

# PID Information

## VOCs and PID

VOCs are organic compounds characterized by a tendency to evaporate easily at room temperature with the potential of forming a toxic gas concentration. While some volatile organic compounds (VOCs) are acutely toxic at low concentrations, the harmful effects of most VOCs are delayed. Negative effects may occur long after the primary exposure thus many people ignore the potential danger. Long-term effects can include leukemia, memory problems, loss of hand-eye coordination, cancer, and a range of other physiological affects. Many personnel throughout the world are unprotected from VOCs in their daily work either because they are unaware of the toxic hazards, or because they are without a monitor that detects for these gas concentrations.

Most VOCs have surprisingly low occupational exposure limits. An increased awareness has resulted in several newly revised VOC exposure limits, including TLVs for diesel vapor, kerosene, and gasoline. Photoionization detectors (PIDs) are able to detect VOCs and large hydrocarbon molecules that are undetectable by catalytic and electrochemical sensors.

**PID equipped instruments are generally the best choice for measurement of VOCs at exposure limit concentrations.**

Substance	Ionization Energy	Detectable by
carbon monoxide	14.01	electrochemical sensor
hydrogen cyanide	13.60	electrochemical sensor
methane	12.98	combustible sensor
sulfur dioxide	12.32	electrochemical sensor
oxygen	12.08	O <sub>2</sub> sensor
chlorine	11.48	electrochemical sensor
chlorine dioxide	10.57	electrochemical sensor
hydrogen sulfide	10.46	electrochemical sensor
n-hexane	10.18	electrochemical sensor
ammonia	10.16	electrochemical sensor
hexane	10.13	combustible sensor
phosphine	9.87	electrochemical sensor
nitrogen dioxide	9.75	electrochemical sensor
acetone	9.69	—
benzene	9.25	—
butadiene	9.07	—
toluene	8.82	—

↑ detectable by 10.6 PID ↓

This table lists ten common VOCs, their lower explosive limit (LEL) concentration and their exposure limits per the UK OEL, NIOSH REL and ACGIH TLV. The table also identifies those contaminants (highlighted in dark gray) with toxic exposure limits lower than 5% LEL.

Contaminant	LEL (Vol%)	OSHA PEL	NIOSH REL	TLV	5% LEL in PPM
Acetone	2.5	1,000 ppm TWA	250 ppm TWA	500 ppm TWA 750 ppm STEL	1250 ppm
Diesel (No.2) vapor	0.6	None Listed	None Listed	15 ppm	300 ppm
Ethanol	3.3	1,000 ppm TWA	1000 ppm TWA	1000 ppm TWA	1,650 ppm
Gasoline	1.3	None Listed	None Listed	300 ppm TWA 500 ppm STEL	650 ppm
Hexane	1.1	500 ppm TWA	50 ppm TWA	50 ppm TWA	550 ppm
Isopropyl alcohol	2.0	400 ppm TWA	400 ppm TWA 500 ppm STEL	200 ppm TWA 400 ppm STEL	1000 ppm
Kerosene/Jet Fuels	0.7	None Listed	100 mg/M3 TWA (approx. 14.4 ppm)	200 mg/M3 TWA (approx. 29 ppm)	350 ppm
MEK	1.4	200 ppm TWA	200 ppm TWA 300 ppm STEL	200 ppm TWA 300 ppm STEL	700 ppm
Turpentine	0.8	100 ppm TWA	100 ppm TWA	20 ppm TWA	400 ppm
Xylenes (o, m & p isomers)	0.9-1.1	100 ppm TWA	100 ppm TWA 150 ppm STEL	100 ppm TWA 150 ppm STEL	450–550 ppm

*Toxic limits that exceed lower explosive limits (LEL)*

## VOCs and other gases detected by PID

Acetaldehyde	Dichloroethene, trans-1,2-	Indene	Oxirane
Acetic acid	Dichloroethylene, 1,1-	Iodine	Oxydiethanol 2,2-
Acetic Anhydride	Dichloroethylene 1,2-	iodoform	Pentan-2-one
Acetone	Dicyclopentadiene	iodomethane	Pentan-3-one
Acroliene	Diesel Fuel	Isoamyl acetate	Pentandione, 2,4-
Acrylic Acid	Diethyl ether	isobutane	Pentane, n-
Allyl alcohol	Diethyl sulphide	isobutanol	Phenol
Allyl chloride	Diethylamine	isobutyl acetate	Phenyl-2-propanone
Ammonia	Diethylaminoethanol, 2-	isobutyl acrylate	Phenyl propene, 2-
Ammonium chloride	Diethylaminopropylamine, 3-	Isobutylene	Phenyl-2,3-epoxypropyl ether
Amyl acetate, n-	Dihydrogen selenide	isobutyraldehyde	Phenylenediamine, p-
Amyl alcohol	Diisobutylene	Isocotane (Naphtha)	Phosphine
Aniline	Diisopropyl ether	Isocetyl alcohol	Picoline, 3-
Anisole	Diisopropylamine	Isopentane	Picric acid
Arsine	Diketene	Isophorone	Pinene, alpha
Asphalt, petroleum fumes	Dimethoxymethane	Isoprene	Pinene, beta
Benzaldehyde	Dimethyl benzene	Isopropanol	Piperidine
Benzenamene	Dimethyl disulphide	Isopropyl acetate	Piperylene
Benzene	Dimethyl ether	Isopropyl alcohol	Prop-2-yn-1-ol
Benzenethiol	Dimethyl formamide, N,N-	Isopropyl chloroformate	Propan-1-ol
Benzonitrile	Dimethyl phthalate	Isosafrole	Propan-2-ol
Benzyl alcohol	Dimethyl sulphide	Jet Fuel JP-4	Propane-1,2-diol, total
Benzyl chloride	Dimethylacetamide N,N-	Jet Fuel JP-5	Propene
Benzyl formate	Dimethylamine	Jet Fuel JP-8, Jet A1	Propionaldehyde
Biphenyl	Dimethylaminoethanol	Kerosene	Propionic acid
Bis (2,3-epoxypropyl) ether	Dimethylaniline, NN-	Ketene	Propyl acetate, n-
Bitumen, petroleum fumes	Dimethylbutyl acetate	n-Limonene	Propylene
Bromine	Dimethylethylamine, NN-	Maleic anhydride	Propylene oxide
Bromobenzene	Dimethylformamide	Mesitylene	Propyleneimine
Bromochloromethane	Dimethylheptan-4-one, 2,6-	Methacrylic acid	Pyridine
Bromoethane	Dimethylhydrazine, 1,1-	Methacrylonitrile	Pyridylamine 2-
Bromoethyl methyl ether, 2-	Dinitrobenzene, m-	Methoxyethanol, 2-	Pyrocatechol
Bromoform	Dinitrobenzene, p-	Methoxyethoxyethanol, 2-	Resorcinol
Bromopropane, 1-	Dinonyl phthalate	Methoxymethylethoxy-2-propanol	Safrole
Butadiene	Dioxane 1,2-	2-methoxy-1-methylethyl acetate	Styrene
Butadiene diepoxide, 1,3-	Dioxane 1,4-	(PGMEA thinners)	Terpinolene
Butan-2-one	Diphenyl ether	Methoxypropan-2-ol	Tert-butanol
Butane, n-	Diphenylamine	Methoxypropyl acetate	Tetrabromoethane, 1,1,2,2-
Butanol, 1-	Divinylbenzene	Methyl acetate	Tetracarbonylnickel
Buten-3-ol, 1-	Epichlorohydrin	Methyl acrylate	Tetrachloroethylene
Butene, 1-	Epoxypropyl isopropyl ether, 2,3-	Methyl bromide	Tetrachloronaphthalenes, all isomers
Butoxyethanol, 2-	Ethanal	Methyl ethyl ketone (MEK)	Tetraethyl orthosilicate
2-butoxyethyl acetate	Ethanol	Methyl isobutyl ketone (MIBK)	Tetrafluoroethylene
Butyl acetate, n-	Ethanolamine	Methyl isothiocyanate	Tetrahydrofuran
Butyl acrylate, n-	Ethoxyethanol, 2-	Methyl mercaptan	Tetrahydrothiophene
Butyl lactate	Ethyl (S)-(-)-lactate	Methyl methacrylate	Therminol
Butyl mercaptan	Ethyl acetate	Methyl oxirane	Thiophane
t-Butyl methyl ether (MTBE)	Ethyl alcohol	4-Methyl pentan-2-one	Toluene
Butylamine, 2-	Ethyl acrylate	1-Methyl-prop-2-ene	Toluene-2,4-diisocyanate
Butylamine, n-	Ethyl amine	Methyl n-propyl ketone (MPK)	Tributylamine
Camphene	Ethyl benzene	Methyl salicylate	Trichlorobenzene 1,2,4-
Carbon disulfide	Ethyl butyrate	Methyl sulphide	Trichloroethylene
Carbon tetrabromide	Ethyl chloroformate	Methyl t-butyl ether (MTBE)	Triethylamine
Chlorine dioxide	Ethyl formate	Methyl-2-propen-1-ol, 2-	Trimethylamine
Chloro-1,3-butadiene, 2-	Ethyl hexyl acrylate, 2-	Methyl-2-pyrrolidinone, N-	Trimethylbenzene mixtures
Chlorobenzene	Ethyl mercaptan	Methyl-5-hepten-2-one, 6-	Trimethylbenzene, 1,3,5-
Chloroethyl methyl ether, 2-	Ethylene	Methylamine	Trinitrotoluene 2,4,6-
Chlorotoluene, o-	Ethylene glycol	Methylbutan-1-ol, 3-	Turpentine
Chlorotoluene, p-	Ethylene oxide	Methylcyclohexane	TVOC
Chlorotrifluoroethylene	Ferrocene	Methylcyclohexanol, 4-	Undecane, n-
Cresol, m-	Formamide	Methylcyclohexanone 2-	Vinyl acetate
Cresol, o-	Furfural	Methylheptan-3-one, 5-	Vinyl bromide
Cresol, p-	Furfuryl alcohol	Methylhexan-2-one, 5-	Vinyl chloride
Crotonaldehyde	Gasoline vapors	Methylhydrazine	Vinylethylene
Cumene	Gasoline vapors 92 octane	Methyl-N-2,4, 6-tetranitroaniline, N-	Vinylidene chloride
Cyanamide	Glutaraldehyde	Methylpent-3-en-2-one, 4-	Vinyl-2-pyrrolidinone, 1-
Cyclohexane	Heptan-2-one	Methylpentan-2-ol, 4-	Xylene mixed isomers
Cyclohexanol	Heptan-3-one	Methylpentane-2,4-diol, 2-	Xylene, m-
Cyclohexanone	Heptane n-	Methylpropan-2-ol, 2-	Xylene, o-
Cyclohexene	Hexamethyldisilazane, 1,1,1,3,3,3-	Methylstyrene	Xylene, p-
Cyclohexylamine	Hexan-1-ol	Mineral spirits	Xylidine, all
Cyclopentane	Hexan-2-one	Monochlorobenzene	
Decane, n-	Hexane n-	Naphtha (iso-octane)	
Diacetone alcohol	Hexene, 1-	Naphthalene	
Dibromochloromethane	Hydrazine	Nitric oxide	
Dibromoethane 1,2-	Hydrogen peroxide	Nitroaniline 4-	
Dichloro-1-propene, 2,3-	Hydrogen sulfide	Nitrobenzene	
Dichloroacetylene	Hydroquinone	Nitrogen trichloride	
Dichlorobenzene o-	Hydroxypropyl acrylate 2-	Nonane, n-	
Dichloroethene, 1,1-	Iminodi(ethylamine) 2,2-	Octane, n-	
Dichloroethene, cis-1,2-	Iminodiethanol 2,2'	Octene, 1-	

Many other hazardous VOCs can be detected by photoionization detection that are not found on this list. Please contact the BW Regional Sales Manager in your area for specific chemicals or concerns.