

**PROTECTIVE FILTERS**

# ABOUT US



The joint-stock company SIGMA GROUP a.s. is a modern and dynamically developing Czech engineering company which heads a group of the most important pump manufacturers in the Czech Republic. SIGMA was established 1868 in Lutín by the Sigmund brothers and has a history of more than 145 years of production and delivery of medium-size, large and unique pumps and pump equipment for use in classic and nuclear energy, the oil and petrochemical industry, mining and processing industry, agriculture, irrigation and other sectors.

SIGMA GROUP a.s. is also a leading Czech manufacturer of protective filters for protective gas masks with a tradition of development and production stretching back to 1935. Nowadays the company offers four different types of protective filters for industry, civil defence, police, army and special rescue teams, providing protection against most solid air pollutants, gases and vapours damaging the respiratory organs.

All the products are manufactured in the Czech Republic from top materials according to the system of quality management ISO 9001:2001, ISO 14001:2004, ISO 18001:2007 and are tested in its own laboratories according to Czech and European technical standards. The technical parameters of filters have also been re-checked by reputable independent laboratories.



The production of protective filters was started by SIGMA's founders – the Sigmund brothers who, in 1935, established a subsidiary company called CHEMA in Lutín and started the development and production of protective devices against combat gases and air protection devices. In the years 1938–1939, the business was extended with the production of plastics and curatives. In that time in Czechoslovakia, CHEMA was the only company in the field of protection against combat gases whose basis was in scientific research. The company's Medical Working Group assembled a PRIMOSANA first-aid box – the first comprehensive kit of medical first-aid means in the case of an attack by combat gases such as mustard gas and lewisite.

CHEMA's activities included:

- Development and production of protective filters for the army and civilian population
- Development of protective gas masks for civil purposes
- Development and production of filter systems for military strongholds in the borderland
- Production of degassing and fog-forming devices
- Training of the civilian population in chemical war defence
- Organizing and financing of the Medical Working Group for the research of combat gases and protection against them

After World War Two, CHEMA ceased to exist and the parent company SIGMA focused on the development and production of protective filters only. Until 1962, small protective filters for gas masks, type CF-II-50, in a steel sheet body were made. Then the production of more modern filters of MOF series followed and, from 1976, their body was made also of AlMg alloy. These filters in various modifications

were designed for individual protection against poison war gases and for protection against effects of industrial substances such as chlorine, hydrogen cyanide, carbon tetrachloride, and other organic and inorganic substances.



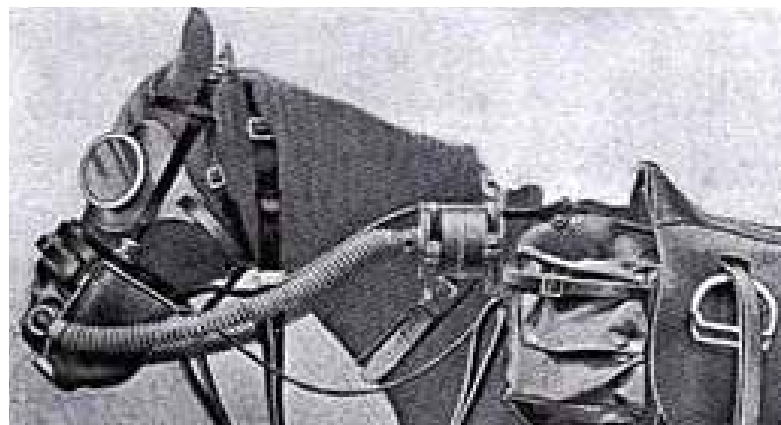
In 1994, the development of the MOF-5 filter was finished and new materials – filter paper, active carbon, sealing compound and plastic body – were tested on it. In 1997, the last model of the combined protective filter MOF-6 was finished and tested. It has a plastic body and contains top-class filtering components meeting European standards EN 141, EN 143 and EN 148-1.

In 1998, upon the requirements of the Czech Army, the OF-90 protective filter in plastic design was developed. It protects against a wide spectrum of poison war gases.

In 2003, the production of the P3 protective filter started. It is designed for protection against solid and liquid particles, aerosols, dust, viruses and bacterial, particularly in the industrial sector.

Since 2006, the OF-02 protective filter (NBC I and NBC II versions) has been produced. It is a combined filter designed for the capture of hazardous substances from the passing air – organic gases and vapours, toxic inorganic gases, sour gases, ammonia, nitrogen dioxide, and mercury vapours. The filter insert with a polymeric sealing compound protects against dust, solid and liquid aerosols.

In 2013, the research and development of frame filters for stationary ventilation units with a capacity of 40-50 m<sup>3</sup>/h started. They are designed for collective protection of the civilian population in the safe rooms of housing units, offices, schools, etc. The sorption part of the frame filter serves for broad-spectrum capture of toxic gases, vapours and aerosols. The frame filter also includes the H7 and H14 particulate filters. SIGMA GROUP a.s. actively participates in the research of nano-fibre based filtering materials in cooperation with the Technical University of Liberec, Czech Republic.







## Protective Filter MOF - 6

### Tactical and technical parameters

Gas protective filter	A2B2E2K2
Body made of special plastic material	
Dimensions:	diameter 112 mm, height 93 mm, weight 290 g
Breathing resistance at:	30 l/min - 120 Pa, 95 l/min - 580 Pa
Thread connection:	EN 148-1 Rd 40x1/7" or GOST 8762-75 OZ 40x4 mm
Standards:	EN 14387 + A1

### Range of protection

Organic, inorganic, sour gases and vapours, chlorine, cyclohexane, toluene, alcohol, phosgene, hydrogen cyanide, cyanogen chloride, chloropicrin, sarin, yperite, formaldehyde, bromine, hydrogen chloride and fluoride, ammonia, organic amines.

### Areas of use

Chemical, petrochemical, food processing and pharmaceutical industries, foundries, paint shops, hospitals, laboratories, populations in endangered locations etc.



## Protective Filter MOF – 6 Combined

### Tactical and technical parameters

Combined protective filter	A2B2E2K2P3 D R
Body made of special plastic material	
Dimensions:	diameter 112 mm, height 93 mm, weight 370 g
Breathing resistance at:	30 l/min - 190 Pa, 95 l/min - 750 Pa
Filtration efficiency:	5·10 <sup>-2</sup> % (0.05%) particle sizes
Thread connection:	EN 148-1 Rd 40x1/7" or GOST 8762-75 OZ 40x4 mm
Standards:	EN 14387+A1, EN 143, TP-SIGMA 578-1/2004, EN 12941 TH3 A2B2E2K2P SL R, EN 12942 TM3 A2B2E2K2P SL R

### Range of protection

Organic, inorganic, sour gases and vapours, chlorine, cyclohexane, toluene, alcohol, phosgene, hydrogen cyanide, cyanogen chloride, chloropicrin, sarin, yperite, formaldehyde, bromine, hydrogen chloride and fluoride, ammonia, organic amines, dust and fluid particles, aerosols, toxic fumes, biological solids and liquid aerosols, radioactive aerosols, bacteria and viruses.

### Areas of use

Army units, police, special rescue teams, fire brigades, chemical, petrochemical, food processing, electronic, foil and pharmaceutical industries, paint shops, hospitals, laboratories, populations in endangered locations etc.



## Protective Filter OF – 90 NBC I.

### Tactical and technical parameters

Combined protective filter	A2B2E1P3
Body made of special plastic material	
Dimensions:	diameter 110 mm, height 77 mm, weight 275 g
Breathing resistance at:	30 l/min - 140 Pa, 95 l/min - 490 Pa
Filtration efficiency:	1•10– 4% (0.0001%) particle sizes
Thread connection:	EN 148-1 Rd 40x1/7" or GOST 8762-75 OZ 40x4 mm
Standards:	EN 141, EN 143, Czech Army Standard TP-SIGMA 578-1/98

### Range of protection

Organic, inorganic, acid, sour gases and vapours, chlorine, cyclohexane, toluene, alcohol, halogens, phosgene, hydrogen cyanide, chloropicrin, sarin, somane, yperite, hydrogen sulphide, sulphur dioxide, cyanogen chloride, formaldehyde, bromine, hydrogen chloride and fluoride, dust and fluid particles, aerosols, toxic fumes, biological solids and liquid aerosols, radioactive aerosols, bacteria and viruses.

### Areas of use

Army units, police, special rescue teams, fire brigades, hospitals, laboratories, populations in endangered locations. Broad spectrum protection against warfare agents (suitable for special task forces).



## Protective Filter OF – 02 NBC II.

### Tactical and technical parameters

Combined protective filter	A2B2E2K2HgNOP3D
Body made of special plastic material	
Dimensions:	diameter 112 mm, height 93 mm, weight 370 g
Breathing resistance at:	30 l/min - 180 Pa, 95 l/min - 750 Pa
Filtration efficiency:	1•10– 4% (0.0001%) particle sizes
Thread connection:	EN 148-1 Rd 40x1/7" or GOST 8762-75 OZ 40x4 mm
Standards:	EN 14387, EN 143, EN 12941, EN 12942

### Range of protection

Organic, inorganic, acid, sour gases and vapours, chlorine, cyclohexane, toluene, alcohol, halogens, phosgene, hydrogen cyanide, chloropicrin, sarin, somane, yperite, hydrogen sulphide, sulphur dioxide, cyanogen chloride, formaldehyde, bromine, hydrogen chloride and fluoride, ammonia, organic amines, nitrogen dioxide, dinitrogen pentoxide, mercury, mercury vapour and her compounds. dust and fluid particles, aerosols, toxic fumes, biological solids and liquid aerosols, radioactive aerosols, bacteria and viruses.

### Areas of use

Army units, police, special rescue teams, fire bigades, chemical, petrochemical, food processing, electronic, foil and pharmaceutical industries, paint shops, hospitals, laboratories, populations in endangered locations etc.



## Particle Filter P3 R

### Tactical and technical parameters

Particle Filter P3 R	P3 R
Body made of special plastic material	
Dimensions:	diameter 110 mm, height 56 mm, weight 95 g
Breathing resistance at:	30 l/min - 60 Pa, 95 l/min - 180 Pa
Filtration efficiency:	1·10 <sup>-4</sup> - 4% (0.0001%) particle sizes
Thread connection:	EN 148-1 Rd 40x1/7" or GOST 8762-75 OZ 40x4 mm
Standards:	EN 143/A1, EN 12941, EN 12942 Corresponds with the Class U15 according to the EN 1822

### Range of protection

Harmful dust solid and fluid particles, aerosols, toxic fumes, biological and radioactive solid and liquid aerosols, dust, bacteria and viruses.

### Areas of use

Chemical, petrochemical, food processing, electronic, foil and pharmaceutical industries, foundries, paint shops, hospitals, laboratories, etc.



### Classification according to standards EN 143, EN 14387, EN 12941, EN 12942

Type	Color Code	Main Application
A	BROWN	Solvents, organic gases and vapours of organic substances with a boiling point over 65°C
B	GREY	Inorganic gases and vapours with the exceptions of carbon monoxide and nitrogen monoxide
E	YELLOW	Sour gases and vapours
K	GREEN	Ammonia and organic amines, ammonium chloride, methylamine, ethylene amine, hydrazine
Hg	RED	Mercury, mercury vapour and its compounds
NO	BLUE	Oxides of nitrogen - NO <sub>x</sub> , e.g. NO <sub>2</sub> - nitrogen dioxide
P	WHITE	Harmful solid and fluid particles, biological and radioactive solid and fluid aerosols, dust, bacteria and viruses



### Main references

- Army, Czech Republic (continuously from 1998)
- Police and fire brigades, Czech Republic (continuously from 2006)
- Army, Slovakia (continuously from 2000)
- Army, Saudi Arabi (2005, 2011)
- Police, Turkey (2007)
- Police, Latvia (2005)



Protective filters, in combination with protective gas masks, half-masks or special devices, protect the respiratory systems of individuals against hazardous substances in the air. In the air mass passage direction, aerosols and dusts are captured first on the filter insert. Then gaseous hazardous substances are removed by physical or chemical sorption in the sorption layer made of specially impregnated active carbon (sorbent). To ensure that the protective filter functions reliably, it is necessary that the minimum oxygen content in the air is 17% vol.

Filters can not protect users from carbon monoxide, nitrous oxide, nitric oxide, and methane. Among others, they can not protect from perfluorobutene which originates inter alia by pyrolysis of Teflon. Furthermore, they can not capture hydrocarbons with low boiling point.

The protective filters are currently manufactured on the basis of a quality system certification according to ISO 9001:2001, ISO 14001:2004 and ISO 18001:2007 attested by TÜV NORD CERT GmbH. For the manufactured types of filters, SIGMA GROUP a.s. holds a valid certificate from the Occupational Safety Research Institute in Prague issued under no. 235. The filters have been tested for virus and bacteria penetration by Nelson Laboratories Inc., USA.

A hundred-percent output quality inspection is carried out for all production of protective filters. The inspection includes weight, resistance, and penetration coefficient by paraffin oil. The dynamic sorption capacity (DSC) of absorbents and other input materials (plastic filter body mouldings, sealing compound, filter paper, etc.) is checked in the company laboratory. Selectively, DSC is also checked in finished products. Standard test gases are phosgene, hy-



drogen cyanide, cyan chloride, chloropicrin, and ammonia. Other testing substances such as hydrocarbons are used for research purposes or upon special requests of customers. All production and inspection activities are audited every year.

The company uses special test equipment – a gas spectrometer from ANSYCO, Germany.

Protective filters MOF-6, OF-90 and OF-02 are tested according to the European technical standards EN 143, EN 14387+A1, EN 12941/A2 and EN 12942/A2. Protective filter P3 R is tested according to EN 143/A1, EN 12941 and EN 12942. All filters are marked with the CE compliance mark.

All protective filters are wrapped in special, long-lasting, multilayer alufan (aluminium based foil) or transparent plastic foil and stocked in shipping containers according to customer requirements. Good conditions of storage for all filter types are provided in a dry, well-ventilated warehouse with relative humidity 0 ÷ 95% and interior temperature from -10°C to +50°C.



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