Bascom-Turner Instruments

Overview, Safety Statement & Note on Response Factors

Catalytic Combustion Detector (CCD-201): Overview and Safety Statement

The CCD-201 is a field analytical leak detection instrument that may be used to test ambient air for Volatile Organic Compounds (VOCs) and thereby identify leaks. The CCD displays combustible gas in parts per million. Above a certain concentration (user selectable), it also notifies the user acoustically of the presence of combustible gas. The factory set acoustic threshold is ten parts per million (10 ppm).

These intrinsically safe instruments measure the concentration of combustible gases in air and give, more generally, an indication of the presence of combustible gases. When used by trained personnel, they constitute one element for assessing the safety, or lack thereof, of a particular atmosphere. However, they must not be relied upon by themselves for judging safety; all other significant factors must be taken into account.

The measured concentration refers only to the immediate vicinity of the probe – concentrations in a wider area may be significantly different. A trained technician should consider possible interferences and be aware that calibrated values are only valid in air. If other gases, including inert gases, such as carbon dioxide are present, the measurements may not be reliable. Finally, although there are built-in safeguards, a specific instrument may malfunction. It is therefore imperative that other safety indicators be taken into account.

WARNING: Each detector responds to the gases for which it was designed. Other toxic or dangerous gases may not be detected.

WARNING: Catalytic combustion sensors do not respond in inert or reducing atmospheres. They should not be used for detecting combustible dusts or mists.

Catalytic Combustion Detector (CCD-201): Note on Response Factors

The Bascom-Turner Instruments CCD-201 is a portable gas analyzing instrument for gas survey monitoring and leak detection. The CCD-201 is calibrated for one or more compounds, known as a “reference compound” (also referred to as a “target gas”) by the Environmental Protection Agency (EPA) [1]. For example, the reference compound that is typically used for this instrument is Methane, but other reference compounds may be used. The CCD-201 also responds to many other compounds, other than the reference compound, with differing levels of sensitivity. To adjust the analyzer reading from “ppm of Methane” to ppm another compound of interest, a correction factor – also known as a “response factor”[2] – must be applied to the reading. A table of measured response compounds and the predicted response factors for various compounds is provided. As per EPA Method 21 – Determination of Volatile Organic Compound Leaks Section 8.1.1.2, a compound with a response factor greater than 10 as compared to the reference compound should not be monitored with a CCD-201.

When using a response factor multiplier to correct a CCD-201 reading for a compound based on the reference compound measurement, simply multiply the reference compound measurement by the response factor for the

[1] Reference Compound: The VOC species selected as the instrument calibration basis for specification of the leak definition concentration. (For example, if a leak definition concentration is 10,000 ppm as methane, then any source emission that results in a local concentration that yields a meter reading of 10,000 on an instrument meter calibrated with methane would be classified as a leak. In this example, the leak definition concentration is 10,000 ppm and the reference compound is methane.). EPA Method 21 *Determination of Volatile Organic Compound Leaks,* Section 3.5 (August 2017)

[2] Response Factor: The ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation. EPA Method 21 *Determination of Volatile Organic Compound Leaks,* Section 3.6 (August 2017)

other compound. Typically, a response factor less than 1.0 indicates that the CCD-201 will give higher readings, whereas a response factor greater than 1.0 indicates that the CCD-201 will give lower readings.

Like an FID, PID or other type of analyzer, the CCD-201 will respond to many different compounds other than the reference compound calibrated for the measurement, producing a reading of all detectable compounds present. If a single compound is present, a single response factor can be applied. If a mixture of compounds is present, the CCD-201 will respond to all components of the mixture or stream and provide a total reading of all compounds present. If the composition of a mixed stream is known, a weighted average of response factors for the mixture can be calculated and applied.

This response factor table is intended to serve as a guide for the application of response factors for corrective purposes against the reference compound only, as discussed above. The CCD-201 is a measurement for leak detection only and is not a measurement that is to be relied upon for worker safety. The CCD-201 is a field analytical leak detection instrument based on a reference compound and/or a response factor, which is intended to locate and classify leaks only, and is not to be used as a direct measure of a mass emission rate for a compound at an individual source. As with other LDAR and Method 21 leak monitoring devices, these measurements are also limited to a specific area and for a small unit of time. Mass emission testing is based on different parameters, including but not limited to, the relevant space, worker time shifts and usage of a facility, taking into account background air and other inert gases as may be required by applicable health and safety standards.

Please understand that Volatile Organic Compounds (VOCs) can pose significant health and safety risks based on an individual's degree and length of exposure, and Bascom-Turner Instruments does not endorse nor accept liability for any issues associated with exposure to VOCs or other compounds. It is the responsibility of the user to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method with a CCD-201 or any other field monitoring device.[3]

[3] As set forth in EPA Method 21, field instruments used for leak detection pursuant to Method 21 may involve hazardous materials, operations and equipment. It is important that the user apply safety and health practices and determine any applicable regulatory limitations prior to use of the device. Several of the compounds that can be present and detected by the device could be irritating or corrosive (e.g., heptane), may be toxic (e.g., benzene) or could be a fire hazard. Compounds that could be present at a facility should be determined in consultation with the facility and appropriate safety precautions should be taken. EPA Method 21 *Determination of Volatile Organic Compound Leaks,* Section 5.0 (August 2017)

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Note: All CCD-201 response factors (CCD Rf) are calculated rather than experimentally verified, unless noted with "*". Compounds noted with "*" have been experimentally verified.

Chemical	MW	CCD Rf
Acetaldehyde	44.05	1.14
Acetic Acid	60.05	1.77
Acetic Anhydride	102.09	1.21
Acetoacetic acid	102.09	2.32
Acetone	58.08	0.85
Acetone cyanohydrin	85.11	0.83
Acetonitrile	41.05	1.02
Acetophenone	120.15	0.76
Acetylacetone	100.12	0.86
Acetylene	26.04	0.79
Acrolein	56.1	0.92
Acrylic Acid	72.06	1.24
Acrylonitrile	53.06	0.83
Adipic Acid	146.14	1.01
Allyl Alcohol	58.08	0.82
Allyl Chloride	76.53	1.01
Allylamine	57.09	0.72
Ammonia	17.03	2.16
Amyl Acetate	130.19	0.79
Amyl Alcohol	88.15	0.72
Amyl Chloride	106.59	0.79
Amylamine	87.16	0.71
Aniline	93.13	0.74
Benzene	78.11	0.65
Benzoyl Chloride	140.57	0.86
Benzyl Chloride	126.58	0.78
Butadiene 1,3-	54.1	0.61
Butane,i-	58.12	0.59
Butene, 1-	56.11	0.60
Butyl Acetate	116.16	0.76
Butyl Acrylate	128.17	0.75
Butyl Alcohol	74.12	0.70
Butyl Chloride	92.57	0.77
Butyl Formate	102.13	0.79
Butylamine	73.14	0.65

Butylbenzene	134.22	0.68
Butylene Oxide-1,2	72	0.70
Butyene-2	54.09	0.60
Butyraldehyde	72.11	0.71
Butyric Acid	88.11	0.86
Butyronitrile	69.11	0.68
Camphor	152.23	0.72
Carbon Disulfide	76.14	1.57
Carbon Monoxide	28.01	3.75
Chloroacetic Acid	94.5	2.67
Chlorobenzene	112.56	0.79
Chloroethanol	80.51	1.51
Cresol-m	108.14	0.72
Cresol-o	108.13	0.74
Crotonaldehyde	70.01	0.73
Cumene	120.19	0.67
Cyanogen	52.03	1.32
Cyclobutane	56.11	0.60
Cycloheptane	98.19	0.63
Cyclohexane	84.16	0.62
Cyclopentane	70.13	0.61
Cyclopropane	42.08	0.62
Decahydronaphthalene	138.25	0.67
Decane	142.28	0.67
Diacetone Alcohol	116.16	0.76
Dibutyl Ether	130.23	0.69
Dibutylamine	129.25	0.67
Dichlorobenzene-o	147	0.93
Dichlorobutadiene	122.98	
Dichloroethyl Ether	143.01	1.00
Dichloroethylene-1,2	97	1.81
Dichloropropene-2,3	110.97	1.17
Diethyl Amine	73.14	0.64
Diethyl Benzene-p	134.22	0.68
Diethyl Ether	74.12	0.69
Diethyl Ketone	86.13	0.70
Diethyl Peroxide	90.12	0.75
Diethylene Glycol Methyl Ether	120.15	0.83

Diethylene Glycol Monobutyl Ether	162.2	0.77
Diethylene Glycol Monobutyl Ether Acetate	204.3	0.82
Diethylene Triamine	103.17	0.75
Diethyl Pentane-3,3	128.26	0.65
Diisopropylamine	101.19	0.65
Dimethylamine	45.08	0.76
Dimethyl Sulfide	62.13	0.72
Dimethyl Sulfoxide	78.13	0.87
Dimethylbutane-2,2	86.18	0.61
Dimethylformamide	73.09	0.88
Dimethylhydrazine-1,1	60.1	0.79
Dimethylpentane-2,3	100.2	0.63
Dimethylpropane-2,2	72.16	0.60
Dioxane	88.11	0.81
Diphenyl Oxide	170.21	0.75
Divinyl Ether	70.1	0.71
Dodecane	170.33	0.70
Epichlorohydrin	92.53	1.10
Ethane*	30.07	0.77
Ethoxyethyl Acetate-2	132.16	0.85
Ethyl Acetate	88.11	0.83
Ethyl Acetoacetate	130.14	0.85
Ethyl Acrylate	100.12	0.79
Ethyl Alcohol	46.07	0.99
Ethyl Amine	45.08	0.78
Ethyl Chloride	64.51	1.13
Ethyl Formate	74.08	1.06
Ethyl Mercaptan	62.1	0.73
Ethyl Nitrite	75.1	1.28
Ethyl Propionate	102.13	0.78
Ethylbenzene	106.17	0.66
Ethylcyclobutane	84.16	0.61
Ethylcyclohexane	112.21	0.64
Ethylcyclopentane	98.19	0.63
Ethylene	28.1	0.75
Ethylenediamine	60.1	0.83
Ethylene Dichloride	98.96	1.61
Ethylene Glycol	62.1	1.33

Ethylene Glycol monobutyl ether	118.18	0.74
Ethylene glycol monoethyl ether acetate	132.16	0.84
Ethylene glycol monomethyl ether	76.1	1.04
Ethylene Oxide	44.05	1.02
Ethylenimine	43.07	0.83
Ethylhexanoic acid-2	144.21	0.75
Ethylhexanol-2	130.23	0.69
Ethylhexyl Acetate-2	172.27	0.77
Formaldehyde	30.031	2.03
Furfural	96.08	0.85
Glycol Diacetate	146.1	0.84
n-butane	58.1	0.70
n-heptane	100.2	0.66
n-Hexane*	86.18	0.67
Hexanone-3	100.16	0.73
Hydrazine	32.04	1.82
Hydrogen Cyanide	27.03	1.57
Hydrogen	1	0.70
Hydrogen Sulfide	34.08	2.25
Isoamyl Alcohol	88.14	0.72
Isobutyl Acetate	116.16	0.81
Isobutyl Alcohol	74.12	0.78
Isobutyl Chloride	92.57	0.82
Isobutyl Isobutyrate	144.24	0.79
Isobutyraldehyde	72.11	0.79
Isobutyric Acid	88.11	0.91
Isoheptane	100.2	0.66
Isooctane	114.23	0.67
Isopentane	72.2	0.64
Isophorone	138.21	0.75
Isoprene	68.12	0.65
Isopropyl Acetate	102.13	0.84
Iso-propanol*	60.1	0.78
Isopropyl Chloride	78.54	0.88
Isopropyl Ether	102.18	0.71
Maleic Anhydride	98.06	1.43
Mesityl Oxide	98.14	0.74
Methallyl Chloride	90.55	0.86

Methane*	16.04	1.00
Methyl Acetate	74.08	1.08
Methyl Acrylate	86.09	0.79
Methanol	32.04	1.59
Methyl Butyl Ketone	100.16	0.73
Methyl Chloride	50.49	1.86
Methyl Chloroacetate	108.52	1.44
Methyl Ether	46.07	0.93
Methyl Formate (Formic Acid)	60.05	1.60
Methyl Isobutyl Carbinol	102.17	0.72
Methyl Isobutyl Ketone	100.16	0.73
Methyl Isopropenyl Ketone	84.1	0.74
Methyl Mercaptan	48.11	0.91
Methyl Methacrylate	100.12	0.85
Methyl Propionate	88.11	0.89
Methyl Vinyl Ketone	70.09	0.77
Methyl-1 Butene-2	70.13	0.64
Methyl-2 Butanol-2	88.15	0.73
Methyl-5 Ethylpyridine-2	121.18	0.73
Methylal	76.09	0.89
Methylamine	31.06	1.04
Methylchloroform	133.4	1.58
Methylcyclohexane	98.19	0.66
Methylcyclopentane	84.16	0.65
Methylene Chloride	84.93	3.07
Methyl Ethyl Ether	60.1	0.74
Methyl Ethyl Ketone	72.11	0.70
Methylhydrazine	46.07	1.04
Methylpentane-2	86.18	0.65
Methylpentane-3	86.18	0.65
Methylpropene-2 (Isobutylene)	56.02	0.64
Methylpropyl Ketone	86.13	0.74
Morpholine	87.12	0.80
Naphthalene	128.17	0.72
Nicotine	162.24	0.77
Nitroethane	75.07	1.28
Nitromethane	61.04	2.20
Nitropropane-1	89.1	0.95

Nitropropane-2	89.1	0.96
nonane	128.26	0.68
n-octane	114.23	0.69
Paraldehyde	132.16	0.88
Pentane*	72.2	0.64
Pentanol-3	88.15	0.72
Pentene-1	70.13	0.64
Phenol	94.113	0.78
Phenylenediamine-o	108.14	0.78
Phthalic Anhydride	148.12	0.95
Propanal (Propionaldehyde)	58.08	1.00
Propane*	44.1	0.63
Propanoic Acid	74.08	1.13
Propiolactone-b (Acrylic Acid)	72.063	1.25
Propionic Anhydride	130.14	0.91
Propionic Nitrile	55.08	0.77
Propyl Alcohol	60.1	0.78
Propyl Amine	59.112	0.71
Propyl Chloride	78.54	0.88
Propyl Ether-n	102.18	0.71
Propyl Nitrate	105.09	1.05
Propylbenzene	120.2	0.70
Propylene Dichloride	112.99	1.12
Propene (propylene)	42.08	0.65
Propylene Glycol	76.095	0.95
Propylene Glycol Monoacrylate	130	0.83
Propylene Oxide	58.08	0.79
Propyne	40.064	0.66
Pyridine	79.1	0.75
Quinone	108.1	0.87
Resorcinol	110.11	0.87
Salicylic Acid	138.12	0.95
Styrene	104.15	0.69
Tetradecane	189.39	0.73
Tetrahydrofuran	72.107	0.75
Tetrahydrofurfuryl Alcohol	102.13	0.82
Tetramethyl Pentane-2,2,3,3	128.26	0.68
Toluene-2, 4-Diisocyanate	174.2	0.92

Toluene	92.14	0.69
Trichloroethylene	131.39	2.40
Triethyl Amine	101.19	0.79
Triethylene Glycol	150.17	0.96
Trimethyl Amine	59.112	0.69
Trimethyl-1-Pentane-2,4,4	112.21	0.67
Trimethylbenzene-1,2,4	120.19	0.70
Trimethylbutane	100.2	0.66
Trimethylpentane-2,2,4	114.23	0.67
Trioxane-sym	90.08	1.27
Vinyl Acetate	86.09	0.95
Vinyl Chloride	62.5	1.34
Vinyl Ethyl Ether	72.107	0.77
Vinyl Toluene	118.18	0.71
Vinylacetylene	52.075	0.66
Xylene	106.16	0.74