TUM SENSE LAB
Quantifying Spatial Wellbeing

BRIEF

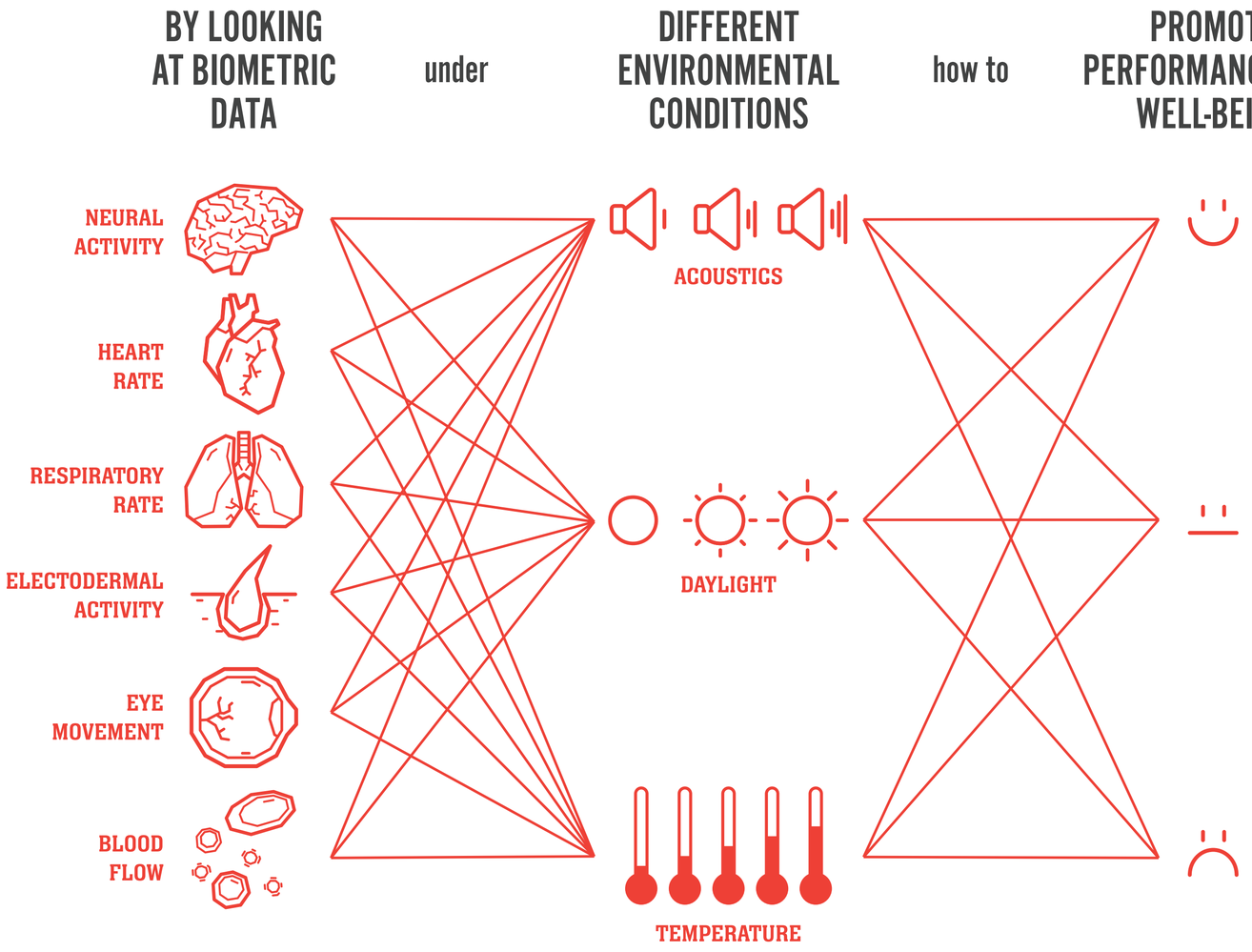
Definition of "comfort" has long been a question for professionals of the built environment. Particularly the numerical definition of it, not only decides how we operate our buildings, therefore manage resources but also how the buildings impact our well-being in return.

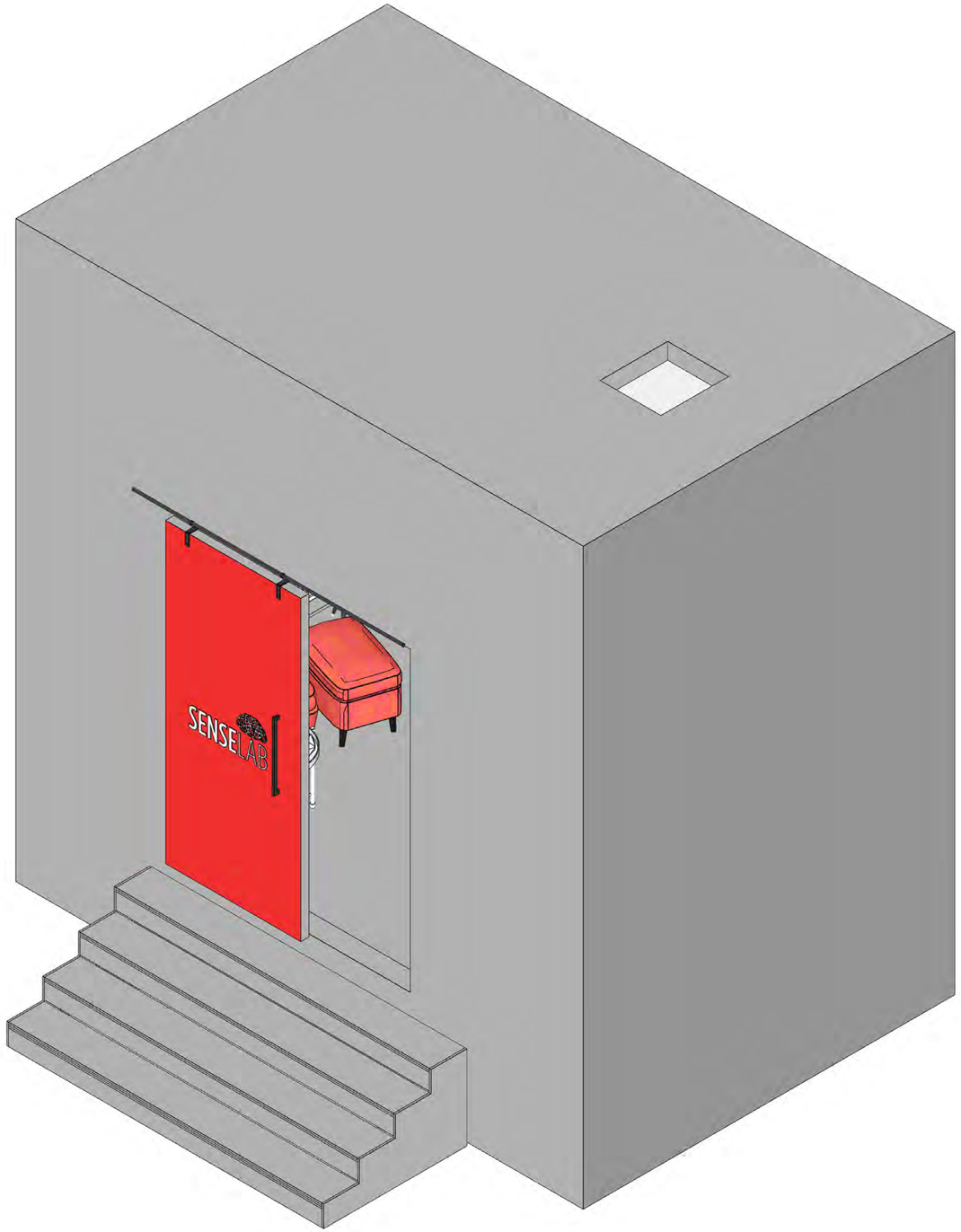
However, this reciprocal relationship still lacks clarity on certain aspects, as research shows that occupants are consistently dissatisfied with the indoor climate and that most buildings struggle with huge performance gaps between simulations and actual measurements.

As the majority of data acquired in the comfort literature comes from user feedbacks, there are concerns with bias, data resolution, or scalability. Furthermore, it is proven by the research that maybe comfort is not what we should be after, but rather health - and not always these two mean the same thing.

Therefore, research project SenseLab aims to tackle the comfort definition from a newly emerging point of view: **Directly looking into the human body.**

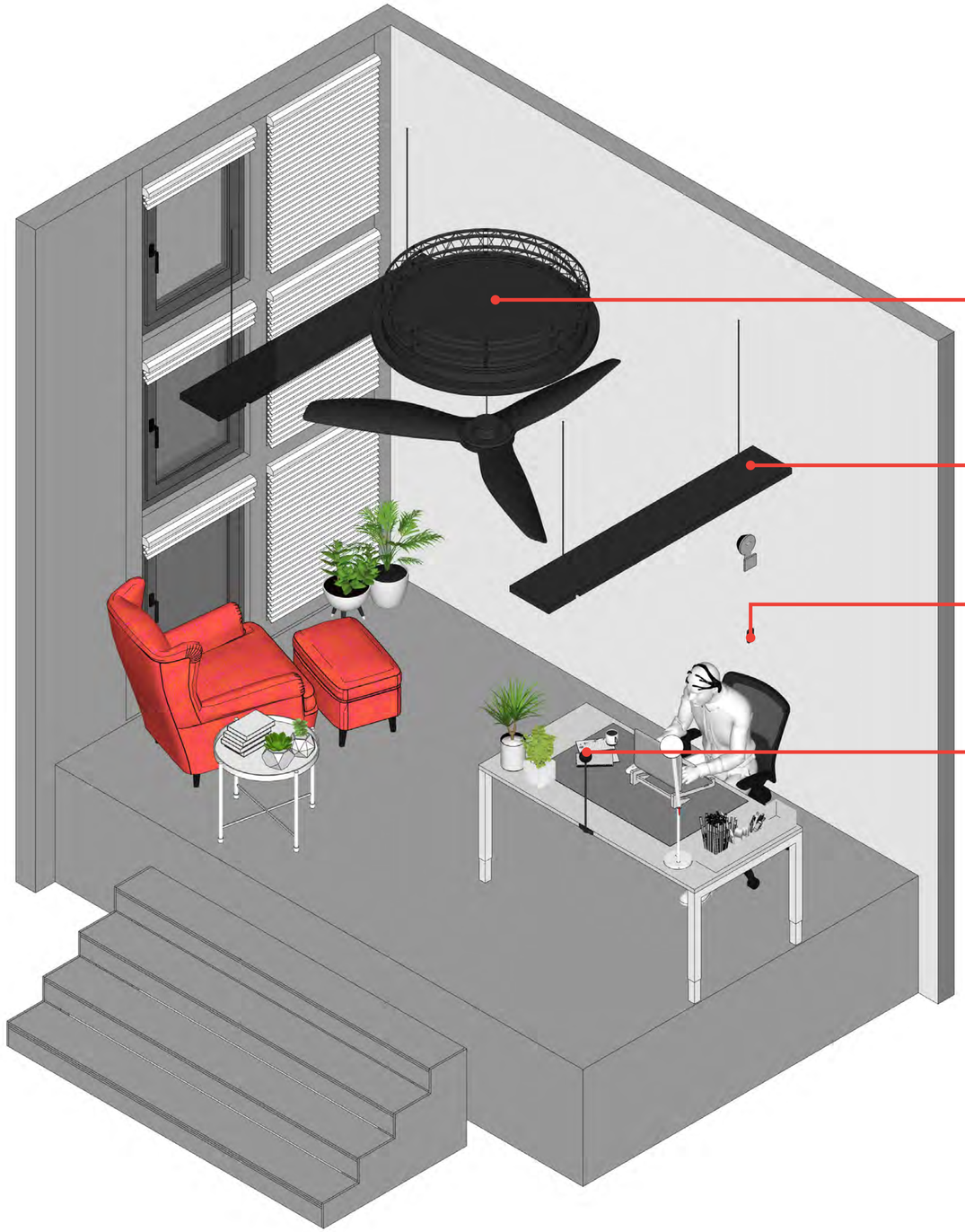
By doing so, we believe that we might not only identify the link between perceived comfort and its physiological markers, but also collect long-term data to observe how the indoor environment impacts our health and well-being.





SenseLab is a testing space where varying environmental conditions can be simulated **while measuring biosignals** such as electrical activity in brain, heart rate variability, electrodermal activity etc. with high precision.

By looking at overlapped datasets of human body and its immediate environment, we aim to learn more about the boundaries of indoor human comfort and establish a **more holistic view to quantify well-being.**



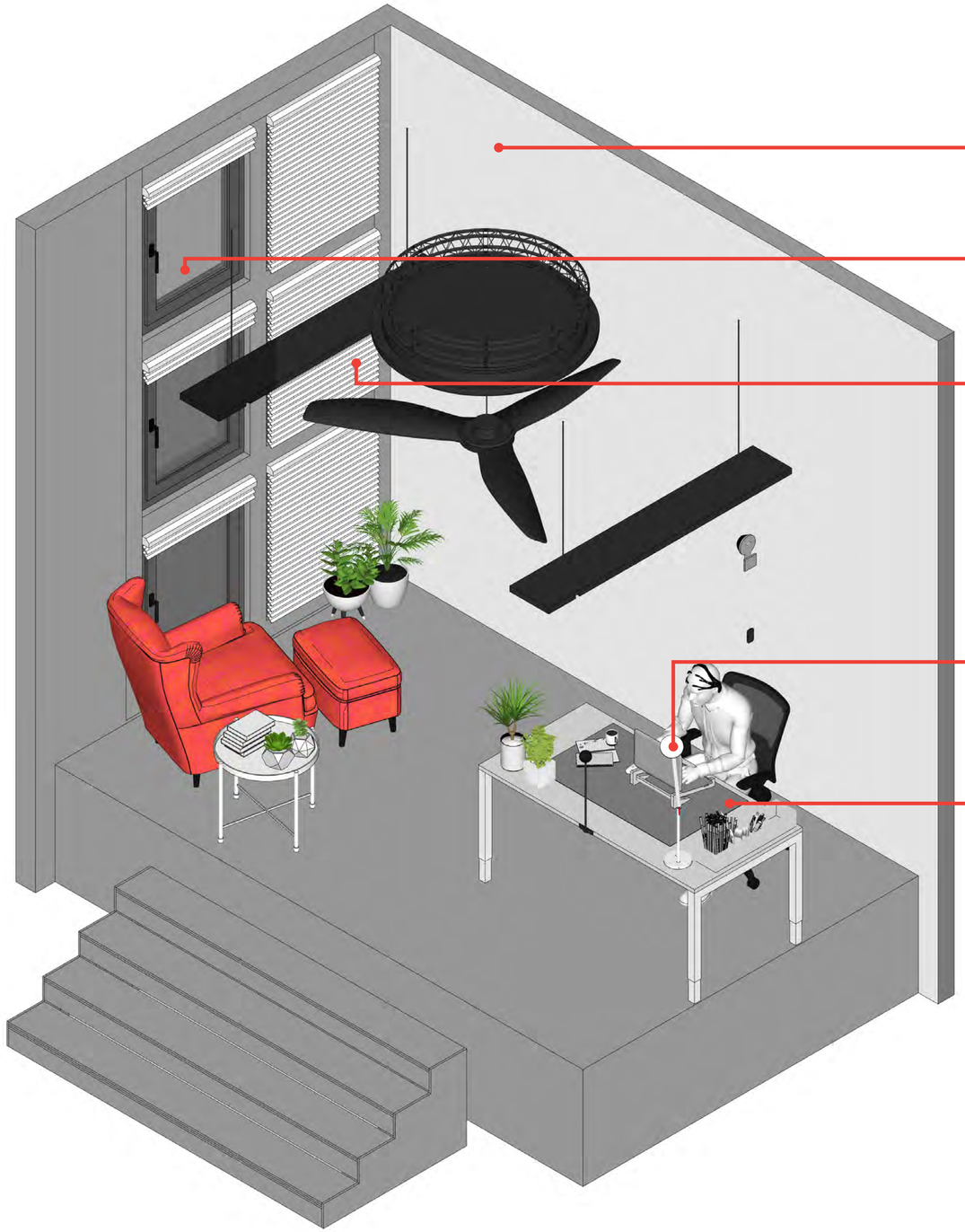
AC UNIT
360-degree cooling, 14kW

INFRARED HEATERS
2 x 2400 W

DATALOGGER
Continuous measurement of air temperature, relative humidity and CO_2 levels

GLOBETHERMOMETER
At head level

THERMAL ENVIRONMENT



HIGHER REFLECTION
Walls and ceiling painted white for more daylight

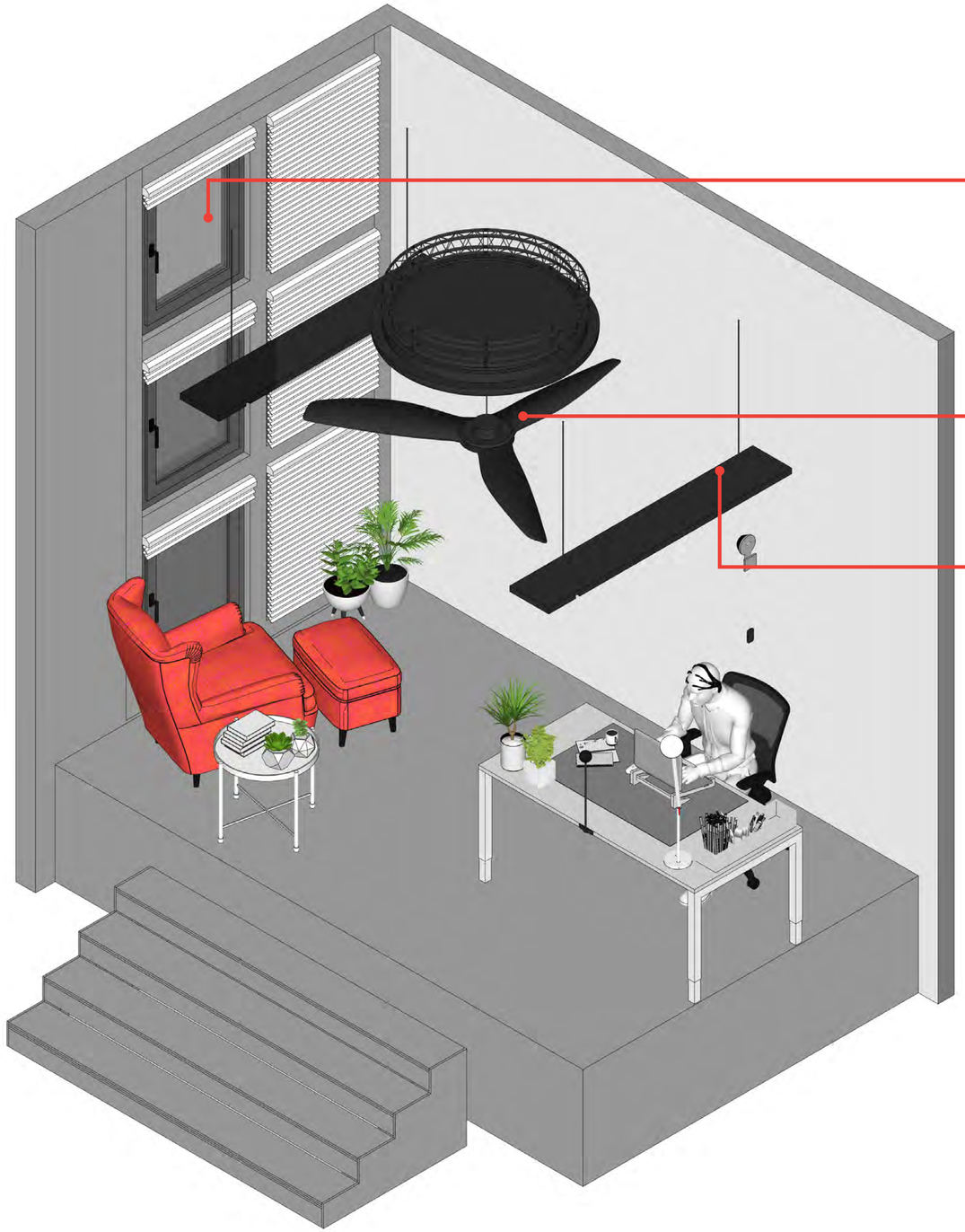
WINDOWS
Facing east south-east

BLINDS
Individually operable per window

TASK LIGHTING
LED lights, dimmable and blue-content controllable

LUXMETERS
Spot measurements from specified spots during the experiments

NATURAL AND/OR ARTIFICIAL LIGHT



WINDOWS

All tilt and turn

Possibility of testing several single sided-ventilation options

CEILING FAN

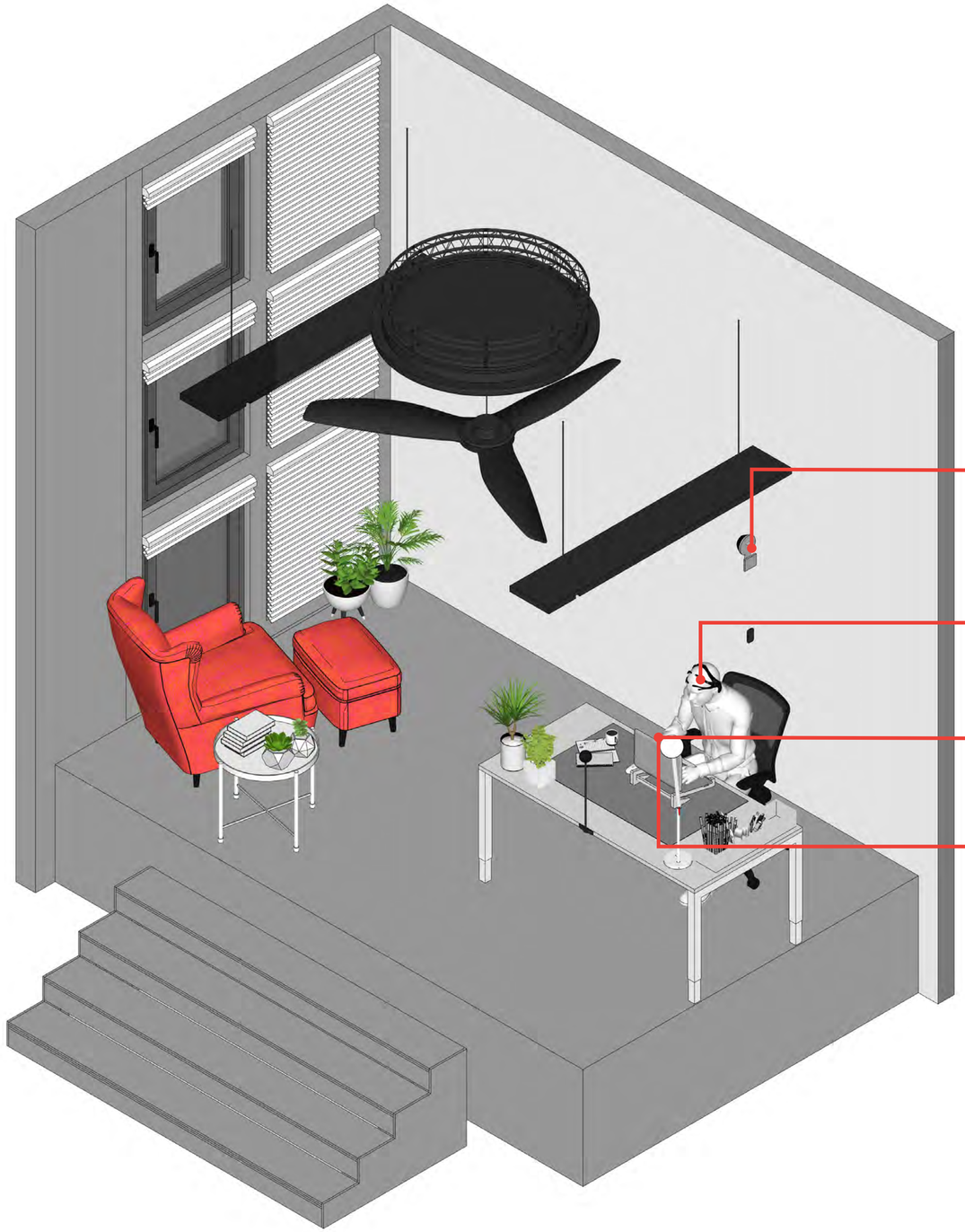
Reversible, 6 speed steps

Can be operated together with the AC

OUTLET

Possibility of simulating cross ventilation

DIFFERENT VENTILATION MODES



CAMERA
A 360-degree camera with live-feed, video and two-way sound

EEG
Electroencephalography, electrical activity in the brain

ECG
Electrocardiogram, heart rate and heart rate variability

EDA
Electrodermal activity, skin temperature

CONNECTED BIOSIGNALS

DIFFERENT SET-UPS

DIFFERENT SET-UPS

DIFFERENT SET-UPS

SENSELAB
EOS 70D

SENSELAB
EXPERIMENT
ONGOING
DO NOT
DISTURB!
9:00AM – 4:00PM
#SENSELAB

RESEARCH BY

The Chair of Building Technology
and Climate Responsive Design

TEAM

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ar.tum.de/klima/forschung/senselab