## *Middle Ear Analyzers* AT235 and AT235h

- Efficient Middle Ear Examinations

# Impedance *precision*

The AT235 is an automatic middle ear analyzer ideal for diagnostic and screening evaluations. The primary design of the AT235 emphasizes ease of use without compromising testing flexibility. Test batteries of the AT235 include standard tympanometry, ispsilateral and contralateral acoustic reflex and reflex decay, Eustachian tube function test and air conduction audiometry.

Automated tympanometry may be combined with 2 programmable reflex test batteries. Further manual reflex testing is available for more tests or to confirm/modify automated reflex results. The AT235 allows more than 40 reflex tests per ear to be stored and printed. These capabilities provide the necessary tests for the majority of any clinic's needs. The addition of high frequency probe tones to optimize tympanometry testing of infants is available with the AT235h model.

**leading diagnostic solutions**

Interacoustics®

# *Middle Ear Analyzers AT235/AT235h*

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## Normal Tympanometry

Interacoustics utilize two beneficial techniques to acquire tympanograms. The first is an 'endless airflow' technique which improves the instrument's ability to obtain a tympanogram on difficult to test patients or when a slight leak is present. This prevents the system from continually resetting to continue the test. The second feature is an intelligently controlled pump system with an adaptive speed control. This feature combines a very fast test speed with high resolution of the tympanogram peak which might otherwise be obtained only with a slower pump speed.

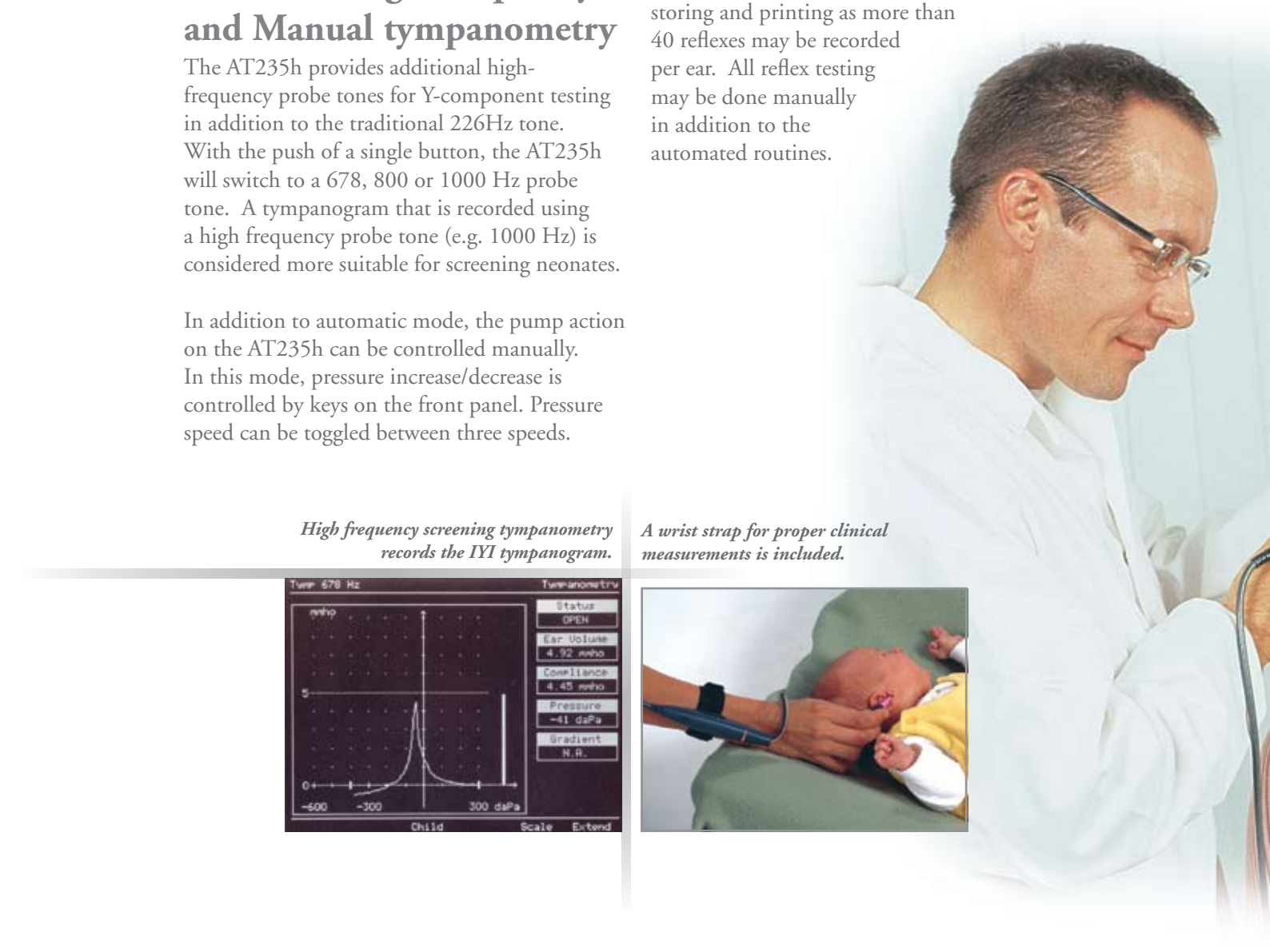
## AT235h - High Frequency and Manual tympanometry

The AT235h provides additional high-frequency probe tones for Y-component testing in addition to the traditional 226Hz tone. With the push of a single button, the AT235h will switch to a 678, 800 or 1000 Hz probe tone. A tympanogram that is recorded using a high frequency probe tone (e.g. 1000 Hz) is considered more suitable for screening neonates.

In addition to automatic mode, the pump action on the AT235h can be controlled manually. In this mode, pressure increase/decrease is controlled by keys on the front panel. Pressure speed can be toggled between three speeds.

## User definable reflex test

Two user programmable acoustic reflex sequences are available allowing the user to define a simple screening procedure for test A and a more in-depth evaluation as test B. These protocols may be programmed and/or selected by the push of a button. The parameters for test A and B come with a factory default setting but are easily changed to better suit alternative clinical test routines. The protocols allow intensity presentations at fixed levels, in auto threshold mode or a defined sequence to display reflex growth. The AT235 and AT235h allow mixing of ipsi and contra reflexes in the protocol as well as a variety of stimuli such as pure tones or noise bands. There are few limitations on storing and printing as more than 40 reflexes may be recorded per ear. All reflex testing may be done manually in addition to the automated routines.



*High frequency screening tympanometry records the IYI tympanogram.*




*A wrist strap for proper clinical measurements is included.*

## Decay – Contra and Ipsi

Acoustic reflex decay testing is available with ispsilateral stimulation as well as with contralateral stimulation. The AT235 comes with a standard single TDH39 transducer for stimulating the contralateral ear, and an insert phone is available as an option.

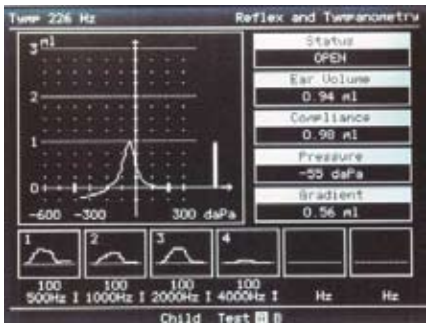
## ETF Test

The AT235 performs a single Eustachian Tube Function test suitable for use when the eardrum is intact. Instructions on the display guide the test. Three tympanograms are produced from which the condition of the Eustachian tube can be inferred.

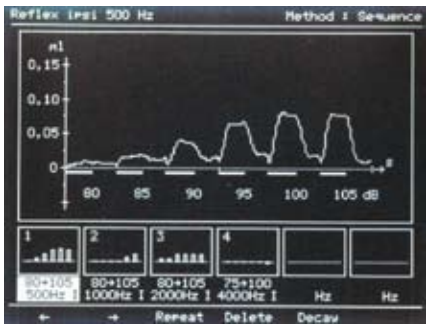
The AT235h has a further ETF test suitable for when the eardrum is perforated.

## Children's Train

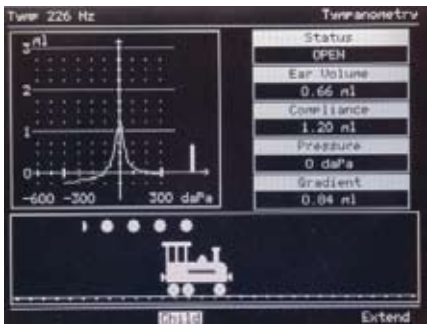
When you need to hold the attention of an active child, all you have to do is press the Child Train button to activate the visual distraction display of a moving train – complete with billows of smoke from the engine.



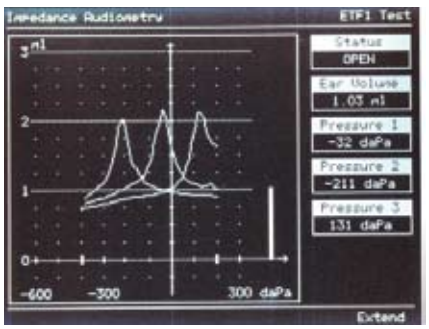

*Tympanogram and reflex test results displayed simultaneously.*




*A group of increasing stimuli for reflex testing, clearly displays reflex growth with increasing intensity.*




*A moving train may help to keep children quiet during testing.*




*Automated Eustachian Tube test is available.*

# *Middle Ear Analyzers AT235/AT235h*

- Efficient diagnostic middle ear examinations

***Detachable probe.***

## Audiometry

A basic air conduction pure tone audiometry function is a standard feature on the AT235 and AT235h. Basic pure tone audiograms may be generated manually or with an automatic HL function. All that is required is the purchase of an optional, independent headset. For patient safety, the maximum output may be limited.

## Probe Systems

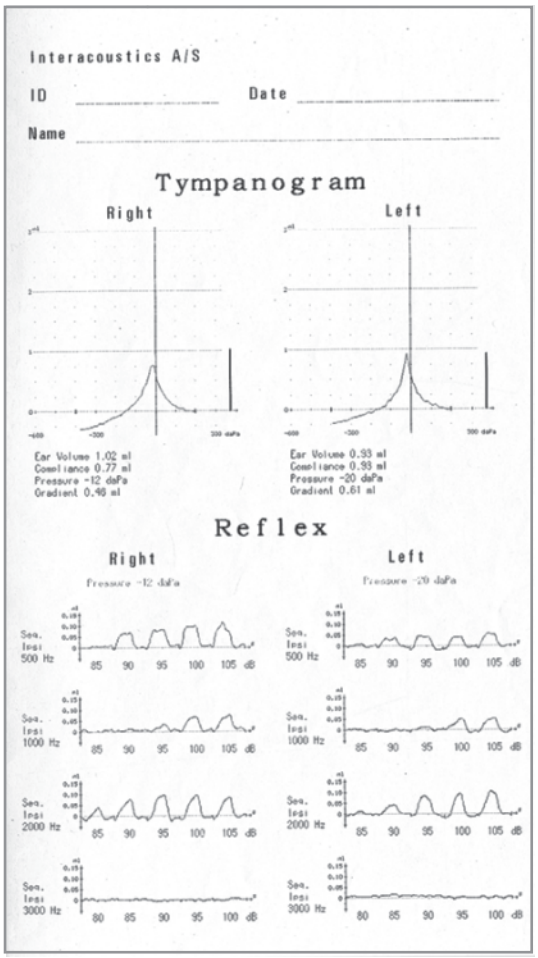
Interacoustics has a unique and efficient probe design that can be quickly converted from a diagnostic style to a screening pencil probe. The software automatically recognizes which probe end is currently in use and converts to the appropriate calibration values. The diagnostic probe is held in place by a custom shoulder strap and is more appropriate for more extensive testing. Meanwhile, the screening probe is ideal for performing quick and basic tympanograms with a screening ispsilateral reflex.

***Clinical measuring is also possible with the included shoulder strap.***

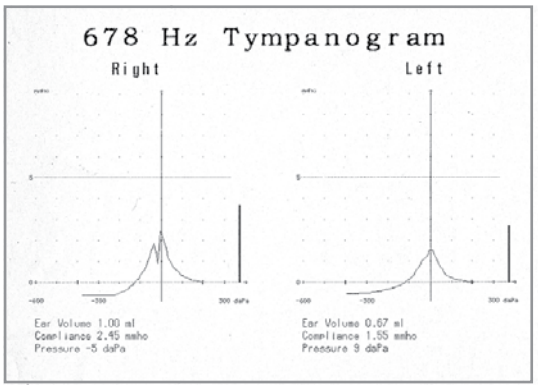
***Audiometry is available through an independent headset with two phones (optional).***

# Printing Options

A fast thermal printer is built into the instrument. If the data is downloaded to the Interacoustics OtoAccess™ database or NOAH, printouts may be generated through the PC.




*Example of printout from the AT235/AT235h.*




*Example of printout from the AT235h.*

# *Middle Ear Analyzers AT235/AT235h*

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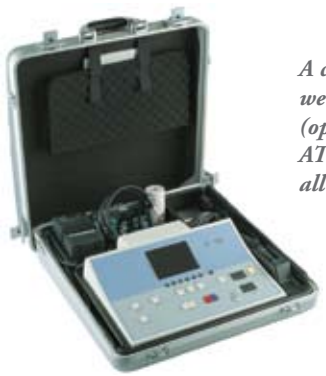
## Data Storage with Windows® Based Software

Transferring data to a PC is possible by two different applications. OtoAccess™ is the Interacoustics® database platform that enables data collection from multiple instrument sources into one patient file. Hearing aid information may also be included. NOAH hearing aid fitting software will also integrate the test data when used with the Interacoustics® NOAH impedance module software.

*Various included and optional parts.*



*A convenient light-weight carrying case (optional) will hold the AT235 or AT235h and all its accessories.*

# General Technical Specifications

**Standards:**
Safety: EN 60601-1, Class I, Type B.
EMC: EN 60601-1-2.
Impedance: EN 60645-5/ANSI S3.39, Type 2.
Audiometer: EN 60645-1/ANSI S.3.6, Type 4 Tone.

**Medical CE-mark:**
Interacoustics A/S meets the requirements of the Annex II of the Medical Device Directive 93/42/EEC. Approval of the quality system is made by TÜV – identification no. 0123.

## Tympanometry:

**Probe tone:**
*Frequency:* 226Hz. *AT235h also:* 678Hz, 800Hz, 1000Hz for traditional IYI-curve tympanometry.
*Level:* 85 db SPL.
*Gain Control:* AGC.

**Air pressure:**
*Control:* Automatic.
*Range:* Default +200 to –400daPa (max. +300 to -600daPa).
*Safety limitation:* -800 daPa and +600 daPa.
*Pressure change rate:* Selectable in the set-up between 50, 150 and >250 daPa/s or automatic.
*Compliance:*
*Range:* 0.1 to 6.0 ml (numerical: 0.1 to 8.0 ml).

**Function:**
Automatic, where pump speed, start and stop pressure can be user-programmed in the set-up.
AT235h: Auto and manual pump functions.

**Eustachian Tube Function:**
AT235: Function test for use when the eardrum is intact.
AT235h: Functions tests for use with both intact and perforated eardrums.

## Acoustic Reflex Functions:

**Test Types:**
*Automatic Reflex:*
Two independent user selectable protocols.
Series of fixed intensities available.
Automated intensity search functions available for threshold search and reflex growth indication.
Free mixing of Ipsi and Contra.
*Manual Reflex:*
Manual control of all stimuli.
May also be used to redo part of automated test results.
*Reflex Decay:*
Manual control, with stimulus duration of 10 sec.
Ipsi or contralateral stimulation.

**Contra Earphone:**
TDH39 or insert receiver CIR22 (optional).

**Attenuator:**
1dB or 5dB steps.

**Memory:**
Internal memory for two ears.
Each ear: 6 Ipsi and 6 Contra recordings. Each may have up to 6 stimuli. Also, there is memory for additional manual reflex recordings. (Total max. 78 reflexes per ear).

## Audiometer Functions:

**Patient Response:**
Connection for patient response switch.

**Outputs:**
Contra TDH39 headset may be used for audiometry.
Double TDH39 Headset for audiometry (optional).

**Test types:**
Manual Audiometry.
Automatic Audiometry according to ISO 8253-1 (Patient controlled Hughson-Westlake).

## Various:

**PC Communication:**
Input/output for computer communication via USB. One mode allows an external PC to both monitor and control the instrument. The control actions can be followed on the display and operation panel. Online communication, where the measurement data are sent to an external PC can be selected.

**Keyboard:**
Connection for external keyboard, standard PC type.

**Printer**
Built in fast thermal printer with paper width: 112 mm.

**Accuracy:**
*Stimulation Frequencies:* ±1%.
*Probe tone frequency:* ±1Hz.
*Probe tone level:* 85 dB SPL.
±1.5 dB measured in an IEC126 acoustic coupler. AGC for ear canal compensation.
*Pressure measurement:* 5% or 10 daPa, whichever is greater.
*Compliance measurement:* ±5% or 0.1 ml, whichever is greater.

# Interconnections

UPS400 Mains Supply100-240V

AT235 / AT235h

IFC69

**Software for PC:**
PrintView
OtoAccess™
NOAH Modules

# General Technical Specifications - continued

**Examples of Compatible Windows Software:**
Interacoustics OtoAccess™ Database.
PrintView for PC monitoring and printing.
IA-NOAH-Imp Module for interfacing to NOAH.

**Frequencies and Intensity Ranges:**
For safety / comfort reasons an optional limitation of maximum intensity is available.

**Power supply:** UPS400 (Included) 100-240V.

**Warm up time:** 10 minutes at room temperature (20°C).

**Consumption:** 15VA, max. 45VA.

**Construction:** Plastic cabinet.

**Dimensions:** (LxWxH): 36x26x10 cm / 14x10x4 inches.
**Weight:** 2.8 kg / 6 lbs.

**Air Freight Packing:** (LxWxH): 48x31x37 cm/ 19x22.2x14.6 inches.
**Gross weight:** 6.5 kg / 12.4 lbs.

| Frequency | Reflex | | | | | | Audiometry | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Contralateral | | | | Ipsilateral | | | | | |
| | TDH39 | | Insert/CIR22 | | | | TDH39 | | EAR-Tone 5A | |
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| Hz | dBHL | | dBHL | | dBHL | | dBHL | | dBHL | |
| 125 | -10 | 90 | - | - | - | - | -10 | 90 | -10 | 95 |
| 250 | -10 | 110 | 0 | 100 | - | - | -10 | 110 | -10 | 100 |
| 500 | -10 | 120 | 0 | 105 | 10 | 105 | -10 | 120 | -10 | 110 |
| 750 | -10 | 120 | - | - | - | - | -10 | 120 | -10 | 120 |
| 1000 | -10 | 120 | 0 | 110 | 10 | 110 | -10 | 120 | -10 | 120 |
| 1500 | -10 | 120 | - | - | - | - | -10 | 120 | -10 | 120 |
| 2000 | -10 | 120 | 0 | 105 | 10 | 105 | -10 | 120 | -10 | 120 |
| 3000 | -10 | 120 | 0 | 100 | 10 | 100 | -10 | 120 | -10 | 120 |
| 4000 | -10 | 120 | 0 | 95 | 10 | 100 | -10 | 120 | -10 | 120 |
| 6000 | -10 | 120 | - | - | - | - | -10 | 120 | -10 | 105 |
| 8000 | -10 | 110 | - | - | - | - | -10 | 110 | -10 | 100 |
| WB noise | -10 | 120 | 0 | 100 | 10 | 105 | - | - | - | - |
| LP noise | -10 | 120 | 0 | 100 | 10 | 105 | - | - | - | - |
| HP noise | -10 | 120 | 0 | 100 | 10 | 105 | - | - | - | - |

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## Printer Option:

AT235/AT235h-xp is identical to the AT235/ AT235h but has no built-in printer. Suitable for installations where computer connection takes care of printing.

## Included Parts:

ATP-AT235u Universal Probe System with shoulder strap and wrist strap
TDH39 Single Contralateral Headset
UPS400 External Switch Mode Power Supply
Power Cable (110/220V, please specify)
BET50 Box of 65 assorted Eartips
TPR26 3 Rolls of Recording Paper
PCR-AT235 Dust Cover
Operation/Multilingual CE manuals

## Optional Parts:

TDH39 Audiometric Headset
EAR-Tone5A Insert Phones for Audiometry
ACC25 Carrying Case
CIR22 Contralateral Insert Phone
APS2 Patient Signal
CAT40 Calibration Unit 0.2-0.5-2.0-5.0 ml
IES-2 Impedance Ear Simulator
OtoAccess™ Database and diagnostic modules software

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