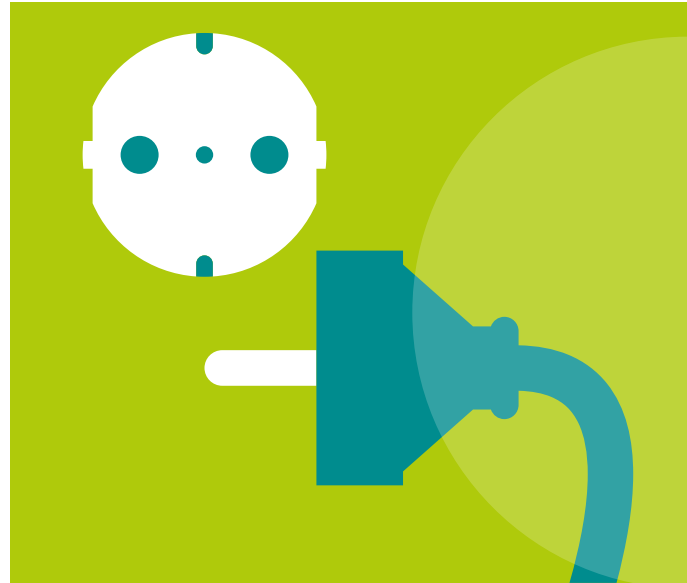


Workplace Instruction –  
General



## **Use of electrical devices**

Guidance for company instruction



# Electric current – possible effects and prevention of accidents

## Facts

Electric current flows through every object that is connected to an electrical power source (e.g. socket, but also flat battery). If this current flows through the human

body, the consequences may be life threatening. Dangers are caused both directly by the current and also by secondary effects (e.g. defensive or startle reactions).

## When is an electrical hazard assumed (limit values)?

- When the voltage at frequencies up to 500Hz exceeds 25V (AC voltage) or 60V (DC voltage)
- When the current caused by the voltage exceeds 3mA effective for AC voltage or 12mA for DC voltage
- When the electrical discharge energy exceeds 350mJ



Warning:  
Electricity  
hazard

## What accidents can be caused by an electric current?

### Arc fault

An arc occurs in the event of a fault and is usually caused by an unintended contact between two electrical conductors (short-circuit). The current flowing between these conductors is called short-circuit current. What are the possible consequences?

- Acoustic effects, e.g. acoustic trauma due to excessive noise
- Thermal effects – burns, fire, pressure waves, melting of metal, etc.
- Eye injuries, e.g. blinding of the eyes or electro-ophthalmia
- Lung injuries due to inhaling hot gases

### Electric current passing through a human body

When an electric current passes through the body, the person becomes part of the electrical circuit. The resulting danger depends on the following factors:

- Intensity of the current
- Voltage
- Duration of the current flow
- Path of the current passing through the body
- Body transfer resistance

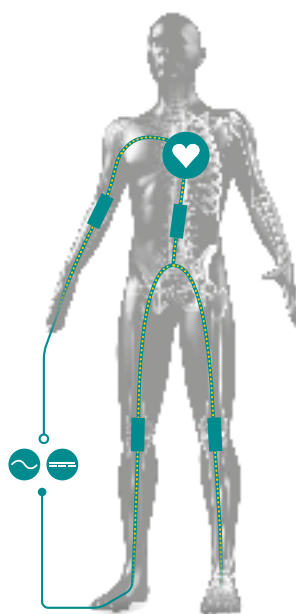


The consequences of the electric current passing through the body depend on the severity of the aforementioned parameters and range from a light electric shock to burns and even death.

### Secondary accidents

In the case of electrical accidents, this cause of accidents is often underestimated. Secondary accidents can occur when the electric current flows through the human body only for a short time. Here, current-related injuries do not necessarily occur. Accidents often result due to defensive or startle reactions, such as:

- Falling (from a height) – A person is carrying out work on a ladder and falls off as a result of the startle reaction due to the exposure to electricity.
- Injuries, e.g. cuts, stabs, bruises, etc., caused by quickly withdrawing the hand from the danger area
- Abrasions on sharp metal edges or similar
- Injuries caused by falling objects; Objects falling (over) near the work area due to a stumbling person.



### The path of the current through the body

- Current path hand to hand approx. 1.000  $\Omega$
- Current path hand to foot approx. 1.000  $\Omega$
- Current path hand to feet approx. 750  $\Omega$

These are standard values for resistance (R) taking simplified assumptions into consideration. At a voltage of 230 V and a resistance of 1.000  $\Omega$ , the electric current is  $I=U/R= 230 \text{ V} / 1000 \Omega = 230 \text{ mA}$ .



The value of current flowing through the body depends on voltage (U) and resistance (R)

**Current:** measurement in ampere (A)

**Voltage:** measurement in volt (V)

**Resistance:** measurement in ohm ( $\Omega$ )

## What has to be done in case of electrical accidents?

**Interruption of the circuit:** Switch off the device, pull out the power plug or unscrew it using the fuse or flip the toggle switch of the fuse.

**Separate the person from the source of electricity:** If that is not possible, separate the injured person from the power source by using a non-conductive object (e.g., a wooden

broomstick). Injured persons must not be touched directly under any circumstances, otherwise the rescuers' lives are in danger.

**Take first aid measures:** If possible, first aid measures should be taken by trained first responders. If no first responder is available, the persons present are obliged to provide first aid immediately.

### Render first aid

Qualified first-aiders should always be present at the workplace. First-aid measures should be given by them. If no first-aider is available, those who are present must give first aid immediately (e.g. heart and lung massages).

### Immediately see the accident insurance consultant (D-physician)

In order to check for any injuries, an examination must be carried out by the accident insurance consultant.



In case of an accident: Disconnect power source, e.g. switch off device! If this is not possible: Separate the injured person from the source of electricity with a non-conductive object!



## How can you protect yourself?

### Follow the instructions of the electrician and check the perfect condition of the equipment

Before use, electrical equipment or devices should be inspected for perfect condition:

- Are there any visual damages?
- Are cables and plug devices damaged?
- Does the strain relief work effectively, is there a bend protection at the cable entry?
- Are light switches or power sockets damaged?
- Have the inspection intervals been complied with?

### Do not manipulate safety devices

Only use the appropriate switches and do not manipulate any safety devices. Protective covers and access points on electrical equipment or switch cabinets must not be opened without authorization.

### Do not carry out repairs yourself

Do not carry out any repairs or “handicrafts” on electrical equipment. Repairs may only be carried out by qualified personnel with the appropriate order.

### Report damages immediately

Damages to electrical equipment or special incidents must be reported to the supervisor or qualified personnel immediately. Defective equipment must not be used and must be deactivated to prevent further use by other staff members.

### Observe environmental conditions

When using portable devices (e.g. electrically operated hand tools), the ambient

conditions at the operation site must be taken into account. It must be ensured at all times that the function of the devices is not impaired by the influence of moisture or chemical substances and that the devices can be used safely in potentially explosive atmospheres. The operating instructions provide information on the intended operating conditions.



Regular visual inspections help to indicate risks and danger



In case of an incident or accident, immediately switch off the power supply, pull out the plug or unscrew the fuse or flip the toggle switch of the fuse.

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**Use of electrical devices**

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