

SAFRA

INFORMATION AND DATA

ON HEALTH AND SAFETY FOR

COPPER ALLOY WELDING WIRES AND RODS



1. PRODUCT/CONSUMABLES

1.1 Product identifier: copper alloys welding wires and rods for MIG and TIG procedures.

1.2 Relevant identified uses of the substance or mixture and uses advised against:

SU15: production of metallic items, except machinery and equipment.

PC38: welding and brazing products.

1.3 Details of the supplier of the safety data sheet:

SAFRA SPA

I-25039 TRAVAGLIATO (BS) ITALY

Tel.: 030 - 6863241 Fax. : 030 -6863246

Responsible for the safety data sheet: info@safraspa.it.

1.4 Emergency telephone number: European emergency number = 112.

2. HAZARDS IDENTIFICATIONS

2.1 Classification of the substance or mixture:

The product is not considered to be dangerous following dispositions relative to directives 67/548/CEE and 1999/45/CE and/or regulation (CE) 1272/2008 (CLP) (and following modifications and amendments).

2.2 Label elements:

Pictograms: not applicable

Precautions: not applicable

Risk phrases R: not applicable

Precautionary statements S: They refer to the product as-is:

Keep it out of reach of children (P102).

Read label before use (P103).

The product doesn't need dangerous goods labelling following point 1.3.4, regulation 1272/2008 (CE) and following modifications and amendments.

2.3 Other hazards: none.

3. COMPOSITION/INFORMATION ON INGREDIENTS.

3.1 Substances: information not relevant.

3.2 Mixtures:

SAFRA	EN ISO 24373	Chemical analysis by weight %										
		Cu	Al	Fe	Mn	Ni	P	Pb	Si	Sn	Zn	others
CAS		7440-50-8	7429-90-5	7439-89-6	7439-96-5	7440-02-0	7723-14-0	7439-92-1	7440-21-3	7440-31-5	7440-66-6	---
SF CuAl8	Cu 6100	Bal.	6,0 – 8,5	*	0,5	*	–	0,02	0,2	*	0,2	0,4 _(c)
SF CuAl9Fe	Cu 6180	Bal.	8,5 – 11,0	1,5	–	–	–	0,02	0,1	–	0,02	0,5
SF CuSn	Cu 1898A	Bal.	0,01	0,03	0,1 – 0,4	0,1	0,015	0,01	0,1 – 0,4	0,5 – 1,0	–	0,2
SF CuSn6	Cu 5180A	Bal.	0,01	0,1	–	–	0,01 – 0,4	0,02	–	4,0 – 7,0	0,1	0,2
SF CuSi3	Cu 6560	Bal.	0,02	0,5	0,5 – 1,5	–	0,05	0,02	2,8 – 4,0	0,2	0,4	0,5
SF CuMn13Al7	Cu 6338	Bal.	7,0 -8,5	2,0 – 4,0	11,0 – 14,0	1,5 – 3,0	–	0,02	0,1	–	0,15	0,5
SF CuAl8Ni2	Cu 6327	7,0 – 9,5	0,5 – 2,5	0,5 – 2,5	0,5 – 3,0	–	–	0,02	0,2	–	0,2	0,4
SF CuAl8Ni6	Cu 6328	Bal.	8,5 – 9,5	3,0 – 5,0	0,6 – 3,5	4,0 – 5,5	–	0,02	0,1	–	0,1	0,5

Legenda:

* and _(c): The total of all elements, including those for which the maximum value or an asterisk (*) is shown, shall not exceed the value specified in "Others total".

CAS: not applicable.

EINECS: not applicable.

The product doesn't contain substances classified as dangerous for health or environment following directive 67/548/EEC and/or Regulation 1272/2008 (CE) with successive modifications or amendments.

4. FIRST AID MEASURES

In case of necessity, contact your local health emergency office or any available public health office.

Measures hereinafter reported are referred to problems that can incur during the welding procedures, and do not relate to the product as-is, whenever the minimal prescriptions reference to health and safety are not fulfilled.

Machining, grinding, flame-cutting or welding of these alloy products will put contaminants, primarily copper, in the air. Aluminum, cobalt, manganese, nickel or zinc may be present if part of the specific alloy grade. If copper dust and fumes are adequately controlled, the other named metals and any unnamed metals which may be present in the alloy will not represent a hazard.

High production machining, grinding and welding operations, etc. frequently require local exhaust ventilation. If ventilation is not adequate, wear a NIOSH approved dust and fume respirator.

4.1 Description of first aid measures: the first aid measures are mainly referred to the product under use (i.e. during welding / brazing) and not to the product as-is.

Eye contact – Do not rub eyes. Remove any contact lenses. Flush eyes thoroughly with water, taking care to rinse under eyelids. If irritation persists, continue flushing for 15 minutes, rinsing from time to time under eyelids. If discomfort continues, consult a doctor.

Skin contact - Contact with dust: wash skin with soap and water. In case of contact with hot or molten product, cool rapidly with water and seek immediate medical attention. Do not attempt to remove molten product from skin because skin will tear easily. Cuts or abrasions should be treated promptly with thorough cleansing of the affected area.

Inhalation – in case of exposure to fumes or particulates, get medical attention if discomfort persists.

Ingestion – Not normally a hazard due to the physical form of product. The material is a physical irritant to the gastro-intestinal tract. If required, call a doctor..

Note to doctor – treat symptomatically. Symptoms may be delayed.

General advice – get medical attention if any discomfort develops. Seek medical attention for all burns, regardless how minor they may seem. Show this safety data sheet to the doctor in attendance.

4.2 Most important symptoms and effects, both acute and delayed:

Copper fumes and dust irritate the nose and throat. If too much fume is inhaled, it will cause a sweet or metallic taste in the mouth. High concentrations of the fumes can cause metal fume fever, which resembles the flu. Inhaling excessive amounts of copper dust and fume over a long period of time can cause anemia. The dust may also cause skin and eye irritation after short exposure.

Some forms of nickel have been found to cause cancer in animals. One form, nickel subsulfide, which was present in an old smelting process no longer used, was the apparent cause of lung and nasal cancer in humans. Since then, studies have shown that the potential for ordinary forms of nickel and its oxides to cause cancer in humans is very weak, if it exists at all.

Long, continued exposure to manganese dust or fume causes a number of symptoms which can get quite serious. On the other hand, manganese is an essential trace element for human metabolism and an average daily intake of 2 to 5 mg, mostly in food, is necessary for health. This intake is about 20 to 50% of the intake resulting from the PEL and TLV of 1 mg/m³ air.

Excessive manganese effects the central nervous system, with the following symptoms in order of increasing exposure: apathy, loss of appetite, uncontrolled laughter, insomnia followed by sleepiness, headache, leg cramps, speech disturbances, mask-like facial appearance, clumsy movement, difficult walking, frequent falling, tremors, salivation, sweating, mental detachment.

Grinding on castings that have not been cleaned or that contain embedded sand may generate significant amounts of dust containing free silica, which can cause silicosis. IARC has listed crystalline silica as Class 2A, probably can cause lung cancer.

4.3 Indication of any immediate medical attention and special treatment needed: seek attention from your doctor.

5. FIREFIGHTING MEASURES

5.1 Extinguishing media.

Suitable extinguishing media: powder or foam. Dry sand.

Small chips, fine turnings and dust may ignite readily. Use coarse water spray on chips, turnings, etc. Use class D extinguishing agents or dry sand on fines. DO NOT use halogenated agents on small chips or fines. Dust clouds may be explosive. PREVENT FORMATION OF A DUST CLOUD.

Molten metal alloys may explode on contact with water. They may also react violently with water, rust and certain other metal oxides (e.g. oxides of copper, iron and lead).

- 5.2 Special hazards arising from the substance or mixture: during fire, gases hazardous to health may be formed. Dangerous combustion products: packaging is made of carton. They can be ignited and, thus, normal fire prevention precautions must be followed.
- 5.3 Advice for firefighters:
Special protection equipment: in case of fire, use auto breather and suitable protective clothing.
Specific measures: none.
- 6. ACCIDENTAL RELEASE MEASURES**
- 6.1 Personal precautions, protective equipment and emergency procedures: not applicable, since the product is solid and not dangerous. However, welders must use suitable protective clothing and, for eyes, certified protective devices used for electric arc welding. Avoid inhalation of dust and contact with skin and eyes.
- 6.2 Environmental precautions: not applicable, since the product is solid and not dangerous.
- 6.3 Methods and material for containment and cleaning up: not applicable, since the product is solid and not dangerous.
- 6.4 Reference to other sections: see section 8.
- 7. HANDLING AND STORAGE**
- 7.1 Precautions for safe handling: solid, high density product. Use with precaution.
- 7.2 Conditions for safe storage, including any incompatibilities: store the product in original packaging in dry areas, protected from atmospheric agents. Avoid thermal shock. Storage in unsuitable environments can lead to surface oxidation phenomena, harmful for material quality.
- 7.3 Specific end use: not established.
- 8 EXPOSURE CONTROL / PERSONAL PROTECTION**
- 8.1 Control parameters:
Threshold limit values TLV-TWA: not applicable. It is suggested to make reference to TLVs of each single element inside the welding fumes (see point 11.1.1).
- 8.2 Exposure controls:
- 8.2.1 Appropriate engineering controls: during use of the product, protect body and eyes from light and fumes emissions, since they can be source of danger.
- 8.2.2 Individual protection measures:
Respiratory protection: depending upon welding and environmental conditions, use a suitable respiratory protection related to welding activity. Use proper ventilation and/or suitable fume extraction unit.
Hand protection: use suitable UV and heat protective welding gloves.
Eyes protection: use suitable lens or helmets provided with UV, IR and light protective filters.
Skin protection: use suitable body, hand and head clothing. Use protective shoes that block radiations, sparks and electric shocks. Avoid using dirty, greasy or oily clothing, as they could ignite during welding.
- 8.2.3 Environmental exposure controls: use suitable ventilation and/or gas/fumes extraction unit.
- 9. PHYSICAL AND CHEMICAL PROPERTIES**
- 9.1 Appearance: copper alloys solid wires and rods, of bronze color, diameter between 0,8mm and 4,0mm.
- 9.2 Odor: none.
- 9.3 pH: not applicable.
- 9.4 Melting point: from 910° to 1090° c.
- 9.5 Boiling point: not applicable.
- 9.6 Flash point: not applicable.
- 9.7 Evaporation rate: not applicable.
- 9.8 Flammability: none.
- 9.9 Upper/Lower flammability or explosive limits: not applicable.
- 9.10 Vapor pressure: not applicable.
- 9.11 Vapor density: not applicable.
- 9.12 Relative density: 7,4 to 8,9g/cm³
- 9.13 Solubility: none.
- 9.14 Partition coefficient: not applicable.
- 9.15 Auto-ignition temperature: not applicable.
- 9.16 Decomposition temperature: not applicable.
- 9.17 Viscosity: none.
- 9.18 Explosive properties: none.

- 9.19 Oxidising properties: none.
9.20 Other information: not available.

10. STABILITY AND REACTIVITY

- 10.1 Reactivity: avoid contact of the product with acids or bases that can generate dangerous fumes.
10.2 Chemical stability: copper alloys wires and rods are stable in normal environment.
10.3 Possibility of hazardous reactions: with acids or bases that can react and emit dangerous fumes (e.g.: ammonium nitrate, fluoride, halogens, nitrates, phosphorous, strong oxidizing agents, sulphur).
10.4 Conditions to avoid: do not touch wires or rods during welding, since burnings or electric shock is possible. Avoid dust formation: dust clouds may be explosive under certain conditions. Avoid contact of molten metal alloys with water as it may explode on contact. It might also react violently with water, rust and certain other metal oxides (e.g. oxides of copper, iron and lead).
10.5 Incompatible materials: acids or bases that can react and emit dangerous fumes.
10.6 Hazardous decomposition products: Welding, burning, sawing, brazing, grinding or machining operations may generate dusts and fumes of metal oxides. Lead oxide fumes may be formed at elevated temperatures.

11. TOXICOLOGICAL INFORMATION

- 11.1 Information on toxicological effects:
11.1.1 Substances: the product as-is has no toxicity. However, during welding or brazing, fumes and gases are produced, whose composition depends upon many factors: base material, process and welding procedures, etc. Other conditions that can influence the fumes composition are: alloy used, substances found in base metal and on its surface, number of welders and volume of welding environment, quality and quantity of ventilation. Given count of these factors, main fume constituents can be Copper, Aluminium, Silicon, Nickel, Manganese and Tin in elementary or composite form (eg. Oxides).

SAFRA COPPER ALLOYS	Fe%	Mn%	Ni%	Cr%	Cu%	Sn%	mg/m3
SF-Cu Sn	0,30	0,60	0,10	0,10	75	-	0,30
SF-Cu Si 3	0,20	1,00	0,20	0,10	73	-	0,30
SF-Cu Al 8	0,30	0,60	0,10	0,10	81	-	0,30
SF-Cu Al 9 Fe	2,00	0,10	0,20	0,10	80	-	0,30
SF-Cu Sn 6	-	-	-	-	65	4	0,30
SF-Cu Mn 13 Al 7	3,00	8,70	0,30	0,10	68	-	0,30
SF-CuAl8Ni2	2,50	1,20	0,30	0,10	78	-	0,30
SF-CuAl8Ni6	5,00	1,20	0,30	0,10	75	-	0,30

The figures quoted in the above table are theoretical maximum concentration at very low values. For best accuracy, a gravimetric determination sampling would need to be carried out for long periods, perhaps even over a complete working day. In these instances, it is suggested that chemical analysis for the main constituent elements of concern might be a more practical approach. It is the responsibility of the user/employee under the Health and Safety Work Act that OEL's are not exceeded. The fume analysis cannot be used to assess the concentration of total welding fume to which a welder/welders is/are exposed. Assessment of the possible exposure of the welder must be carried out by a competent person and may involve air concentration. Additional fumes may arise when these wires and rods are used to weld contaminated base materials, coated or plated materials, other metals and alloys, or when incorrect welding conditions are used. The only accurate way of determining the composition and quantity of fumes and gases to which workers are exposed is to take air samples from inside the welders' helmets, if worn, or in the worker's breathing zones.

Individual fume measurements should be made in these cases using recognized sampling and analysis standards. Based on the results of these measurements, additional fume controls may be required to ensure that all the fume constituents are controlled below their exposure limits.

CARCINOGEN CLASSIFICATION

Ingredient	OSHA	NTP	IARC	TARGET ORGAN
Chromium	N	Y	3	Lung
Hexavalent Cr	N	Y	1	Lung
Lead	N	N	2B	Lung, Stomach
Nickel	N	Y	1	Lung, Stomach

Legenda:

N = Not listed as a human carcinogen

Y = Listed as a human carcinogen

Code for IARC evidence of human carcinogenicity: 1 = Positive; 2A = Probable; 2B = Possible; 3 = Not classified; 4 = Probably Negative.

11.1.7

Information on likely routes of exposure:

Inhalation: Small over exposition to welding fumes can provoke metal fumes fever, dizziness, sickness, dehydration or nose/throat/eyes irritation; they can also worsen pre-existent respiratory diseases such as asthma and emphysema. Copper welding and brazing can generate ozone gas. Over exposition to ozone may result irritant on mucous membranes and can be cause of irritations, congestions and edemas. Copper brazing on zinc-coated steel plates can generate also zinc oxide and copper oxide fumes.

Carcinogenicity: risk of cancer cannot be excluded with prolonged exposure.

ACGIH Carcinogens:

Aluminium (CAS 7429-90-5): A4 not classifiable as a human carcinogen

Lead (CAS 7439-92-1): A3 confirmed animal carcinogen with unknown relevance to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity:

Lead (CAS 7439-92-1): 2B possibly carcinogenic to humans.

US NTP Report on Carcinogens: anticipated carcinogen:

Lead (CAS 7439-92-1): Anticipated carcinogen.

Ingestion: there are no specific information available for toxicological effects due to product ingestion.

Eyes or skin contact: eventual effects deriving from UV rays exposition from welding arc can be conjunctivitis or skin burns.

12.

ECOLOGICAL INFORMATION

12.1

Toxicity: use the products following good working practices, avoiding dispersion of product in the environment. The product does not contain inhibiting effects on microorganisms activity.

12.2

Persistence and degradability: the product does not contain substances for which information has been given about their degradation capacity in determined environmental circumstances following biodegradation or other processes such as oxidation and hydrolysis.

12.3

Bioaccumulative potential: not established.

12.4

Mobility in soil: the product doesn't contain substances for which indications regarding their distribution in environmental compartments have been provided, or data concerning their absorption/de absorption.

12.5

Results of PBT and vPvB assessment: not established.

12.6

Other adverse effects: not established.

13.

DISPOSAL CONSIDERATIONS

13.1

Waste treatment methods: dispose of residues and waste following local laws.

CER code on waste disposal:

120113: welding residues

120103: filings and shavings of non-ferrous materials.

14.

TRANSPORT INFORMATION

Transport: the product is not classified as goods dangerous for transport on truck, rail or air.

14.1

UN number: not applicable

14.2

UN proper shipping name: not applicable.

- 14.3 Transport hazard class(es): not applicable.
- 14.4 Packing group: not applicable.
- 14.5 Environmental hazard: none.
- 14.6 Special precautions for user: none.
- 14.7 Transport in bulk: not applicable.

15. REGULATORY INFORMATION

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.
Classification following Directive 1272/2008/CEE: not classified.
- 15.2 Chemical safety assessment: not applicable.

16. OTHER INFORMATION

Prior to using this product in any new process or experiment, a deep study upon security and product compatibility with materials must be undergone. The supplying company cannot be held responsible for eventual damages arising from the use of the product in incorrect applications and/or in conditions differing from the expected ones. This safety data sheet has been compiled in conformity with current valid European Directives and is applicable to all countries that have implemented these Directives in their national legislations. The data reported are the data reported in technical specialized literature; whatever reported in this sheet is only for information purpose and doesn't substitute standards or disposition issued by public organizations. The information has been supplied in order to protect health and safety in workplace. No responsibility will be accepted if damages arise from use of the product other than the mentioned ones. This safety sheet cancels and replaces all previous revisions.

GENERAL BIBLIOGRAPHY

1. Directive 1999/45/CE and subsequent modifications.
2. Directive 67/548/CEE and subsequent modifications and amendments (annulled).
3. Regulation CE 1907/2006 of European Parliament (REACH).
4. Regulation CE 1272/2008 of European Parliament (CLP).
5. Regulation CE 790/2009 of European Parliament (I Atp. CLP).
6. Regulation CE 453/2010 of European Parliament (Safety Data Sheets).
7. ACGIH: American Conference of Government Industrial Hygienists.
8. TLV: Threshold Limit Value.
9. TWA: Time-Weighted Average.
10. CAS: Chemical Abstract Service.
11. EINECS: European Inventory of Existing Commercial Chemical Substances.
12. PBT: Persistent, Bioaccumulating and Toxic.
13. vPvB: very Persistent and very Bioaccumulating.

Note for user:

The information contained in this safety sheet is based upon available knowledge up until revision date. The user must ensure suitability and completeness of information relative to the specific product use. This document must not be interpreted as a warranty of any specific property of the product. Since the use of the product does not fall upon SAFRA SPA direct control, it is the user's obligation to follow, under his own responsibility, the valid laws and regulations concerning hygiene and security. SAFRA won't assume any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, SAFRA cannot guarantee that these are the only hazards that exist.

ANNEX 1

EXPOSURE SCENARIO

Welding/Brazing produces fumes which can affect human health and the environment. Fumes are a varying mixture of airborne gases and fine particles which, if inhaled or swallowed, constitute a health hazard. The degree of risk will depend on the composition of the fume, concentration of the fume and duration of exposure. The fume composition is dependent upon the material being worked, the process and consumables being used, coatings on the work such as paint, galvanizing or plating, oil or contaminants from cleaning and degreasing activities. A systematic approach to the assessment of exposure is necessary, taking into account the particular circumstances for the operator and ancillary worker that can be exposed.

Considering the emission of fumes when welding, brazing or cutting of metals, it is recommended to (1) arrange risk management measures through applying general information and guidelines provided by this exposure scenario and (2) using the information provided by SAFRA's MSDS, issued in accordance with REACH.

The employer shall ensure that the risk from welding fumes to the safety and health of workers is eliminated or reduced to a minimum. The following principles shall be applied:

- 1) Select the applicable process/material combinations with the lowest class, whenever possible.
- 2) Set welding process with the lowest emission parameter.
- 3) Apply the relevant collective protective measure in accordance with class number. In general, the use of PPE is taken into account after all other measures is applied.
- 4) Wear the relevant personal protective equipment in accordance with the duty cycle.

In addition, compliance with the National Regulations regarding the exposure to welding fumes of welders and related personnel shall be verified.

Risk Management Measures for individual process / base material combinations

Class ¹	Welding process (according to ISO4063)	Base Materials	Remarks	Ventilation / Extraction / Filtration ²	PPE ³ DC<15%	PPE ³ DC>15%
Non-confined space¹⁰						
I	GTAW (141)	All	Except Aluminium	GV low ⁴	n.r.	n.r.
	SAW (12)					
	Autogeneous (3)					
	PAW (15)					
	ESW/EGW (72-73)					
	Resistance (2)					
	Stud welding (78)					
	Solid state (521)					
	Gases brazing (9)					
II	GTAW (141)	Aluminium	Except Cd- alloys.	GV low ⁴	n.a.	FFP2 ⁵
III	GMAW (131 – 135)	All	Except Cu-Be- V- alloys	GV low ⁴ LEV low ⁶	Improved helmet	FFP2 ⁵
IV	All processes class I	Painted / primed / oiled	No Pb containing primer	GV low ⁴		
	All processes class III	Painted / primed / oiled	No Pb containing primer	GV low ⁴ LEV low ⁶	FFP2 ⁵	FFP3, TH2/P2 o LDH2 ¹¹
V	MMAW (111)	Stainless, Ni, Be- and V- alloys.	n.a.	LEV low ⁶	TH3/P3, LDH3 ⁹	TH3/P3, LDH3 ⁹
	FAW (136/137)	Stainless, Mn- and Ni- alloys.				

	GMAW (131)	Cu- alloys.				
	Powder Plasma Arc (152)	Stainless, Mn-, Ni- and Cu- alloys.				
Closed system or confined space¹⁰						
I	Laser (52)	All	Closed System	GV medium ⁷	n.a.	n.a.
	Electron beam (51)					
VIII	All	All	Confined Space	LEV high ⁸ – External air supply	LDH3 ⁹	LDH3 ⁹

Legenda:

¹ Class: approximate ranking to mitigate risk by selecting process/material combinations with the lowest value. Identified collective and individual risk management measures shall be applied.

² Recommended measures to comply with national maximum allowable limits. Extracted fumes, for all materials except unalloyed steel and aluminium, shall be filtered before release in the outside environment.

³ Personal Protective Equipment (PPE) required avoiding exceeding the National Exposure Limit Value (DC: Duty Cycle, expressed in 8 hours).

⁴ General Ventilation (GV) low. With additional Local Exhaust Ventilation (LEV) and extracted air to the outside, the GV or LEV capacity may be reduced to 1/5 of the original requirement.

⁵ Filtrating half Mask (FFP2)

⁶ When an alloyed consumable is used, measures from “Class V” are required.

⁷ General Ventilation (GV) Medium (double compared to Low).

⁸ Local Exhaust Ventilation (LEV) high, extraction at source (includes table, hood, arm or torch extraction).

⁹ Helmet with powered filters (TH3/P3), or helmet with external air supply (LDH3).

¹⁰ A confined space, despite its name, is not necessarily small. Examples of confined spaces include ship, silos, vats, utility vaults, tanks, etc.

¹¹ Filtrating Half Mask (FFP3), helmet with powered filters (TH2/P2), or helmet with external air supply (LDH2).

In the above table “Risk Management Measures for individual process / base material combinations”, reference is made to the below standards for personal and collective protection measures:

ISO 4063	Welding process Reference Numbers according to ISO 4063.
EN ISO 15012-1:2006	Health and safety in welding and allied processes - Requirements testing and marking of equipment or air filtration - Part 1: Testing of the separation efficiency for welding fume.
EN ISO 15012-2:2008	Health and safety in welding and allied processes - Requirements, testing and marking of equipment for air filtration - Part 2: Determination of the minimum air volume flow rate of captor hoods and nozzles.
EN 149:2009	Respiratory protective devices - Filtering half masks to protect against particles - Requirements, testing, marking (FFP1 - FFP2 - FFP3).
EN 1835:2001	Respiratory protective devices. Light duty construction compressed air line breathing apparatus incorporating a helmet or a hood. Requirements, testing, marking (LDH1 - LDH2 - LDH3).
EN 12941:2009	Respiratory protective devices. Powered filtering devices incorporating a helmet or a hood. Requirements, testing, marking (TH1 - TH2 - TH3).
EN 143:2007	Respiratory protective devices - Particle filters - Requirements, testing, marking (P1, P2, P3).
Directive 1998/24/EC	Article 6.2 on the protection of the health and safety of workers from the risks related to chemical agents at work.
BGR 190	Benutzung von Atemschutzgeräten (Berufsgenossenschaftliche Regel für Sicherheit und Gesundheit bei der Arbeit).
TRGS 528	Schweißtechnische Arbeiten (Technische Regeln für Gefahrstoffe).