

*Work and  
safety instructions for  
soldering at University  
of Southern Denmark*

September 2013

This work/safety instruction is based on the Danish Working Environment Authority's AT- vejledning (health and safety guidelines) C.O.8 March 2002

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## 1 In general

The standard operating procedure and safety instruction covers all soldering work at the University of Southern Denmark where there is a risk of exposure to flux fumes, metallic lead and its ionic compounds.

### 1.1 Work processes deemed to be covered

All soldering is covered by the safety instruction.

### 1.2 Health hazards

Flux fumes are absorbed through the respiratory system.

Flux fumes can irritate the nose, throat, lungs and, after prolonged exposure, cause allergic reactions.

Lead is absorbed into the body by inhalation and via the gastrointestinal tract.

Long-term exposure to lead or short-term exposure to large amounts of lead can cause health injuries in:

- **The nervous system:** Brain functions can be affected in the form of irritability, reduced ability to concentrate and failing memory. Muscle strength may be reduced and there may be pain and numbness in the arms and legs.
- **The blood:** Lead affects the ability to produce red blood cells, so prolonged exposure can lead to anaemia.
- **The kidneys:** Long-term lead exposure can cause damage to kidney tissue, resulting in impaired kidney function.
- **Reproductive capacity:** Lead affects both sperm and egg cells, reducing the ability to have children. Lead can also affect foetal development.
- **Gastrointestinal tract:** Lead exposure can cause loss of appetite, digestive difficulties, constipation and, in severe cases, stomach pain.

Certain lead compounds, such as lead chromate, are included in the Danish Working Environment Authority's list of substances that are considered to be carcinogenic.

### 1.3 Considerations before carrying out the work

As a rule, all soldering work must be carried out with lead-free solder on lead-free components. ROHS-marked components/equipment are lead-free.

However, there may be exceptions when it may be necessary to use leaded solder.

This could be repair work on older electronics or soldering on constructions where there are high demands on robustness, e.g. against vibrations, or on components/constructions where there is high temperature sensitivity.

If soldering cannot be carried out without the use of lead, a substitution statement, cf. attachment, must be drawn up explaining why it is necessary to use lead.

## 2 Lead-free Soldering

### 2.1 Necessary precautions

Lead-free tin soldering should normally only be carried out in rooms with effective process ventilation (point or peak extraction) to the outdoors. The air must not be recirculated.

For soldering in the “field”, mobile extraction can be used with ventilation to the outdoors (welding extraction device or similar).

Triviality limit: Recirculating ventilation with HEPA filters (and documented maintenance and replacement of filters) can be used solely in exceptional and rare cases and where the hazard is considered minimal. This is strictly an emergency solution and only as an alternative to lack of process ventilation.

Food/drink must not be stored/consumed in the immediate vicinity of the workplace where soldering is taking place.

After the work has been carried out, finish with thorough hand washing.

### 2.2 Necessary

**equipment** Rooms with  
point extraction, Soldering iron  
Solder

### 2.3 7. Work instruction

1. Switch on the extraction for the workplace
2. Switch on soldering iron
3. Perform repair/assembly
4. Switch off soldering iron/extractor
5. Remove print and other materials from the workplace
6. Clean material residues from the work area

## 3 Soldering with leaded tin/materials

### 3.1 Necessary precautions

Soldering with leaded tin may only be carried out if a prior assessment shows that soldering without the use of lead cannot be done. A written account in the form of a completed substitution declaration is required, cf. attachment.

Leaded tin soldering must only be carried out in a fume cupboard or a separate room with other effective process ventilation (point suction, peak suction) to the outdoors. (The air must not be recirculated.) For soldering in the "field", mobile extraction can be used with ventilation to the outdoors (welding extraction device or similar).

When working with leaded tin/material/print, overalls/protective gloves must be worn to ensure that clothing/skin does not come into contact with the solder.

When not in use, the solder is to be stored in an airtight container.

Food/drink must not be stored/consumed in the immediate vicinity of the workplace where plumbiferous material is being worked on.

After the work is done, wipe down the work surface in the fume cupboard with disposable cloths, which should be disposed of in airtight packaging. Finish with thorough hand washing.

### 3.2 Necessary equipment

Fume cupboard with sufficient air change; alternatively, the work can be carried out in a separate room with room ventilation and local extraction

Nitrile gloves

Disposable overalls

Soldering iron

Solder

Disposable wipes

### 3.3 Work instruction

1. Wear disposable overalls and disposable gloves
2. Switch on the extraction for the workplace
3. Place components and necessary material in the fume cupboard
4. Switch on soldering iron
5. Perform repair/assembly
6. Switch off soldering iron
7. Remove print and other materials from the workplace
8. Wipe down the work area with disposable cloths
9. Dispose of disposable gloves, overalls, material waste and cloths in airtight containers.

## Substitution declaration

A copy of this declaration is made available on the unit's area at kemibrug.dk

Name of unit:	Management responsibility:

Substance name and hazard label:	CAS-no.:
<i>Lead, powder, dust, smoke and inorganic compounds</i>	CAS 7439-92-1

Are there any special regulations?

<i>The Danish Working Environment Authority's guidelines on limit values for substances and materials – C.0.1., August 2007 Limit value calculated as Pb (1996) 0.05 mg lead/m<sup>3</sup> (=50 µg lead/m<sup>3</sup>) The individual's blood level must not exceed 20 µg Pb/100 ml blood. (=1 µmol/l).</i>
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Can lead soldering be replaced by a non-hazardous or less hazardous process, including soldering without the use of lead?

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Reason for a no:

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How much is expected to be used annually?

In which period should the substance be used?

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The declaration is issued by:

\_\_\_\_\_  
Name and title

\_\_\_\_\_  
Date

Signatures of the health and safety group:

\_\_\_\_\_  
Supervisor

\_\_\_\_\_  
Occupational Health and Safety Representative