

# MASK FILTRATION: CERTIFICATION REQUIREMENTS

## CERTIFICATION OVERVIEW

There are numerous global agencies that independently approve respiratory filters and personal protective equipment, perhaps the most commonly known are NIOSH (National Institute for Occupational Safety & Health), serving the Americas and EU Notified Bodies serving Europe. NIOSH is a US federal agency and forms part of the CDC (Centers for Disease Control and Prevention). The biggest difference between NIOSH and EU Notified Bodies is that NIOSH only approves systems, for example a mask and filter combination, whereas European standards dictate these devices be viewed independently. NIOSH has its own standards and tests mask and filter systems to these accordingly. EU PPE approval on the other hand is achieved via a different process. Relevant device standards are defined by a technical board, CEN, in the case of filtration EN 14387:2004+A1:2008 & EN 14:2000 and for masks EN 136:1998 ; product samples are tested by authorised test laboratories in accordance with these standards. Only once these standards are deemed to be met, can products carry a CE mark demonstrating compliance through type-examination to the relevant standard(s) issued by a recognised EU Notified Body.

## PARTICULATE FILTERS

Both the NIOSH and the EN filter standard offer multiple particulate categories and have three levels of efficiency. For NIOSH these are rated as 95 (95%), 99 (99%) or 100 (99.97%). NIOSH also defines whether the filter is resistant to oil. N-series (e.g. N95) filters may only be used in environments free of oil aerosol. R-series filters have some resistance to oil and P-series, manufactured by Avon (e.g. P100) are strongly resistant to oil. EN standards classify by P1 (80%), P2 (94%) and P3 (99.95%). The percentages refer to the effectiveness of removing particles that are at the most penetrating particle size, 0.3 microns in diameter. All filters sold by Avon Protection meet minimum P100/P3 requirements.

## CBRN FILTERS

**NIOSH** – NIOSH does not approve filters individually, instead approving the filter and mask combination, meaning only certain filters are approved for use with certain masks. For example, the Avon Protection C50

is NIOSH approved for usage with both the CBRNCF50 CBRN canister and CTCF50 riot control canisters.

The statements of standards that NIOSH require filters to conform to are detailed in 42 CFR Part 84. Filter manufacturers must specify a minimum service life as part of the application for certification. When this minimum service life is below 60 minutes, applications are identified in 15 minute intervals (15, 30 and 45 minutes). Canisters are subjected to a number of gases/vapours at set concentrations at a fixed humidity with a constant flow rate of 64 lpm to the minimum specified service time. In order to pass, canisters shall meet or exceed the specified service times without exceeding the breakthrough concentrations NIOSH set.

Filters that pass are given a CAP approval, the most common of which are CAP1, CAP2 and CAP3 which provide a minimum of 15, 30 and 45 minutes of protection against the gases/vapours NIOSH test against. Avon Protection filters are CAP1.

**EU** – Unlike NIOSH, European standards treat filters and masks separately, meaning that masks and cartridges of different manufacturers can be used interchangeably as long as they share a common threaded connection (i.e. 40 mm). European standards (ENs) have been developed for a range of Respiratory Protective Equipment (RPE) and are unique to a particular type of RPE, for example, EN 14387 is the standard that applies to gas and combination filters such as those manufactured by Avon Protection.

Gas filters are tested and classified according to the type of gas they remove, which forms their ABEK rating. Each letter refers to a type of specified gas they

remove and is signified on the filter body by a particular colour.

The table below provides an overview of some of the most common substance classifications which combination filters are rated to protect against.

Most gas filters are further divided into three classes in terms of capacity (Class 1, 2 and 3) based upon how much of the gas or vapour the filter can hold. Class 1 filters have the lowest capacity and Class 3 filters the highest.

Filters are tested in accordance with EN 14387 with particular gases representing each of the groups A,B,E, & K at fixed concentrations and at a breathing rate of 30 lpm. The higher the class, the higher the concentration of the test gas filters are subjected to during testing. EN 14387 details a minimum breakthrough time that they must meet to be awarded that classification; for example A1 means that the filter gives a minimum breakthrough time of 70 minutes at 30 lpm breathing rate at a test gas concentration of 1000 ppm.

When looking at filters, for example the CBRNCF50CE, the filter is classified as per the below figure. The protection it offers is clearly visible via the labelling which corresponds to the colours in table 1.0.

**A1B2E1K1P3**

Avon Protection manufactures a range of respiratory protective equipment for law enforcement and militaries around the world. For more information, please visit [www.avon-protection.com](http://www.avon-protection.com).

Substance	Filter Type	Colour
Particles	P	White
Organic gases and vapours (BP > 65 °C) as specified by the manufacturer	A	Brown
Inorganic gases and vapours as specified by the manufacturer (excluding carbon monoxide – CO)	B	Grey
Sulfur dioxide and other acid gases and vapours as specified by the manufacturer	E	Yellow
Ammonia and organic ammonia derivatives as specified by the manufacturer	K	Green

Source: EN 529 October 2005