User manual
RDI 3000

Dual Inventive
Ubiquitous Rail

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TABLE OF CONTENTS

1 PREFACE

Please read this manual carefully. The correct understanding and execution of the instructions is obligatory for using the RDI 3000 safely and correctly. Always keep this manual near, so you can use it at any moment. This manual belongs to the RDI 3000 and must be given to the new owner in case of resale or trade-in.

This manual is also available on https://www.dualinventive.com/en/downloads.

If you encounter any ambiguities while using the RDI 3000, we invite you to report them via info@dualinventive.com or by telephone. Ultimately, the product should make you happy and we like to work hard for that. Your response will contribute to a better safety and distribution of rail capacity. On behalf of the Dual Inventive team, we wish you a lot of worksite security with the RDI 3000.

To support the use of the RDI 3000, resources have been made available by Dual Inventive. Please consult https://www.dualinventive.com.

The following documents are referenced in this manual:

- User manual MTinfo 3000 web;
- User manual MTinfo 3000 app;
- Quick start RDI 3000.

Dual Inventive has originally written this manual in English. If anything is unclear or deviates from the original in a translated version, the original English document is leading.

1.1 Purpose user manual

The purpose of this user manual is to instruct the user on the correct and safe use of the RDI 3000. The RDI 3000 is a safety device for activating the combination of a LED light, flag and detonator.

This user manual contains instructions regarding the:

- personal safety and product safety that must be observed to avoid risks that could lead to physical and/or property damage;
- use of the RDI 3000;
- maintenance of the RDI 3000;
- storage of the RDI 3000;
- disposal of the RDI 3000.

1.2 User

Typical users of the RDI 3000 are:

- the work planner who prepares safety plans and assigns the locations for installing the RDI 3000 on the railway track;
- the installer, the track worker who installs the RDI 3000 on the railway track;
- the operator, the track worker who switches the RDI 3000 on the railway track.

The RDI 3000 is supported by the web interface MTinfo 3000 and the app. The work planner will frequently use MTinfo 3000 web and the installer and operator will frequently use the app.

Every user of the RDI 3000 must meet the following requirements:

- certified to work with the RDI 3000;
- authorized by the user company's perspective for the right access and user rights for MTinfo 3000.

After certification, the user receives a personal MTinfo 3000 account. See 3.6 for the terms of use.

1.2.1 Vulnerable persons

The RDI 3000 may not be used by persons:

- younger than 18 years;
- with reduced physical, sensory or mental capabilities;
- with a pacemaker, because the RDI 3000 has strong magnets.

1.3 Reading guide

In principle, every user should read the whole user manual. Depending on the user, some sections are more relevant for the:

- installer: section 6;
- work planner: section 7;
- operator: section 8.

To alert the reader to safety issues and important information, the following symbols and terms are used in this manual:

SYMBOL	MEANING
	**DANGER** Indicates a hazardous situation which will result in death or serious injury if the safety instructions are not followed.
	**WARNING** Indicates a hazardous situation which could result in death or serious injury and/or damage to the product or the surrounding area if the safety instructions are not followed.
	**CAUTION** Indicates a hazardous situation which could result in minor and/or moderate damage to the product or the surrounding area if the safety instructions are not followed.
	**NOTE** Provides important information.
	**NOTE** Refers to a document.

1.4 Abbreviations

ABBREVIATION	MEANING
DNCM	Dual-inventive Network Communication Module
EEPROM	Electrically Erasable Programmable Read-only Memory
PPE	Personal Protective Equipment
SIL	Safety Integrity Level
RDI 3000	Remote Detonator Installer 3000
ZKL 3000 RC	Line Blockage System 3000 Remote Control

Table 1-1: Abbreviations

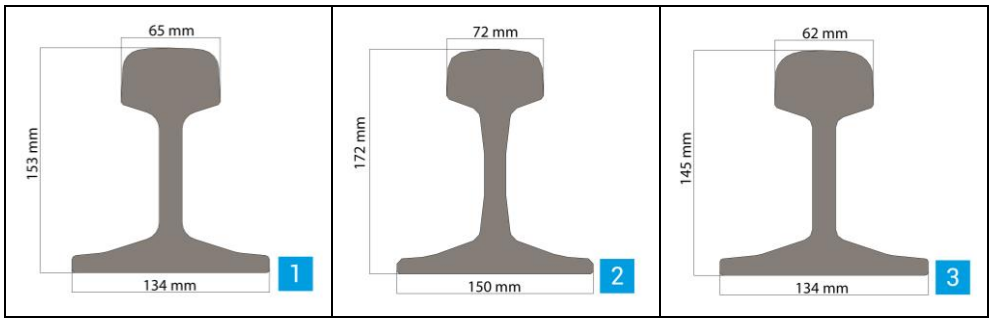
2 INTRODUCTION

2.1 Intended use

The RDI 3000 is intended to activate and deactivate the combination of a LED light, flag and detonator. The RDI 3000 is a safety device.

The RDI 3000 can be used on the following rail profiles:

- 50 E1;
- 60 E1;
- U33.



LEGEND
1. 50 E1
2. 60 E1
3. U33

Figure 2-1: Rail profiles

WARNING
Wear due to train traffic or rail grinding can change the dimensions of the rail profile. Check during the installation of the RDI 3000 if the degree of wear is acceptable. So that the RDI 3000 detonator plate is installed with a maximum of 10mm space from the head of the rail.

2.2 Non-intended use

Any other use than the intended use is prohibited.

WARNING
Non-intended use could have consequences for the personal safety and can cause material damage of the RDI 3000 and its surroundings.

NOTE
In case of non-intended use, the warranty of the RDI 3000 is voided.

2.3 Lifespan

Every four years, maintenance of the RDI 3000 is required by Dual Inventive. After this service, the lifespan is extended by four years each time.

2.4 Warranty and delivery conditions

Dual Inventive's products are carefully manufactured from high-quality materials. The RDI 3000 is supported by a service contract that contains the:

- general delivery conditions;
- warranty conditions;
- maintenance conditions.

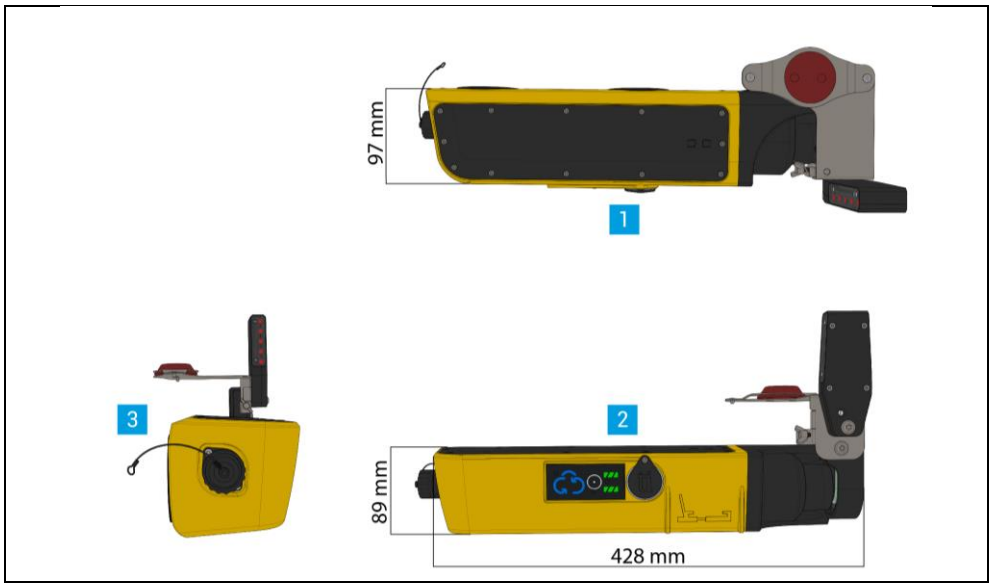
2.5 Specifications

2.5.1 Technical specifications

SPECIFICATION	VALUE
Compatible rail profiles	• 50 E1 • 60 E1 • U33
Telecommunication	• Default: 4G network • Fallback: 2G network
Safety Integrity Level	• SIL 3
Time needed for (de)mounting the RDI 3000 on/off the track	• ± 30 sec. using a power tool • < 60 sec. using the red allen key
Motor power	• Sufficient to raise the flag with 4 kg of ballast
IP protection level	• RDI 3000: IP 65 • Main battery: IP 65
Temperature range	• Operability: -10 to 70 °C • Recovering: > -25 °C
Internal battery life	24 hrs. with: • 8 cycles of activation and de-activation • 8 hrs. of illuminated LEDs at 12 °C
Main battery life	25 days with: • 20 cycles of activation and deactivation • 48 hrs. of illuminated LEDs at 12 °C
Weights	• RDI 3000 without detonator: 2.8 kg • Clamp: 0.4 kg • RDI 3000 battery cable: 1.1 kg • RDI 3000 power splitter: 0.2 kg • Transport case: 4.6 kg • Total weight: 9.1 kg

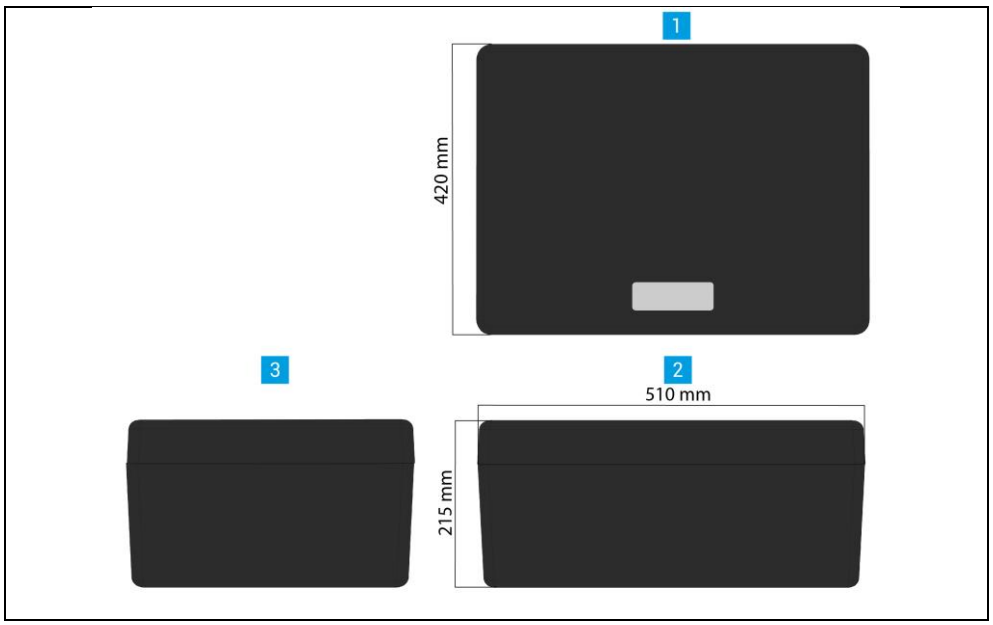
Table 2-1: Specifications

2.5.2 Dimensions



LEGEND
1. Top view
2. Front view
3. Side view

Figure 2-2: Dimensions RDI 3000



LEGEND
1. Top view
2. Front view
3. Side view

Figure 2-3: Dimensions transport case

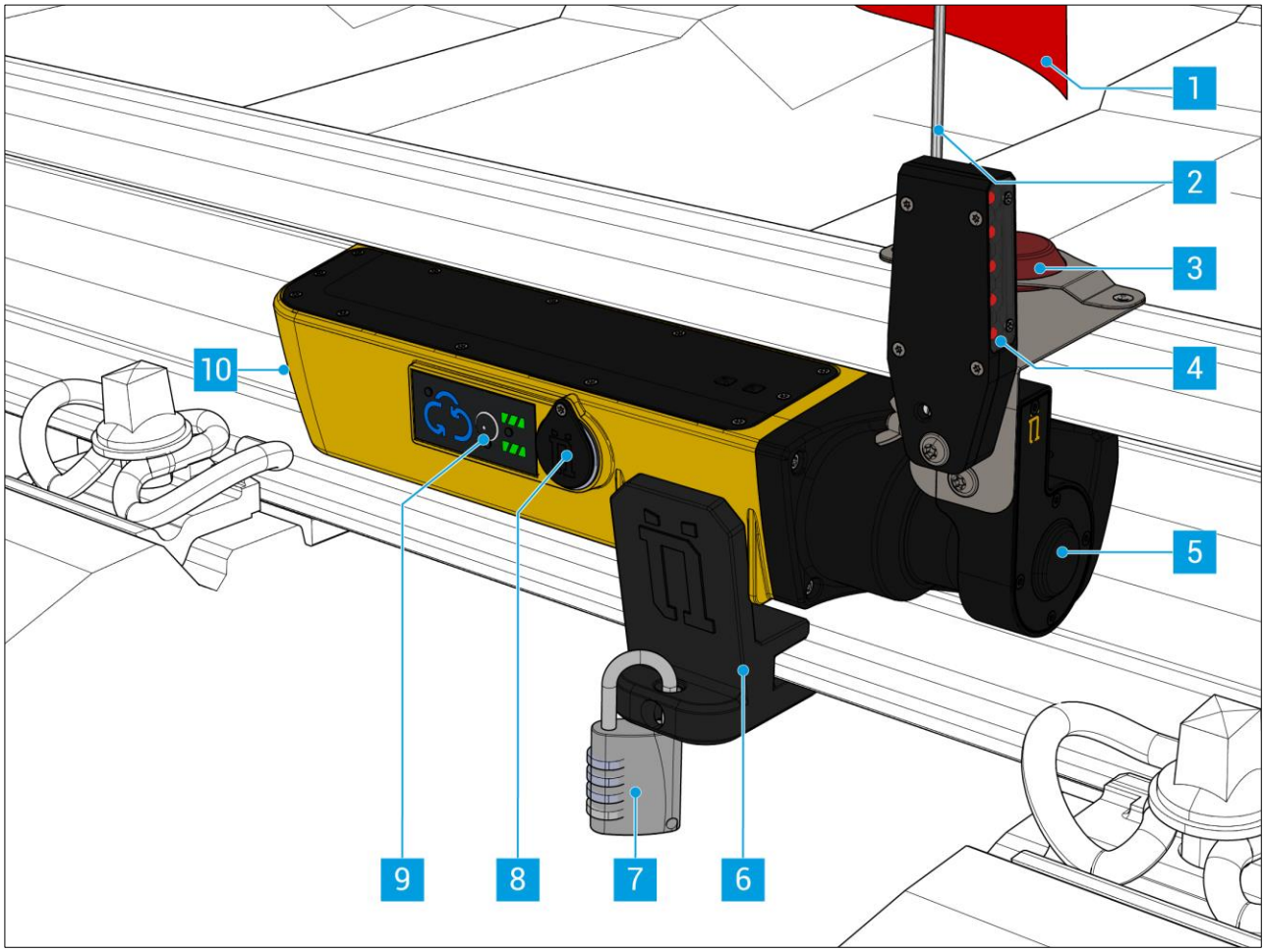
2.6 Worksite

Always ensure your own safety when entering the railway environment. Follow the applicable local regulations and organizational procedures. Please feel free to define your own labor rules in addition to these regulations and procedures.

3 PRODUCT DESCRIPTION

3.1 RDI 3000

The RDI 3000 is a safety device for activating and deactivating the combination of a LED light, flag and detonator.



POS.	LEGEND	POS.	LEGEND
1.	Flag	6.	Clamp
2.	Pole	7.	4-digit combination padlock
3.	Detonator plate	8.	Key switch
4.	LEDs	9.	Display
5.	Lever	10.	Charging point

Figure 3-1: RDI 3000

The function of the LEDs and the flag is to provide a visual warning signals to a train approaching a safety zone. The function of the detonator is to provide an acoustic signal up to 162 dB(A) to warn both the track worker and the train driver when a train, or wagon or on track plant accidentally enters a safety zone.

The RDI 3000 has an electrical motor for raising the lever (activation) or pulling it down or lowering the lever (deactivation). The electrical motor and LEDs are powered by an internal and/or main battery.

The RDI 3000 is mounted on the rail with magnets and a clamp. The 4-digit combination padlock prevents theft.

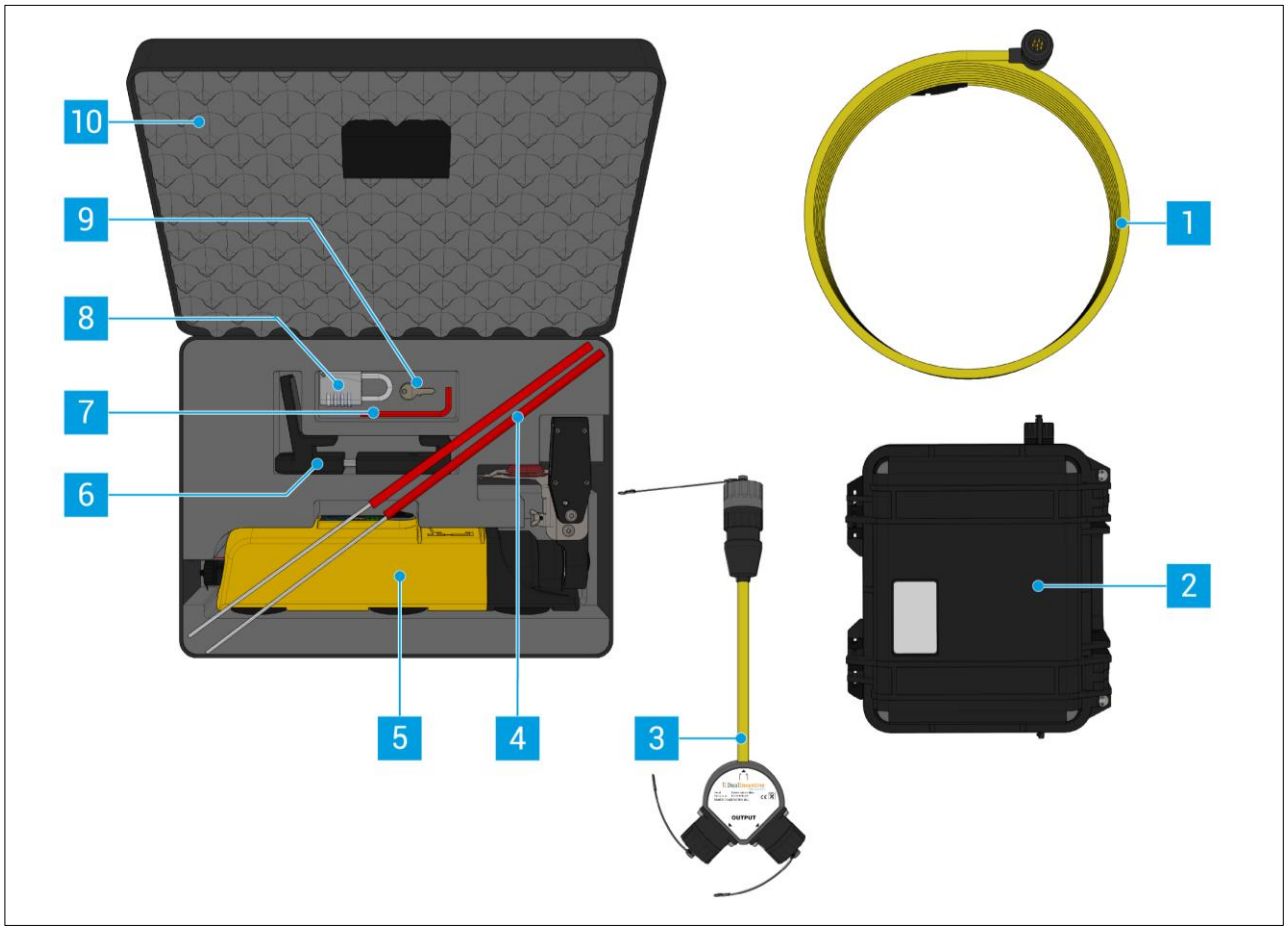
The (de)activation of the RDI 3000, named switching, is done by remote or local control. Because the RDI 3000 can be controlled remotely, users do not need to visit the track to manually place detonators and flags. This increases the safety of track workers, saves time and reduces the emission of carbon dioxide.

The display of the RDI 3000 has a cloud light and a battery indicator. The internal antenna facilitates telecommunication (4G or 2G).

The RDI 3000 has an internal battery that also functions as a back-up battery. The RDI 3000 is powered by an external battery, named the main battery.

The RDI 3000 can be used together with the ZKL 3000 RC. For an optimal interaction between the two products, the key and the main battery are interchangeable.

3.2 Transport case and accessories



POS.	LEGEND	POS.	LEGEND
1.	Cable	6.	Clamp
2.	Main battery	7.	Red allen key
3.	Cable splitter (Y-splitter)	8.	4-digit combination padlock
4.	2 flags	9.	2 uniform keys
5.	RDI 3000	10.	Transport case

Figure 3-2: Transport case and accessories RDI 3000

The RDI 3000 and its accessories are delivered in a transport case. For safe transport and storage of the RDI 3000 and a detonator, the transport case has a pressure relief valve ~~which makes~~ that make the transport case suitable for air transport. The transport case is designed for safe transport of detonators. If a detonator is activated during transport, the design of the transport case will mitigate the consequences.

The cable splitter (Y splitter) is an optional deliverable accessory. It can be used for connecting a RDI 3000 and a ZKL 3000 RC to the same main battery.

In the transport case, you will find the Quick start RDI 3000.

CAUTION
Before using the Quick start RDI 3000, always read this user manual and make sure that you comprehend its contents.

3.3 Identification

The type plate **(1)** is located on the back/magnet side.

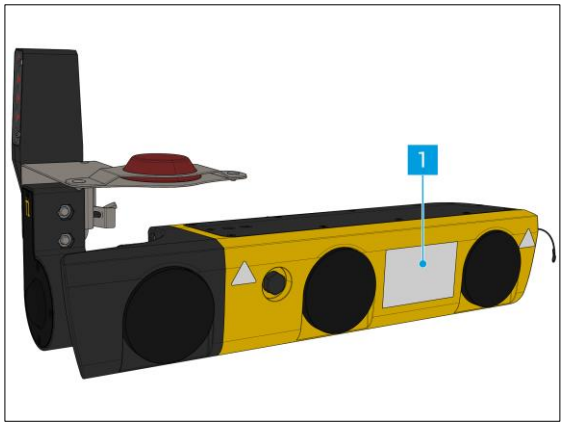


Figure 3-3: Type plate and location

3.4 MTinfo web and app

The RDI 3000 is used in combination with the MTinfo 3000 web interface (web) and the MTinfo app. For the product descriptions, see:

- User manual MTinfo 3000 web;
- User manual MTinfo 3000 app.

In order to use the functionality of the RDI 3000, a stable connection with a 2G or 4G network is needed. In areas with poor 2G or 4G connection, the RDI 3000 may lose its connection with MTinfo 3000. This means that the RDI 3000 can temporarily not be switched remotely.

3.5 Work scenarios

The RDI 3000 can be used for two work scenarios:

Short term jobs (< 24 hrs.): the RDI 3000 is powered by the internal battery.

One- or two-weekly jobs: the RDI 3000 is powered by the main battery.

3.6 Terms of use

1. Do not use the RDI 3000 if it has been damaged or shows defects. The RDI 3000 should not have major damage; a slight scratch is acceptable. If the RDI 3000 is damaged place it in quarantine and contact Dual Inventive.

WARNING
The user is not allowed to repair the RDI 3000 ~~and~~ or its accessories.

2. The RDI cannot be placed:
    a. In the moving parts of a switch
    b. In a railway crossing
    c. In a portion of track where the soul of the rail is not accessible due to
        i. a cable
        ii. heating element
        iii. concrete slabs
        iv. other items that might obstruct the placement of the RDI 3000
    d. When the lever can't move freely, for instance:
        i. The ballast shoulder is too high, and the flag can't return to its deactivated state
        ii. The railway platform wall blocks the flag from returning to its deactivated position
    e. In the vicinity of a gas heating system, please refer to the operating temperatures of the RDI 3000
    f. In an expansion joint
3. The RDI 3000 is designed to be used in both directions as long as it is placed on the outside of the track. Always place the RDI 3000 on the outside of the track.
4. The RDI 3000 is provided with a clamp for mounting it firmly to ~~on~~ the rail~~s~~. Always use the RDI 3000 with the clamp installed.
5. The flag is prone to wear and tear. It can easily be replaced by loosening the wing nut by hand. Always make sure the flag is in good condition and is connected tightly.
6. The glass lens in front of the LEDs may ~~get~~ become dirty. The glass lens is designed for easy cleaning. Keep the glass clean to ensure a strong light output.
7. Do not use the RDI 3000 without a live detonator. Please consult the manual of the detonator manufacturer for instructions of use concerning the detonator.

3.6.1 Main battery

The optional cable splitter allows to connect two devices to one main battery. The following combinations are possible:

1. One RDI 3000 and one ZKL 3000 RC.
2. Two identical devices: two RDI 3000s or two ZKL 3000 RCs.

The RDI 3000 is designed to work with the main battery. The main battery extends the operational time of the RDI 3000 to a period of 25 days. Intensive use of the RDI 3000 may

reduce the operational time. When the main battery is used to power two devices, the operational time will be reduced.

CAUTION
Ensure enough battery capacity for a whole working shift.

In case of damaged batteries, avoid exposure to the batteries. Send the batteries back to Dual Inventive in accordance with the applicable laws and regulations. If you do not have the correct transport packaging, please contact Dual Inventive.

CAUTION
The lithium batteries of the RDI 3000 are defined as a hazardous substance. For transport and storage, make sure to follow the applicable laws and regulations.

3.6.2 Environment

The RDI 3000 can be used within a temperature range from -10 to 70 °C. The RDI 3000 can recover from temperatures as low as -25 °C. While the RDI 3000 is designed to cope with these extreme temperatures, do not use the RDI 3000 in heavy snowfall.

4 SAFETY

4.1 General

4.1.1 Intended use

For safe use, only use the RDI 3000 for its intended use.

4.1.2 Non-intended use

Non-intended use of the RDI 3000 can cause unsafe situations or malfunctioning.

4.1.3 Activated detonator

When a detonator is activated during the use of the RDI 3000, the device must be considered as irreparable and must be removed from service. Return the RDI 3000 to Dual Inventive.

4.2 General safety instructions

Specific safety instructions are part of the installation, preparation and switching the RDI 3000, which are described in these sections. In addition, follow these general safety instructions:

1. Be certified to work with the RDI 3000 before using the device.
2. Installation of the RDI 3000 must be performed only when a worksite is protected from trains, in accordance with the relevant rail infrastructure controllers safe track access instructions.
3. Guarantee safety while installing the RDI 3000. Installing the RDI 3000 is a job in itself. The user is responsible for a safe installation. Follow the local, national and organizational regulations and procedures.

Check whether the RDI 3000 has the correct certification. Consult https://www.dualinventive.com for the needed certificates.

Distribute the keys of the RDI 3000 only among certified persons. Organize good key management.

WARNING
The user is responsible for a safe installation.

4.3 Residual risks

Dual Inventive has performed a risk assessment of the RDI 3000 for the intended use and normal operating conditions. The following acceptable, residual risks are present with the intended use and the normal operating conditions:

HAZARD	RESIDUAL RISK
Blinding light	The LEDs of RDI 3000 can shine very bright. This can cause temporary blindness when looking too long into the LEDs.
Magnetic field	The RDI 3000 has three strong magnets to ensure a firm attachment to the rail. The magnetic field can damage electrical equipment. The magnetic field can disturb a pacemaker.
Explosion	Working with live detonators. Refer to the manual of the detonator manufacturer for safe handling of detonators.

Table 4-1: Residual risks

4.4 Personal Protective Equipment

Due to the standard safety measures and PPE for track workers, there is no need for extra PPE while using the RDI 3000.

4.5 Safety symbols

In accordance with the residual risks, the RDI 3000 has the following safety symbols to warn the user:

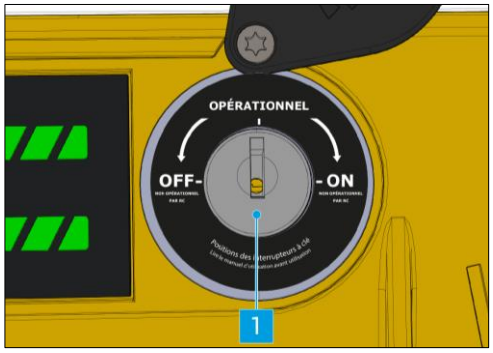
SYMBOL	DESCRIPTION	WARNING
	General warning sign	Do not look directly into the LEDs to avoid temporary blindness.
	Dangerous for people with active implanted cardiac devices	Users with a pacemaker are not allowed to use the RDI 3000.

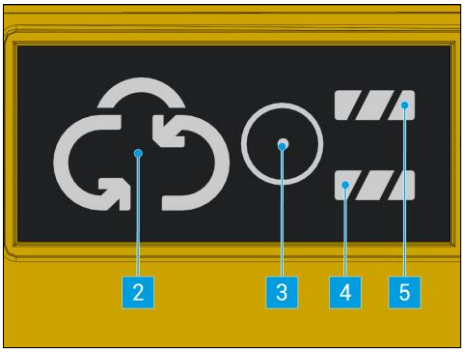
Table 4-2: Safety symbols

4.6 Switching on/off and indication lights

For a safe and correct use, the RDI 3000 has:

- a key switch;
- a cloud light;
- an activation button;
- two battery indicators;
- a power off mode.





LEGEND
1. Key switch
2. Cloud light
3. Activation button
4. Internal battery indicator
5. Main battery indicator

Figure 4-1: Control panel RDI 3000

4.6.1 Key switch

Use the key switch for the positions: ON, OFF and OPERATIONAL. The function and use of these positions are explained in section 6 and 8.

4.6.2 Cloud light and activation button

The cloud light shows the status of the RDI 3000 while it is operating. By default, the cloud light is switched off after 20 sec. to save battery capacity.

To activate the cloud light, push the activation button. After activation, the cloud light has the following indications:

INDICATION	STATUS
Blue (Constantly lit)	Online and is working properly.
Red (Constantly lit)	Online and has an error/a low battery.
Fade-in-fade-out (Blue or red); 1Hz	Offline

Table 4-3: Indications cloud light

When the RDI 3000 does not come online within a reasonable timespan (5-10 min.), contact Dual Inventive for support. If the RDI 3000 has an error, check the battery or the warning & error messages, see section 9. Try to resolve the problem or restart the RDI 3000. If the error remains, contact Dual Inventive for support.

DANGER
Do not use the RDI 3000 when it is offline or has an error.

4.6.3 Battery indicators

The two battery indicators show the current battery percentage of the internal and main battery.

4.6.4 Power off mode

The RDI 3000 has an intelligent power off mode for an optimal use of the main battery.

When the key is switched to OFF, the RDI 3000 will be deactivated. The lever will lower and the LEDs will turn off. After 5 minutes, the power off mode is activated automatically. In the power off mode, the RDI 3000 does not send or receive signals and the cloud light is off.

When the key is switched to ON or OPERATIONAL, the RDI 3000 leaves the power off mode.

When you store the RDI 3000, make sure the key switch is in the OFF position.

5 TRANSPORT AND STORAGE

Follow these instructions for safe transport and storage:

1. Always use the transport case for transporting the RDI 3000, including a detonator. The transport cases are stackable.
2. Carry the transport case and the RDI 3000 by hand alongside the body.
3. Do not wind the battery cable too tight to prevent cracks in the cable. Create a cable roll with a minimal diameter of 200 mm.
4. Avoid dropping the RDI 3000. The RDI 3000 contains components that can withstand shocks and vibrations, but the device can break down.
5. Do not change the RDI 3000 position by pulling the lever. It can bend which can result in a wrong position of the detonator plate.

When you will not use the RDI 3000 for a longer period of time, follow these instructions for proper storage:

1. Make sure that the contents of the transport case are complete.
2. Clean and dry the RDI 3000 before storage.
3. Make sure the RDI 3000 is in the power off mode.

6 INSTALLATION

6.1 Before installation

WARNING
Before installation, check the worksite and make sure that everything is safe.

Before installing the RDI 3000, follow these instructions:

1. Check whether the RDI 3000 has not passed the critical maintenance date. This date can be found on the sticker 'next inspection date'. Do not use the RDI 3000 and report it to the responsible person within the organization.
2. Check the RDI 3000 and its accessories visually for damage and flaws. If those are present, do not use the RDI 3000 and accessories, report it to the responsible person withing the organization.
3. Be aware of situations where you cannot use the RDI 3000, see section 9.
4. Always start with two full batteries.
5. Start the installation of the RDI 3000 with the key in the OFF position.

For the detonator to be activated, it is important that the distance between the rail and the detonator plate is as low as possible. A minimum distance of 5 mm is always necessary to prevent it from freezing onto the rail. By grinding rails too much, the distance between the detonator plate and the rail can become too large. Do not use the RDI 3000 when the distance between the detonator plate and the rail exceeds 10 mm. To ensure the right distance, see section 6.6.

The installation of the RDI 3000 has the following steps:

1. Charging the main battery.
2. Placing the RDI 3000.
3. Securing the RDI 3000.
4. Placing the flag.
5. Carrying out the functional test.

6.2 Charging the batteries

6.2.1 Before charging

The charge time of the main battery is ± 24 hrs. Before charging the main battery, follow these instructions:

1. Charge batteries only:
   a. inside;
   b. in a dry environment;
   c. not below 6 °C.
2. Keep a minimal distance of 5 cm between chargers for enough ventilation.
3. Check the charger for damage before using. Do not use a damaged charger.
4. Do not repair the main battery or charger yourself. Send them back to Dual Inventive.
5. Transport the charger under dry conditions.

6.2.2 Charging main battery

Instruction:

1. Connect the power cable to the charger. Plug the charger into the wall socket. The two red LEDs on the charger will light up. The fan in the charger will start for cooling purposes; you will hear a buzzing sound.
2. Connect the charger to the main battery through the plug. Both LEDs on the charger burn red when the main battery is charging.
3. Wait for the LED to turn green. Now, the main battery is fully charged.

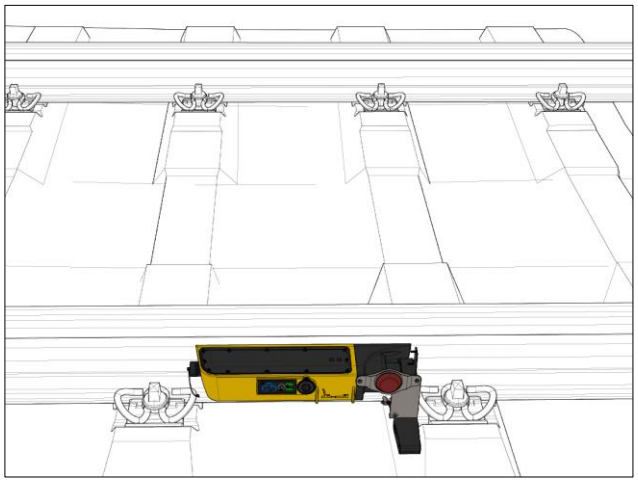
NOTE
If you want to use the charger again, first remove it from the socket before connecting a new battery to it.

6.2.3 Charging RDI 3000 internal battery

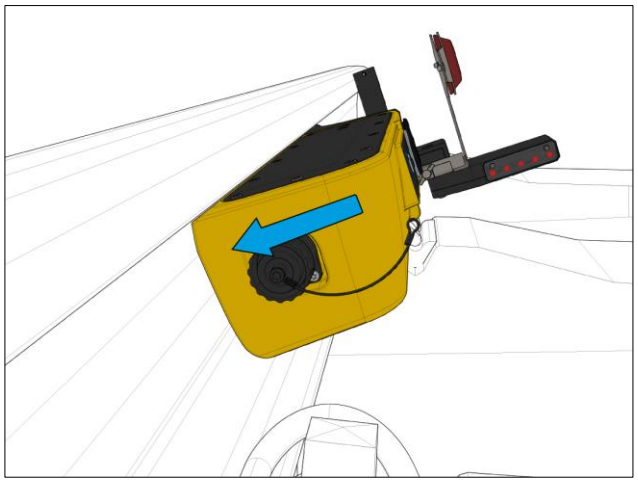
Instruction:

1. Plug the charger into the wall socket. Connect the cable to the RDI 3000. Turn the key to operational. You will see the battery indicator blink on the RDI 3000 to indicate it is charging.
   a. It can take up to 30 minutes before the charging starts due to battery management of the RDI 3000
2. Wait till all segments of the internal battery indicator are green and stop blinking. Now, the internal battery is fully charged.

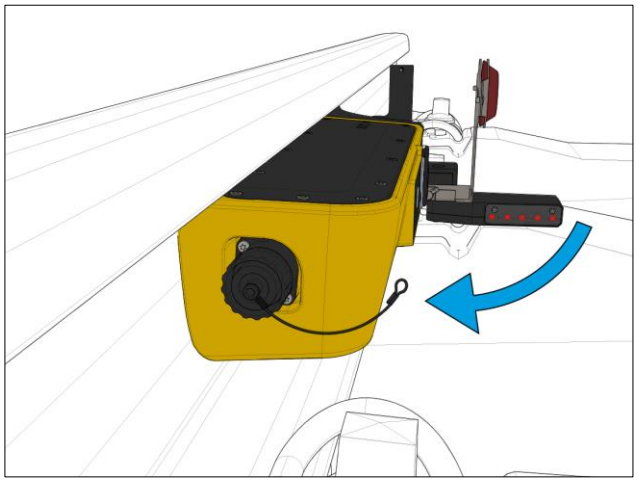
6.3 Placing the RDI 3000



1. Always place the RDI 3000 on the outside of the track and in between two sleepers.



2. Place the RDI 3000 sloping and just below the rail head.



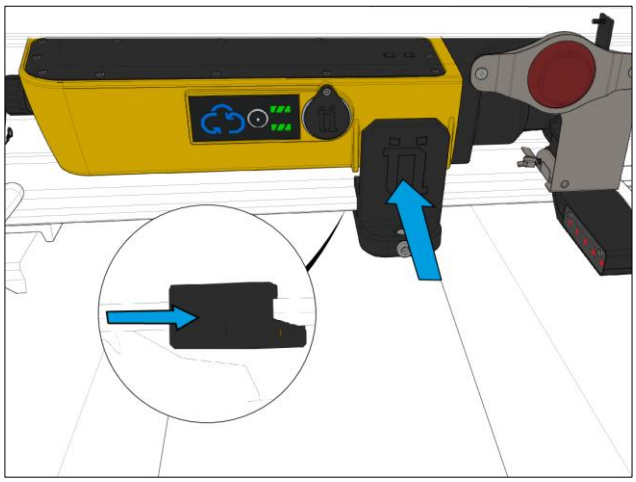
3. Clamp the RDI 3000 on the rail head.

Figure 6-1: Placing the RDI 3000

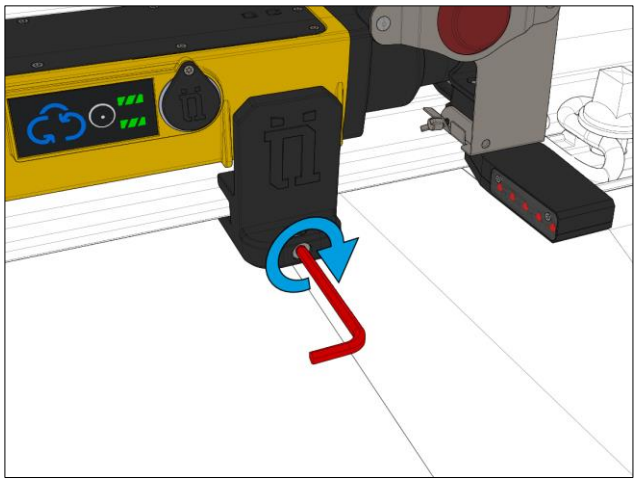
The magnets on the backside of the RDI 3000 will pull the RDI 3000 into the rail core. For the remainder of the installation, it is no longer necessary to hold the RDI 3000 in place manually.

6.4 Securing the RDI 3000

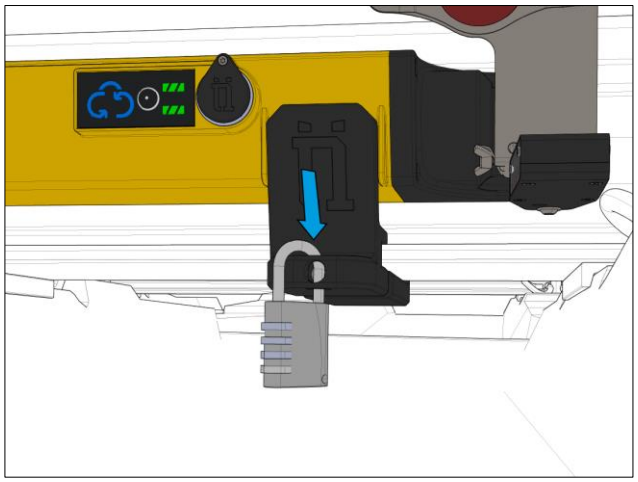
Before securing the RDI 3000 with the clamp, you may need to remove some ballast to create enough space for the clamp.



1. Place the clamp to the right side of the key switch.



2. Tighten the clamp with the red allen key until it is fastened securely with a force of 3,5Nm.

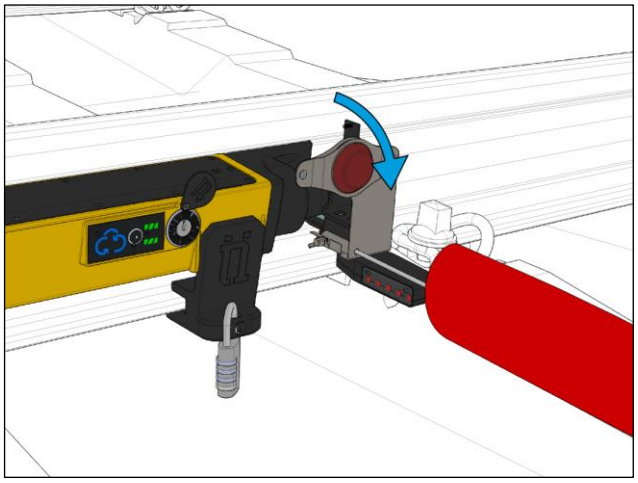


3. Place the 4-digit combination padlock, facing down.

Figure 6-2: Securing the RDI 3000

NOTE
Always use the clamp & the flag when installing the RDI 3000.

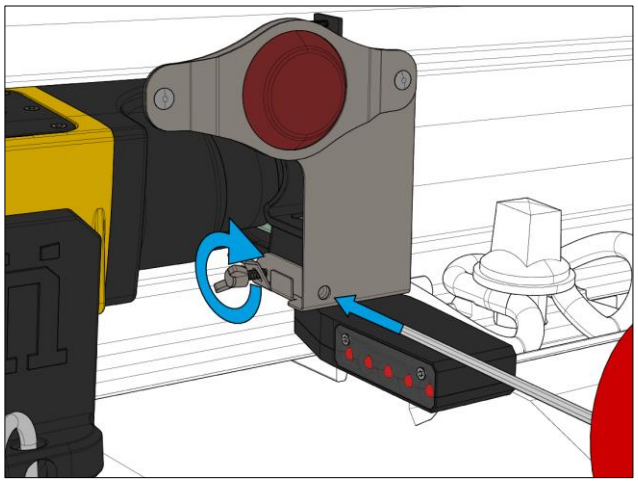
6.5 Placing the flag



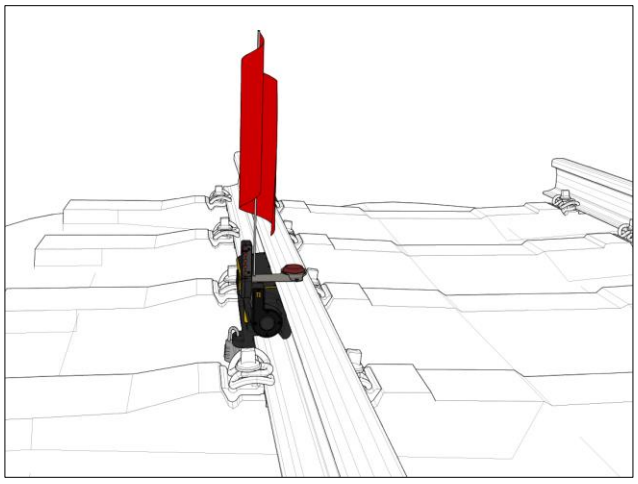
1. Turn the key to the OFF position, this helps you to easily place the flag.

   The lever moves away from the rail and the LEDs switch off.

   Make sure there are no obstacles or loose ballast while lowering the lever.



2. Place the flag in the tube next to the LED block. Secure the flag by tightening the wing nut.



3. Turn the key to the ON position. The lever moves towards the rail and the LEDs switch on.

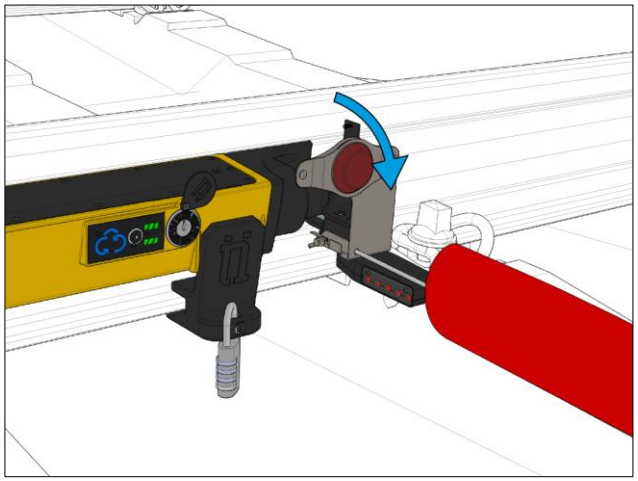
   Check that the flag and LEDs are visible from a train driver's perspective.

Figure 6-3: Placing the flag

WARNING
When deployed, the flag and the LEDs of the RDI 3000 must be visible to a train driver.

6.6 Functional test

Perform the functional test with the installed cable and main battery to verify that these are working as intended. Do not use the battery cable if it is damaged. Quarantine the cable and report it to the responsible person. During the test, check the status of the RDI 3000 in MTinfo 3000.



1. Turn the key to the OFF position.

   The lever moves away from the rail and the LEDs switch off.

   Make sure there are no obstacles or loose ballast while lowering the lever.

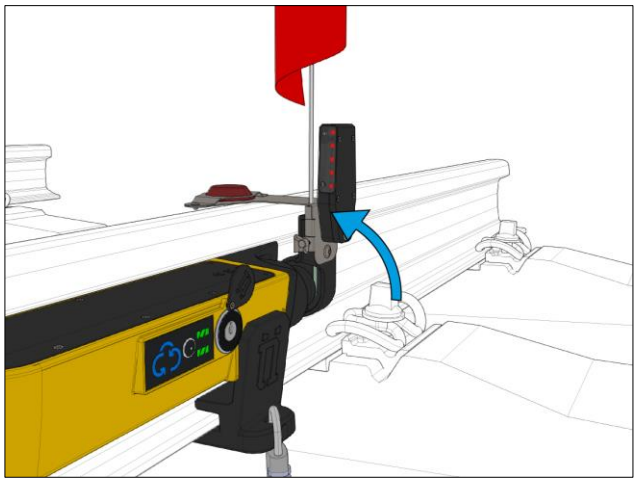
   Check the real-time status in the app:

   - device status: Online (blue);
   - switch status: Switched OFF (red);
   - key position: Off;
   - attached to track: No.

2. Turn the key to the OPERATIONAL position.

   Check the real-time status in the app:

   - device status: Online (blue);
   - switch status: Switched OFF (red);
   - key position: Operational;
   - attached to track: No.



3. Turn the key to the ON position. The lever moves towards the rail and the LEDs switch on.

   Check the battery status by pressing the cloud light button.

   Check the real-time status in the app:

   - device status: Online (blue);
   - switch status: Switched ON (green);
   - key position: On;
   - attached to track: Yes.

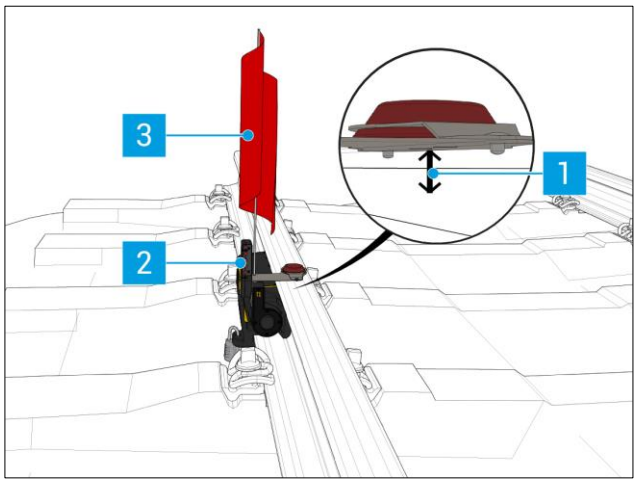


Figure 6-4: Functional test

4. Turn the key to the OPERATIONAL position.

   Check the real-time status in the app:

   - device status: Online (blue);
   - switch status: Switched ON (green);
   - key position: Operational;
   - attached to track: Yes.

   Make sure the detonator plate hovers closely above the rail. The distance between the detonator plate and the rail **(1)** is typically ± 5 mm and must always be less than 10 mm.

   Check that the LEDs **(2)** and flag **(3)** are visible from the train driver's perspective.

After the functional test, switch the key to the desired position:

- OPERATIONAL: remote switching;
- ON: activated (placed on the track);
- OFF: de-activated (not on the track).

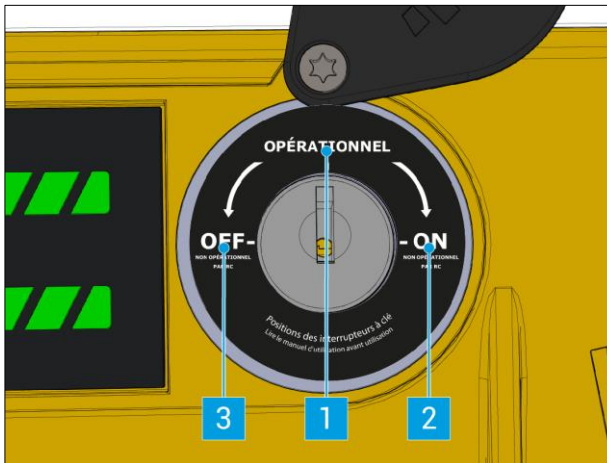


Figure 6-5: Key positions

POS.	LEGEND
1.	OPERATIONAL
2.	ON
3.	OFF

NOTE
Verify the functional test are preformed after installation.

7 SETUP MTinfo 3000

After installation and the functional test of the RDI 3000, you need to setup MTinfo 3000. The setup in MTinfo 3000 for the RDI 3000 is similar to that for the ZKL 3000 RC. It allows users who have experience with setting up a project for the ZKL 3000 RC, to create a project with one or more RDI 3000s.

It is also possible to combine more RDI 3000's and ZKL 3000 RCs in the same protection zone and to activate or deactivate them simultaneously. This allows a practical use of the RDI 3000 for different scenarios. Some examples are:

- projects with only RDI 3000s, containing one or multiple protection zones;
- combined projects with RDI 3000s and ZKL 3000 RCs.

The RDI 3000 and ZKL 3000 RC can be switched by the same project. Depending on the design and arrangement of the protection zones, the RDI 3000 and ZKL 3000 RC can be switched simultaneously or separately.

NOTE
For the setup of the RDI 3000 in MTinfo 3000 and terms of use of MTinfo 3000, refer to the User manual MTinfo 3000 web. You can download this manual from https://www.dualinventive.com/en/downloads.

8 SWITCHING

8.1 Introduction

After the functional test and the setup of MTinfo 3000, you can switch the RDI 3000:

- manually with the key;
- remotely with MTinfo 3000 or the app.

Before switching, please pay attention to the following:

- to protect against loss of signal to MTinfo 3000, the RDI 3000 can be switched to manual control with the key. Make sure the key to switch is always available on the project;
- without the key, phone/app or computer connection, the RDI 3000 cannot be switched.

8.2 Manual switching

8.2.1 Activation

Insert the key into the key switch and switch to the ON position.

The RDI 3000 goes into the active mode (LEDs illuminated, detonator plate on the track, flag raised).

The real-time status in MTinfo 3000 is set to:

- device status: Online (blue);
- switch status: Switched ON (green);
- key position: On;
- attached to track: Yes.

8.2.2 Deactivation

Switch the key to the OFF position.

The RDI 3000 goes into the inactive mode (LEDs off, detonator plate off the track, flag down).

The real-time status in MTinfo 3000 is set to:

- device status: Online (blue);
- switch status: Switched OFF (red);
- key position: Off;
- attached to track: No.

After 5 minutes, the RDI 3000 goes into the power off mode.

The real-time status in MTinfo 3000 is set to:

- device status: Offline (grey);
- switch status: Switched OFF (red);
- key position: Off;
- attached to track: No.

8.3 Remote switching

For remote switching, switch the key to the OPERATIONAL position.

NOTE
For remote switching the RDI 3000 in MTinfo 3000, refer to the User manual MTinfo 3000 web. You can download this manual from https://www.dualinventive.com/en/downloads.

NOTE
For remote switching the RDI 3000 in the app, refer to the User manual MTinfo 3000 app.

8.4 Daily inspections

During the operational period of the RDI 3000, check the following on a daily basis:

- the status of the flag;
- the status of the LEDs;
- the position of the lever;
- the visibility from the train driver's perspective;
- if foreign objects are blocking the visibility or functionality of the RDI 3000.

In case the lever is blocked by a foreign object, remove it and perform a functional test.

In case the flag is damaged by a foreign object, replace the flag with a new flag.

In case the lever or LEDs is damaged by a foreign object, take the RDI 3000 out of service. Quarantine the device and send it back to Dual Inventive.

9 TROUBLESHOOTING

9.1 Introduction

The RDI 3000 sends push notifications (MTinfo 3000 and app) or SMS messages (phone) to inform or warn the user. The user needs to act on the received message to resolve a potential problem. Ensure that the RDI 3000 is functioning correctly.

The RDI 3000 is equipped with an SD card to store data from the device. The SD card is not accessible to the user and can only be read by Dual Inventive. The user can access data of the RDI 3000 using MTinfo 3000. The SD card is not a safety-critical element. The SD card is only used as a back-up when data needs to be retrieved that, for some reason, is not visible in MTinfo 3000.

NOTE
If you frequently receive warning and error messages, contact Dual Inventive.

9.2 General problems

For general problems with the connectivity or MTinfo 3000, refer to the table below:

CONTEXT/CAUSE	SOLUTION
One or more devices in a project are offline.	The device could be defect. Check the device and perform a functional test. The batteries could be empty. Check the status of the batteries. When empty, recharge the batteries.
When starting, it is not possible to release the project.	The project design or project planning steps are not completed or one of the devices is not in the correct state. Please check the project and devices according to the feedback.
The app indicates that the project has not been released yet.	The app shows the person that needs to be contacted to release the project.
The person who is authorized to release the project is ill or cannot be reached.	Make sure that the keys of the RDI 3000 are always available on site. Please contact the work planner and assess whether the RDI 3000 can switched manually.

Table 9-1: General problems

9.3 Errors and Alerts

Users with switching rights on a released project will automatically receive alerts via text messages (SMS). Users' mobile phone number is entered as alarm number within the user profile to enable this. The notification service starts as soon as the RDI 3000 has been assigned to a project and the project is released. It is the responsibility of the recipient to act upon these alerts.

The text message alerts that require action are:

ALERT	EXPLANATION	ACTION
RDI 3000 "Serial Number" * is offline. Please check manual for more information	RDI 3000 with ID "Serial Number" is offline. The RDI 3000 cannot make a connection to MTinfo 3000.	Restart the device, move the device 10 meters or check the Status page for network outage. If this doesn't solve the issue contact Dual inventive
RDI 3000 "Serial Number" is NOT against the track. Please check the manual for more information	RDI 3000 with ID "Serial Number" * is NOT against the track. The RDI 3000 might have been removed from track.	Go to the device location and check if the RDI 3000 is correctly installed. Reinstall the device. If this doesn't solve the issue replace the device and return it for service.
RDI 3000 "Serial Number" has a broken led group. Please check the manual for more information.	RDI 3000 with ID "Serial Number" * has a broken led group. The RDI 3000 light indication is not sufficient any longer.	Deactivate and activate the device by key. If this doesn't solve the issue replace the device and return it for service.
RDI 3000 "Serial Number" * detonator state is NOT ok. Please check manual for more information.	RDI 3000 with ID "Serial Number" * detonator state is NOT ok. The RDI 3000 cannot guarantee the detonator is on track.	Go to the device location and check if the RDI 3000 is correctly installed. Reinstall the device. If this doesn't solve the issue replace the device and return it for service.
RDI 3000 "Serial Number" * The backup battery is CRITICAL, the main battery is CRITICAL. Please check manual for more information	Both batteries of RDI 3000 with ID "Serial Number" are critical. The system will send a new alert as soon as one of the batteries is getting depleted.	Replace the Main battery with a full main battery as soon as possible.
RDI 3000 "Serial Number" * The backup battery has sufficient power, the main battery is CRITICAL. Please check manual for more information	The main battery of the RDI 3000 with ID "Serial Number" is critical and the backup battery is ok (either full or half full). The system will send a new message as soon as one of the batteries will reach the next depletion level.	Replace the Main battery with a full main battery as soon as possible.
RDI 3000 "Serial Number" * The backup battery is CRITICAL, the main battery has sufficient power. Please check manual for more information	The backup battery of the RDI 3000 with ID "Serial Number" is critical and the main battery is ok (either full or half full). The system will send a new message as soon as one of the batteries will reach the next depletion level.	Check the status of the backup battery in a few hours. If after a few hours it is still not charged then replace the battery.
RDI 3000 "Serial Number" * The backup battery has sufficient power, the main battery is DEPLETED. Please check manual for more information	The main battery of the RDI 3000 with ID "Serial Number" is depleted and the backup battery is ok (either full or half full). The system will send a new message as soon as the ok battery reaches the next depletion level.	Replace the Main battery with a full main battery as soon as possible.
RDI 3000 "Serial Number" * The backup battery is DEPLETED, the main battery has sufficient power. Please check manual for more information	The backup battery of the RDI 3000 with ID "Serial Number" is depleted and the main battery is ok (either full or half full). The system will send a new message as soon as the ok battery reaches the next depletion level.	Check the status of the backup battery in a few hours. If after a few hours it is still not charged then replace the battery.

RDI 3000 "Serial Number" * The backup battery is DEPLETED, the main battery is CRITICAL. Please check manual for more information	The backup battery of the RDI 3000 with ID "Serial Number" is depleted and the main battery is critical. The system will send a new alert as soon as the main battery is depleted.	Replace the Main battery with a full main battery as soon as possible. Check the status of the backup battery in a few hours. If after a few hours it is still not charged then replace the battery.
RDI 3000 "Serial Number" * The backup battery is CRITICAL, the main battery is DEPLETED. Please check manual for more information	The main battery of the RDI 3000 with ID "Serial Number" is depleted and the backup battery is critical. The system will send a new alert as soon as the backup battery is depleted.	Replace the Main battery with a full main battery as soon as possible. Check the status of the backup battery in a few hours. If after a few hours it is still not charged then replace the battery
RDI 3000 "Serial Number" * The backup battery is DEPLETED, the main battery is DEPLETED. Please check manual for more information	Both batteries of RDI 3000 with ID "Serial Number" are depleted.	Replace the Main battery with a full main battery as soon as possible. Check the status of the backup battery in a few hours. If after a few hours it is still not charged then replace the battery.
RDI 3000 "Serial Number" * The backup battery is CRITICAL, the main battery has been REMOVED. Please check manual for more information.	The backup battery of the RDI 3000 with ID "Serial Number" is critical and the main battery has been removed. The system will send a new alert as soon as the backup battery is depleted.	Install a full main battery as soon as possible. Check the status of the backup battery in a few hours. If after a few hours it is still not charged then replace the battery.
RDI 3000 "Serial Number" * The backup battery is DEPLETED, the main battery has been REMOVED. Please check manual for more information.	The backup battery of the RDI 3000 with ID "Serial Number" is depleted and the main battery has been removed. The system will send a new alert as soon as the backup battery is removed.	Install a full main battery as soon as possible. Check the status of the backup battery in a few hours. If after a few hours it is still not charged then replace the battery.

Table 9-2: error and alerts

9.4 Errors and Alerts - reminders

For the offline and critical events a reminder system is introduced. The reminders are helping the user to remind that there is an unresolved issue with a specific RDI 3000.

Battery notifications already have an implicit reminder system as the user is notified when the main or backup battery reaches critical and depleted levels.

NOTE
Reminders do not relieve the user of his responsibility to go immediately to the device to inspect it when receiving the first alert massage!

Please, always consult the Real Time Status for the up-to-date situation.

A reminder is sent after a 15-minute interval. A maximum of 3 reminders are sent for one continuously 'not ok'-situation. Reminders are only sent when the device is in active state (i.e. in an activated protection zone).

The reminder text messages are:

ALERT	EXPLANATION	ACTION
Reminder: RDI 3000 "Serial Number" * is offline. Please check manual for more information	Reminder message when the device is offline and the device is in an activated protection zone.	Restart the device, move the device 10 meters or check the Status page for network outage. If this doesn't solve the issue contact Dual inventive
Reminder: RDI 3000 "Serial Number" is NOT against the track. Please check the manual for more information	Reminder message when the device might have been removed from track or moved to a different place.	Go to the device location and check if the RDI 3000 is correctly installed. Reinstall the device. If this doesn't solve the issue replace the device and return it for service.
Reminder: RDI 3000 "Serial Number" has a broken led group. Please check the manual for more information.	Reminder message when the device light indication is not sufficient any longer.	Deactivate and activate the device by key. If this doesn't solve the issue replace the device and return it for service.
Reminder: RDI 3000 "Serial Number" * Detonator state is NOT ok. Please check manual for more information.	Reminder message when the device cannot guarantee the detonator is on track.	Go to the device location and check if the RDI 3000 is correctly installed. Reinstall the device. If this doesn't solve the issue replace the device and return it for service.

Table 9-3: error and alerts reminders

10 MAINTENANCE

10.1 Periodic maintenance

CAUTION
Maintenance of the RDI 3000 by the service department of Dual Inventive is required once every four years, if the correct monitoring subscription is in place.

NOTE
The warranty on the RDI 3000 expires when the periodic maintenance is not performed.

The RDI 3000 is designed to operate at a railway track. Tests have been done to ensure the correct operation of the RDI 3000 in an environment where it is exposed to all kinds of weather, shocks, vibrations and electromagnetic signals. The RDI 3000 and the accessories are designed to work at least four years without maintenance by Dual Inventive if the correct monitoring subscription is in place. MTinfo 3000 issues a message one month prior to the service and when the service date has passed. Consult the responsible user for maintenance and remove the RDI 3000 from track for service.

The service date and the maintenance intervals are limited to the RDI 3000 without the detonator. Detonators do have a shelf life. This must be checked by the user of the RDI 3000.

DANGER
Remove detonators when the RDI 3000 device is sent back to Dual Inventive for maintenance.

10.2 Cleaning

The LEDs are covered with a plastic transparent cover for easy cleaning. Clean the cover and the RDI 3000 with a soft, wet cloth.

CAUTION
Do not use aggressive cleaning agents.

The flag can get dirty from all sorts of debris in and around the track. The RDI 3000 is designed to quickly replace the flag by a new one.

10.3 Accessories

Dual Inventive provides the following accessories for the RDI 3000:

- main battery;
- battery cable;
- Y-splitter;
- clamp;
- 4-digit combination padlock;
- red allen key;
- flag.

Please contact the Dual Inventive sales department for ordering and information about accessories.

10.4 Detonator plate Installation

Before you start the installation procedure select a clean, well-lit area. PPE such as safety goggles, standard leather gloves and ear mufflers are essential when handling the detonator plate.

WARNING

- Operations carried out by unqualified personnel are forbidden.
- Ensure your space isolated and enclosed as the detonator emits an acoustic signal up to 155-160 dB at 10 meters.

NOTE

Refer to the safety data sheet for comprehensive precautions specific to the detonator.

Tools:

- 2x Pop rivet; A2 SS 4X8mm
- Hand riveter; 10mm

Method:

1. Load the rivet into the riveting tool's nosepiece (the front end).
2. Securely position the detonator into the central aperture of the plate.
3. Position the riveting tool through the holes on both ends of the detonator plate. The rivet's stem should stick out through the hole and touch the materials' surface.
4. Firmly squeeze the handles of the riveting tool together. As you squeeze, the rivet's stem will begin to deform, expanding the rivet body and creating a secure joint between the materials.
5. Continue squeezing the handles until you hear a pop sound. This indicates that the rivet has been properly set, and the stem has broken off.
6. After setting the rivet, inspect the joint to ensure it is secure and flush with the surface. If the rivet's head is protruding, the rivet may not have been set correctly.
7. Repeat the process for the second rivet.

10.5 Detonator plate Removal

Before you start the removal procedure, select a clean, well-lit area. PPE such as safety goggles, standard leather gloves and ear mufflers are essential when handling the detonator plate.

WARNING

- Operations carried out by unqualified personnel are prohibited.
- Ensure your space isolated and enclosed as the detonator emits an acoustic signal up to 155-160 dB at 10 meters.

NOTE

Refer to the safety data sheet "FDSP_QPE004545_PETARD_45_07_EN" for comprehensive precautions specific to the detonator.

Tools:

- Power Drill on drill mode with lowest speed setting (1). Percussion drill mode is prohibited.
- 1x Drill bit; Cobalt 4mm or 4.5mm

Method:

1. Insert the selected drill bit into the chuck of the power drill. Tighten the chuck securely to hold the drill bit in place.
2. Ensure the detonator plate is securely held on the wooden block to prevent movement during drilling.
3. Position the drill bit precisely over the centre of the rivet head on the plate.

WARNING

Exercise caution during the drilling process. Drilling the cap could pose a potential risk in case of slippage. Avoid accidental hits on the cap or integral casing of the detonator.

4. Turn on the power drill and apply moderate pressure to the rivet head. Drill straight down into the centre of the rivet head. Allow the drill bit to work its way through the rivet material.
5. Continue drilling until the rivet head is entirely removed. This will free the plate from the rivet.
6. Repeat the process for the second rivet.
7. Once the rivet heads are removed, you should be able to easily remove the plate from its original position.

NOTE

- The detonator must be stored safely within temperature range of –20 to +50°C for reuse (when not detonated yet).
- Erase any signs of surface corrosion using a damp cloth.

8. Use pliers or a suitable tool to grip the remaining rivet shaft and pull it out completely.

9. After removing the plate and rivets, inspect the area to ensure there are no sharp edges or debris left behind.

11 DISPOSAL

The RDI 3000 contains harmful substances which must never be disposed into the environment. Dispose the RDI 3000 correctly so that the materials can be recycled.

CAUTION
The owner of the RDI 3000 is responsible for proper disposal.

Dual Inventive offers a service for a responsible collection and recycling of the RDI 3000. Please contact Dual Inventive for this service.

DANGER
Remove detonators when the RDI 3000 device is sent back to Dual Inventive for disposal.

If no take-back agreement has been made, consult local authorities and specialized disposal companies. They will provide information about environmentally responsible waste processing.