

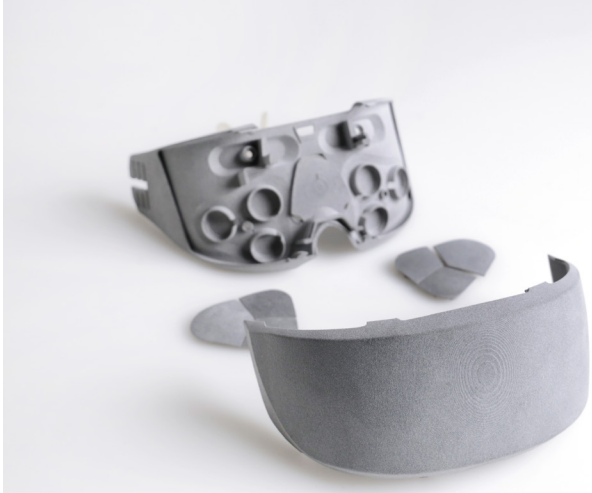
FOCUS OPEN 2023
Silver

A Solution for Sleep Disorders:

DQBD and GEMTEC's Somnosync Sleep Mask Featuring H350™ 3D Printed Parts

"We chose the H350 3D printer to print the snap-fit pieces based on SAF™ technology's accuracy and repeatability.

Sebastian Hess
DQBD CEO and Founder



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Case Study

The universal thing we all do, for eight hours a night if we're lucky, is sleep. Unfortunately, sleep doesn't come easy to some people, and they may struggle with falling asleep, staying asleep, or from REM sleep behavior disorders.





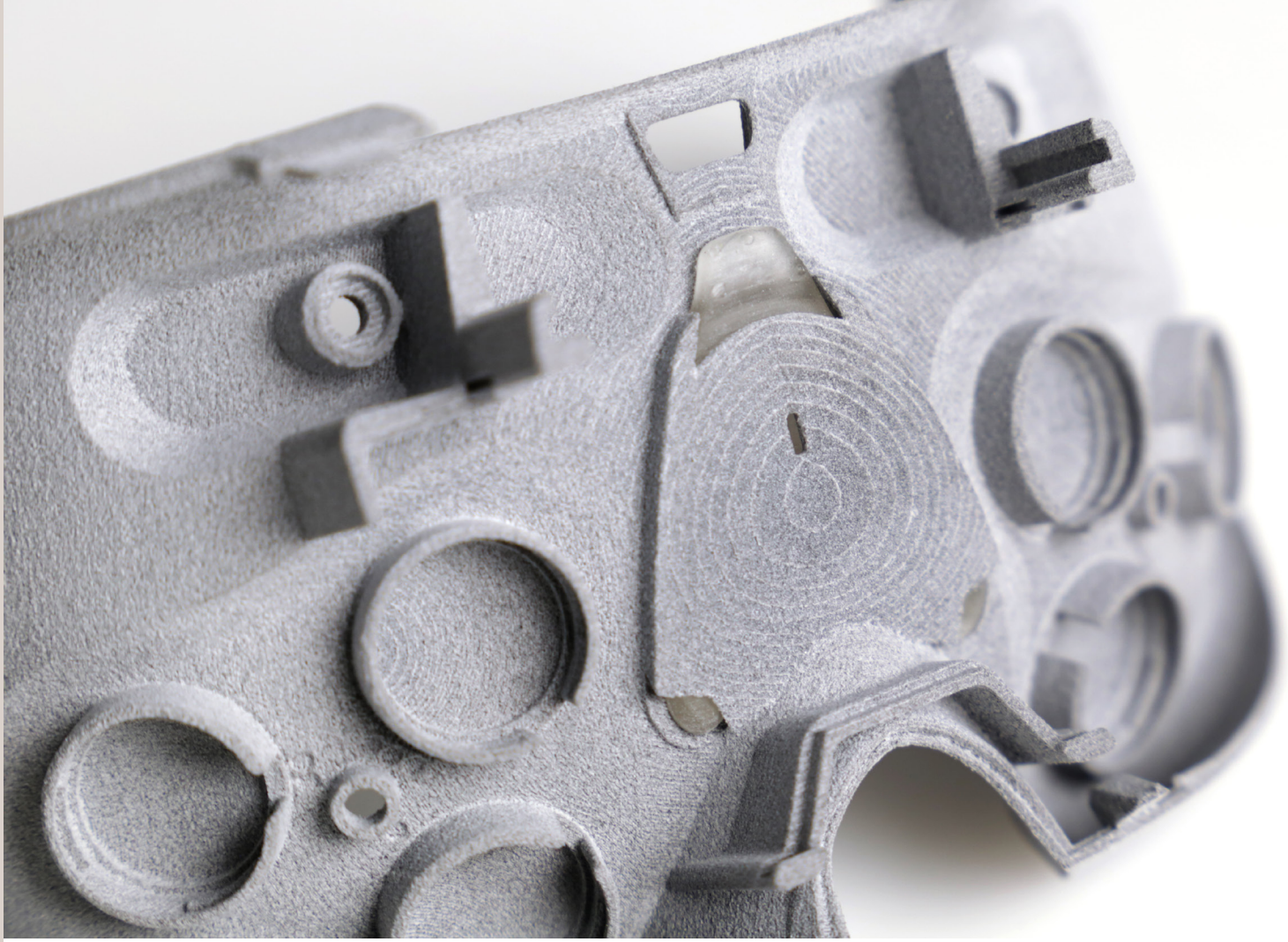
The Challenge

To help identify these issues and treat the source of the problem, sleep is typically analyzed in a sleep laboratory using polysomnography. This involves extensive and complicated cabling as well as adhesive electrodes which are connected to the patient's skin. The electrodes may cause skin-irritation and the quality of sleep can be negatively affected by the overall experience.

The Solution

GEMTEC, through a BMWi funded project in collaboration with the FZI Karlsruhe, developed new technology which is accessible for everyone and user-friendly. To create this low-volume sleep mask, innovator Gerhart Schroff from GEMTEC partnered with DQBD, an innovation driven design and development firm based in Germany. DQBD has extensive additive manufacturing experience in the design development process for creating mockups, prototypes for testing, and initiating new products. This led DQBD to embed the entire technology into a convenient, ergonomic, and volume-optimized housing, utilizing the H350 3D printer powered by SAF technology to print the snap-fit receptacles.

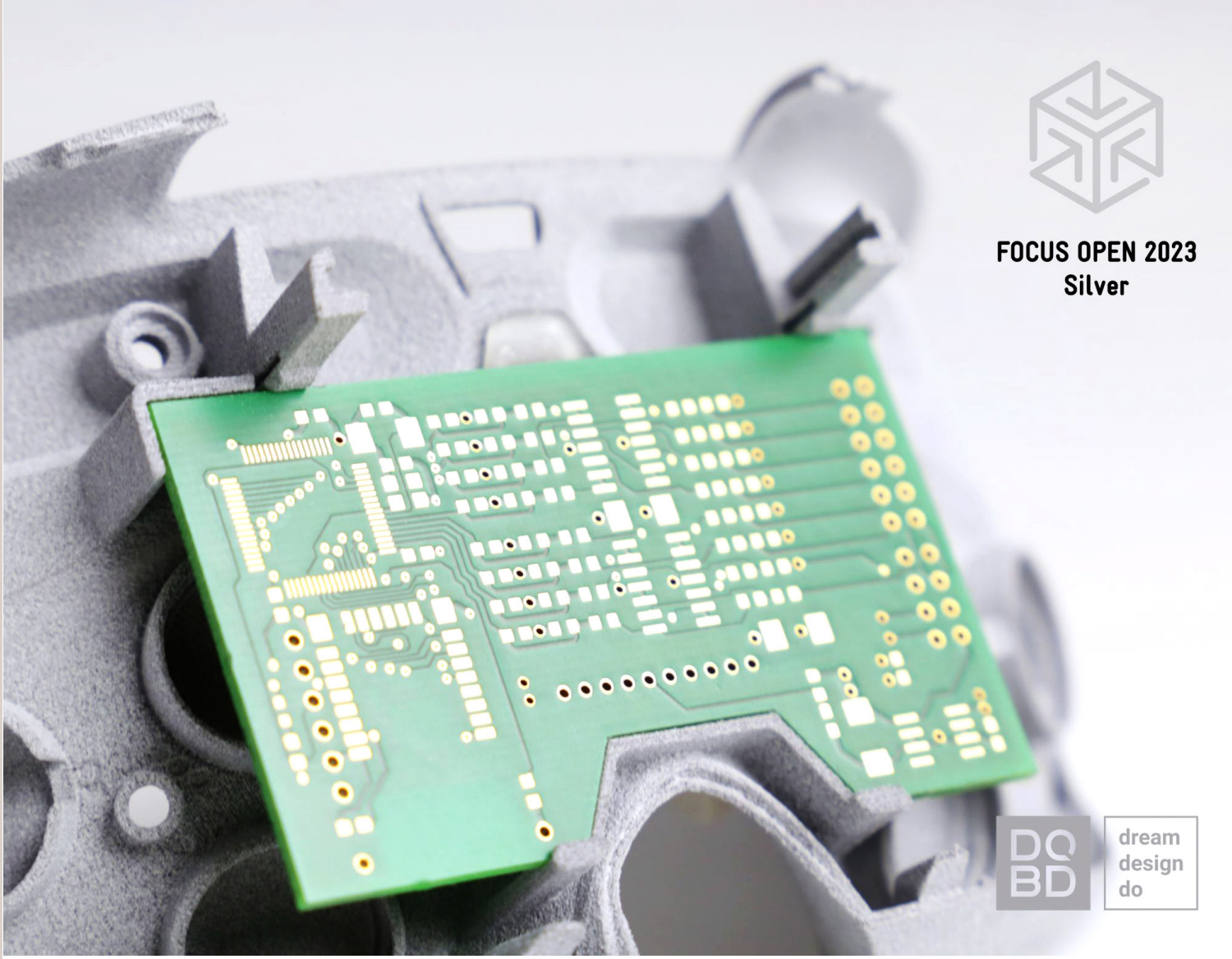




Science Behind the Somnosync

The Somnosync sleep mask offers contactless detection which identifies REM phases in real-time. This enables the mask to be utilized in narcolepsy and sleep disorder therapy. The mask features highly sensitive sensors which register electrical fields generated by rapid eye movement, or REM. Once patients are in the beginning of this stage, visual or auditory signals are used to gently wake the user. This provides access to lucid dreaming which may help change the course of nightmares and allow the sleeping person to be more in control. The sensor technology works wirelessly, and data can be transmitted via Bluetooth.

Improving REM sleep is critical since, according to neurological sleep research, the risk of developing dementia or Parkinson ‘s disease is considerably increased in people with REM sleep behavior disorder.



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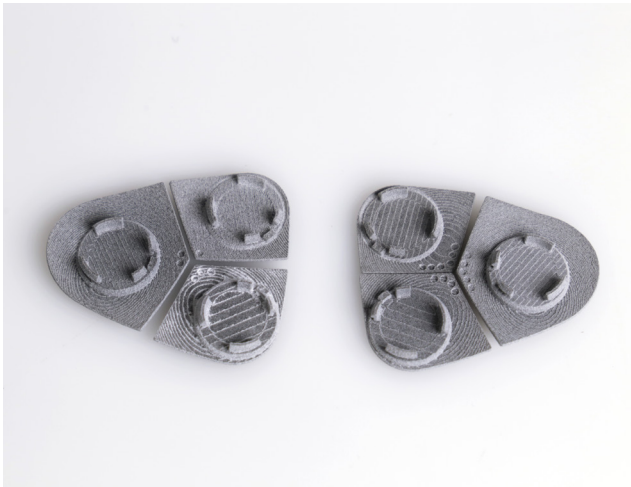
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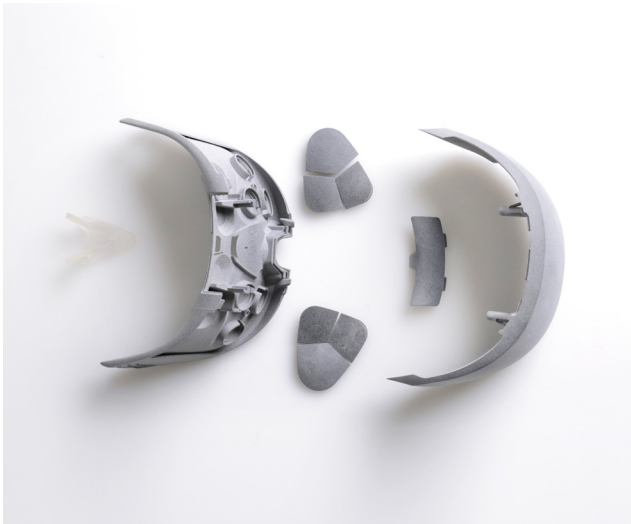
The Somnosync's Design

The main design challenge was to create wearable housing, which is non-invasive, minimalistic, and comfortable enough for sleep. The Somnosync includes a slim design which hugs the eye area and remains in place throughout sleep phases, guaranteeing accurate results. DQBD focused on five strategic points on the face (without significant anatomical differences) to ensure comfort: the nose hump, pads above the two eyebrows, and pads at the two temple areas. The adaptive nose pad on the nose's hump is cushioned and can be personalized and replaced by using additive manufacturing based on a scan.

The base housing element is partially decoupled, offering flexibility at the temple areas. The base housing and temples are a single part, so the base is designed in a way which allows the temples to have enough flexibility to adapt to the head and face contour. This prevents pressure points from arising. The device only involves a few parts which can be interchanged, ensuring efficiency and ease of use. Air circulation was also vital to the design since the mask must prevent water condensation due to patients sweating during sleep.

For their design of the Somnosync sleep mask, DQBD won the FOCUS OPEN 2023 Silver Award in June 2023, presented by the Design Center Baden-Württemberg.





Additively Manufactured Parts with the H350

The housing components include snap-fit receptacles for the PCB, battery, and sensors. Based on the part's complexity, this would require an extremely high investment for one or more injection molds to accomplish the optimized design that SAF delivers in a single part. Additionally, printing according to the specific anatomy of the user's face is also a determining factor. This can be completed with additive manufacturing at a lower cost point than injection molding.

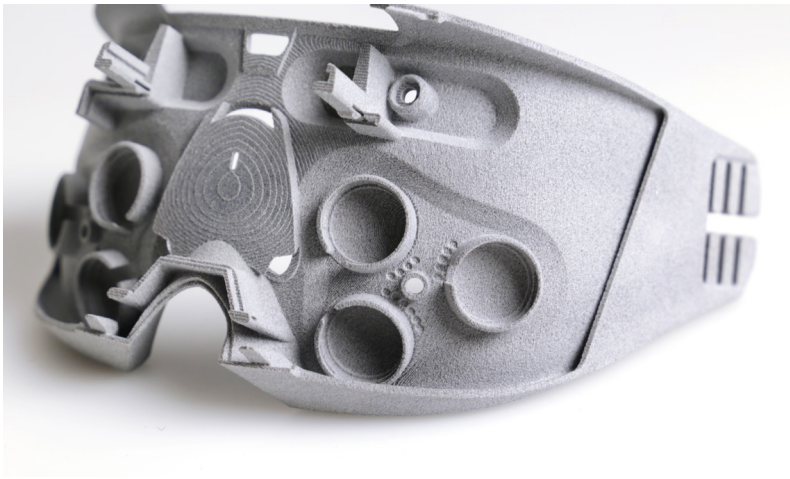
"We chose the H350 3D printer to print the snap-fit pieces based on SAF technology's accuracy and repeatability. It was essential to precisely reproduce each snap-fit so the Somnosync's components remain intact, and the user's sleep can be tracked correctly" - Sebastian Hess, DQBD CEO and Founder.

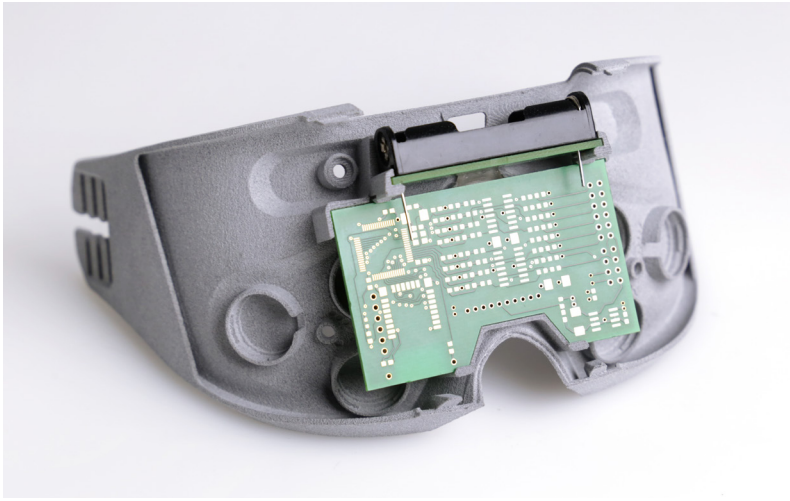
Additionally, with the H350's optimized nesting capability, more components can fit in a single build, thus reducing overall cost.

The H350 additive manufactured parts include multiple clip-on elements (such as the 3+3 sensor caps), the battery housing cover, the PCB clip-on, and the connection between the two main housings (base and outer housing element).

Since the design of the snap-fit receptacles is saved within the GrabCAD Print Pro™ software, printing can be completed at different locations, achieving the same result in terms of precision and functionality.

Regarding the material, DQBD printed with High Yield PA11 since it produces sturdy parts that are impact resistant to shock and vibration. It is vital that the snap-fit components exhibit strength and high ductility due to their use. Additionally, PA11 is eco-friendly and completely bio-based from sustainable castor oil.





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Sebastian Hess
DQBD CEO and Founder



Testing the Somnosync

To validate the Somnosync, individual tests have been completed. To further authenticate the sleep mask, a larger case study will be conducted in a sleep-laboratory that tests how the Somnosync analyzes REM sleep behavior disorders.

The Somnosync is changing the way sleep can be diagnosed and treated, from the comfort of the patient's own bed.

USA - Headquarters
7665 Commerce Way
Eden Prairie, MN 55344, USA
+1 952 937 3000

ISRAEL - Headquarters
1 Holtzman St., Science Park
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000

EMEA
Airport Boulevard B 120
77836 Rheinmünster, Germany
+49 7229 7772 0

SOUTH ASIA
1F A3, Ninghui Plaza
No.718 Lingshi Road
Shanghai, China
+86 21 3319 6000

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