USER MANUAL

ZKL 3000

THE NEXT GENERATION T-COD
(self diagnostic)

Figure: ZKL 3000

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Author : Dual Inventive
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ZKL 3000

The ZKL 3000 is the next generation T-COD (Track Circuit Operating Device 3000). Actually it is a "self diagnostic" T-COD. The ZKL 3000 is a device that creates a short in the rail track of an isolated track section and then measures and monitors this particular short in track. Specific data of the ZKL 3000 can be requested via MTinfo 3000. This is a webbased system that gives the management information for an organization about the use of the ZKL 3000.

Before taking the ZKL 3000 into use:

Read this User Manual in full and ensure that you understand everything. Confirm that the ZKL 3000 has not exceeded the critical maintenance date as indicated on the "next inspection date" sticker on the measuring unit.

Before and during the installation:

The ZKL 3000 may only be installed by a competent person carrying the relevant certification. The recommendation being this person will be minimum COSS level. Always visually check the ZKL 3000 ensuring it is fit for purpose. Follow the procedures set out in the rule book.

Safety directions

- Before use, check whether the ZKL 3000 electronics are in good working order (see Section 4.2). If they are not in good working order or do not work at all: **DO NOT USE THE ZKL 3000!!**
- Before use, visually check the ZKL 3000 for damages and flaws. If any damages or flaws are detected": **DO NOT USE THE ZKL 3000!!**
- Never oil or lubricate the contact points.
- Use the side handles when transporting the device.
- For maintenance and repairs, please contact our Service Department. Never try to make repairs to the ZKL 3000 yourself. (Contact points may be user-installed, see Section 4.3)
- Always use two fully charged batteries at the start of the work.
- Only use the original charger that belongs with this model.
- The charger may only be connected indoors to an 240 V mains power or, when using the car charger supplied, inside a car.
- The ZKL 3000 may only be charged outside the track at a distance of at least 10 metres from the track.
- De-charge the batteries using the yellow button and charge the batteries at least twice before first use in order to achieve their full power capacity.
- When a **red** LED lights up continuously, it means that the ZKL 3000 is powered. **STATUS: BATT LOW!!** → Replace the ZKL 3000 battery as soon as possible.
- When a **green** LED is continuously **blinking,** this means that the ZKL 3000 has been installed under the correct conditions. **STATUS: SAFE**
- Install the ZKL 3000 only when the track is free of rolling stock.
- Please refer to the document *ZKL 3000 Product Specifications* for the specific product specifications of the ZKL 3000.

Do not treat the ZKL 3000 as regular domestic waste. Please contact the municipal authorities or Dual Inventive for more detailed information on recycling the ZKL 3000.

Do not treat the NiMH batteries of the ZKL 3000 as domestic waste. Please contact the municipal authorities or Dual Inventive for more detailed information on recycling such batteries.

1. Product description

The ZKL 3000 is a folding track circuit operating device with a black box. The black box is used to store all relevant data such as the status of the short, the GPS location coordinates and if the batteries are running low. As such, the ZKL 3000 is the first of its kind.
The ZKL 3000 also has several additional functions, including a text message (SMS) functionality and LED light intensity amplification.

The ZKL 3000 consists of:

- a folding frame (A) with control unit (B), GPS unit (B) and GSM unit (B),
- connection points (C) as well as measuring points (C),
- a unique padlock with matching keys (D),
- at least one rechargeable battery (E),
- a battery charger (F),
- service agreement (G),
- transportation case (H),
- User Manual (I)
- Test-Tool; a functionality tester (J)

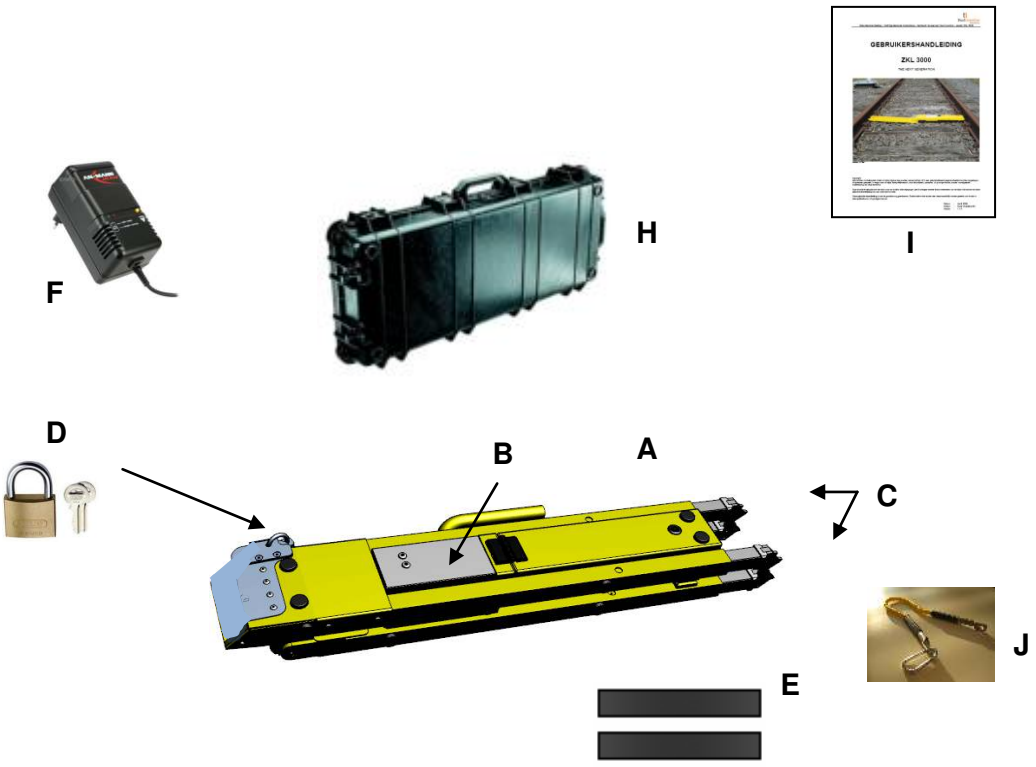


Figure 1.1; Survey of all parts of the ZKL 3000

Because of its low mounting height, the ZKL 3000 will remain more than 75 mm below the head of the rail and, consequently, is almost flat on the ballast. This minimizes the danger of tripping.
With its yellow colour, the ZKL 3000 is highly visible, which minimizes the danger of tripping for track workers.

In its untensioned, folded state, the ZKL 3000 is 880 mm long, 210 mm wide and 130 mm high. With its limited length and side handles it is easy to carry around.

When the ZKL 3000 is installed in accordance with the instructions in this User Manual, it cannot be removed without intentional and excessive brute force. The ZKL 3000 is locked with a unique padlock.

After installation, the ZKL 3000 has a guaranteed profile-free set-up (including the red measuring area).

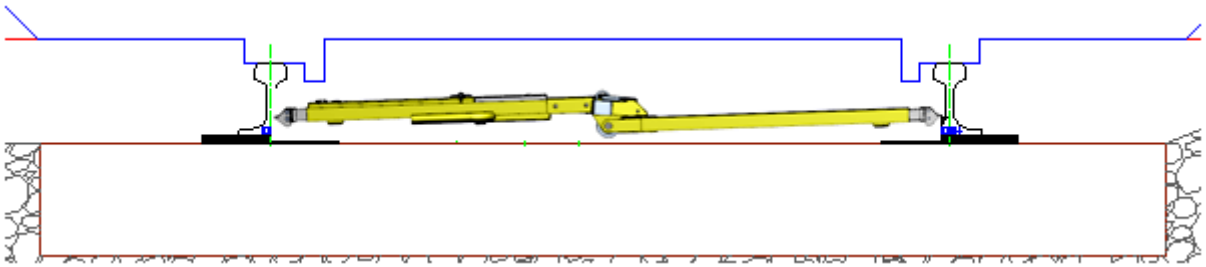


Figure 1.2; Overview of installed ZKL 3000

The ZKL 3000 has a front (1), back (2), upper end (3), lower end (4), up side (5), down side (6), length (L), width (B) and height (H).

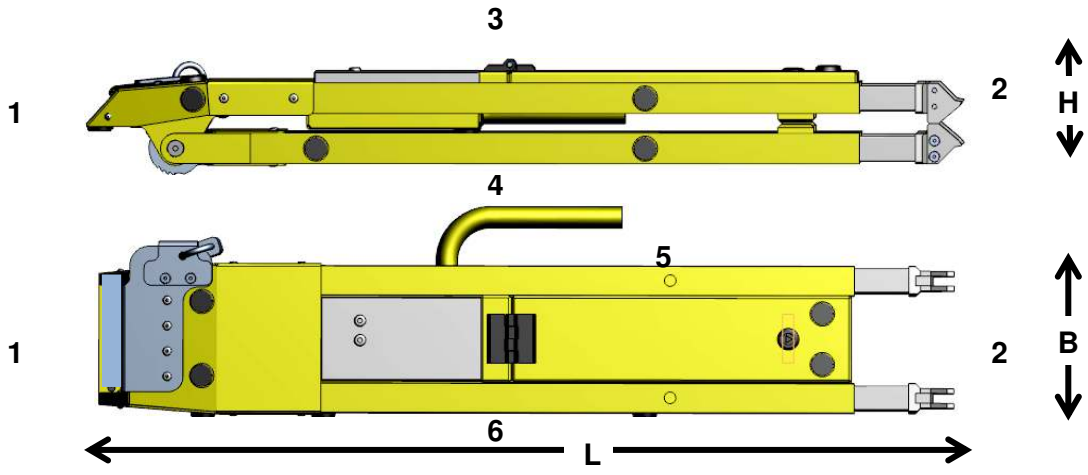


Figure 1.3; Overview of ZKL 3000

2. General

2.1 Application area of the ZKL3000

The ZKL 3000 can be used in nearly all types of rails with a track width of 1435 mm such as;

- NP46,
- UIC54,
- UIC60,
- 95 lb RBS,
- 85 lb RBS,
- 109 lb
- 110A
- 113A
- 113lb

Only when there is no 4th Rail.

The ZKL 3000 can be used wherever there are track circuits such as;

- Jeumont-Schneider peak voltage track circuit (PVTC),
- Classic track circuit: 12V AC voltage 75 Hz,
- Siemens sound frequency track circuits FTGS46 & FTGS917,
- GRS Overlay Track Circuit (OTC),
- Alstom Jade system
- bi-rail type CV50B3P,
- High power pulses type CVTHBG,
- TI21 type track circuits (EBI track 200),
- TI21-M type track Circuits (EBI track 300),
- Aster SF 15 type track circuit.

The ZKL 3000 can be used under all weather conditions.

If there are cables in the bottom of the centre of the rail, on the inside, the installer must take these cables into account and not pinch them.

THE ZKL 3000 MAY NOT BE USED!!

- **On rail crossings (they may be used directly next to them),**
- **On any type of level crossing,**
- **Where check rails exist,**
- **On sections of the track with axle counters,**
- **In tracks with a 4th Rail,**
- **In switches at the height of the tongue movement.**

2.2 Functional description of the ZKL 3000

When you install the ZKL 3000 in accordance to the instructions in this User Manual, you will promote effective use of the track within a green zone.

Before installing the ZKL 3000 you must verify the safe functioning of the ZKL 3000.

- Switch on the ZKL 3000;
- Manually press the contacts together, see Section 4.2.
- The green LED will start blinking,
- After the contacts are released again the green LED will stop blinking.

Should any other situation occur, this means that safe operation of the ZKL 3000 is not guaranteed. If a red LED lights up on the ZKL 3000, the supply voltage is too low and a different power source needs to be installed.

Also, all ZKL 3000 activities are logged in the black box whenever the batteries are below the required charge level or when the short is lifted (e.g. in case of vandalism).

2.3 Explanation of the added value in terms of functionality

Because of its weight of 6 kilograms, its dimensions, the efficient way in which it is transported and the easy positioning of the ZKL 3000 - which can be done while standing straight – the ZKL 3000 is a one of a kind. Every ZKL 3000 has its individual black box in which relevant safety data are registered. Every ZKL 3000 also features a GPS and an SMS functionality that support the administration of your ZKL 3000.

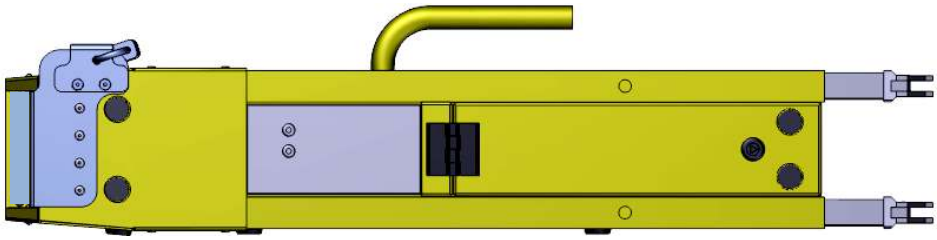


Figure 2.1; the ZKL 3000 is compact and easy to carry by its handle

3. Users

The ZKL 3000 is useful to several users. These users can be divided into users in the planning stage, the transportation stage, the application stage, the maintenance/storage stage and administration respectively. MTinfo 3000, the management information system, will be used for quality and planning purposes.
However, the responsibility for the use of the ZKL 3000 during the installation stage and the application stage **always** lies with a **certified** person installing ZKL 3000.

4. Use / installation of the ZKL 3000

The use of the ZKL 3000 is simple and efficient. This Section is limited to the actual physical use during the transportation stage, the installation stage in AC- and DC-traction (third Rail) powered tracks, the application stage and the maintenance/storage stage respectively. The warnings below apply to all stages.

Before taking the ZKL 3000 into use:
Read this User Manual in full and ensure that you understand everything. Confirm that the ZKL 3000 has not exceeded the critical maintenance date as indicated on the "next inspection date" sticker on the measuring unit.

Before and during the installation:
The ZKL 3000 may only be installed by a competent person carrying the relevant certification. The recommendation being this person will be minimum COSS level. Always visually check the ZKL 3000 ensuring it is fit for purpose. Follow the procedures set out in the rule book.

4.1 Transport stage

Always transport the ZKL 3000 in its transportation case. Below are the product specifications of the transportation case.

Phenomenon	Description	Level / limit
Colour	-	Black
Dimensions	Internal L x W x H	910 x 350 x 133 mm
	External L x W x H	968 x 452 x 155 mm
Weight	empty	6.5 kg
Humidity Class	Case	IP 67
Material	-	Polycarbonate

The cases are stackable and, consequently, easy to store in a warehouse and/or a storage container. The dimensions are also ideal to transport the ZKL 3000 in a passenger car. The cases have also been fitted with transportation wheels.

If the ZKL 3000 is transported without its case, e.g. to carry it to the installation location, it should be carried horizontally next to the body. Use the handle or carry strap to carry it. Be aware of your direct environment during transportation. (slips trips and falls)

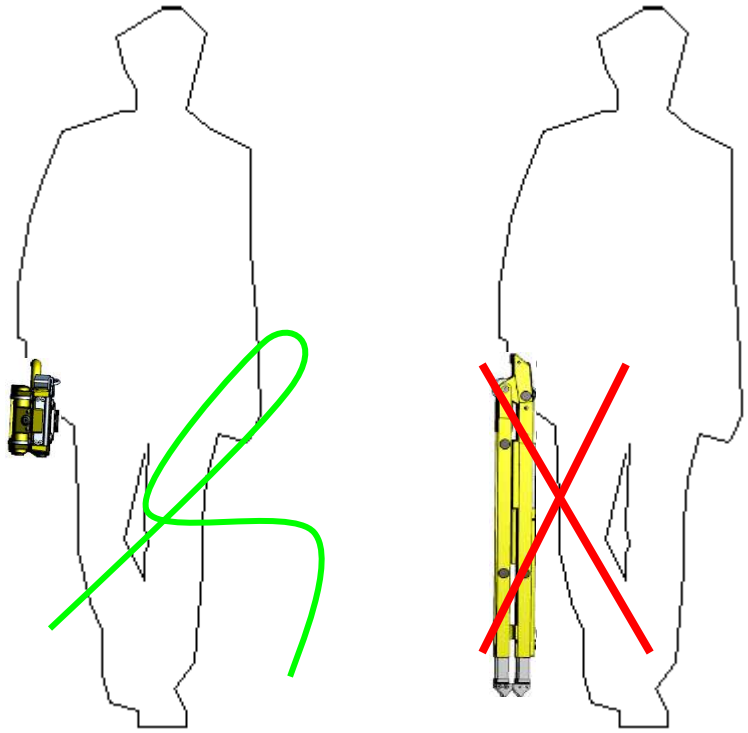
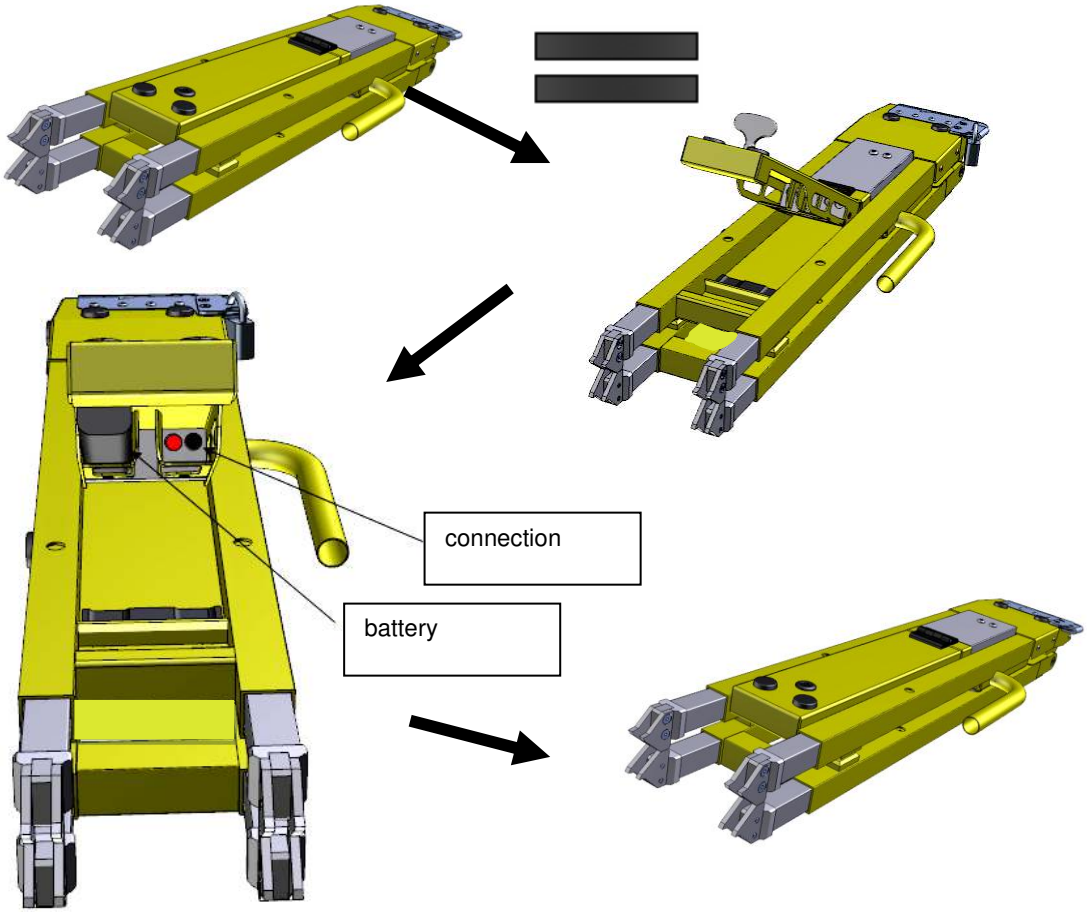


Figure 4.1; the correct carrying position of the ZKL 3000 is shown in the left picture

4.2 Installation stage

The ZKL 3000 must be visually inspected and tested for correct operation before installation. Use the procedure below to test for correct operation and internal shorts. If you find any deficiencies in the ZKL 3000, **do not use it**, but replace it by another ZKL 3000 that shows no deficiencies.

1. **Testing the ZKL 3000**
   Always test the ZKL 3000 in a **safe location**. Before testing, clean the contacts with a wire brush. The ZKL 3000 can then be tested easily, see figures below.
   a. Before use, install two charged batteries as shown in the figure



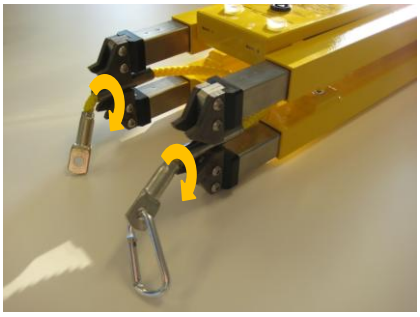
Remove the batteries by following the above steps in reversed order.

b. Use the switch on the front (see arrow) to switch on the ZKL 3000 ten seconds after the batteries have been installed. Hold down the switch for 2 seconds – a continuously lit red LED will appear on the switch. After that the LED will blink again to show if it is connected to MTinfo 3000.

c. After cleaning the contact points take the Test-Tool and put it between the contact points in folded position and press them together, see picture below. The green LED will blink continuously 2 x per second. This indicates **status safe.** Check this status for a minimum of five seconds. The ZKL

3000 is ready to be installed. If the green LED does not blink (2 x per second) the ZKL 3000 should not be used. Replace the ZKL 3000. If the red LED lights up this indicates that the battery power is low and they require replacing.
See below a guide for using the Test-Tool

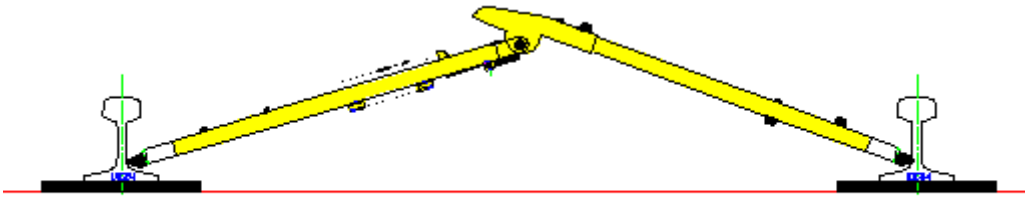
The Test-Tool components:
1. Metal tubes
2. Connecting rope
3. Clip



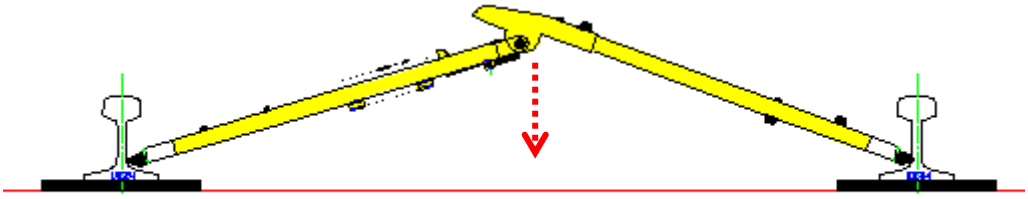
2. Installing the ZKL 3000 in AC-traction track (overhead lines)

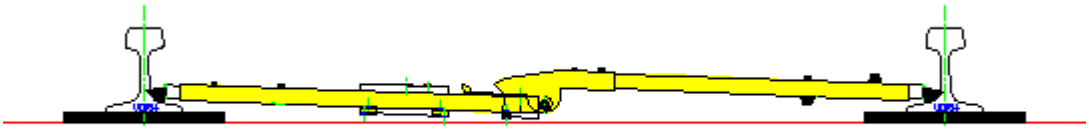
After the ZKL 3000 has been tested in a safe location and the result is a **safe** status, it can be installed as shown on the figures below.

a. Switch on the ZKL 3000, open the ZKL 3000 open and install the ZKL in the centre between the two rails. Position yourself in the centre of the track.

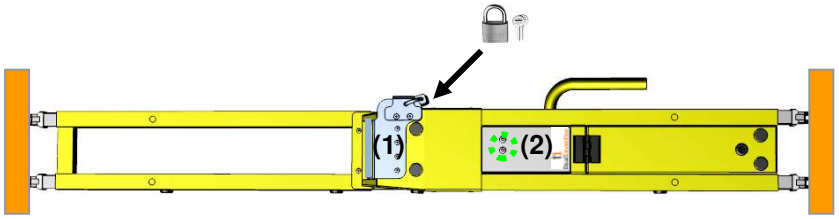


b. Use your foot to push down the ZKL 3000 (see figure below). The green LED starts blinking (twice per second). Check this status for a minimum of five seconds.





c. Lock the ZKL 3000 with a padlock through the eyelets, see arrow, after sliding the locking plate to the closed position.



d. Remove the ZKL 3000 from the track by opening the sliding lock by turning it. Then put the palm of your hand on the sticker (1) and wrap your hand around it. Put your second hand on our logo (2). Now squeeze the handle and move the ZKL 3000 up while simultaneously stopping the ZKL 3000 with your other hand.

For the installation video you can go to our website.
www.dualinventive.co.uk

3. Installing the ZKL 3000 in DC-traction track (3rd Rail only)

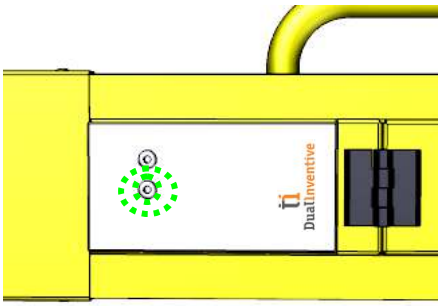
The ZKL 3000 is installed simultaneously on both rails. When correctly installed and removed it is not possible to get in contact with the conductor rail.

4.3 Application stage

1. ZKL 3000 statuses.

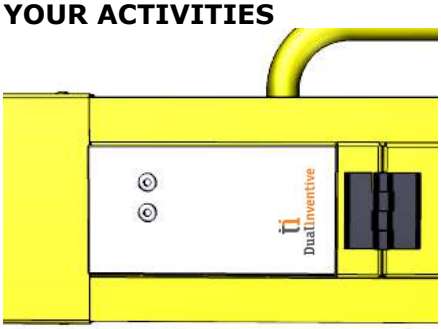
The following situation can occur.

a. Green LED blinks → status safe



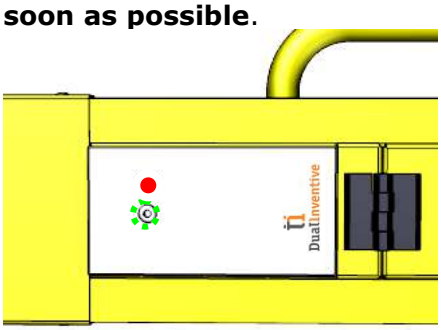
Cause:
The ZKL 3000 is switched on and measures a correct short.

b. Green and red LED are both off → **INDISCERNIBLE SITUATION, STOP YOUR ACTIVITIES**



Possible causes:
- The ZKL 3000 is not switched on,
- No battery power to the ZKL 3000,
- The ZKL 3000 is severely damaged.

c. One of the situations above plus the red LED lit → **Replace the battery as soon as possible**.

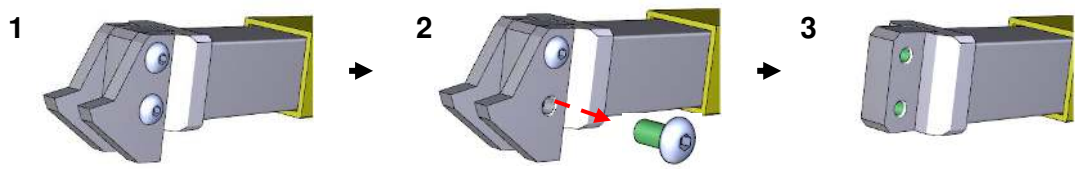


Cause:
The battery power is below the required level.

4.3 Maintenance and storage

Careful maintenance and adequate storage will prolong the life of the ZKL 3000. Clean the ZKL 3000 after every use with a cloth and/or a brush. Particularly the spring-activated contact arms and the contact points need to be cleaned regularly to prevent dirt from settling on it and causing damages. The contact points need to be cleaned with a wire brush. Store the ZKL 3000 in its transportation case and store the case in a storage container or warehouse. Use the yellow button to de-charge the batteries and regularly charge the batteries to prolong their useful working life.
After some time (depending on the actual use) the contact points will need to be replaced – both the shorting contacts and the measuring contacts. When you have to redo the installation of the ZKL 3000 in track more than three times before getting a good short circuit indicating by the green LED, the Contact points need to be changed. Replace both by new original contact points. The ZKL 3000 does not have to be re-calibrated.

Replacing the contact points – use a T25 Torx head wrench or bit to loosen the screw. Once the 4 screw have been unscrewed, the old contact points can be removed and replaced by new ones. Follow the above steps in reversed order to install the new contact points. Fasten these screws with 6.1Nm torque range.



Once every two years, the ZKL 3000 needs to be calibrated and serviced by our Service department. Refer to the "next service date" on the sticker on the measuring unit. You can also use the unique ID number of the ZKL 3000 for your administration.
You can replace measuring points and shorting points by yourself whenever you consider this necessary. No other maintenance is required to the ZKL 3000, provided that the ZKL 3000 is applied as described in this User Manual.

Do not treat the ZKL 3000 as regular domestic waste. Please contact the municipal authorities or Dual Inventive for more detailed information on recycling the ZKL 3000.

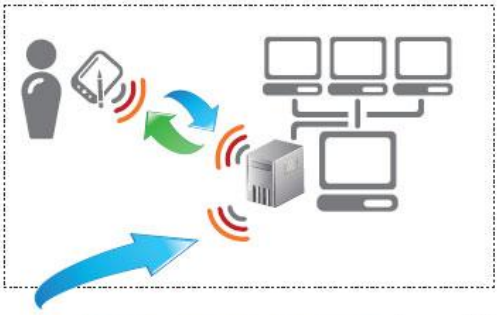
Do not treat the NiMH batteries of the ZKL 3000 as domestic waste Please contact the municipal authorities or Dual Inventive for more detailed information on recycling such batteries.

5. Features

The ZKL 3000 has MTinfo 3000 that makes it unique.

5.1 MTinfo 3000

MTinfo 3000 is an extension to the ZKL 3000. MTinfo 3000 synchronizes the black box data from the ZKL 3000 to a server. The data on the server is arranged and can be retrieved by authorized users using a PDA, GSM or computer via a web interface on the Internet.



MTinfo 3000 gives authorized users access to;

- Real-time status of the ZKL 3000 on Google maps,
- Status of the power supply,
- SMS (text message) functionality,
- Downloading journals of the usage,
- History of the ZKL 3000 per warehouse, project and maintenance.

MTinfo 3000 synchronizes and arranges the black box data from the ZKL 3000 to a server. The data on the server is arranged and can be retrieved with the use of a PDA, GSM or computer with the use of the correct authorization.

SMS

If required an alarm message can be sent via MTinfo 3000, the ZKL 3000 will send an SMS to a predetermined person via MTinfo 3000, see below;

When	Contents	To
1 minute after switching on the ZKL 3000 (when installed correctly).	<ID> * MEASUREMENT ON * DET. OK * BATT1. OK * BATT2. OK * GPS 51.904871,5.780358	The alarm number programmed in the ZKL 3000 via MTinfo 3000
As soon as the detection is gone.	<ID> * DET. ALARM	The alarm number programmed in the ZKL 3000 via MTinfo 3000
As soon as the status of one of the batteries changes	<ID> * BATT1. ALARM * BATT2. OK *	The alarm number programmed in the ZKL 3000 via MTinfo 3000
As soon as the status of one of the batteries is flat.	<ID> * BATT1. LOW * BATT2. OK *	The alarm number programmed in the ZKL 3000 via MTinfo 3000

The GPS coordinates can be entered into a programme such as Google Earth so the location can be shown on a map.

6. Who is Dual Inventive

Dual Inventive strongly believes in the further development and utilization of the 'railway system' as a sustainable and attractive transportation mode in the future. The market opportunities for the innovations are a derivation of the trends and development that apply in a broad sense to the rail sector and that in turn are fed by several fundamental social and economic developments.

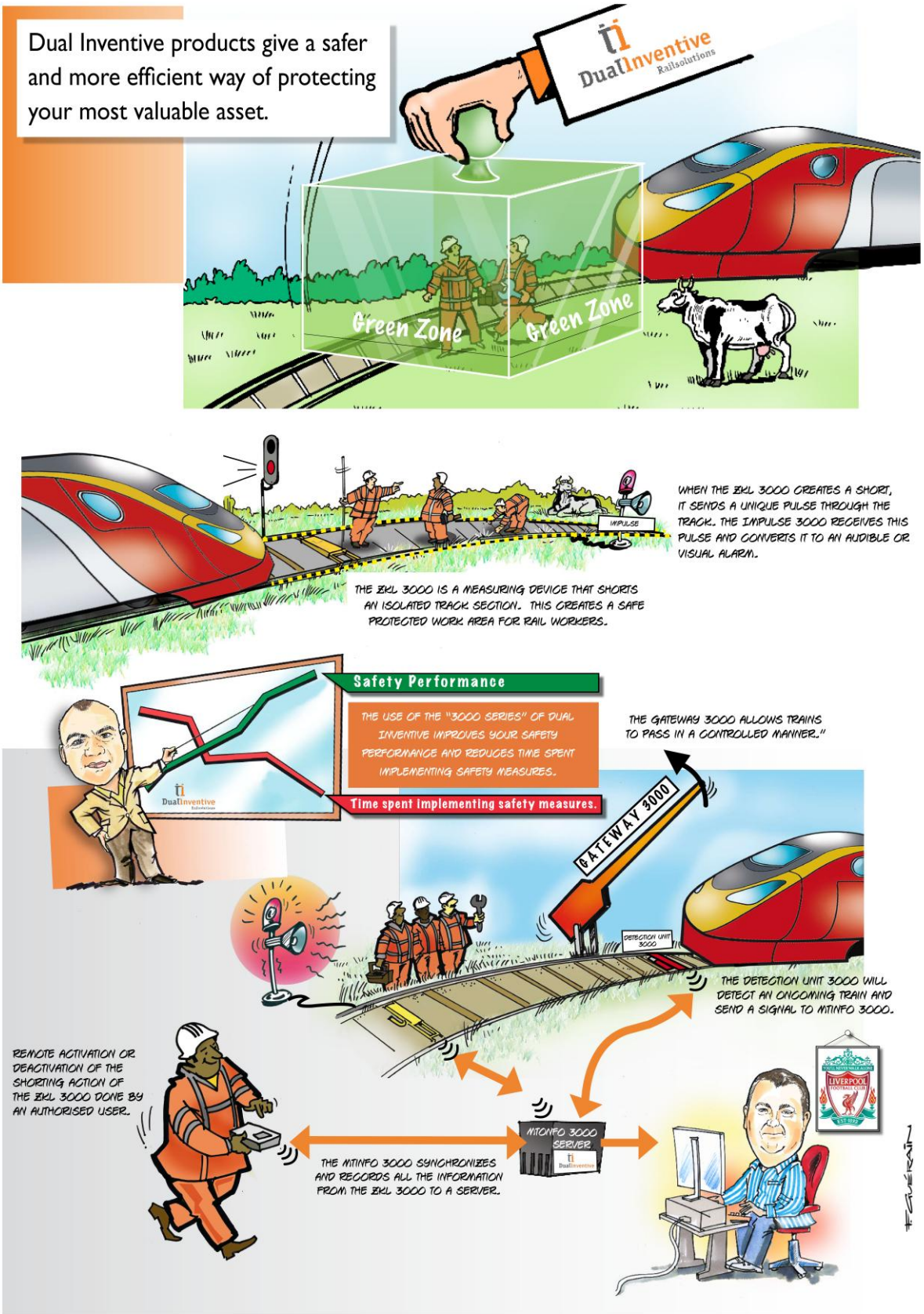
Safety & Efficiency
Dual Inventive develops and produces technology products that serve to make the railway infrastructure safer and more efficient, to maximize rail capacity, and to improve the reliability of the railway infrastructure.

Innovative
Developed by Dual Inventive products are innovative, high-quality, and always developed on the basis of customer needs.

Partnership
Dual Inventive is an active networker; we stay in charge but we also involve others in the development process so our products match the user requirements in the best possible way.

Europe
Dual Inventive considers the European railway market as its working ground.

7. Our Vision


Dual Inventive products give a safer and more efficient way of protecting your most valuable asset.
DualInventive
Railsolutions
Green Zone
Green Zone
IMPULSE
WHEN THE ZKL 3000 CREATES A SHORT, IT SENDS A UNIQUE PULSE THROUGH THE TRACK. THE IMPULSE 3000 RECEIVES THIS PULSE AND CONVERTS IT TO AN AUDIBLE OR VISUAL ALARM.
THE ZKL 3000 IS A MEASURING DEVICE THAT SHORTS AN ISOLATED TRACK SECTION. THIS CREATES A SAFE PROTECTED WORK AREA FOR RAIL WORKERS.
Safety Performance
THE USE OF THE "3000 SERIES" OF DUAL INVENTIVE IMPROVES YOUR SAFETY PERFORMANCE AND REDUCES TIME SPENT IMPLEMENTING SAFETY MEASURES.
Time spent implementing safety measures.
THE GATEWAY 3000 ALLOWS TRAINS TO PASS IN A CONTROLLED MANNER."
GATEWAY 3000
DETECTION UNIT 3000
THE DETECTION UNIT 3000 WILL DETECT AN ONCOMING TRAIN AND SEND A SIGNAL TO MTINFO 3000.
REMOTE ACTIVATION OR DEACTIVATION OF THE SHORTING ACTION OF THE ZKL 3000 DONE BY AN AUTHORISED USER.
MTINFO 3000 SERVER
THE MTINFO 3000 SYNCHRONIZES AND RECORDS ALL THE INFORMATION FROM THE ZKL 3000 TO A SERVER.
LIVERPOOL

8. To conclude

On behalf of the Dual Inventive team, we wish you the best possible safety at work.

Dual Inventive

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