

UOZ-1 - ANIMAL DETERRING DEVICE

DESIGNED FOR HIGH-SPEED RAILWAY LINES



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Introduction

The subject of this Technical Information is an animal deterring device, also called an animal protection device - hereinafter referred to as the UOZ-1. The document presents a short description of the device, basic technical parameters, its construction and the principles of operation, necessary to design the system for a railway line.

Intended use

UOZ-1 devices are intended for installation along railway lines, for the purpose of preventing the migration of game animals such as deer, elk, boar and fox across railway tracks, assuming a speed on the line of $V=160\text{km/h}$, in order to minimize losses in the populations of such animals caused by collisions with rapidly approaching trains, while the same time not imposing limitations on free movement of animals in feeding and breeding areas.

Acoustic signals are used in order to scare away the animals, utilizing their existing mechanism of genetically conditioned fear against natural predators and dangers. These signals are emitted by the UOZ-1 device for a specified time, just before the passage of a train. They can be changed in order to eliminate the effect of weakening the animals' vigilance with respect to a warning stimulus being repeated many times and originating from the same area.

The sound sequences have been developed by scientists at the Forestry Research Institute (IBL) in Warsaw, specializing in behavior issues pertaining to large animals.

The operation of UOZ-1 devices does not violate provisions of the Nature Protection Act, pertaining to the prohibition against startling and scaring wild animals. Only sounds that actually occur in nature are used to construct sound sequences, which are emitted at a natural volume. The purpose of the devices' use is to limit the mortality of animals.

The presence of protected species habitats is not a counter indication to the use of UOZ-1 devices.

Scope of application

The scope of utilizing UOZ-1 devices consists of protecting railway routes at locations through which animals regularly migrate - in such instances, this is a point specific type of protection, covering an area that is approximately 400 m long, or as a continuous type of protection that can have a length of several kilometers or over a dozen kilometers (e.g. along the boundaries of natural reserves or within large forest complexes) operating within an area that is specified by the size of the protected zone.

The use of UOZ-1 devices depends on the speed that trains will travel on a specific rail line and the planned traffic density, i.e. the time between trains. At low speeds - up to 50 km/h - it is not necessary to utilize acoustic devices, because „flight zone“ mechanism still operates properly and the animal has a high probability of effectively fleeing from the tracks. At higher speeds, i.e. between 50 to 200 km/h - UOZ-1 devices should be utilized to protect animals against collisions, as confirmed by the results of tests conducted on the E 20 rail line. At a high trade speeds, above 200 km/h - it is necessary to fence off the railway lines and build a system of passageways for animals. An intrinsic barrier to the utilization of UOZ devices is dense rail traffic with the regular intervals between trains of 5 minutes or less (traffic lines within large municipal areas). For a two track rail line, this means that the barrier effect becomes very significant and animals will have major difficulties safely crossing the tracks. In practice, for primary rail lines this phenomenon does not occur, and even if there are periods of time with a high traffic density, there will also be periods of shorter, longer and very long interruptions (e.g. the night break), when animals may be present in the area of the tracks or cross them without any limitations.

Instances of animal behavior recorded on the E20 rail line demonstrate that as soon as after 1-2 minutes subsequent to UOZ device operation being discontinued and the passage of the train, animals return to continuing interrupted activities (feeding or an attempt to cross the tracks).

Construction and operation of UOZ-1 devices

The complete animal protection system consists of UOZ-1 (trackside repeller) devices installed adjacent to the rail tracks and interoperating with UOZ-MDS control modules, installed in containers of the automatic block signal system or in specialized KUOZ containers. The trackside devices are permanently mounted on concrete foundations, located adjacent to the tracks in the line of the traction posts, on alternating sides, at intervals of approximately 70 m (measured along the axis of the tracks).

Activation of the trackside devices takes place on the basis of information on the location of trains passing through the area being protected. Under circumstances when the UOZ interoperates with the station railway network signaling devices, information on the passage of trains through station tracks and adjacent routes is transmitted through the communications module of a UOZ-MDS-SPS station railway network signaling device via cable to a UOZ-MDS diagnostic-control device, installed in KUOZ containers or automatic block signal system containers.

Power is provided to the devices via cables from the KUOZ container or automatic block signal system container, with a 230V 50Hz separated voltage, with power backup for a period of 2 hours or without power backup (depending on local requirements). The maximum amount of power drawn by a single UOZ-1 device is approximately 40 VA, which pertains to setting the highest level of signals being emitted. The actual average amount of power drawn while in standby mode is approximately 25 VA (including the heater).

The trackside UOZ-1 devices belonging to a single repeller position are connected via a wired communications system between each other and the UOZ-MDS diagnostic-control module that interoperates with them. The greatest length of the transmission line, measured along the cable from the container to the last UOZ-1 device, should not exceed 1200m for each control branch.

The trackside device is adapted both for grounding and for connection with collective rail bonding, utilizing multiple actuation thyristor switches, equalizing the electrical potential of the UOZ-1 with the potential of the tracks. The recommended solution is to connect the trackside devices to the collective traction bonding system, which through a connection via a single cable to the nearest traction post simultaneously solves the problems of track bonding and grounding of the devices.

The devices are equipped with a diagnostic system, allowing for the remote detection and localization of any operating problems. Detailed information on the location and type of the damage is shown on the terminal (touch screen) of the UOZ-MDS diagnostic-control device in the container.

The devices are also equipped with an anti-burglary system, reacting to attempts to disassemble or destroy the housing. Upon detection of an attempt to disassemble or destroy the housing, all devices belonging to a single repeller position emit an alarm signal for 90 seconds, with the information on the break-in being sent to the automatic block signal container and further transmitted to the local control center (LCS-CUiD).

Detailed information pertaining to the design, assembly and maintenance of system components is included in the Technical and Operational Documentation (DTR) for the trackside animal protection devices.

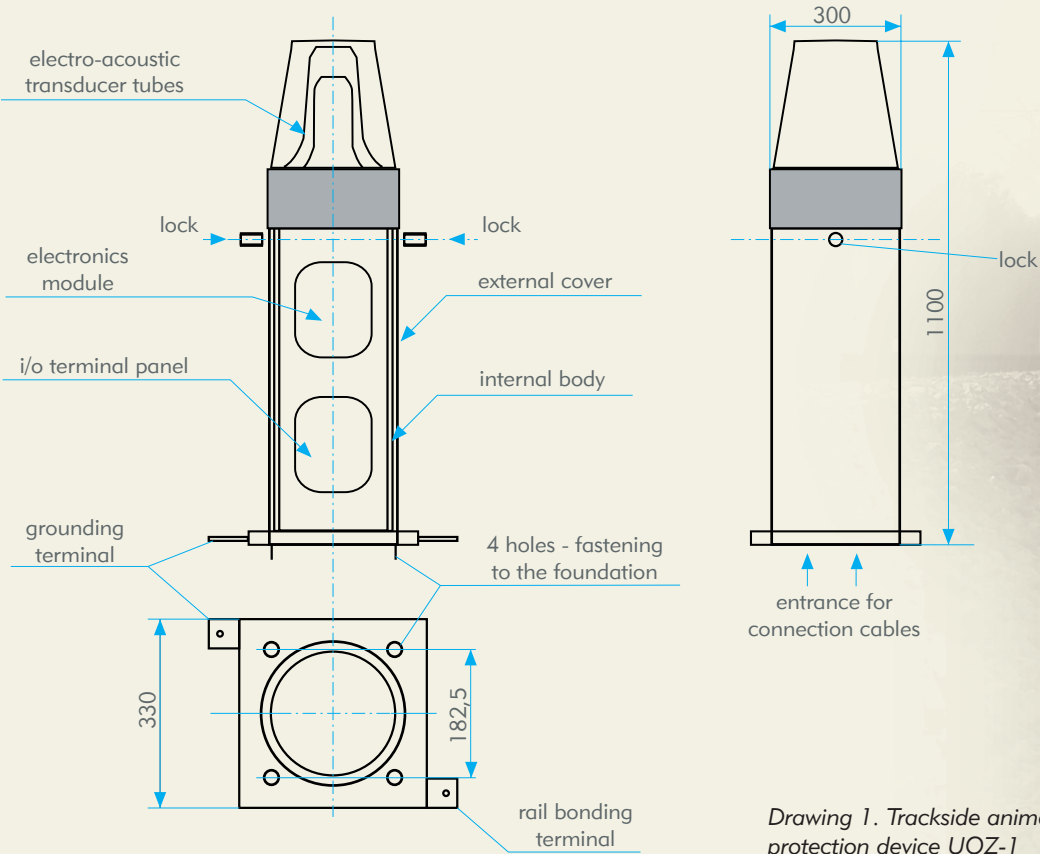
Specifications

The UOZ-1 trackside device is designed for operation outside, within a temperate climate.

Weight of UOZ-1 device (composite housing)	~19 kg (190N)
Weight of UOZ-1 device (metal housing)	~27 kg (270N)
Weight of foundation	~168 kg (1.68kN)
Level of protection	IP 65.
Power supply	230VAC, (separated voltage).
Nominal current of station	$I_n = 0.12\text{A}$
Maximum power drawn	40VA, $\cos\phi > 0.9$.
Protection	C2 type installation switch
Overvoltage protection	overvoltage protector for the power circuit
Overvoltage protection	overvoltage protector for the communications circuit
Maximum Amplifier output power	$P_{\text{max}} = 40\text{W}$.
Test voltage	4000 V RMS
Transmission of digital data	RS485 or CAN/RS-485
Transmission speed	300-1200 baud for RS-485
Environmental temperature	$-40^\circ\text{C} \div +55^\circ\text{C}$
Max. Relative humidity of air	100%
Altitude above sea level	< 2000m
Type of operation	continuous operation

Dimensions

The construction and dimensions of the device are presented in Drawing 1.



Drawing 1. Trackside animal protection device UOZ-1