

# APPLICATION NOTE

# LD19-06



## VOCs measurement in the air

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MultiDetek2 ▲

The analysis of indoor/outdoor air quality is becoming an important part of our day-to-day priorities due to the increasing contaminant level caused by the industrial processes. The main contaminants to be controlled in the air are the VOCs (volatile organic compounds).

VOCs are human-made contaminants used and produced in the processing of product manufacturing as paints, adhesives, petroleum products, pharmaceuticals, and refrigerants. This includes emissions from automotive and industrial activity among other sources.

This classification includes different compound groups with various structural characteristics and chemical properties:

- ▶ **Halogenated hydrocarbons**
- ▶ **Aromatics**
- ▶ **Ketones**
- ▶ **Nitriles**
- ▶ **Acrylates**
- ▶ **Acetates**
- ▶ **Ethers**
- ▶ **Sulfides**

Many of these compounds contaminate our environment today. Acceptable exposure limits and regulations for the release of VOCs to the environment are provided by the EPA and other regulatory bodies.

The most common technique used to detect, identify and quantitate VOC is gas chromatography coupled with an FID (flame ionization detector).

## LDETEK SOLUTION

The MultiDetek2 compact GC, configured with one FID can offer multiple methods for the analysis of VOCs in the air. This document will show the most common configuration for the air quality monitoring.

The first channel having an injection valve and an arrangement of columns is used for the analysis of trace CH<sub>4</sub>, NMHC and THC. The second channel, having similar configuration of valve/column can be added for the analysis of BTEX when it is required. Both channels merge in the FID for the analysis of the components. The diaphragm valves, the columns and the detector are mounted in their respective isothermal heated area to maintain the temperature and the reading stable.

By default, the system comes with a choice of 2 pre-configured/calibrated methods:

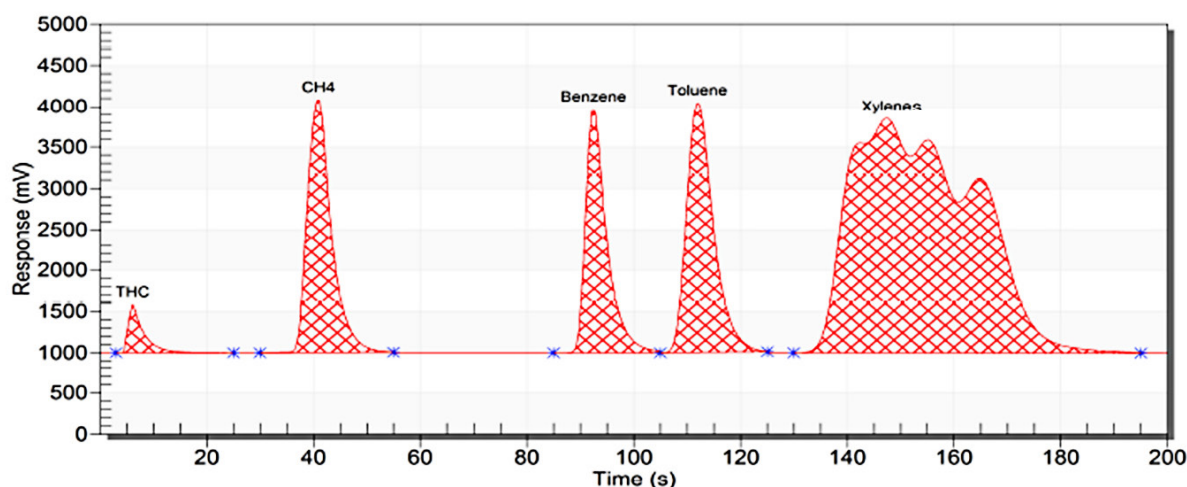
**Method 1** → *Trace CH<sub>4</sub>-NMHC-THC in the air*

**Method 2** → *Trace CH<sub>4</sub>-NMHC-THC-benzene-toluene-xylenes in the air*

## RESULTS

This chromatogram represents the method 2 analysis. It has been performed using a certified gas bottle containing 105mg/NM<sup>3</sup> CH<sub>4</sub>, 93.7mg/NM<sup>3</sup> benzene, 95.3mg/NM<sup>3</sup> toluene and 96mg/NM<sup>3</sup> xylenes in a balance of air. The response time for complete analysis of VOC + BTEX is below 4 minutes. The NMHC are calculated and offered when required. The results for the method 1 are the same, except that the measured impurities are CH<sub>4</sub>-NMHC-THC only. The analysis time is then reduced to 1 minute for the method 1.

PEAK	UNIT	CALIBRATION VALUE	_AREA COUNTS
CH <sub>4</sub>	mg/Nm <sup>3</sup>	105.00	15784
THC	mg/Nm <sup>3</sup>	105.00	1837
Benzene	mg/Nm <sup>3</sup>	93.70	13519
Toluene	mg/Nm <sup>3</sup>	95.30	17703
Xylenes	mg/Nm <sup>3</sup>	96.00	78188



## LIMIT OF DETECTION

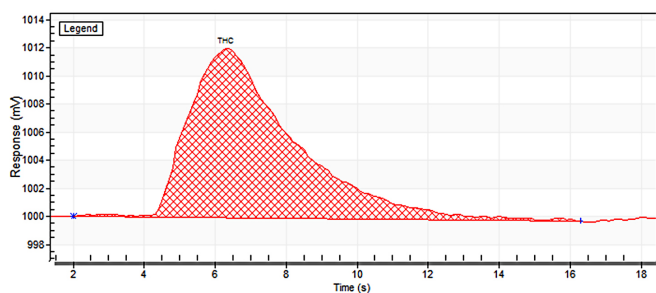
Running at low concentration, the ldl value is identified as being 3 times the noise level. Refer to the chromatograms and chart below.

COMPONENT	CONCENTRATION	PEAK HEIGHT	NOISE AVERAGE	LDL (3X NOISE)
THC	1.0mg/NM3	12mV	0.2mV	0.050mg/NM3
CH4	0.225mg/NM3	5.5mV	0.4mV	0.049mg/NM3
Benzene	0.332mg/NM3	7.5mV	0.3mV	0.040mg/NM3
Toluene	0.338mg/NM3	6.9mV	0.25mV	0.037mg/NM3
Xylenes	0.176mg/NM3	15mV	1.5mV	0.053mg/NM3

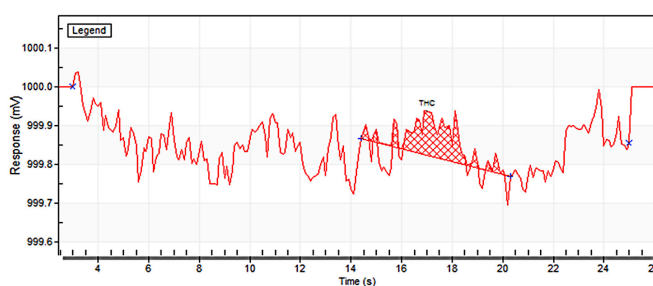
Note: other LDL could be obtained with different injection volume and chromatographic condition

### LOW CONCENTRATION CHROMATOGRAM

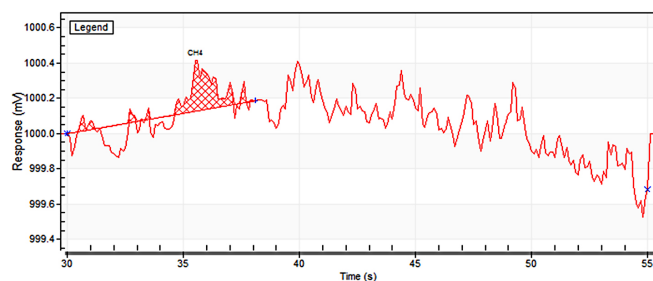
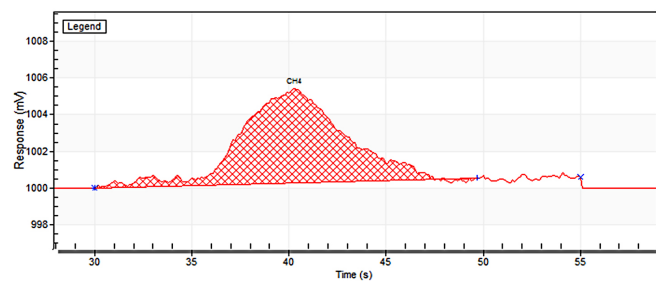
THC: 1.5mg/NM3



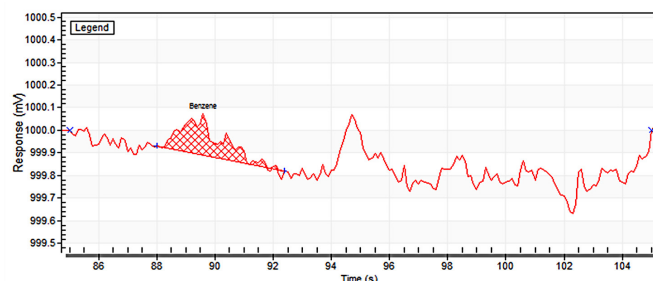
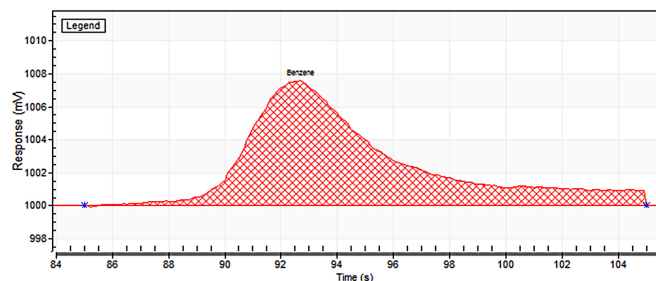
### NOISE BASELINE IDENTIFICATION



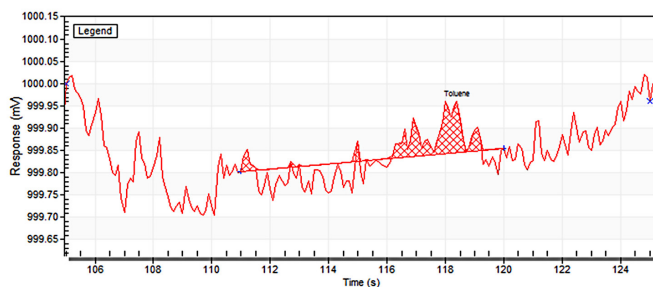
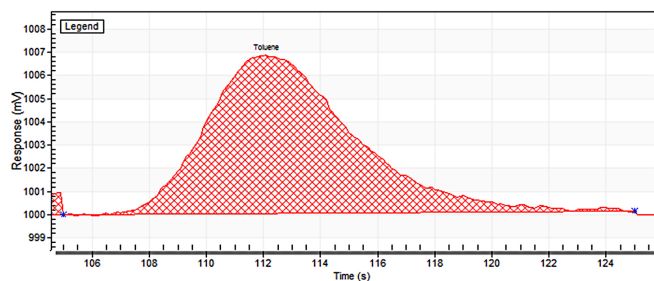
CH4: 0.225mg/NM3



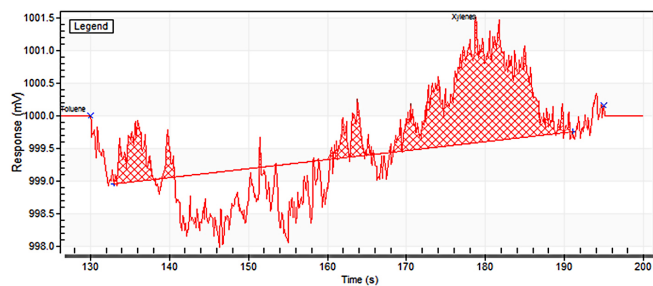
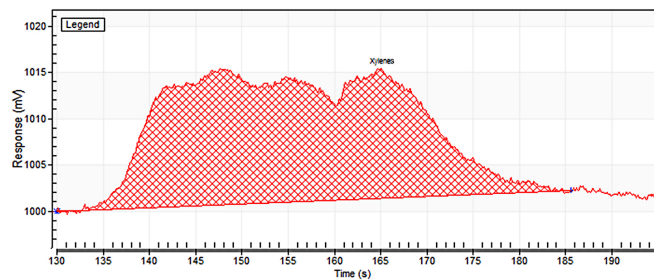
Benzene: 0.332mg/NM3



### Toluene: 0.338mg/NM3



### Xylenes: 0.576mg/NM3



## REPEATABILITY

A value of  $CV\% \times 3 < 5\%$  for a series of consecutive analysis at a fix concentration in a balance gas of air has to be performed. Refer to the charts below.

COMPONENTS	Repeatability (CV% x 3)
NMHC	0.59%
THC	0.58%
CH4	0.46%
Benzene	0.52%
Toluene	0.48%
Xylenes	0.23%

## ANALYSES

Start	NMHC	THC	CH4	Benzene	Toluene	Xylenes
2019-09-13 08:07	259.962 mg/Nm3	263.538 mg/Nm3	3.575 mg/Nm3	3.164 mg/Nm3	3.222 mg/Nm3	15.617 mg/Nm3
2019-09-13 08:03	258.758 mg/Nm3	262.330 mg/Nm3	3.572 mg/Nm3	3.166 mg/Nm3	3.221 mg/Nm3	15.607 mg/Nm3
2019-09-13 08:00	258.895 mg/Nm3	262.466 mg/Nm3	3.570 mg/Nm3	3.169 mg/Nm3	3.218 mg/Nm3	15.601 mg/Nm3
2019-09-13 07:56	258.861 mg/Nm3	262.427 mg/Nm3	3.566 mg/Nm3	3.174 mg/Nm3	3.216 mg/Nm3	15.584 mg/Nm3
2019-09-13 07:53	259.375 mg/Nm3	262.943 mg/Nm3	3.568 mg/Nm3	3.174 mg/Nm3	3.216 mg/Nm3	15.583 mg/Nm3
2019-09-13 07:50	259.759 mg/Nm3	263.328 mg/Nm3	3.569 mg/Nm3	3.177 mg/Nm3	3.211 mg/Nm3	15.594 mg/Nm3
2019-09-13 07:46	259.381 mg/Nm3	262.952 mg/Nm3	3.571 mg/Nm3	3.182 mg/Nm3	3.206 mg/Nm3	15.580 mg/Nm3
2019-09-13 07:43	259.111 mg/Nm3	262.681 mg/Nm3	3.570 mg/Nm3	3.190 mg/Nm3	3.207 mg/Nm3	15.571 mg/Nm3
2019-09-13 07:39	259.326 mg/Nm3	262.899 mg/Nm3	3.573 mg/Nm3	3.190 mg/Nm3	3.209 mg/Nm3	15.561 mg/Nm3
2019-09-13 07:36	258.653 mg/Nm3	262.222 mg/Nm3	3.568 mg/Nm3	3.189 mg/Nm3	3.207 mg/Nm3	15.559 mg/Nm3

Model : MultiDetek2  
 Serial Number : MD2-67719  
 Method : VOC + BTEX

## CONCLUSION

Using our MultiDetek2 GC combined with our FID, the air quality monitoring can be performed quickly using the well-known international standards for the detection of VOCs. The unit design is compact, robust and offering all the standard industrial communication protocols.



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