

# Filter range selection chart



# | How to choose a filter

The choice of the **respiratory protection filter** depends on the conditions of the environments in which it will be used and the inherent risks. When selecting the filter it is necessary to take into account protection factors, the type of filter used, the filtration capacity of the device and to analyze the environment conditions.

## | Protection factor

It is necessary to know the concentrations and the occupational exposure limits related to the contaminants you want to protect from, on which ratio the minimum protection factor required will be determined (EN 529). The protection factor of the Personal Protective breathing equipment refers to intact and correctly used devices.

**There are two main classifications:**

**1. Nominal Protection Factor (NPF):** minimal level of protection the equipment has to demonstrate under laboratory conditions to gain approval to the appropriate class of the performance standard.












**2. Assigned Protection Factor (APF):** EN 529 acknowledges that laboratory performance may not be achievable in real use. Figures are taken from EN 529 and are the minimum level of protection calculated for 95% of trained wearers using the equipment in the workplace. The Assigned Protection Factor may vary from country to country. Figures quoted by **DPI** are those valid in Italy.

Device	Protection	NPF	APF
Half mask filtering facepiece	FFP1	4	4
	FFP2	12	10
	FFP3	50	30
Half mask with particulate filter	P1	4	4
	P2	12	10
	P3	48	30
Full face mask with particulate filter	P1	5	4
	P2	16	15
	P3	1000	400
Half mask with gas filter	--	50	30
Full face mask with gas filter	--	2000	400



# Type of filter

Contaminants may be present in different forms, such as particulate gas or a combination of both. Therefore the type of filter that can offer greater protection for the risk must be chosen. According to EN 14387 and EN 143, the various types of filters are recognizable by distinctive colours as below:

Colour	Filter type	Main field of application
 Brown	AX	Gases and vapours of organic compounds with boiling point < 65 °C
 Brown	A	Gases and vapours of organic compounds with boiling point > 65 °C
 Grey	B	Inorganic gases and vapours e.g. chlorine, hydrogen sulphide, hydrogen cyanide
 Yellow	E	Sulphur dioxide, hydrogen chloride
 Green	F	Ammonia
 Black	CO	Carbon monoxide
 Red	Hg	Mercury vapours
 Blue	NO	Nitrous gases, including nitrogen monoxide
 Orange	Reaktor	Radioactive iodine including radioactive methyl iodide
 White	P	Particles, dust and mist
 Purple	SX	Special types on request

# Class of filter

In addition to the type of filtering device, you must choose the appropriate class of the filter. Here below are the concentrations required by EN 14387 and EN 143 of toxic substances according to the filtration device class:

Type of filter	Filtration class	Maximum protection allowed
ANTIGAS FILTERS	1	0.1% vol
	2	0.5% vol
	3	1.0% vol
PARTICULATE FILTERS	1	4*T.L.V.
	2	12*T.L.V.
	3	50*T.L.V. (with half mask) / 100*T.L.V. (with full face mask)

Capacity Efficiency

**N.B. Do not use filtering devices:**

- In the atmosphere with oxygen deficiency (<17%);
- In poorly ventilated or confined spaces;
- In cases where types or concentrations of toxic substances are not known, or where you can run into immediate risk to health;
- At concentrations higher than those allowed by chosen protector devices;
- With substances that cannot be perceived;
- With asphyxiating substances.

**You must leave the contaminated area and then remove the device if:**

- Breathing becomes difficult;
  - You begin to perceive smells;
  - Dizziness, irritation or other events appear;
  - The device is damaged.
- Make also sure that there are no toxic gases if you use a particulate filter and, conversely, make sure that there are no contaminants in the form of particulate if you use a gas filter. The device has a filter efficiency only if correctly worn.

# Lifetime of the filter

The lifetime of the filter **depends on the class and on the conditions of use**: several factors affect the duration of the device such as the humidity and the temperature of the inhaled air, the consumption of air by the user and the concentrations and combinations of toxic contaminants in the environment, affect the duration of the device. For these reasons it is not possible to specify a lifetime of the device if even one factor is unknown. Usually the breaking of the filter is shown by the perception of odours. With regards to particulate filters, the lifetime of the device is indicated by the filter clogging, resulting in an increase of respiratory resistance.

In the below table\* are reported some of the main toxic contaminants, their **TLV-TWA** (Time Weighted Average) and **STEL** (Short term exposure limit) values and the type of device suggested.

**WARNING:** If TLV-TWA and STEL values are very low always USE full face masks.

\*Table updated following the Decree of the Minister of Labour and Social Policy and the Minister of Health of 18 May 2021 transposing Directive No 2019/1831/EU establishing a fifth list of indicative occupational exposure limit values in implementation of Directive 98/24/EC.

## Occupational exposure limit values

N.CE(1)	CAS (2)	NAME OF CHEMICAL SUBSTANCE	LIMIT VALUES				NOTATION (3)	FILTER TYPE
			8 Hours (4)		Short-term (5)			
			mg/m <sup>3</sup> (6)	ppm (7)	mg/m <sup>3</sup> (6)	ppm (7)		
252-104-2	34590-94-8	(2-methoxymethylethoxy)propanol	308	50	–	–	Cute	A
208-394-8	526-73-8	1,2,3-trimethylbenzene	100	20	37,8	–	–	A
204-428-0	120-82-1	1,2,4-trichlorobenzene	15,1	2	–	5	Cute	A
202-436-9	95-63-6	1,2,4-trimethylbenzene	100	20	–	–	–	A
204-661-8	123-91-1	1,4-dioxane	73	20	60	–	Cute	A
203-400-5	106-46-7	1,4-dichlorobenzene	12	2	101,2	10	Cute	A
203-961-6	112-34-5	2-(2-butoxyethoxy)ethanol	67,5	10	–	15	–	A
203-906-6	111-77-3	2-(2-methoxyethoxy)ethanol	50,1	10	7,6	–	Cute	A
205-483-3	141-43-5	2-aminoethanol	2,5	1	333	3	Cute	A
203-933-3	112-07-2	2-butoxyethyl acetate	133	20	–	50	Cute	A
203-234-3	104-76-7	2-ethylhexan-1-ol	5,4	1	–	–	Cute	A
203-804-1	110-80-5	2-ethoxyethyl acetate	8	2	–	–	Cute	A
203-839-2	111-15-9	2-Etossietil acetato	11	2	–	–	Cute	A
202-704-5	98-82-8	Cumene	50	10	250	50	Cute	A
203-603-9	108-65-6	2-methoxy-1-methylethyl acetate	275	50	550	100	–	A
203-713-7	109-86-4	2-methoxyethanol	–	0,5	–	–	Cute	A
203-772-9	110-49-6	2-methoxyethyl acetate	–	0,5	–	–	Cute	A
203-403-1	106-49-0	p-toluidine	4,46	1	8,92	2	Cute	A
208-793-7	541-85-5	5-methylheptan-3-one	53	10	107	20	–	A
203-737-8	110-12-3	5-methylhexan-2-one	95	20	–	–	–	A
210-946-8	626-38-0	1-methylbutyl acetate	270	50	540	100	–	A
	620-11-1	3-Pentanol, acetate (8CI)(9CI)	270	50	540	100	–	A
205-500-4	141-78-6	Ethyl acetate	734	200	1468	400	–	A
204-662-3	123-92-2	Isopentyl acetate	270	50	540	100	–	A
203-745-1	110-19-0	Isobutyl acetate	241	50	723	150	–	A
204-658-1	123-86-4	N-butyl acetate	241	50	723	150	–	A
211-047-3	628-63-7	Pentyl acetate	270	50	540	100	–	A
	625-16-1	2-Butanol, 2-methyl-, acetate	270	50	540	100	–	A
203-300-1	105-46-4	sec-butyl acetate	241	50	723	150	–	A

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			8 Hours (4)		Short-term (5)			
			mg/m <sup>3</sup> (6)	ppm (7)	mg/m <sup>3</sup> (6)	ppm (7)		
203-545-4	108-05-4	Vinyl acetate	17,6	5	35,2	10	–	A
200-662-2	67-64-1	Acetone	1210	500	–	–	–	AX
200-835-2	75-05-8	Acetonitrile	35	20	–	–	Cute	A
200-580-7	64-19-7	Acetic acid	25	10	50	20	–	EP2-BP2
201-177-9	79-10-7	Acrylic acid	29	10	59 (14)	20 (14)	Cute	A
233-113-0	10035-10-6	Hydrogen bromide	–	–	3,7	2	–	EP2-BP2
231-595-7	7647-01-0	Hydrogen chloride	8	5	15	10	–	EP2
231-634-8	7664-39-3	Hydrogen fluoride	1,5	1,8	2,5	3	–	EP2-BP2
200-579-1	64-18-6	Formic acid	9	5	–	–	–	E-B
231-714-2	7697-37-2	Nitric acid	–	–	2,6	1	–	EP2-BP2
231-633-2	7664-38-2	Orthophosphoric acid	1	–	2	–	–	P2
205-634-3	144-62-7	Oxalic acid	1	–	–	–	–	P2
201-176-3	79-09*4	Propionic acid	31	10	62	20	–	A
231-977-3	04/06/7783	Hydrogen sulphide	7	5	14	10	–	B
231-639-5	7664-93-9	Sulphuric acid	00,5	–	–	–	–	P2
205-480-7	141-32-2	Butyl acrylate	11	2	53	10	–	A
203-453-4	107-02-8	Acrylaldehyde	0,05	0,02	0,12	0,05	–	AX
203-470-7	107-18-6	Allyl alcohol	4,8	2	12,1	5	Cute	A
204-633-5	123-51-3	3-methylbutan-1-ol	18	5	37	10	–	A
200-521-5	61-82-5	Amitrole	0,2	–	–	–	–	AP2
231-635-3	7664-41-7	Ammonia, anhydrous	14	20	36	50	–	K
204-696-9	124-38-9	Carbon dioxide	9000	5000	–	–	–	-
231-195-2	05/09/7446	Sulphur dioxide	1,3	0,5	2,7	1	–	E
200-539-3	62-53-3	Aniline	7,74	2	19,35	5	Cute	AP3
231-131-3		Silver (soluble compounds)	0,01	–	–	–	–	P3
231-131-3	7440-22-4	Silver	0,1	–	–	–	–	P3
247-852-1	26628-22-8	Sodium azide	0,1	–	0,3	–	Cute	P2
		Barium (soluble compounds)	0,5	–	–	–	–	NO
233-272-6	10102-44-0	Nitrogen dioxide	0,96	0,5	1,91	1	–	P2
201-245-8	80-05-7	4,4'-isopropylidenediphenol	2 (12)	–	–	–	Cute	B
231-778-1	7726-95-6	Bromine	0,07	0,1	–	–	–	A
203-788-6	110-65-6	But-2-yne-1,4-diol	0,5	–	–	–	–	A
201-159-0	78-93-3	Butanone	600	200	900	300	–	A
203-905-0	111-76-2	2-butoxyethanol	98	20	246	50	–	B
206-992-3	420-04-2	Cyanamide	1	–	–	–	Cute	B
200-821-6	74-90-8	Hydrogen cyanide	1	0,9	5	4,5	Cute	BP3
205-792-3	151-50-8	Potassium cyanide	1	–	5	–	Cute	BP3
205-599-4	143-33-9	Sodium cyanide	1	–	5	–	Cute	A
203-806-2	110-82-7	Cyclohexane	350	100	–	–	–	A
203-631-1	108-94-1	Cyclohexanone	40,8	10	81,6	20	Cute	BP3
231-959-5	7782-50-5	Chlorine	–	–	1,5	0,5	–	A
200-871-9	75-45-6	Chlorodifluoromethane	3600	1000	–	–	–	A
200-830-5	75-00-3	Chloroethane	268	100	–	–	–	BP3

N.CE(1)	CAS (2)	NAME OF CHEMICAL SUBSTANCE	LIMIT VALUES				NOTATION (3)	FILTER TYPE
			8 Hours (4)		Short-term (5)			
			mg/m <sup>3</sup> (6)	ppm (7)	mg/m <sup>3</sup> (6)	ppm (7)		
200-663-8	67-66-3	Chloroform	10	2	–	–	Cute	AX
200-817-4	74-87-3	Chloromethane; methyl chloride	42	20	–	–	–	–
200-838-9	75-09-2	Dichloromethane; methylene chloride	175	50	353	100	Cute	AX
200-864-0	75-35-4	1,1-dichloroethylene	8	2	20	5	–	AX
		Metallic chromium, inorganic chromium compounds (II) and inorganic chromium compounds (III) (insoluble)	0,5	–	–	–	–	P2-P3
202-704-5	98-82-8	Cumene	100	20	250	50	Cute	A
207-069-8	431-03-8	Butanedione	0,07	0,02	0,36	0,01	–	A
202-425-9	95-50-1	1,2-dichlorobenzene	122	20	306	50	Cute	A
200-863-5	75-34-3	1,1-dichloroethane	412	100	–	–	Cute	AX
203-716-3	109-89-7	Diethylamine	15	5	30	10	–	AX
200-467-2	60-29-7	Diethyl ether	308	100	616	200	–	AX
202-981-2	101-84-8	Diphenyl ether	7	1	14	2	–	A
215-137-3	1305-62-0	Calcium dihydroxide	1 (13)	–	4 (13)	–	–	P2
204-697-4	124-40-3	Dimethylamine	3,8	2	9,4	5	Cute	K
200-843-6	75-15-0	Carbon disulphide	3	1	–	–	–	B
203-313-2	105-60-2	ε-caprolactam (dusts and vapours)	10	–	40	–	–	AP2
203-388-1	106-35-4	Heptan-3-one	95	20	–	–	–	A
205-563-8	142-82-5	Heptane	2085	500	–	–	–	A
203-767-1	110-43-0	Heptan-2-one	238	50	475	100	Cute	A
204-065-8	115-10-6	Dimethyl ether	1920	1000	–	–	–	AX
205-438-8	140-88-5	Ethyl acrylate	21	5	42	10	–	A
200-834-7	75-04-7	Ethylamine	9,4	5	–	–	–	K
202-849-4	100-41-4	Ethylbenzene	442	100	884	200	Cute	A
203-473-3	107-21-1	Ethane-1,2-diol	52	20	104	40	Cute	A
202-705-0	98-83-9	2-phenylpropene	246	50	492	100	–	A
1 203-632-7	108-95-2	Phenol	8	2	16	4	Cute	A
1 231-945-8	7782-41-4	Fluorine	1,58	1	3,16	2	–	B
		Inorganic fluorides (expressed as F)	2,5	–	–	–	–	B
203^481-7	107-31-3	Methyl formate	125	50	250	100	Cute	AX
232-260-8	7803-51-2	Phosphine	0,14	0,1	0,28	0,2	–	B
200-870-3	75-44-5	Phosgene	0,08	0,02	0,4	0,1	–	BP3
231-484-3	7580-67-8	Lithium hydride	–	–	0,02 (12)	–	–	P3
210-868-3	624-83-9	Methyl isocyanate	–	–	–	0,02	Cute	BP3
201-142-8	78-78-4	2-methylbutane	2000	667	–	–	–	AX
		Manganese and inorganic manganese compounds (expressed as manganese)	0,2(12) 05(13)	–	–	–	–	P2
		Mercury and divalent inorganic mercury compounds including mercuric oxide and mercury chloride (measured as mercury) (9)	0,02	–	–	–	Cute	P3
203-604-4	108-67-8	Mesitylene	100	20	–	–	–	A
201-297-1	80-62-6	Methyl methacrylate	–	50	–	100	–	A
200-659-6	67-56-1	Methanol	260	200	–	–	Cute	AX

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			8 Hours (4)		Short-term (5)			
			mg/m <sup>3</sup> (6)	ppm (7)	mg/m <sup>3</sup> (6)	ppm (7)		
202-500-6	96-33-3	methyl acrylate; methyl propenoate	7	2	36	10	Cute	A
203-550-1	108-10-1	4-methylpentan-2-one	83	20	208	50	_	A
203-539-1	107-98-2	1-methoxypropan-2-ol	375	100	568	150	Cute	A
203-628-5	108-90-7	Chlorobenzene	23	5	70	15	_	A
233-271-0	10102-43-9	Nitrogen monoxide	2,5	2		_		NO
211-128-3	630-08-0	Carbon monoxide	23	20	117	100		CO
203-815-1	110-91-8	Morpholine	36	10	72	20	Cute	A
203-576-3	108-38-3	m-xylene	221	50	442	100	Cute	A
200-679-5	68-12-2	N,N-dimethylformamide	15	5	30	10	Cute	A
204-826-4	127-19-5	N,N-dimethylacetamide	36	10	72	20	Cute	A
207-343-7	463-82-1	Neopentane	3000	1000	_	_	_	AX
203-777-6	110-54-3	n-hexane	72	20	_	_	_	A
200-193-3	54-11-5	Nicotine	0,5	_	_	_	Cute	AP3
202-716-0	98-95-3	Nitrobenzene	1	0,2	_	_	Cute	A
201-188-9	79-24-3	Nitroethane	62	20	312	100	Cute	A
212-828-1	872-50-4	1-methyl-2-pyrrolidone	40	10	80	20	Cute	A
201-083-8	78-10-4	Tetraethyl orthosilicate	40	5	_	_	_	A
215-138-9	1305-78-8	Calcium oxide	1 (13)	_	4(13)	_	_	P2
216-653-1	1634-04-4	tert-butyl methyl ether	183,5	50	367	100	_	A
202^122-2	95-47-6	o-xylene	221	50	442	100	Cute	A
233-060-3	10026-13-8	Phosphorus pentachloride	1	_	_	_	_	B
203-692-4	109-66-0	Pentane	2000	667	_	_	_	AX
215-236-1	1314-56-3	Diphosphorus pentaoxide	1	_	_	_	_	P2
215-242-4	1314-80-3	Diphosphorus pentasulphide	1	_	_	_	_	A
		Inorganic lead and its compounds	0,15	_	_	_	_	A
203-808-3	110-85-0	Piperazine (dusts and vapours)(8)	0,1	_	0,3	_	_	B
	8003-34-7	Pyrethrins (purified of sensitising lactones)	1	_	_	_	_	AX
203-396-5	106-42-3	p-xylene	221	50	442	100	Cute	P2
203-585-2	108-46-3	resorcinol; 1,3-benzenediol	45	10	_	_	_	P2
231-978-9	7782-41-4	Dihydrogen selenide	0,07	0,02	0,17	0,05	_	BP3
222-995-2	3689-24-5	Sulfotep	0,1	_	_	_	Cute	AP3
262-967-7	61788-32-7	Terphenyl, hydrogenated	19	12	48	5	_	AP2
204-825-9	127-18-4	Tetrachloroethylene	138	20	275	40	Cute	A
200-262-8	56-23-5	Carbon tetrachloride	6,4	1	32	5	Cute	A
203-726-8	109-99-9	Tetrahydrofuran	150	50	300	100	Cute	A
203-625-9	108-88-3	Toluene	192	50	_	_	Cute	A
200-756-3	71-55-6	1,1,1-trichloroethane	555	100	1110	200	_	A
233-046-7	10025-87-3	Phosphoryl trichloride	0,064	0,01	0,12	0,02	MW	BP2
204-469-4	121-44-8	Triethylamine	8,4	2	12,6	3	Cute	A
200-875-0	75-50-3	Trimethylamine	4,9	2	12,5	5	_	B
200-240-8	55-63-0	Glycerol trinitrate	0,095	0,01	0,19	0,02	Cute	B
215-535-7	1330-20-7	Xylene, mixed isomers, pure	224	50	442	100	Cute	A

## | Table notes

- (1) EC number: EC number (European Community) - numerical identifier of substances within the European Union.
- (2) CAS: Chemical Abstract Service Registry Number.
- (3) The notation of the term "skin" for an occupational exposure limit value indicates the possibility of absorption significant through the skin.
- (4) Measured or calculated in relation to a reference period of eight hours, as a time weighted average (TWA).
- (5) Short Term Exposure Limit (STEL). Limit value that must not be exceeded. The reference period is 15 minutes, unless otherwise specified.
- (6) mg/m: milligrams per cubic meter of air. For chemicals in the gaseous or vapor phase the limit value is expressed at 20°C and 101.3 kPa.
- (7) ppm: parts per million by volume of air (ml/m<sup>3</sup>).
- (8) The detection method must simultaneously detect dust and vapour.
- (9) When monitoring exposure to mercury and its inorganic divalent compounds, it is necessary to keep in mind the related biological monitoring techniques that complement the occupational exposure limit values.
- (10) When selecting an appropriate exposure monitoring method, limitations and interference should be taken into account potentials that may result from the presence of other phosphorus compounds.
- (11) Nebulization is defined as the thoracic fraction.
- (12) Inhalable fraction.
- (13) Respirable fraction.
- (14) Short term exposure limit value in relation to a 1 minute reference period.
- (15) During exposure monitoring it is appropriate to keep in mind the relevant biological monitoring values, as suggested by the Scientific Committee for Occupational Exposure Limits to Chemical Agents (SCOEL).
- (16) According to the provisions of Article 3 of Directive no. 2019/1831 / EU the reference to cumene is deleted with effect from 20.