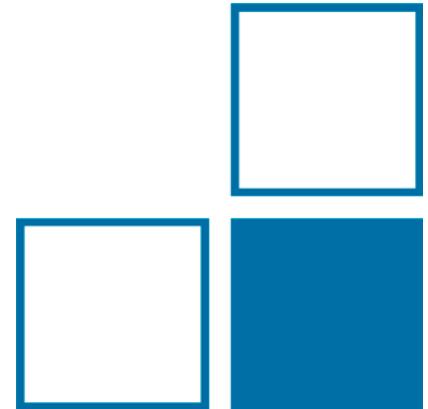


# **„Evidential“ breath alcohol analyzer**

OIML R 126 as basis for defining evidential

Regina Klüß



According to OIML R 126 an

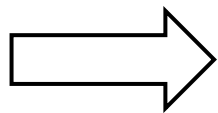
**Evidential Breath Alcohol Analyzer is**

„an instrument that measures and displays the breath alcohol mass concentration of exhaled human breath within specified error limits“

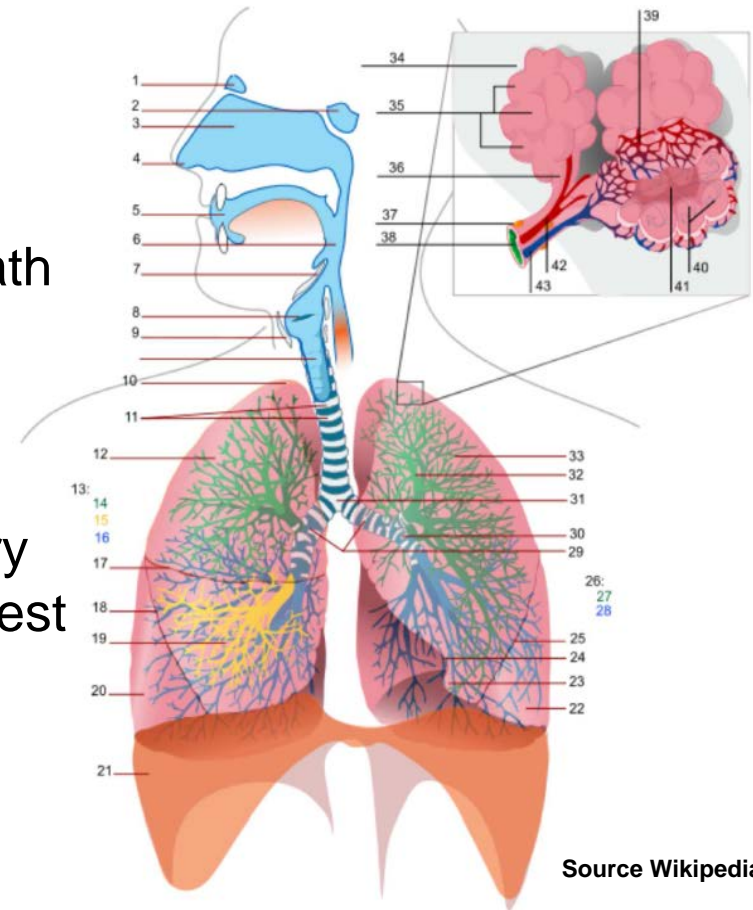
“Evidential Breath alcohol analyzers (EBA) are used worldwide in professional applications like law enforcement, promotion of traffic safety and work safety. Test results may lead to severe consequences for everybody involved. Therefore, the test results shall be reliable and acceptable.”

# 1) What is breath in this context

- In the alveoli of the lung, blood and breath are in close contact, equilibria will be established for all gases and volatile substances present
- inhaled breath → oxygen → blood
- blood → CO<sub>2</sub> and alcohol → exhaled breath
- In the upper part of the respiratory tract (anatomical dead volume), no exchange between blood and breath takes place
- For a correct measurement, it is necessary to get deep-lung air (alveolar air) for the test



**Minimum volume per breath sample necessary**



Source Wikipedia

## 2) What is meant exactly by alcohol?

- Depending on the legislation, driving under the influence of alcohol could be restricted to only ethanol or rather open to the class of drinking alcohols, which includes ethanol together with by-products of the fermentation process like methanol or isopropanol.
- OIML R 126 concentrates only on ethanol – other alcohols are considered as interfering substances and their influence, if any, has to be detected by the instrument
- Interfering substances according to OIML R126 (2012):
  - Acetone
  - Methanol
  - Isopropanol
  - Carbon monoxide

National Authorities might add additional substance, e.g solvents like Toluene or Diethylether to this list.

There is an ongoing discussion within the OIML-project group to reintroduce some of the list of 1998



### 3) What is a reliable measurement?

A reliable measurement shall be:

- correct with defined limits
- repeatable
- not influenced by:
  - Environmental conditions
  - Manipulation attempts



To achieve this, both aspects of a measurement have to be taken into account:

- - The measuring instrument
- - the breath sample/ person to be measured

## 4) reliable instrument

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For an reliable measurement, the most important requirements on an evidential breath analyzer are:

- measurement stability for a defined period (drift)
- repeatability of measurement results
- correct with the mpes over the complete measuring range
- Insensitivity to storage conditions
- sensors should be specific to alcohol
- Protected against manipulation of hard- and software

These basic requirements are defined in the OIML R 126.

In many countries the national requirements for evidential breath analysers are equal to this recommendation.

## 5) reliable breath sample

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For an reliable measurement, also a good breath sample is vitally important :

The breath sample should be:

- taken from deep lung air
- Shall not be manipulated by breathing techniques (panting, holding the breath)
- Shall not be influenced by other substances
- Shall be taken when the subject is in the period of alcohol depletion

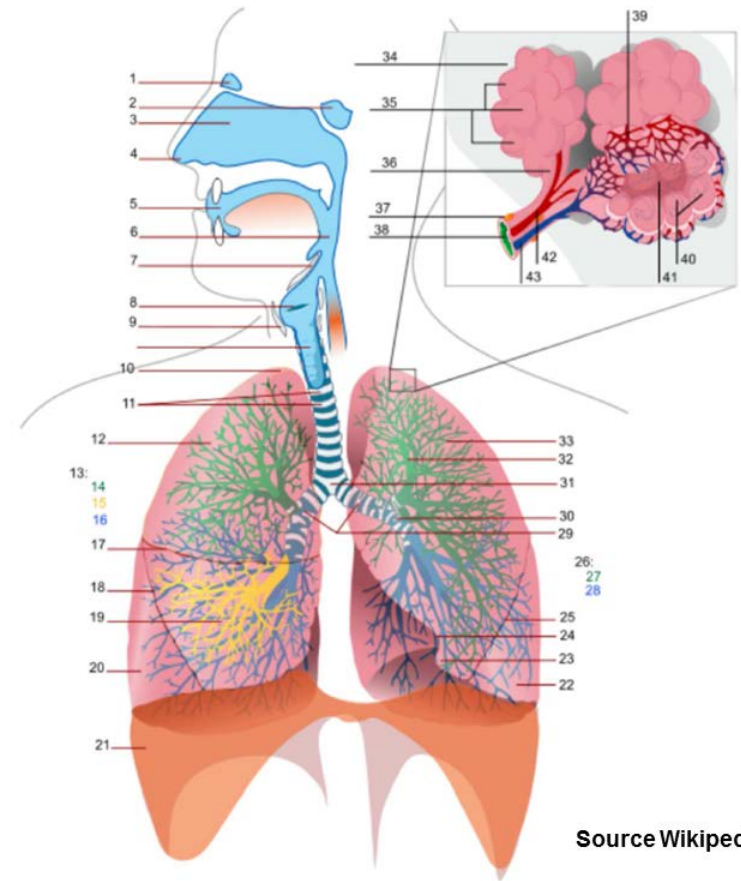
Since it is not possible to standardize a human being, the actual breath sample will always be influence in one way or another.

To minimize this, the following rules should be considered:

## 5) Reliable breath sample – alveolar air

The breath sample should be taken from deep lung air:

- The so-called “dead anatomical volume” is formed by the volume of mouth, throat and trachea
- Exchange of gases between blood and breath happens deep down in the lung in the alveoli
- To achieve a valid breath sample, first the dead anatomical volume has to be discarded to get a breath sample which alcohol content is in equilibrium with the blood



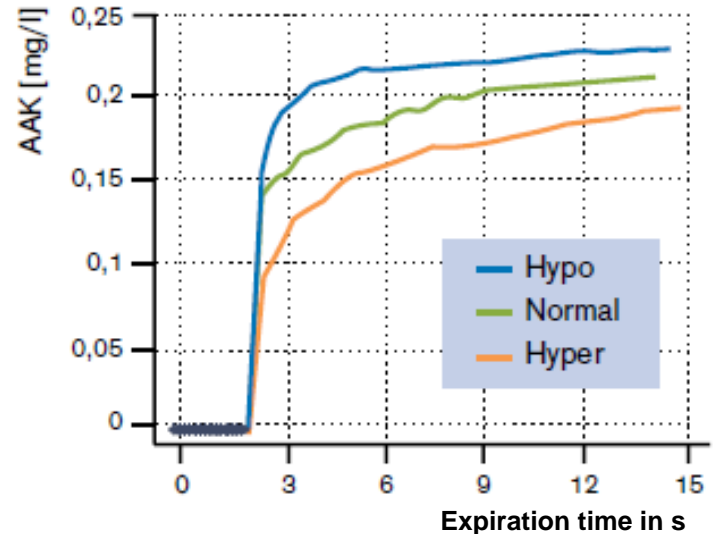
Source Wikipedia



The breath sample should not be manipulated by breathing techniques:

The commonly known breathing techniques have two effects:

- forced interchange of breath
- cooling of the upper respiratory tract
- These effects have no influence on the alcohol concentration in the blood but can influence the breath measurement



Countermeasures:

- Demanding a minimum volume of 1 L or more, with the actual measurement of alcohol at the end of the sample  
→ the subject is forced to blow intensely, the effects of the techniques will be minimized
- Monitoring of the flow by the instrument will prevent short breaks in between
- Supervising the blowing and stopping any attempts of manipulating the breath

Without temperature correction  
(source: FH Gießen-Friedberg)

The breath sample should be shall not be influenced by other substances e.g.:

- Interfering substances from the beverage, the human metabolism or the environment:  
→ these shall be covered by the measurement technique of the instrument
- Mouth rest alcohol: (effect only shortly after drinking of raising the alcohol content of the breath)  
→ this shall be covered by the measurement techniques of the instrument;  
Alternatively, a supervision time of at least 10 minutes before the measurement will give this effect time to disappear
- Interfering substances from cigarettes, candies, chewing gums, mouth wash, regurgitation, ...  
→ it has to be ensured by the supervising person that the subject doesn't put anything in its mouth (smoking, eating, drinking, taking medicine) in front of the measurement (10 min supervision recommended)

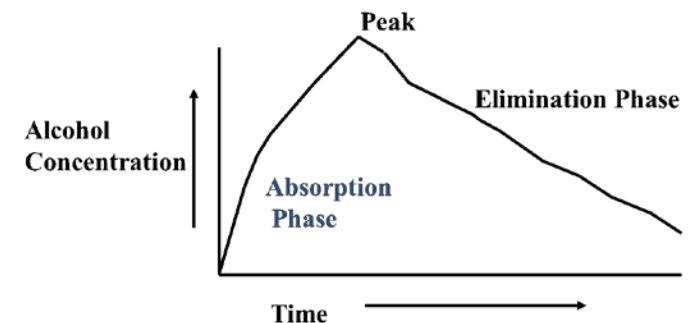
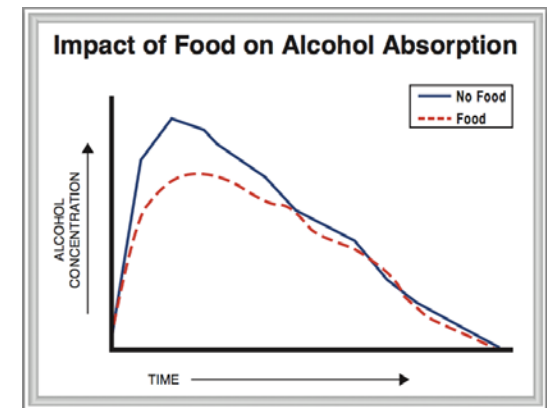
## 5) Reliable breath sample –time after drinking

The breath sample should best be taken when the subject is in the period of alcohol elimination:

The alcohol takes some time to get absorbed from the stomach, so directly after stop drinking, the alcohol level in the blood is still rising,

It would not be sensible to measure directly after catching the subject since you only have the statement of the subject of how much drinks and when

- decision of the supervising person to decide if a subject is ready to be measured, many countries demand a supervising time before an evidential measurement (e.g. 20 min)
- some countries require 2 measurements shortly after another to check if the alcohol concentration is rising or rather stable



## 6) conclusion

An evidential measurement means:

A measurement that can be trusted by the court that it was a trustworthy measurement made with

- a reliable instrument
- a representative breath sample
- which is not influenced neither by the instrument nor by the subject



So, not only the technical equipment is important, also the supervising person should be trained to be able to take a representative breath sample!



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