



Portable Gas Analyzer
Model:pAir4810-IAQ (NIR Laser Spectrum Gas Analyzer)

Portable Indoor Air Quality Analyzer 《Datasheet》

Ref: pAir4810_IAQ_Int_E

Version:2005-02-03

- *Intelligent Analysis Based on Powerful CPU*
- *Rapid Test in Seconds*
- *Sub-ppm or ppm detection of over 120 gases possible*
- *100 frame Data log*
- *LCD 8x20 Display, Backlight Available*
- *RS232/485 Communication*
- *Full Function Keypad Operation*
- *Memo Driven Software, Easy to use; easy to train new operators*
- *Lightweight and easily portable*
- *Long life sensor designed*
- *Free of maintenance*
- *None of interferences of water vapor at most case*
- *High selective is expected*
- *Versatile and up-gradable to suit your needs(Spectral Scanning upgrade permits collection of spectral fingerprint of unknowns, for further in-depth analysis and identification)*
- *ISO 14000 / ISO 14001 ENVIRONMENTAL MANAGEMENT Analyzer*

High reliable, Free from Interferences

pAir4810 was special designed for environ gases analysis. It was based on high resolution TDLAs NIR spectroscopy technology.

pAir4810-IAQ Indoor Air Quality Analyzer is specially designed for environ order detection.

pAir4810IAQ is designed fro professional measurement, it could be developed further by users to satisfy the requirements to monitor the real contaminants in certain cases.

Pollutant Sources

There are many sources of indoor air pollution in any home. These include combustion sources such as [oil](#), [gas](#), [kerosene](#), [coal](#), [wood](#), and [tobacco products](#); building materials and furnishings as diverse as deteriorated, [asbestos](#)-containing insulation, wet or damp carpet, and cabinetry or furniture made of certain [pressed wood products](#); products for [household cleaning and maintenance](#), [personal care](#), or [hobbies](#); central heating and cooling systems and humidification devices; and outdoor sources such as [radon](#), [pesticides](#), and outdoor air pollution.

Basic Information About Indoor Air Quality:

<http://www.epa.gov/iaq/ia-intro.html>

Applications:

- Emergency Response Analysis
- Occupational hygiene analysis
- Occupational Air Quality
- Industrial Hygiene
- Air quality in indoor work environments.
- to implement controls for specific contaminants and their sources such as outdoor air contaminants, microbial



contamination, maintenance and cleaning chemicals, pesticides, and other hazardous chemicals within indoor work environments.

- to limit the degradation of indoor air quality during the performance of renovation, remodeling and similar activities
- Detection of leaks from storage facilities.
- VOCs and particulates emit source location, such as Appliances, office equipment, and supplies monitor. Including Adhesives, Caulking Compounds, Carpeting, Ceiling Tiles, Clipboard/Particle Board, Floor and Wall Coverings, Paints, Stains & Varnishes, Appliances, Carbonless Copy Paper, Computers/Video Display Terminals, Computer/Video Display Terminals, Duplicating Machines, Electrophotographic Printers, Photocopiers & Related Supplies, Microfiche Developers/Blueprint Machines, Preprinted Paper Forms, Typewriter Corrections Fluid

Instrumental Functions

- LCD 320×240 Graphic LCD Display, with backlight
- RS232/RS485 serial port. Supporting STIMcom / Modbus communication, and printer; USB support in new version
- Non-volatile memory supported data store and read out, or output to computer
- Built-in Sampling pump included, and suitable sample pre-process assembly
- Built-in alarm include LED flash, LCD indication, and Beep; Alarm limit setup supported, default to TWIN standard
- Sampling gun with filter/trap for dusts and condensed water drain.
- System diagnostic
 - Protection against accidental turn-off
 - Over-range protection for all installed sensors
 - Storage protection for sensors
- Flexible tubing for re-configuration
- User complete calibration, zero-adjust and essential data setup support
- Interfering gas compensation select
- Basal humidity and temperature detected for compensation and controlled for normal test. Over limit alarm support
- Rechargeable batteries to provide 100 hours of continuous operation
- 15-24 V DC powered. Local AD to DC adapter supported
- Basal intrinsically safe system, except parts of pump and heater. Special order for class 1 div. 1, groups a, b, c and d and class 2 div. 1, groups e, f and g for use in hazardous areas recommended.

Specifications

Electronic unit: BD6, ADC resolution: 0.0015%FS

Protection against electromagnetic and radio frequencies interference

Maintenance interval: Recommended every 3 months (no consumables needed)

Calibration: In situ with flow through cell, or in separate calibration device,

Identification set by high pure gas only.

Storage or standby would not decay the system. Long life supported.

Detector Type	Single beam near infrared spectrophotometer
Optics	Bandwidth: 0.1 to 0.001nm; Refer to Laser list
Dynamic range:	General 1000 to 100000 :1
Accuracy:	2% of reading or LDL whichever is great
Pump Flow Rate	1-15 liters/ minute
Analysis Time	1-20s;
Alarms	User Definable
Readout	8 line x 40 character LCD
Start up:	3mins
Response Time	T90:1-10 seconds to 90% of final reading
Optical Path length (OPL)	OPL1: 0.5m to 1.00m OPL10: 10m OPL36k:36km OPL could be expanded to kilometers by Perrot Cell for trace gas analysis.

Sample Cell Volume	2.0 liters
Instrument span drift:	< 4% of measuring range between maintenance intervals
Instrument zero drift:	Negligible (<2% of measuring range between maintenance intervals)
Sampling pressure:	Atmosphere $\pm 20\%$ (Standard sampling condition)
Sampling temperature:	-10 °C to 50 °C(Standard sampling condition)
Battery	Internal, rechargeable NiCd. 12V nominal; 2 Ah Capacity. Recharge time 4 to 8 hours Continuous running time: >24Hr/ each charge; Standby time: 7 days
Output	0-2.5Vdc, Serial RS232 or RS485
Dimensions	553mm (W) x 365mm (H) x 193mm (D) Mass 15 kg
Intrinsic Safety	User specified models are certified for CENELEC, Groups IIC, Zone 1 and 2
Certifications	ETL (Class I, Div 1, Groups B, C, & D, Temperature Class T4; ETL-C (Class I, Div. 1, Groups, B, C, & D, Temperature Class T4); CENELEC (EEx ib d IIB + H2 T4)

Environment Requirements:

Environmental Humidity:	Operating:0 to 100% RH, non-condensing Storage:0 to 90% RH, non-condensing
Environmental Temperature Range:	N:Operating -10 °C to 50 °C N:Storage -40 °C to 70 °C

Important Contaminants to Monitor

P.No	Parameter	Range	Temp	Repeatability	Life /year	Drift/Y	-Pro	-VOC
1	T	-40-100°C		+/-0.2%	5	included	√	
2	RH	0-99%RH	-30-70	+/-2%R	5	<5%	included	√
3	Air velocity	0.01-20m/s	-30-70	+/-10%R	5		√	
4	SO ₂	0.025-10/100ppm	-20-50	+/-2%R	5	<2%	LNIR	√
5	NO ₂	0.01-10ppm	-10-40	+/-2%R	5	<5%	LNIR	√
6	CO	0.1-500/1000ppm	-15-40	+/-2%R	5	<5%	LNIR	√
7	CO ₂	2-2000ppm	-15-40	<+/-1%R	5	<5%	LNIR	√
8	NH ₃	0.1-100ppm	-25-30	+/-10%R	5	<-10%	LNIR	® ®
9	O ₃	0.05-50ppm	-10-40	+/-5%	2	<4%	LNIR	® ®
10	HCHO	0.05-10.0ppm	-20-50	<2%	5	LNIR	® ®	
11	C ₆ H ₆	0.03-30ppm	-20-50	<2%	5	LNIR	® ®	
12	C ₇ H ₈	0.04-50ppm	-20-50	<2%	5	LNIR	® ®	
13	C ₈ H ₁₀	0.04-50ppm	-20-50	<2%	5	LNIR	® ®	
14	B[a]P	0.015-1.5mg/NM ³	-10-40	<2%	5	<5%	LNIR	® ®
15	TSP	0.01-2/20mg/M ³	-10-40	+/-10%R	5	LS	√	
15	PM ₁₀	0.01-2/20mg/M ³	-10-40	+/-10%R	5	By filter		
15	PM _{2.5}	0.01-100mg/M ³	-10-40	+/-10%R	5	By filter		
16	TVOC	0.01-1000ppm	-20-50	+/-5%	5	<5%	LNIR	® ®
17	TNB	0-25000CFU/NM ³				●Bacterium		
18	Radon	0-1000Bq/NM ³				●	√	
19	CH ₃ OH	0.05-50ppm	-20-50	<2%	5	<5%	LNIR	® ®
20	CH ₃ Br	0.25-10ppm	-20-35	<5%F	5	10%/m	LNIR	

Available Models

pGas4810Ha-OPL100-MP4-IAQ Parameters

P.No	Parameter	Range	Temp	Repeatability	Life /year	Drift/Y		-Pro	-VOC
1	T	-40-100°C		+/-0.2%	5		included	√	
2	RH	0-99%RH	-30-70	+/-2%R	5	<5%	included	√	
3	Air velocity	0.01-20m/s	-30-70	+/-10%R	5			√	
4	SO ₂	0.025-10/100ppm	-20-50	+/-2%R	5	<2%	LNIR	√	
5	NO ₂	0.01-10ppm	-10-40	+/-2%R	5	<5%	LNIR	√	
6	CO	0.1-500/1000ppm	-15-40	+/-2%R	5	<5%	LNIR	√	
7	CO ₂	2-2000ppm	-15-40	<+/-1%R	5	<5%	LNIR	√	
8	NH ₃	0.1-100ppm	-25-30	+/-10%R	5	<-10%	LNIR	®	®
9	O ₃	0.05-50ppm	-10-40	+/-5%	2	<4%	LNIR	®	®
10	HCHO	0.05-10.0ppm	-20-50	<2%	5		LNIR	®	®
11	C6H6	0.03-30ppm	-20-50	<2%	5		LNIR	®	®
12	C7H8	0.04-50ppm	-20-50	<2%	5		LNIR	®	®
13	C8H10	0.04-50ppm	-20-50	<2%	5		LNIR	®	®
14	B[a]P	0.015-1.5mg/NM ³	-10-40	<2%	5	<5%	LNIR	®	®
15	TSP	0.01-2/20mg/M ³	-10-40	+/-10%R	5		LS	√	
15	PM ₁₀	0.01-2/20mg/M ³	-10-40	+/-10%R	5		By filter		
15	PM _{2.5}	0.01-100mg/M ³	-10-40	+/-10%R	5		By filter		
16	TVOC	0.01-1000ppm	-20-50	+/-5%	5	<5%	LNIR	®	®
17	TNB	0-25000CFU/NM ³					●Bacterium		
18	Radon	0-1000Bq/NM ³					●	√	
19	CH ₃ OH	0.05-50ppm	-20-50	<2%	5	<5%	LNIR	®	®
20	CH ₃ Br	0.25-10ppm	-20-35	<5%F	5	10%/m	LNIR		

Table II. GB / T 18883—2002 < Indoor Air Quality Standards>

S.N.	Parameters	Unit	Standards		
1	Physical	Temperature	22—28	夏季空调	
a			16—24	冬季采暖	
2		Humidity	40—80	夏季空调	
a	30—60		冬季采暖		
3	Air velocity	M/s	0.3	夏季空调	
a			0.2	冬季采暖	
4	New air flow	M ³ / h.p	300	a	
5	Chemicals	SO ₂	mg / NM ³	0.50	1 小时均值
6		NO ₂	mg / NM ³	0.24	1 小时均值
7		CO	mg / NM ³	10	1 小时均值
8		CO ₂	%	0.10	日平均值
9		NH ₃	mg / NM ³	0.20	1 小时均值
10		O ₃	mg / NM ³	0.16	1 小时均值
11		HCHO	mg / NM ³	0.10	1 小时均值
12		C ₆ H ₆	mg / NM ³	0.11	1 小时均值
13		C ₇ H ₈	mg / NM ³	0.20	1 小时均值
14		C ₈ H ₁₀	mg / NM ³	0.20	1 小时均值
15		B(a)P	mg / NM ³	1.0	日平均值
16		PM ₁₀	mg / NM ³	0.15	日平均值
17		TVOC	mg / NM ³	0.60	8 小时均值
18	Microbial Contamination	TNB()	cfu / NM ³	2500	依据仪器定
19	Radioactivity	Radon 222Rn	Bq / NM ³	400	年平均值

Table III-1. - Emissions From Building Materials or Interior Furnishings

Material Typical Pollutants Emitted	
Adhesives	Alcohols
	Amines
	Benzene
	Decane
	Dimethylbenzene
	Formaldehyde
	Terpenes
	Toluene
	Xylenes
Caulking Compounds	Alcohols
	Alkanes
	Amines
	Benzene
	Diethylbenzene
	Formaldehyde
	Methylethylketone
Xylenes	
Carpeting	Alcohols

	Formaldehyde
	4-Methylethyl-benzene
	4-Phenylcyclohexene
	Styrene
Ceiling Tiles	Formaldehyde
Clipboard/Particle Board	Alcohols
	Alkanes
	Amines
	Benzene
	3-Carene
	Formaldehyde
	Terpenes
	Toluene
Floor and Wall Coverings	Acetates
	Alcohols
	Alkanes
	Amines
	Benzenes
	Formaldehyde
	Methyl styrene
	Xylenes
Paints, Stains & Varnishes	Acetates
	Acrylates
	Alcohols
	Alkanes
	Amines
	Benzenes
	Formaldehyde
	Limonene
	Polyurethane
	Toluene

Table III-2. - Emissions From Appliances, Office Equipment and Supplies(1)

Appliances	Carbon Monoxide
	Nitrogen Dioxide
	Sulfur Dioxide
	Polyaromatic hydrocarbons
Carbonless Copy Paper .	Chlorobiphenyl
	Cyclohexane
	Dibutylphthalate
	Formaldehyde
Computers/Video Display Terminals	n-Butanol
	2-Butanole

	2-Butoxyethanol
	Butyl-2-Methylpropyl phthalate
Computer/Video Display Terminals	Caprolactam
	Cresol
	Diisooctyl phthalate
	Dodecamethyl cyclosiloxane
	2-Ethoxyethyl acetate
	Ethylbenzene
	Hexanedioic acid
	3-Methylene-2-pentanone
	Ozone
	Phenol
	Phosphoric Acid
	Toluene
	Xylene
Duplicating Machines	Ethanol
	Methanol
	1,1,1-Trichloroethane
	Trichloroethylene
Electrophotographic Printers, Photocopiers & Related Supplies	Ammonia
	Benzaldehyde
	Benzene
	Butyl methacrylate
	Carbon black
	Cyclotrisiloxane
	Ethylbenzene
	Isopropanol
	Methylmethacrylate
	Nonanal
	Ozone
	Styrene
	Terpene
	Toluene
	1,1,1-Trichloroethane
	Trichloroethylene
	Xylenes
	Zinc stearate combustion Products
Microfiche Developers/Blueprint Machines	Ammonia
Preprinted Paper Forms.	Acetaldehyde
	Acetic Acid
	Acetone
	Acrolein
	Benzaldehyde

	Butanal
	1,5-Dimethylcyclopentene
	2-Ethyl furan
	Heptane
	Hexamethyl cyclosiloxane
	Hexanal
	4-Hydroxy-4-methyl pentanone
	Isopropanol
	Paper dust
	Propionaldehyde
	1,1,1-Trichloroethane
Typewriter Corrections Fluid.	Acetone
	1,1,1-Trichloroethane
Footnote(1) Source [Ex. 4-33]	

Table III-3. - Examples of Biologicals Found in Indoor Environments(1)

Class	Agent or Component	Origin
Arthropods and Insects	Whole organism, Body parts, feces	Furnishings, building materials, food
Microbes:		
Algae	Whole organism, cellular components	Outdoor air, HVAC (rare)
Bacteria	Whole organism, spores and cell walls, endotoxin	Stagnant water, floods, cooling towers, industrial processes
Fungi	Whole organism spores and hyphae toxins and volatiles	Moist surfaces, HVAC system, bird droppings, outdoor air
Protozoa	Whole organism cellular components	Water reservoirs, pets (rare)
Viruses	Whole organism	humans and pets (rare)
Pets	Skin, scales danders, urine, saliva, feces	Pets, pet litter, pet Cages, pet toys, pet bedding
Plants	Stems, leaves and pollens	Outdoor and indoor air
Footnote(1) Adapted from Ex. 4-33		

Table III-4. - Indoor Air Allergens Associated With Asthma(1)

Class	Typical examples
Animal:	
Avian	High and low molecular weight proteins from feathers and droppings
Canine and Feline	High and low molecular weight proteins from dander, saliva, and feces
Arthropods:	
Mites, Cockroaches,	Structural proteins, carbohydrates
Crickets and Moths	and metabolites
Dusts, Particulates and Fibers:	
Household	Pollens, fungi, danders and mites

Metal	Chromium, cobalt, nickel, platinum, and vanadium
Plant	Castor bean, coffee, cotton, flour, and grain
Wood	Oak, mahogany, redwood, red cedar
Chemical Volatiles and Dusts	Acrylates, amines, anhydrides, colophony, enzymes, epoxy resins, freon, furfuryl alcohol, resins, isocyanates, latex, organophosphates, polyvinyl chloride, vegetable gums
Microbes and Microbial Products:	
Bacteria \ Bacillus spp	
Fungi	Alternaria spp., Aspergillus spp., Botrytis spp., Cladosporium spp., Penicillium spp., Pullularia spp
Pollens	Agrostis spp., Alopecurus spp., Anthoxanthum spp. Cynosurus spp., Dactylis spp., Holcus spp., Lolium spp., Secale spp
Footnote(1) Source: [Ex. 4-33]	

Table III-5. Indoor Air Contaminants Associated With Hypersensitivity Pneumonitis(1)

Class	Typical Examples
Animals:	
Avian	High and low molecular weight proteins from feathers and droppings
Rodent	Low molecular weight proteins from urine and feces
Arthropods:	
Weevils	Sitophilus spp
Mites	Ascaris spp
Altered Host Proteins or Chemical Hapten-Carrier Conjugates	Amines, anhydrides, epoxy resins vegetable gums, and isocyanates
Microbes:	
Bacteria	Thermoactinomycetes spp., Bacillus spp
Fungi	Aspergillus spp., Auerobasillium spp., Cephalosporium spp., Penicillium spp
Organic Dusts & Particulates:	
Wood	Bark, Sawdust and Pollen
Grain	Arthropod- and microbially-contaminated grains and flours
Cleaning Products	Dust residues from carpet cleaning agents
Footnote(1) Source: Ex. 4-33	

Table III-6. - Vapor Phase Constituents of Tobacco Smoke and Related Health Effects

Constituent	Amount in MS	Ratio in SS/MS	Health Effects
Carbon monoxide	10-23 mg	2.5-4.7	Nervous system, cardiovascular system.(1)
Carbon dioxide	20-40 mg	8-11	Nervous system, cardiovascular system.(1)
Carbonyl sulfide	12-42 ug	0.03-0.13	Irritant, cardiovascular, and nervous systems.(1)
Benzene	12-48 ug	5-10	Known human carcinogen.(3)
Toluene	100-200 ug	5.6-8.3	Irritant, nervous system.(1)

Formaldehyde	70-100 ug	0.1 --50	Probable human carcinogen.(3)
Acrolein	60-100 ug	8-15	Irritant, pulmonary.(1)
Acetone	100-250 ug	2-5	Irritant.(1)
Pyridine	16-40 ug	6.5-20	Irritant, nervous system, liver, kidney.(1)
3-methylpyridine	12-36 ug	3-13	Irritant.(2)
3-vinylpyridine	11-30 ug	20-40	Irritant.(2)
Hydrogen cyanide	400-500 ug	0.1-0.25	Irritant, nervous, cardiovascular and pulmonary system.(1)
Hydrazine	32 ng	3	Probable human carcinogen.(3)
Ammonia	50-130 ug	3.7-5.1	Irritant.(1)
Methylamine	11.5-28.7 ug	4.2-6.4	Irritant.(1)
Dimethylamine	7.8-10 ug	3.7-5.1	Irritant
Nitrogen oxides	100-600 ug	4-10	Pulmonary and cardiovascular system.(1)
N-nitrosodi-menthylamine	10-40 ng	20-100	Probable human carcinogen.(3)
N-nitrodiethylamine	ND-25 ng	< 40	Probable human carcinogen.(3)
N-nitrosopyrrolidine	6-30 ng	6-30	Probable human carcinogen.(3)
Formic acid	210-490 ug	1.4-1.6	Irritant, skin, kidney, liver.(1)
Acetic acid	330-810 ug	1.9-3.6	Irritant.(1)
Methyl chloride	150-600 ug	1.7-3.3	Nervous system.(1)
1,3-butadiene	69.2 ug	3-6	Probable human carcinogen.(3)
Footnote(1) NIOSH Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services. Public Health Services, 1990. Ex. 4-238			
Footnote(2) Hazards in the Chemical Laboratory. Ed: L. Bretherick, The Royal Society of Chemistry, 1986. [Ex. 4-137]			
Footnote(3) EPA: Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders, 1992. [Ex. 4-311]			

Table III-7. - Particulate Phase Constituents of Tobacco Smoke and Related Health Effects

Constituent	Amount in MS	Ratio in SS/MS	Health Effects
Particulate matter contains di- and polycyclic aromatic hydrocarbon	15-40 mg	1.3-1.9	Animal carcinogen.(4)
Nicotine	1-2.5 mg	2.6-3.3	Nervous and cardiovascular system.(1)
Anatabine	2-20 ug	< 0.01-0.5	N/A.(5)
Phenol	60-140 ug	1.6-3.0	Irritant.(1)
Catechol	100-360 ug	0.6-0.9	Irritant.(3)
Hydroquinone	110-300 ug	0.7-0.9	N/A.(5)
Aniline	360 ng	30	Probable human carcinogen.(4)
2-Toluidine	160 ng	19	Irritant, cardiovascular system.(1)

2-Naphthylamine	1.7 ng	30	Known carcinogen. (4) human
4-Aminobiphenyl	4.6	31	Known carcinogen. (4) human
Benz[a]anthracene	20-70 ng	2-4	Animal carcinogen. (4)
Benzo[a]pyrene	20-40 ng	2.5-3.5	Probable human carcinogen. (4)
Cholesterol	22 ug	0.9	N/A. (5)
gamma-butyrolactone	10-22 ug	3.6-5.0	Animal carcinogen. (4)
Quinoline	0.5-2 ug	3-11	Irritant. (3)
Harman [1-methyl-9H-pyrido[3,4-b]-indole	1.7-3.1 ug	0.7-1.7	N/A. (5)
N-nitrosornicotine	200-3000 ng	0.5-3	Animal carcinogen. (4)
NNK [4-(N-methyl-N-nitrosamino)-1-(3-pyridyl)-1-butanone]	100-1000 ng	1-4	N/A. (5)
N-nitrosodiethanolamine	20-70 ng	1.2	Probable human carcinogen. (4)
Cadmium	110 ng	7.2	Probable human carcinogen. (4)
Nickel	20-80 ng	13-30	Known human carcinogen. (4)
Zinc	60 ng	6.7	Irritant, nausea, vomiting. (2)
Polonium-210	0.04-0.1 pC	1.04.0	Known human carcinogen. (4)
Benzoic acid	14-28 ug	0.67-0.95	Irritant.
Lactic acid	63-174 ug	0.5-0.7	Irritant. (3)
Glycolic acid	37-126 ug	0.60.95	Irritant. (2)
Succinic acid	110-140 ug	0.43-0.62	N/A. (5)
PCDD's and PCDF's(6)	1 pg	2	N/A. (5)
Footnote(1) NIOSH Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services. Public Health Services, 1990. Ex. 4-238.			
Footnote(2) The Merck Index, 10th Edition, Merck & Co., Inc., 1983. Ex. 4-220.			
Footnote(3) Hazards in the Chemical Laboratory. Ed: L. Bretherick, The Royal Society of Chemistry, 1986. [Ex. 4-137]			
Footnote(4) EPA: Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders, 1992. [Ex. 4-311]			
Footnote(5) N/A-Relevant information not available.			
Footnote(6) PCDDs-Polychlorinated dibenzo-p-dioxins; PCDFs-Polychlorinated dibenzofurans.			

Table III-10. Mean Nicotine Levels in Home and Workplace Air: Area Monitors(1)

Study and location	Sample	ug/m(3)	Comment
Leaderer and Hammond 1991, homes, NY State	47	2.17	7-day average smoking
Hammond [3-1096] Mass., industrial		24	9-hour average workshift (nonsmoker's air; smoking allowed on premises)

White collar	60	21.5	
Blue collar	123	8.9	
Food service	51	10.3	
Carson (1988), offices, Canada	31	11	Workday samples
Miesner (1989) workplaces, MA	11	6.6	Workweek average
Oldaker (1990), restaurants, NC	33	10.5	1-hour average (range)
Jenkins (1991), Knoxville, TN, metro			1-hour average
Restaurants	7	3.4	
Cocktail lounges	8	17.6	
Bowling alleys	4	10.7	
Gaming parlors	2	10.7	
Laundromats	3	2.0	
Airport gates	2	6.0	
Office	1	6.0	
Nagda (1989), U.S. Aircraft-in-flight average:			
All flights	69	13.4	Smoking section
Domestic	61	0.11	Nonsmoking section
International	8	0.33	Nonsmoking section.
Vaughn (1990), highrise office building	1	2.0	Nonsmoking air; 9-hour average
Footnote(1) Adapted from Repace and Lowrey 1993 [Ex. 4-263]			

Table III-11. - Nicotine in Nonsmokers' Air: Personal Monitors(1)

Study and Location	Sample	ug/m(3)	Comment
Schenker (1990), railroad clerks, NE	40	6.9	Workshift median
Coultas (1990), white collar, NM	15	20.4	Workshift mean +/- SD
Mattson (1989); flight attendants	4	4.7	4 flights, mean +/- SD
Footnote(1) Adapted from Repace and Lowrey 1993 [Ex. 4-263]			