

MANUAL  
Electrostatic **R**adioactive **A**erosol **C**ollector  
Type: BITT-ERAC

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ERAC  
Type: BITT-ERAC  
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## 1 Important basic information

### 1.1 Items supplied

- ERAC standing- or wall-mounted version (depending on the order)
- Cabinet including combined distribution frame and electronically parts
- Backup battery (optional)
- Manual ERAC
- Gamma Detector RS04 (optional)

### 1.2 Responsibilities

#### 1.2.1 The manufacturer's responsibilities

The ERAC and the optional equipment was designed and built on the basis of a risk analysis and is under consideration of all relevant harmonized standards as well as further national standards and technical specifications. The system thus conforms to the current level of technology and guarantees the highest possible degree of safety.

#### 1.2.2 The operating organization's responsibilities

The highest possible degree of safety can only be achieved in practice if all necessary measures are observed in dealing with the equipment. It is therefore part of the duty of care of the operator to plan these measures and check that they are executed correctly.

In particular the operator must ensure that

- the equipment only is used as prescribed (cf. chapter "Correct use"),
- the equipment is operated only in a fault-free, operational condition and in particular the safety devices are regularly checked to ensure that those function as stipulated,
- any necessary protective equipment or apparel for the operating, maintenance and repair personnel is available and is used,
- the operating manual is always legible and is available in full at the product's location,

- the product is operated, maintained and repaired only by sufficiently qualified and authorized personnel,
- the personnel is regularly instructed in all matters relating to occupational safety and environmental protection and is familiar with the operating manual and in particular the safety instructions that it contains.

### 1.3 Legal notes

The operating instructions must not be electronically or mechanically reproduced, distributed, amended, transmitted, translated into other languages or used in any other way – either in full or in part – without the express written approval of Bitt Technology-A Ges.m.b.H.

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### 1.4 Significance of the operating instructions

The operating instructions

- are part of the product,
- must be retained and maintained for the entire service life of the product (i.e. updated as necessary),
- must be passed to any subsequent owner or user of the product.

This document shall allow the customer to put an ERAC into operation. But it is strongly recommended to get the help of someone who is familiar with networking and at best with Linux too.

## 2 Safety

### 2.1 Basic safety instructions

#### 2.1.1 Requirements on the personnel, duty to take due care

- All work on the electrical equipment must be carried out by trained electrical specialists only.
- Electrical equipment must be checked regularly: Loose connections must be made secure, damaged wires or cables must be replaced immediately.
- All electrical supply units must always be kept locked. Access is only permitted for authorized persons.
- Never clean electrical apparatus with water or similar liquids.

The ERAC is only permitted to be operated and maintained by personnel who has reached the minimum age stipulated by law.

A suitable qualified person is everyone who is due to his/her specialist training, knowledge, and experience; as well as knowledge of the applicable stipulations, is able to assess the work assigned to him/her and can recognize possible hazards.

#### 2.1.2 Electrical danger

When working on the equipment there is a risk of electrical danger from

- direct contact with live parts or parts which have become live due to faults,
- electrostatic processes,
- short circuits / overloading.

Batteries can present a risk of electric shock or burn from high short circuit current. The following precautions should be observed:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Do not lay tools or metal parts on top of batteries.

**ELECTRICAL ENERGIE HAZARDS:** Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.

### 2.1.3 Disposal

Dispose of all components in accordance with locally applicable national regulations.

## 2.2 Correct usage

### 2.2.1 Application

The ERAC is intended exclusively for:

- Data measurement (alpha, beta, gamma, aerosol activity / concentration)
- Data storage
- Visualizing data directly through a web server
- Log in to console over native serial port or ssh
- Using features described in chapter 3 “Technical data” and chapter 4 “Layout and function”

Correct usage also includes reading this operating manual and complying with all the instructions it contains – in particular the safety instructions. Furthermore, all inspection and maintenance work must be carried out at the stipulated intervals.

The ERAC is not designed for applications other than those listed here - this is considered as improper use!

If the ERAC is not used in accordance with these conditions, safe operation of the equipment cannot be guaranteed.

For any injury or damage to persons or property resulting from improper use, the operator, but not the manufacturer of the system will be responsible!

### 2.2.2 Operating conditions

For consistent quality, it is imperative that the following ambient conditions are met.

Permissible room temperature: -20 °C to 50 °C

Permissible relative atmospheric humidity: 0% to 90 % non-condensing

### 2.2.3 Connection conditions

Power connection for the optional power supply:

Voltage: 230V 1~/N/PE

Frequency: 50 Hz / 60 Hz

Power consumption: 35VA

## 2.3 Incorrect usage

The ERAC and the peripherals are not allowed to be modified or changed without approval.

The components of the ERAC are not permitted to be integrated in other systems.

Maintenance work other than described in this manual only is permitted to be performed by Bitt technology personnel.

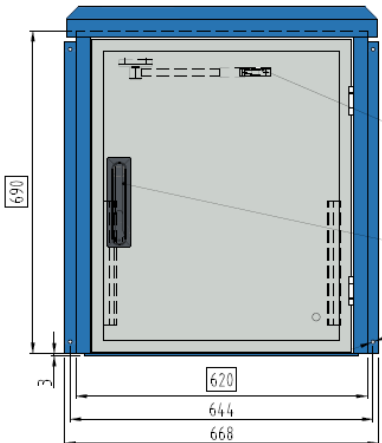
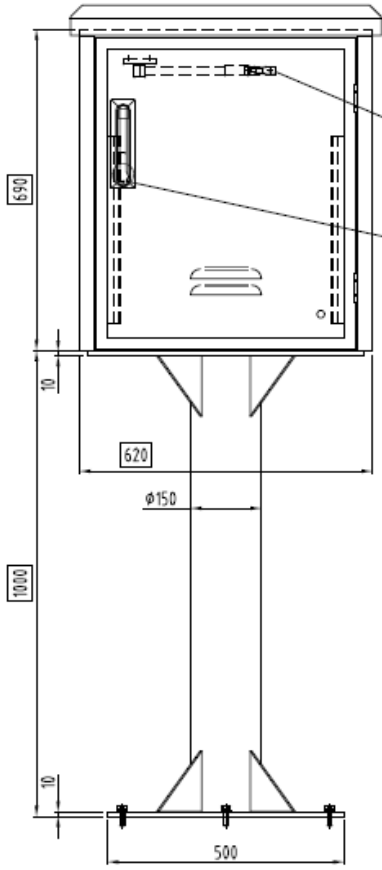
None of the operating conditions defined in correct usage are permitted to be changed.

## 2.4 Residual hazards and protective measures

- Electronic components can be damaged by electrostatic processes.
- The electrical components are not protected against water spray.
- Appropriate safety precautions must be taken by the customer.
- Prior to working on the electrical system unplug from the main or isolate the mains connection.
- Do not shortcut the optional battery (cf. chapter 2.1.2 “Electrical danger“)

### 3 Technical data

#### 3.1 Technical data ERAC

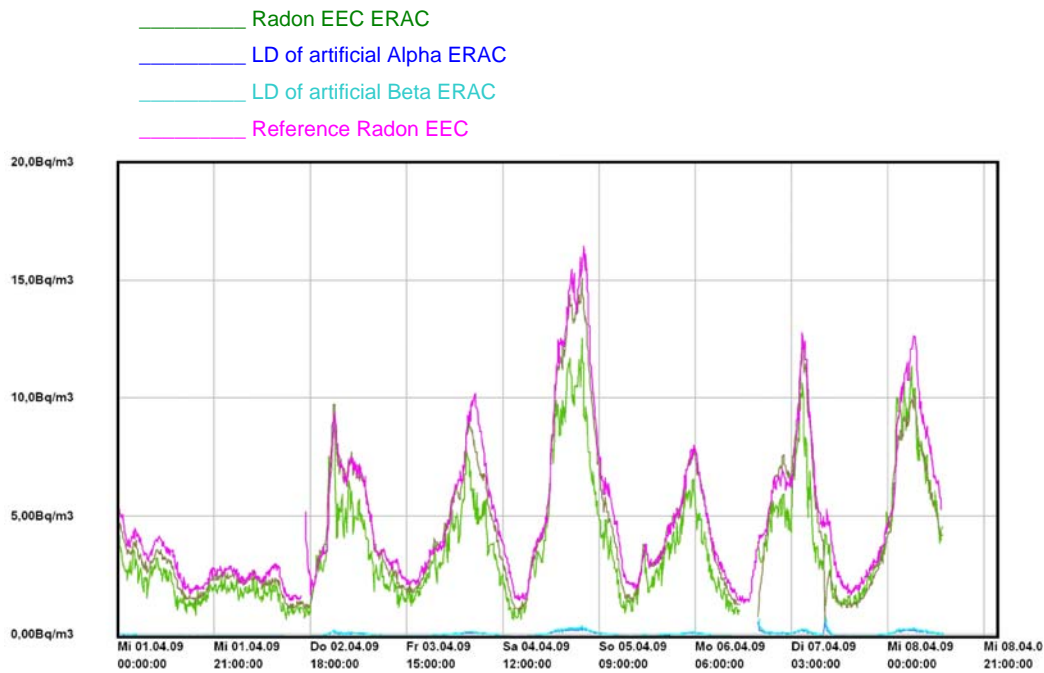
Type	Wall- mounted	Standing- mounted
Drawing		
Dimensions (depth x width x height)	600 x 668 x 1741	600 x 668 x 1741
Weight	appr. 25kg	appr. 75kg
Power	230VAC / 50Hz / 35VA also possible variant: 12VDC operation (eg. Solar module)	
Operating conditions	Temperature: -20°C - +50°C Relative humidity: 0% to 90%	
Detector	Semiconductor 2000 mm <sup>2</sup> Proportional Counter Gamma sensor RS04 (optional)	
Differentiation on artificial and natural nuclide	Yes	

Measuring range: artificial alpha, beta, gamma	1 – 6000Bq/m <sup>3</sup>
Natural background measuring	<sup>222</sup> RN EEC Range: 0.1 – 1000Bq/m <sup>3</sup>
Spectral evaluation	MCA 64 Ch.
Data logger	WebDL2
Precipitate method	Regulated electrostatics Deposition ~6kV
Precipitate carrier	aluminum foil
Foil transport	4mm/h
Flow rate effective	ca. 7.5m <sup>3</sup> /h
Drop-out voltage bridge	yes
Deep discharge protection	yes
Backup battery	optional
Surge protection	yes
Protection	IP 42
Anti corrosion design	aluminum housing
Operating time without maintenance	6 month

### 3.1.1 Sensitivities

The smallest detectable radioactivity was calculating the system, considering only realistic sampling and measurement situations. Values are given in Bq/m<sup>3</sup> units for measurement cycle time of 600 sec.

	30 min	1 hour
Natural radon background < 20 Bq/m <sup>3</sup> EEC.		
Artificial $\alpha$ -LD ( <sup>239</sup> Pu)	1.2	0.9
Artificial $\beta$ -LD <sup>90</sup> Sr [Bq/m <sup>3</sup> ]	1.5	1.2
Natural radon background < 5 Bq/m <sup>3</sup> EEC.		
Artificial $\alpha$ -LD ( <sup>239</sup> Pu)	1.0	0.3
Artificial $\beta$ -LD <sup>90</sup> Sr [Bq/m <sup>3</sup> ]	1.2	0.5



### 3.2 Technical data Surge protection

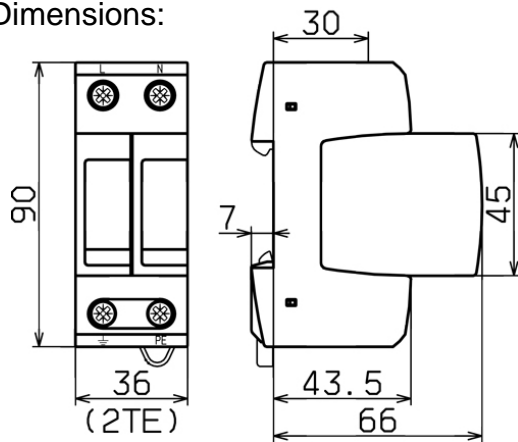
Type: DG M TT 2P 275

- 2-pole, modular surge arrester for single-phase 230VAC
- SPD Type 2 according to EN -11
- Base part with plug-in protection modules
- Easy exchange of protection modules with module release button
- DIN rail mounted device



Max. continuous voltage: 275VAC  
Voltage protection level:  $\leq 1.25\text{kV}$   
Nominal discharge current: 20kA  
Short circuit withstand capability: 50kArms

Dimensions:



### 3.3 Technical data Surge protection for gamma-detector

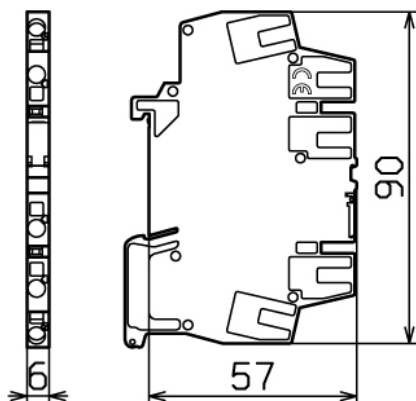
Type: DCO RK ME 24

- Surge protective terminal block
- SPD class TYPE 2/P1, tested acc. to EN 61643-21,
- for protection of 2 single cores or unbalanced interfaces,
- 2-pole terminal, width: 6 mm, with spring pressure connection system
- DIN rail mounted device



Max. continuous voltage:	33VDC
Nominal current :	0.5A
C2 Total nominal discharge current (8/20 $\mu$ s):	10kA
Series impedance per line:	1.8ohms

Dimensions:



### 3.4 Technical data Surge protection for network

Type: BVT TC1

- Surge arrester BLITZDUCTOR VT
- SPD class TYPE 2/P2, tested acc. to EN 61643-21
- For the protection of analog modems in switchgear cabinets
- Also for ASDL, ISDN Uko, 2-pole
- RJ45(12)-socket
- DIN rail mounted device

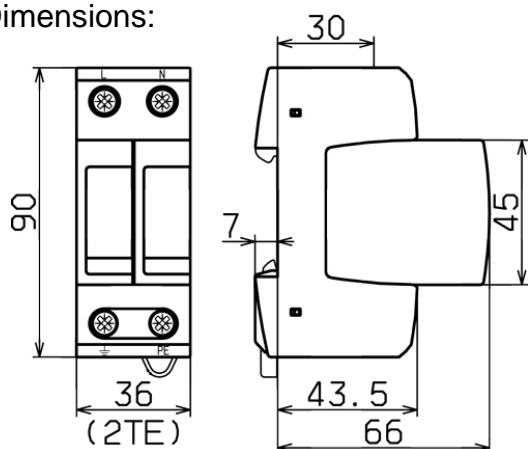


Max. continuous voltage: 170VDC

Nominal current: 200mA

C2 Total nominal discharge  
current (8/20  $\mu$ s): 5kA

Dimensions:



### 3.5 Technical data Surge protection for network (alternative)

Type: DPA M CLE RJ45B 48

- Surge arrester class E, fully shielded
- SPD class TYPE 2/P1, tested acc. to EN 61643-21
- For universal use according to EN 50173 up to 48 V DC for the protection of 4 pairs of data network interfaces via RJ45 socket.
- For single application or application in 19 inch cabinets, width 19 mm.

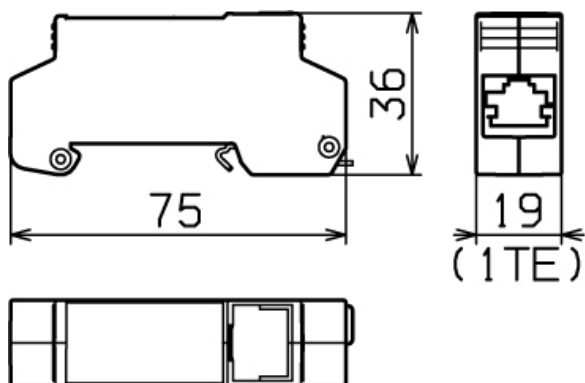


Max. continuous voltage: 48VDC

Nominal current: 1A

C2 Total nominal discharge current (8/20  $\mu$ s): 10kA

Dimensions:



### 3.6 Technical data Power supply

Type: Bitt PS-40 W-14,0VDC

- Input: 100 – 240VAC, 1,2 A, 50-60 Hz
- Output nominal: 14VDC, 2,8 A
- Voltage adjustable range: 13,5 – 16,5 VDC



### 3.7 Technical data Deep discharge protection

Type: Bitt-DDP

Designed for lead acid battery with 12V nominal voltage.

Typical Ratings:

- Input (V+IN): 14VDC
- Battery voltage: 12 – 13,8VDC

Maximum Ratings:

- Input: 18VDC
- Battery voltage: 18VDC

Output: 5VDC max. 1A or 3A, depending on option



### 3.8 Technical data ERAC control

Type: Bitt URM Control

- Control of the mechanics
- Data evaluation
- Data transmission to WebDL
- Power supply gamma detector



### 3.9 Technical data WebDL2

Type: Bitt WebDL2



#### 3.9.1 Hardware features WebDL2

- ARM CPU
- 64MB RAM
- 8MB Data flash (boot loader)
- SD Card / Mini SD Card
- 1 Ethernet port 10/100Mbit (PoE)
- 1 USB connector external
- 1 USB connector internal
- 3 native serial ports (RS232)
- 1 native RS232 port or alternative RS485/422
- 1 native RS232 port or alternative OLED
- 1 native RS232 debug port
- MAXIM 1-wire interface connected to one RS232 port
- Real time clock (RTC), powered by an ultra capacitor (1 Farad), so changing of the battery isn't necessary!
- JTAG (optional)
- I2C (optional)
- 4-row LCD Display incl. 4-button keypad (optional)

#### 3.9.2 Software features

- Running Linux (2.6.x).
- The acquired data are stored in a simple SQL database and/or files
- For specific purpose the "BITT-WebDL can also provide the collected data through a FTP server.
- Every Browser can act as a client. The web page is optimized for MS Internet Explorer 6 or 7 but also tested with Firefox 3.x
- Support of SSL (https and SSH)

- Configuration of the station through the web page.
- Emergency and maintenance login over a console is provided at a native serial port.
- Login over Telnet and SSH is supported

### 3.9.3 Hardware options

- 230VAC power supply (optional)
- 4-row LCD Display incl. 4-button keypad (optional)
- Backup battery (optional)
- Via USB it is possible to connect several peripherals like printers, displays and modems.
- Flash memory is easily expandable via a flash memory stick connected to the USB port.
- 10,4" / 12,1" / 15,1" TFT Display.

### 3.9.4 Software options

- Every data is visualized through a web server (optional)
- Charts and tables of every measured value (optional)
- Tables of status data via predefined queries or user defined queries (optional).
- Configuration of various alarm triggers. The alarm notification can be carried out by email and SMS (optional).
- Confirmation of every triggered alarm (optional).
- Changing and adding of languages is very easy. The whole web page is stored in a dictionary. So it is possible to add every desired language. By default the dictionary contains English and German (optional).
- Connections over SAMBA (e.g. MS Windows shares).
- Adapting the systems to special customer requirements is possible because Linux is used as operating system which offers many more features, than listed in this product folder!

**For further information see WebDL manual (scope of delivery).**

### 3.10 Technical data DC+- power supply

Type: Bitt-URM-DC+-var

Power supply for semi-conductor diode strip



### 3.11 Technical data High voltage power supply

Type: Bitt-RegHV

High voltage power supply and control



### 3.12 Technical data Router

Type: Funkwerk bintec RS120wu

- Integrated UMTS modem – HSxPA
- 5 x Gigabit Ethernet
- WLAN – 902.11n, 2.4 und 5 GHZ
- Web-based configuration / wizards
- IPSec – 5 tunnels, HW acceleration
- Stateful Inspection Firewall



#### Hardware Features

Feature	Description
Realtime clock	System time persists even at power failure for some hours.
Wall mounting	Integrated in housing
Environment	Temperature range: Operational 0°C to 40°C; storage -10°C to 70°C; Max. rel. humidity 10 - 95% (non condensing)
Power supply	External wall power supply 110-240V / 12 V DC, 1.5 A, with energy efficient switching controller; complies with EuP directive 2008/28/EC
Power consumption	Less than 5 Watt
housing	Metal case, opening for Kensington lock, connectors at back side, prepared for wall mounting
Dimension	Ca. 235 mm x 31.5 mm x 146,5 mm (W x H x D)
Weight	Ca. 1100g
Fan	Fanless design therefor high MTBF
Reset button	Restart or reset to factory state possible
Status LEDs	Power, Status, 10 * Ethernet, SFP, WLAN, UMTS (3G), USB
Certification	Wi-Fi Certified according 802.11abgn (Rel.7.9.4)

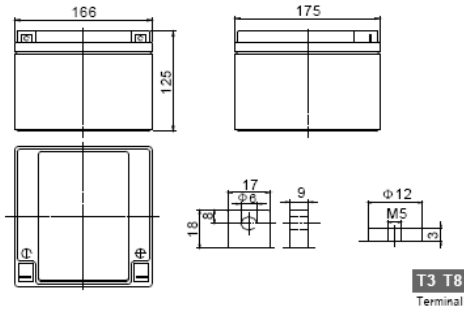
**For further information see router manual (scope of delivery)!**

### 3.13 Technical data (optional) Battery

Type: First Power 12V 28Ah

Type: First Power 12V 12Ah

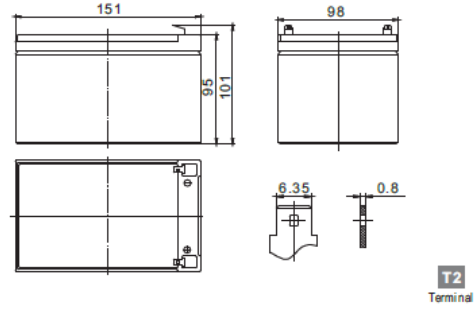
**Dimension(mm)**



**Specification**

Nominal Voltage		12 V
Capacity(20HR, 25°C)		28Ah
Dimension	Length	166mm (6.54inch)
	Width	175mm (6.89inch)
	Height	125mm (4.92inch)
	Total Height(T3/T8)	125mm(4.92inch)/125mm(4.92inch)
Approx. Weight		9.0kg (19.9lbs)

**Dimension(mm)**



**Specification**

Nominal Voltage		12 V
Capacity(20HR, 25°C)		12Ah
Dimension	Length	151 mm (5.94inch)
	Width	98mm (3.86inch)
	Height	95mm (3.74inch)
	Total Height	101 mm (3.98inch)
Approx. Weight		3.60kg (8.14lbs)

(min. 7Ah – max. 100Ah)

## 4 Layout and function

### 4.1 Functional description

To assess a radiation contamination of the environment the easiest instrument is the evaluation of the external gamma radiation. The next important assessment of the environment is the aerosol activity which finally in the air of the ground-level atmosphere is inhaled by people for this is all above the alpha- and beta activity the criterion.

The use of aerosol measuring instruments, which are able to work under the same conditions as the gamma stations so far failed primarily on the price and the possibility of establishing such facilities outdoor.

The ERAC is a fully automatic continuously working measuring instrument for the measuring of the alpha and beta activity as well as the gamma radiation which can be used both in radiation early warning systems and for the monitoring of radon concentration in buildings and outdoor.

#### **Measurement principle:**

With a commercial fan as used in PCs the air is sucked over an ionization distance while a large part of the aerosols respectively dust particles are deposited on commercial aluminium foil. The aluminium foil is gradually forwarded.

For the gamma activity a proportional counting tube is designed below the foil.

Above the aluminium foil a semi-conductor diode strip is ordered which measures both the alpha spectrum as well as the beta-radiation.

The measurement in 2 steps (every 10 minutes an evaluation is made):

1. Step: The fan and the ionization section are switched on and at the same time the gamma radiation is measured.
2. step: The fan and the ionization section are switched off and the alpha-, beta- and as well the gamma measurement are made.

#### **Application method:**

Recording of the Rn 222 concentration in the environment, in-door, in waterworks and in thermals as well as in earthquake- dangerous areas for the earthquake warning.

The instrument is also ready for the measurement of artificial radio nuclides, especially plutonium 239.

The detection limit for artificial nuclides will be evaluated and the LD (Limit of Detection) is also displayed graphically.

This figure is important because the natural radon levels in the environment can vary strongly.

## **5 Transport**

### **5.1 Special safety instructions for transport**

The optional battery must be transported separately.

The ERAC must be transported upright.

## **6 Installation conditions**

### **6.1 Ambient conditions**

Read Chapter 2.2.2 “Operating conditions”

### **6.2 Space required**

Read Chapter 3.1 „Technical data ERAC“

### **6.3 Instruction for installation**

#### **6.3.1 Wall mounted version**

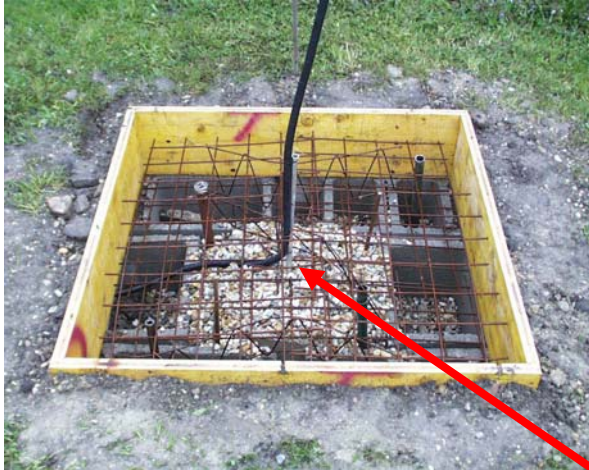
The ERAC must be mounted on a suitable and weight-bearing wall.

Use minimum 4 screws with 8mm diameter and appropriate rawlplugs!

## 6.3.2 Standing mounted version

### 6.3.2.1 Ground Work

For the fixed installation of the station a strong concrete ground work is essential. Recommended dimension for the ground work: 100cm x 100cm. The depth of the ground work is made accordingly to the frost limit of the ground of this area. Please always refer to the project specific calculations of a structural engineer. Different environmental aspects can require more extensive basements!



Attention! Should the additional gamma probe be installed on an external standing pipe (not on the mechanic of the station), there must be provided a blank pipe system in the ground work (in the middle of the ground work).

The length of the blank pipe system should have such a length that the end stand out 20cm from the upright standing pipe.

Attention! Should further inlets be planned (external additional power supplies) these also must be provided in an own blank pipe system at current now.



By mounting of the probe on an external standing pipe please pay attention to the distance between probe and station to have no impairment of the direction dependence of the probe.

### 6.3.2.2 Mounting of the standing pipe



The standing pipe should be fixed in the middle of the ground work.

Attention! Blank pipe is to be conducted through the standing pipe.

**Attention!!** On the standing pipe are conductor holders for the round conductor. These holders should be on the back side.



The fixing should be made with the heavy duty mounting screw (MKT SZ-S 12/30), which is included in the delivery.



Please along-screw the earth conductor clip on the back side.



## 6.4 Connection condition

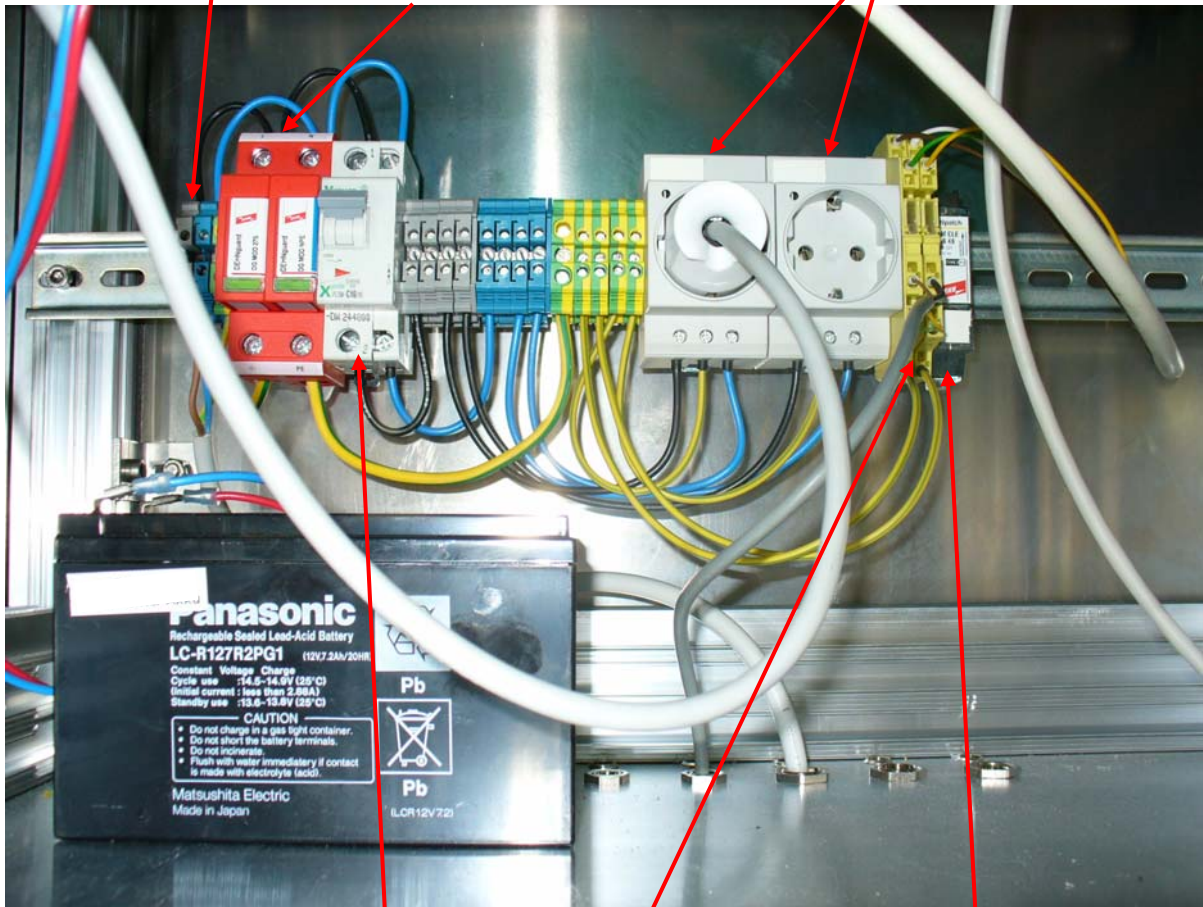
Read Chapter 2.2.3 “Connection conditions”

## 6.5 ERAC connections (distribution frame)

Power supply 230V 1~/N/PE

For electronic device and router / modem

Surge protection device



Gamma-detector surge protection

Circuit 16A /1+N /C

Network surge protection

## 6.6 Customer safety precautions

Read chapter 2 “Safety”

## 7 Operation

### 7.1 Controls

- 4 button keyboard (optional)
- Homepages of the devices (WebDL, Router)
- SSH (encrypted console)
- Debug port (native console)
- Reset button (WebDL)
- Foil button (Foil feed)

### 7.2 Displays and warning devices

Deep discharge protection:

- MAINS LED
- LOAD LED
- ACCU LOW LED

WebDL:

- 4 row display
- Homepage of the device

DC+- Unit:

- DC +- LED

RegHV:

- Power LED

Router:

- Power, WLAN; UMTS etc. (see Router manual)

### **7.3 Special tools, equipment, material**

For complete configuration of the device an additional Laptop or Desktop-PC with network capability is required.

### **7.4 Placing in service**

The device (re)starts automatically after power is (re-) established.  
The device always starts with a new measuring (also after reestablishing power).

### **7.5 Aligning, setting up**

There are no settings to do by the customer. For assigning an IP address, setting date and time, etc. see WebDL manual.

### **7.6 Operating**

See router and WebDL manuals.

#### **7.6.1 Inserting / changing the foil**



### **7.7 Instructions on the detection of error states**

- Use warning devices
- Use display and look for errors
- Use SSH and check the display files
- Use central unit software Scada

## 8 Troubleshooting

### 8.1 Service address

BITT Technology  
Wienerstraße 70  
A-2104 Spillern

Tel.: 0043/ 2266/ 80216  
Fax.: 0043/ 2266/ 80216 12

[office@bitt.at](mailto:office@bitt.at)  
[www.bitt.at](http://www.bitt.at)

### 8.2 Diagnostics and identification of error states

Use debug port of WebDL for checking embedded Linux system messages.

Error message	Possible cause(s)	Rectification
Display without backlight	Screensaver after 60 seconds	Press a key of the 4 button keyboard
Mains LED dark (DDP)	Power failure	Check power line
All LEDs dark	Battery failure	Check battery and DDP
LED "DC ok" power supply dark	Power failure	Check power line and battery
LED "Power" RegHV dark	Power failure	Check power line and battery

## 9 Maintenance

### 9.1 Service address

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### 9.2 Definition of maintenance intervals

- Every 6 month
- Checking battery 1 time a year recommended
- Clean the air intake system if necessary

### 9.3 Repair work

Replace damaged devices.

#### 9.4 Spare parts and consumables

Part nr.	Part name
1283	DIN rail clamp yellow/green
1284	DIN rail clamp standard
1285	DIN rail clamp blue
2697	Cover D-UK 4/1
2712	DIN rail power socket
3013	DIN rail bridge 10-pin
3161	Cover D-UK 4/10 BU
3165	DC power supply unit PS-40 W
3188	Deep discharge protection
3488	ERAC control (URM Control)
3430	WebDL2 unit
3465	DC+- power supply
3461	RegHV unit (High voltage power supply)
3192	Surge protection
3196	Gamma-detector surge protection
3250	Network surge protection BVT TC 1
3197	Network surge protection DPA M CLE RJ45B 48
3200	End cover plate
1261	Battery FP12120 12V12Ah
3241	Battery FP12280 12V28Ah
request	4-row LCD Display incl. 4-button keypad
request	Aluminium foil

## Document release

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