



Center of Applied
Research and Development
for Additive Manufacturing

PRODUCT SPECIFICATION – RP95-M HALF MASK

The half mask is designed to meet all the requirements for medical staff and first responders, certified according to the **ČSN EN 140:1999** standard.

Half mask tech. specification:

Shelf life: >10 Years
Certification: ČSN EN 140:1999 (incl. P3R filter)
Weight: 60g
Temp. range: -10°C do +121°C

Half mask is made of very durable materials: PA12, TPE and VMQ silicone.

Filter tech. specification:

Shelf life: > 20 years
Filter efficiency: > 99,9999%
Certification: EN 143:2000
Weight: 100g
Thread connection: EN 148-1 Rd 40x1/7"
Temp. range: -10°C do +50°C

Highly efficient protection against carcinogenic and radioactive substances and pathogens such as viruses, bacteria and fungal spores.



Fig. 1 - RP95-M half mask



Fig. 2 - RP95-M half mask and P3 R filter

Advantages over respirators and masks

The **P3 R combined particle filter** offers a maximum level of protection that corresponds to the **FFP3** characteristics. The product is intended for **all users in the so called "font line"**, such as doctors, nurses, paramedics, firefighters, police and military personnel, customs officials as well as shop assistants, line workers and similar.

The protective mask is designed to **significantly reduce the financial costs** of all organizations that make use of these types of resources.

The mask set is completely **designed and manufactured in the Czech Republic**, this means it is not subject to the risks involved in the importation of materials from abroad and its manufacture **supports the local economy**.

Disinfection and sterilization

The half mask is disinfected in ethanol, sterilization is done in an autoclave at 120°C and a pressure of 2 bars for 20 minutes. Disinfection of the filter is possible using standard chemicals (e.g.: disinfection based on Peracetic acid), sterilization is done by plugging up the filter and subjecting it to 75°C.



Compared to disposable respirators

Due to the shortage of FFP3 respirators, the comparison is with the attainable FFP2 type which are currently being used by the health services.

RP95-M half mask + 1 pc filter 	Type A disposable respirator 	Type B disposable respirator 
Protection type: FFP3	Protection type: FFP2	Protection type: FFP2
Lifespan (of the filter): 5 days minimum	Lifespan: cca 8 hours	Lifespan: cca 8 hours

Comparing the purchase cost of the RP95-M half mask with regular respirators

Our product, the RP95-M half mask (at FFP3 quality), brings substantial financial savings in the **first week of deployment**. The purchase costs are on average **5 times** lower in the **first week** of usage than with some types of FFP2 protection.

After acquiring the half mask, the only other additional costs involved are with the actual filter changes, and therefore the weekly costs on protective equipment is roughly **13 times lower** in the **first week** of deployment when compared with the readily available FFP2 type respirator.

Our solution allows a far greater number of personnel to be equipped with quality protective tools and secures their protection for longer periods with a high standard of quality and comfort.



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FAQ

Q: The mask is similar to the one developed a few weeks ago at the CTU, the one modified for manufacture by 3D printing by the Czech Institute of Informatics, Robotics, and Cybernetics (CIIRC) to be precise. How is this possible? A: The RP95-M half mask is based on the CIIRC RP95-3D model. Based on the CTU's start-up company TRIX Connections exclusive license, the design of the mask was modified by our technologists and designers for mass production.

Q: The mask seems large; won't weight be a problem?

A: The weight of the half mask is 160g including the filter. During testing it was proven that the mask can be comfortably work for long durations of time.

Q: Why is the filter fixed to one side?

A: The filter is mounted to the side due to safety reason during use. When lifting an object off the ground and tilting one's head, there was a risk that the mask would be pushed off by one's own chest. This solution also widens the user's field of view.

Q: How many times can the mask be used?

A: Thanks to the durable materials, the mask can be sterilized in and autoclave multiple times. The polyamide used on the mask allows for a limitless amount of sterilizations. The sealing material, a thermoplastic elastomer, allows for a 100 sterilization cycles and an unlimited amount of disinfection cycles.

Q: How many cycles does the filter last?

A: The limiting factor on the life of the filter is the degree of mechanical fouling due to heavier breathing. In a dusty environment such as a building site, the filter can be clogged in two days. In a clean environment such a hospital, the filter may last at least a week of continuous usage. In practice, this time may prove longer. Clogging up does not influence the filter's ability against viruses, however.

Q: Is the use of the respirator dangerous to the user's surroundings?

A: Using the half mask primarily protects the user. If the user's surroundings are not protected otherwise, it is good to supplement the respirator with a basic surgical mask. Our team is currently working on incorporating a nano particle fabric into the exhaust valve that would eliminate the need for a supplementary surgical mask. Masks thus equipped would be ideal for old age homes and maternity wards.



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Czech development – Czech manufacturing

The original prototype of the half mask for manufacturing by 3D printing developed at the **CTU** in Prague, the **Czech Institute of Informatics, Robotics, and Cybernetics (CIIRC)** to be precise. **TRIX Connections s.r.o.** (a CTU start-up) prepared a modified model of the RP95-M for injection molding on the grounds an exclusive license. R&D personnel at **CARDAM s.r.o.** a **BENEŠ a LÁT a.s.** took part in the design and development for mass production. The **Institute for Physics at the Czech Academy of Sciences** developed the testing apparatus for the quality control prior to shipping. **JAN SVOBODA s.r.o.** partook in the manufacturing and delivery of the production tools. To ensure speeding up the manufacture of the molds and production launch, work was distributed among 6 different tool works companies that are working on 10 molds in parallel to ensure a production capacity of 50 000 masks weekly. In the case of a high demand for this product a simple modular increase of production in production is easily possible.

Realization of this project was made possible by:



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