

**Technical specifications:**

**DISTORTION PRODUCT OTOACOUSTIC EMISSIONS (DPOAE)**

Stimulus 2 sinus stimulus channels  
 Geometric Center  
 Frequencies 0.5, 0.75, 1.0, 1.5, 2.0, 3.0, 4.0, 6.0, 8.0 kHz  
 Stimulus Level Range 30-70 dB SPL  
 Stimulus 3rd order  
 Intermodulation < -80 dB  
 Input Sensitivity ≥ 50 dB SPL: 80 to -30 dB SPL  
 For Stimulus < 50 dB SPL: 60 to -50 dB SPL

**Frequency Response Accuracy**

Microphone: ± 3 dB from 500 to 4000 Hz  
 ± 6 dB from 4000 to 9000 Hz  
 711 Coupler Reference (volume compensated)  
 Sound Level: ± 4 dB from 500 to 4000 Hz  
 ± 7 dB from 4000 to 9000 Hz  
 In Situ Sound Level Adjustment  
 ± 4.5 dB from 500 to 4000 Hz

**TRANSIENTLY EVOKED OTOACOUSTIC EMISSIONS (TEOAE)**

Stimulus Type  
 Non-linear & Fast-Screen: 3 clicks of the same polarity and 1 click of opposite polarity, at 3 times the amplitude of the 1st click. Pulse width 40, 80, 120 µsec  
 Linear: Unipolar click. Pulse width 40, 80, 120 µsec  
 Stimulus Level Range 30-80 dB p.e. SPL approx. -30 to 60 dB nHL  
 Level Accuracy ± 4 dB  
 Acoustical Bandwidth 500-4000 Hz ± 5 dB @ 1000 Hz

**SPONTANEOUS OTOACOUSTIC EMISSIONS (SOAE)**

Input Sensitivity 0-70 dB SPL  
 Frequency Ranges 500-5000, 500-10,000 Hz

**ECHO-SCREEN MODE**

Stimulus Mode Non-linear: 3 clicks of the same polarity and 1 click of opposite polarity, at 3 times the amplitude of the 1st click.  
 Pulse width 83 µsec  
 Stimulus Level Range 70-85 dB SPL automatic volume adapting  
 Signal Bandwidth 1400-4000 Hz

**TYMPANOMETRY MODE**

Standards EN 61027, ANSI S3.39  
 Probe Tones 226 Hz at 85 dB SPL  
 1000 Hz at 75 dB SPL  
 Volume Range 0.1 ml to 8 ml  
 Air Pressure Range +200 to -400 daPa  
 Accuracy ±10% or ±10 daPa  
 Air Pump Speed 50-400 daPa/sec and as fast as possible (A.F.A.P.)

**POWER SUPPLY**

AC 50/60 Hz, 100-240 V. Fuses Type 1A T (accessible from outside the cabinet).  
 Power Consumption: Approx. 55 VA

**PATIENT SAFETY**

Complies with EN 60601-1, Class I, Type B, IPX0.  
 Battery version complies with EN 60601-1, Class I, Internal Powered, Type B, IPX0

**EMC**

EMC Emission and Immunity Complies with EN 60601-1-2

**OPERATING ENVIRONMENT**

Temperature 10°-35°C  
 Relative Humidity 30-90%, non-condensing  
 Atmospheric Pressure 600-1090 hPa

**DIMENSIONS AND WEIGHT**

Hardware Platform 305 x 284 x 59 mm,  
 12" x 11" x 2¼" (W x D x H)  
 Net Weight Approx. 1.8 kg, 4 lbs (excl. PC)  
 Probe Assembly 73 g, 2.6 oz.  
 Standard Probe 4 g  
 Echo-Screen Probe 4 g (incl. baby eartip)

**HARDWARE REQUIREMENTS**

Minimum Pentium III, minimum 128 MB RAM.  
 VGA Graphics Adapter.  
 Windows operating system (NT, 98, Me, 2000, XP).  
 RS232C Serial interface.

**ACCESSORIES\***

Users' Manual, Quick Guide, Shoulder Harness, Headband, Eartips, Standard Probe, Probe Tips, Echo-Screen Probe, Carrying Case, M.E. Auto. Serial Switch Box.

\* Which accessories are standard and which are optional depends on which application modules are purchased. Please contact your local GN Otometrics distributor.

Distributor:

Build your own  
 Windows-based system  
 for objective diagnostics



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Hearing Assessment   Fitting Systems   Balance Assessment

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# The modular MADSEN Capella holds the building blocks which take OAE into the future

**All in one – or modular**  
With GN Otometrics' Capella, you can combine otoacoustic emissions (OAE) testing, screening tympanometry and infant hearing screening in the same Windows™-based system. In fact, Capella is the only system to offer both OAE and middle-ear diagnostics.

Because Capella is software-based and modular, you can choose only those testing options you require now and add more later. Each testing mode is offered as a separate application module in the form of software and accessories.

The following application modules can be freely combined to suit your individual requirements: Distortion Product OAE, Transient Evoked OAE, Screening Tympanometry, and Echo-

Screen™ TEOAE Screening (requires Echo-Screen baby screening probe). Both DPOAE and TEOAE modules include a mode for measurement of Spontaneous OAEs.

## Seamless software integration

You can't find a more complete OAE system than Capella. And you can't find another system resembling Capella in a user-friendly NOAH-based platform.

With NOAH, all your OAE measurements can be organized in a professional database, saving you a lot of paperwork and allowing you to more easily manage large numbers of patients. Moreover, your OAE test system can be installed on the same PC or network you use to perform other audiological measurements, like au-



The Echo-Screen module includes an ultra-lightweight probe (4 grams) for screening babies and small children.

diometry and real ear measurement, for example. And all your measurements can be saved in the same patient file.

## Screening modes for OAE and tympanometry

In addition to its other capabilities, Capella emulates GN Otometrics' Echo-Screen handheld OAE infant hearing screener. This permits you to make a quick screening of cochlear function, follow up with a middle-ear check and, if necessary, move on to a complete OAE analysis. All with one system – in one quick process. And Capella's Screening Tympanometry module offers you the choice

of both 226 and 1000 Hz probe tones.

## Potential applications for OAE measurements

The non-invasive nature of OAE measurement, as well as its accuracy and objectivity in assessing cochlear function, provide numerous potential clinical applications, ranging from auditory screening to sensorineural diagnosis.

### HEARING SCREENING

- Difficult-to-test patients including infants
- Industrial (occupational hearing loss)
- Schools/Itinerant

### RESEARCH

- Cochlear function
- Outer hair cells (OHCs)
- Basilar membrane
- Efferent innervation

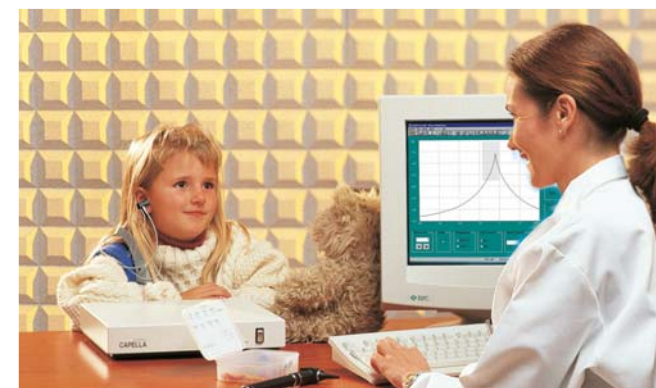
### CLINICAL EVALUATION

Differential diagnosis (cochlear vs retrocochlear)

Monitoring:

- Progressive hearing loss
- Otorotoxicity
- Middle-ear surgery
- Noise-induced hearing loss

The Capella hardware platform is compact, and can easily be connected to your PC.



## Simple, compact, and easily portable

Capella is more than user-friendly. It's easy to set up. Software is installed directly from NOAH, and you can just plug the Capella hardware platform into your PC via the serial COM port – no additional hardware installation is necessary within the PC.

As with GN Otometrics' other software-based diagnostics equipment, Capella is completely portable. The system consists of a platform about the size of a laptop PC, and a probe assembly. Together with a laptop it weighs less than 5 kg (11 lbs.) and packs in seconds. In fact, it isn't necessary to unpack it at all if you purchase the optional hard-walled carrying case. All you have to do is open the case, take out the probe, power on the hardware and PC, and you're ready to test. And if you opt for the battery version of the hardware, you don't even need an AC power source.

The multi-function OAE and Tymp. probe can be supplemented by the Echo-Screen probe for baby screening (TEOAE only).

## The computer people in audiology

GN Otometrics is the world's leading manufacturer of computerized audiological equipment, both for diagnostics and hearing instrument fittings. Unlike the traditional stand-alone systems, we focus on providing solutions that utilize the power and speed of the PC.

Owners of our PC-based systems can upgrade their prod-

ucts with software rather than having to buy new hardware. Our products integrate with office management networks (we strongly support the NOAH™ standard) and hospital mainframe systems. Even equipment diagnostics and troubleshooting can be handled via modem. All in all, computerized audiological equipment just makes more sense.

Four separate modules are available for Capella (and SOAE is included as standard).

