

# Nutriguard-MS



## INSTRUCTIONS FOR USE

**Data Input  
Lindenberg 7  
82343 Pöcking**

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### Abbreviations:

BIA	Bioelectrical Impedance Analysis
MS	Measurement segmental
Z	Impedance
R	Resistance
Xc	Reactance
kHz	Kilohertz
CH	Charger
CA	Cable
TE	Tester
TBM	Total Body Measurement
R ↑	Hand resistance
R ↓	Foot resistance
$\phi$	Phase angle (PhA)
KZ	Body Composition
BCM	Body Cell Mass

## A. Bioelectrical Impedance Analysis (B.I.A)

B.I.A. is the measurement of electrical resistance in an organic body. A constant field of alternating electric current is created in the patient's body, via electrodes on the skin, and the total resistance = impedance (Z), is measured in  $\Omega$  (Ohms).

The impedance of a homogeneous, biological conductor consists of two vectors: the resistance (R) and the reactance (Xc).

The **resistance R** is the pure opposition of a conductor to an alternating current and is indirectly proportional to total body water. The high percentage of water and electrolytes in the lean body mass makes it a good electrical conductor whereas fat mass has a high opposition.

The **reactance Xc** (capacity) is the opposition which a condenser offers to alternating current. Each cell membrane in the body acts as a mini-condenser because of its protein lipid layer. The reactance is therefore a measurement of the body cell mass and the functionality of the body cell mass.

To separately determine both these components of impedance modern B.I.A. apparatus possess phase sensitive electronics. The principle of measurement is based upon a time difference ( $\Delta t$ ). This occurs in the condensers in a field of alternating current: the maximum of the electrical current flows faster than the maximum voltage. Because alternating current has a sinusoidal form it is measured in  $^\circ$  (degrees) and known as phase angle ( $\alpha$ ). If the mass consisted purely of cell membranes the phase angle would be 90 degrees. Pure electrolyte water has a phase angle of 0 degrees. The measurement apparatus Nutriguard-MS measures the above-named parameters and is the basis for further analysis of body composition.

In addition to further information about the patient (weight, height, sex, age) a detailed analysis of body composition can be calculated by using the 3 parameters resistance, reactance and phase angle. Published formulae and special software which contains the appropriate statistical data is used to achieve the diagnosis.

The use of the multi-frequency technology has brought further improvement to the B.I.A. measurement because different frequencies are dispersed differently in the body tissue.

High frequencies, for example 100 kHz, can completely overcome membrane opposition and are therefore dispersed evenly throughout the entire body tissue. These are suitable for measuring the total body water.

Medium frequencies, for example 50 kHz, can only partially overcome the opposition of the cell membranes. They are dispersed to two thirds in the extra-cellular and one third in the intra-cellular parts of the body. These are suitable for calculating the total body water and body cell mass.

Low frequencies, for example 5 kHz, cannot overcome the opposition of the body cell membranes and are only dispersed in the extra-cellular parts of the body. These are suitable for the calculation of the extra-cellular water.

## **B. Scope of Delivery**

Please check the contents of the impedance measurement apparatus for completeness.

1. Impedance analysis apparatus Nutriguard-MS, (1 q.v.p. 5)
2. Charger, (2 q.v.p. 5)
3. Measurement cable CA, (3 q.v.p. 5)
4. Tester (TE), (4 q.v.p.5)
5. USB Y-cable (5 q.v.p.5 )
4. Instructions for use
5. Package NutriSegment (available as accessory)
6. Bag or suitcase (available as accessory)
7. Analysis software NutriPlus with Dongle (available as accessory)

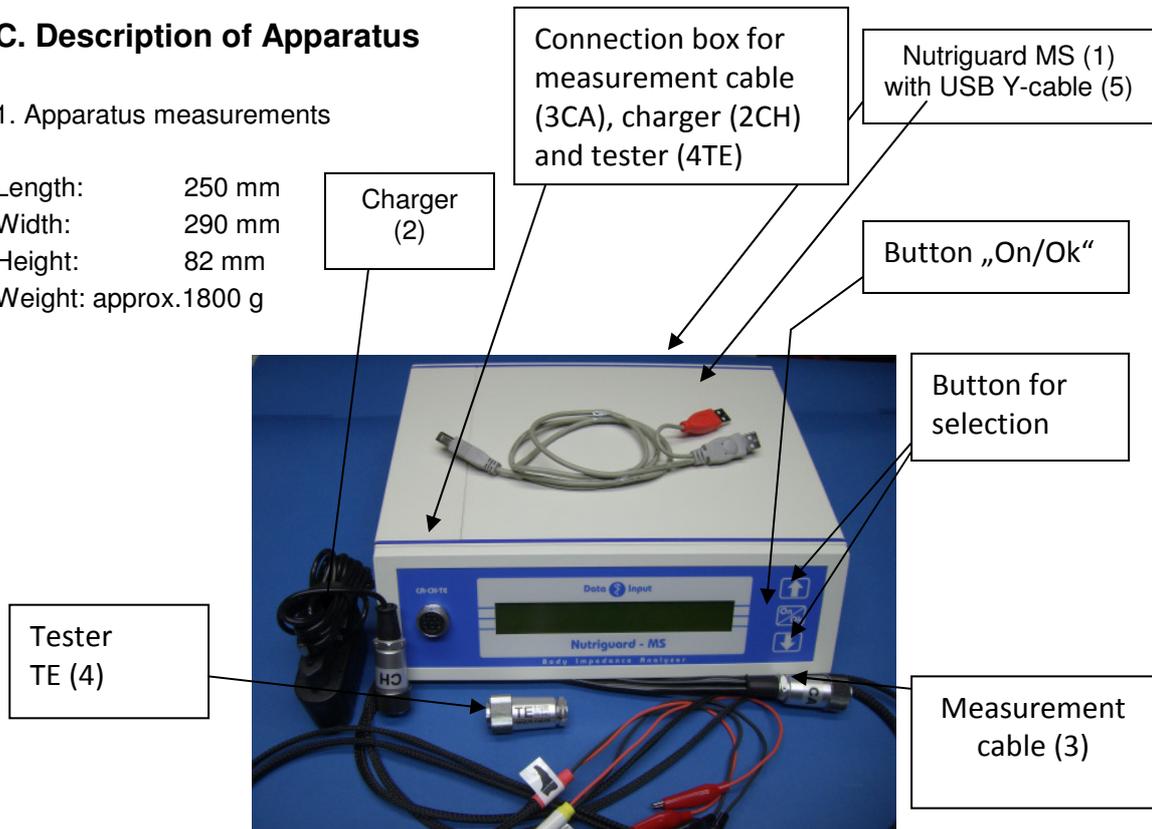
### **Operating and storage:**

**Your apparatus automatically turns itself off when not in use. The enclosed battery will be charged independent of it, as long as it is connected to a current source (PE). Separate this connection with devices which are not switched off during night. The battery will be thankful. Avoid extremely high or low temperatures. Storage and transport temperatures should be between -10 °C and +40 °C.**

## C. Description of Apparatus

### 1. Apparatus measurements

Length: 250 mm  
Width: 290 mm  
Height: 82 mm  
Weight: approx.1800 g



### 2. Front

On the front of the apparatus you will find:

- The button for on and confirmation (Button „On/Ok“) and the button for selection  $\uparrow \downarrow$
- The screen (LCD field) to view the measurements and INFO values.
- The connection box for the measurement cable CA, the tester TE and the charger CH.

### 3. Measuring frequencies: Nutriguard MS measures at 5, 50 and 100 kHz

### 4. Back of the apparatus

On the rear you will find a USB port to automatically transfer the measurement data to the special software of a connected computer, the CE sign, the serial number and if so the detection of the Medical Device Approval on the CE sign

### 5. Bottom and top of the apparatus

The bottom of the apparatus contains the battery compartment. Here you can open the battery compartment by pushing.

The top of the apparatus should only be opened for repairs or maintenance by the dealer responsible.

## Using and menu navigation of the apparatus

The using and menu navigation are extensively self-explanatory.

The menu navigation through the functions of the apparatus is with the 3 buttons „On/Ok“, „ $\uparrow$ “ and „ $\downarrow$ “ as well as beeps“. There are short and long beeps. Each button press, registered by the apparatus, is confirmed by a short beep. A long beep signals the end of a measurement or of any other function. The screen asks questions (.....?) or beckon you to do something (see also D.7)

A running apparatus can be switched off directly on the control buttons. It will switch off itself after a few minutes when it will not be used.

## D. Technique of Measurement

In order to carry out BIA measurements you need:

- A possibility to lie down
- A medical scale (optional)
- A BIA apparatus including measurement cable and special electrodes
- Disinfectant and swab
- A computer with analysis software (optional)

Precise and reproducible results of measurements can only be achieved by using an accurate technique of measurement. E.g. a differing positioning of the electrodes of just 1cm can cause a deviation of measurement of up to 20 Ohms. This corresponds to about 1l of body water of a total body measurement.

### Carrying out the Measurement:

#### 1. Indication/Contraindication

The measurements can be carried out on people of all ages. There are no illnesses which are in contraindication to the impedance measurements. In principle, patients with a cardiac pacemaker can be measured without any side-effects. Contraindication: Even though there are no known incidents world-wide as a result of a BIA measurement, patients with a defibrillator implant should not undergo a measurement. The possibility that the induced field of electric current during a measurement could activate the defibrillator cannot be definitely eliminated. Because it is often not possible to give specifications on the type of pacemaker, **you may refrain from carrying out the measurement on patients with a pacemaker generally.**

#### 2. General Preparations

- The patient should be nil by mouth (NBM) for 4-5 hours
- The last sporting activity should date back 12 hours
- The last consumption of alcoholic beverages should date back 24 hours
- The extremities should have the temperature of regular skin circulation

### Basically:

#### Always make a comparable measurement situation

Measurement station with BIA apparatus Nutriguard M



### 3. Preparation of Measurement

- 3.1 The patient should be in a relaxed horizontal position for the measurement. The patient usually lies on his back but it is also possible to carry out the measurement with the patient lying face down. Please note that variations from the horizontal position or strong tensions in the extremities can influence the measurement data. The patient should lie still for a few minutes until the blood volume is spread evenly throughout the body.
- 3.2 The patient's legs should lie apart at approximately  $45^\circ$  so that the thighs do not touch each other. The arms should be spread at approximately  $30^\circ$  and should not touch the rest of the body. Contact between the legs and the arms and the torso may shorten the flow of the electric current during the impedance measurement and may influence the results. **Please make sure that the BIA measurement is carried out on a flat surface which fits the size of the patient.**
- 3.3 During the measurement the extremities should remain at the same level as the rest of the body. Should an arm or a leg be higher or lower the results will be influenced.
- 3.4. The patient should have no contact with metal objects (e.g. the bed frame). However, jewellery, ear rings or watches worn on the body or osteosynthetic plates and pacemakers in the body have no influence on the results.
- 3.5. For reasons of standardisation the measurement should be carried out on the dominant half of the body. In most cases this is the right side (right hand, right foot). Continuing measurements should always be carried out on the same side
- 3.6 The hand and foot which are connected to the electrodes should be bare for measurement. Compressing bandages change the fluid concentration of the extremities and may influence the measurement results.

### 4. Positioning of Electrodes

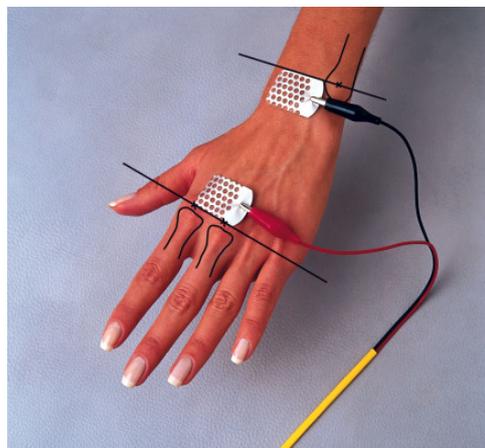
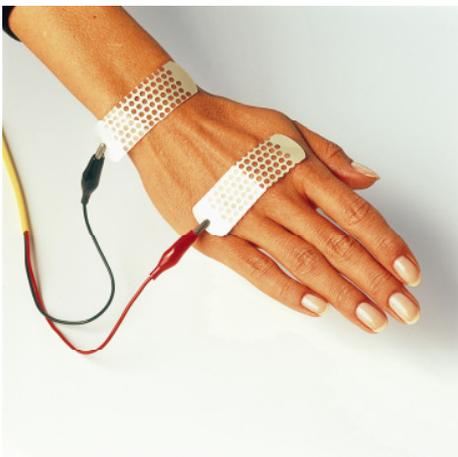
The tetrapolar and ipsilateral measurement using sticking electrodes has been established worldwide as a method for medical bioelectrical impedance measurements. Therefore two gel electrodes are fixed on one hand and one foot of the same side of the body. The precise positioning of the electrodes is vital to the accuracy of the measurement.

#### 4.1 Electrodes on the hand:

Electrode on the wrist: the electrode shall be attached in a horizontal line through the ulna head (processus styloideus ulnae) whereby the main surface of the electrode shall lie above the fissure of the wrist.

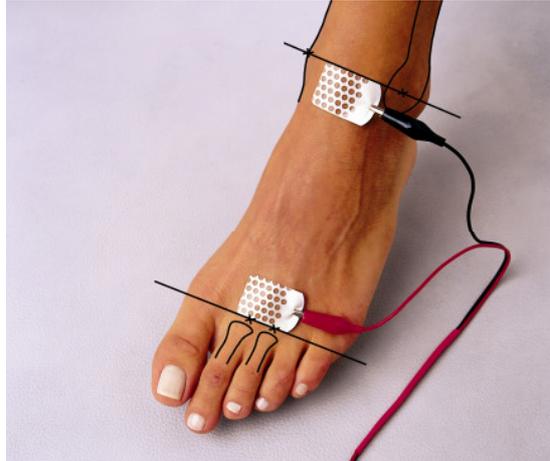
Electrode on the fingers:

The electrode shall be attached slightly distal from the base joint of the middle finger. The main surface of the electrode shall lie on the soft tissue between the second and third bone in the middle of the hand



#### 4.2 Electrodes on the foot:

- 4.2.1 Electrode on the toe: The main surface of the electrode should lie on the soft tissue between the second and third bones in the middle foot. Bow the toes to make joints visible. Fix the distal end of the electrode along this line.
- 4.2.2 Electrode on the ankle: The electrode is placed on the back of the foot in a horizontal line through the inner ankle. Fix the proximal end of the electrode along this line.



The patient's skin should be clean, dry and warm (neither hot nor extremely cold). Greasy or moist skin causes poor adhesion of the electrodes. The skin should therefore be cleaned with alcohol before positioning the electrodes. Should a patient have extremely dry or hairy skin the transfer of current can be improved by applying a little bit of ECG paste.



## 5. Electrodes

Please use BIA recommended electrodes only (e.g. BIANOSTIC AT). They shall meet the following requirements:

- Gel surface > 4 cm<sup>2</sup>
- Hand and foot resistance at 50 kHz and accurate positioning < 250 Ohms
- Sandwich resistance at 50 kHz < 30 Ohms (q.v. chapter: Sources of Error)

The most common reason for problems or errors of measurements is the use of improper electrodes.

The distance between the electrodes should be at least 4 cm if used on adults and at least 3cm if used on children. A smaller distance may cause interactions between the electrodes. If the hands are very small as it may be the case with young children, large electrodes may be split in half lengthwise.

e.g. Bianostic AT



Sources of error concerning the choice and positioning of electrodes:

- Inaccurate positioning of electrodes
- Improper electrodes
- Multiple use of electrodes
- Improper storage or dried electrodes
- Insufficient contact between skin and electrodes
- Insufficient circulation of extremities (also due to temperature)

If the contact resistance  $R_{\uparrow\downarrow}$  or  $R_{\downarrow\uparrow}$  at 50 kHz exceeds 300 [Ohm], the software will not show R and XC as the first measurement results but  $R_{\uparrow\downarrow}$  and  $R_{\downarrow\uparrow}$ . Please check the cause shown. The results R and Xc can be shown by the selection buttons anyway.

Please check if the values of  $R_{tot.}$  exceeds 1300 [Ohm]. In this case you have to reckon with implausible values of R and XC. The phase angle is specified too small.

## 6. Measurement cable and connection of cable

Please screw the measurement cable on the apparatus tightly.

The measurement cable consists of two double cables. Each individual cable has a crocodile clip at the end. Each double cable and clip is marked:

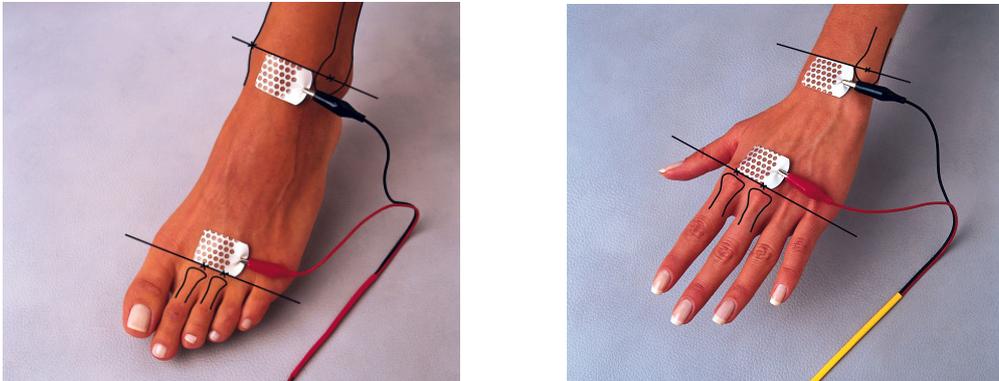
Markings of double cable for hand and foot:

- The double cable for the foot electrodes has a red sleeve.
- The double cable for the hand electrodes has a yellow sleeve

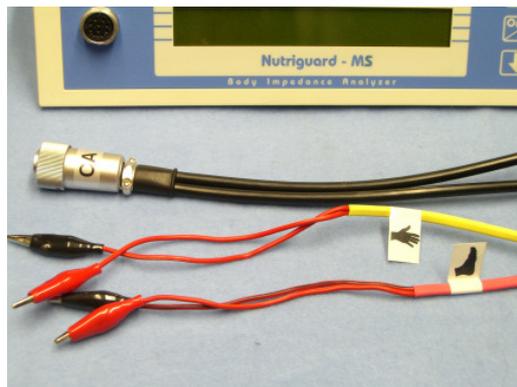
Markings of distal and proximal crocodile clips:

- Clip red clips onto distal electrodes (near fingers and toes).
- Clip black clips onto proximal electrodes (close to ankle and wrist).

During the measurement the cable should be suspended and not be knotted. Should the measuring cable lie flat during the reading it is important to make sure that it does not come into contact with any metal surfaces or metal objects, for example, the metal frame of a patient's bed.



Marked in black you will find the bones which will help you to position the electrodes.



## 7. Measurement

Please press the button „On/Ok“.

The apparatus will show following information, in the following order, on the display automatically: „ACCU“, „ACCU CHECK“ (with the appropriate information for the ACCU-state), „NUTRIGUARD MS“, „SELFTTEST CHECK“ (with the appropriate information), „PRESS On/Ok“ (as request). The next picture will ask you for your requested measurement frequency. The first proposal will be „50 kHz TBM“ (Total Body Measurement).



With the button „On/Ok“ you can confirm the shown frequency or choose with the button for selection  $\uparrow$   $\downarrow$  another frequency for your measurement. Also you can change with this buttons to the menu of the segment measurement (SEGMENT-MEASUREMENT?)

or to the menu Service



By selecting and confirming of the button “On/Ok” e.g. standard measurement “50 kHz TBM?” you will see following on the display:



After measurement you will see the values for R (resistance) and XC (reactance) as well as S (check sum) on the display.

If the values of the measurement are stable a signal will be sounded and R, Xc und  $\Sigma$  can be read for further processing.

$$\mathbf{R = \dots \quad Xc = \dots \quad \Sigma = \dots}$$

With the button for selection  $\uparrow$  further information will be shown:

$$R_{\uparrow} = \dots \quad R_{\downarrow} = \dots$$

and

$$R_{\text{tot.}} = \dots \quad \varphi = \dots$$

It is advisable to note the measurement values straight away. Please note: After some time, the apparatus will automatically turn itself off. The measurement values are not saved. By doing on-line measurements using NutriPlus the data is automatically transferred into the software programme.

The body composition is calculated using R and Xc. Several software programmes also require the check sum  $\Sigma$  to calculate the body composition. The check sum serves to verify the correct transfer of the data to the programme.

Resistance of the hand ( $R_{\uparrow}$ ) and the resistance of the foot ( $R_{\downarrow}$ ) are the contact resistance between the two hand- or foot electrodes. The values are used for the control of the quality and correct placement of the electrodes as well as the blood flow of the extremities.

Total resistance Rtot. is the value for the measurement of total resistance throughout the complete path of the current (incl. the transfer opposition between the skin and the electrodes). Rtot. serves as an internal control for the apparatus. If the total opposition is too high no measurement data is displayed because not enough stable filed can be built up. The causes are usually electrode problems or broken cables. With values of Rtot > 1300 [Ohm] the accuracy of R and XC cannot be ensured.

The phase angle  $\varphi$  corresponds the phase fluctuation between electrical current and potential and serves to calculate cell mass in the lean body mass.

To repeat a measurement, please press the button „On/Ok“ again.

Error message:

If the measurement cable is not connected properly the display will show Cable? after a few second and you will hear short beeps.



Afterwards the display will automatically return to the announcement

## 50 kHz TBM ?

By pressing the selection button  $\downarrow$  again „off?“ appears on the display. Press the button “On/Ok” to turn off the apparatus.

## E. Using the Nutriguard MS

### 1. Acquisition of electric current

The apparatus is equipped with a high quality NiMH battery. The manufacturers of the battery guarantee 1000 complete cycles for loading.

Measurements can only be carried out connected to the battery. It is therefore necessary to check that the battery is adequately charged before starting the measurement.

### 2. Recharging the battery

The battery is full when displayed  $> 8$  V. It is empty when displayed 6.3 V. A prophylactic use of recharge the battery is recommended after not using the apparatus for more than 6 weeks and displayed  $< 8$  V

A battery charging is only required when using the apparatus without PC or laptop

Charge the battery only when the apparatus will not be needed for a long time ( $> 6$  weeks) or the battery indicator goes down correspondingly. A permanent discharge of the battery, caused by non-use over a long period of time or frequent use of the lower charge state ( $V < 6,3$  V) without charging can severely damage the battery. We therefore recommend that you recharge the battery every 4-6 weeks, even when not in use (see also chapter H point service level of charge)

The following steps are necessary to recharge the battery:

2.1 The charger CH is plugged into the front of the apparatus.

2.2 The charger CH is constructed for normal household electricity 230 [Volt] and 50 [Hz].  
Plug the charger CH into the mains.

2.3 Press the button "On/Ok" to turn on the apparatus. Important: the B.I.A. apparatus must always be switched on to recharge the battery. The apparatus will confirm that the charging process is started and the display goes out. The apparatus recharges itself and when finished automatically turns itself off. It is therefore not necessary to monitor the recharging process. With extensive discharge of the battery a charging cycle takes up to 4 hours. We recommend after a charging process to disconnect the connection between the apparatus and the general power supply system.

### 2.4 Level of charge

The charge indicator will light up briefly when the apparatus will be switched on. Under the menu item "Service" you can always see the actual state of charge.

With a charging display of 6.3 V, **the apparatus should be recharged.**

Warning message, voltage control:

Should be displayed on the apparatus  $< 6.1$  [V] level of charge the apparatus will display the warning („ACCU TOO LOW"); and also sound a warning signal.

With a too low battery voltage, the apparatus switches off automatically.

Because of a possible total discharge the apparatus should not be switched off for longer time in this state but recharged urgently.

### 2.5 Testing and renewing the battery

To test or renew the battery you must send the apparatus to your dealer

### 3. Working time and electricity use

The battery capacity is 2 Ah. With a full battery there are more than 300 measurements possible within one hour and without recharging. The end of a measurement is announced by the sounding of a signal.

### 4. Electricity supply during measurement with automatic data copying

During measurement with automatic data copying a USB-connection between PC and B.I.A. analyzer has to be existent.(USB Y-cable is always included). With this Y-cable the battery is automatically recharged by the PC (Laptop or Netbook).

## F. Sources of Error and Trouble Shooting

Shows the apparatus nothing on the display after switch on following errors are possible:

- The battery is deeply discharged (eg. the apparatus was turned off with heavily discharged battery for a long time). With a deeply discharged battery the apparatus will not show information on the display even when the charger will be plugged in and the apparatus switched on. It is necessary to keep the apparatus for at least 4 hours connected to the charger. After 15 minutes, please check whether the apparatus can be switched on. If he apparatus does not switch on the battery is damaged and has to be renewed.
- Making a mistake while replacing the battery. The consequence is that an internal fuse blows.  
**Please contact your dealer.**
- Damaged charger: The display shows „CABLE ?“ instead of „ACCU-CHARGE“  
**Please contact your dealer.**

Measurement problems of another kind are mostly expressed by:

- an extended time interval to display the measurement on the B.I.A. analyzer, or
- incomprehensible, extremely high or low measurements.

To determine and remove the cause of the problem quickly we recommend following procedure: Please test one after another the apparatus, the measurement cable and the electrodes.

Hardware check:

Should any measurement seem to be unlikely, please screw the tester (TE) on the Nutriguard MS. Then start the apparatus. It performs a self test after each reboot (- SELF TEST CHECK -) by all three frequencies and reports the result briefly in the display. After completing the self test "PRESS ON/OK" or "SELF TEST FAILED!" is shown.

After the message: "SELF TEST FAILED" the apparatus switches off itself and a measurement is not possible. Start your apparatus again. Will this message shown several times please contact your dealer.

Furthermore, you can make a test with the tester TE for the 50 kHz frequency. Are the measurement values within the target range  $R = 500$  and  $XC = 67$  (+/- 4) the apparatus has passed another test and the error is in the range of measurement cable or electrodes.



The display light disappear automatically after „SELFTTEST: OK !“ or „SELFTTEST FAILED!“ was shown.

### Checking the measurement cable:

The check of the measurement cable is carried out by causing a short circuit by connecting all 4 crocodile clips.



Message shown on the display:

If no values are displayed for R or Xc when moving the cable connections, a defective contact due to a hair crack might have occurred. Please check, if the capillary joints of the clips are loose. A damaged cable has to be replaced.

Please note:

Wrong measurement results caused by a measurement error of the apparatus are extremely rare because of the purely digital measurement technique. Most errors are induced by problems related to the measurement cable, positioning of the person and / or the electrodes.

### Checking the electrodes and type of electrodes:

For many reasons certain electrodes are not suitable for B.I.A. measurements:

The most coming reasons are as follows:

- Multiple use  
Everywhere in the medical industry must save on money. However electrodes should only be used once and **not reused** time and time again. Furthermore, electrodes can transmit bacteria or fungal infections when they are reused.
- Damages caused by transport or storage  
The gel dries out quicker in rooms with a higher temperatures or dry air and leads to self-opposition of the gel. Once a packet of electrodes has been opened they should be used within 2 months. Damages caused during transportation by frost or heat are hard to prove. Indications of this are when they stick strongly to the packet or extremely high foot or hand oppositions.
- Molybdenum Foil  
Electrodes with a molybdenum foil covering are **not** suitable for B.I.A. measurements. The reasons for this are unknown.

You can test the quality of your electrodes anytime with the sandwich test:

Stick the gelled sides of 2 electrodes together; the flaps must be in opposite directions. Attach one red and one black crocodile clip of a measuring cable to each flap. Turn on the apparatus at 50 kHz. You are now measuring the opposition of the electrodes.

Values should be: Resistance R < 30 Ohm, good electrodes values are R < 20 Ohm  
Reactance Xc < 1 Ohm

Example of a quality check of electrodes:



#### Further Notes:

As with all metal objects electro-static sparks can occur between the operator and the apparatus especially when wearing insulated shoes or in a dry atmosphere. The display then goes blank. Turn the apparatus on again and this should solve the problem.

All external devices which is to be connected to any analogue or digital interface of the device (B.I.A.) must give proof to, and meet the EN specifications (i.e. EN 60950 for a data processing device) or En 60601 for electro-medical devices). Furthermore all configurations must meet the system-norm VDE 0750 Part 1-1. A person connecting additional devices to the system's signal-entrance or -exit becomes a System-Configurator and thus is responsible for meeting the foresaid system-norm VDE 0750 Part 1-1. In case of questions, please contact your local dealer or technical service.

The measurement values of digital Bio Impedance Analyzer are extremely accurate and reliable. The reason for incorrect measurements is almost found in the area of the storage of the persons, measurement cable, electrodes. The most common reasons of incorrect measurements are the electrodes.

If you get very anomalous and irreproducible results, we recommend to make a consistency check of the row data at 50 kHz (applies to persons > 15 years, > 45 kg body weight and BMI < 35)

#### **Consistency Check for the First Measurement**

##### 1. Resistance values at 50 kHz:

The physiological range for resistance should be::

Woman R = 400 - 750 Ohm

Men R = 350 - 650 Ohm

Should the R value be outside of the physiological range, then please note: in rare cases the values can occur with patients with a very high or low body cell mass, or with Oedema. The most common reason is however an electrode or measuring cable problem. Try new B.I.A. tested electrodes.

##### 2. Reactance Values at 50 kHz

The physiological range for reactance lies between 8% - 14% of the respective resistance value. (e.g. with a resistance of 500 Ohm  $X_c$  should be between 40 and 70 Ohm).

Should the R value lie outside the physiological range then please note the following: measurement values. < 8 % can occur in patients with malnutrition. Measurement values > 14% can occur in well-trained athletes i.e. body builders. The most common problem however is usually the electrodes or the measuring cable. Try new B.I.A. tested electrodes.

##### 3. Hand or Foot opposition at 50 kHz > 300 Ohm

The opposition represents the transfer opposition between the skin and the electrode. If the opposition of the hand or foot > 300 Ohms there are usually 2 possible reasons: a) skin problems (very dry, insulating skin or greasy skin which the electrodes cannot adhere to correctly) or b) the use of unsuitable electrodes. For dry skin you need to apply some ECG paste. Greasy skin must be cleaned thoroughly, possibly with high percentage alcohol. Always use B.I.A. rested electrodes

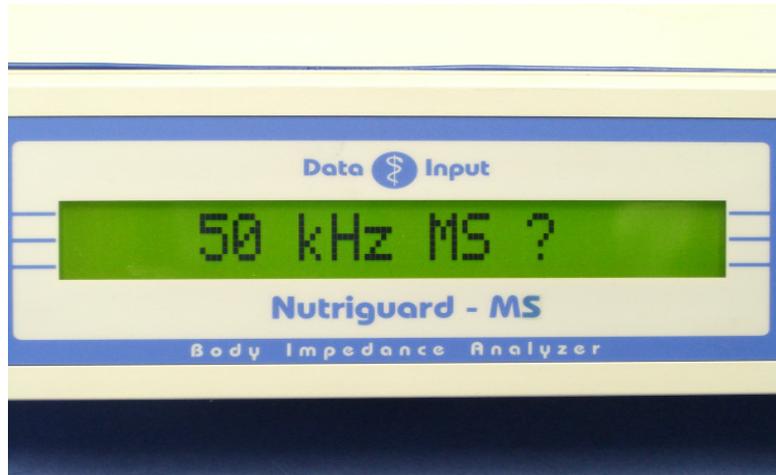
## G. Measurement Segmental:

The apparatus Nutriguard MS includes an advanced measurement function. The menu point "SEGMENT-MEASTEM.?" you reach by pressing the arrow button. ⬆ or ⬇

A straightforward and valid measurement of individual arms and legs is possible. We recommend using the segment measuring cable with 8 pins and the measurement with 8 electrodes (see also the instruction for use for the software NutriSegment).

A segment measurement with only four electrodes is also provided in the menu, but it should only be reserved for specially trained persons.

You can measure the segments with all 3 frequencies. The picture below shows a segment measurement suggested at 50 kHz.



## H. Repairs and Maintenance

Menu – SERVICE –

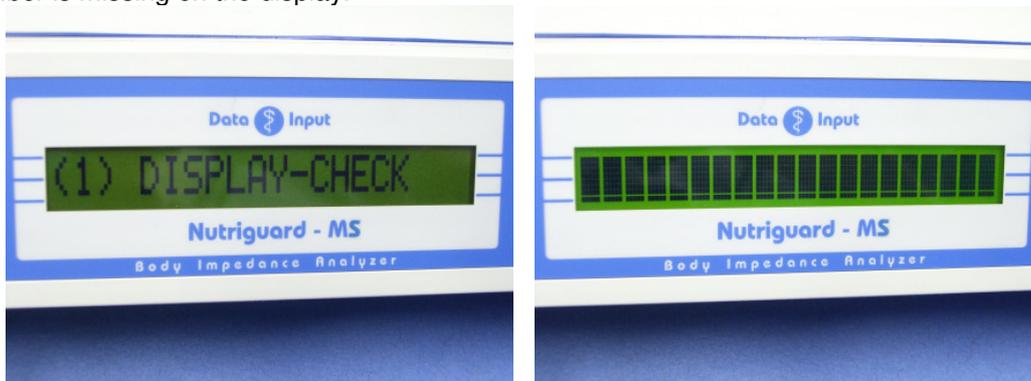


The menu SERVICE has 7 check-functions:

1. DISPLAY -CHECK
2. KEY -CHECK
3. SOUND -CHECK
4. BACKLIGHT -CHECK
5. ACCU -CHECK
6. SEGMENT -CHECK
7. INFO

To 1.:

The display will be cleared. After about 1 second the advisable fields in the display are built-on. All shown fields in the display must be filled with a black bar. This ensure you that no part of a number is missing on the display.



To 2.:

The selection button „↑“, die button „On/Ok“ and the selection button „↓“ will be tested once after the other.. In the next picture you can see e.g. the check for the selection button „↑“ and the request Press: ↑. The check used to test the keypad.



If the displayed button works correctly. it will be confirmed with "OK on the display.

To 3.:

It appears the display



and you can hear a beep

with illuminated display „Sound on“. After this appears „Sound off“ with non-illuminated display.

To 4.:

The Backlight-Check shows if the lights of the display are working properly to make the reading of the display easier. With reduced battery-power the lights of the display does not work anymore. (except for the backlight check) It is a test to find out whether if a non lightning display is a battery or display problem.



To 5.:

The ACCU-CHECK is automatically done when the power is turned on, but also possible to check during the general operation in this issue. From a battery state of <math><6,3\text{ V}</math>, the apparatus should be loaded.

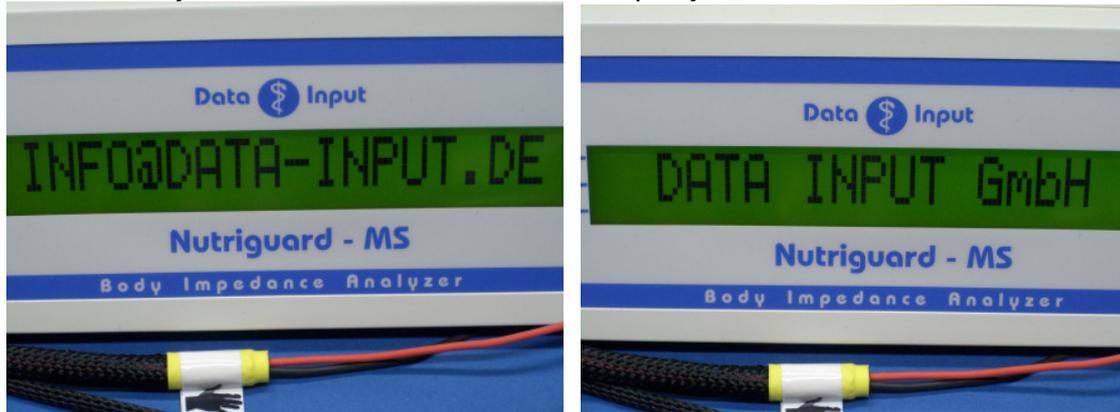


To 6.:

The point „SEGMENT-CHECK“ is testing the communication between B.I.A. analyzer and the test card for segment  
You will hear a sound of the relay (it clacks). The display shows the information „SEGMENT-CHECK-OK!“.

To 7.:

INFO shows you the e-mail-address and company name.



**Reset:** If the analyzer does not answer anymore you have the possibility to press the selection buttons   at once for 5 seconds to make a reset.

### General instructions:

Always handle your BIA Measurement apparatus with care.

1. All cables (measurement cable CA and tester TE) must be connected carefully. All cables have a standard plug connection for which no strength is required.
2. Avoid heavy shaking  
As with every electronic product your BIIA apparatus can be damaged by knocking or shaking. We recommend that you use the original case when travelling on long journeys.
3. Avoid damp conditions  
Do not keep your BIA apparatus in rooms with a humidity of over 80 %. This may influence both the function as well as the life period on the apparatus.
4. Storage  
Your apparatus automatically switches off when not in use. Avoid extremely high or low temperatures. The recommended temperature of transport and storage: -10 to +40 °C.
5. Cleaning  
You may clean the body of the apparatus with a wet cloth. If necessary you may also use standard cleaning products. The cover of the apparatus and the measurement cable can be sanitized.
6. Repairs  
If the apparatus is in need of repair please contact your dealer.
7. Disposal  
The apparatus and accessories can be returned to your dealer for disposal. You may not dispose via domestic waste.

**If you need any further information about the service available please contact your dealer for support**

## I. Technical Data

### Impedance Analysis Apparatus Nutriguard-MS

#### RESISTANCE (R):

Area of measurement: 0 - 999 Ohm  
Resolution of measurement: 1 Ohm  
Exactness of measurement:  $\pm 0.5$  % of measurement value  
 $\pm 1$  digit.  
 $\pm 0.5$  % from the end of the scale

#### REACTANCE (Xc):

Area of measurement: 0 - 250 Ohm  
Resolution of measurement: 1 Ohm  
Exactness of measurement:  $\pm 2.0$  % of measurement value  
 $\pm 1$  digit.  
 $\pm 2.0$  % from the end of the scale

Charger: Current outlet from the FW 7333 AC/DC adapters:  
  
12 [Volt] co-current flow, 700 mA

The exact details given for the measurement values are only valid for opposition in Ohm-based, high capacity components.

Measurement Current: 0,8 mA bei 5, 50 und 100 kHz (mit  $Z=0 - 1000 \Omega$ )  
Exactness of the measurement current:  $\pm 3$  %  
Measurement frequency: 5, 50 und 100 kHz Sinusoidal frequency  
Source of electrical current: Built- in battery  
Apparatus name: Impedance-Analyzer  
Apparatus type: Nutriguard-MS  
Class of protection Nutriguard-MS: Apparatus with internal electrical current  
Degree of protection Nutriguard-MS: Type B  
Class of protection for the charger: Apparatus in the protection class II  
Type of current for the charger: primary A.C., secondary D.C. conversion  
Potential: 230 V  
Rated power: 200 mA

The security for the people to be measured from a 220V mains voltage is warranted for the time of measurement. During a measurement, the apparatus works with an internal power supply and is separated from the USB interface.

### Information



The apparatus includes a NiMH battery-pack



When not in use, please recharge every 3 months.

Charge your apparatus at an ambient temperature of 10-40 °C

Empty or damaged battery packs, please give back to your dealer or provided collecting point.

Only use the original charger



Diagnosis by a BIA measurement only is forbidden.

The device must be protected from direct sunlight to beware overheating