# Respiratory Phase Detector

## *Product description*

Statistics from 2018 indicate that annually, among the 20 million people who received intensive care, about 50% of people required mechanical respiratory support. Since 2019, in the era of the COVID-19 pandemic, this percentage, depending on the country, has increased at least several times, which in turn has led to an increase in the demand for mechanical ventilation devices. It is estimated that from 2021 to 2027, this market will expand fivefold.

During the weaning phase, most of these patients breathe independently through an endotracheal or tracheotomy tube for some time. In order to ensure optimal breathing conditions, a heat moisture exchanger HME ("artificial nose") is attached to the artificial respiratory tract.

From the point of view of a physiotherapist, in order to improve the effectiveness of rehabilitation and respiratory efficiency in this group of patients, it is necessary to clearly and quickly determine the current phase of breathing (inhalation or exhalation). The physiotherapist needs a signal so that he or she knows when to let the patient breathe in.

A physiotherapist working in an anesthesiology and intensive care unit may have difficulty recognizing the phase of a patient's breathing. This is due to, inter alia, a consequence of activating various alarms from the systems monitoring the patient's vital functions during physiotherapy or the coexistence of other sounds coming from the patient's environment.

In order to improve the work of physiotherapists, the so-called "Breath phase detector". The device has a simple structure, it contains a tube with a tube with a ball. The detector is an external single use product that connects between the tracheal tube and the HME. The undoubted advantage of the device is the simple and unambiguous transfer of information about the breathing phase in which the patient is currently undergoing pulmonary rehabilitation. Additional advantages are also: easy connection, non-invasive and low unit price.

Correct breathing therapy, assisted by a respiratory phase detector, aims to improve the work of a physiotherapist by easier and, therefore, faster identification of the patient's breathing phase. As a result, the time of the physiotherapist's reaction to potential abnormalities related to the patient's breathing should be shortened. A quick reaction of the physiotherapist should, in turn, lead to more effective rehabilitation and thus positively affect the improvement of the patient's respiratory efficiency.

## *Key words*

Respiration, respiratory phase detector, detector, physiotherapy

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## *Legal status of the product*

**Patent**:

Decision of 22 June 2021 on the grant of the patent titled Respiratory phase detector and its application as well as a way of respiratory phase monitoring, following application filed in 2018.

**Application number: 427914. Owner of the invention Medical University of Gdańsk**

**In 2018, 2 industrial designs of the European Union were also registered:**

a. **Protection right No: ZWW 005835006 0001, Name of the protection right: Respiratory Phase Detector**
b. **Protection right No: ZWW 005835006-0002, Name of the protection right: Respiratory phase detector**

## *Subject of the offer*

The subject of the offer is a device for identifying the respiratory phase in a patient breathing spontaneously through an artificial respiratory tract (endotracheal or tracheotomy tube) with a connected heat and moisture exchanger, the so-called Respiratory phase detector.

## *Financing of the product research so far*

The project was financed under the programme "Innovation incubator +", carried out under the Operational Programme Smart Development 2014-2020 (Measure 4.4) titled: "Supporting the management of research findings and R&D results commercialisation in scientific facilities and enterprises".

## *Competitive analysis*

There are multi-functional, complex mechanical appliances, i.e. respiration and heart rhythm sensors, currently available on the market. Although such a sensor enables a contactless reception of a signal carrying information about the respiratory and heart activity of the patient being monitored, it does not provide any useful information to the physiotherapist performing manual respiratory rehabilitation. During manual respiratory rehabilitation, the device provides clear information about the respiratory phase in which the patient is, which enables the physiotherapist to give optimal stimulation during his/her work.

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## *Advantages of the proposed product*

According to the design, the device is simple to use, non-invasive, disposable, low-cost, and supports the work of a physiotherapist while he/she performs manual respiratory rehabilitation. The device will allow physiotherapists to work more effectively with patients breathing with the help of an intubation or tracheotomy tube by means of a heat and moisture exchanger (so-called "artificial nose") thanks to clear indication of the respiratory phase the patient is in.

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