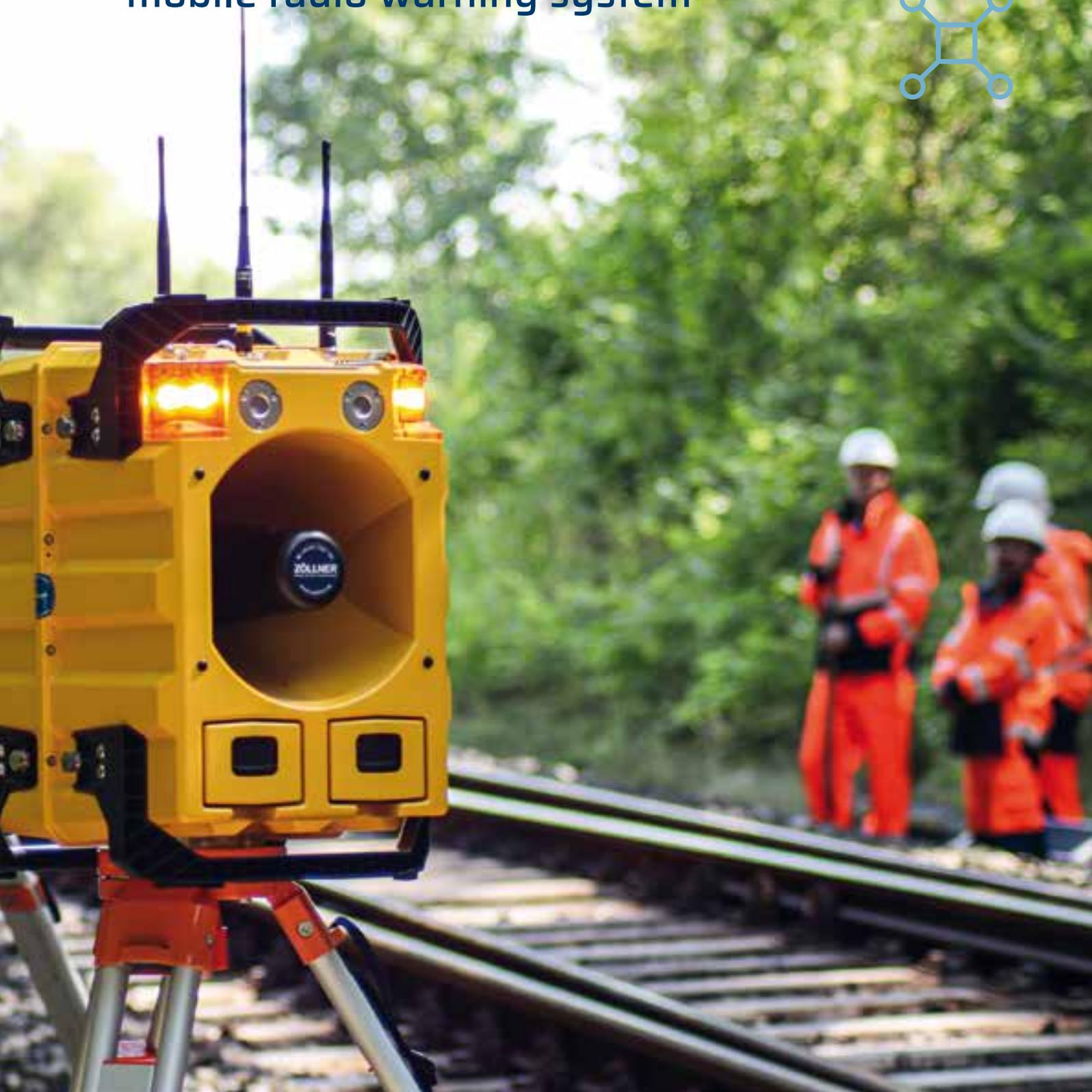


MRWS

Maximum safety for all worksites with the mobile radio warning system



We're here for you

YOUR PARTNER FOR SAFETY



Focused on our customers // Whether you need a standard or bespoke solution, we have the right system. Flexibility is extremely important to us. We are always there to support you as your competent and reliable partner thanks to many years of experience with rail worksites, flexible solutions and our ability to deliver immediately.



Team // A team of over 180 employees in Kiel is behind the name ZÖLLNER. Development, product management, production, training, sales, settlement and after sales: We take care of everything at one place.



24/7 support // Our 24/7 support hotline is available to you around the clock. Experienced technicians advise you if you have problems on your worksite or help you on site, if needed.



Academy // We are an acknowledged educational provider and offer practice-related training courses through our own training centre, the ZÖLLNER Academy. Our training programmes will bring you up to speed and teach you how to safely use components from our company – either in our excellently equipped Academy or on your premises.

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Security “Made in Germany”

ZÖLLNER
 signal system technologies

06100156EN1 // 08/21 // Subject to alterations.

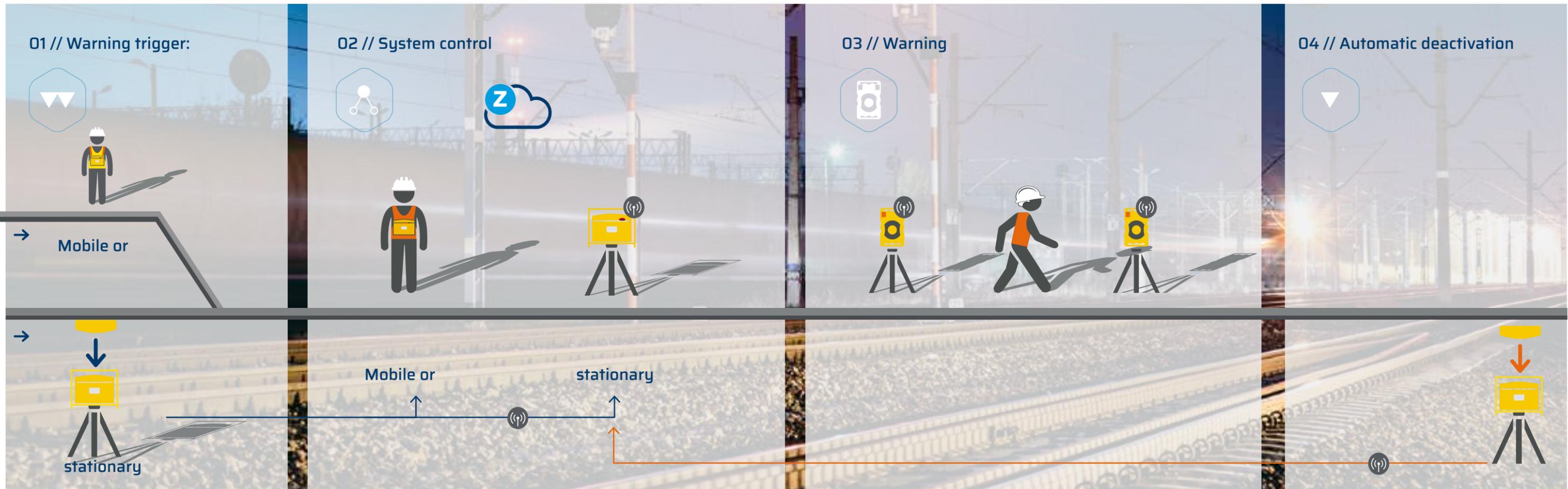
Contents

MRWS – system structure	4
Modular, flexible, safe – one system, many possibilities!	6
Advantages of the MRWS in detail	9
Our products in detail // Warning trigger	10
Our products in detail // System control	13
Our products in detail // Warning devices	14
Permanent Warning Systems	18
Additional members of the MRWS family //	
Personal warning	26
Keep an eye on everything digitally with ZCloud	30
Training programmes relevant to practice at our certified Academy	32
Our competent service team is available to assist you around the clock	33



MRWS - system structure

For many years, the MRWS mobile radio warning system has been used to protect employees in track areas on several thousand worksites. The components in the MRWS family can be combined modularly and flexibly, making it possible to always provide the best solutions for every worksite situation.



The warning can be triggered automatically, and/or it can be triggered manually via a mobile radio transmitter.

The control unit triggers the warning signal issue of the individual warning devices. It can be operated either in stationary or mobile form.

The warning devices issue warnings selectively exactly where work is being performed. When doing so, they automatically adapt the volume of the warning signal to the environmental noise (Autopro-wa® effect).

As soon as the rail vehicle has passed the worksite, the warning is cancelled either automatically or manually at the control unit.



SIL4

Advantages of the MRWS in detail

Flexible, user friendly, well-designed and equipped with state-of-the-art wireless technology, the MRWS has many advantages and offers the optimum solution.

// Many years of comprehensive experience for maximum safety

As a SIL4-certified system, the MRWS is “failsafe” and has proven itself in over 250,000 deployments during ten years. Both the option of triggering the Ro3 emergency warning using a button on the control unit or the on ZPW and the automatic starting routine with an integrated plausibility check guarantee safe worksite situations, even in exceptional circumstances.

// Maximum flexibility combined with simple application for high levels of efficiency and profitability

Thanks to its modular construction, the MRWS is ideal for a large number of worksite situations. User friendliness was our main focus during the development process. Examples of this are using the warning device ZPW-12 as the control unit as well and the option of managing up to four train detectors in one transmitter. Thus, many functionalities can be realised with low material expenditure. The low weight of the individual components and optimised, quick commissioning make transport and on-site handling easier. Charge status indicators on all batteries and the option of changing batteries even during ongoing operations facilitate simple charge management. It is also possible to create a direct supply with 230V mains voltage. In these situations as well, the MRWS can be optimally adapted to specific worksite situations.

// Low-noise protection with Autoprowa® effect

All warning devices in the mobile radio warning system are equipped with Autoprowa® effect. The environmental noise is continually measured using microphones that are integrated into the warning device. Warning signals are then issued exactly as loudly as they need to be so employees are sure to perceive them at any time, yet as softly as possible to strain the environment and residents as little as possible.

// Ready indicator

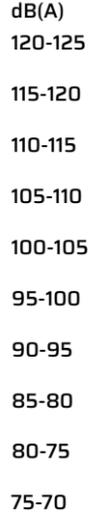
The LEDs integrated into the flashing lights (ZPW126 and WGL) indicate the system’s operational readiness. That means it is possible to recognise whether a warning device is in operation and protection is thus guaranteed at any time.

// Highest availability

The radio components have state-of-the-art radio technology and guarantee the greatest range, even on topologically difficult terrain. If there is a loss of radio communication or a fault, the MRWS automatically reverts to warning mode to guarantee the safety of all employees. An “auto recovery” function in the event of loss of radio and direct error indications on system displays can restore protection as quickly as possible, however. Should you require help, our service hotline is available 24 hours a day, seven days a week.

Fig. right This graph is based on the following parameters:
 Distance of warning device chain to the working track: **6,5 m** // Distance between the warning devices: **30 m** // Alignment of the individual warning devices in the direction of the working track: **15°** // Noise source: road-rail excavator with vibratory plate: **97dB(A)** // Distance from the nearest ZPW126-10 to the noise source: **ca. 10m**

It can be clearly seen that with the almost seamless Autoprowa® effect, the signal level automatically adjusts to the ambient noise level and is only as high as it needs to be to warn workers safely.



Our products in detail // Warning trigger



ZFS-10 technical details

- » Protection class: IP65
- » Dimensions (W x H x D): 340 x 245 x 105 mm
- » Weight: approx. 2.4 kg
- » Surrounding temperature: -25°C to +55°C
- » DC 24 V voltage supply

Trains in motion are detected either using rail contacts embedded in the track or manually by a safety monitor. In both cases, the radio transmitter ZFS transmits the information on the upcoming train in motion to the worksite, where the warning signal issue is triggered. After the railway vehicle has passed the worksite, the warning is cancelled, and work can continue.

ZÖLLNER radio transmitter ZFS

The ZÖLLNER radio transmitter ZFS can be used both in stationary form for automatic train detection via rail contact (F500 or F300) and in mobile form when carried. It is especially well-suited for use as a hand switch for sighting distances near the train station with many possible trains in motion or quickly moving work. Its automatic person monitoring creates maximum safety. When used in stationary form, the ZFS can function either as an on-switch or an off-switch and manage up to four train detectors.



F500 technical details

- » Protection class: IP68
- » Dimensions: (W x H x D): 270 x 165 x 330 mm
- » Weight: approx. 8.7 kg
- » Surrounding temperature: -25° to +70°C

F500-SEN train detector

The inductive F500-SEN train detector is redundant and perfectly suited for even high-speed routes. The F500-SEN works with no wear and tear thanks to contactless detection. Because it is easy to install, the F500-SEN is efficient for even short deployments. Its compact design makes it possible to install the detector even in tight spaces.

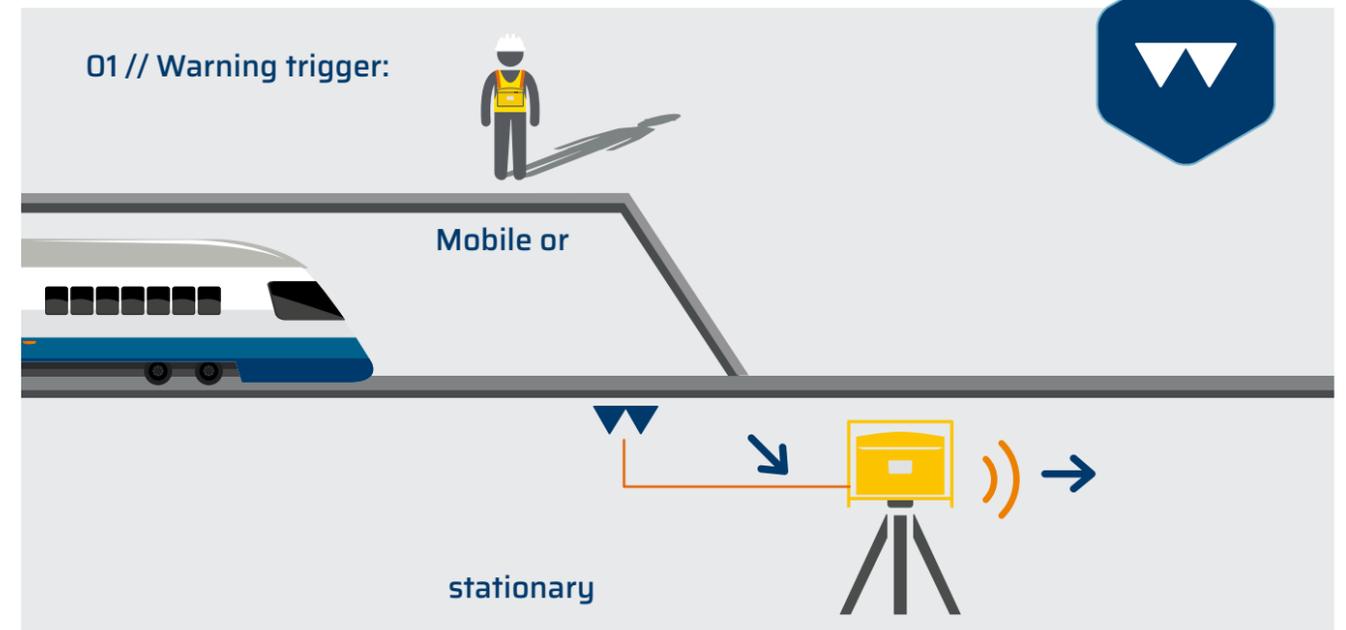


Fig. above The activation point for automatic train detection is composed of the wheel sensor F500-SEN, the connection box F500-AB and the radio transmitter ZFS.

Fig. to the left The train detector F500-SEN can be quickly installed, and the associated F500-AB is ready for operation quickly thanks to its one-touch calibration.



Connection box F500-AB

The connection box F500-AB evaluates the information from the train detector F500-SEN and transfers it to the radio transmitter ZFS. Simple commissioning outside of the danger zone (one-touch calibration) and compact design ensure easy, simple assembly.

F500 AB technical details

- » Protection class: IP65
- » Dimensions (W x H x D): 360 x 250 x 120 mm
- » Weight: approx. 3.0 kg
- » Surrounding temperature: -25°C to +55°C
- » Voltage supply: DC 24 V



Mobile or



stationary

Fig. above There are different options for realising MRWS system control. Whether stationary, mobile, using ZRC or using ZPW, the MRWS's extremely high level of flexibility is impressive in this case as well.

Fig. below The ZRC-10 can function as a control unit in both a mobile and stationary form. During stationary use, both automatic deactivation and manual warning withdrawal are possible.



Our products in detail // System control



ZRC-10 technical details

- » Protection class: IP65
- » Dimensions: (W x H x D)
360 x 250 x 120 mm
- » Weight: approx. 3.0 kg
- » Surrounding temperature: -25°C to +55°C
- » Voltage supply: DC 24 V

The control unit is the heart of the MRWS. Both the ZRC and ZPW can be used as control units. Both components can be operated as both stationary or mobile units.

ZÖLLNER remote control ZRC

The ZÖLLNER remote control ZRC connects and manages the radio components of the system and thus serves as a control and operating unit for the safety supervisor. The ZRC can be operated either as a mobile unit in a harness (e.g. for short-term or quickly moving worksites) or as a stationary unit (e.g. for longer worksites with automatic deactivation). Regardless of the operating mode, the ZRC makes it possible for the safety supervisor to always have an overview of the operating status and the charging states of the batteries of all components installed in the system. An emergency warning with Ro3 can be triggered at any time using a pushbutton and a subsequent warning with the toggle switch. If desired, the ZRC can be integrated into the ZCloud.



ZPW-12 technical details

- » Protection class: IP65
- » Dimensions (W x H x D):
360 x 250 x 120 mm
- » Weight of the ZPW: approx. 4.7 kg
- » Surrounding temperature: -25° to +55°C
- » Voltage supply: DC 24 V
- » Max. sound pressure level of the ZPW acoustic warning devices: 120dB(A)

ZÖLLNER personal warning device ZPW

The ZÖLLNER personal warning device ZPW is a warning device from the MRWS family that can also be used as a control unit. The ZPW has both speakers to issue the acoustic warning signal and flashing lights that indicate upcoming moving trains in the event of a warning. When the ZPW is operated as a control unit, the safety supervisor can read the status and the charging states of all components registered in the system on the display.

Our products in detail // Warning devices

03 // Warning



The warning device family from the company ZÖLLNER offers a selection of different components that can be used flexibly and combined with one another. With the Autoprowa® effect, every warning device measures the environmental noise and adapts the volume of the warning signal to it. That guarantees the warning signal is always as quiet as possible but, at the same time, as loud as necessary. Employees are therefore safely warned without straining the environment and residents unnecessarily.

ZÖLLNER personnel warning device ZPW126-10

The newest member of the MRWS family was developed pursuant to CENELEC and fulfils the requirements of SIL4. Its optics and acoustics are united in a stackable, robust outdoor housing. The device's practical design makes it possible to stack up to 24 ZPW126-10 of them on a euro pallet, which reduces transport expenditure and costs.

The wireless, plug-in batteries make it easy to manage batteries in addition to saving time on the worksite. Of course, the batteries can be changed during ongoing operation.

The continuous Autoprowa® effect makes it possible to adjust the warning signal issue very precisely in a range from a minimum of 97 dB(A) to a maximum of 126 dB(A) and thus adjust it to the environmental noise as well as possible.

State-of-the-art technology facilitates longer revision cycles.



ZPW126-10 technical details

- » Protection class: IP65
- » Dimensions (W x H x D): 278 x 435 x 364 mm (without antennae)
- » Weight: approx. 9.35 kg (without batteries), approx. 10.7 kg (with batteries)
- » Surrounding temperature: -25°C to +55°C
- » Supply voltage: DC 14.4 V



LEDs on every corner of the housing guarantee 360°, all-around perceptibility, and the ready indicators provide information on the operational readiness of the system at all times. The ZPW126-10 can function either as a master or remote. Actuation of the ZPW126-10 in master operation makes it possible to incorporate an unlimited number of warning device groups, each with up to five remote warning devices (see the graphic on the following page).

That guarantees the warning devices in a defined warning area behave in a uniform manner. The ZPW126-10 can be used as a receiver to actuate a machine warning system via the ERRI interface. The ZPW126-10 can be hung directly on a machine or an excavator using the magnetic holder. That way, the warning device moves along the worksite together with the loud noise on the machine or excavator.



Fig. Intrinsically safe acoustics and optics in a single housing provide the highest level of safety and guarantee easy handling.



Fig. The ZPW126-10 can also be used as a mobile warning device on track construction machines or can actuate the machine's own warning system using the integrated ERRI interface.



Fig. The compact design of the ZPW126-10 makes it possible to stack up to 24 warning devices on a euro pallet. This enables efficient, economical transport.

Configuration for a small worksite with the ZPW126-10

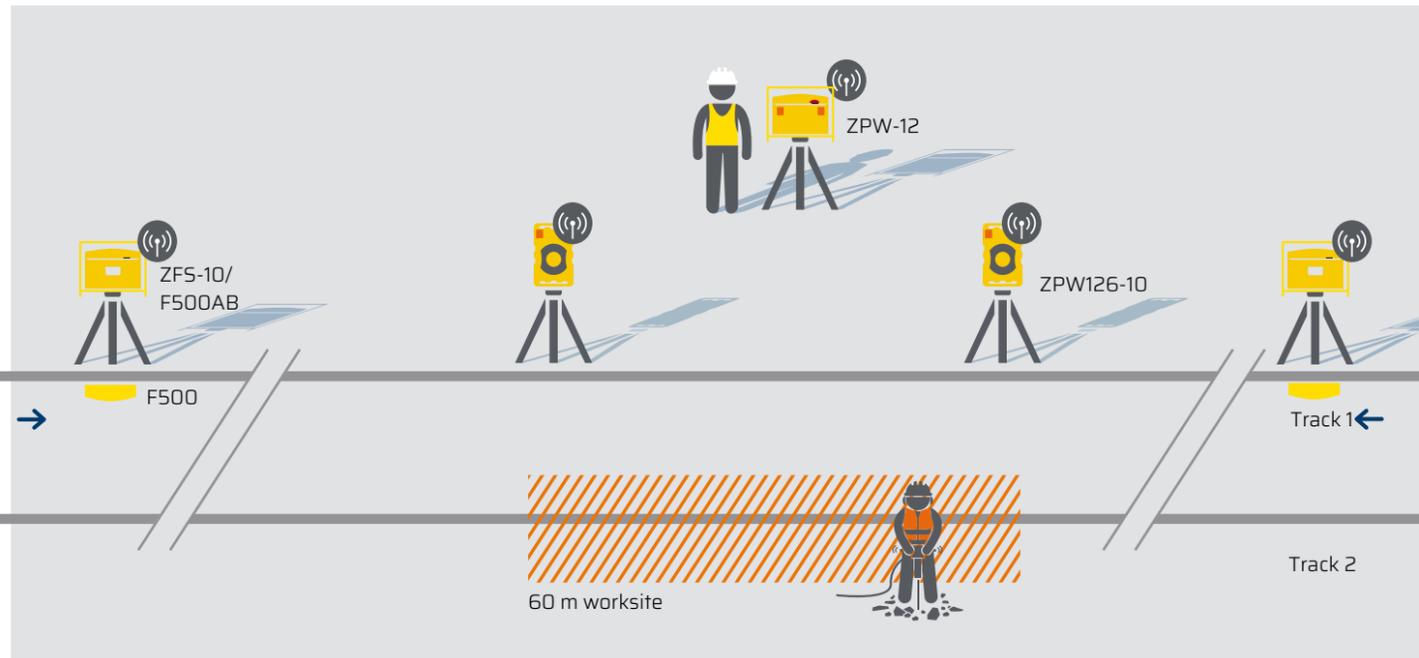


Fig. above For smaller or loud worksites, the ZPW126-10 is used at certain points as a warning device. The warning can be triggered automatically - as depicted - manually or a combination of both.

ZPW126-10 configuration on the machine

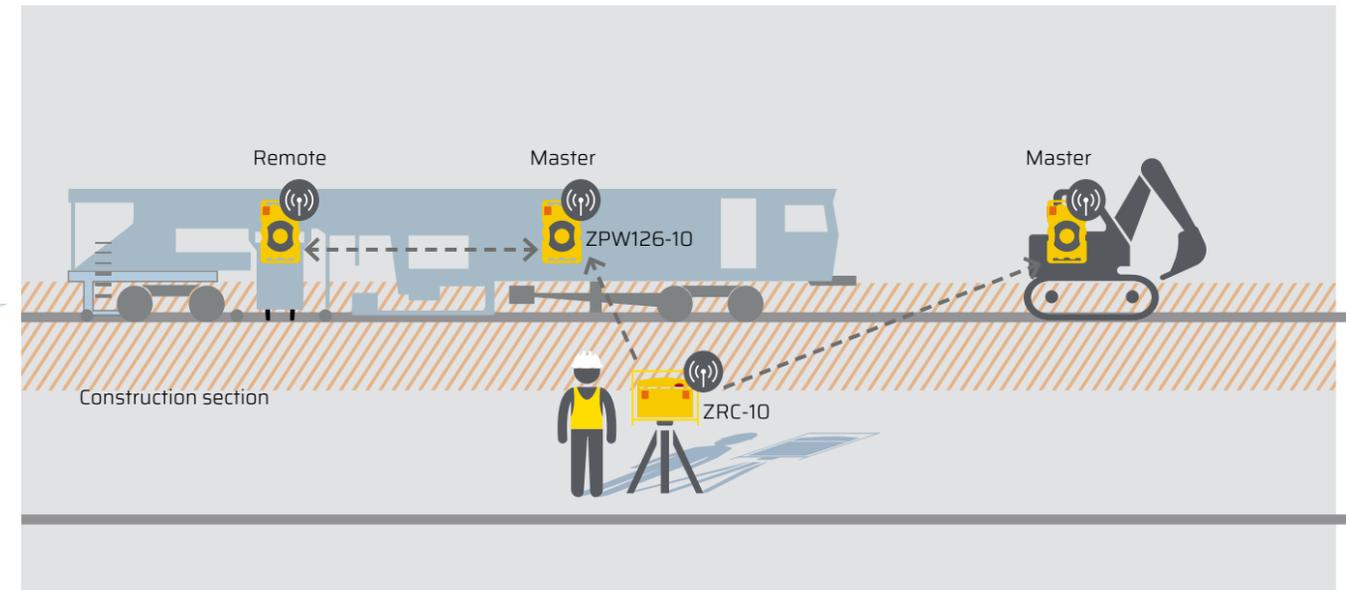


Fig. above The ZPW126-10 can be attached directly to a machine or an excavator using the magnetic holder and function as part of a warning device group and/or, as an alternative, actuate the machine's own warning system via its ERRI interface. The ZPW126-10 master and remote on the machine form a warning device group. On the excavator, the ZPW126-10 constitutes its own warning device group.

Configuration for worksites larger than 400 m with automatic deactivation

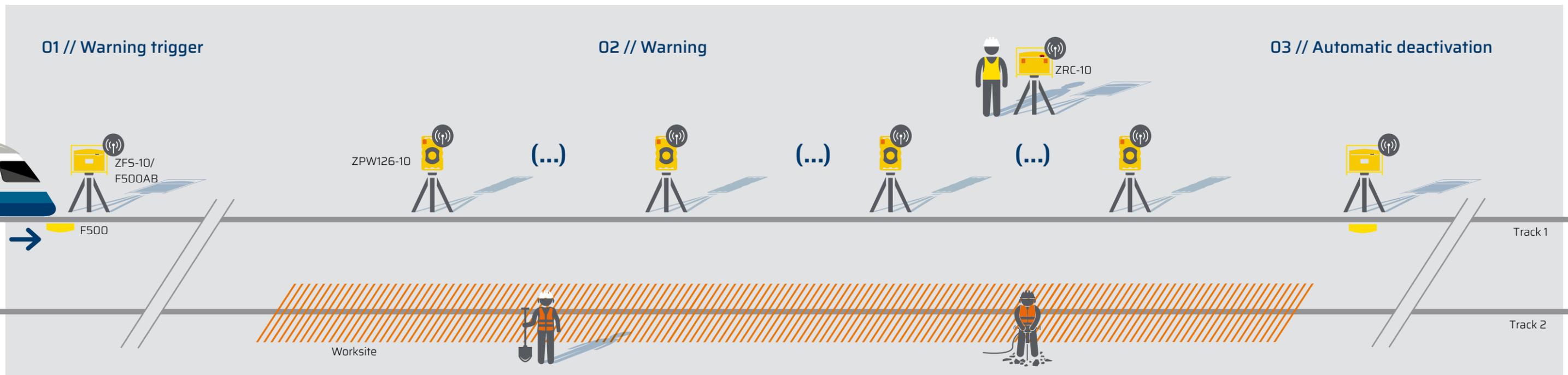


Fig. below Longer worksites can also be optimally protected with the ZPW126-10.

Permanent Warning Systems



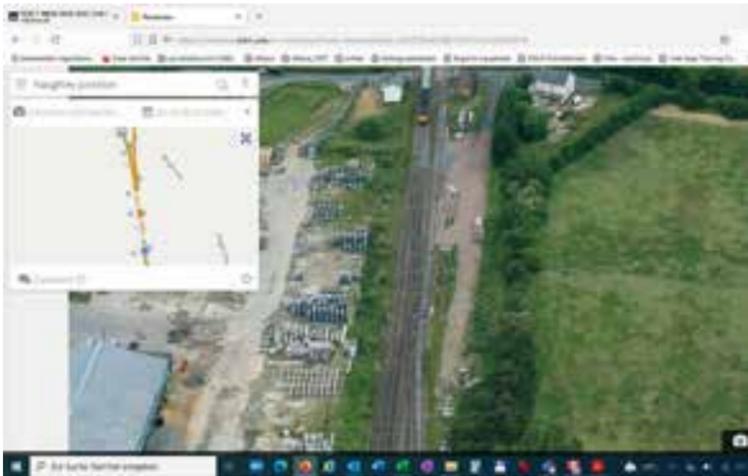
Another innovative method to protect worksites that require regular maintenance access are permanently installed warning systems. Examples are junctions, Tunnels or Bridges.

Semi-permanent Installation // Electronic train detectors are installed and are left on track for several weeks or months. Other system components, e.g. radio transmitter and warning device will be brought to site and operated on battery power.

Permanent installation // Train detectors are permanently installed. Plug-in points are installed in a position of safety either near the train detectors or within the warning area. the photo on the left shows a system where the

whole train detection part of the system including the radio transmitter are installed in a cabinet and are permanently powered by mains.

To use the system simply the warning devices need to be logged into the system. the setting up time is very low.



Configuration for a permanently installed warning system

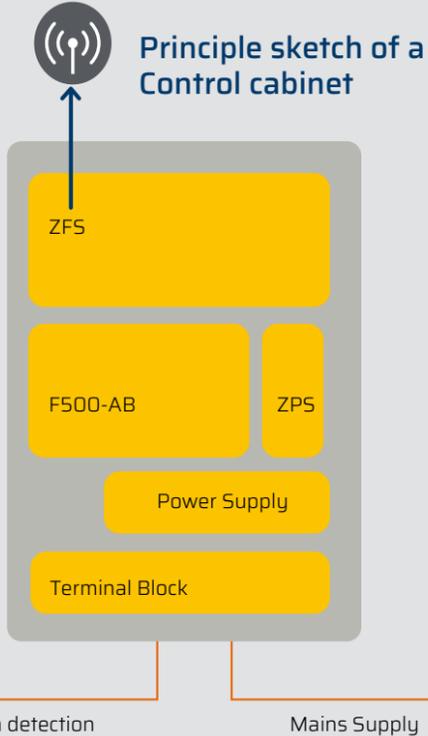
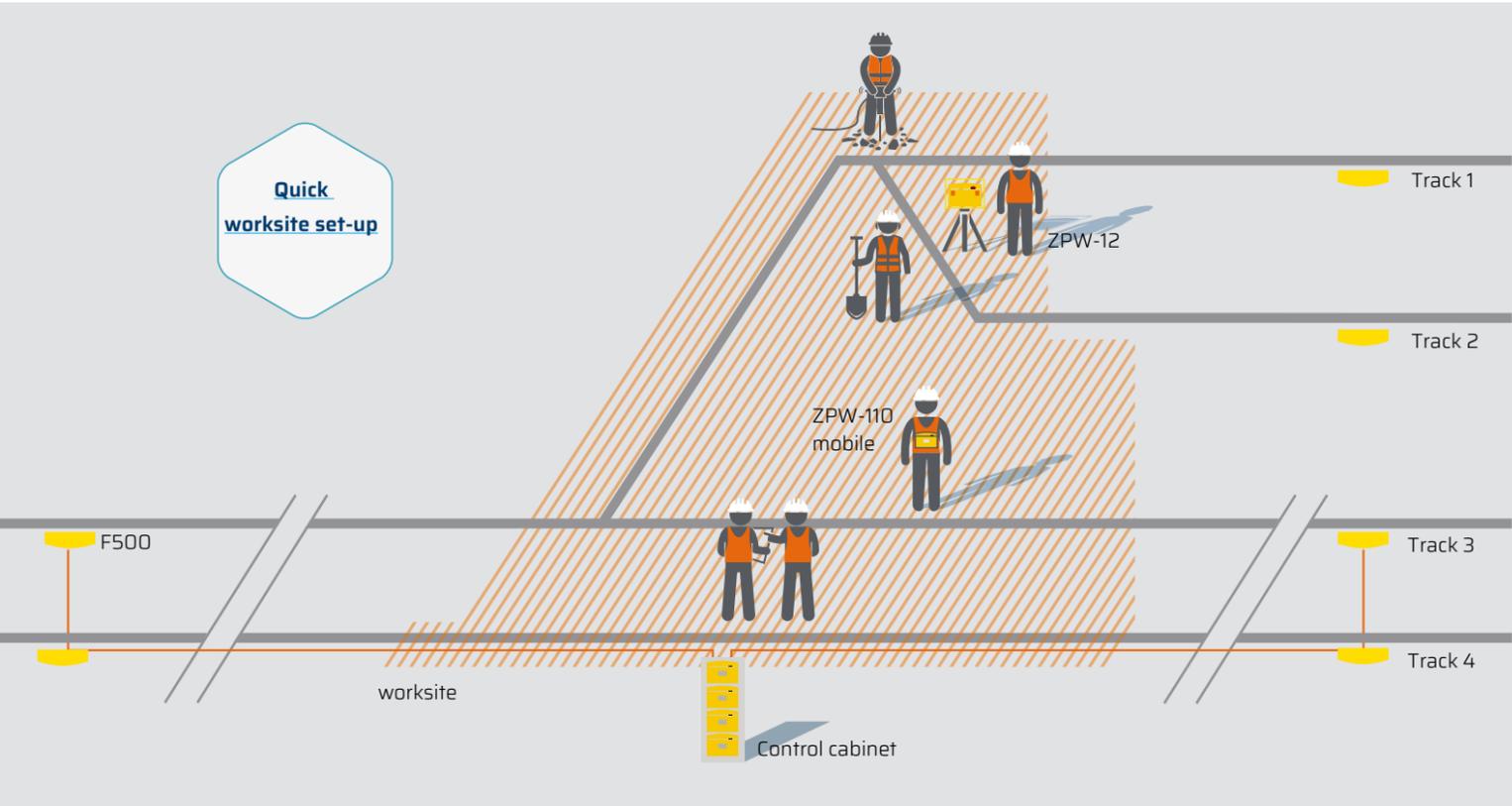


Fig. above Example installation for a permanent warning system // Haughley project

Fig. above Control Cabinet // Project Haughley



ZPW-12 technical details

- » Protection class: IP65
- » Dimensions (W x H x D): 360 x 250 x 120 mm
- » Weight: approx. 4.7 kg
- » Surrounding temperature: -25° to +55°C
- » Voltage supply: DC 24 V
- » Max. sound pressure level of the ZPW acoustic warning devices: 120dB(A)

ZPW: Warning device and control unit in one component

The ZPW can serve as both a warning device and a control unit (see page 13). Integrating both of these functions into one component makes the ZPW especially attractive for very small worksites as well. That way, for example, selected activities can be protected with minimum material expenditure.

The ZPW is also equipped with the Autoprow® effect and adapts the warning signal proportionately to the environmental noise (97-120 dB(A)). The device developed pursuant to CENELEC fulfils the requirements of SIL4 and works "failsafe". Monitored flashing lights indicate upcoming moving trains and are extremely noticeable thanks to LED technology.



Figures above The ZPW can be both carried mobile and used as a stationary unit on a stand.

Configuration for moving worksites

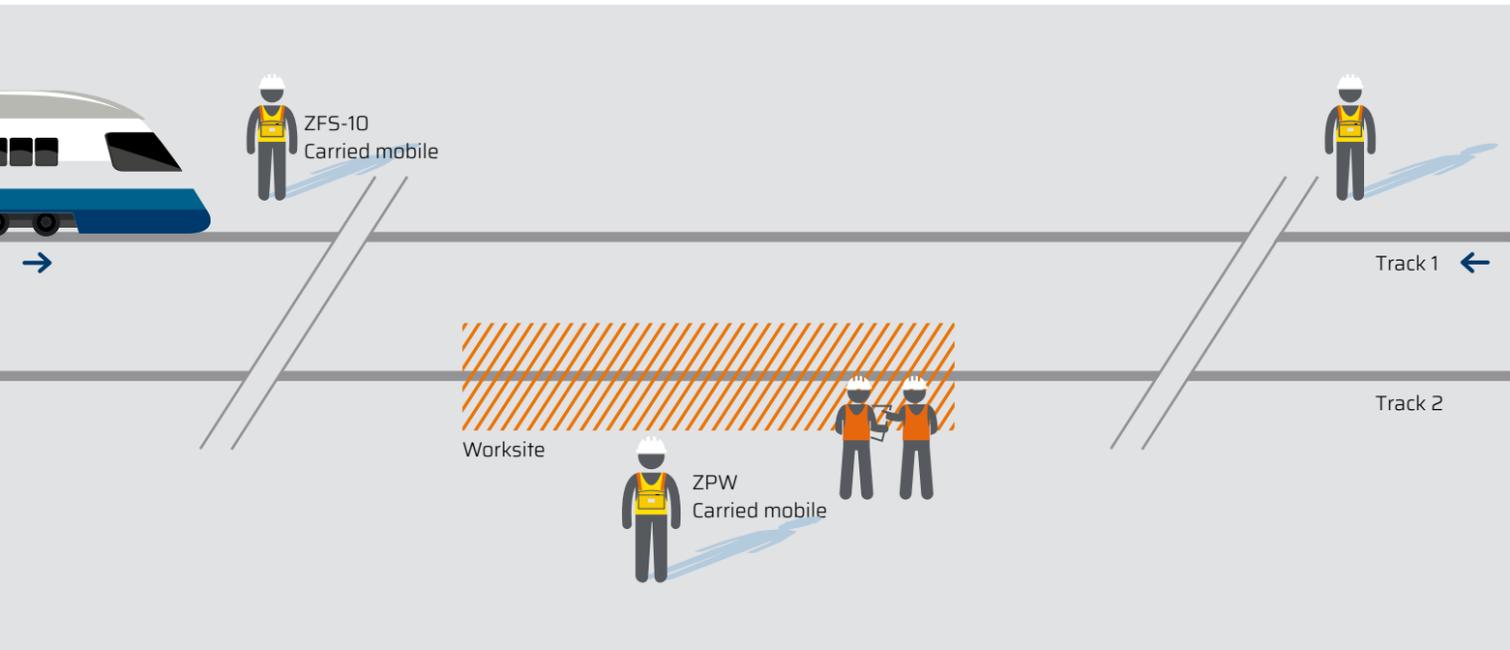


Fig. above The double function of the ZPW as a warning device and a control unit reduces material expenditure to a minimum. In Great Britain, for example, the ZPW is carried mobile on moving worksites.

Configuration for small worksites

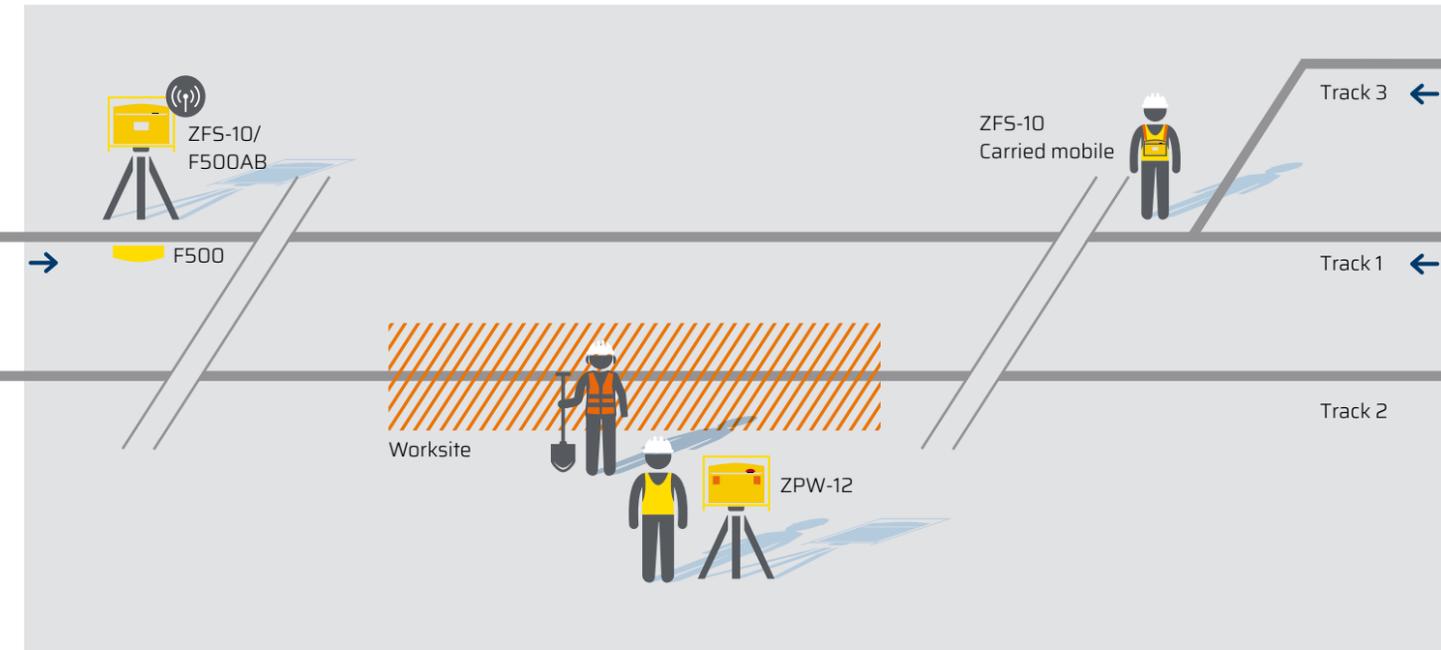


Fig. above Depending on the situation at the activation point, the warning can be triggered either manually using the ZFS or automatically using a train detector.



The WHG/WGL warning device

The WGH is integrated into the MRWS via its connection to the ZPW. Also equipped with Autoprowa® effect, the acoustic warning device WGH adapts its acoustic warning signals proportionately to the environmental noise. The horn can issue signals of up to 126 dB(A) and is thus especially well-suited for protecting loud activities. Combined with the WGL LED light, the WGH has a visual reminder that is visible all around. The operational readiness display integrated into the WGL indicates the active status "OK" of the warning system.

With a hand switch, the WGH can also be used as a single horn without the WGL.

WGH/WGL technical details

- » Protection class: IP65
- » Dimensions (W x H x D):
WGH: 540 x 495 x 240 mm
WGL: 165 x 540 x 165 mm
- » Weight of the WGH: 10.9 kg
WGL: 1.6 kg
- » Surrounding temperature: -25° to +55°C
- » Voltage supply: DC 24 V
- » Max. sound pressure level of the acoustic warning devices: 126dB(A)

Configuration for small worksites

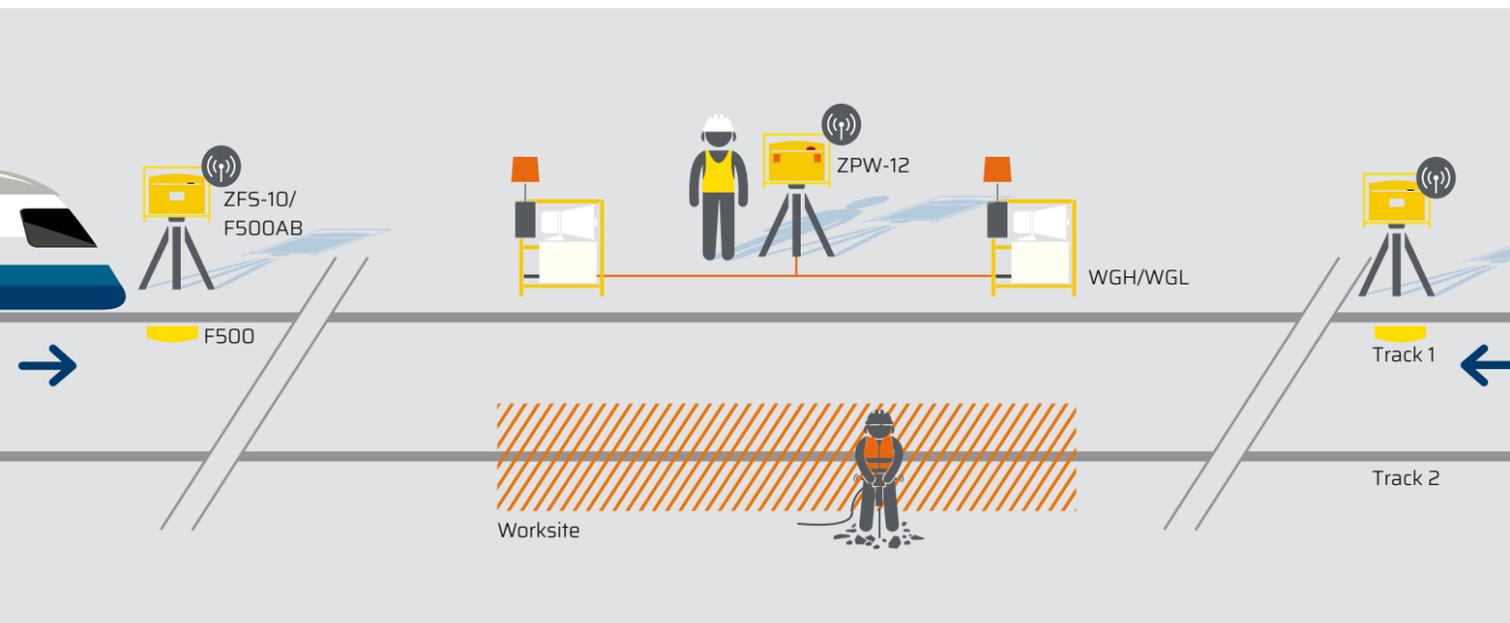


Fig. above For especially loud work, two WGH/WGL can be connected to each ZPW to warn all employees with a warning signal of up to 126 dB(A) that is sure to be heard.



Fig. above The WGH/WGL warning device is integrated into the MRWS via connection to the ZPW.

Fig. below In addition to its use in the MRWS, the WGH can be used as a single horn with manual operation.



**“Our goal:
Maximum safety on
every worksite!”**



Additional members of the MRWS family // Personal warning



ZVW technical details

- » Protection class: IP65
- » Dimensions (W x H x D): 100 x 228 x 45 mm (without antenna)
- » Weight: approx. 440 g (without battery), approx. 550 g (with battery)
- » Surrounding temperature: -25° to +50°C
- » Voltage supply: DC 7.2 V

For certain activities, such as quickly working through vegetation, a collective warning is not enough or is very difficult to implement. In order to optimally protect these activities as well, ZÖLLNER offers the systems ZVW and CLARIS, which are based on the well-known components of the MRWS.

ZÖLLNER Vegetation Warning System ZVW

Vegetation work features special challenges: All employees wear hearing protection and must maintain minimum distances from one another. To guarantee that the warning signal is sure to reach every employee, the system ZVW is used.

The ZVW is a person-related warning system that integrates the warning devices into existing personal protective equipment. The warning is generated in the hearing protection (ZWG – Zöllner warning device), and LEDs on the visor of the helmet remind the wearer of upcoming moving trains or indicate the status "OK" or exceptional operation through various blinking patterns. Vegetation employees wear the radio receiver in special harnesses or integrated into the appropriate pockets in the carrying harnesses of their work tools.

Sample configuration of ZVW

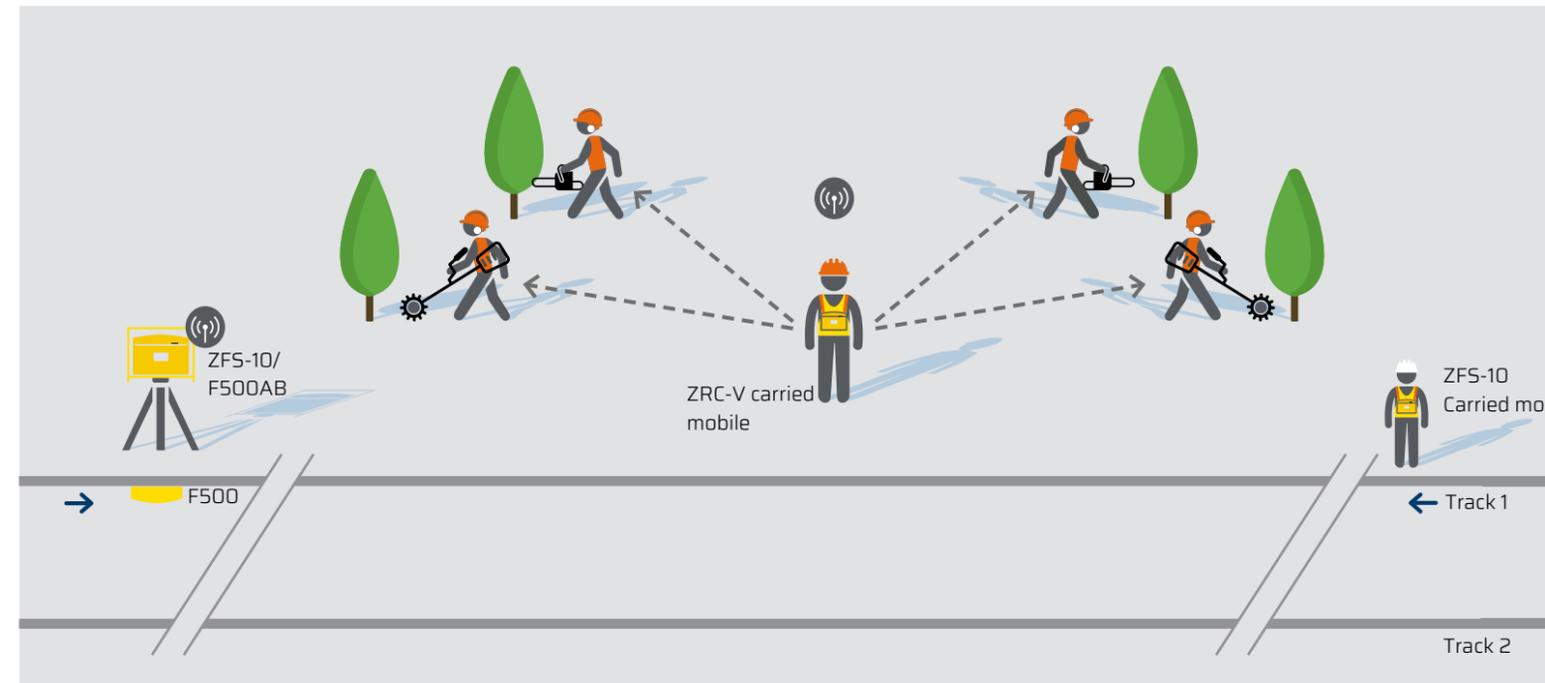


Fig. above Vegetation work protected with ZVW

The safety supervisor is informed of all system statuses, such as warning, status "OK", break from work, etc. via the control unit ZRC-V.

Using the ZVW makes it possible to work through vegetation considerably more efficiently and economically.



Fig. left Vegetation workers protected by ZVW



Fig. above The system CLARIS connects protection staff and vegetation workers to another via radiotelephony.



CLARIS technical details

- » Protection class: IP65
- » Dimensions (W x H x D): 360 x 250 x 120 mm
- » Weight: approx. 4 kg
- » Surrounding temperature: -25° to +60°C
- » Voltage supply: DC 24 V
- » Max. sound pressure level of the ZRC-40: 118dB(A)

Personal warning including voice communication - CLARIS

The system CLARIS was developed to guarantee optimally perceptible warnings in loud environments and enable voice communication for employees. The control unit ZRC-40 communicates with the well-known ZFS MRWS radio transmitters.

Every employee wears a Duplex hearing protection device into which both the warning and the voice communication system are integrated. However, the hearing protection device also enables voice communication with people in the immediate vicinity without them having to be incorporated in the system. The Duplex hearing protection device is connected to a guardian terminal that communicates with all participants registered in the system. That way, all employees can exchange voice information at any time and are still safely warned if a train is going to be moving soon. The warning signal is issued with higher priority than voice communication in this case.

Sample configuration of CLARIS

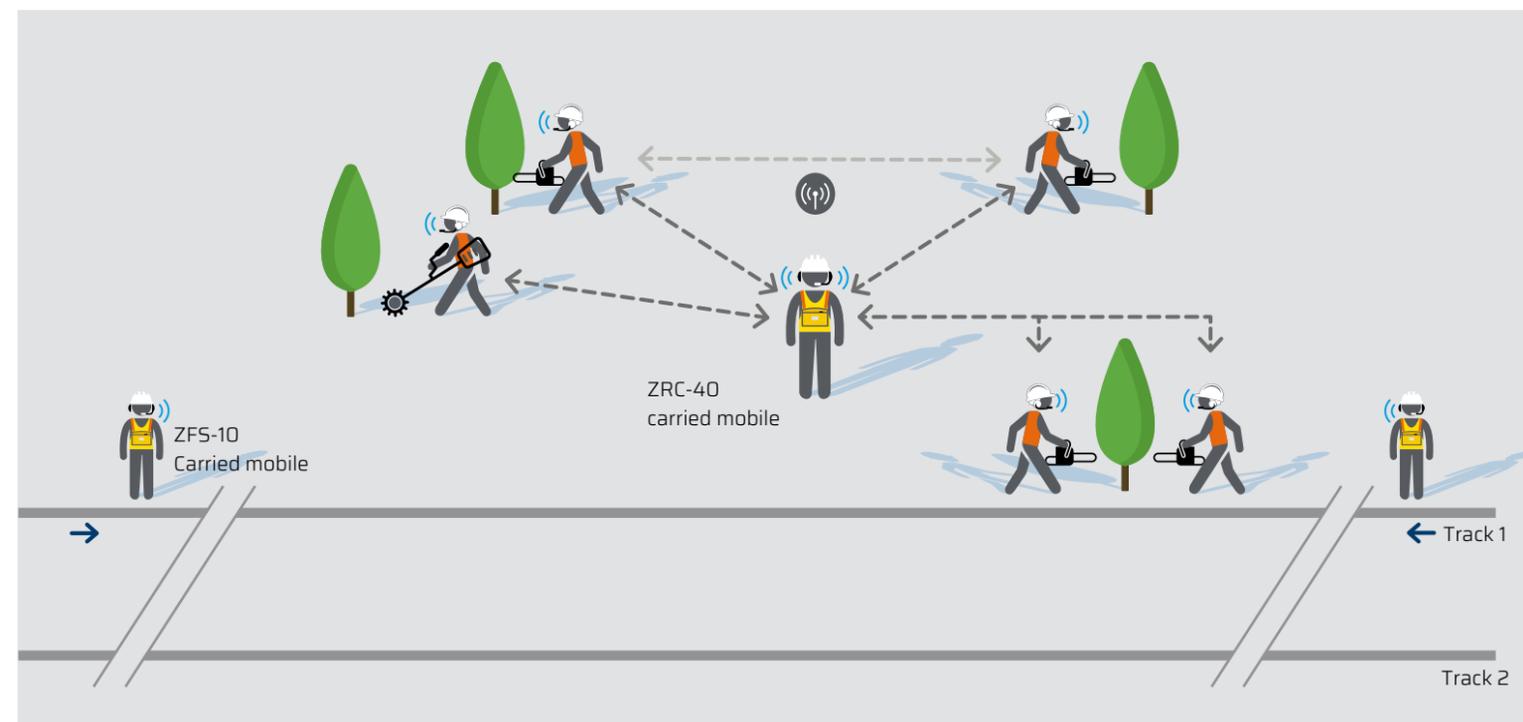


Fig. above The system CLARIS guarantees employees are safely warned when performing very loud work while making voice communication amongst them possible.

Keep an eye on everything digitally with ZCloud

ZCloud // Tracker

Information (location, device status, revision data, etc.) of all active MRWS systems can be queried at all times using the web-based ZCloud. ZCloud uses the device tracker to recognise which components work together in a system and automatically groups them together as an "active system". All components in the respective stock of devices that are not currently in use or are not assigned to a system are listed separately. All available data are stored in the log book and can be called up or exported there.

Monitoring device positions

Even when the terminal device is deactivated, the location information is transmitted to ZCloud for up to an additional 24 hours.

Information on the current distance between ZFS and the control unit via location information from both components

The lookout can obtain information about their distance from the worksite in the display.

Simple access regulation with optimum user and device management

If a customer decides to use ZCloud, they receive secure access to the cloud. Within this access, each customer manages user authorisations themselves and can add new employees at any time.

ZCloud can be operated on various terminals (smartphones, tablets or PCs).



Fig. above ZÖLLNER devices communicate with ZCloud. That way, the data can be called up on mobile terminals using the web app.



Fig. ZCloud enables real-time monitoring of all device data.



Real-time monitoring

Keep an eye on worksites, device data, system statuses and location information in real time and regardless of your location.



Notifications & alarms

Timely notifications and alarms concerning critical device and system states, such as low charge levels.



Tracking

Keep an overview of system deployment, components used and all other devices all the time and everywhere.



Distance monitoring

Permanent determination of the distance between the activation transmitter and the worksite. The current distance is shown on the activation transmitter's display.



Data analyses

It is possible to evaluate utilisation times, operating times and deployment locations by analysing and exporting stored device data.



Training programmes relevant to practice at our certified Academy

Our ZÖLLNER Academy is a certified educational provider of DB Netz AG and offers a large selection of product training programmes. Our experienced trainers support you by providing manufacturer's expertise either in our training rooms or, upon request, on your premises. The programmes focus on practical exercises so every participant learns how to safely handle our products. Of course, system components are always available for this purpose. They can be realistically set up and operated on our practice track, for instance. Our employees are happy to provide you with competent consulting on the topic of training programmes. From safety personnel to ATWS plan reviewers: When you

participate in our training programme, you will grow from a novice to an expert. A complete listing of our offerings is available on our website. Contact us if you don't find what you are looking for there. We are happy to design custom training programmes for you.

It's your choice

- » Benefit from the advantages of our training centre in Kiel with training rooms featuring modern equipment and a practice track, or
- » use our service on your premises



Your contact information // Tel.: +49 431 7027-183
Mobile: +49 171 834 01 20
training@zoellner.de // zoellner.de



Fig. above Whether you need setup support at a worksite or advice in the event of a problem, our technicians are there for you!

Our competent service team is available to assist you around the clock

Safety on the tracks and smooth processes on worksites are our top priorities at ZÖLLNER. That is why our service team consisting of experienced technicians can be reached by phone at any time. If needed, our colleagues will also give you support right on your business premises.

24/7 support // Our 24/7 service hotline is available to you around the clock:
Service hotline +49 (0)177-35 71 466





The partner at your side.
We're here for you! Together we guarantee secure track worksites.



Developed pursuant to CENELEC
Certified, independent institutions check the development process, which complies with standards



Customer-specific developments
Project-related developments and system modifications



Future-oriented, sustainable design
Products and components with long lifecycles and preventive obsolescence management



Fig. A glance at our Autoprowa® workshop // Highly-qualified employees and certified processes are important building blocks for our products' reliability.

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