



BOSCH

Invented for life

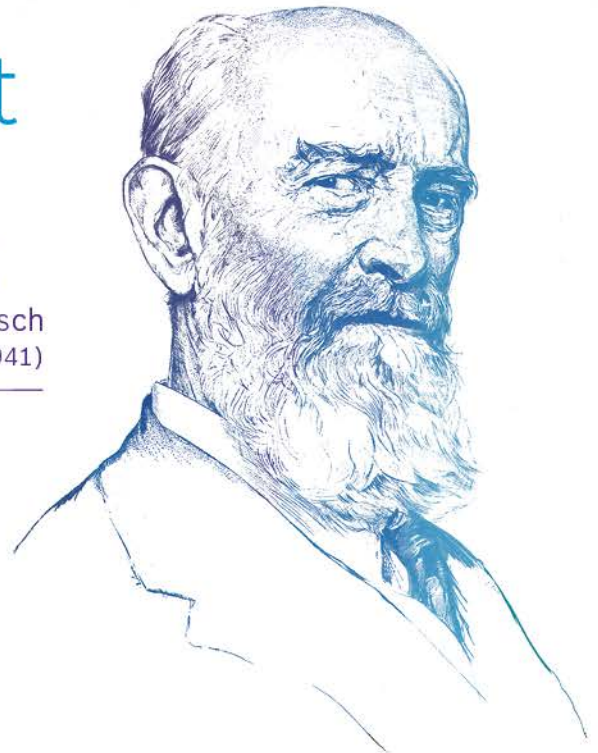


for *vivatmo*

Small victories
make a big difference.

What sets us apart

“It is inherent to the nature of medicine that its greatest concern is to cure suffering and, where this is not possible, to alleviate pain.” Robert Bosch (1941)



Bosch Healthcare Solutions: Our vision and competencies

With products and services that are “Invented for life”, Bosch Healthcare creates solutions that significantly improve the world we live in. Our high level of technological expertise makes us a preferred partner in the international marketplace. We build our products and services exclusively and consistently on the core competencies of the Bosch Group. These include sensor and microsystem technology, miniaturization and automation, smart networking and algorithms, innovative services, and the manufacturing of high-precision, complex products. Bosch quality, developed and made in Germany.

Asthma

Airway inflammation can affect anybody at any age – and this is especially true for asthma. Difficulty with breathing, coughing at night, shortness of breath and tightness in the chest are typical symptoms that sufferers experience on the long road to an effective therapy. Asthma is one of the most prevalent chronic diseases worldwide. Asthma control in clinical practice is often poor even though therapies are available. Insufficient asthma control is associated with an increased risk of exacerbation, impaired quality of life, increased healthcare utilization and reduced productivity.

“The goal of good asthma therapy is that the patient, in spite of the illness and with medication in the lowest possible dose, can do everything that a non-asthmatic individual can do. In other words: to live a normal life.”

Prof. Dr. med. Herth,
University of Heidelberg, Germany¹

Each year, **250,000** people **worldwide die** of asthma

10% of children and **5%** of adults have asthma*

Among **children asthma** is the most **common chronic disease**

in **80%** of cases*, **allergies** are the primary **cause of asthma**

Roughly **330 million** people have asthma 

45% remain uncontrolled in spite of long-term therapy 

By 2025, an additional **100 million** people are expected to have developed asthma

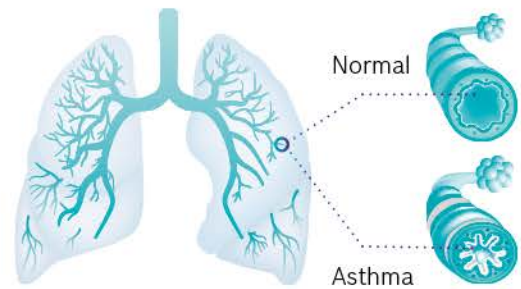
and **75%** report negative impact on their working productivity 

FeNO measurement

An inflammatory marker in exhaled breath

Nitric oxide (NO) is recognized as a biological mediator, which is also produced in the bronchia by the human lung and is present in the exhaled breath. It has been implicated in the pathophysiology of lung diseases, including asthma. Asthma research has revealed that higher-than-normal levels of NO are released from epithelial cells during eosinophilic airway inflammation.

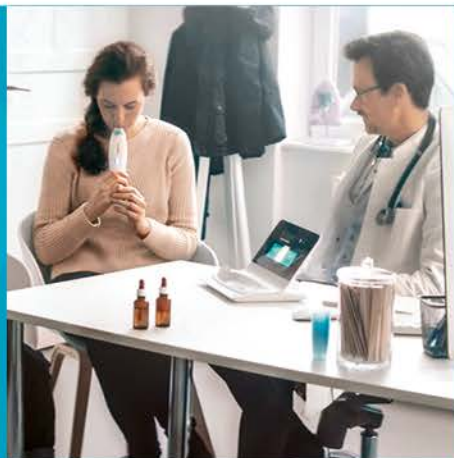
Exhaled NO from the lower airway can therefore be used as a direct biomarker of eosinophilic airway inflammation and reflects the inflammatory activity of allergic bronchial asthma. The exhaled breath has to be fractionated to gain a sample of the lower airway NO. The measurement of fractional exhaled NO (FeNO) has been standardized for clinical measurement.^{2,3} The quick, painless and non-invasive FeNO measurement is therefore a reliable way of monitoring allergic airway inflammation in patients.



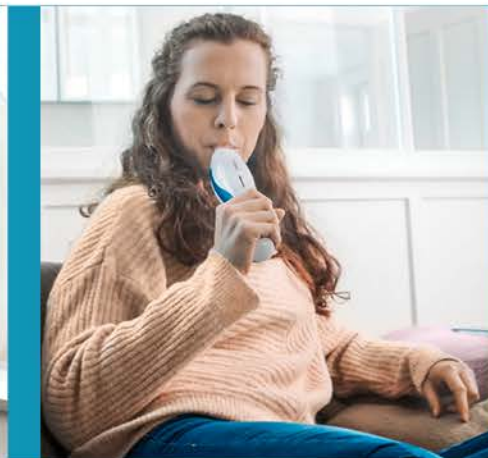
“By measuring NO at home, the patient can now monitor inflammation levels in the lungs and respond with inhalative corticosteroid therapy based on the NO.”

Prof. Dr. med. Herth,
University of Heidelberg, Germany¹

Use cases for FeNO measurement



Supporting differential diagnosis



Asthma therapy management



Asthma monitoring

Numerous studies verify the importance of FeNO measurement in delivering diagnosis confirmation and a prognosis of response to treatment with inhaled corticosteroids (ICS) for asthma patients.⁴⁻⁶

Regular FeNO measurement simplifies the monitoring of airway inflammation and improves patients' adherence to ICS treatment. FeNO-based therapy management can therefore support the patients to keep better track of their asthma and help to avoid exacerbation.^{7,8}

Recommendation by National Health Institute for Health and Care Excellence (NICE):

- ▶ “Offer a FeNO test to adults (aged 17 and over) if a diagnosis of asthma is being considered.”
- ▶ “Consider a FeNO test in children and young people (aged 5 to 16) if there is diagnostic uncertainty...”
- ▶ “Consider FeNO measurement as an option to support asthma management in people who are symptomatic despite using inhaled corticosteroids.”⁹

¹ Prof. Dr. med. Felix Herth is Medical Director of Thoraxklinik at Heidelberg University Hospital, Germany (Statements 2016)

² ATS & ERS. Am J Respir Crit Care Med 2005;171:912-30

³ Horváth et al. Eur Respir J 2017;49:1600965

⁴ Dweik et al. Am J Respir Crit Care Med 2011;184:602-15

⁵ Karrasch et al. Thorax 2017;72:109-16

⁶ Taylor et al. Thorax 2006;61:817-27

⁷ Petsky et al. Cochrane Database of Systematic Reviews 2016;9:CD011440

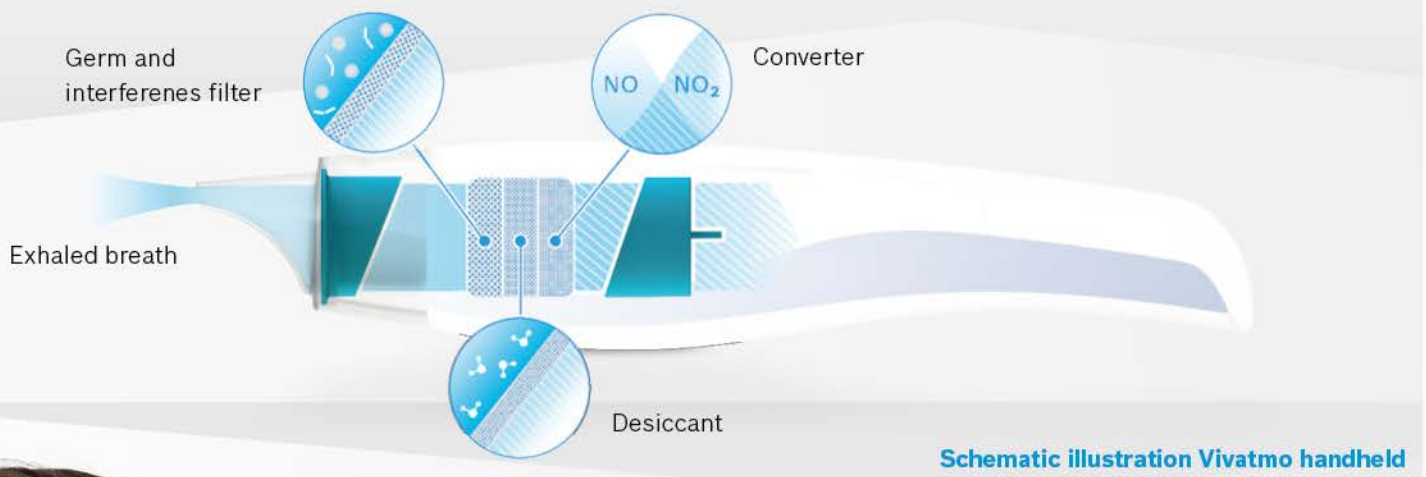
⁸ Essat et al. Eur Respir J 2016;47:751-68

⁹ NICE: Guideline Asthma - diagnosis and monitoring (November 2017, www.nice.org.uk)

The unique Vivatmo system

A new dimension in the treatment of airway inflammation

At Bosch Healthcare Solutions, we made it our mission to significantly improve asthma patients' quality of life with the help of innovative technology. The result is the Vivatmo system. With Vivatmo, Bosch is now bringing recognized exhaled breath measurement from the physician's office straight into patients' homes. Therefore, the Vivatmo system creates the prerequisites for the best possible therapy and monitoring of the disease.



Maintenance-free, reliable measurement thanks to smart and compact design

Correct fraction sampling of breath excluding upper airway volumes

- ▶ Ergonomic mouthpiece for relaxed and natural breathing
- ▶ Exhalation against light back pressure

Mouthpiece for sophisticated sample preparation

- ▶ Protection against cross-contamination
- ▶ Elimination of interfering components and gases
- ▶ Sample dehumidification
- ▶ Conversion of NO to measured equivalent NO₂

Innovative measuring module

- ▶ Sensor technology measures NO₂ with high specificity
- ▶ Smart algorithm based translation and correction of measured NO values in parts per billion (ppb)

Display

- ▶ Measurement procedure is guided by handheld display and LED on upper side in a user-friendly and easy way
- ▶ New and stored measured values are shown in a clean and clear manner

¹ Reddel et al. Eur Respir J 2015;46:622-39

Interpretation of FeNO results

Recommendation of American Thoracic Society (ATS)¹

	Normal	Elevated	High
FeNO	Adults < 25 ppb Children < 20 ppb	Adults 25-50 ppb Children 20-35 ppb	Adults > 50 ppb Children > 35 ppb
Diagnosis			
Symptoms present at ≥ 6 weeks	<ul style="list-style-type: none"> ▶ Eosinophilic airway inflammation unlikely ▶ Alternative diagnoses ▶ Unlikely to benefit from ICS * 	<ul style="list-style-type: none"> ▶ Be cautious ▶ Evaluate clinical context ▶ Monitor change in FeNO over time 	<ul style="list-style-type: none"> ▶ Eosinophilic airway inflammation present ▶ Likely to benefit from ICS
Monitoring (in patients with diagnosed asthma)			
Symptoms present	<ul style="list-style-type: none"> ▶ Possible alternative diagnoses ▶ Unlikely to benefit from increase in ICS 	<ul style="list-style-type: none"> ▶ Persistent allergen exposure ▶ Inadequate ICS dose ▶ Poor adherence ▶ Steroid resistance 	<ul style="list-style-type: none"> ▶ Persistent allergen exposure ▶ Inadequate ICS dose ▶ Poor adherence or inhaler technique ▶ Steroid resistance ▶ Risk of exacerbation
Symptoms absent	<ul style="list-style-type: none"> ▶ Adequate ICS dosing ▶ Good adherence ▶ ICS taper 	<ul style="list-style-type: none"> ▶ Adequate ICS dosing ▶ Good adherence ▶ Monitor change in FeNO 	<ul style="list-style-type: none"> ▶ ICS withdrawal or dose reduction may result in relapse ▶ Poor adherence or inhaler technique

¹Dweik et al. Am J Respir Crit Care Med 2011;184:602-15

*ICS: inhaled corticosteroid



Vivatmo *pro* for professionals

Intuitive and maintenance-free device for practices and clinics

Vivatmo *pro* was specifically developed for professional use. Thanks to its simple measuring procedure and intuitive operation, it is optimized for integration into clinical routines. This means physicians can be more efficient in their everyday clinical work, enabling them to further improve personalized patient treatment. The Vivatmo *pro* device for physicians differs from other devices in that it is wireless, maintenance-free and exceptionally user-friendly.

Benefits

- ▶ Easy measurement thanks to intuitive user guidance and visual animation
- ▶ Results are available immediately after measurement
- ▶ Flexibility of use thanks to cordless measuring device and inductive charge management
- ▶ Optimum integration into practice workflows thanks to direct patient data collection, transfer via Vivatmo *pro* and connectivity to IT environment via HL7 or GDT interface
- ▶ Maintenance-free system: no calibration required during the unit's entire life-time





Vivatmo *me* for patients

The world's first FeNO measuring device for home use

The Vivatmo *me* FeNO measurement device is designed to measure airway inflammation in asthma patients in order to give them a better understanding of their condition and therefore more confidence in their daily lives. Patients who regularly monitor their own FeNO levels may improve their adherence to medication.¹



reddot award 2016
winner

Benefits

Patients obtain information about the degree of their airway inflammation directly after the successful measurement including a trend.

- ▶ Patients' degree of inflammation is evaluated via a traffic light classification: red, yellow and green
- ▶ The light, handy and easy-to-use device integrates smoothly into patients' everyday life, whereby the battery-operated measurement ensures higher autonomy
- ▶ Regular analysis of the airways allows for better management of the condition, which can help to optimize therapy and improve adherence^{1,2}



Vivatmo app

As a valuable add-on, the Vivatmo *app* ideally complements the Vivatmo *me*. This enables asthma patients to keep a closer look on their course of disease.



¹Price et al. Clin Transl Allergy 2013;3:37

²Stoneham. Nursing Times 2013;109:22-5

