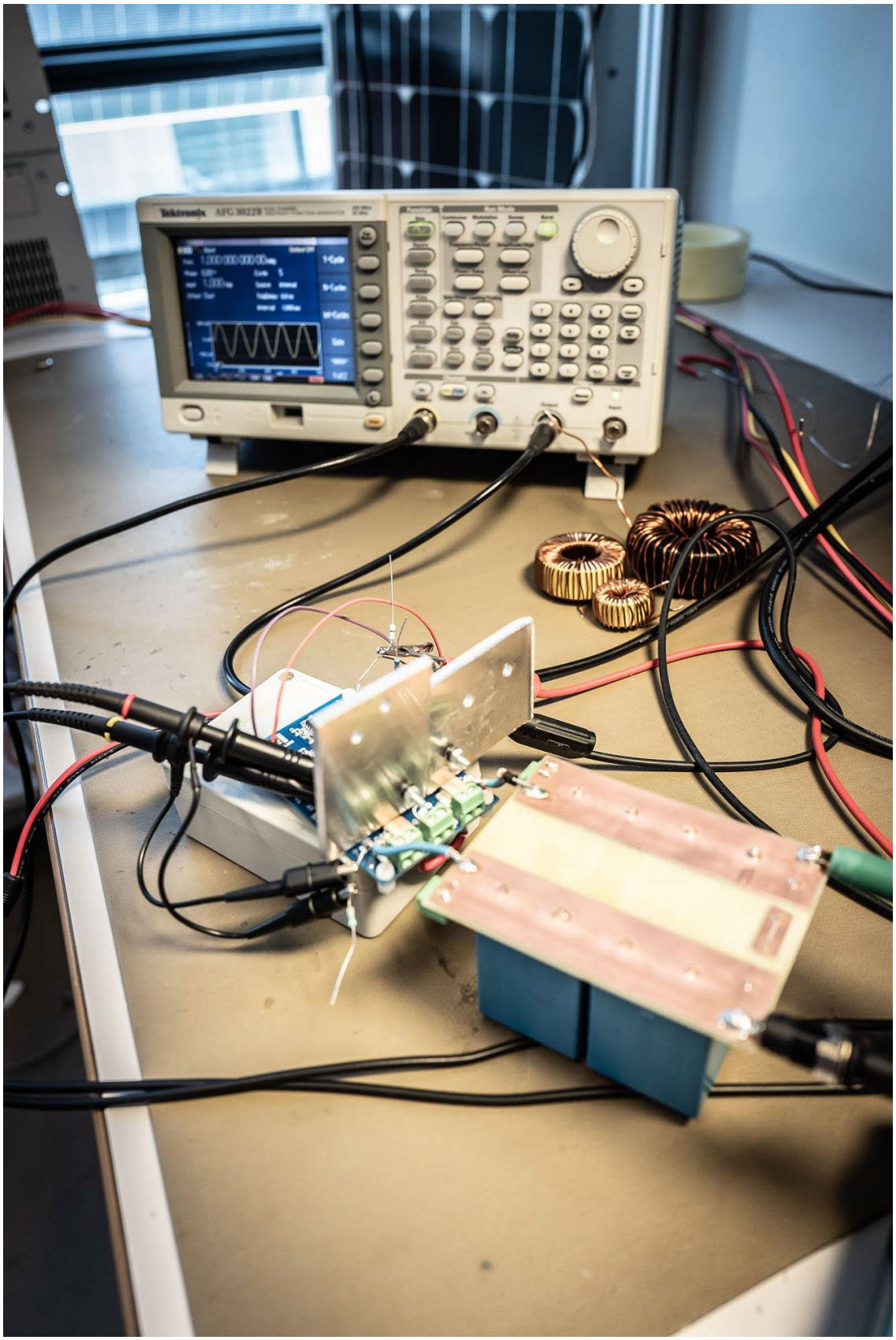
# Electrical Safety at TEK



## Contents and Keywords

## 1. Summary and Checklist for Electrical Safety

1. Does the process include setups/installations with voltage (>0 Volts)?
    a. No: You do not need this guidance in the current process.
    b. Yes: Go to point 2.
2. Carry out a thorough risk assessment before starting work. Security measures are clarified and implemented, e.g. (the list is not exhaustive):
    a. Clarify who is responsible and can approve the process before initiation; if you are in doubt, contact the person who is responsible for the lab, your manager, or your local health and safety group.
    b. Is there a need for specialist advice, possibly from an external consultant (see chapter 13)?
    c. Can risks be eliminated, e.g., by using other equipment, working in de-energized state, etc.?
    d. Need for technical measures? For example, shielding, insulation of conducting parts, grounding and securing of equipment, use of correct cables and chargers, etc.
    e. Can the risk be eliminated so that you can work completely safely, or must a procedure be established which prevents working alone? Are other organizational measures needed?
    f. Is personal protective equipment needed, e.g., insulating gloves, insulated tools, protective glasses, etc.?
    g. Emergency procedure in case of accidents? For example, TEK's emergency plan incl. alarm instructions and the guide "In case of serious accident" (Appendix 2), as well as specific local actions.
    h. Emergency equipment for use in accidents? For example, suitable fire extinguishing material, eyewash etc.
    i. Need for safety signage?
    j. Other important messages to include in risk assessment and safety instruction?
3. Ensure that all safety measures are implemented and the process approved before the work is initiated.
4. Ensure that all users – employees and students – have received and understood the risk assessment and safety instruction before they are allowed to start working with the equipment/process.

See in-depth explanations in the following sections.

## 2. Purpose and Target Groups for this Document

The purpose of this document is to provide an overall introduction to electrical safety in connection with activities at the Faculty of Engineering (TEK) at SDU. The document is thus an internal guide, which is one of the components in ensuring that our work can be carried out in a fully safe and healthy manner.

The focus is on areas that, from experience, are relevant and important at TEK, and some areas are legally required to address in connection with work with electricity. At the same time, there are references to where you can find more inspiration or help to secure your work with electricity.

The document is aimed at both employees and students at the TEK.

***The document is not exhaustive, and it cannot replace risk assessment and safety introduction to the specific processes (see section 5.d).***

## 2.1 When should this guide be used?

This guide must be used in all situations where you work with voltage above 0 Volts. As a minimum, an initial risk assessment must always be carried out, which does not need to be in writing. Here you must, among other things, find out whether there is a need for an actual (written) risk assessment, as well as for an electrical safety course (see section 5).

## 3. Roles and Responsibilities[1]

**Everyone** has a responsibility to work together for a healthy and safe working environment. And **you** have a special responsibility for the processes you work with.

**The person responsible for the room/laboratory** has a duty to monitor the safety of the room and point out "faults and deficiencies"; including ensuring that risk assessments and safety instructions are prepared (see section 4.d).

**The working environment organization** has a facilitating role. They are not specialists on all safety issues, but they can help identify problem areas and point out that they need to be addressed.

**The management** must supervise the safety work and are always responsible for ensuring that the work is planned and organized so that it is safe and healthy. Management is also responsible for ensuring that risk assessments and safety instructions are prepared.

## 4. Definitions

### 4.a Extra Low Voltage

*AC voltage **less than** 25 Vac and DC voltage **less than** 60 Vdc are referred to as Extra Low Voltage.*

DC voltage mainly occurs in connection with the use of laboratory power supplies, batteries, and mains adapters. Most AC adapters provide direct current (alternating voltage may occur). Here the voltage is typically so low that it is harmless (5-24v).

### 4.b Low Voltage

*Systems / experimental setups supplied with voltages above 25Vac and 60VDC are referred to as Low Voltage.*

[1] Sources:
1) The Working Environment Act; esp. chapters 2 and 4; https://at.dk/regler/love-eu-forordninger/arbejdsmiljoe-2062-sam/
2) Description of Lab Responsibility at TEK: MS Teams for TEK arbejdsmiljø-laboratoriefiler (documents 1a and 1b).

*Typically, these are setups with 230/400 Vac supply as well as setups with High Power DC supplies, including laboratory power supplies with high voltage / high current (Power Sources), e.g., motor test rigs and transformer exercises.*

The voltage ranges up to 1000 V AC and up to 1500 V DC are covered by the European Low Voltage Directive.[2] A number of security measures apply to this area.

### 4.c High Voltage

High voltage is a high electrical voltage. According to the International Electrotechnical Commission, *voltages greater than 1000 V AC or 1500 V DC are referred to as high voltage*.

A number of special security measures apply to this area.

*As a general rule, you must not work with high voltage at TEK. Should the need occur, please contact your working environment group[3] for further investigation and agreement.*

### 4.d Batteries

Batteries come in many different sizes. Ranging from button cells to large battery packs for electric vehicles. The battery voltage varies from 1.5v and up to approx. 5-600Vdc. Lithium-ion batteries are often used in connection with drones, mobile robots, and electric vehicles. Battery packs / systems for supplying emergency power systems and electric vehicles are often composed of smaller batteries / packs of up to 25Vdc.

The battery voltage is typically not that high (typically 15-16Vdc), but on the other hand the batteries are often able to deliver a very high short-circuit current which can lead to sparks and overheating of both the connected electronics and not least the battery pack itself. The battery pack and the connected equipment must therefore be protected with a suitable size fuse, e.g., an automatic circuit breaker.

**Definitions:**

- Low-performance < 100wh: Mobile phones, tablets, laptops, etc.
- Medium ≥ 100wh < 12kg / battery: Electric bicycles, hand tools, etc.
- High-performance > 100wh > 12kg / battery: Electric vehicles, mobile robots, UPS systems, etc.

See also more about batteries in sections 5.d and 10.

[2] The European Low Voltage Directive: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32014L0035
[3] Find a link to your local working environment group here: https://sdunet.dk/en/enheder/fakulteter/teknik/arbejdsmiljoe-og-personaleforhold/safety

*Lithium battery packs*


*Fuse*

*Inline fuse holder*

### 4.e Capacitors

Capacitors typically come in two designs, polarized and non-polarized. Non-polarized capacitors are often used for filtering and decoupling.

Polarized capacitors are typically used as short-term energy storage and come in many different sizes; ranging from small surface-mounted to large enclosures that must be bolted down. The polarized capacitor is often made of a wound thin aluminum foil with an electrolyte in between. The voltage can vary from approx. 3V and up to several hundred volts.

**Definitions:**

- *Low performance: Less than 470µF/63V. Small circuit power supplies etc.*
- *Medium performance: From 470µF/63V to 2500µF/63V. Power supplies, small motor drivers, etc.*
- *High performance: Over 2500µF/63V. High-power converters, motor drivers.*

## 5. Basic principles for working with electricity at TEK

Users must always be trained/instructed in relation to the risk level at which they must work.

As a basic principle, you must always ensure that the equipment is in a **de-energized state before** making modifications to setups:

- shut off completely
- protect against reconnection
- control de-energized state
- establishment of grounding and short-circuiting
- establishment of protection against nearby live parts.[4]

**The Danish Working Environment Authority's guideline:**
*"The employer must establish procedures for the preparation and execution of the work depending on the nature and complexity of the work:*

- *Working in de-energized state. Whenever possible, work must be done in de-energized state. This means that the plug is removed and secured against reinsertion, or the supply disconnector is disconnected and locked before accessing the parts that may be live. Extraneous control voltage and other voltage sources such as capacitors, batteries or backup supplies must be taken into account. Competence: Expert or specially instructed.*

[4] Cf. Dansk Standard: DS/EN 50110-1:2013, section 6.2.1.

- *Work near live parts, e.g., measurement at a low short-circuit level. Competence: Expert or specially instructed.*
- *Work near live parts, e.g., measurement where the short-circuit current can reach a dangerous level. Competence: Expert.*
- *Work on live parts. In general, and where the short-circuit current can reach a dangerous level, it is required that the work is carried out by an expert person who has received the necessary training. The training must provide the knowledge and experience to analyze the risks and avoid the dangers that electricity can create and enable the person to assess and avoid the dangers where the short-circuit current can reach a dangerous level. Competence: Expert + specially appointed by the employer + trained. The training must provide the person with knowledge and experience corresponding to DS/EN50110-1."* [5]

### 5.a Extra Low Voltage

See section 4.a for definition of Extra Low Voltage.

DC voltage mainly occurs when using laboratory power supplies, batteries, and mains adapters. Most mains adapters deliver DC voltage (AC voltage may occur). Here, the voltage is typically so low that it is harmless (5-24v).

Extra low voltage is considered harmless by normal skin contact. However, there may be a risk if moisture is present.

Users are instructed in laboratory safety in low-voltage laboratories: grounding of equipment, protection with fuses and RCD relay, use of laboratory cables, equipment, measurement, and covering/safeguarding/shielding of setups.

### 5.b Low Voltage

See section 4.b for definition of Low Voltage.

Voltages above 25 V AC and 60 V DC are referred to as Low Voltage, can be very harmful and measures must therefore be taken to protect against contact.

Users are instructed in laboratory safety in low-voltage laboratories: Grounding of equipment, protection with fuses and RCD relay, use of laboratory cables, equipment, measurement, and covering/shielding of setups.

In addition, there is a requirement a safety course meeting the standard EN20110 before you can work with high current at TEK.

### 5.c High Voltage

IMPORTANT: See section 4.c above if you need to work with voltages greater than 1000 V AC or 1,500 V DC (high voltage).

### 5.d Batteries

*(Low, medium or high performance, cf. section 4.d)*

[5] https://at.dk/arbejdsmiljoeproblemer/arbejdsulykker/typiske-ulykker/andre-typer-ulykker/kontakt-med-elektricitet/arbejd-sikkert-med-el-paa-maskiner/

Users are instructed in laboratory safety in connection with work on battery systems: Protection with fuses, use of laboratory cables, equipment, measurement, and covering/shielding of setups.

In addition, a safety course that meets the standard EN50110 is required in connection with work on high-performance battery systems such as electric vehicles/mobile robots/Formula Student/UPS systems/Smart Grid, and generally always when the total battery performance is over 250 Wh.

When installing high-performance battery systems, the battery poles must be secured individually, and insulating cover and gloves as well as safety glasses must be used. Adequate insulated tools must also be used.

See more about batteries in sections 4.d and 10.

### 5.e Risk Assessment and Safety Instruction[6]

Processes that involve special risks require the preparation of a written risk assessment and safety instruction.

The person responsible for the room must ensure that risk assessments and safety instructions are prepared for the processes in the room/lab; however, it is often someone other than the person with room (lab) responsibility who must make the risk assessment.

*Please note: The person who prepares the risk assessment must be educated at the level that the risk assessment covers. For example, you must at least have a safety course at a level that meets the EN50110 standard when assessing risks in the high-current area; see also section 13.c.*

Risk assessments must be in writing and prepared on an ongoing basis from the beginning of the work/when you start setting up experiments. The purpose is to identify and prevent risks on an ongoing basis.

A risk assessment is the same as an APV (workplace assessment). It must be renewed when changes occur, and at least every three years.

You can find templates as well as several examples of risk assessments at MS Teams for TEK work environment laboratory files: MS Teams for TEK arbejdsmiljø-laboratoriefiler (access for TEK employees).

*Please note: The written risk assessment and safety instruction must be available to all users of the process / equipment at or from the workplace, and it must **always** be followed by an oral instruction to ensure that the instruction is understood.*

### 5.f Alone at Work

When working with *hazardous* processes / materials / equipment such as electricity and rotating machines, at least two people who have received the safety instruction – and when working with electricity also a safety course that meets the EN50110 standard – must be present.[7]

[6] https://at.dk/arbejdsmiljoearbejdet/apv-arbejdspladsvurdering/hvad-er-en-apv/
[7] https://at.dk/regler/at-vejledninger/oplaering-instruktion-tilsyn-1-7-1/bilag-4/, section 4.11.

# 6. Equipment and Documentation Requirements

## 6.a CE Marking and Manuals [8]

In Europe, there is a requirement that all electrical equipment must be CE marked, and there must be a manual, which must at least be in Danish, the original language, as well as in a language that any international users understand, typically English.

Regardless of the equipment – if it's a machine or other technical equipment – this rule also always applies: Order Regarding the Use of Equipment (*Bekendtgørelse om anvendelse af tekniske hjælpemidler*): When it is relevant to the safety, the manual must be available in Danish and a language that the user(s) understand. The manual must be "adequate" – meaning that it must include all the important information in Danish and a language that the user(s) understand.[9]

As a general principle, there is also a requirement for CE marking of own test setups / own-manufactured equipment, which exists unchanged for more than approx. 6 months.

See also section 8 regarding purchase of new equipment, as well as Appendix 1 on CE marking.

## 6.b Quality

Check before every use if equipment is defective. Defective equipment must be returned for repair immediately or discarded; pay special attention to cables, reliefs, connectors, and insulation.

Electrical equipment may only be repaired by authorized personnel.

The cables must be of robust quality, without holes or burn marks from hot plates etc., and they must be firmly attached to the cable relief of the plug and the appliance. If in doubt about the quality, discard the cable and get a new one!

## 6.c Connecting Equipment - Connectors, Cables, and Extension Cords

All electrical appliances must be connected correctly.

All electrical laboratory equipment must be earthed via the mains cable, i.e., the mains plug must be a Danish type K or CEE power plug. If the mains plug of the appliance does not fit into the socket, the **plug must be replaced**. If this is not possible, e.g., in connection with testing new equipment, a PE adapter MUST be used. PE adapters can be ordered from the Central Warehouse at SDU.

[8] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:157:0024:0086:EN:PDF
Product directives can be found here: https://eur-lex.europa.eu/homepage.html

[9] Order Regarding the Use of Equipment (*Bekendtgørelse om anvendelse af tekniske hjælpemidler*), § 16, https://www.retsinformation.dk/eli/lta/2022/428

Varenummer 575

**kr. 27,47**

Adapterstik Schuko til jord

Adapter mellem DK jord og Pind jord.

| | |
|---|---|
| Leverandør | SDU Centrallager |
| Aftale | SDU100759 SDU Centrallager |
| UNSPSC | 26121536 - Forlængerledning |
| Salgsenhed | stk |

*Type K and CEE Plug*

When using extension cables, it is important that the ground connection on the plug is also inserted into the socket. When using extension cables, make sure that they ALL carry the ground connection further.

If you connect two extension cables together in a chain, there is a risk that much more current will be drawn through the cables than they are dimensioned for. If you need a very long cable, you may want to use a cable drum instead. Consider using a protective enclosure when assembling plugs, which protects the joints from water.

Also be careful not to leave sockets and extension cables loose on the floor. If you step on them, the insulation may be worn or the plastic in the socket may break. It can also be flammable, just as loose cables pose a tripping hazard and make cleaning difficult. Instead, the cables should be attached to the panels or something else.[10]

### 6.d Test wires (banana plugs), measuring probes, metal clamps (alligator clips), cover caps, bushings, coaxial cables, plugs, etc.

Test wires (banana plugs), measuring probes and clamps (alligator clips), plugs, etc. must be of the insulated type with fixed covers. Test wires / measuring probes must have the correct rating (insulation level and cross section) both in terms of voltage and current. When measuring with several voltages / potentials, isolated differential probes must be used.

If the test cannot be performed with isolated parts, the working environment group must be contacted and the working environment group must approve the risk assessment, procedure / instruction, and measures.

[10] Kilder:
1) https://www.sik.dk/privat/gor-det-sikkert/el/brug-elprodukter-sikkert/undga-elulykker-sikker-brug-elektriske-haveredskaber
2) https://alstrom.dk/varekategorier/89-stikdaaser/

*Insulated test wires / alligator clips and isolated differential probe*

### 6.e Measuring Equipment

All measuring equipment must be CE marked and have the correct voltage / current rating, and not least the correct level of insulation.

### 6.f Cover Plates, Shielding, Cages, and the Like

All electrical equipment must be protected against unintentional contact with the live parts in all conceivable situations. However, this does not apply to installations below 25 V AC and 60 V DC (see section 4.a).

If it is not possible to completely cover live surfaces, the area must be cordoned off and signs must be made so that you cannot get into contact with the live parts.

If you are in doubt about how best to cover/insulate your setup, contact your local laboratory technician for guidance (see section 13.c).

### 6.g Fuses and RCD Relays

Equipment and setups must always be supplied via outlets protected with RCD relay and the correct size fuse.

### 6.h Power Supplies

There are many different types of power supplies and power classes.

**Max. 2x30Vdc or 1x60Vdc**

Users are instructed in laboratory safety: Grounding of equipment, protection with fuses and RCD relay, use of laboratory wires, equipment, measurement, and shielding.


*2x30v Lab Power Supply*

**Maximum 125Vdc**

Users are instructed in laboratory safety: Grounding of equipment, protection with fuses and RCD relay, use of laboratory wires, equipment, measurement, and experimental setups.

**Maximum 500Vac / 1000Vdc**

Users are instructed in laboratory safety in: Grounding of equipment, protection with fuses and RCD relay, use of Power Sources and laboratory wires, measurement, and cover / shielding of installations.

In addition, there are requirements for a safety course that meets the standard EN50110.


*AC Power Source*

## 7. Protective Equipment, Shielding, etc.

Modification of set-ups and connection of measuring probes must always be done in a de-energized state / unplugged, cf. section 5.

All test setups above 150Watt must be shielded.

Electric rotating / moving machines / parts must be shielded.

Experimental setups must be checked on an ongoing basis. See also section 5.e on risk assessments.

**When working on battery systems where the battery cannot be switched off, protective equipment such as insulating cover material and gloves as well as safety glasses must be used.**

**Installations must not be left while they are turned on** unless it is strictly necessary, e.g., for long-term tests. Here, the installation must be protected against contact and be marked with signs indicating the contact person and instructions for proper switch-off of the installation. Remember that, for example, cleaning staff and Technical Service have access to the laboratory, and they do not have specialist knowledge of the risks of the installation.

## 8. Acquiring New Equipment

Before procuring new (electrical) machines and equipment that entails new risks in the room, a risk assessment must be made. This is done by the person who is responsible for the process / equipment and must be reviewed and approved by the department's work environment organization.

For machines / equipment that affect building installations, and / or have consequences in relation to space utilization, noise, vibrations, anchoring in the floor, need for cage / shielding, etc., the assessment is sent to TEK Building Committee (Kirsten Præstegaard, Mogens Brabech and Susanne Arnsted) and should at least include the following:

- Responsible person / contact person
- Description of the work process

- Initial risk assessment and safety instruction
- Requirements for installation
- Approval of the immediate supervisor and the work environment group (head of department and work environment representative)

TEK Building Committee must then ensure the involvement of Technical Services.

The process is the same in cases where the department constructs equipment / machines / experimental setups itself.

Technical Services will, in collaboration with the faculty, assess the desired procurement in relation to legislation, the suitability of the buildings and supplies.
Based on this dialogue, the work can either be initiated or an order form must be completed if the task is of a certain size.

Equipment – especially specialized equipment – must be purchased with installation included when possible.
However, Technical Services must always still be involved in relation to special requirements for installation (contact: 8888@sdu.dk).

Find more information and request forms at SDUnet:
https://sdunet.dk/en/enheder/fakulteter/teknik/praktisk-info-og-faciliteter/ombygninger-og-installationer

## 9. Condensation / Moisture and Work in Wet Rooms

Remember that virtually all liquids in the laboratories are electrically conductive. Many of them are even extremely good conductors and correspond to direct connection with the connected wires.

Electrical equipment and wires must therefore always be dry and clean, without salt deposits.
Never work with electrical equipment with damp hands / gloves (the thin rubber gloves do not insulate against high voltages).

Cold in the rooms entails an increased risk of electrical faults and accidents due to condensation problems.

Wet room covers must always be mounted on loosely mounted connectors in wet rooms.

## 10. Batteries

### 10.a Handling

Batteries must be handled according to the manufacturer's instructions, and generally carefully. Avoid blows, shocks, etc.

Improper handling of batteries and mechanical damage can pose a significant safety risk.

Exposed poles pose a risk of short circuits and must therefore always be protected against contact (covered, for example, with insulating tape or foil).

### 10.b Storage

Batteries must be stored with the correct state of charge in approved containers / cabinets (typically specified in the battery manual).

The batteries should be stored at room temperature to avoid "Thermal Runaway".

### 10.c Charging

Batteries must be charged with suitable chargers to ensure proper charging, and to avoid thermal runaway that may cause fire. Charging must take place in a room / area that is designed for charging with non-conductive / combustible materials. Charging must be attended or in a secured environment (e.g., battery cabinet or container).

### 10.d Transport

The batteries should be transported in suitable containers / suitcases with inserts that protect the batteries from shocks and impacts.

*Examples of transport packaging:*

### 10.e Disposal

Used batteries must be in white containers which must be correctly labeled in terms of contents and placed together with other environmental waste.

Exposed poles pose a risk of short circuits and must therefore always be protected against contact (covered, for example, with insulating tape or foil).

## 11. Capacitors

Users are instructed in laboratory safety in connection with work with capacitors: use of laboratory cables, equipment, measurement, and covering of setups.

In addition, it is supplemented with electricity safety course EN50110 or an equivalent safety course in relation to work with capacitors for e.g., high power DC-DC converters/UPS systems/smart grid, and generally always when the total system output is over 250W.

When mounting capacitors above 470µF/63V, it must be ensured that the individual capacitor is discharged before mounting.

**Storage: Previously charged capacitors >470µF/63V must be fully discharged before putting them back into storage. Electrolytic capacitors for high voltages 2500µF/63V must be stored with the terminals shorted.**

**Installations with capacitors >470µF/63V must be discharged before working on the installation.**

## 12. Emergency Procedures in the Event of Electric Shock

### 12.a Immediately After the Incident

Guideline from Sundhed.dk:

*" What is electric shock [11] ?*

- *Minor electric shocks are not uncommon*
- *They are usually more surprising than dangerous, but in some cases even small amounts of electricity can be life-threatening and cause unconsciousness, cardiac arrest, or cessation of breathing.*
- *Electric shock can also cause severe, deep burns and major tissue damage*
- *Even severe electrical burns can sometimes only leave a minor mark on the skin, but the damage to the tissue can still be significant"*

*First Aid in Connection with Electric Shock[12]*

*"If you think someone has been subjected to an electrical shock:*

1. *Call 112 or call for emergency medical help*
2. *Look first. Do not touch the person who may still be in contact with the electrical source. Touching the person can also give you a shock*

[11] https://www.sundhed.dk/borger/patienthaandbogen/akutte-sygdomme/foerstehjaelp/varme-og-kulde/elektrisk-shock/; 25. oktober 2021.
[12] Kilde: https://www.sundhed.dk/borger/patienthaandbogen/akutte-sygdomme/foerstehjaelp/varme-og-kulde/elektrisk-shock/

3. *Disconnect the power if possible. If this is not possible, you should move the electrical source away from the affected person using a non-conductive object such as cardboard, plastic or wood*
4. *As soon as the person is free from the electrical source, check that the person is breathing and has a pulse*
    a. *If there is no response or the pulse is alarmingly slow and weak, start CPR*
    b. *If the person has fainted or is pale and showing other signs of shock, then lay the person down with the head slightly lower than the body and the legs elevated*
    c. *Unconscious persons who are breathing and have a pulse should be placed in a stable lateral position*
5. *Cover major fire damage to prevent evaporation"*

### 12.b Procedure in Case of No Symptoms After Electrical Shock

- After electric shock, you must always seek medical advice a.s.a.p., or the injured person must be brought to the emergency room, even if no symptoms are found. Cf. the information in 12.a, even minor shocks can be life-threatening and the injured person may not necessarily immediately see or feel internal damage.
- The injured person must not be alone and must not go out into the traffic him/herself but must be transported and followed.

### 12.c Emergency counselling to the Injured Person and Witnesses to a (Serious) Accident

- Give emergency counselling to the injured person and any relevant witnesses:
    - Immediately after the above life-saving first aid, please follow the procedure: "I tilfælde af alvorlig ulykke / In case of critical event" (See Appendix 2).
    - In the coming days, weeks and months after the incident, please follow the guideline: "Crisis counselling".
- The injured person and any witnesses must be offered psychological help: https://sdunet.dk/da/personale/arbejdsmiljoe/personalepsykolog.

### 12.d Analysis, Information, and Claim Form

- Work-related accidents must always be reported to the immediate manager of the injured person, research manager, and leader of the departments work environment (= Head of Department/Working Environment Group).
- A claim form must be filled in to report the work-related accident and the local working environment group must contact TEK Senior Advisor for Working Environment, who ensures that HR Working Environment Office are notified: https://sdunet.dk/da/servicesider/hr/arbejdsmiljoe/arbejdsskade
- An electrician or Technical Services must be contacted as needed to investigate the course of the accident.
- The circumstances and the equipment in connection with the accident must be investigated thoroughly. It is important to make a comprehensive investigation.
- It must be examined if there are similar risks elsewhere in the organisation.

### 12.e Follow-up

- All relevant repairs, amendments, preventive initiatives, and procedures must be implemented in all relevant parts of the organisation.
- Knowledge must be shared with the rest of the organisation via the working environment organization and SDU HR Working Environment Team (arbejdsmiljoe@sdu.dk).

# 13. Some Links and Tools

## 13.a Template for Risk Assessment and Safety Instruction

See section 5.e above.

## 13.b Links to rules and guidelines

- The Danish Standard DS/EN 50110-1:2013
- Find more information at the home page of the Danish Working Environment Authority, Arbejdstilsynet: www.at.dk. (Limited amount of information in English).
- International Electrotechnical Commission: https://www.iec.ch/homepage.
- The Machine Directive (several languages): https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006L0042

## 13.c Whom Can You Ask for Help and Guidance?

### *Lab Technicians and Other Professionals at TEK*

**Odense:**
Martin H. Thygesen, mht@sdu.dk
In case of Martin's absence:

Brian Bolander Hansen, bbha@sdu.dk

If both are absent:
Please contact the colleagues in Sønderborg.

**Sønderborg:**
Christian Christensen, christensen@sdu.dk
Jakob Grønning, jakob@sdu.dk

If both are absent:
Please contact the colleagues in Odense.

### *Questions Regarding Roles and Responsibilities*

- Your Working Environment Group
- Senior Advisor for Working Environment at TEK

Find links and contact details here: https://sdunet.dk/en/enheder/fakulteter/teknik/arbejdsmiljoe-og-personaleforhold/safety

### *SDU Technical Services*

Regarding buildings and installations etc.: Contact SDU Technical Services as early in the process as possible at 8888@sdu.dk.

Please also see section 8 regarding acquisition of new equipment.

### *Consultants/Specialists*

If we don't have the competences internally at TEK, and generally in complex cases, please contact an external consultant or electrician, depending on the nature of the task. If questions about safety cannot be answered internally, and external consultant MUST be contacted.

## Appendix 1: CE marking

1. Machinery, electrical products, etc., **manufactured from and including 1 January 1995, must be CE marked**. Pay special attention when purchasing from countries outside the EU.
2. REMEMBER that CE marking is most often done by the manufacturer himself. Therefore, CE marking is unfortunately not a real guarantee that all rules are complied with. The marking is merely a promise on the part of the manufacturer that various directives have been complied with, including the Machinery Directive, and that dangerous machines have been tested by an independent party. Once the equipment is on our premises / possession, we have a responsibility to ensure that it complies with the rules. For example, check for correct mains and high voltage sockets.
3. Components and safety components must NOT be CE marked; only finished machines and replaceable equipment must be CE marked. [13]
4. As a starting point, temporary test setups must not be CE marked, but they must comply with the requirements of the Machinery Directive, and a (written!) Risk assessment must be made.
5. Remember that all equipment must also live up to Danish requirements, and the manual MUST be available at least in Danish, as well as in a language that other users understand.
6. If you need to make changes to CE marked equipment, it is best to leave it to the supplier if possible. If you make changes yourself, you must document the change in the technical dossier and make a **CE Marking Conformity Declaration**, you must test the equipment and document that it has been tested with the change, and you then take over responsibility for the CE marking and product with the change. Pay special attention to whether a possible warranty on the equipment lapses upon change.

If an experimental setup / machine / apparatus (in a laboratory) exists in the same form - with the same properties - for a longer period, then it is no longer considered an experimental setup, cf. point 4 above. The Danish Safety Technology Authority (Sikkerhedsstyrelsen, Christoffer Blæsberg, end of October 2019) defines as follows:

- In general, a test set-up / machine / apparatus should not exist for more than approx. 6 months without being CE marked.
- If it is necessary in relation to collecting the required data from the experiment, however, it may well be acceptable that an experimental setup exists for a period of one year +/-.
    - The need for continued data collection must be documented (in writing).
    - The Danish Safety Technology Authority cannot guarantee that the Danish Working Environment Authority, which is the controlling authority, will not reprimand the missing CE marking.
    - When changes are made to the experimental setup, which changes its properties / function, then it is a new experimental setup. Therefore, a new or adjusted written risk assessment is made for each experimental setup, and safety instructions are made / given and the work is planned on the basis of this ("risk management").

[13] Source: https://www.ds.dk/da/standardisering/ce-maerkning/produktgrupper/maskiner

## Appendix 2: Emergency Counselling

# I tilfælde af kritisk hændelse
# In case of critical event

1. Følg Alarminstruksen
   Follow the Alarm procedures

2. Tilkald leder; hvis ikke tilgængelig, tilkald anden leder eller kollega for hjælp
   Call manager; if not available, call other manager or colleague for help

3. I laboratorier og værksteder: Tilkald lokaleansvarlig
   In labs and workshops: Call room responsible

4. Påbegynd kollegial omsorg:
   - Skab ro og tryghed
   - Hjælp chokerede kolleger med praktiske ting, herunder pårørendekontakt
   - Tal om det, der er sket – lyt
   - Sørg for at de ikke er alene efter ulykken
   - Sørg for at skadelidte og vidner til ulykke kan transporteres sikkert hjem

4. Start Acute collegial mental first aid:
   - Create a feeling of calm and security
   - Help shocked colleagues with practical tasks, including contact to close relations
   - Talk about what happened – listen
   - Ensure that they are not alone after the accident
   - Ensure that the injured person and witnesses can be transported home safely

*v. 1.0, nov. 2020*