

HIGH-ENERGY VENTILATOR

A low-cost, versatile, high-quality ventilator

Ventilators provide oxygen enriched air to patients who have difficulties in breathing, or cannot breathe autonomously. The HEV was born during the COVID-19 pandemic. HEV is a ventilator designed to provide long term alveolar ventilation support to patients, both in and out of Intensive Care, for both intubated and mask/non-invasive cases.

In light of the importance of pressure controlled ventilation modes for COVID-19 patients, the design provides standard Pressure Control and Pressure Support modes, as well as CPAP support. PEEP is provided for all modes, as is patient triggering for both the inhale and exhale phases of the breathing cycle. The pneumatic concept of the ventilator, i.e. ventilation provided via a low-pressure buffer, allows a precise and safe pressure control and accurate monitoring of flow rates. The step-down pressure design via the buffer puts safety up-front in the design.

In addition to the COVID-19 official emergency guidelines from the MHRA, WHO and AAMI, clinical advice has guided the main choices. Much attention is paid to fast response and precise and stable pressure delivery, the simplification of ventilation modes, the synchronicity patient/ventilator and an intuitive and familiar interface for clinicians.

The mechanical design is robust, rapid and simple to construct with low cost, readily commercially available components. The functionality is aimed at the treatment of the vast majority of COVID-19 cases, but suitable as a general-purpose ventilator beyond COVID-19. The use of HEV could free up the very high-end machines for the most intensive cases.

The HEV is a fully functional prototype, and we are looking for partners who will integrate the design into a medical device that complies with applicable regulatory requirements. The HEV is also interesting academic research, as a vehicle for implementing new ideas concerning ventilation.

APPLICATIONS

Mechanical ventilation in hospitals (ICU and non-ICU), for intubated and non-invasive cases.

AREA OF EXPERTISE

- Medical devices

TECHNOLOGY STATUS

- Prototype

CONTACT

kt.medicalapplications@cern.ch

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Knowledge Transfer
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FEATURES

- Functionality based on MHRA, WHO and AAMI guidelines for COVID-19 emergency ventilators
- Low-cost design based on commercially available components, thanks to the two-step pneumatic design
- Design inherently flexible and modular, for adaption to different requirements and environments.
- High quality breath control and breath support, with patient comfort set as a priority
- Air/Oxygen mixing provided internally, no need for an external unit
- Intuitive and ergonomic touch-screen control
- Equipped with standard bulkhead thread connector, for easy adaption to match hospital connectors around the world
- Can be powered by a standard AC connection, or a 24V DC source from a UPS backup
- Internal battery provides up to 45 minutes autonomy, can be augmented with a second external battery

Referenced in Buytaert, J., et al. “The HEV Ventilator” arXiv:2007.12012 (2020). <https://arxiv.org/abs/2007.12012>

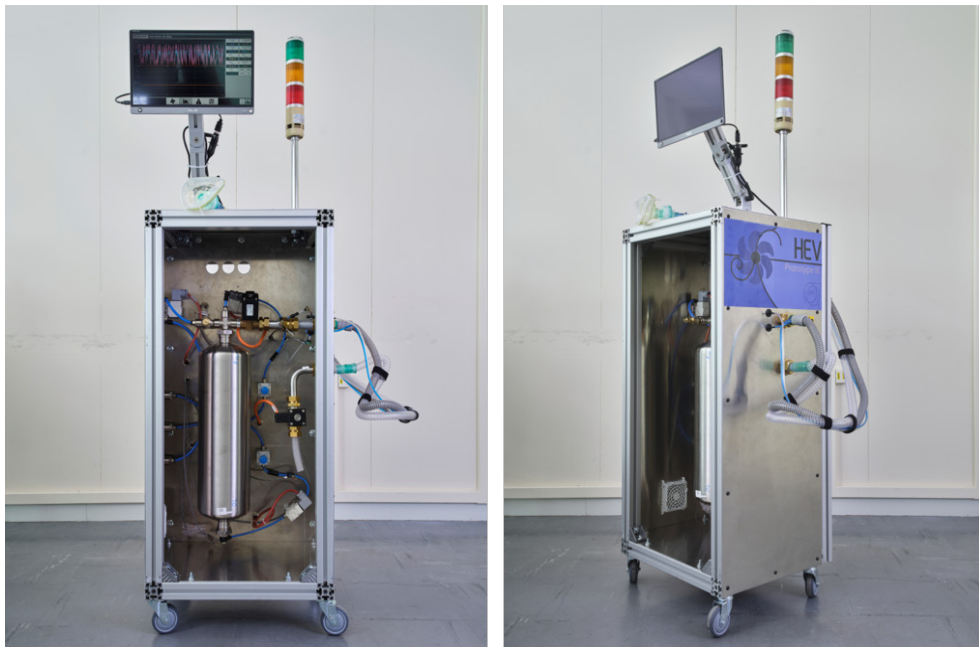


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