EUROPEAN SOLVENTS INDUSTRY GROUP

European Safety Federation ESF

BEST PRACTICE GUIDELINES

Respiratory Protection Selection and Use – Guide for Solvents

CONTENTS

ESF – European Safety Federation is the organisation which groups the suppliers (manufacturers, importers and distributors) and service providers of Personal Protective Equipment (PPE) for professional use in Europe.

ESIG – European Solvents Industry Group is the joint activity of the European manufacturers of hydrocarbon and oxygenated solvents and act as the point of reference for the safe and sustainable use of solvents, enabling science-based decision-making for stakeholders and regulators alike.

This document has been prepared by the Working Group "ESF Respiratory protectives devices", the secretariat of which is held by ESF.

PART 1 Scope of the document

This document is intended to provide general guidance on how to select, use and verify respiratory protective equipment for the protection of workers when using substances that are used, among other things, as solvents.

This document has been prepared by working group "ESF Respiratory protective devices", the secretariat of which is held by ESF.

The guide provides general indications, the actual assessment of the suitability of the respiratory protective equipment must be made by a professional industrial hygienist and must take into account the real conditions of use, the real concentrations and working conditions, as well as the use of other means of personal protection.

Respiratory protective devices (RFP) are designed to be worn in hazardous environments and should provide wearers with an adequate supply of breathable air. Personal Protective Equipment, including Respiratory protective devices, are considered to be at the bottom of the hierarchy of protective measures and should only be used after an acceptable case for their use has been established by way of an appropriate risk assessment.

ESF does not accept responsibility for incorrect use of the indications in this document. The guidance contained in this document is not intended to be exhaustive but highlights important aspects to which attention should be given. The recommendations in this document will help to comply with national legislation on this subject where it exists, or with European legislation.

PART 2 Normative references and marking
(general, the specific markings are covered at paragraph 4)

European legislation defines the requirements for Personal Protective Equipment with the (PPE) Regulation (EU) 2016/425.

As of April 2018, the new Personal Protective Equipment (PPE) Regulation 2016/425 repeals the PPE Directive 89/686/EEC. The new regulation has been introduced to harmonize processes and reflect current practice for developing and bringing PPE to the market in Europe.

The PPE Regulation is a binding legislative act and imposes clear and detailed requirements which must be applied in their entirety across the EU member states. The regulation applies to all forms of PPE supply, including distance selling, and seeks to establish high levels of health and safety practice, protection of users, and fair competition.

The EU Declaration of Conformity has to be provided with each product (or a link to where it can be obtained).

All respiratory protective equipment's are classified under the Category 3 in the (PPE) Regulation 2016/425 and they must have CE marking with digits code of Notified Body involved in the production controls.

Recommendations for the PPE user:

- When appropriate, request documentation showing compliance to the Regulation from your PPE supplier
- Train workers in the correct selection and use of PPE
- Ensure all PPE is properly maintained and used for its intended purpose

The following referenced documents are indispensable for the application of this document. For updated references, the latest edition of the referenced document (including any amendments) applies.

EN 132:1998, Respiratory protective devices – Definitions of terms and pictograms.

EN 134:2024, Respiratory protective devices – Nomenclature of components.

EN 529:2005, Respiratory protective devices - Recommendations for selection, use, care and maintenance - Guidance document.

This document has been prepared by the Working Group "ESF Respiratory protectives devices", the secretariat of which is held by ESF.

PART 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 132:1998 and EN 134:2024 and the following apply.

Nominal protection factor: number derived from the maximum percentage of total inward leakage permitted in relevant European Standards for a given class of respiratory protective device. The relationship between nominal protection factor and total inward leakage can be expressed as follows:

nominal protection factor = 100/ permitted maximum percentage total inward leakage

There are two distinct types of respiratory protective devices:

a. **Filtering devices:** these purify the ambient air to be breathed using filters able to remove contaminants in the air.

b. **Breathing apparatus:** these supply the wearer with breathable air (e.g. compressed air) from an uncontaminated source.

Both have different parts:

- **Facepieces:** the facepiece directs the uncontaminated breathable air to the wearer's nose and mouth area.
- **Tight-fitting facepieces** (filtering facepieces, quarter masks, half masks and full-face masks) rely heavily on a good seal between the mask and the wearer's face.

Loose-fitting facepieces (e.g. hoods, helmets, visors, blouses, suits) rely on enough air being provided to prevent contaminants leaking into the facepiece as the wearer breathes and moves about. They are only used on powered filtering devices or with suitable breathing apparatus. Contaminants:

Identify the airborne contaminants that may pose a risk to the respiratory tract and in what physical form they occur:

- **Dusts/fibres:** solid particles generated by crushing solid materials
- **Fumes:** very fine solid particles that form when a metal is melted and then cools down quickly (e.g. welding fumes)
- **Mists/aerosols**: tiny liquid droplets suspended in the air (e.g. oil mists)
- **Gases/Vapours:** substances in the gaseous phase (e.g. solvents)

Similarly exposure to an oxygen deficient atmosphere can lead to death.

Characteristics of contaminants

The main source for identifying the hazardousness of a substance is the safety data sheet that the supplier is obliged to deliver to its customers.

We need to define some elements that will help to understand the selection criteria:

- **TLV-TWA:** Threshold limit value - time-weighted average.
  It is the average concentration, in air, measured over an eight-hour working day and 40 working hours per week, to which almost all workers can be repeatedly exposed, day after day, without adverse health effects.
- **TLV STEL:** Threshold limit value - limit for short-term exposures.
  This is the concentration to which workers may be exposed for a short period of time (measurement takes place over 15 minutes).
- **ODOR THRESHOLD:** It is the concentration at which you can perceive the smell of a gas/vapour.
  Since the perception of the smell of the substance is subjective, a range of concentrations is often indicated as the olfactory threshold.

PART 4 Classification and type of respirators

INTRODUCTION

In this part of the document the several types of products will be explained. After a short introduction the most common products will be showed, followed by an explanation on classifications.

Respiratory Protective Devices (RPD) can be split in two categories of products. Air Purifying Respirators (APR) and Breathing Apparatus (BA).

APR use the principal of filtering. Filters remove contaminants from the air being breathed in. Breathing apparatus use breathable air supplied by a compressor or cylinder.

Figure 1 shows the several devices in a clear overview.

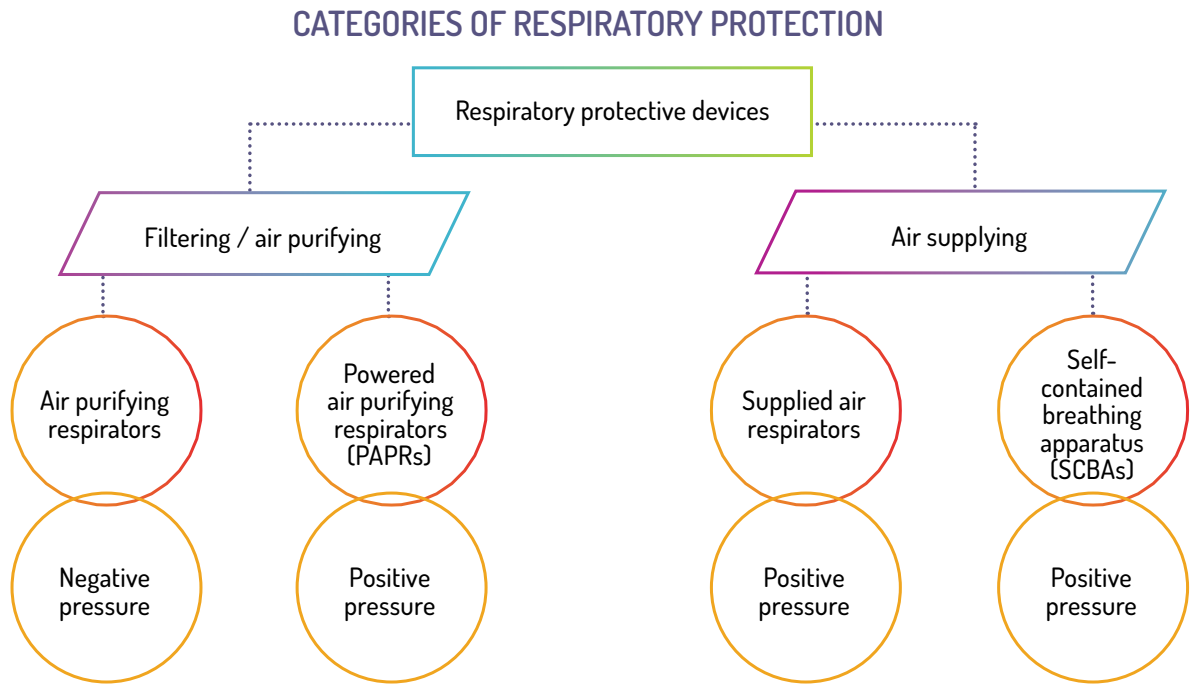


Figure 1: *Source : Working Group "ESF Respiratory protective devices", – June 2023*

All types of RPD are equipped with a facepiece. This facepiece can be a so called tight-fitting facepiece or a loose-fitting facepiece. Tight-fitting facepieces make use of the users face to create a seal between the facepiece and the face. Loose-fitting facepieces rely on enough clean air being provided to the wearer to prevent contaminant leaking in[1]. For this, positive pressure inside the facepiece is required. Examples of loose-fitting facepieces are hoods, helmets, visors, suits. Also, tight-fitting RPD can be equipped with positive pressure.

1 Sentence copied from HSE guide HSG53 (Fourth edition, published 2013).

RESPIRATORY PROTECTIVE DEVICES: OVERVIEW OF PRODUCTS

1. Air Purifying Respirators (APR)

- Filtering facepieces (FF)
- Half- and full-face masks
- Powered Air Purifying Respirators (PAPR)

2. Breathing Apparatus (BA)

- Positive pressure airline systems
- Self-contained Breathing apparatus (SCBA)

Warning: Never use Air Purifying Respirators in Oxygen-deficient atmospheres! Breathing apparatus, in some cases, can be used. Always follow the instruction of a certified safety engineer or other suitably qualified professional.

1. Air Purifying Respirators (APR)

Filtering facepieces (FF)

a. Disposable dust masks

Disposable dust masks are tight fitting masks and are products designed for limited time of use. The filters are integrated within the mask and cannot be replaced. The masks are in principle maintenance free and disposed after one shift of work. The masks are certified against the standard EN 149:2001 + A1:2009.

This type of mask e used filtering system is only suitable for filtering of particles. Three levels of protection are available: FFP1, FFP2, FFP3.

b. Maintenance free half masks

Maintenance free half masks are tight fitting masks and are products designed for limited time of use. The filters are integrated within the mask and cannot be replaced. The masks are in principle maintenance free but can be used for more shifts of work if cleaned and stored properly. Storage in an airtight box or bag is recommended. The masks are certified against the standard EN 405:2001+A1:2009.

This type of mask is suitable for both particles and gases/ vapours in several levels of protection

Half and full-face masks

a. Half masks

Half (face) masks are tight fitting masks and are products designed for multiple use. The filters can be removed and changed with new filters of the same type or filters with another specification depending on the area of use. Most types are designed to be maintained, parts can be replaced if necessary. After use, the masks should be cleaned and stored properly. Storage in an airtight box or bag is recommended. The masks are certified against the standard EN 140:1998.

This type of mask is suitable for both particles and gases/vapours in several levels of protection. Particle filters are certified against the standard EN 143:2000 + A1:2006. Gas- and combine gas-particle filters are certified against the standard: EN 14387:2004 + A1:2008.

b. Full face masks

Full face masks are tight fitting masks and are products designed for multiple use. Besides integrated protection of the eyes, the level of protection is considered to be much higher than the protection of a half mask. The filters can be removed and changed with new filters of the same type or filters with another specification depending on the area of use. Most types are designed to be maintained, parts can be replaced if necessary. After use, the masks should be cleaned and stored properly. Storage in an airtight box or bag is recommended. The masks are certified against the standard EN 136:1998.

The used filtering system is suitable for both particles and gasses/vapours in several levels of protection. Particle filters are certified against the standard EN 143:2000 + A1:2006. Gas- and combine gas-particle filters are certified against the standard: EN 14387:2004 + A1:2008.

Powered Air Purifying Respirators (PAPR)

Powered are purifying Respirators are air filtering devices making use of a fan-motor that actively sucks are through a filter and blows uncontaminated air it into a tight-fitting or loose-fitting facepiece. A positive pressure inside the facepiece takes care of the right level of protection within the breathing zone of the user. PAPR devices are products designed for multiple use. The available facepieces in the market upgrade the PAPR from pure respiratory protection towards extra personal protection such as face shields, welding shields, safety hardhats and chemical protection. The filters can be removed and changed with new filters of the same type or filters with another specification depending on the area of use. Most types are designed to be maintained, parts can be replaced if necessary. After use, the systems should be cleaned and stored properly. Storage in an airtight box or bag is recommended. The PAPR systems are certified against the standards EN 12941:2024 (Loose-fitting PAPR) or 12942:2024 (Tight-fitting PAPR).

This type of filtering system is suitable for both particles and gases/vapours in several levels of protection. Certification of the filters is integrated within the EN 12941/2.

2. Breathing Apparatus (BA)

Positive pressure airline systems

Positive pressure airline systems make use of supplied breathable air (EN 12021). The breathable air is either supplied by a compressor or a high-pressure cylinder. Supply hoses bring the air from the supply to the facepiece over a distance from up to 40 meters. A positive pressure inside the facepiece ensures no inward leakage of contaminants. Positive pressure airline systems are products designed for multiple use. The available facepieces in the market upgrade the systems from pure respiratory protection towards extra personal protection such as face shields, welding shields, safety hardhats and chemical protection. Most types are designed to be maintained, parts can be replaced if necessary. After use, the systems should be cleaned and stored properly. The positive pressure airline systems are certified against the standards EN 14593-1:2018 (full face masks with demand valve), EN 14593-2 (half masks with demand valve) or EN 14594:2018 (Loose-fitting facepieces, continuous flow).

Self-Contained Breathing apparatus (SCBA)

Self-Contained breathing apparatus (SCBA) makes use of a high-pressure air cylinder, supplying breathable air (EN 12021). The high-pressure breathable air is reduced to a breathable pressure by means of a regulator on the facepiece, or demand-valve. The demand valve keeps the positive pressure inside the facepiece at level and will only supply air if the user is inhaling air. SCBA are products designed for multiple use. During use the availability of air is limited to the volume of the cylinder. Users of this product shall be properly trained before use. Maintenance and cylinder refill is possible. After use, the systems should be cleaned and stored properly. SCBA are certified against the standards EN 137:2006.

CLASSIFICATION AND PROTECTION

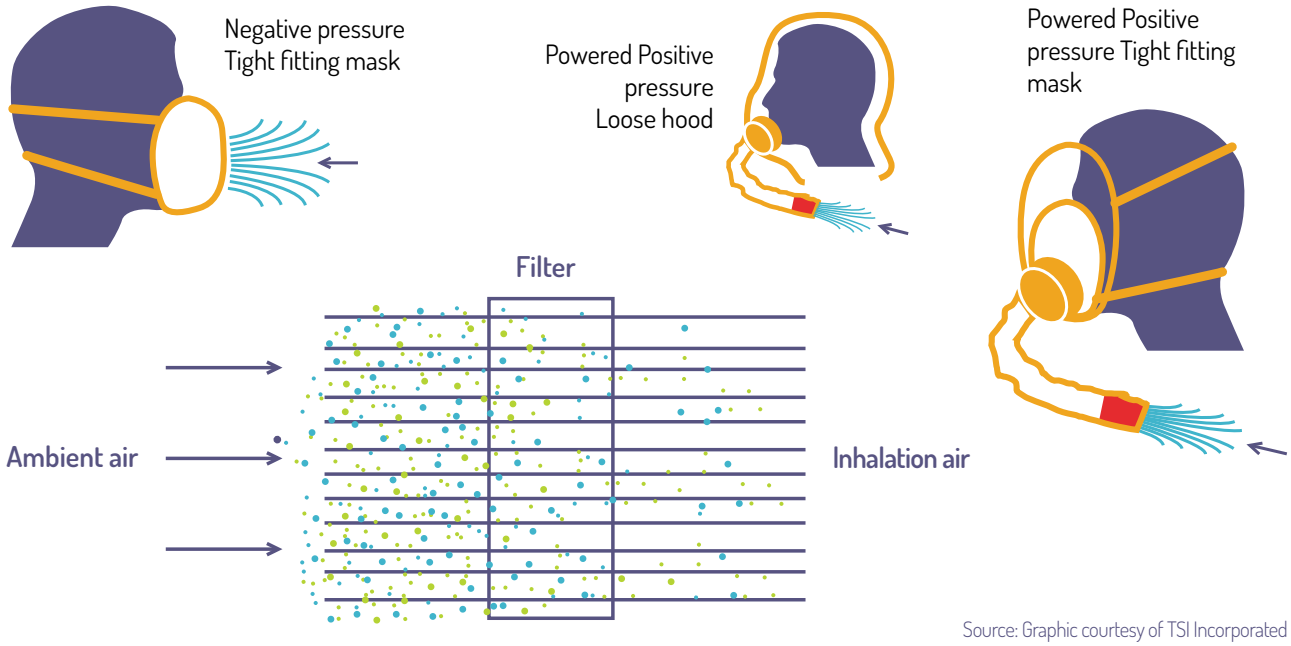
Filtering devices

Filters used in RPD are designed to remove contaminants from the surrounding air. This means that the air inside the facepiece is expected to be much cleaner than outside of the facepiece. How much cleaner is depending on the type of filter used in combination with RPD that holds the filter.

In general we distinguish two types of filters in the market. Filters against particles and aerosols, and filter against gases and vapours. Those filters can also be used as combination filters. The filters can be a fixed part of the RPD or an exchangeable part.

FUNCTIONALITY OF RESPIRATORS

Air purifying respirator



Source: Graphic courtesy of TSI Incorporated

This document has been prepared by the Working Group "ESF Respiratory protectives devices", the secretariat of which is held by ESF.

Particle filters [2]

Non-motorized filtering devices against particulates and aerosols have the designation 'P'. There are three classes: P1, P2 and P3, with P3 providing the highest level of protection. . PAPR-filters are not tested separately but only in combination with the complete PAPR system.

The requirements of a P(article) filter test include breathing resistance, filter penetration against test aerosols and inward leakage. The requirements also depend on the type of RPD. Table 5.3 summarizes the current requirements for maximum filter penetration and inward leakage for different types of RPD.

It is important to realize that for filter class P3 the same effectivity does not always apply; this also depends on the type of RPD. The filter penetration rate for an FFP3 is 1% maximum, but for a P3 filter for a half or full-face mask is 0.05%.

It is also important to note that for half- and full-face masks, there are separate standards for the filter and for the mask, while motor-powered devices are inspected as a whole.

Table 5.3: Performance requirements for respiratory protection against particles

FILTERING FACE PIECES	MAXIMUM FILTER PENETRATION (%)	STANDARD
FFP1	20	EN 149
FFP2	6	
FFP3	1	
Half or full-face masks	Maximum filter penetration (%)	Standard
Half or full-face masks 1	20	EN 143
Half or full-face masks 2	6	
Half or full-face masks 3	0.05	
Powered filtering device incorporating a loose-fitting hood or a helmet	Total inward leakage (%)	Standard
TH1P	10	EN 12941
TH2P	2	
TH3P	0.2	
Powered filtering device incorporating full face mask or half mask	Total inward leakage (%)	Standard
TM1P	5	EN 12942
TM2P	0.5	
TM3P	0.05	

FF: Filtering face pieces
TH: turbo helmet / hood, powered hood or helmet
RM: turbo mask, powered half-or full-face mask

2 Source: NVvA-Richtlijn Ademhalingsbeschermingsmiddelen 2024

Gas filters [2]

Filters against gases and vapours are marked with a letter and a colour, visible on the filter. The complete overview is shown in the Table A.1 (taken from EN529:2005). The most commonly available filters are marked with A, B, E and K or a combination of those, with more specialist filters also available . The filters are available in three different capacities.

- **Class 1:** low capacity
- **Class 2:** middle capacity
- **Class 3:** large capacity

Table A.1: Types of particles, gas and vapour filters

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
Sulphur 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
Mercury	Hg Incorporates P3 filter and maximum use is limited to 50 h	Red-white
Oxides of nitrogen	NO Incorporates P3 filter and for single use only	Blue-white
Organic gases and vapours (B ≤ 65° C) substance as specified by the manufacturer	AX Single use only	Brown
Filters against specific substances as specified by the manufacturer	SW Market with the name of the chemical	Violet Violet-white if combined with particle filter
NOTE: Many of these filters can be used with filtering devices relying on the breathing action of the wearer (negative pressure devices) and also with powered devices. Filters may carry two sets of classification, one for negative pressure devices and the other for the powered device marking is not relevant when used with negative pressure devices and vice versa.		

2 Source: NVvA-Richtlijn Ademhalingsbeschermingsmiddelen 2024

Filters with a low capacity will reach the state of saturation sooner. Once saturated a gas filter will lose its protection. In an example this means that an A2-filter will protect for a longer period or against a higher concentration of hydrocarbons than a filter type A1. The filter capacity levels are only applicable for filters used at non-motorized filtering devices (EN14387). For PAPR systems different capacity levels are applicable (EN 12941/EN 12942).

AX-filters protect against Organic gases with a boiling point below 65 degrees Celsius and are meant for single use only.

Based on the breakthrough time as used in standard EN 14387, it is impossible to predict how long a filter can be used in practice. For example, gas filters are tested when the test gas is fed through continuously, whereas in practice, due to breathing, there is pulsating air throughput. Research has shown that with pulsating throughput, breakthrough is more likely to occur at elevated contaminant concentrations. Furthermore, in practice the following factors in particular affect the operating time of a filter: the type of gas, vapor or mixture, the concentration at the workplace, the humidity and the breathing volume. Heavy work leads to a higher breathing volume and a shorter breakthrough time. A Class 1 or 2 gas filter will often break through at concentrations of about 500 ppm within as little as 10 to several dozen minutes.

A suitable and sufficient risk assessment should always be completed.

If there are no other options to reduce the concentration of the contaminants, RPD must be correctly selected and used to maintain effective protection, gas filters must be replaced in a timely manner before breakthrough occurs, or higher-class filtration should be used.

Protection factors[2]

When using respiratory protective devices (RPD), contaminants from the ambient air can penetrate into the RPD. Therefore, RPD do not provide 100% protection. The degree of protection is expressed in a protection factor. This is the ratio between the concentration of contaminants outside the RPD and the concentration inside the RPD. However, the degree of ingress of contaminants into an RPD is not fixed, but depends on, among other things:

- The construction
- The filter used (in the case of dependent respiratory protection)
- The adaptation to the user (e.g. size and fit)
- The method of use
- The maintenance
- The level of training of the user.

All of these issues should be part of a respiratory protection program in which, based on the nature of the contamination and the work to be performed, the appropriate RPD is selected. A protection factor gives a picture of the degree of protection to be expected in the workplace. The protection factor is a tool for selecting the right RPD. There are different protection factors, each with its own definition. The most important are: NPF: Nominal protection factor and APF: Assigned protection factor.

NPF: The ratio of pollution outside the RPD and inside the RPD, based on the Total Inward Leakage (TIL). The NPF is part of the European standardization.

APF: The APF is the expectation level of respiratory protection that can realistically be achieved in the workplace by 95% of properly trained and supported users using a properly functioning and correctly fitting mask.

2 Source: NVvA-Richtlijn Ademhalingsbeschermingsmiddelen 2024

Table C.1: EN 529:2005

STANDARD	DESCRIPTION	CLASS	NPF	ASSIGNED PROTECTION FACTORIES USED IN SOME COUNTRIES				
				FIN	D	I	S	UK
EN 149	Filtering half mask	FF P1 FF p2 FF P3	4 12 50	4 10 20	4 10 30	4 10 30	4 10 20	4 10 20
EN 405	Valved filtering half mask	FFGasX FFGasX P2 FFGasX P3	4 50 12 33		4 30 10 30	- - - -		4 10 10 10
EN 140 (mask) Filters: EN 141*) EN 143 EN 371 & 372*) EN 14687 EN 12083	Half mask and quarter mask with filter	P1 P2 P3 GasX GasX P1 GasX P2 GasX P3	4 12 48 50 4 12 48	4 10 20	4 10 30 30 30	4 10 30 30 -	4 10 20	4 10 20 10 10
EN 12941	Powered filtering device incorporating a hood or a helmet	TH1 TH2 TH3	10 50 500	5 20 200	5 20 100	5[b] 20[b] 200[b]	5 20 200	10 20 40
EN 12942	Powered assisted filtering device incorporating full-face mask, half mask or quarter mask	TM1 TM2 TM3	20 200 2000	10 100 1000	10 100 500	10[b] 100[b] 400[b]	10 100 1000	10 20 40
EN 14593-1	Compressed air line breathing apparatus with demand valve – Part 1: Apparatus with a full-face mask		2000	1000	1000	400	1000	40
EN 14593-2	Compressed air line breathing apparatus with demand valve – Part 2: Apparatus with half-mask at positive pressure		200					
EN 14594	Continuous flow compressed airline breathing apparatus	1A / 1B 2A / 2B 3A / 3B 4A / 4B	10 50 200 2000					

2 Source: NVvA-Richtlijn Ademhalingsbeschermingsmiddelen 2024

STANDARD	DESCRIPTION	CLASS	NPF	ASSIGNED PROTECTION FACTORIES USED IN SOME COUNTRIES				
				FIN	D	I	S	UK
EN 138	Fresh air hose breathing apparatus	Half mask Full-face mask	50 2000	500	100 100	- 400	500	10 40
EN 269	Powered fresh air hose breathing apparatus incorporating a hood	Hood	200		100			
EN 137	Self-contained open circuit compressed air breathing apparatus	Negative pressure command Positive pressure command	2000 20000		>1000[a] >1000[a]	400 1000		40 2000
EN 145	Self-contained open circuit compressed		20000	500	>1000[a]	400	500	
EN 402	Self-contained open circuit compressed air breathing apparatus with full-face mask or mouthpiece assembly for escape		20000		>1000[a]	-		

*) superseded by EN 14387

a Comment from BGR (2004) "Rules for the uses of respiratory protective devices": These devices can be used, particularly when filtering devices cannot provide sufficient protection. A restriction of the field of use due to high concentrations of harmful substances cannot be derived from the use of these types of devices as far is known until now. This applies to devices with normal and positive pressure.

b Values based on old EN 146 for apparatus THP1/THP2/THP3 and TMP1/TMP2/TMP3.

PART 5 Selection of RPD

RPD: SELECTION, CARE, USE AND MAINTENANCE

When all other measures have been taken to reduce dangerous levels of exposure, respiratory protection is the last but important step to prevent harmful air contaminants from entering the body through the airways.

The employer is responsible for the selection, maintenance and provision of breathing protection equipment and its use in the workplace. The user is in his turn responsible for using it according to the employer's routines. A program designed to protect employees from exposure to air contaminants is described in the EN 529 guidelines: ¬recommendations for the selection, use, care and maintenance of respiratory protection equipment.

FACE FIT TESTING

To maximize on the correct protection from respiratory equipment, it is crucial to ensure that the RPD fits the user to an optimum level. Air will always take the path of least resistance, so any small gaps between the face and the respirator will result in reduced protection for the wearer. It is crucial to their safety that the user has a suitably sized and positioned respirator, which they know how to correctly fit.

- Face Fit Testing is a method of checking that a specific model and size of tight-fitting face piece matches the wearer's facial features and seals adequately to their face.
- It will help to identify unsuitable face piece's that should not be used and highlight to the wearer the consequences of poor fit and improper use on the effectiveness of the respirator.
- It should be carried out as part of the initial selection of the appropriate respirator.
- It should be completed for each model of respirator and repeated whenever there is a change to the wearers face shape, and periodically where possible or as required by local or in-country regulation. This will ensure that the tight-fitting respirator remains a good fit for the wearer and that it is creating a good seal.
- Note: when used with other PPE, compatibility should be checked to ensure the respirator fit is not impacted. Other PPE worn, such as goggles, should also work in tandem with the respirator i.e., fit comfortably and not steam up for example.
- A competent person should conduct fit testing. Competence can be demonstrated by qualification under the voluntary Fit2Fit RPE Fit Test Providers Qualification Scheme (or similar) available in several countries. Further details on the scheme can be found at www.fit2fit.org (or fit2fit websites in your country/language).
- There are two basic types of fit testing: QLFT Qualitative fit testing, QNFT Quantitative fit testing.
  - QLFT is a pass/fail test based on the wearer's subjective assessment of leakage, usually by exposing the wearer to a bitter or sweat aerosol (non-toxic), to test the ability of the mask to filter out aerosols. It is typically only used with disposable and re-usable half masks.
  - QNFT results in a 'fit factor' which is a numerical measure of how well a respirator is sealing against a wearers face. It is suitable for disposable half masks, re-usable half masks and full-face masks.
  - QNFT are completed using RFD fitted with particulate filters only, since the test method measures particles inside and outside the respirator. Test methods using gases are not approved at this time. Heavier and larger filters can be worn in normal use. This should not affect the fit however the user will need to consider this during pre-use checks and adjust the straps accordingly. Further information on face fit testing is available. Examples of such are HSE in the UK published the INDG479 Guidance on respiratory protective equipment (RPE) fit testing, information is available on the **www.fit2fit.org** website.

This document has been prepared by the Working Group "ESF Respiratory protectives devices", the secretariat of which is held by ESF.

WHY UNDERTAKE A FACE FIT TEST (FFT)?

It is recommended that any FFP, half or full-face mask user undergoes a Face Fit Test. Such a test ensures the correct comfort, fit and protection obtained whilst the user is wearing a face mask. One size does not fit all, and the mask must have a suitable and effective fit for you! Facial hair and jewellery, scars or outstanding facial features can all significantly detract from the performance of a respirator. In order to ensure that there is no leakage between the face and the respirator, leading to potential health issues, the face fit test is used to ensure an adequate seal has been achieved. Exposure to even low levels of particles, gases and vapours can cause permanent and irreversible damage to the lungs and other vital organs. The importance of correctly protecting against these contaminants over an entire working career has become more apparent. A face fit test ensures that the RPE is both fit for purpose and acceptable to the wearer. In some markets it is a legal requirement, whilst in others it is only a guidance.

Carefully check the regulation that applies to you!

THINGS TO CONSIDER

1. Identification – know your workplace

It is essential that you understand which substances are present, in order to make an informed risk assessment and to use the most effective controls for the activity. One way to do this is to undertake workplace measurements and monitor the concentrations of the hazardous substances.

2. Risk assessment – what are the factors

Is sufficient oxygen present in the working environment during the entire period of exposure? What are the effects on health of the substances present? Are there any occupational exposure limits for these substances? Are there any other risks, such as splashing, sparks or explosive mixtures?

These are some questions you need to ask yourself before making a choice on RPD.

Other factors could be:

- What substance
- OEL
- Impact, risk
- Lack of oxygen/IDLH limits
- Workplace measurements
- Protection factor
- Work duration
- Workload
- Freedom of movement
- Visibility
- Communication
- Climate, temperature

3. Remove or minimize the risks – what can be done before RPD

Personal protective equipment (PPE) is at the bottom of the hierarchy of control, therefore you should take all means possible to remove or reduce the level of risk to a substance hazardous to health,

In many instances, elimination or substitution of the substance to be used is not possible. Consequently, more technical means are required and can include totally or partially enclosing the process, installing engineering controls in the form of local exhaust ventilation, general ventilation, introducing work practices that reduce the duration of exposure such as job rotation, a permit to work system, and lasting looking at PPE and RPE to further reduce exposure. More often than not, you will find that workplaces apply a combination of the above methods to control exposure.

4. Selection of breathing protection – make a choice that checks the above factors

FFP, half mask, full-face mask, powered or air-fed respirators.

5. Training – know your equipment

Fitting, function checks, donning, storage and maintenance. Routines for cleaning and replacing filters and wearing parts.

PART 6 Criteria for using respiratory protective devices

PRE-USE

When use of a respiratory protective device is required, and the appropriate respirator and filters have been selected, it is important to carry out pre-use checks and tests (where applicable), per local and manufacturer requirements. It is also important to clean, store and maintain them correctly as per the information supplied by the manufacturer within their instructions for use (IFU). The user must use the respirator in accordance with these instructions and training must be provided by the employer.

Depending on your location and industry, a number of standards and regulations may apply to your selection and use of respirators, and other personal protective equipment. These may include local requirements, in-country regulations and standards, requirements specific to particular contaminants, e.g. silica, asbestos, organic pathogens, etc. Know which requirements apply to your location and industry.

Before using the respirator, it is important to check and where possible test that it will be safe to use and that it will provide the required level of protection. The following are examples of the pre-use checks and tests that can be done.

→ Check the type and level of contamination. Verify that airborne contaminant concentrations do not exceed those allowed by applicable regulations and recommendations for the type of respirator selected.

→ Check that the correct respirator has been selected, with consideration to factors like, are you are likely to experience abnormal temperature or humidity? Do you wear spectacles or contact lenses? Do you need to communicate? Are there any restrictions to movement?

→ Check that the respirator is the correct one for the protection needed, check the level and type of protection. Refer to the product markings and IFU to confirm.

→ Check that a good fit can be achieved. Is the respirator the right shape and size, is there anything that would affect a seal for tight fitting respirator? For example facial hair, any markings, facial deformity e.g. scars.

→ Check that it is comfortable to wear. Uncomfortable respirators may interfere with work, which can lead to incorrect use affecting the level of protection. Where possible it is good to have a choice of several adequate and suitable respirators, so that the most comfortable one can be used.

→ Check that the respirator is in good working order, clean and that the correct filters are assembled for the intended use (where applicable). Refer to the manufacturer's instructions for information.

→ Check the maintenance log for the respirator, has it been maintained correctly?

→ Check the expiry date of the respirator and filters.

→ Check for any special or critical user instructions and/ or specific limitations before donning the respirator. Refer to the manufacturer's instructions for information.

→ Check what the work rate, wear time will be. Different types of respirators for example tight fitting, loose fitting, powered air, have different recommended times. Refer to e.g. HSG53 for further information.

For tight fitting respirators, a Face Fit Check before use can be done. A Face Fit Check is done when donning a tight-fitting respirator for use to check the fit and seal on the wearer. Users should complete this check every time they use it. The check will cover a variety of things, dependent on the type of RPE. Follow the manufacturer's instructions for the type of RPD to be worn.

Face Fit Check:

- A face fit check should be done each time when donning a tight-fitting respirator to check the fit and seal on the wearer. Ideally the wearer will have completed before-hand the face fit test to select and prove that the respirator is suitable for them.
- All tight-fitting respirators should have a method to carry out a face fit check, normally blocking the inlet and breathing in or in some cases blocking the exhaust and exhaling, this will be documented in the manufacturers IFU.

This document has been prepared by the Working Group "ESF Respiratory protectives devices", the secretariat of which is held by ESF.

- Adjustments can be made to the respirator in the case of the mask not fitting and sealing, this following the manufacturer's guidance in the IFU. Common parts which can be adjusted include head straps, head harnesses, nose bridges and also the position on the face.
- Damage to the mask, worn or degraded parts, face makeup, facial changes, facial hair are examples of what can affect the fit and seal of the respirator.
- If a good fit and seal cannot be achieved, then the wearer should not continue, report it to a supervisor or other direct report. Further checks should be made and if needed an alternative appropriate respirator provided.
- Remark : a face fit check does not replace a face fit test as described in section 5.

DURING USE

When using the respirator it is important for the wearer to be protected throughout the duration of use. The following things are examples of what is important for the wearer:

→ Know how to correctly use the respirator, what would be considered as misuse and know not to modify the respirator in any way, so not to affect the function or performance. Especially when working in environments with temperatures and humidity's which may make the respirator un-comfortable.

→ How long they should use the respirator for in a single continuous use.

→ Keep vigilant of the respirators warning features / devices, and ensure they know what the mean before use. For example, when a filter becomes clogged or is at its end of life, low flow of breathing air, breathing becomes more difficult (indicating particular filter is blocking), smell of odour inside the mask, battery running low etc.

→ Know to remove themselves, immediately, to a safe area if any of the above examples occur, or if anything unusual occurs such as irritation or dizziness.

→ For tight fitting respirators, repeat fit checks can be performed to ensure continuous protection.

→ Be vigilant of any changes around them, the environment, ventilation and other factors which may pose a risk. Equipment is available to measure and monitor airborne contaminant levels in the work area if required.

→ For supplied air respirators (carried out by another person) the air pressure must be continually monitored at the point of supply. Air pressure must be read from a reliable pressure gauge whilst the respirator has air flowing through it. The air should be regularly sampled to ensure that it meets EN 12021 (AS/NZS 1715) requirements.

CLEANING, STORAGE AND MAINTENANCE

It is important to clean, store and maintain respirators correctly as per the instructions in the manufacturer's information for use. If not done the respirator is unlikely to provide the required protection.

Maintenance and cleaning are required for all respirators except for those which are disposable (single use). Storage requirements are applicable to all respirators.

When cleaning the respirator checks can be made which can form part of the maintenance of the respirator. Manufacturer's information for use will contain cleaning instructions, materials and disinfectants, the drying instructions and environments. It is common to check all components daily for signs of damage or wear and tear that may reduce the level of protection originally provided, this would include for example:

→ Inhalation and exhalation valves.

→ Head straps or harnesses.

→ The filters.

→ The respirator face piece for any deterioration, splits, contamination which cannot be cleaned off etc.

→ Battery charge remaining and air flow rate for PAPR respirators.

→ Air-line hoses for supplied air respirators.

→ Check expiry dates of the respirator, filters and other parts.

Parts which are damaged or deteriorated must be replaced before next use, or instructed to be replaced at a set time as part of the maintenance plan. Parts should never be substituted, modified, added or omitted. Only exact replacement parts should be used in the configuration as specified by the manufacturer.

The maintenance plan should document when and what is required, with instructions of how to report and tackle any problems that could arise. Everyone involved in the selection, use, storage, cleaning and maintenance of respirators should be trained against the plan, and responsibilities clearly defined.

Manufacturers will define storage conditions and requirements in the user instructions, there is often instructions for short-term and long-term storage, which will include environmental conditions; humidity, temperature, limiting it to exposure to things like direct sunlight and UV rays. They will often recommend storing in its original packaging, a designed case or bag etc. to protect the respirator whilst being stored. It is important that cleaning and maintenance are carried out before storage.

TRAINING

Training is required for all people involved in the selection, use, storage, cleaning and maintenance of respirators. Within industry it is common for a training programme to be developed and enforced for all persons involved. A trainer shall have the appropriate qualifications, be knowledgeable in the application and use of the respirator(s), practical knowledge in the selection and use and work practices at the site, knowledge of the sites program and applicable regulations. Guidance documentation such as HSG53 can be used.

It is important for the responsibilities of the employee and the employer to be defined, and all people involved to know what they are responsible for, this will ensure the safety of the wearer.

For the user of the respirator the following are examples of what should be included in their training:

→ How to don and doff the RPE correctly, together with any other required PPE following the manufacturer's instructions for use.

→ How to correctly use the respirator, and things not to do.

→ How long they should use the respirator for in a single continuous use.

→ For tight fitting respirators, what can affect the fit and seal of their respirator, especially with things that can regularly change, e.g. hair, use of spectacles, other PPE, facial hair, make-up need to be known.

→ Where tight fitting respirators cannot be used, like for users who are un-able to be clean shaven an appropriate loose-fitting respirator should be selected.

→ How to clean, inspect and maintain their respirator.

→ How and where to store their respirator.

This document has been prepared by the Working Group "ESF Respiratory protectives devices", the secretariat of which is held by ESF.

For further information please visit our website at https://eu-esf.org

EUROPEAN SAFETY FEDERATION
Bavikhoofsestraat 190. B-8531 Bavikhove, Belgium

www.linkedin.com/company/esf---european-safety-federation/
Or contact us by mail esig@cefic.be

For further information please visit our website at www.esig.org

EUROPEAN SOLVENTS INDUSTRY GROUP
Rue Belliard 40, B.15, B-1040 Brussels, Belgium

www.linkedin.com/company/european-solvents-industry-group/
Or contact us by mail esig@cefic.be

A sector group of Cefic

European Chemical Industry Council - Cefic aisbl
EU Transparency Register n° 64879142323-90