MAXAM Deutschland GmbH
Zünderwerke Ernst Brün

ZEB Blaster OP

User Manual V1.1

MAXAM Deutschland GmbH
Zünderwerke Ernst Brün
Boschstraße 10a - 45770 Marl – Germany
Tel: +49 2365 5020 900
E-Mail: zeb@zeb.maxam.net
Web: www.zeb-maxam.com

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Introduction

The ZEB Blaster OP is a high voltage Shock Tube Initiation System. The battery powered device charges a high voltage capacitor and discharges it by command into an electrode to generate a powerful spark to initiate shock tubes.

ZEB Blaster OP (Left: Slave Mode, Right: Master Mode)

The following document will give an overview on functions and safety issues of ZEB Blaster OP. There will be a focus on operation in different modes, safety, accessories, handling and maintenance.

ZEB Blaster OP (Local Mode preparation)

Safety information and Overview

Explanation of symbols

Caution! Read this instruction manual carefully before using the device, even if you already have experience and pertinent training in blasting technology!

Warning: High Voltage! Risk of electrical shock!

The device may only be used by trained and qualified personnel under observation of the applicable regulations and ordinances. It may only be transferred to third parties with the instruction manual. Access to the machine by unauthorized persons must be prevented.

It is not allowed to power the ZEB Blaster OP with an external power source other than the delivered. Do not blast while connected to a power net!

Only touch the electrode or the socket at the end of the flex-electrode cable when the device is fully discharged (OFF), since a very high DC voltage is present at the terminal while ignition. There is a risk of burns from the ignition spark. The device may only be triggered when the centering cap is installed!

Proper use:

The ZEB Blaster OP features a battery cut power switch. Only turn to switch on and push down to switch off. Always switch machine off after operation is finished. The equipment will take permanent damage if power stays on until battery cell damage. Battery states are indicated by light signals.

CAUTION! Always switch equipment off (push power button down) after operation!

Always stow antenna and flex electrode in the top of the housing. Replace ignition electrode when the spark is no more powerful to initiate shock tubes. Do not connect battery charger while operation.

BAM Homologation

Each Zeb Blaster OP is tested during quality control while the manufacturing process. The equipment is homologated by the BUNDESANSTALT FÜR MATERIALFORSCHUNG UND -PRÜFUNG (BAM) (German Federal Materials Research and Testing Institute).

Improper use

Never use the ZEB Blaster OP in mines with a methane or coal dust explosion hazard or in other areas with explosion hazards. The device is not designed for use in explosive environments. (Not explosion-proof). It is strictly prohibited to do any physical changes to the device. This could lead to safety technology defects, possible material damage or personal injury during blasting work, and to the destruction of the equipment. Never attach any other adapters or Antennas to the antenna terminal than products provided by the manufacturer. Test products are homologatedOnly use the provided antenna that comes with each blaster according to the mounted radio module or ZEB approved antennas matching to the mounted radio module. The ZEB Blaster OP must only be used in accordance with the specified guidelines.

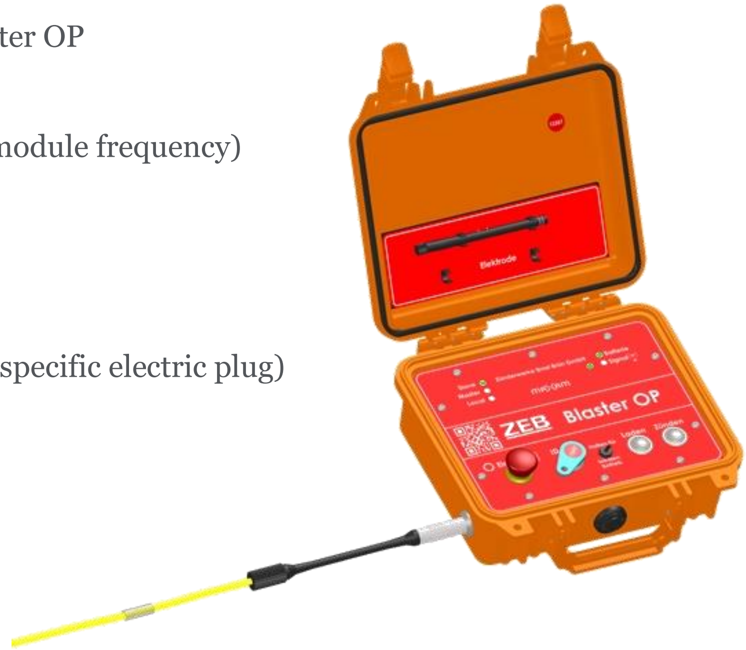
Transportation and storage

Please inspect the packaging immediately upon receipt and the device during unpacking for any visible outer damage. Store all parts in the transport bag or the original packaging in case return shipment becomes necessary. Only the original packaging may be used for return shipment. Secure all parts and protect them from damage. Be sure that the equipment is switched OFF.

The ZEB Blaster OP is powered by a rechargeable 12V/4Ah lead battery. An absorbent glass mat and the ABS housing grants this battery a classification as non-spillable and it is declared as non-dangerous good by IATA, FAA, ADR and IMDG. It can be stored in any position without leakage. The battery cut off switch in combination with this battery type allows a transport by plane without any internal disassembling.

Scope of delivery

- Shock Tube Initiator ZEB Blaster OP
- Unique ID Chip
- Antenna (matching the radio module frequency)
- Flex-Electrode cable
- Ignition electrode
- Centering cap
- World battery charger (region specific electric plug)
- This Instruction Manual



Technical data

Type	ZEB Blaster OP
Operating principle	Electronical
Power Supply	12V/4Ah rechargeable lead battery
Weight	~4kg
Dimensions (LxWxH)	220 x 180 x 70 mm
Standard Antenna	λ/2
Voltage (max)	Approx. 1800 V
Capacity	330 nF
Electrode	Approx. 500 ignitions (ideal)
Range	Approx. 2000m
Transmitting power	<500mW
Frequency	868MHz (Region 1) 915MHz (Region 2)
Protection	IP67
Temperature Range	-20°C to +55°C
Optional antennas	Magnet unidirectional

Region 1 & 2 Countries

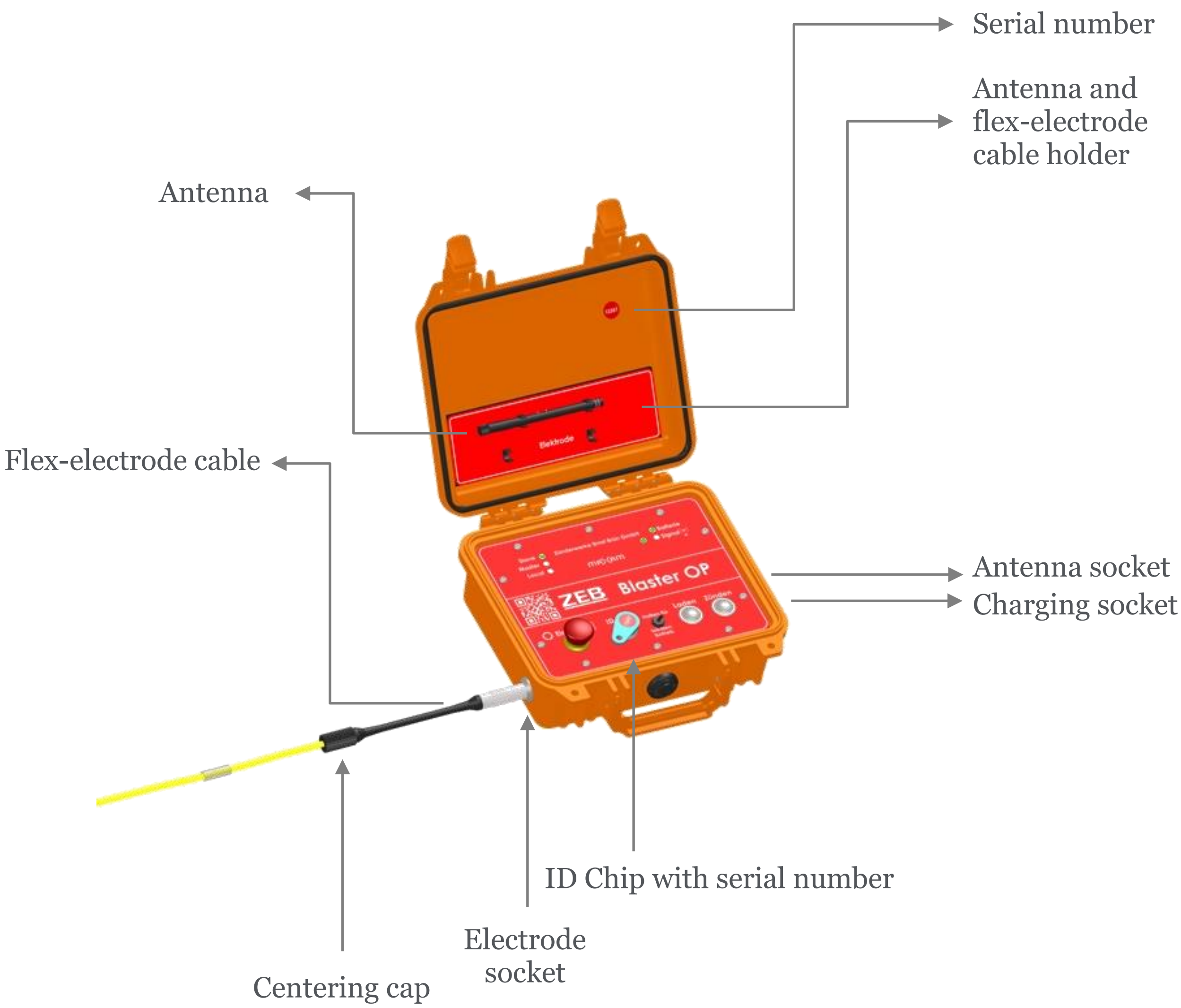
Region 1: 868MHz Orange
Region 2: 915MHz Grey

Dimensions

LxWxH: 220 x 180 x 70 mm

Explanation of material

For a better understanding of this user manual the explosion chart shows the most important parts and positions of components.



LED color code

The ZEB Blaster OP is equipped with several indication lights:

Upper indication

Power LED	green	Battery good
Power LED	orange	Battery medium
Power LED	red	Battery empty
Link LED	green	Signal Connect
Act LED	green	Command received
Slave LED	green	Slave mode
Master LED	blue	Master mode
Local LED	red	Local mode

Lower indication

ID Chip LED	green	Memory OK
ID Chip LED	red	Memory fault
Charge LED	green	Charging
Charge LED	red	Generator fault
Fire LED	green	Ready to fire
Fire LED	red	Slave fault

ZEB Blaster OP (front panel)

Buttons and switches

The ZEB Blaster OP is equipped with several buttons and switches:

Element	Action	Result
Power Button	Turn	Power ON
Power Button	Push down	Power OFF
Local Operation Switch	Hold upwards	Enable Local Mode (only if matching ID Chip is attached)
Charge Button	Push down	Charge Generator
Charge Button	Release	Discharge Generator
Fire Button	Push down	Fire (only if Charge Button is still pressed)

QR Code

Scan QR code with any App without internet access

The QR code on the front panel features a short user guide how to operate the equipment in the different modes. The language in the code is according the customer requirements.

Housing overview

Housing upwards and on the ground

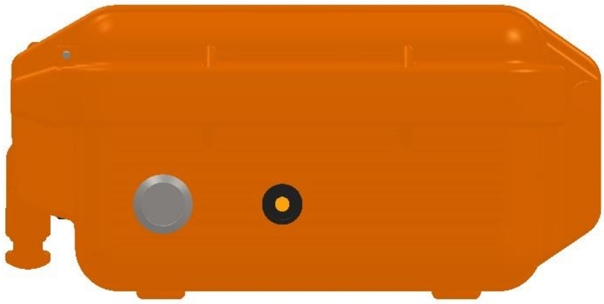
The PELI housing is equipped with two waterproof sockets for battery charging and flex-electrode. There is also a sealed socket for the antenna.

Housing left side

Housing left side with electrode socket

The flex-electrode must be mounted to the left side of the housing. It simply needs to be pushed into the socket. Socket and plug are coded with 2 pins to prevent damage by plugging wrong cables into wrong sockets.

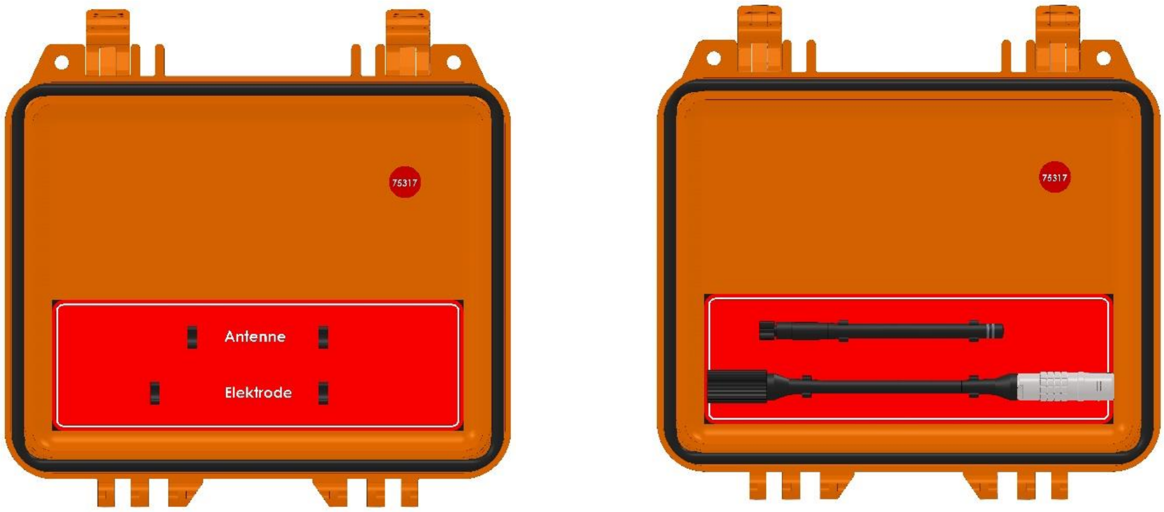
Housing right side



Housing right side with battery charge and antenna sockets

The battery charger must be mounted to the right side of the housing. It simply needs to be pushed into the socket. Socket and plug are coded with 3 pins to prevent damage by plugging wrong cables into wrong sockets. Next to the battery charger socket the RP-SMA socket for the antenna is located. It is protected against hit and water by a custom holder socket.

Housing top



Housing top with accessories holder and equipped accessories

In the top of the blaster the standard antenna according to the mounted radio module and the flex electrode cable are fixed. The flex-electrode cable features an automatic waterproof push-pull plug.

ID Chip reader

ID Chip reader with LED indication and ID Chip

To ensure a very high safety level during trainings and operation the ZEB Blaster OP is equipped with unique ID-Chips. Each equipment is programmed with a unique ID Chip. Only with the matching ID Chip a blaster can be remote controlled or initiated.

Local Initiation Switch

SPDT switch for Local Operation mode change

If a blaster should not operate in Master or Slave Mode because the operator wants to locally initiate a blast, the matching ID Chip needs to be placed on the ID Chip reader the Local Mode switch needs to be pushed upwards until the mode LED switches to local (red). The operator can now charge and initiate the blaster. As soon as the ID Chip is removed from the reader no more initiation is possible and the blaster switches back to Slave Mode.

Flex-Electrode Cable

SPDT switch for Local Operation mode change

On the left side of the blaster the flex-electrode cable needs to be connected. At the end the centering cap holds the ignition electrode in place.

Operation modes

The Zeb Blaster OP features three independent operation modes. The Local Operation Mode allows the operator to charge and fire the blasters generator. Additionally, two radio modes are available. In Master Mode the blasters generator is disabled and the blaster becomes a controller. In Slave Mode all buttons are disabled and the blaster becomes a remote-controlled unit. The modes are switched automatically by attaching and removing the unique ID Chip.

Slave Mode Operation

Slave Mode with accessories

In Slave Mode the equipment is in the basic start up state. Charge and Fire buttons are disabled, as is the local operation toggle switch. The Slave Mode indication LED lights green. Antenna and flex-electrode should be mounted. The equipment can only be operated by a Zeb Blaster OP in Master Mode with the slave's unique ID Chip attached.

Master Mode Operation

Master Mode with accessories

To switch to Master Mode any other blasters ID Chip can be attached. The equipment will detect a mismatch between the internal ID and the attached ID Chip and will automatically switch to Master Mode. In Master Mode the internal high voltage generator is disabled. The Charge and Fire buttons control the ID Chip’s matching Slave’s functions and generator. The Master Mode indication LED lights blue. Antenna should be mounted while flex electrode is not used. The equipment can only operate one Slave at a time. As soon as the ID Chip is removed the blaster will revert to Slave Mode until another not matching ID Chip will be attached.

Local Mode Operation

Local Mode with accessories

The Local Mode allows the operator total control on all components of the system. To switch to Local Mode the blasters own ID Chip needs to be attached to the equipment. The equipment will detect a match between the internal ID and the attached ID Chip and stay in Slave Mode. Once the Local Operation toggle switch is held up for some seconds the blaster will switch to Local Operation Mode and the red local LED will light up. The toggle switch can be released. The blaster stays in Local Mode until the ID-Chip will be removed. The operator has full control on the internal high voltage generator and the Charge and Fire buttons.

The Antenna is not needed for this operation and can stay stowed in the holder in the top. The flex-electrode cable is mandatory to connect the blaster with the shock tube. Caution! Observe safety distance!

As soon as the ID Chip is removed the blaster will revert to Slave Mode.

How to operate:

Always keep in mind to switch all Blasters OFF after operation! The ID Chips are unique. A loss will cause the resend the blaster to ZEB for reprogramming a new ID Chip!

WARNING!! Keep a minimum distance of >5m between each Blaster. If used with a shorter distance the radio modules will be damaged!!

Slave Mode operation

1. Prepare the blasting site. Connect all shock tube detonators and delays. Be sure the ZEB Blaster OP's battery is charged.
2. Clear the blasting site from staff, check for a safe blasting site.
3. Connect the antenna to the right side.
4. Connect the flex-electrode cable with mounted ignition electrode and centering cap.
5. Remove the ID Chip (if not already done).
6. Switch on the ZEB Blaster OP by turning the power switch for 30° left or right and pull gently upwards. All LEDs will light up for initialization.
7. If the battery LED is lighting orange or red the battery needs to be recharged!
8. Cut off about 50cm of the starting shock tube to ensure there is no humidity in the tube.
9. Insert the shock tube into the ignition electrode.
10. Close top and leave for a safe initiation position.
11. Operation with another ZEB Blaster OP in Master Mode
12. After the blast stow antenna and flex-electrode cable in the top of the blaster and push down power button to switch it OFF.

Place the antenna on an elevated position for example on a tripod to lift it from the ground. To increase the range of the system.

Master Mode operation

1. Prepare a ZEB Blaster OP as slave.
2. Take the slave ID Chip with you.
3. Clear the blasting site from staff, check for a safe blasting site.
4. Prepare a second ZEB Blaster OP as designated master by removing the ID Chip and connecting the antenna. This second ZEB Blaster OP is now referred as master.
5. Switch on master by turning the power switch for 30° left or right and pull gently upwards. All LEDs will light up for initialization.
6. If the Battery LED is lighting orange or red the battery needs to be recharged!
7. Place the slave's ID Chip on reader. The Blaster will switch to blue Master Mode.

   ⚠ If the slave is in range the master unit has now total control about the slave.

8. The signal LED will light as long as the controlled slave is in range and communication is stable. The act LED will flash during command transmission about every second.
9. To start charging process of the slave press and hold the master's Charge button.
10. When the slave is ready to fire the Charge button and Fire button illumination will light green.
11. To initiate the blast additionally press the Fire button. Then release all buttons.
12. After the blast stow antenna in the top of the blaster and push down power button to switch it OFF. Remove the Slave's ID Chip and stow it.
13. Pick up slave blaster and switch it off. Stow slaves flex-electrode cable and antenna in the slave's top. Recharge all blasters if needed.

⚠ Place the antenna on an elevated position for example on a tripod to lift it from the ground. To increase the range of the system.

Local Mode Operation

1. Clear the blasting site from staff, check for a safe blasting site.
2. Switch on the ZEB Blaster OP by turning the power switch for 30° left or right and pull gently upwards. All LEDs will light up for initialization.
3. If the battery LED is lighting red the battery needs to be recharged!
4. Place ID Chip on the reader.
5. Hold the local operation toggle switch upwards until the blaster switches to red Local Mode.
6. Once Local Mode is active release the toggle switch.

⚠ The operator now has total control about the generator.

7. Connect the flex-electrode cable to the left side of the blaster and attach the shock tube.
8. To start charging process press and hold the Charge button.
9. When the blaster is ready to fire the Charge button and Fire button illumination will light green.
10. To **initiate** the blast additionally press the Fire button. Then release all buttons.
11. After the blast stow the flex-electrode cable in the top of the blaster and push down the power button to switch it OFF. Remove the ID Chip and stow it.
12. Recharge all blasters if needed.

Recharging the battery

Every equipment comes with an automatic charging unit with indication led.

ZEB Blaster OP World Charger

The socket can be changed according to the local power network. The Charger can handle 120-230V for worldwide usage. The Charger is equipped with a waterproof automatic plug that connects to the power socket on the equipment's right side (3pin). The plug is coded and only fits in the charging socket. To fully recharge the battery, it needs about 10hours. The Charger will automatically regulate the current to optimize the loading procedure and protect the battery.

Antenna Guidelines

- Always setup antennas vertical
- A line of sight is not mandatory but an advantage
- Trees or vegetation at all attenuate the radio signals
- Structures like solid rock or metal reflect radio signals
- **A raised antenna position of >1m** over the ground improves range enormous
- Do not block the signal with metallic or other solid bodies
- Reduce radio communication if possible to avoid radio disturbances
- Do never place any sensible (TYPE S) electric detonators close to the equipment while it's operating because of the transmission power of 500mW over the air

Examples:

Slave Mode

Master Mode

Faults

The equipment can help the operator to make a diagnosis in case something is not working properly.

Fault Explanation Table

Charge button lights red	Generator cannot reach target voltage. A hardware damage to the generator might have occurred.
Fire button doesn't light while pressing Charge button	Generator reached target voltage, but can't fire. A hardware damage to the initiation circuit might have occurred.
Link LED switches off in Master Mode	No or only broken commands are received within the allowed communication window. Reduce distance to target, avoid metal structures, lift the antennas higher over the ground or change the position relative to the target. Keep in mind to always setup the antenna upwards.
Battery status LED lights orange	Only local initiations are permitted. The radio module's large power consumption might disturb the generators properties. Recharge the Blaster salve or exchanging master and slave might help.
Battery status LED lights red	No operation permitted. Battery empty. Switch blaster off and recharger for 12h.
Blaster does not switch to Slave Mode once the own ID Chip is placed on reader	In case a blaster acts as master and is used for a sequence of several slave blasts it switches back to Slave Mode once the ID Chip was removed. If it does not accept its own ID Chip to do a local operation, switch off the blaster. Always switch off the blaster after the blasting operation. Then retry and activate local mode.
All LEDs flashing	In case the radio signal is disturbed by other radio signals at the same frequency, the blaster might start flashing of all LEDs. Switch off the blaster and restart it. It will act normal.

Accessories & Spare Parts

ZEB offers some accessories for the ZEB Blaster OP like other Antennas or transport cases.

Magnetic Universal Antenna

In case the slave blaster is hidden behind a rock or the operator needs protection in a bunker it is possible to use the unidirectional magnetic universal antenna. It features a 3m connection cable.

Flex-Electrode Cable, Centering Cap & Ignition Electrode

If the flex-electrode cable is damaged or missing a replacement is available. This also counts for the centering cap and the ignition electrodes. The ignition electrodes are wear parts and need to be replaced once their energy spark couldn't ignite a shock tube anymore.

Transport Bag for up to two blasters

For an easy transportation of two units as a classic setup we designed a transport bag. The bag holds two blasters and is equipped with an additional compartment for accessories like spare electrodes, antennas, charging units, etc…

Charging Unit & Regional Plugs

The Charger can handle 120-230V for worldwide usage. It is equipped with a waterproof automatic plug that connects to the power socket of the equipment. Different power plugs are available for regional power networks.

Maintenance

Regular inspections

The functional and safety technology features of the ZEB Blaster OP must be inspected at regular intervals within the framework of quality assurance. The responsible operating company must define a suitable interval and the type and scope of this inspection. The respective applicable legal or agency regulations and ordinances for blasting technology accessories must be observed. Subject to other requirements, we recommend a maximum testing interval of 2 years for the energy output analysis at the manufacturer.

Cleaning, Service, Maintenance, and Disposal

Do not use any aggressive cleaning agents (solvents or the like), only a cloth moistened with a mild soap solution. Ensure that no liquid gets into the device and dry it with a soft, dry cloth. Large amounts of dirt must be removed immediately. Take care to ensure that the sockets for electrode, charging unit and antenna are kept clean. Also take care of the ID Chip reader. The device is subject to type testing by BAM and LOM. This prerequisite requires that the service personnel have years of experience and a thorough knowledge of the design and function of the ignition system. Necessary inspections, maintenance, and repairs may only be performed by ZEB or by local partners authorized by ZEB. Only original spare parts may be used.

The old device may not be disposed of in household waste.

Warranty

The regular one-year warranty and conformity expires in case of

- non-observance of the manufacturer guidelines in the instruction manual
- use not conforming to the described application
- modification of the device
- mechanical damage and damage due to substances or liquids

The warranty expires with natural wear and tear.