate
2027 3-Methyl pyridine	5013 Phosphine	2079 2,6-Toluene diisocyanate
2041 n-Methyl pyrrolidinone	4060 Phosphorus oxychloride ▼	3196 Toluene-db
3074 Methyl salicylate	4109 Phosphorus trichloride	2073 o-Toluidine
3075 3-Methyl valeric acid	3155 Pinacolone	2066 Tributylamine
3067 Methyl vinyl ketone	3147 Pinacolyl alcohol	4074 1,2,4-Trichlorobenzene
3200 2-Methyl-1-butanol	5027 Pinacolyl methylphosphonate	4068 1,1,2-Trichloroethane
3201 3-Methyl-1-butanol	3122 α-Pinene	4036 Trichloroethylene
3098 1-Methyl-2-propanol acetate	3154 β-Pinene	4080 1,2,3-Trichloropropane
2007 Methylamine	2043 Piperidine	4097 Trichlorosilane
2052 Methylaminoethanol	3005 Propane	3150 Tridecane
3205 2-Methylbutanal	3079 1,2-Propanediol	5032 Triethyl phosphite
2063 Methyl diethanolamine	3054 1-Propanol	2078 Triethylamine
4077 Methylene bromide	3046 Propionaldehyde	2019 Triethylenetetramine
4028 Methylene chloride	3072 Propionic acid	3112 Triethylphosphate
3169 1-Methylnaphthalene	2023 Propionitrile	4092 Trifluoroacetic acid
3174 2-Methylnaphthalene	3057 n-Propyl acetate	3203 1,1,3-Trimethoxypropane
3164 a-Methylstyrene	3056 n-Propyl benzene	5034 Trimethyl phosphite
1024 3-(Methylthio)propionaldehyde	1014 n-Propyl mercaptan	2047 Trimethylamine
2015 Monoethanolamine	2087 Propylamine	3175 1,2,3-Trimethylbenzene
3152 Myrcene	3006 Propylene	3129 1,2,4-Trimethylbenzene
3040 Naphthalene	3071 Propylene oxide	3170 2,3,5-Trimethylnaphthalene
5007 Neon	2024 Pyridine	3171 2,3,5-Trimethylphenol
2054 Nicotine	2024 Pyridine-d5	3149 Undecane
2022 Nitric acid	2085 Pyrrole	3187 Valeraldehyde
2081 Nitric acid-d	2031 Quinoline	3080 Vanillin
2001 Nitric oxide	5022 Silane	3047 Vinyl acetate
2022 Nitric-15N-acid	4065 Silicon tetrachloride	3087 Vinyl acetylene
2069 Nitrobenzene	4062 Silicon tetrafluoride	4019 Vinyl bromide
5004 Nitrogen	3032 Styrene	4020 Vinyl chloride
2002 Nitrogen dioxide ▼	3089 Styrene oxide	3084 4-Vinyl cyclohexane
4008 Nitrogen trifluoride	1001 Sulfur dioxide	4064 Vinyl fluoride
2076 N-Nitrosodimethylamine	1028 Sulfuric acid	3102 Vinylcyclohexene monoxide
2077 N-Nitrosomorpholine	3188 α-Terpinene	4030 Vinylidene chloride
2083 2-Nitrotoluene	4075 1,1,2,2-Tetrachloroethane	2025 4-Vinylpyridine
2012 Nitrous oxide	4035 Tetrachloroethylene	5011 Water
3137 n-Nonane	3146 Tetradecane	5006 Xenon
3136 n-Octane	5019 Tetraethyl orthosilicate	3042 m-Xylene
2058 Octyl cyanide	4099 1,1,1 Tetrafluoroethane	3076 o-Xylene
5003 Oxygen	3050 Tetrahydrobenzaldehyde	3036 p-Xylene
3151 Pentadecane	3060 Tetrahydrofuran	
4091 Pentafluorobenzene	3148 Tetrahydrofurfuryl alcohol	
1023 Pentamethylene sulfide	1034 Tetrahydrothiophene	