User Manual

RT-B77 HELB

High Efficiency Locator Beacon

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NOTE

RHOTHETA Elektronik GmbH reserves on making modifications at any time and without previous information of the here described product.

Contents

1 User Information

1.1 Legend of Symbols

NOTE
This symbol designates tips or additional notes that must be paid attention to and make work easier.

ATTENTION
Means that ignoring the instructions may lead to property damage or loss of data.

WARNING
Means that ignoring the instructions, there can be a danger to health or life.

2 EU Declaration of Conformity

Hereby RHOTHETA Elektronik GmbH declares that the product RT-B77 *HELB* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

The full text of the EU declaration of conformity is available at the following internet address: http://www.rhotheta.com/products/rt_b77_helb

The personal locator beacon RT-B77 *HELB* is determined for use in all Member States of the European Union except Belgium.

3 Security

RHOTHETA Elektronik GmbH is constantly trying to keep the safety standard of the products up to date and to offer the customers the highest possible level of security.

RHOTHETA products are designed and tested in accordance with the valid safety regulations. The compliance with these standards is continuously monitored by our quality assurance system. This product is manufactured in accordance with the EC Certificate of Conformity, tested and left the factory in perfect technical and safety-relevant condition.

To maintain this condition and to ensure safe operation, the user must pay attention to all instructions and warnings given. For any questions regarding these safety instructions, RHOTHETA Elektronik GmbH can be contacted at any time.

The observance of the safety instructions will help to prevent personal injury or damage caused by all kinds of dangers. This requires that the following safety instructions must be read carefully and understood before using the product, as well as observed when using the product. The additional safety instructions such as for protecting persons appear in relevant parts of the product documentation and must also be paid attention to.

In addition, it is the responsibility of the user to use the product appropriately. The product RT-B77 *HELB*, a professional emergency receiver, is intended for use at the man and may not be used in any way that a person / thing is injured or damaged.

The use of this product other than its designated purpose or in disregard of the instructions of the manufacturer is the responsibility of the user. The manufacturer takes no responsibility for the misuse of the product.

The manufacturer is not liable beyond the scope of legal rules!

This guide is part of the product RT-B77 *HELB* and is retained throughout the lifetime and to pass with the product.

3.1 Basic Safety

ATTENTION
Read and observe the following instructions, warnings and safety instructions!

- At all work, the local or national safety and accident prevention regulations must be observed.
- Use only by RHOTHETA Elektronik GmbH prescribed components and recommended material and do not change this.
- Connect only approved accessories kits or additional equipment.
- The product may only be opened by authorized service personnel.
- The unit voids its type approval on operating with unauthorized modifications on the device or by not intended use.

ATTENTION
Activate the beacon only in case of emergency. Activation by fault may cause an expensive rescue action, which has to be paid by the causer. Activation on the distress frequency (121.500 MHz) for test or training purposes without permission of the regulatory authority of the relevant country is strictly forbidden.

ATTENTION
Activation and transmission on any test frequency can disturb communication on the air band and occurs on the own risk of the RT-B77 *HELB* user. When performing any rescue training or transmissions on a training frequency, the user has to ask for permission at the appropriate local authority of the country where the beacon is used. The manufacturer assumes no liability for any consequences arising from unlawful use.

WARNING
The RT-B77 *HELB* is not buoyant. For operation on water the unit has to be fixed on a buoyant safety equipment, e.g. a life jacket. Combined with the specially designed bag it is buoyant as well.

WARNING
Don’t expose the RT-B77 *HELB* to extremely strong magnetic fields; these may cause unwanted activation or deactivation.

3.2 Safety - Batteries

ATTENTION
The battery replacement should be performed only by RHOTHETA Elektronik GmbH or an authorized service station. Otherwise the warranty claim will expire.

- Use only batteries that are destined for this product.
- Keep batteries away from children.
- Do not disassemble batteries, and do not insert them in the wrong orientation. Do not expose batteries to liquids, moisture, fire, or extreme temperatures.

4 Use, Characteristics

4.1 Use

The RT-B77 *HELB* is a microprocessor-controlled personal locator beacon (PLB) transmitting on the international civil distress frequency 121.500 MHz. The RT-B77 *HELB* is designed for professional use under rough conditions. It is optimised for MOB (man over board) applications.

WARNING
For use on water, the RT-B77 *HELB* shall be fixed on a life jacket, a survival suit, a life raft or other qualified personal safety equipment.

4.2 Characteristics and Special Features of the RT-B77 *HELB*

- The RT-B77 *HELB* is a light weight device offering high wearing comfort.
- Easy to use and extremely reliable in operation
- It features a self-test to check all important functions.
- Automatic activation by water immersion sensor
- Activation can be coupled to inflating life west with pull-away-contact.
- Very large transmitting range through very high output power (up to 2 W)
- Long-time transmitting endurance through microprocessor-controlled power-management
- Functional and operating feedback by LED and built-in speaker
- Status messages in clear text via integrated speaker
- Beacon-ID programmable by user (factory setting: serial no.)
- Beacon-ID transmitted as digital code.
- Beacon-ID transmitted as clear voice message (AM).
- Pre-selectable test/training frequency

- Waterproof housing
- Comfortable verifiability and maintenance via IrDA interface
- Software update via serial interface

5 Short Description

Pos.	Designation	Function	Chapter
1	Monopole Antenna	Straight monopole antenna	-
1a	90° Antenna	90° angled antenna for use with a life jacket	-
2	Function Indication LED	The **WHITE** LEDs are blinking when the RT-B77 *HELB* is activated or the self test indicates no failure	-
3	Water Immersion Activator	Water sensor for automatic activation if beacon is immersed into water	6.3.3
4	Status LED	LEDs (**GREEN**, **RED**) for visual status messages	-
5		Activation button for manual activation of the beacon	6.3.1
6	Pull-Away Activator	This clip activates the beacon manually if pulled away by hand or automatically if the cord is connected to the release of a life jacket.	6.3.2
7	IrDA Interface	IrDA interface, optical In/Out-port, used for maintenance and programming of customer specific test/training frequency and beacon identification	Separate service manual
8	Rotary Switch OFF / ARM	Main switch which is used to - arm the beacon. - switch off all working modes of the beacon.	6.2
9	Speaker	Output of voice status messages and sweep modulation of distress signal as acoustic feedback.	-
10		Test button used • to activate self test or • to swap into training mode.	6.5 6.6
11	Test LED	The **YELLOW** LED is blinking • while unit is carrying out a self test. • when unit is switched into the training mode.	6.5 6.6
12	Battery Pack	The battery pack contains 2 pieces lithium 9 V blocks $LiMnO_2$.	
13	Short Instruction		-

6 Operation

6.1 Short Instruction for Use

There are three points you should observe when using routinely the beacon RT-B77 *HELB*.

I. While or after you have fastened your rescue equipment (life west), turn the rotary switch (8) into position **ARM** (see below chapter 6.2)**.**
II. Check the beacon → Press the button **TEST** (10) for about 1 second and wait for the voice message "**Test OK**".
III. When taking off your life west turn the rotary switch (8) into **OFF-**position in order to avoid false alarm while storing the rescue equipment.

NOTE
There is no harm to battery life leaving the rotary switch in **ARM**-position, because the beacon doesn't consume battery power while it's in standby mode. Switching off will prevent false alarm.

6.2 Arming the Beacon

Turn rotary switch (8) into position **ARM**.

The beacon is now standby (armed) and all functions are available:

a) Activation
b) Self test function
c) Training mode
d) Service mode

NOTE
In this mode the unit does **not** consume any battery power.

6.3 Activation

Before the beacon can be activated, it has to be armed with the rotary switch (see chapter 6.2).

The RT-B77 *HELB* features 3 different ways of activation (see below chapter 6.3.1; 6.3.2; 6.3.3).

If the RT-B77 *HELB* is activated, the **white** function indicating LEDs (2) in the antenna and the **green** status LED (4) are blinking. After activation a sweeping sound can be heard for about 2 seconds. After 30 seconds the beacon ID will be indicated acoustically. During activation the sweeping tone of the distress signal modulation is given out every 30 seconds for duration of 2 seconds.

NOTE

Every activation will be recorded by the microcontroller. Activation on the distress frequency will break a “software-seal”. This flag is set and will be displayed on the *User Config Tool* and can only be reset by RHOTHETA Elektronik GmbH or an authorized service partner. The user cannot reset it.

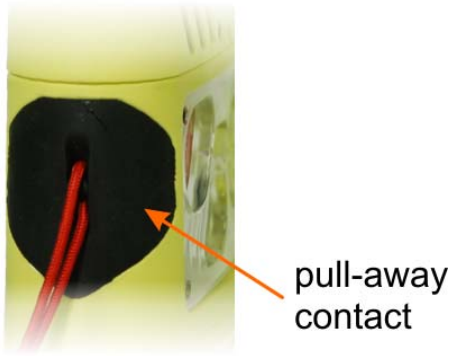
6.3.1 Manual Activation

Press the activation button (5) for minimum 1 second. The RT-B77 *HELB* will start transmitting.

6.3.2 Pull-Away Activator

If the pull-away activator (6) is removed from its place on the housing for more than 3 seconds the RT-B77 *HELB* will start to transmit.

NOTE
We recommend connecting the pull-away contact to the life jacket by the means of a cord in a way that it will be removed when the life jacket is inflated.



ATTENTION
The pull-away contact has to be placed in the right direction. The pointed end of the clip has to be orientated to the bottom of the housing.

NOTE
On special request the Pull-Away Activator could be disabled and is not removable.
Modified beacons are marked by a label.

6.3.3 Water Contact

If the RT-B77 *HELB* is immersed into water for more than 10 seconds the PLB will be activated automatically. For that the water contacts behind the slots have to be bridged by water.

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NOTE
On special request the water-contact could be disabled. Modified beacons are marked by a label.

6.4 Switching OFF

Turn the rotary switch (8) into position **OFF**. Now the RT-B77 *HELB* is switched off. The manual activator, the pull-away activator, the water contact and the test button are disabled. If there was a function active (standard, service, test) it will stop with the voice message: "**Power OFF**".

If the RT-B77 *HELB* was just armed you will get no acoustic feedback.

NOTE

Also, in this case the unit did not consume battery power.

6.5 Self Test

The rotary switch (8) is in position **ARM**. When pressing the button **TEST** (10) for about 1 second**,** The RT-B77 *HELB* will carry out a self-test procedure. It will check internal electronic parameters and the battery's condition.

During the test the **YELLOW** Test LED (11) is blinking. If no failure is detected and not more than 10% of the battery capacity is lost, the self test finishes with the voice message: "**Test OK**". The **green** status LED (4) and the **white** function indicator (2) will blink 3 times.

If a failure is detected or the battery is not in proper condition (less than 90% of its capacity), the status LED (4) is blinking **RED** and the speaker will put out a failure description.

ATTENTION
If failures are indicated, the beacon has to be brought to service at an authorized service station before next use.

Status LED	Voice Message	Failure Description
Blinks 3 times **GREEN**	"Test OK"	Beacon is OK, no failure detected
Blinks 2 times **RED**[1]	"Battery Error, Need Service"	Battery voltage is low or capacity is less than 90%, battery has to be replaced
Blinks 3 times **RED**	"Low Power Error, Need Service"	There is no sufficient RF-Power, beacon needs service (only advanced self test)
Blinks 5 times **RED**	"Transmit Error, Need Service"	Failure in RF transmitting circuit detect-ed (only advanced self test)
Blinks 4 or 6 times **RED**	"Error, Need Service"	Failure in electronics, beacon needs service

NOTE

The advanced self-test routine (factory setting) activates the complete amplifier circuit of the transmitter electronics. During this test the RT-B77 *HELB* will transmit a RF carrier-signal on the preselected training frequency for about a ¼ second. So the whole electronics can be checked, making the test more reliable and conform to legal regulations.

[1] At temperatures below -10°C the battery voltage is so low that an error is indicated although the battery is in good condition. In this case the error message can be ignored.

6.6 Training Mode

The RT-B77 *HELB* features a training mode, e.g. to accomplish a Man-over-Board training, a check of the receiver or of the direction finder of your MOB system. In this mode the beacon is working as in standard operating mode, transmitting on the programmable training frequency (factory setting: 121.650 MHz)

Turn rotary switch (8) into position **ARM**. Press key **TEST** (10) for more than 3 seconds. The beacon will shift to training mode. This status is indicated by a flashing **YELLOW** LED (11). Now the RT-B77 *HELB* is armed on the test frequency (factory setting: 121.650 MHz) and can be activated as described in chapter 6.3. Turn rotary switch (8) into position **OFF** to exit the training mode and switch off the beacon if it was activated.

ATTENTION

Important difference to the standard operating mode:

If the beacon is armed in training mode the batteries are discharged (YELLOW LED is blinking). After each training exercise the batteries have to be changed.

6.7 Service Mode

This mode is used only for service and maintenance purposes and should only be activated by the manufacturer or by persons who are authorized to maintain the RT-B77 *HELB*.

6.7.1 Entering

Turn rotary switch (8) into position **ARM**. Simultaneously press both buttons **TEST** (10) and **ACTIVATE** (5) for more than 3 seconds. The voice message "**Service Mode**" resounds and all LEDs are blinking.

6.7.2 Exiting

Turn rotary switch (8) into position **OFF**. The voice message "**Power OFF**" resounds.

7 Intelligent Power Management

It is an important feature of the RT-B77 to use the available power at its best in all possible scenarios of use. Therefore a complex, intelligent power management is necessary for battery-driven mobile devices, in order to guarantee in e.g. very cold temperatures as well the best compromise between high transmitting power (= wide range), long transmission period and trouble-free use.

ATTENTION
The output power and the duration are highly dependent on the current temperatures.

Short common technical background:
Each battery depends of its surrounding temperature. The internal battery resistance can rise in case of very deep temperatures (e.g. -20°C) or at very old batteries (> 5-10 years). In that case only a restricted quantity of current/power will be available any more. If this fact will not be considered, the battery voltage can break down, which will cause poor utilization of power and – worst case – even wrong function.

7.1 RT-B77 Power Management

Therefore all parameters of the RT-B77 are controlled by a very contrived power management, in order to guarantee a power at its best at all times. Even during active emergency transmission the unit reacts continuously to changing surrounding conditions. In a worst case scenario the RT-B77 is being used e.g. on a ship's deck at -10°C air temperature and +5°C water temperature. In case of a Man Over Board emergency, the beacon will be bathed by water and therefore even "slightly warmed up", which leads immediately to a higher maximum top transmission power.

After having activated the RT-B77, it runs through several performance profiles for optimum use.

There are three different, fully automatically regulated modes of transmission:

- **High Power Mode** with max. 2 Watt max. output power
- **Endurance Mode** with max. 1000 mW output power
- **Power Save Mode** with max. 400 mW output power

Normally (battery change done according to instruction, and temperatures higher than approx. -10°C) the RT-B77 goes always to the **High Power Mode** when being activated, in order to guarantee an immediate, safe and reliable alarm. This is very important for an effective and very fast rescue even under the worst conditions (transmitting antenna completely under water with the Man Over Board is floating on his front, or cold water). After approx. 4 hours the RT-B77 changes automatically to the **Endurance Mode** for a compromise between still very high transmission power and a long transmission time. This is a very important period if the own crew can't do the rescue and if emergency services have to be led. After approx. 12

hours of permanent operation, the **Power Save Mode** will be activated. This mode has been optimized to run the RT-B77 without interruption as long as possible (> 50 hours).

Chart of the three different RT-B77 power modes:

Transmission mode:	Max. output power @ 50Ω (peak)	Average power consumption	Transmission RF On / Off
High Power Mode	+33 dBm = 2000mW	175 mA	70% On / 30% Off
Endurance Mode	+30 dBm = 1000 mW	100 mA	55% On / 45% Off
Power Save Mode	+26 dBm = 400 mW	25 mA	25% On / 75 % Off

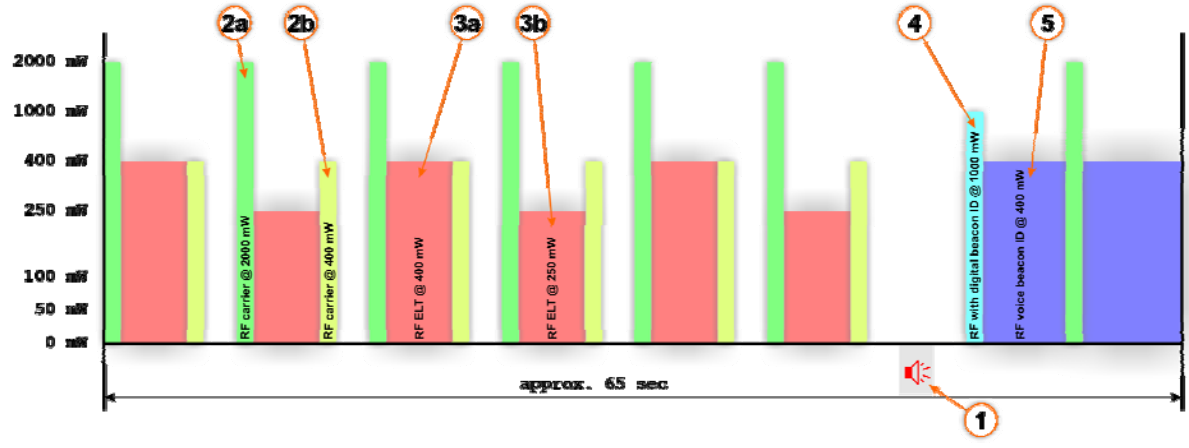
Typical sample of a complete RT-B77 power management procedure:
(Temperature ≥ 0°C; Battery capacity > 90% at moment of activation)

4 hours: High Power Mode	→	8 hours: Endurance Mode	→	> 36 hours: Power Save Mode

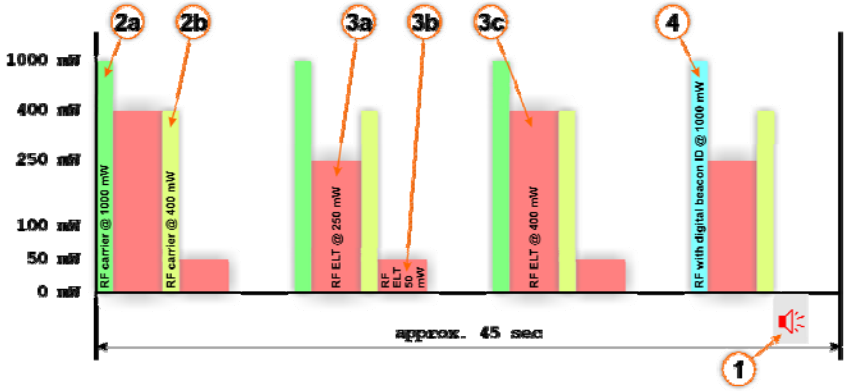
7.2 Exact description of the individual transmission cycles

After activation of the RT-B77 beacon, there is first transmitted for approx. 30 sec the typically ELT modulated sweep tone to trigger the alerting of the crew or any monitoring receiver / direction finder. After this, depending of the transmission mode, different pulses/signals are transmitted with a repeating 30..60 sec cycle for the best operation.

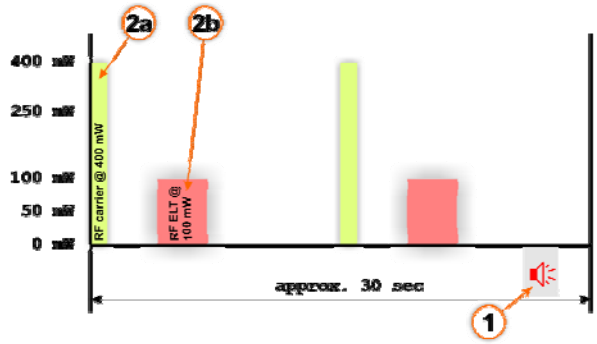
High Power Mode:



Endurance Mode:



Power Save Mode:



(1) **Short speaker output of the ELT sweep tone** using the internal RT-B77 speaker, getting an audible feedback for the user of the activated emergency beacon.

(2) **Unmodulated RF transmission pulse with high output power** optimised for the use with homing and direction finder units (best bearing accuracy and max. range).

(3) **RF transmission of typical modulated ELT sweep tone**

(4) **Short RF transmission pulse with digital beacon ID**

(5) **RF voice transmission of the Beacon ID** (clear words oft he beacon ID)

8 Technical Data

Operating frequency:	121.500 MHz (VHF)
Training frequency:	Pre-selectable (in 25 kHz increments between 120.000 and 125.000 MHz)
Frequency precision:	Better than ±500 Hz
Output power:	2 W*
Modulation:	A3X, ASK (software definable), FSK (on request)
Ambient temperature:	-20 °C to +55 °C
Battery type:	2 x 9 V block $LiMnO_2$ Type: ULTRALIFE U9VL-J
Battery life:	12 h to 48 h*
Interfaces:	IrDA and RS-232
Antenna:	• 260 mm monopole antenna • 90° monopole life jacket antenna
Dimensions:	103 x 75 x 27 mm
Weight:	245 g with antenna and batteries

* As a function of microprocessor controlled power management. On special request the maximum output power may be limited to a lower level. Modified beacons are marked by a label.

9 Maintenance

9.1 Cleaning

In order to clean the beacon we recommend warm water and a microfiber cloth.
In order to remove stubborn stains use dish detergent. Never use abrasive, solvents or alcoholic substances.

ATTENTION
If the beacon was in contact with salt-water, flush it with sweet water in order to avoid salt deposit in the mechanics of the rotary switch and other parts of the beacon.
Dry the beacon.

9.2 Battery Change

In the following cases a battery change is required:

a) Every 4 years routinely
b) If the self test shows the result „**Battery error**“.
c) If the beacon was activated for a long time (>15 min) or many short times.
d) If there are other reasons for a doubt about the full battery capacity.

RHOTHETA Elektronik GmbH or an authorized person (e.g. service partner) should carry out the battery change. At this opportunity all operating parameters will be read out and checked. All counters will be reset, the electronics will be checked and the tightness of the housing.

ATTENTION
Warranty will expire if battery change or service is not executed by RHOTHETA Elektronik GmbH or an authorized person (service partner).

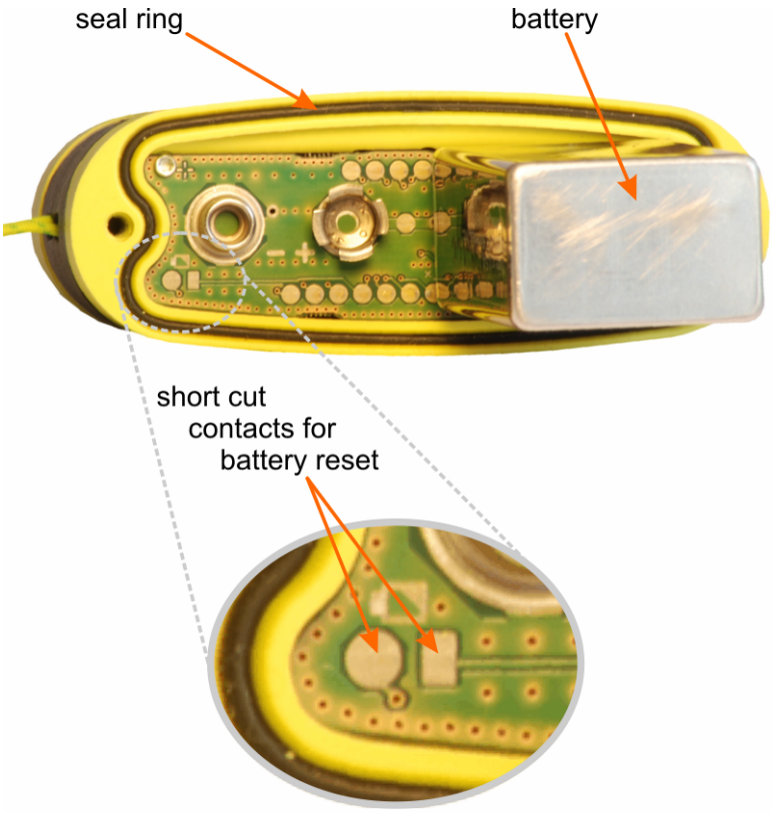
If it is not possible to change the batteries at an authorized service station or if is it not desired, you can change the batteries by yourself.

Take special attention to the following points:

a) **Use only** batteries of the specified type (see Technical Data)
b) **Always change** both batteries
c) **Use only batteries** of the same production charge (the impressed number has to be equal)
d) **Do not use batteries** older than maximum 2 years
e) **Always change** (renew) seal ring of the housing

Procedure of battery change:

a) Turn rotary switch (8) to **OFF** position
b) Open battery case bolts using torx-screwdriver (size: TX 8) and remove the battery case
c) Remove both batteries
d) Change seal ring
e) Reset battery capacity counter as follows:
   - Insert one battery on the right side (see figure below)
   - Turn rotary switch (8) to position **ARM**
   - Activate service mode (see chapter 6.7)
   - Short-circuit the contacts as shown below, using tweezers or an other suitable tool. If the reset was successful the message „**Battery OK**“ is put out acoustically.
f) Turn back the rotary switch (8) to position **OFF**
g) Insert 2nd battery
h) Place the battery case and fasten it with the bolts. There should be no chink between the battery case and the beacon housing
i) Update the label of battery expiration date on the battery case
j) Used batteries should be collected and disposed correctly.



10 Disposal within the European Union

10.1 Product Disposal


Product labeling according to EN 50419

At the end of product life, this product may not to be disposed together with normal household waste. Even disposal via the municipal waste disposal collection for electrical and electronic equipment is not permitted.

The correct disposal of this product helps to protect the environment and prevent any potential damage to the environment and human health, which can occur due to improper handling of the product.

- Therefore, supply the device to an electronics recycling after the final taken out of service.

Or

- The RHOTHETA Elektronik GmbH takes back all products that are subject to the requirements of the WEEE Directive (2002/96/EC) of the European Union to supply these products to professional disposal.

10.2 Disposal of Batteries

This product contains a battery containing harmful substances. This battery should not be disposed of with household waste. After the end of life, the disposal may only be done by RHOTHETA Elektronik GmbH or an appropriate collection point.

11 Disposal outside the European Union

For the disposal of this product and / or the batteries in accordance with the local regulations in countries outside the European Union please consult your dealer or local authorities.

12 Notes