TUV test report (reference document DIN 33963 1-2)

Please find enclosed this official document on the TUV test report and some comments and explanations about the procedures.

Study report on the air monitoring instrument for benzene, toluene, Ethylbenzene, m.p., xylene and o-xylene, airmoBTX 1000.

The **RWTÜV**, institute Essen is a private service contractor in the metrology market. It is registered by the German government as one out of several institutes which are authorized to certify instrumentation for the use of ambient air quality control.

The approval of the airmoBTX 1000 has been pronounced by the **LAI** which is a committee of the German government; it has been published in the official newspaper of the German government in 1996 (**GMBl** " Gemeinsames Bundesministerialblatt").

*Below the translation of the main principles of this GMBI on the **Benzene** and the **AirmoBTX for benzene:***

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*5. **BENZENE***

This TUV is in accordance with the DIN norm 33963 – 2 :

Measurement of organic compounds in ambient air – Part 2: Basic requirements and testing instructions for automated single cycle measuring instruments for benzene in air with concentrating sampling followed by gas chromatographic separation.

5.1 : Airmo BTX for benzene

6. Instrument to measure several compounds: in accordance with the DIN norm: 33963-1:

Measurement of organic compounds in ambient air – Part 1: Requirements and testing instructions for automated single cycle measuring instruments for organic components in air.

*6.1 Test report for **toluene, ethylbenzene, m-p-xylene and o-xylene***

Note: be careful: Moisture has an effect on ethylbenzene and xylene measurement during the analysis and the calibration.

The decision of the **LAI** is based on the detailed report of both the laboratory and the field test done with two units of the airmoBTX 1000. Both the test and the report have been issued by the **RWTÜV**, institute Essen.

All the test procedure has been executed in compliance with the two **DIN norms #33963**, part I and II. These norms have been draft version at that period of time; they are official norms now since about two years.

The national reference method as demanded by the LAI and used during the test of the aimoBTX 1000 is : **VDI norm # 3482**

Over the study report on the air monitoring instrument AirmoBTX 1000, a procedure detailed in the following VDI directives has been carried out.

VDI directive 3482, sheet 1: "Measurement of gas pollution in ambient air *–Monitoring extra components* of organic compounds". Basis of the provision on the gaschromatography, feb.86 and

VDI directive 3482, sheet 4: "Measurement of gas pollution in ambient air". Provision on the gaschromatography of the organic compounds with capillary columns. Sampling with a active coal enrichment. Desorption with solvent, Nov. 84.

VDI directive 3482, sheet 5 "Measurement of gas pollution in ambient air"; gaschromatographic provision of aromatic hydrocarbon : sampling with active coal enrichment- desorption with solvent, Nov 84.

The analysis of sampling references was implemented on the benzene, toluene, ethylbenzene, m.p. xylene and o-xylene concentration in the RWTÜV laboratory.

Our instrument :

AirmoBTX is the only instrument certified for five compounds (benzene, toluene, ethylbenzene, m-p xylene and o-xylene). Both for fix and mobil operations.

- This instrument is Swiss quality made (airmotec) manufactured in France

- It has been sold over 150 units all over the world and mainly in European networks (Germany, France, Austria, Switzerland, UK, Spain…).

- This instrument is very rugged and easy to use, to install (half a day or one day maximum) and easy to maintain (two to four maintenance visits per year).

- Depending on the service done, the working time (per year) of the instrument is usually between 90% and 99% that is to say that the instrument doesn't give any result for a period between a month and 4 days in the year including the maintenance time and different problems that can be encountered !

- Chromato-Sud /Airmotec has a strong and long experience : we are focused on BTEX and VOC monitors in ambient air (urban air) since more than 12 years and we are able to provide service and spare parts, commissioning our instruments all over the world and they are not specialist of GC instruments.

- We provide with our instrument a very powerful software (in English) called VISTACHROM that runs under Windows 95 or 98 and that allow many possibilities : to master a calibration unit (option) to run zero or calibration and analysis, to provide complete trends on concentration, retention times, averages depending on time scale…

- We propose you (as an option) a very powerful system which is a modem and a software called PC anywhere that allow us to have the remote control of the instrument wherever in the world at any time and so to give immediate support to you and/or to the customer by our specialist (after sales engineer, software engineer, application chemist…).

- A typical configuration include :

the instrument airmoBTEX
the H_2 generator or cylinder to be provided from the customer.
the calibration unit with permeation tubes (3 tubes are enough) or calibration cylinder.
the modem and software for immediate support.
the spare parts for year operation.

Approval of airmoBTX 1000 EQUIPMENT

airmoBTX 1000 Monitors are approved to **DIN 33 963 (part 1 and 2) standard. Testing was done by RWTÜV**

Test according with Standard DIN 33963-1/-2 for Benzene

Subject	Limits according to DIN	airmoBTX 1000 Measured values	In limits
Performance (given reference value of 10 µg/m3 benzene)			
Dynamic range	at least from 0.1 to 30 times the reference value	0, 13 to 383 µg/m^3 0, X to 105 ppb	yes
Linearity over the dynamic range concentration : ⇒ at the reference value ⇒ at highest	 +- 2, 5% not defined	 < 2 ,0% < 1, 5%	yes
Standard deviation of two instruments at reference value	not defined	< 0, 2µg/m^3	yes
Detection limits	10% of reference value (10µg/m^3 benzene)	0, 16µgm^3	yes
Stability of airmoBTX with external temperature changes ⇒ sensibility ⇒ zero point	Range from +5 to 35°C <+-5% <+-5%	 < 3,4% < 1, 2%	 yes yes
Stability of (reproducibility) Sensibility ⇒ over 24 hours ⇒ over 14 days zero point ⇒ over 24 hours ⇒ over 14 days	 <+-5% <+-10% <+-5% <+-10%	 < 0, 12% < 1, 6% +-0, 0% +-0, 0%	 yes yes yes yes
Interference towards other compounds : water as humidity (20%/80%) ozone and organic mixture (no.1) ozone and organic mixture (no.1)	at reference concentration / at 0,0µg/m^3 <+-5% / <+-5% <+-10% / <+-10% <+-10% / <+-10%	at reference concentration / at 0, 0µg/m^3 < 4, 16% / <+-0, 0% < 8, 02% / <+-0, 0% < 8, 54% / <+-0, 0%	 yes yes yes
Set up time (from switch on to running mode)	30 min (in Germany)	<< 15 min	yes
Memory of materials of the sampling path while concentration changes from 300 to 0 µg/m3	first value : 2 µg/m^3 second value : 1µg/m^3	0,9 µg/m^3 0,7 µg/m^3	yes yes
Endurance of all consumable (Gas, memory space)	14 days	6 weeks	yes
Time interval for service	3 months	6 months	yes
Power consumption ⇒ mean ⇒ peak	 max.500 VA max. 1000 VA	 60 VA 160 VA	 yes yes
Availability in field measurements	80%	99%	yes