

Material Safety Data Sheet

According to the EC Directive 93/112

MSDS No. TE001 Tungsten Electrodes

Rev 0 – 17.01.05

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1. Product and company designation

Product Name: TUNGSTEN ELECTRODES

Product Brands: BOC EWP, EWCe EWLa, EWTh, and EWZr

Product Specification: AWS/ASME SFA 5.12 or other

Product Classification: Types EWP, EWCe, EWLa, EWTh, and EWZr

Recommended use: Gas Tungsten Arc Welding

Supplier: BOC Customer Service Centre

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2. Details of composition

These electrodes consist of solid tungsten or tungsten alloy rods, manufactured in short lengths and supplied in packages. The composition of the tungsten electrodes varies depending on the type of electrode supplied to different classifications of the relevant National Standards. They consist of tungsten metal containing different amounts of metal oxide powders.

Details of the contents of the tungsten electrodes covered by this data sheet are given below.

TABLE 1: APPROXIMATE COMPOSITION OF TUNGSTEN ELECTRODES (WT %)

AWS Classification	W (min.)	CeO ₂	La ₂ O ₃	ThO ₂	ZrO ₂	Other oxides or elements (total max)
EWP	99.5	-	-	-	-	0.5
EWCe-2	97.3	1.8-2.2	-	-	-	0.5
EWLa-1	98.3	-	0.8-1.2	-	-	0.5
EWLa-1.5	97.8	-	1.3-1.7	-	-	0.5
EWLa-2	97.3	-	1.8-2.2	-	-	0.5
EWTh-1	98.3	-	-	0.8-1.2	-	0.5
EWTh-2	97.3	-	-	1.7-2.2	-	0.5
EWZr-1	99.1	-	-	-	0.15-0.40	0.5

3. Hazards identification

There are no recognised hazards associated directly with unused electrodes prior to grinding and welding. Packaged consumables may be heavy, and should be handled and stored with care. FOLLOW MANUAL HANDLING REGULATIONS.

Some low levels of dust may be produced during handling. DO NOT BREATHE THE DUST.

When preparing (grinding) and using these electrodes as part of the welding process additional potential hazards are likely:

GRINDING.

Toxic and radioactive dusts. ENSURE ADEQUATE DUST EXTRACTION, VENTILATION AND DUST DISPOSAL

WELDING.

Electric shock from the welding equipment or electrode. This can be fatal.

Hot metal spatter and heat, which can cause burns to the hand and body, and may cause fire if in contact with combustible materials.

UV, IR and light radiation from the arc, which can produce 'arc eye' and possible eye damage to unprotected eyes. WEAR SUITABLE PROTECTIVE EQUIPMENT.

Fumes produced from the electrodes, material being welded and the arc radiation:

- Radioactive fume from the thoriated types of electrode.
- Particulate fume such as metal oxides from the electrodes, and complex metal oxides and silicates from the weld materials.
- Gaseous fume such as ozone and nitrogen oxides from the action of arc radiation on the atmosphere.
- SHORT TERM INHALATION OF THESE FUMES AND GASES MAY LEAD TO IRRITATION OF THE NOSE, THROAT AND EYES.
- LONG TERM OVEREXPOSURE OR INHALATION OF HIGH LEVELS OF FUMES MAY RESULT IN HARMFUL EFFECTS TO THE RESPIRATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND LUNGS.
- LOCAL EXTRACTION AND /OR VENTILATION SHOULD BE USED TO ENSURE THAT ALL HAZARDOUS INGREDIENTS IN THE FUME ARE KEPT BELOW THEIR INDIVIDUAL OCCUPATIONAL EXPOSURE STANDARDS IN THE WELDER'S AND OTHER WORKERS' BREATHING ZONES.

NOTE: If welding is performed on plated or coated materials such as galvanised steel, excessive fume may be produced which contains additional hazardous components, and may result in metal fume fever and other health effects.

4. First aid measures

No first aid measures should be required for the unused electrodes. During welding:

Inhalation

If breathing is difficult, bring the patient in fresh air; breathe in fresh air deeply.

For skin burns

Submerge affected area in cold water until burning sensation ceases and refer for immediate medical attention.

For eye effects such as arc eye and dusts

Irrigate eye with sterile water, cover with damp dressing and refer for immediate medical attention if irritation persists.

Ingestion

Ingestion is considered unlikely due to product form. However, if swallowed do not induce vomiting. Seek medical attention. Advice to doctor: treat symptomatically.

Electric shock

If necessary resuscitate and seek immediate medical attention.

5. Fire prevention measures

No specific measures required for the electrodes prior to welding.

Welding should not be carried out in the presence of flammable materials, vapours, tanks, cisterns and pipes and other containers which have held flammable substances unless these have been checked and certified safe.

6. Measures in case of unintentional release

No specific actions for electrodes prior to use.

Welding in proximity to stored or used halogenated solvents may produce toxic and irritant gases. Prohibit welding in areas where these solvents are used.

7. Handling and storage (for safety)

No special precautions are required for these welding electrodes.

Welding electrodes are dense materials and can give rise to a handling hazard when multiple packages are lifted or handled incorrectly or with poor lifting posture.

Good practice for handling and storage should be adopted to prevent physical injuries.

8. Exposure prevention / Controls / Personal protection

Exposure Prevention

Welders should not touch live electrical parts, and should insulate themselves from the work and the ground. Manufacturer's guidelines for the use of electrical welding machines should be observed at all times.

Welders and co-workers should be educated about the health hazards associated with welding fume, and trained to keep their heads out of the fume plume.

During grinding of these electrodes, toxic and radioactive dusts may be produced. Ensure adequate dust extraction, ventilation and dust disposal during and after grinding to prevent contamination of operators and co-workers.

During welding, fumes and gases will be produced and emitted from the welding process. The content of the fume is dependent on the electrode type and base material being welded. The amount and concentration of fume generated is dependent on factors such as current, voltage, welding practices and number of welders in a given area. By following recommended welding practices, fume production can sometimes be minimised.

When welding with the main tungsten electrodes covered by this Data Sheet, the fume will consist of tungsten oxide from the electrodes, and may contain either cerium, lanthanum, thorium or zirconium oxides (depending on the electrode type), and other complex metal oxides and silicates from the material being welded.

Gaseous ozone and nitrous oxides are also formed by arc radiation. In some cases ozone levels can be high and additional controls may be needed.

The individual exposure limits (when specified) for the constituents mentioned above are given below

Fume exposure should be controlled to below the recognised exposure limit for each of the individual constituents, and to below 5 mgm/m³ for the total particulate fume.

TABLE 2: HAZARDOUS FUME COMPONENTS

Welding fume component	CAS No.	OEL ¹ 8hr TWA	STEL ¹ 15min TWA
Total welding fume (particulate)	-	5	
Tungsten and compounds (as W)			
Soluble	7440-33-7	1	3
Insoluble		5	10
Zirconium compounds (as Zr)	7440-67-7	5	10
Nitrogen dioxide (NO ₂)	10102-44-0	3ppm	5ppm
Ozone (O ₃)	10028-15-6		0.2ppm
Nitrogen monoxide (NO)	10102-43-9	25ppm	35ppm

Units are in mgm/m³ except when stated otherwise. For UK only.

* Please refer to <http://www.hse.gov.uk/pubns/chan28.htm> & <http://www.hse.gov.uk/pubns/chan29.htm>

These fume exposure limits indicate that several of the fume constituents have low exposure limits. In addition, Thorium will be present in the grinding dust and welding fume of thoriated electrodes and THORIUM IS RADIOACTIVE.

This, together with the fact that some additional particulate fume components can be present from the material being welded, means that additional controls are required beyond the 5mgm/m³ total fume exposure limits.

The fume constituents which may need extra controls are thorium, ozone and nitrogen dioxide.

THE ADVICE ON FUME EXPOSURE CONTROL GIVEN ABOVE IS BASED ON REASONABLY EXPECTED FUME CONSTITUENTS FROM THE TUNGSTEN ELECTRODES AND THE WELDING ARC. IT DOES NOT, AND CANNOT TAKE INTO ACCOUNT THE FUME PRODUCED FROM THE MATERIALS BEING WELDED.

ACTUAL FUME LEVELS WILL VARY IN PRACTICE, AND MAY CONTAIN OTHER CONSTITUENTS FROM THE MATERIAL BEING WELDED THAT REQUIRE ADDITIONAL CONTROLS.

THE ONLY ACCURATE WAY TO DETERMINE THE COMPOSITION AND QUANTITY OF FUMES AND GASES TO WHICH WORKERS ARE EXPOSED IS TO TAKE AIR SAMPLES FROM INSIDE THE OPERATORS HELMET, IF WORN, OR IN THE WORKER'S BREATHING ZONES.

Individual fume measurements should be made in these cases using recognised 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.

Controls

Good general ventilation, and/or local fume extraction at the arc should be used to control the fumes and gases produced during welding to below their individual recognised exposure limits when measured in the welder's and co-workers' breathing zone. In addition the ventilation and extraction should also be sufficient to ensure that the total particulate fume levels are reduced below 5mgm/m³ when measured in the breathing zone.

In confined spaces where ventilation is not adequate, an air fed breathing system should be used. All precautions for working in confined space should be observed. Refer to:

Safe work in confined spaces Free HSE leaflet INDG258 HSE Books 1999. Also available in priced packs ISBN 0 7176 1442 5.

Safe work in confined spaces: Approved code of practice, regulations and guidance L101 HSE Books 1997 ISBN 0 7176 1405 0.

Where fume levels exceed the recognised exposure limits, respiratory protection may be required in the form of a Class P2 (metal fume) respirator.

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Personal Protection

Welders and co-workers in the vicinity should wear protective clothing and eye protection appropriate to arc welding as specified by local standards.

Protection of Body and Skin

Suitable clothes for welding should be worn such as non light reflective fireproof overalls, leather apron, welding helmet, leather boots spats and gloves

Protection of Hands

Welders should wear suitable hand protection such a welding gloves or gauntlets of a suitable standard. Co-workers should also wear suitable hand protection against hot metal, sparks and spatter.

Eye Protection

Welders should wear a welding helmet fitted with the appropriate optical welding filter for the operation. Suitable protective welding screens and goggles should be provided, and used by others working in the same area.

9. Physical and chemical properties

Physical state: Solid

Colour: Generally greyish, but other colours can be present

Form: Metallic tubular rod

Odour: Odourless

PH: Not available

Vapour pressure: Not relevant

Vapour Density: Not relevant

Boiling point / range: Not relevant

Melting Point: ~3400°C

Solubility in water: Insoluble

Density: Not available

Explosive / ignition point: Non flammable. No fire or explosion hazard exists

10. Stability and reactivity

There are no stability or reactivity hazards from welding electrodes as supplied.

Hazardous decomposition products such as metal oxide fumes and gases (see Section 8) are produced during grinding and welding.

11. Toxicity data

Welding fumes if inhaled can potentially produce several differing health effects caused by the metal containing particles and the gases produced during the welding process, both of which are present in the 'fumes'. The exact nature of any likely health effect is dependent on the consumable, material being welded, weld process, all of which affect fume quantity and composition, as well as the use of adequate ventilation, respirators, or breathing equipment as circumstances require.

Inhalation of the fumes/gases produced during welding may lead to irritation to the nose throat and eyes. The range of health effects include respiratory effects with symptoms such as asthma, impaired respiratory and lung function, chronic bronchitis, metal fume fever, pneumoconiosis , possible emphysema and acute pulmonary oedema.

Other potential health effects at elevated levels of exposure include central nervous effects possible lung cancer, bone disease, skin and fertility effects. Which of these health effects is potentially likely is related to the fume composition, and this needs to be consulted with the specific toxicity data below to assess the health risk when using any particular welding process.

Unprotected skin exposed to UV and IR radiation from the welding arc may burn or redden, and UV radiation is potentially a carcinogen. UV radiation can affect the unprotected eye by producing an acute condition known as 'arc eye'.

Specific effects relevant to major particulate and gaseous fume constituents which may be produced from these electrodes, (excluding fume from filler material and the components being welded).

Tungsten

Any fume or dust given off by these electrodes will consist mainly of tungsten and tungsten oxides. Exposure to tungsten and its compounds as a dust or fume generally shows low toxicity with no long term fibrotic effects on the lung. Some lung effects observed with exposure to tungsten carbide dust have been attributed more to cobalt than to tungsten compounds.

Thorium

THORIATED electrodes contain Thorium which is RADIOACTIVE. The exact amount of thorium in the fume depends on the grade of thoriated electrode used, and the welding parameters.

Using DC supply, fume levels from the tungsten electrode during welding are negligible and hence any exposure to radioactivity is also negligible. However, during electrode grinding and AC welding, fume or dust containing thorium will be emitted and exposure to radioactivity will be higher. In these circumstances extract ventilation is required to control any fume/dust emissions.

Thorium is a radioactive substance that emits beta radiation externally and alpha radiation internally. The latter radioactive properties can cause cancer of specific organs.

Zirconium

Zirconium is relatively non-toxic to humans and no adverse health effects would be expected from exposure to zirconium dust or fume.

Ozone and Nitrogen oxides.

These gases are formed due to interactions of the arc with the surrounding air. Both gases can produce eye, respiratory and lung irritation and also can produce longer term lung effects such as decreased lung capacity, chronic bronchitis, and emphysema. Of particular concern with both gases is that exposure to high levels (eg due to build up in confined spaces) can result in acute lung effects such as delayed pulmonary oedema.

12. Ecological data

The welding process produces particulate fumes and gases which may cause long term adverse effects in the environment if released directly into the atmosphere. Welding some materials with the electrodes covered by this data sheet can produce carbon dioxide gas, which is dangerous to the ozone layer.

13. Disposal data

Packaging, and electrode stubs should be disposed of as general waste or recycled.

No special precautions are required for this product, except for the grinding dust and stubs of thoriated electrodes, which may require special disposal.

14. Transport information

No special requirements are necessary in transporting these products

15. Regulations

- Health and Safety at Work Act 1974.
- The Management of Health and Safety at Work regulations 1992.
- L5 Control of substances hazardous to health. The Control of Substances Hazardous to Health Regulations 2002. Approved codes of practice and guidance. (ISBN 0717625346).
- Guidance Note EH40 – Occupational Exposure Limits (ISBN 0717621944).
- BS EN ISO 10882-1:2001 - health and safety in welding and allied processes - sampling of airborne particles and gases in the operator's breathing zone - part 1: sampling of airborne particles
- HSG 37 – An Introduction to Local Exhaust Ventilation. (ISBN 0717610012).
- L25 Personal protective equipment at work. Guidance on Regulations. Personal Protective Equipment at Work Regulations 1992. (ISBN 0717604152).
- L23 Manual handling. Manual Handling Operations Regulations 1992 (as amended)
- BS EN 169:2002 – Personal eye-protection - filters for welding and related techniques - transmittance requirements and recommended use
- BS EN 379:2003 – Personal eye-protection - automatic welding filters.
- BS EN 12477:2001 Protective Gloves For Welders.

- HSG 118 – Electrical Safety in Arc Welding (ISBN 0717607046).

16. Other information

The customer should provide this Materials Safety Data Sheet to any person involved in the materials use or further distribution. BOC Limited requests the users (or distributors) of this product to read this Materials Safety Data Sheet carefully before usage.

The information contained in this Material Safety Data Sheet relates only to the specific materials designated and may not be valid for such material used in combination with any other material or in any process.

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