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1 *Sensor platform*

FINDING THE IDEAL ESCAPE AND EMERGENCY ROUTE

Measuring system for the determination of the propagation of hazardous materials in critical infrastructures and complex buildings for the prevention of civil disasters (BMBF project "MAusKat", 13N11677).

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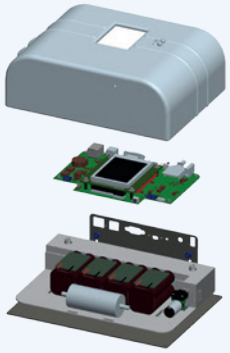
Introduction

Escape and emergency routes in subway stations, airports, hospitals, shopping malls and high-rise buildings are ideally planned such that in the event of an evacuation persons can safely reach the outside using the shortest possible and hazard-free route. It must be ensured that, due to the structure of a building, these escape routes are not as well the potential pathways of smoke and other toxic gases released during the incident. In this respect, subway stations, airports, hospitals, shopping malls and high-rise buildings as well as all other complex building structures represent an increased risk potential, since the possibilities for escape and rescue are limited. Additionally, there is almost a complete overlap with potential pathways of smoke dispersal and released toxic gases, accidently or wilfully, often leading to a high number of casualties. An integrated measuring and analysis system has been developed within the project "MAusKat", partly funded by BMBF, for tracking the spreading of gaseous and airborne hazardous substances in critical

Scheme of sensor platform



infrastructures and complex buildings. Real flow and concentration data of a tracer gas (SF_6) are implemented into a simulation tool to identify hazard zones, improve existing escape and rescue possibilities and plan new escape and evacuation strategies.
To measure gas concentrations and climatological data Fraunhofer IMM has developed a mobile, infrastructure independent sensor platform in cooperation with smartGAS Mikrosensorik GmbH.

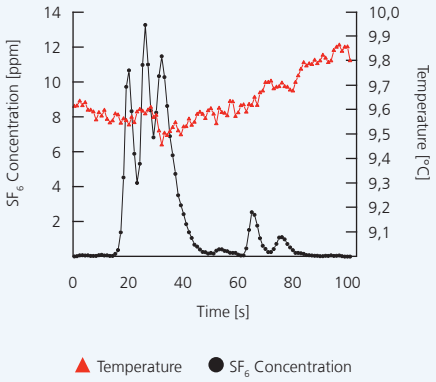
Technical structure

The sensor platform detects tracer gas concentration and climatological data like temperature, humidity, barometric pressure as well as wind speed in x, y and z direction by connecting an external ultrasonic anemometer. The recorded measurement values will be stored with an interval of one second on the internal memory together with an ultra-precision timestamp. The precision of the time is relevant for comparing the sensor platforms among each other. In addition to the integrated touch screen for online monitoring, each sensor platform provides an USB and an Ethernet interface. After measuring the stored data can be easily transferred by an USB-Stick to the analysis platform. Optionally, a wireless interface as well as WLAN, Bluetooth or Zigbee can be integrated into the sensor platform. Due to the core requirement "infrastructure independent" each sensor platform is equipped with a network independent power supply, which ensures operation of more than 24 hours. If necessary, the platform can also be connected to an existing home network.

Technical details of the sensor platform

- ARM microcontroller
- 32 MB external RAM
- 128 MB NAND flash memory for operating system
- 1 GB flash memory for measurement data
- Linux based operating system
- Internal power source for up to 24 hours of operation
- SmartGas sulphur hexafluoride flow sensor
- Adjustable diaphragm pump for the flow sensor
- Analog temperature sensor with an accuracy of ±0.15 °C. Range of -60 °C to +150 °C
- Digital temperature sensor with an accuracy of ±0.5 °C. Range of -20 °C to +100 °C
- Digital barometric pressure sensor, 300 to 1100 hPa (±2.5 hPa)
- Digital humidity sensor, 10 %rh to 90 %rh (±4.0 %rh)
- Real-time clock with an accuracy of ±3.5ppm at -40 °C to +85 °C

Tracer gas concentration



Climatological data