TO 113 WELDING WORK

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1 Introduction

This guide considers personal protection in different welding work. This guide does not cover machines where different types of welding devices are used.

2 Personal protective equipment in welding work

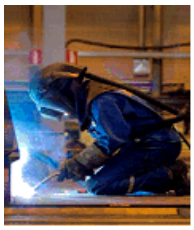
2.1 Using personal protective equipment in welding work in general

1. In areas where the use of a protective helmet is mandatory one must also use a helmet in welding work.
2. Welding gloves must be used in all welding work. The required class of the gloves for different welding works can be found in chapter 2.4.
3. The safety footwear should be half boot or boot model, with penetration resistant and heat-resistant soles.
4. Requirements for protective clothing: class 2 according to standard ISO 11611
5. When welding stainless steel and highly alloyed steel grades a welding mask equipped with a blower unit must be used. The welding mask and the blower unit must be made by the same manufacturer due to these items are accepted as an ensemble.
6. When using a blower unit, the worker must always consider the following matters related to safe working:
    - Always familiarize yourself with the instructions of the device. Before starting the welding work, check the functionality of the blower, the tightness of the face mask and its parts, and the condition of the hoses.
    - During the work monitor the resistance of the breathing. If the blower's input (airflow) decreases, change the battery or check if the blower output hose has been pinched (working position - welding hoses)
    - Perform maintenance to the mask after each use. Check the hoses and the face mask; recharge the battery after each working day.

7. In welding, electromagnetic fields exist, for example, near the welding cables. Because of this the welding cables should be kept as far from the welder as possible (not on the shoulder). The welding cables should be bundled together for the maximum possible length, which allows the magnetic fields to dampen each other.

8. When welding, try to place yourself in such a way that you are not above the welding gases. In tank works and confined spaces ensure sufficient clean breathing air.

9. It is also recommended for all welding works to use a welding mask equipped with a blower unit. Do not make any changes to the personal protective equipment. Edge seals of the welding mask are essential for the protection – do not remove them. Use mask and blower unit only as an ensemble as it is accepted. Do not use items made by different manufacturers together unless it is specifically permitted by the blower unit manufacturer.



Picture: The correct working method, the blower unit air hose must not be pinched.

2.2 Protective clothing

The protective clothing in welding work must meet standard EN ISO 11611. The protective clothing provides protection against fire hazard, welding sparks, heat radiation and also, to some extent, from direct heat. The clothing may be a one-piece or two-piece. In addition, if necessary, additional protection, such as a hood, separate sleeves or leggings, should be used.

Use

Protect the neck, the back of the neck and wrists, and the front part of the body. Close the clothing fasteners, press and hold down the sleeves and keep the pant legs over the shoes. It is important to keep the clothing fasteners up and closed to the top, to avoid sparks getting inside the clothing. Use flame resistant clothing between underwear and outerwear. Do not use artificial fiber underclothing, they may melt into the skin and increase the severity of the burn! Replace a dirty clothing with a clean one regularly, as the dirty one can be highly combustible from a spark! Remember regular cleaning and replace a broken piece of protective clothing with a new one.

2.3 Safety footwear

The best protection for the ankle area is provided by half boot or boot model leather shoes. The safety footwear must have a toe protection and / or penetrating protection and heat-resistant soles. The safety footwear must meet the EN ISO 20345:2004 standard: impact test 200J and compression test 15kN, CE mark, safety footwear marking S3 for penetration protection on the soles and HRO for heat resistance of the soles.

2.4 Protective gloves

In welding work there is a risk of exposure to chromium and nickel and heat. Avoid irritant or allergic dermatitis and burns and wear protective gloves.

There are gloves with two levels of protection:

- Class B gloves for tasks requiring more finger dexterity, such as TIG welding.
- Class A gloves are suitable for other welding work. They are thicker but provide better protection against heat than class B gloves.
- Standard number EN 12477, “flame” and “hammer" marking, CE-mark, class A or B, size of the glove, manufacturer ID.

2.5 Hearing protection

When welding, welder is exposed to strong impulse noise which contains fast and high noise peaks. Tinnitus, or ringing in the ear, is associated with the hearing loss resulting from the impulse noise more often than usual. When welding, welder is also exposed to hazardous chemicals which have adverse effects to the hearing organs. These are carbon monoxide (acetylene welding), lead and manganese. The welding room should be well-ventilated, since good ventilation also protects against hearing loss. A hearing damage develops slowly and is incurable. For welders the largest cause of occupational diseases is noise. Prevent hearing loss and use hearing protection during the whole time of the noise exposure.

2.6 Eye and face protection

Protect the entire facial area by using a welder's face shield or automatic mask. The filter of the welding mask must be a filter approved for welding work. A welding mask may be equipped with a respirator, i.e. a blower unit with a filter. For example, when oxygen/acetylene and oxygen/ liquefied gas flame cutting is being done, one must use flame cutting glasses.

Filters

A welding filter is a special filter that provides protection from bright light or glare and reduces the ultraviolet and infrared radiation. The filter shade level is classified as numbers 12-16. The shade level is selected according to the welding current being used (amperes, A). Be sure to clean the filter according to instructions, and check the mask's condition, at regular intervals, by performing visual inspection of the mask to ensure that there are no cracks in the mask or the filter.

When welding stainless steel, it should be noted that thermal stress is being formed into the welding seam, which may cause the slag to become loose and be thrown to the surrounding area when the welding seam cools down (in tack welding).

It is important to take care of the radiation protection of bystanders or others working in the same workspace. Welding work should primarily be done in special welding workstations which are equipped with welding curtains.

2.7 Respiratory protective equipment

The recommended respirator is a filter respirator equipped with a blower unit or a compressed air respirator, with a welding mask as a face part of the device. The efficiencies of the protective equipment are different, and they are determined by the structure of the whole assembly.

Combination of a powered air respirator and a welding mask. A blower unit with filters is attached with a waist belt on the dorsal side. The blower unit brings the filtered air through the hose into the welding mask. The solid impurities resulting from the welding are filtered by the P3 filter. Filters must be replaced with new ones periodically when they are saturated (filled up).

When welding stainless steel and highly alloyed steel grades, always use a welding mask equipped with a blower unit. It is also recommended for all welding work that a welding mask equipped with a blower unit to be used.

Dangers in welding coated materials. Paint, plastic and zinc coatings may release large amounts of harmful fumes and gases. When welding paint and plastic coatings welder must use a filtering respirator with a P3A2 filter.

It is forbidden to use compressed air from Tornio site compressed air supply line as a breathing air! Air in the supply line may contain small amounts of dust or oil. There is also a risk that the air in the supply line may contain gases/chemicals if there is accidentally an incorrect connection in the supply line or a gas/chemical leak which affects to the supply line.

Safety

When the appropriate work, safety and personal protective equipment are used in a well-designed work environment, the welding work can be done safely. Welding and metalworking generate smoke and fumes with adverse health effects, which may contain metals (chromium, nickel) and gaseous compounds such as ozone. You need to protect yourself from these while welding.

Welding work also generates noise, particularly the pre- and post-processing phases of the welding work. Welder must take care of hearing protection. It is also important to protect oneself from the welding sparks and flames, as well as the ultra-violet (UV) radiation, the light arc and electrical accidents. Fire safety must also always be maintained.

The ergonomics of the welding work can be improved by paying special attention to the working positions. For example, avoiding welding above shoulder height, and having enough pauses during the work. Aids and devices such as the adjustable welding table and welding positioners, wire feeding device and the supporting arms of the welding gun will also help to lighten the work. Obtaining a good working position may require the use of scaffolds or personnel hoist.

The primary method at the workplace is to remove air pollutants using a local exhaust ventilation and good general ventilation. If it is not technically possible to implement this, personal respiratory protective equipment must be provided to the staff. Protection is necessary because the fumes and other air pollutants may travel to the lungs and continue into the blood stream and other parts of the body. Welding fumes may cause chronic bronchitis. Zinc and copper fumes may cause metal fume fever. Metal fumes are dangerous to human health. Places where stainless steel is welded must be marked and isolated from outsiders.

Marking and isolating areas of potential cancer risk: places that are designated places for welding of stainless steel must be equipped with signs (see the picture). Employer must assure that only people whose presence is required can enter the welding area during welding. In addition to isolation warning signs are used during welding or permanently. Isolation of the area can be done, for example, by locating a stainless steel welding area in a separate room with a good general ventilation and a local exhaust ventilation or by separating a stainless steel welding area with welding curtains, good general ventilation and local exhaust ventilation.

Text in the picture: Stainless steel is welded in this area

- Carcinogenic compounds are formed in welding

- Unnecessary presence and passage in the area must be avoided

APPENDIX: TO 113 Welding work, a summary of the person's personal protective equipment in different welding work

When the appropriate work, safety and personal protective equipment are used in a well-designed work environment, the welding work can be done safely. Welding and metalworking generates smoke and fumes with adverse health effects, which may contain metals (chromium, nickel) and gaseous compounds such as ozone. Welder must protect him/herself against these dangerous substances.

1. Head protection: In the areas, where the use of a protective helmet is mandatory, welder must use a welding helmet with powered air respiratory protection for welding work.

When welding stainless steel and highly alloyed steel grades a welding mask equipped with a blower unit must be used. The welding mask and the blower unit must be made by the same manufacturer due to these items are accepted as an ensemble.

2. Hand and arm protection: Welding gloves must be used in all welding work. Category of protective gloves: standard number EN 12477, “flame” and “hammer" marking, CE-mark, class A or B.

3. Foot protection: Safety footwear must be half boot or boot type, must have a toe and / or penetrating protection and heat-resistant soles.

4. Protective clothing requirement: Protective clothing in welding work must meet standard welding EN ISO 11611 class 2 A1. In addition, the protective clothing must meet standard protection against heat EN ISO 11612 A1 B1 C1, E3.

5. Hearing protection: For welders the largest cause of occupational diseases is noise. Welder must prevent hearing loss and use hearing protection during the whole time of the noise exposure.

6. Respiratory protection: Combination of a powered air respirator and a welding mask. A blower unit with filter is attached with a waist belt on the dorsal side. The blower unit brings the filtered air through the hose into the mask. The solid impurities resulting from the welding are filtered by the P3 filter. Filters must be replaced with new ones periodically when they are saturated (filled up).

When welding stainless steel and highly alloyed steel grades, always use a welding mask equipped with a blower unit. It is also recommended for all welding work that a welding mask equipped with a blower unit to be used.

When welding a paint and plastic coated material a filtering respirator with a P3A2 filter must be used.