ZÖLLNER
SIGNAL SYSTEM TECHNOLOGIES

Deployment of the Mobile Radio Warning System

Safety for today and tomorrow. World wide.

The Mobile Radio Warning System (MRWS) – Advantages:

+ Safety
  - » SIL 4 Certification
  - » Developed according to CENELEC
  - » Failsafe
  - » Automatic detection of train movement
  - » Emergency button on all warning devices and the control unit

+ Flexibility
  - » Configuration can be adapted to individual worksite requirements
  - » User friendly and light-weight equipment
  - » Long radio range
  - » Easy application even for complex track layouts

+ Autoprowa® Effect:
  - » Automatic noise level adaptation
  - » Safe audible warning in all circumstances
  - » Reduction of unnecessary noise emissions

+ Higher productivity
  - » System available 24/7
  - » Suitable for difficult weather or morphological conditions

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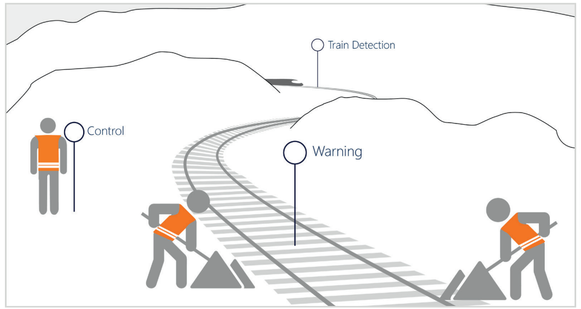
Overview of Equipment

The ZÖLLNER´s Mobile Radio Warning System Autoprowa® consists of different devices which can be modularly configured within the system to meet individual needs.

The passing train is detected at the required distance, the information is transmitted via radio and the warning signal is issued on the worksite. When the train has left the worksite area, the warning is cancelled by the operator and work can continue.

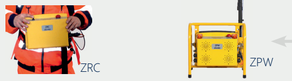


Train Detection

The trains can be detected by an inductive sensor F500 installed for each possible route leading to the worksite. The F500 sensor is controlled by a junction box, which is connected to the transmitter ZFS. Alternatively the warning can be manually activated by a lookout using the ZFS in a harness.

Control

The system is controlled by the operator either by a ZRC or a ZPW. With these devices it is possible to manage the radio communication, cancel the warning, issue additional or emergency warning and shut down the system. The control unit also displays status messages for all the components.



Warning

People working on or near the track are warned acoustically and visually by the ZPW. The audible warning is only given once, while the lights remain flashing until the warning is cancelled. For noisy worksites the ZPW can be combined with warning horns WGH and WGL. In addition personal warning devices can also be used with the system.

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For all kinds of track worksites:

For small, individual use, medium worksites and large projects

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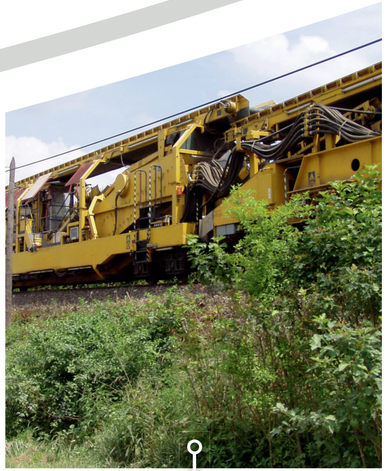
5 - Worksite with automatic train detection and cancellation PAGE 11



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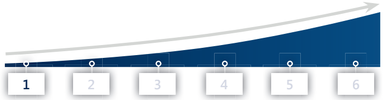
1 - Mobile Worksite with manual activation (LOWS – Lookout Operated Warning System)

For mobile worksites, patrolling and inspection work a LOWS (Lookout Operated Warning System) is the easiest and most flexible configuration for ensuring high safety standards on the worksite.
This configuration is based on permanently monitored and manual operated hand-switches which are worn by Lookouts in a harness. In order to keep the warning system as flexible as possible, the warning unit (ZPW) is also worn in a harness, which ensures free movement inside the covered warning area.
In case of an approaching train a Lookout manually triggers the train and the signal is sent to the warning unit. As soon as the train has passed the worksite, the operator of the ZPW cancels the warning manually via the ZPW which resets the warning system to „Status OK".

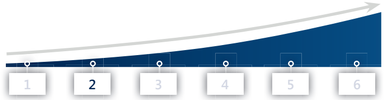


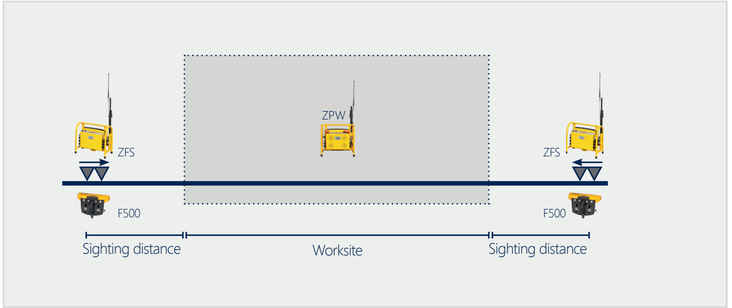
2 - Mobile Worksite with automatic train detection

The train sensors are installed according to the planned strike-in-points. Each sensor is connected to a junction box and a ZFS (radio transmitter). The ZFS transmits the warning information to the ZPW which warns of an approaching train. ZÖLLNER's inductive train sensors trigger the train automatically and need no active operation. The cancellation of the warning is done manually by the operator. The main advantage over the LOWS is the automatic triggering by the inductive sensors, minimising the human error factor and providing the high level of safety (SIL 4) of the system. The sensors trigger approaching trains with a maximum train speed of 300 km/h.

Typical examples of usage:

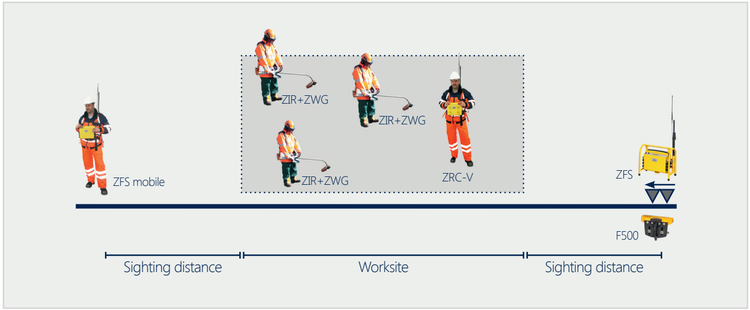
- Inspections
- Other controlling works
- Undergrowth clearance
- Electric works





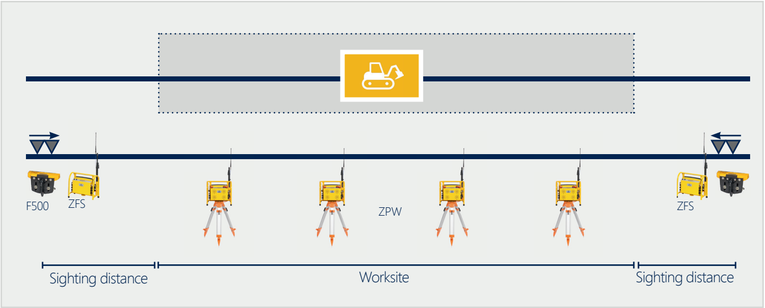
3 - Personal warning for small moving groups

One of the evolutions of the Mobile Radio Warning System (MRWS) is the use in combination with a personal warning receiver ZIR. It can be used in combination with the ZWG e.g. for vegetation cutting. The device is carried in a back-pack and warns of approaching trains via head phones and LEDs, integrated into the Personal Protective Equipment (PPE). The optical warning flashes as long as the warning is active.
Further warning devices can be connected to the ZIR e.g. for personal warning in tunnels.



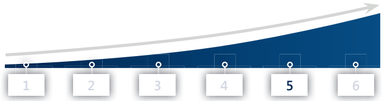
4 - Middle-sized worksites

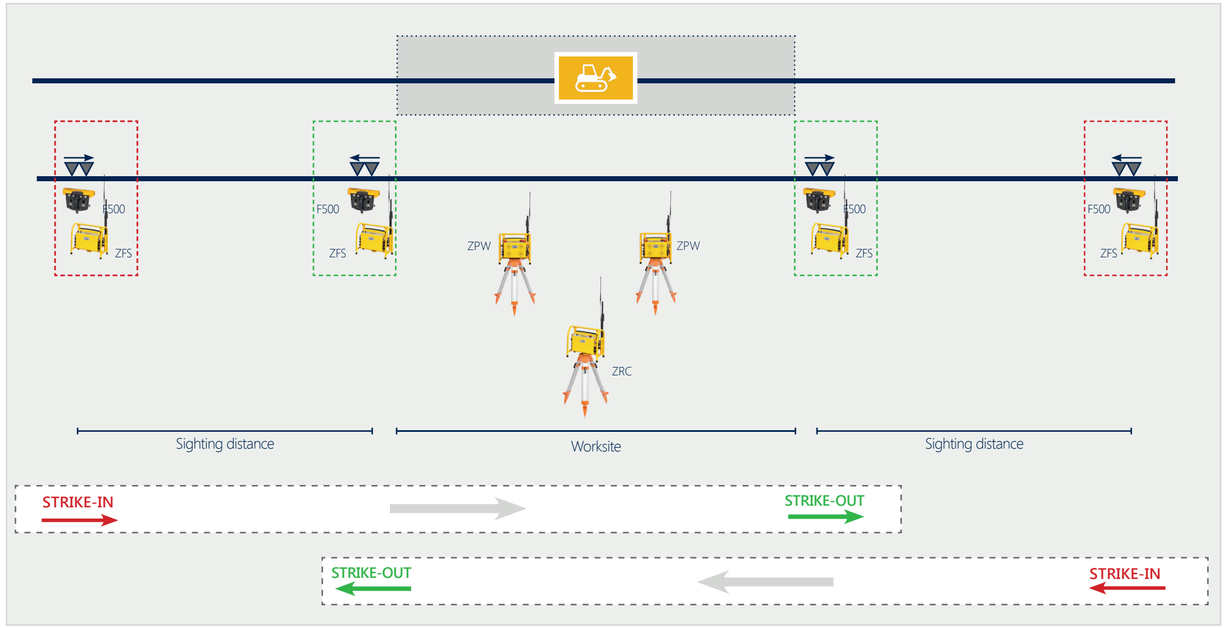
The ZÖLLNER MRWS can be used for middle-sized worksites by connecting various ZPWs in a warning chain. The ZPW is connected to a radio group with their related sensors. One ZPW is selected as a Master-unit. The log-in and log-out of additional ZPWs is done via the Master-ZPW by selection and deselection when starting the system.
The information of an approaching train is sent to the warning devices, which warn the personnel on the worksite immediately. The cancellation of the warning is done via the ZPW-Master.



5 - Worksite with automatic train detection and cancellation (ATWS)

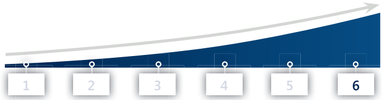
If required ZÖLLNER's MRWS can also be used fully automatically, which means sensors (and junction-boxes and transmitter) for automatic strike-in as well as automatic strike-out points are deployed.
The control unit (ZRC) manages the warning information of all strike-in points and the automatic warning cancellation of the strike-out points. Additionally it gives an overview of the status of all the components within one system.



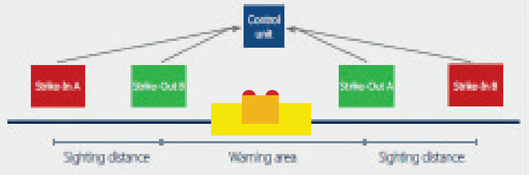


6 - Large worksite with moving track construction machinery (SATWS)

Another possible use of ZÖLLNER's portfolio is the protection of large construction worksites. The worksite can be devided into several sections of e.g. 1000 m. Each section is covered by a fully automatic MWRS with automatic strike-in and strike-out sensors and has its own dedicated radio chanel. All workers and machinery are equipped with warning devices working on a dedicated chanel.
This way the warning devices are always positioned next to the noise source allowing an optimised warning level for the moving work groups next to the machine.



- The worksite is split into warning areas and every warning area is covered by its repective warning system.
- Each warning area contains of strike-in and –outs (including junction box and transmitter) a central unit (ZRC) and the necessary warning units (ZPW).



- The warning system is furthermore divided into a field side (control unit and strike-in/out points) and a working track side part (warning unit, which can be mounted on the machine).

  This configuration ensures the ideal warning in all noisy spots. In this way it is possible to reduce noise pollution while ensuring a safe and perceivable warning for the workers.

- As soon as the machinery moves to the next warning area, it is possible to switch to the new dedicated channel.

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06100053EN9 • 06/18 • subject to alteration.

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