

**PRINCIPLE**

An electric fence consists of a controller and a connected fence where the controller feeds electric impulses into the fence. The fence represents a "psychological barrier" for the animals; it can also be used to train a certain behavior (eg. cow trainer in the stable).

**STANDARDS FOR THE FENCE CONTROLLER**

The fence controller must comply with the European Standard EN 60335-2-76. Fence controllers must not cause radio + tv interference.

This is ensured if they comply with European Directive (EMC) 89/336/EEC and if they are printed with the CE mark.

There are controllers of different output performances. A main rule is: Not as powerful as possible but as powerful as necessary.

For safety reasons high power controllers ( with more than 5 Joule at 500  $\Omega$  ) shall not be used. Medium power controllers (up to 3,5 Joule) provide safe fencing with all ordinary fences even with some vegetation, dry ground and long fences. There are special controllers for cowtrainers and similar applications. Further application hints can be found in the catalogue.

The time between two pulses must not be shorter than 1 second. Especially in case of accumulator or mains controllers they must be set out of duty immediately and be repaired in an authorized service station.

**GENERAL REQUIREMENTS FOR ELECTRIC FENCES**

**Electric fences** shall be installed and operated so that they cause no electrical hazard to persons, animals or their surroundings.

**Electric fence** constructions which are likely to lead to the entanglement of animals or persons shall be avoided.

An **electric fence** shall not be supplied from two different **energizers** or from independent **fence circuits** of the same **energizer**.

For any two different **electric fences**, each supplied from a different **energizer** independently timed, the distance between the wires of the two **electric fences** shall be at least 2 m. If this gap is to be closed, this shall be effected by means of electrically non-conductive material or an isolated metal barrier.

Barbed wire or razor wire shall not be electrified by an energizer

Any part of an **electric fence** which is installed along a public road or pathway shall be identified at frequent intervals by warning plates securely fastened to the fence posts or firmly clamped to the fence wires.

A distance of at least 10 m shall be maintained between the **energizer earth electrode** and any other earthing system such as the power supply system protective earth or the telecommunication system earth.

Except for low output **battery-operated energizers**, the **energizer earth electrode** shall penetrate the ground to a depth of at least 1 m.

**Connecting leads** that are run inside buildings shall be effectively insulated from the earthed structural parts of the building. This may be achieved by using insulated high voltage cable.

**Connecting leads** that are run underground shall be run in a conduit of insulating material or else insulated high voltage cable shall be used. Care shall be taken to avoid damage to the **connecting leads** due to the effects of animal hooves or tractor wheels sinking into the ground.

**Connecting leads** shall not be installed in the same conduit as the mains supply wiring, communication cables or data cables.

**Connecting leads** and **electric fence** wires shall not cross above overhead power or communication lines.

Crossings with overhead power lines shall be avoided wherever possible. If such a crossing cannot be avoided, it shall be made underneath the power line and as nearly as possible at right angles to it.

If **connecting leads** and **electric fence** wires are installed near an overhead power line, the clearances shall be not less than those shown in table.

**Minimum clearances from power lines**

| Power line voltage ( V ) | Clearance ( m ) |
|--------------------------|-----------------|
| ≤ 1000                   | 3               |
| >1000 ≤ 33000            | 4               |
| > 33000                  | 8               |

If **connecting leads** and **electric fence** wires are installed near an overhead power line, their height above the ground shall not exceed 2 m.

This height applies either side of the orthogonal projection of the outermost conductors of the power line on the ground surface, for a distance of

- 2 m for power lines operating at a nominal voltage not exceeding 1000 V;
- 15 m for power lines operating at a nominal voltage exceeding 1000 V.

### **Mounting**

In case of indoor mounting the fence controller shall not be installed at places where there is a risk of fire, eg. barns or stables. Indoor installed connecting leads having a voltage of more than 1000 V require a special insulation which is effective with respect to structural parts connected to earth. This insulation can be achieved by adequate air gaps or with high voltage cable. The controllers shall be so installed that they are out of reach of children and not subject to mechanical damage.

### **Keep off combustible materials**

Combustible materials shall be kept away from the fence wires and the connecting leads.

### **Gate insulation**

Parts of electric fences liable to be handled (e.g.gates) shall be insulated from electric pulse leading parts, e.g. by insulated gate handles.

### **Fence controllers with metal enclosure**

For controllers provided with metal enclosures, fence wires and connecting leads shall be so connected to the controller that they cannot come into contact with the enclosure.

### **Spacings to other metal parts**

Fence wires and connecting leads shall not be in contact with metal parts not belonging to the electric fence, such as the railing of a bridge or a cattle water place.

## **PARTICULAR REQUIREMENTS FOR ELECTRIC ANIMAL FENCES**

**Electric fences** intended for deterring birds, household pet containment or training animals such as cows need only be supplied from low output **energizers** to obtain satisfactory and safe performance.

In **electric fences** intended for deterring birds from roosting on buildings, no **electric fence** wire shall be connected to the **energizer earth electrode**. A warning plate shall be fitted to every point where persons may gain ready access to the conductors.



A non-electrified fence incorporating barbed wire or razor wire may be used to support one or more off-set electrified wires of an **electric animal fence**. The supporting devices for the electrified wires shall be constructed so as to ensure that these wires are positioned at a minimum distance of 150 mm from the vertical plane of the non-electrified wires. The barbed wire and razor wire shall be earthed at regular intervals.

Where an **electric animal fence** crosses a public pathway, a non-electrified gate shall be incorporated in the **electric fence** at that point or a crossing by means of stiles shall be provided. At any such crossing, the adjacent electrified wires shall carry warning plates.

#### **Operation inside stables**

Voltage leading parts of fence installations inside stables must be so installed that animals can move freely. It must be ensured that animals cannot get in contact with those parts that are not intended to get into touch in normal use. All voltage leading parts must be separated automatically from the voltage supply if an animal becomes entangled with the parts.

### **FENCE WIRE, POSTS AND INSULATORS**

#### **Wires**

must have a good conductivity and breaking strength and they must be weather resistant. A good visibility can enhance the efficiency. Barbed wire shall not be used for electric fences. Zinc galvanized wires with a diameter of 1,5 - 2,5 mm are used for permanent fencing. Temporary fences are realized preferably with tinsel wires or plastic poly wires or tapes. The conductivity of poly wires and tapes can be different but cannot be assessed from outside.

High quality poly wires or tapes have a typical resistance of less than 1 Ohm/m, low quality can reach 10 Ohm/m, resulting in making even powerful controllers ineffective already with medium fence lengths. The single conductors of the poly wires or tapes must be in contact in order to avoid parts of the fence losing voltage. **Important:** pay attention to the technical data of the manufacturer and prefer poly wires and tapes with a typical resistance of 1 Ohm/m or less.

#### **Connection cable fence**

Using poly wires and tapes as fence wires the connection of the high voltage cable from the controller to the fence wire made e.g. by a heart clamp can be unsafe. The new horizontal universal-clamp provides safe contact with all kinds of fence wires.

#### **Fence posts**

All materials can be used for fence posts in connection with adequate insulators. Especially suitable are wooden and plastic posts. Metal posts can very easily short the fence voltage to ground in case of brittle insulators and high peak voltages. The distance between the posts can vary between 4 - 10 m, depending on the wire weight. Parts of the electric fence intended to be handled must be insulated, e.g. gate handle. Fence wires and connecting leads shall not be in contact with metal parts not belonging to the electric fence such as railings of a bridge. Fence wires and connecting leads shall not be fixed to poles used for low-voltage, high-voltage, telephone or telegraph lines. When installing electric fences the national safety regulations must be respected.

#### **How to avoid radio interference**

Faulty connections on the fence can cause radio and TV interferences. Knot connections and wires loosely put onto each other are critical as the supplied voltage causes sparks. This may occur especially with poly wire and polytape. The horizontal tape connector is an adequate mean to avoid sparks. Control: walk along the fence with a radio - faulty connections cause crack sounds. In the darkness sparks become visible.

#### **Fence installation**

Fence wires and connecting leads shall be adequately supported on insulators of electrically and mechanically reliable material. Insulators must be placed in such a manner that fence wires and connecting leads maintain a distance of at least 3 cm to structural parts, pipes, wires and comparable parts. Connecting leads to electric fences for domestic and wild animals shall not be laid into or through buildings or places where there is a risk of fire (barns, stables etc.).

## INSTALLATION OF MAINS CONTROLLERS

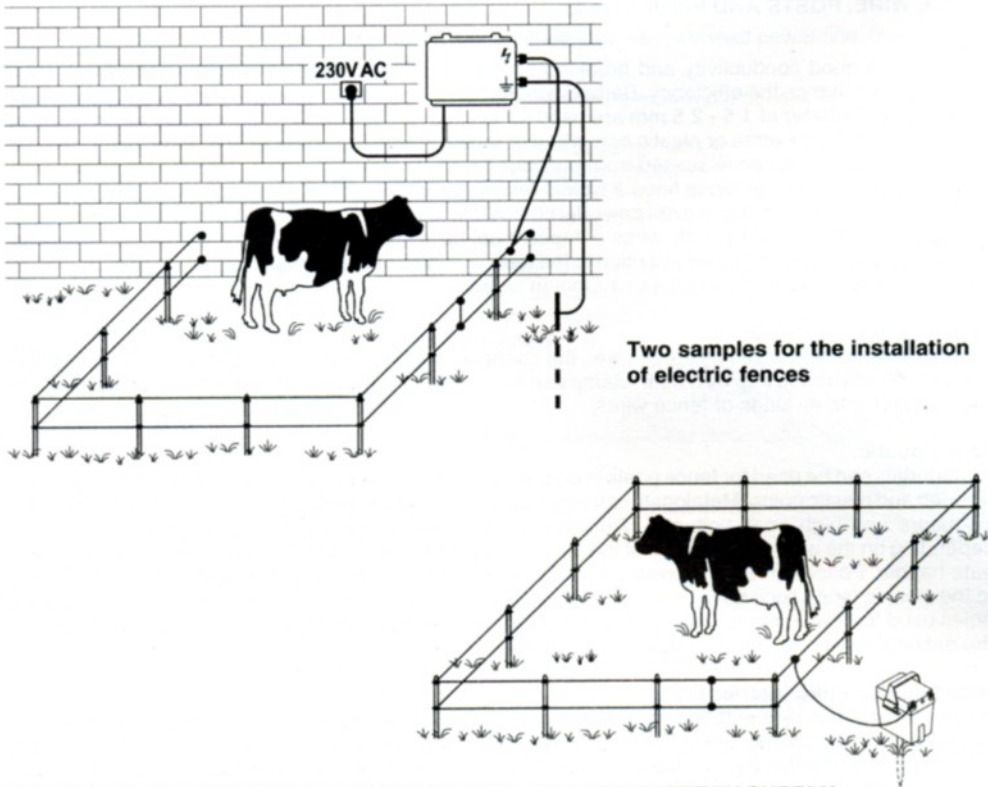
In case of outdoor installation of the controller this shall be done by a competent person in accordance with the relevant wiring rules. Indoor installation can be carried out by a plug in connection. In USA and Canada observe the relevant marking on the controller concerning indoor / outdoor installation.

### System earth for mains and accumulator operated fence controllers

For a faultless operation and to obtain best possible output a good grounding is very important. Therefore the grounding must be made at a rather moisty and overgrown place. An 1 m earth stake (e.g. 12 mm  $\varnothing$ ) and or an additional 5 m strip type earth conductor (two spades deep) shall be used. With long fences and on dry soil a ground return wire with intermediate groundings (every 50 m) is necessary (see corresponding sketch in the instruction manual). The distance between the system earth and the protective and system earth of the supply net work shall be at least 10 m.

### Electric fence installation in stables

For installation in stables ask your local electricity supply utility.



## INSTALLATION OF ELECTRIC FENCE CONTROLLERS FOR BATTERY SUPPLY

Battery operated controllers shall not be connected to the supply network neither directly nor indirectly (charger) .

### System earth for battery operated controllers

The original earth rod is to use according to the manual. It shall be driven into the ground as far as possible at a moisty place and close to the controller. An additional long earth rod (1 m) can improve the efficiency of the whole installation too. The same rules apply as with the mains controllers.



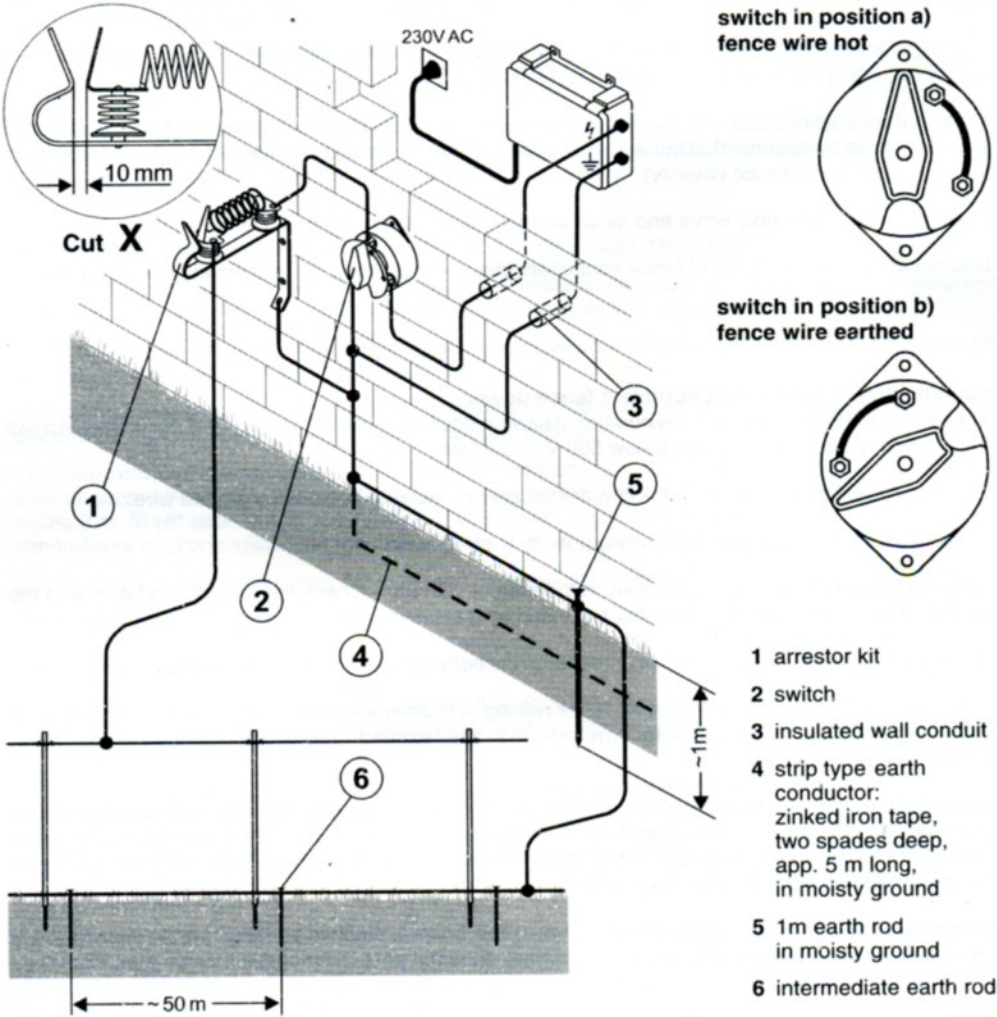
## PRECAUTIONS AGAINST LIGHTNING DAMAGES

### Lightning suppression in buildings to prevent fire

To prevent damages caused by lightnings the connection lead must have a lightning gap in series before entering the building. Furthermore the controllers being installed inside buildings and supplying outside fences shall not be installed at places where there is a risk of fire, e.g. barn, stables etc. The lightning suppression device must be installed by a competent person. According to experience mains controllers are more subject to lightning damage than battery controllers, so it is recommended to use a lightning arrester kit (ref.no. 15498). The installation is to be carried out according to fig.1. The system earth of the electric fence shall be galvanically connected to the earthing system of the lightning arrester. If the connection lead is led away from a building a lightning arrester must be installed. Electric fences not being operated shall be connected to earth, **switch in position b.**

The base (lower) distance between the two horns of the spark gap (air gap) of the lightning arrester should be about 10mm, **see cut X.**

**The earthing must be carried out at a damp place with an earthing rod of at least 1 m depth.**



## MAINTAINING NORMAL OPERATING CONDITIONS

### The following checks must be carried out

Testing the controller according to the manual especially the output voltage (daily)

Some horizon controllers have an incorporated testing device "argutektor resp. arguswitch" (Pat.pend.). This device is capable to recognize fence faults at the controller, e.g. fallen down fence. It is very important to measure the fence voltage at the "end of the fence" for example with the digital-voltmeter or the horizon voltage tester (fig.2).

The voltage at the end of the fence shall not be much lower than the voltage at the terminal measured against ground.

In case of much lower voltage the reason may be bad conductivity of the fence wire (bad poly wire) or bad conductivity of the ground. In the last case an additional ground wire must be installed with intermediate ground rods at distances of app. 100 m.

No voltage at the end of the fence means interruption of the fence leads.

Testing of the battery voltage (daily)

Testing of the fence - mechanical state and vegetation (daily)

Testing of indoor installations, wires connection leads and earth leads with respect to combustible materials getting into contact with the leads (weekly)

Testing of connections at connection leads, fence wires (e.g. knots) and earth leads with respect to good contact. It must be ensured that there are no loose contacts in order to provide an orderly operation and to avoid radio interference (weekly)

Testing of insulators, poly wires and tapes on being damaged or brittle (weekly)

Due to safety risk. Servicing of fence controllers shall be made only in authorized service places.

### Fault finding in case of not sufficient fence power

Inadequate earthing - increase the number of earth rods (1 m) in moisty ground until the voltage across earth terminal and ground drops below 500 V (digimeter)

bad ground conductivity in dry ground with little grass - install an additional ground wire

or use a multiwire fence with alternating polarity (hot - ground - hot etc.)

controller does not operate - no output, with fence or without. - Check the fuse -if available- and the battery. If no success let the controller be tested by a service station

Discharged dry or wet battery - renew or recharge the battery. Use the battery testing devices if available

Too long fence, especially with electric fence netting or multiwire fences -check the voltage at the end of the fence with the digital-voltmeter - the indication shall exceed 1500 V. Reduce fence length or use a more powerful unit

Interruption or bad conductivity of the fence wire - in case of poly wire use only high quality material (1ohm/m or less), make knots carefully and always more than only one. The leads must be in close contact one to the other. Be aware of the limited life time of poly wire at all. To detect interruptions on the line check the voltage beginning from the end of the fence

Unsatisfactory insulators - can be perceived partly by brittle, cracked surface or broken plastic body - this is especially dangerous in case of insulators on metal post = direct short to the ground.