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Smart inhalers

Improving effectiveness of therapy with asthma patients

Inhaler are medical devices used by asthma patients to administer drugs directly to the lungs. In the majority of the cases, asthma patients use the devices wrongly, compromising the therapy effectiveness. When equipped with sensors, the devices are called “smart inhalers”. They measure therapeutic data, including the inhalation profile and transmit them to mobile apps or cloud platforms for monitoring the drug delivery and the progress of the disease. They improve drug effectiveness, prevent administration errors, and offer valuable insights for disease management to prevent degradation of the patient’s health conditions.

Target customers:
- Smart inhaler
- manufacturers

Application challenges

1. Identify patient errors with inhalation and actuation timing
2. Monitor patient compliance with inhalation profile, monitor the course of the disease and anticipate exacerbation
3. Compact and battery-driven device
4. Sensor is part of patient air path requiring airtight sealing and material biocompatibility

Sensirion’s solutions

1. Fast response time, no zero-flow drift
2. Precise measurement of air flow, high sampling rate.
3. Small sensor size, low power consumption
4. Adequate choice of materials to comply with regulations

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Sensirion sensor solution:

SDP3x: digital differential pressure sensor

Size (LxWxH): 8.5 x 5.5 x 5.15 mm³

Additional sensor features

- Measurement range with up to ±1500 Pa
- SMD components
- Independent on mounting position
- High sensitivity: accuracy better than 0.2% FS near zero
- No drift at zero-flow over time
- Analog and digital (I²C) versions

Other applications

- Nebulizers
- BiPAP, APAP ventilators
- Oxygen therapy
- Respiratory monitoring
- Cough assist
- Gamification of treatment in pediatric care

FAQs

- **How to determine flow using a differential pressure (DP) sensor?**
  Flow is measured via a pressure drop on the airpath defined by the inhaler. The pressure drop increases with increasing flow. For conversion to flow, a characterization in the final device shall be performed. See the application note “Engineering Guidelines”.
- **How to design the sensor into the flow path?**
  SDP3x is designed for pick-and-place assembly onto the PCB.
- **How should I connect the sensor’s ports?**
  One of the sensor’s port should be connected to the ambient environment, while the other port to the inhaler’s channel. A manifold can be used to connect the ports to the right locations.
- **Does the sensor impact the dosage of the drug?**
  The sensor does not interact with the drug since the drug does not need to flow through the sensor. The sensor measures a part of the air inhaled before drug release.
- **Is the biocompatibility of the device impacted?**
  The materials of the SDP3x sensor are selected specifically for respiratory applications including critical care. The biocompatibility of the device is not impacted by the sensor.
- **How do you clean the sensor when the patient coughs or mistakenly exhales?**
  The sensor is designed at the back of the inhaler. The inhaler geometry intrinsically prevents particles from reaching the sensor.

Getting started

SEK-SDP31 evaluation kit

Related sensors

↗SHT40
↗SDP3x

Useful documents

Datasheets, application notes, handling instructions, samples codes, step files, certificates

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