

MADSEN Micromate 304

Portable Screening Audiometer

User Manual

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All information, illustrations, and specifications in this manual are based on the latest product information available at the time of publication. GN Otometrics A/S reserves the right to make changes at any time without notice.

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Technical support

Please contact your supplier.

GN Otometrics A/S

9 Hoerskaetten

DK-2630 Taastrup Denmark

T: +45 45 75 55 55, F: +45 45 75 55 59

www.otometrics.com

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Portable Screening Audiometer

User Manual

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Contents

Portable Screening Audiometer • User Manual

1 Introduction

May we congratulate you on your choice of the MADSEN Micromate 304 portable screening audiometer.

Intended Use Micromate 304 is intended for screening and diagnostic use by audiologists and other health care professionals in testing the hearing of their patients.

Battery or AC Power Supply This audiometer permits the performance of complete manual audiological screening tests - either battery-powered or with AC power supply as an option.

Auto Power-Off Although alkaline batteries have a long life in the Micromate 304 (up to 300 hours!), the audiometer automatically switches itself off approximately 10 minutes after use to conserve power. Blinking LED's indicate when batteries are low.

Battery Low Indication

The operator of a Micromate 304 will appreciate the simplicity of operation and ergonomic design. The low profile cabinet, combined with the silent touch pushbutton controls produce fast and accurate results.

The attenuator has a hearing level range of -10 to +90 dB in 5 dB steps, at 9 frequencies (250 to 8000 Hz). Tone presentation is indicated by a yellow LED and is controlled by an ambidextrous tone bar which enables onehanded operation by both left- and right-handed users. Frequency and hearing level are indicated by easily readable LED indicators on the front panel.

Audiogram Form If a record of thresholds is desired, an audiogram form may be attached to the front panel and the coordinate system of indicators used to mark the audiogram curve.

Optional Carrying Case The Micromate 304 audiometer may be supplied with an optional custom-made carrying case for self-contained operation—all standard accessories including the ME70 Noise-Excluding Headset may be packed together with the audiometer and optional Mains Adaptor.

Typographical conventions

The use of Warning, Caution and Note

For safety reasons and appropriate use of Micromate 304, the manual contains **Warnings, Cautions** and **Notes**, which you should read carefully. The use of these headings is denoted as follows:

Warning • *A warning indicates that there is a risk of danger to persons and data.*

Caution • *Caution indicates that there is a risk of damage to data.*

Note • *A note indicates that you should take special notice.*

2 Test conditions

The ambient noise conditions for audiometric tests should be less than 40 to 50 dB SPL. The audiometric tests may normally be performed under quiet office conditions, but an audiometric booth is recommended under noisy conditions.

2.1 Training

It is recommended that you read this Manual before you start operating Micromate 304 so that you become familiar with the device before testing on a patient.

Test conditions

Training

3 Standards

The Micromate 304 complies with the following standards for audiometers:

EN 60645-1

EMC: EN 60601-1-2

ANSI S3.6



The Micromate 304, type 1024, and this manual are CE-marked according to the Medical Devices Directive 93/42/EEC.



The Micromate 304, type 1024 is marked with this symbol to indicate compliance with Type B requirements of EN 60601-1.



The instrument is marked with this symbol to indicate that it is electronic equipment covered by the Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

4 Safety

This User Manual contains information and warnings which must be followed to ensure the safe performance of the Micromate 304. Local government rules and regulations, if applicable, should also be followed at all times.

4.1 Warnings

Unwanted noise may occur if Micromate 304 is exposed to a strong radio field. Such noise may interfere with the process of recording correct measurements. Many types of electrical devices, e.g. mobile telephones, may generate radio fields. We recommend that the use of such devices in the vicinity of Micromate 304 is restricted as much as possible.

Safety

Warnings

5 Service and repair

Service and repair of electromedical equipment should only be carried out by the equipment manufacturer or by authorized representatives.

The manufacturer reserves the right to disclaim all responsibility for the operating safety, reliability and performance of equipment serviced or repaired by other parties.

5.1 Equipment failure

Warning • *Do not use a defective instrument.*

If you believe the correct function or operation safety of Micromate 304 to be faulty in any way, disconnect Micromate 304 from the power supply, remove the batteries, and make sure that it cannot be used by others until it has been serviced.

Warning • *Under no circumstances disassemble Micromate 304. Contact your supplier.*

Service and repair

Equipment failure

6 Unpacking

The Micromate 304 portable screening audiometer is shipped in one carton containing the instrument and all standard accessories.

Upon receipt, refer to the enclosed Packing Specification and check that the carton is undamaged and when unpacked check that the audiometer and accessories are complete and intact.

Unpacking

Equipment failure

7 Storage and shipment

To protect the audiometer during storage or shipment you should always use the best packing available. If it is necessary to return the instrument to the MADSEN distributor or to the factory for repair, use the original shipping carton.

Caution • *Batteries should be removed prior to storage to prevent damage caused by battery leakage! Never put the audiometer in an enclosed container with the power on.*

Storage and shipment

Equipment failure

8 Installation

Connections Connect the headset and the patient signal to the respective connectors on the rear panel of the instrument (refer to Fig. 1).

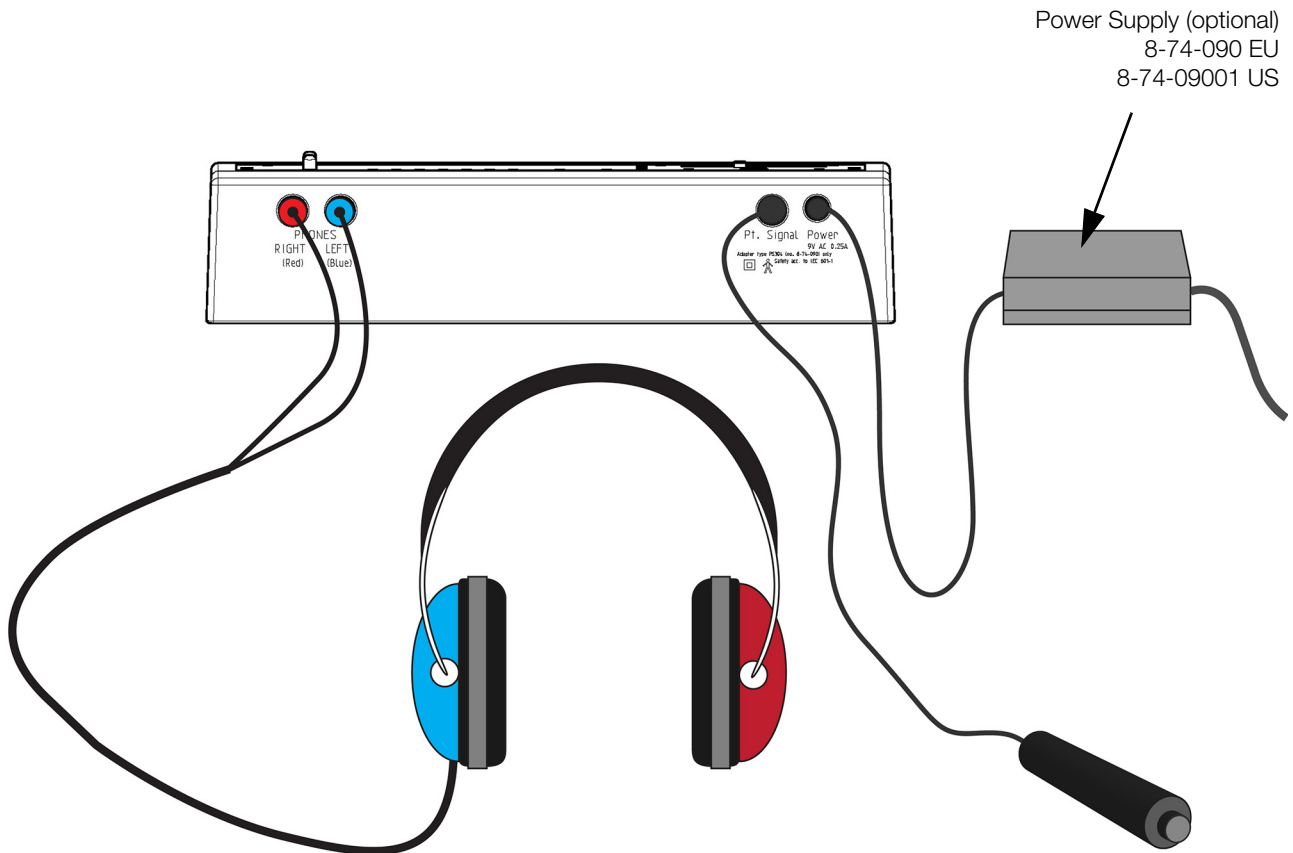


Fig. 1 Micromate 304 Rear Panel.

Note that the headphone jacks are color-coded: blue is for left, and red for right. The plugs on the rear panel for the headphones are clearly marked for Right and Left.

Power Supply Remove both screws on the battery compartment cover located on the base of the instrument and insert 6 1.5 V Type C batteries ensuring that the poles are correctly installed (see Fig. 2) or connect the optional AC power adaptor (see Fig. 1)

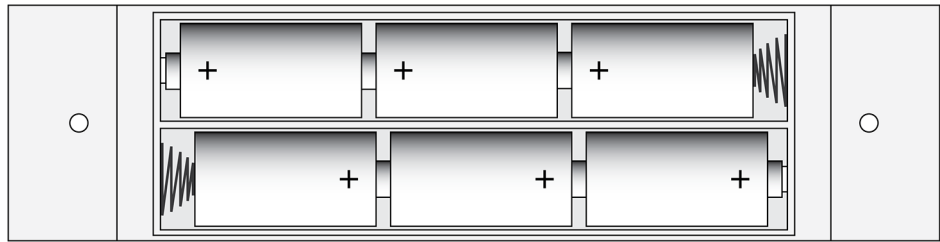


Fig. 2 Micromate 304 Battery Compartment.

Power On Switch the instrument on by pressing the black tone switch on the bottom left of the front panel of the instrument and note that the following indicators light up: 20 dB, 1000 Hz, and Left channel. No warm-up time is required.

9 Care and maintenance

Cleaning The Micromate 304 requires no preventive maintenance. However, it is recommended that the following guidelines be observed.

The instrument should be kept clean and as free of dust as possible:

Remove dust using a soft brush and take special care to dislodge any accumulations of dirt on or around the pushbuttons on the front panel.

KEEP AWAY FROM LIQUIDS! To clean the cabinet and the front panel, use a soft, slightly damp cloth with a small amount of mild detergent on it. Do not allow any moisture inside the instrument!

Warning • *Chemical cleaning agents containing ammonia or alcohol will damage the cabinet. DO NOT USE ABRASIVE CLEANERS!*

Do not expose the instrument to direct sunlight and keep it well ventilated at all times to prevent overheating.

Caution • *The earphones are in constant contact with your patients so care should be taken to ensure that they are kept clean. Just wipe them regularly with a moist cloth.*

Care and maintenance

Equipment failure

10 Calibration

Calibration should be performed annually by suitably qualified personnel, using the appropriate equipment.

Your Micromate 304 is dispatched from the factory in Denmark together with a Test Report (Calibration Certificate). The Test Report specifies which transducers have been calibrated (i.e. those which have been supplied together with the instrument), according to which standards, and what equipment was used for calibration. Results are listed for each transducer at all standard frequencies.

In general, the instrument is calibrated in dB HL using the stated reference equivalent thresholds, which are related to sound pressure levels (dB SPL = dB re 20 μ PA).

Note • *Calibration has only been performed on the supplied transducers! If you wish to use any other transducer for testing with the Micromate 304, please contact your local MADSEN distributor first.*

Calibration

Equipment failure

11 Operation with batteries

11.1 Battery type

Type C Batteries Only! The Micromate 304 screening audiometer is designed for use with Type C dry cell batteries only.

The amount of energy stored in different types and brands of battery varies greatly. In order to obtain a long operating life and to avoid leakage problems, alkaline batteries are strongly recommended.

11.2 Battery life

Up To 300 Hours Of Operation As mentioned in 11.1, battery life depends on the type of battery used. With alkaline batteries, battery life is typically 200 - 300 hours of operation (Ref. DURACELL MN1400 LR14, 7000 mAh).

Replace Batteries Once A Year As a precaution, batteries should be replaced at least once a year, regardless of the number of operation hours, in order to prevent battery leakage.

11.3 Battery low

Battery Low Indication When the batteries begin to fail, the selected intensity and Left/Right ear LED's begin blinking, indicating the battery low state! Replace all batteries as soon as possible.

The number of operation hours available after battery low indication depends on the type and age of the batteries in question. However, sufficient energy to conclude the current examination is guaranteed (approximately three minutes).

Typically, 'valid' operation time after battery low indication will be longer.

11.4 Rechargeable batteries

DO NOT USE RECHARGEABLE BATTERIES! Rechargeable batteries may not be used in this instrument because of their low nominal voltage!

12 Basic instructions

In order to familiarize yourself with the Micromate 304 Digital Audiometer as quickly as possible, sit in front of the instrument and do the following:

Power On Assuming that the audiometer has been installed according to previous instructions, switch the instrument on using the tone switch on the front panel and note that power-on is indicated by the following indicators lighting up: 20 dB, 1000 Hz, and Left channel.

No warm-up time is required.

See Fig. 3 at Back of This Manual Now observe the logical and ergonomic front panel layout (pull out drawing at the back of this manual and refer to Fig. 3):

- Audiogram Alignment Knobs* • There are two black alignment knobs on the front right for the purpose of attaching holed audiogram pads.
- Hearing Level & Frequency Displays* • Above the audiogram coordinate grid are the Frequency indicators and to the left of it the Hearing Level (intensity) indicators.
- Patient Signal* • At the top left is a red Patient Signal response indicator which lights up when the patient activates the patient signal pushbutton.
- Tone Indicator* • Beneath the Pt. Signal is a Tone LED for indicating Tone presentation.
- Left/Right Channel LED's* • On either side of the Tone Indicator are LED's which indicate which channel has been selected—when powered up, the audiometer always defaults to the Left channel. Left channel is green, Right channel is red.
- H.L. & Frequency Control Buttons* • The audiometer is operated by the cluster of controls on the bottom left of the front panel enabling one-handed operation. There is a pushbutton marked L/R Shift for switching between the left and right channels; a left arrow pushbutton for decreasing Frequency and a right arrow pushbutton for increasing Frequency. There is a black Tone Switch for presenting tones and a black rotary control knob for selecting Hearing Level.

Basic instructions

Rechargeable batteries

13 Screening tests

Screening/Sweep Test Method For rapid checking of large numbers of subjects, the screening or sweep testing method is employed. This routine is subject to variations according to local circumstances but the basic technique, however, is uniform.

Normally, in order to save time, two or three subjects receive simultaneous instruction in the testing room after which each subject is tested individually.

Fixed Hearing Level The Hearing Level (intensity) is set to a fixed level and remains unaltered throughout the series of tests. The intensity level is usually determined by the local authority, school board, employer, etc., for whom the screening tests are being conducted.

Screening levels are usually in the 20 - 30 dB range (this audiometer defaults at 20 dB). In the interest of swiftness, pure tone frequencies are sometimes limited to the 500 - 4000 Hz range.

The object of the sweep test is to determine whether each of the pure tones can be heard at the pre-arranged intensity.

13.1 Patient instruction

Seat the patient with his/her back towards you so that he/she cannot see the operation of the audiometer.

Power On BEFORE Fitting Headset! Remember to power on by pressing the Tone Switch **BEFORE** fitting the headset!

Before you place the headset over her/his ears, inform the patient about what is about to happen, i.e. that some tones will be presented via the headset either in the left or the right ear and that he/she is to signal a response immediately whenever a tone is heard.

Fitting Headphones When fitting the double headset, adjust the headband to suit the subject and ensure that the apertures are located directly over the ear canals. The red earphone is fitted to the right ear and the blue one to the left ear.

13.2 Operating instructions

Default Settings After power-on you will note that the audiometer defaults as follows:

- | | |
|----------------|------------|
| Tone: | • Left Ear |
| Hearing Level: | • 20 dB |
| Frequency: | • 1000 Hz |

Audiogram Form • Attach a holed audiogram form to the two black alignment knobs on the right of the front panel.

Start With Left Ear! • Normally, the left ear is tested first.

Present Tone • To present a tone in either ear, press the Tone Switch and note that tone presentation is indicated on the Tone LED.

ATTENTION! **Note** • *If using battery power, the selected intensity and Left/Right ear LED's begin blinking to indicate that the batteries are failing! Replace all batteries as soon as possible.*
Battery Low Indication

Hearing Level • To change the tone intensity, use the black rotary control knob. Each click of the knob increase or decreases tone intensity by 5 dB.

Frequency • To increase or decrease the frequency use the two Frequency buttons. Always set the frequency before introducing the tone.
The Micromate 304 automatically change frequency if one of the Frequency pushbuttons is held down at the same time as the Tone Switch is depressed.

Start at 1000 Hz • It is best to start the sweep test at 1000 Hz, following with higher frequencies and concluding with frequencies below 1000 Hz.
• Brief pulses of tone lasting 1 - 3 seconds are preferable.
• Instruct the patient to press the patient signal button whenever a tone is heard. Note that the Patient Signal LED lights to indicate a response.
• If the patient does not respond to the first tone presentation, present the tone once again. Make a record of 'response' or 'no response'.
• Go to the next frequency and repeat the procedure for as many frequencies as needed for both ears.
• When a threshold has been established, note it on the audiogram form in the conventional manner.
• Failure to hear a single given tone indicates hearing loss and the subject is rescheduled for further examination.

ATTENTION! **Note** • *The screening level is normally selected as 20 dB, but may vary according to local circumstances. Masking is not available.*

13.3 Technical specifications

Technical specifications	
Hearing Level Range	-10 to + 90 dB in 5 dB steps
Frequencies	50–500–1000–1500–2000–3000–4000–6000–8000 Hz
Accuracy	Frequencies: better than $\pm 3\%$
	Hearing Level: within ± 3 dB of indicated level (provided that temp. is within 15 – 35°C, and power voltage within $\pm 10\%$ of nominal)
Standards	EN 60645-1 for Audiometers, Type 4
	EMC: EN 60601-1-2
Calibration	ISO–389, ANSI S3.6
Patient Safety	EN 60601-1
Distortion	Less than 1%
Static Force of Transducer Headbands	TDH 39: 4,5 N \pm 0,5 N
Operating Environment	Temperature: 15° – 35°C, 59° – 95°F
	Relative Humidity: 30% – 90%
	Air pressure: 600 hPa a 1060 hPa
Caution • <i>Operation at temperatures below -20° C or above +60° C may cause permanent damage!</i>	
Storing and handling	Temperature: 15° – 35°C, 59° – 95°F
	Relative Humidity: 30% – 90%
	Air pressure: 500 hPa a 1060 hPa
Power Supply	6 X 1.5 V Type C Batteries
	Auto Power-Off, Battery Low Indication
Battery Current Consumption	Approx. 30 mA
Battery Life	200 - 300 hours (Duracell Alkaline)
External Power Supply	9 VAC, 250 mA; Auto Power-Off
Standard Accessories	ME 70 Noise-Excluding Headset fitted with TDH 39 Receivers, Patient Response Handswitch, Audiogram Pad, Roller Pens (red and blue)

Screening tests

Technical specifications

Technical specifications	
Optional Accessories	Carrying Case (hard or soft), TC89E Headband, AC Power Adaptor, AC 50/60 Hz, 115/ 230 V (DEMKO approved), Service Manual
Dimensions	(W X D X H) 300 X 210 X 60 mm 12 X 8,4 X 2,4 in.
Weight	With batteries: 1275 g (2.8 lbs.)
	Without batteries: 1000 g (2.2 lbs.)
Weight of AC Mains Adaptor	400 g (14 oz)

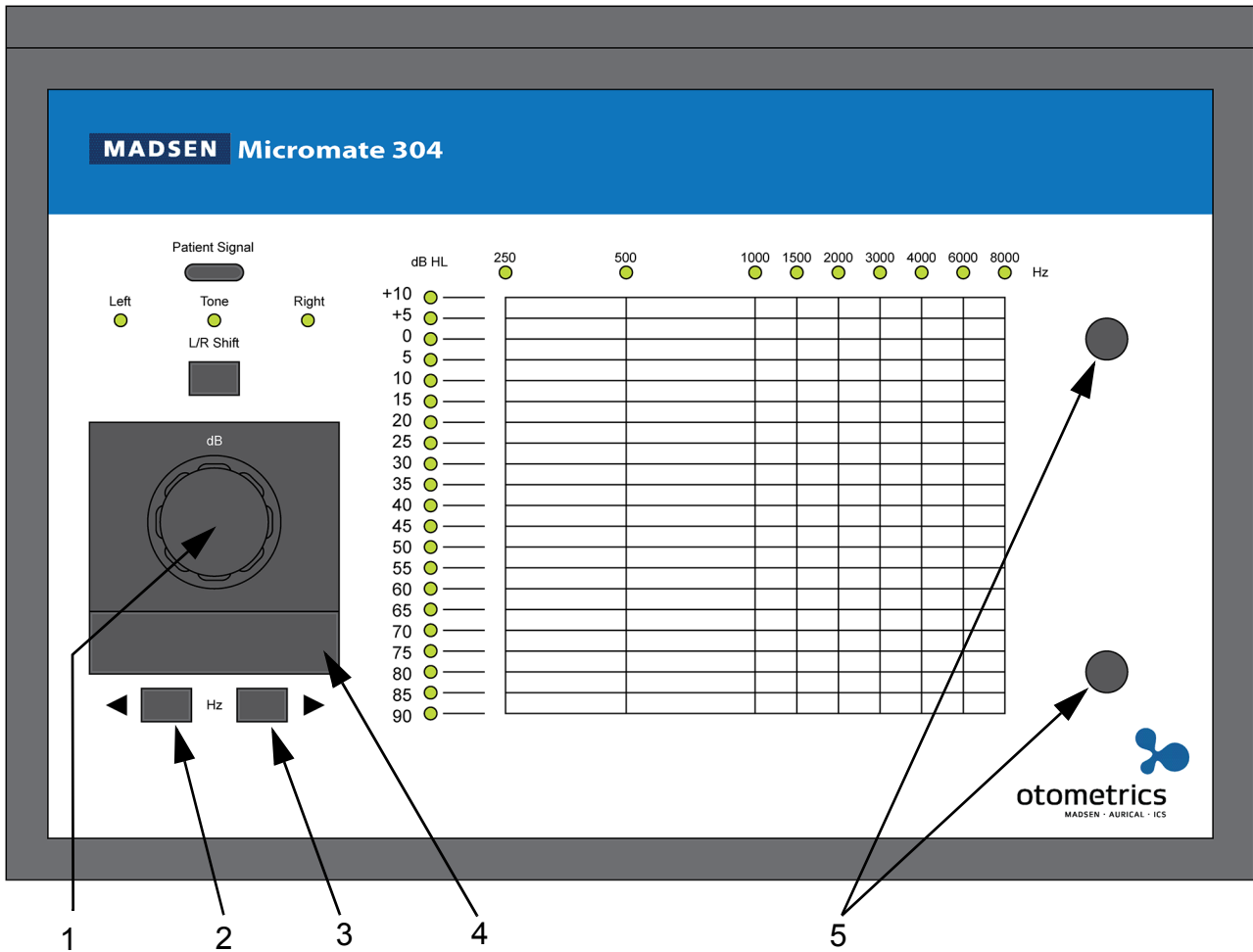


Fig. 3 Micromate 304 Front Panel.

1. Hearing Level Knob
2. Frequency Down Pushbutton
3. Frequency Up Pushbutton
4. Tone Switch
5. Audiogram Form Alignment

