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TRACE-GAS NH_3 analyzer

(LAS - Laser Absorption Spectroscopy)

Example: NH_3 slip SCR

The TRACE-GAS NH_3 analyzer combines reliability, fast response and easy handling in one instrument. Developed for a calibration-free and direct measurement of NH_3 e.g. at the SCR or SCR Sensor development.

+ no cross sensitivities

+ low adsorption effects

+ no calibration required

- hot, extractive measurement
- no formation of condensate
- selective continuous real-time measurement
- quick response
- low detection limit
- nearly maintenance-free
- long life span
- resistant to chemicals
- long term signal stability
- no consumables required

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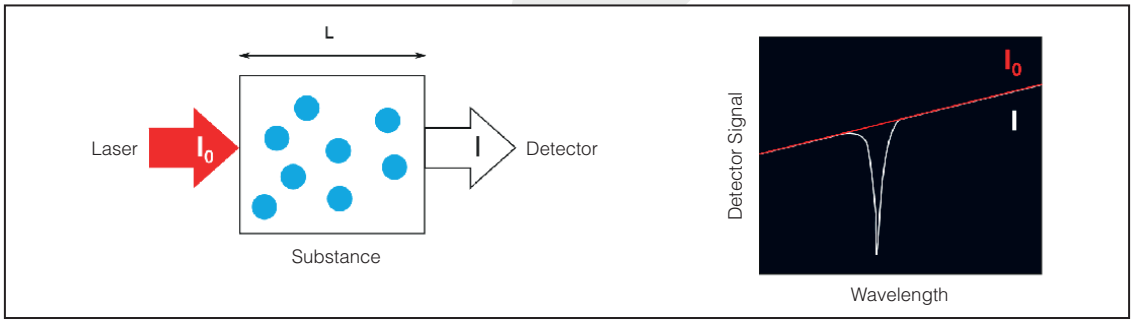
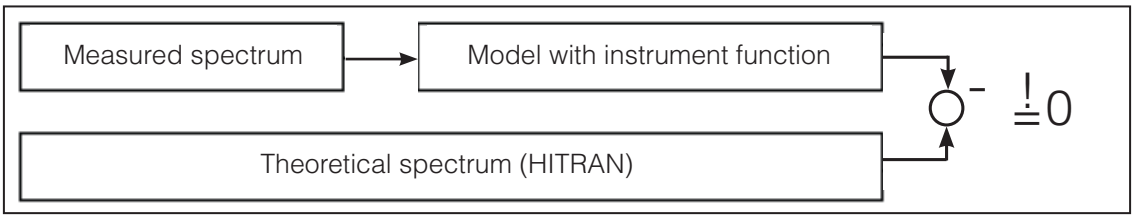
The smart and calibration-free measuring method for NH_3

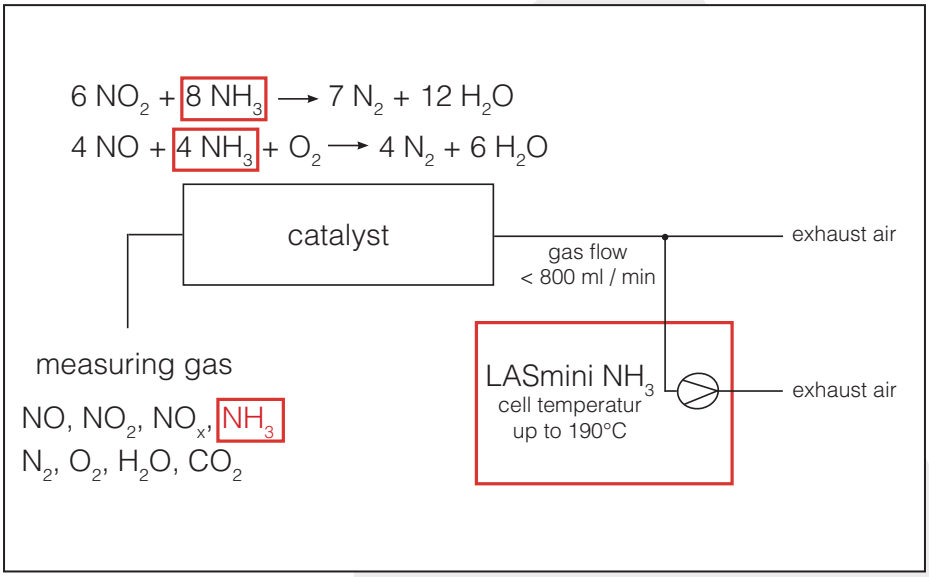
The highly precise LAS (Laser Absorption Spectroscopy) measurement principle is based on absorption of specific light wavelengths by molecules to be detected. The infrared laser is tunable to 1/1,000 wave numbers and long-term stabilized to the corresponding absorption wavelengths. The determination of the concentration follows the Lambert-Beer's light absorption law, evaluating the relation between intensity of transmitted (I) to incident light (I_0) at the detector. The method is not subjected to drift and insensitive to pollution.



The measured spectrum and the model for the instrument function are compared with the HITRAN database containing the theoretical absorption spectrum of NH_3. The analysis algorithm continuously verifies the absence of divergences and ensures a correct measurement.



If the measured spectrum ever differs from the theoretical spectrum, the system issues a warning. In this situation users can visually inspect the absorption spectrum to discover the reason fast.



The exact measurement of ammonia (NH_3) is of particular importance in the development of catalysts (SCR) or their sensors. The coordination of catalyst efficiency and consumables is reflected in the ammonia slip, which is continuously determined in the hot measuring gas.

Benefits at a glance

Direct physical measurement

Selective and continuous measurement of the concentration from the spectrum in MID-IR range.

> Real spectroscopy (no measurement of auxiliary parameters)

> Quantum Cascade Laser (QCL) used to achieve the best possible performance

Calibration-free and physically traceable

No regular calibration of the end point is required, since the measurement is exclusively based on Lambert-Beer's light absorption law and the HITRAN database. As influences of other parameters are absent, the measurement is calibration-free and physically traceable.

> Time-consuming calibration procedures are not necessary

No cross sensitivities

The narrow-band tunable laser source ensures highest selectivity for NH_3. A plausibility check of the transmission spectrum is continuously running, profiting from a smart algorithm. Misinterpretation of the results is prevented.

> Selective measurement of NH_3 in every operating state

> Divergencies are reliably detected and users are informed by means of a warning

No condensation, fast response time, low adsorption effects

As the pressure and temperature stabilized measuring chamber is kept in vacuum state, it is (thanks to the correspondingly lowered dew-point) protected from formation of condensate. The high (adjustable) flow, together with the vacuum, enables a fast response time and reduces adsorption and delay effects to a minimum.

Operation without consumables

No calibration gas, chemical substances or exchange of service parts required.

> Minimal operating costs

Hot measurement (raw gas)

> Hot measurement of raw gas up to 190°C, eliminating the need for a cost-intensive dilution unit

	LASmini (hot)
Technical data	
Ambient temperature	10...35 °C (non condensing)
Inlet pressure	800...1,100 mbar
Gas flow	≤ 0.8 l/min
Communication	Modbus TCP/IP + Analog output 4...20 mA
Dimensions (L x W x H)	520 x 485 x 190 mm
Weight	approx. 15 kg
Supply voltage	100 - 240 V AC / 50 - 60 Hz
User Interface	7“ LCD (capacitive touch)

Specifications		
Measuring range (FS)	**min.**	0...300 ppm
	max.	0...1,000 ppm
Limit of detection (LOD)[1] @ t_{10}-t_{90} ≤ 10 s		≤ 0.15 ppm (3σ, 100s)
Linearity (greater of)		≤ ± 0.75 ppm or ≤ ± 0.5 % of MV[2]
Zero drift		≤ ± 0.15 ppm in 10 h
Span drift		≤ ± 0.5 % FS in 10 h

[1]specified for constant ambient temperature, flow and inlet pressure
[2]measured value

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