



Vestibular *precision*

The Interacoustics VNG Module offers complete oculographic analysis that is easy to administer and comfortable for the patient.

The lightweight Combi Mask is recognized as one of the best video masks available today for reasons of patient comfort and versatility in fitting on a variety of patient populations.



VNG *systems* VN415/VO425

- Efficient Vestibular Examinations

The Challenge

Eye movement measurements play an essential part in patient diagnosis by providing the clinician with important qualitative and quantitative information. However, traditional electro-nystagmography (ENG) has the same problems inherent in most electrode-based systems, including biologic and external noise and signal drift. Electrodes consume additional time and expense and are generally an uncomfortable inconvenience for the patient. ENG does not allow the visual evaluation of eye movements.

VNG – The Solution

Video Nystagmography (VNG) provides the solution to the limitations of previous measurement techniques.

Eye images are recorded without direct contact using high resolution cameras with infrared illumination. Setup is as fast and easy as using Frenzel glasses.

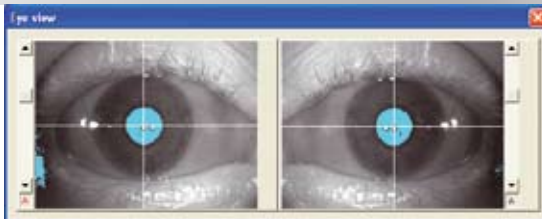
The eyes are visualized, enabling simultaneous subjective evaluation, while eye position is analyzed by digital image processing to obtain vertical and horizontal eye position.

VNG can also demonstrate eye movement patterns for teaching purposes.

Disease processes and their effects can be visualized by both patients and students while being described by the clinician.

The Advantages

- **Fast:** eye-tracking at 105Hz binocular, 174Hz monocular
- **Accurate:** resolution 0.1°
- **Time saving:** easy setup with visual control, no need to spend time attaching electrodes
- **Easy to use:** slip on mask and start! Analysis software within Microsoft Windows
- **Complete evaluation:** standard analyses for all nystagmography tests
- **High quality printouts** of all analyses and selected raw data
- **Database:** full measurement data and analyses, GDT interface, intuitive search of patient details, supports all Interacoustics modules.
- **Objective:** positional examinations can be recorded and documented without artifact problems
- **Subjective** evaluation with nystagmus edit function
- **Firewire® camera technology:** direct goggles-to-PC video transfer



Eye tracking algorithm registering the centre of the pupil.





The lightweight and comfortable combi mask offers the possibility of doing free-field-of-view as well as light occluded testing.

The Combi Mask

- Disposable foam rim
- Lightweight, comfortable and stable
- No need for darkened examination room
- Visual observation of both eyes
- Easy adjustments for interpupillary distance and focus
- Built-in fixation lights for visual suppression
- Default calibration for examinations in occluded view mode
- Cover can easily be fitted and removed, particularly practical with the apprehensive patient.
- Available with one or with two cameras.
- One-camera goggle allows for recording of right eye or left eye at examiner's discretion.

Test situation for Caloric Irrigation.

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VO425 – Video Oculography

The VO425 offers a complete vestibular analysis system that is easy to administer and comfortable for the patient. The VO425 provides all of the standard vestibular examinations plus the unique *VisualLab* for optimal presentation of optokinetic stimuli. The VO425 Windows based examination software and report generator make it easy to run through a test, analyze the data and quickly generate a professional report. Depending on requirements, the VO425 is available in a binocular or monocular configuration.

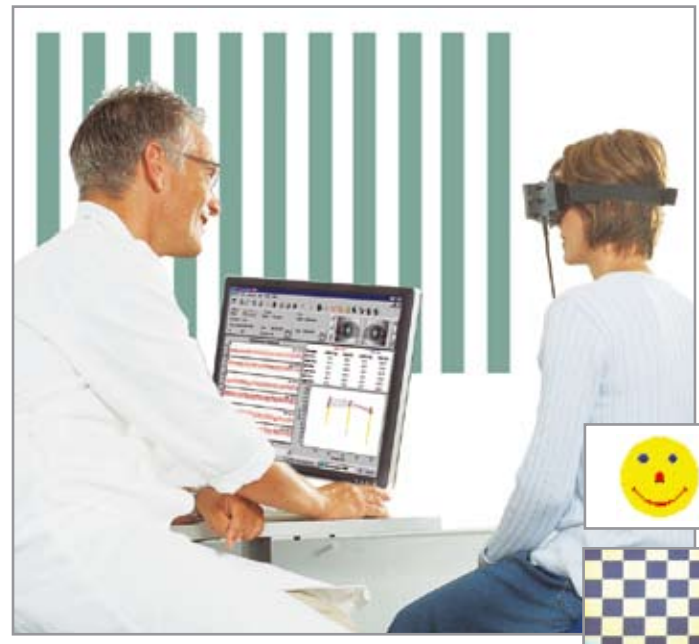
The VO425 test battery is designed for complete vestibular analysis.

Vestibulo-Ocular Reflexes may be examined with the following tests:

- Spontaneous Nystagmus Test
- Multi Condition Test
- Bithermal Caloric Test (with normative data)

Vestibulo-Spinal Reflexes may be examined with the following tests:

- Saccade Test (with age dependent normative data)
- Smooth Pursuit Test (with normative data)
- Optokinetic Test (with normative data)
- Gaze



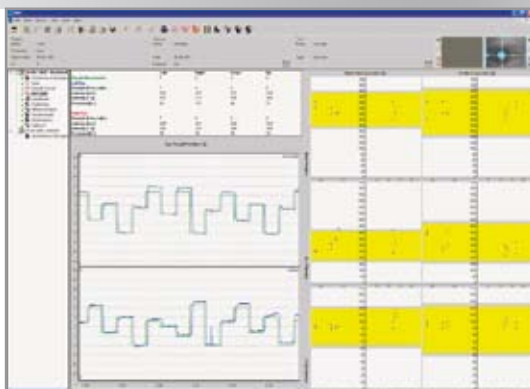
Performing an oculomotor test and examples of included patterns for the visual stimulus system for oculomotor testing and calibration.

VisualLab

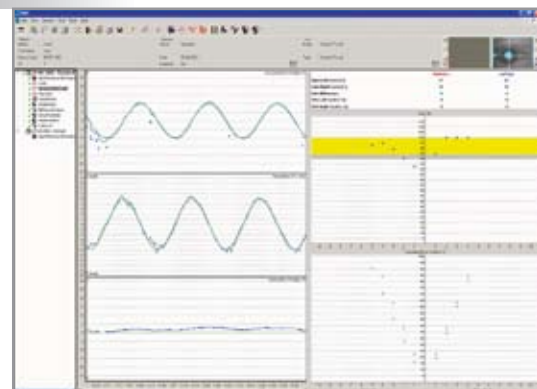
VisualLab is a software based image generator that offers a unique selection of stimulus patterns unmatched by other systems. Choices in color patterns, scenery and image size make the VisualLab an obvious choice for the professional vestibular clinic

Advantages of VisualLab

- Full visual field stimulation
- Assorted stimulus patterns
- Easy adaption to different test spaces
- Able to import custom stimuli
- Fast calibration



Saccade Test Window



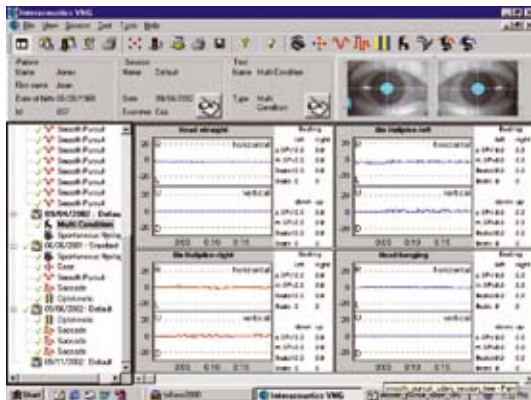
Smooth Pursuit Test Window

VN415

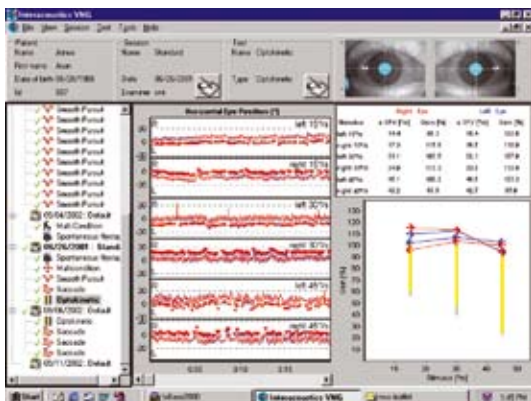
The VN415 is similar to the VO425, but does not include the VisualLab for the specialized oculomotor testing. The VN415 records the patient's eye movements using the same mask and camera system as used with the VO425. The PC-based system then analyzes the video images.

Test battery includes:

- Spontaneous nystagmus
- Caloric
- Multi-Condition



Multi Condition Test Window



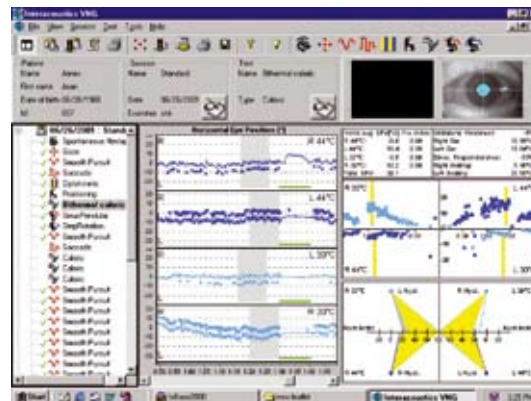
Optokinetic Test Window

Advantages of the software

- Create your own examination templates
- Create independent, high quality reports for each template
- View graphical data and corresponding eye positions
- Fast statistical analysis
- Normative value comparisons
- Record comments during examination
- Infrared remote control

Examination Templates and Test Views

The *Examination Designer* allows the creation of your own test protocol. Once the protocol is defined you can step through the examination by simply pressing a footswitch. It couldn't be any easier! During the examination the test view provides you with graphical data and immediate »On Line Analysis« while simultaneously displaying the eye images for subjective control during the exam. The examiner can even type in comments while the test is in progress. These features greatly reduce the number of time consuming steps often involved in generating test data.



Caloric Irrigator Test Window

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Additional Options

- Reader station for remote data access
- Setup to record rotary chair movement
- Recording to VCR or DVD-R

Interacoustics Modularity

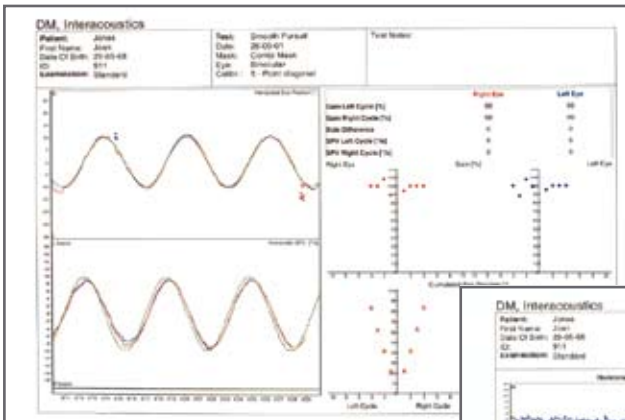
The assessment of the ear places demands on instrumentation within the modern clinic. The Interacoustics modular arrangement offers a complete line of instruments integrated within a common Windows environment. Screening, threshold detection and vestibular testing are addressed in otoacoustic emission, evoked potential and video nystagmography modules.

Also complementing the arrangement are the Interacoustics classic line of Audiometers, Impedance instruments and Hearing Aid Analyzers. The ultimate benefit of integrating these modules is that patient and test data from all modules can be stored in our proprietary database.

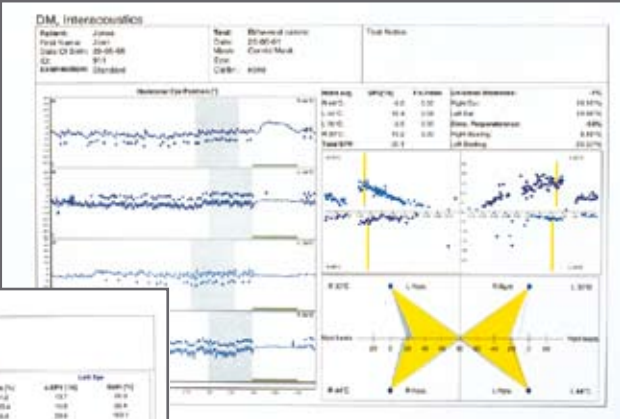


The Database

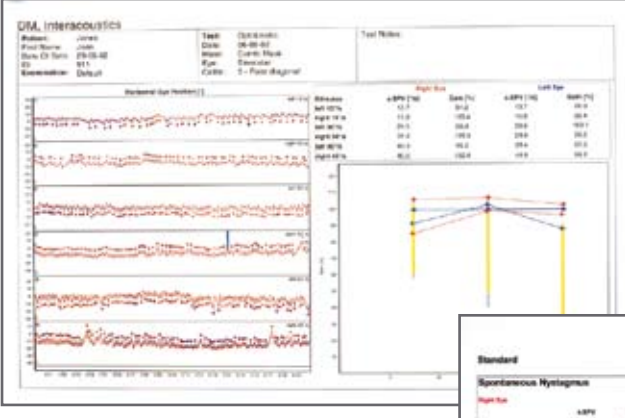
The integrated extensive database provides a practically unlimited storage capability. The database works not only with VN415/VO425 but also accepts data from Interacoustics audiometers, impedance bridges, hearing aid analyzers, ABR and OAE systems.



Example of printout of Smooth Pursuit Test



Example of printout of Caloric Test



Example of printout of Optokinetic Test

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Spontaneous Nystagmus				Gaze			
Right Eye	Left Eye	Right Eye	Left Eye	Right Eye	Left Eye	Right Eye	Left Eye
Gain (%)	98	98	98	98	98	98	98
Gain Phase (deg)	98	98	98	98	98	98	98
Gain Amplitude	98	98	98	98	98	98	98
Gain Latency (ms)	98	98	98	98	98	98	98
Gain Error (%)	98	98	98	98	98	98	98
Gain SD (%)	98	98	98	98	98	98	98
Gain CV (%)	98	98	98	98	98	98	98
Gain RMSE (%)	98	98	98	98	98	98	98
Gain RMSE (deg)	98	98	98	98	98	98	98
Gain RMSE (ms)	98	98	98	98	98	98	98
Gain RMSE (deg/ms)	98	98	98	98	98	98	98
Gain RMSE (deg/ms²)	98	98	98	98	98	98	98
Gain RMSE (deg/ms³)	98	98	98	98	98	98	98
Gain RMSE (deg/ms⁴)	98	98	98	98	98	98	98
Gain RMSE (deg/ms⁵)	98	98	98	98	98	98	98
Gain RMSE (deg/ms⁶)	98	98	98	98	98	98	98
Gain RMSE (deg/ms⁷)	98	98	98	98	98	98	98
Gain RMSE (deg/ms⁸)	98	98	98	98	98	98	98
Gain RMSE (deg/ms⁹)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹⁰)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹¹)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹²)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹³)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹⁴)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹⁵)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹⁶)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹⁷)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹⁸)	98	98	98	98	98	98	98
Gain RMSE (deg/ms¹⁹)	98	98	98	98	98	98	98
Gain RMSE (deg/ms²⁰)	98	98	98	98	98	98	98

Example of printout of numerical statistical data

Printouts

The VO425 can produce clear and detailed color reports suitable for hardcopy storage. Reports are printed in an easy to read format including all patient information directly from

the database. Reports can be printed as full-detailed tracings and graphs or as statistical data only to save space.

General Technical Specifications

Standards:

EN60601-1 (General safety)
EN60601-1-1 (Safety of system)
EN60601-1-2 (EMC)

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.

System Requirements:

Hardware

Intel Core 2 Duo processor 1.8 GHz or better
Minimum 1 GB of RAM
Laptop PC: One 34 mm PCExpressCard slot available
Desktop PC: PCI Firewire board with dual 6-pM ports
Two USB ports available
One VGA port available
Monitor resolution 1024 x 768 or better

Software

Windows®XP SP2 Operating System
Microsoft .Net 2.0 Framework
Windows Installer 3.x”

Examination Templates:

Several default examination templates included. As many examination templates as desired may be designed and added by examiner.

OtoAccess™ Database:

Database: SQL
Data format: XML
Full network capability
Unlimited storage. Patient demographic data.
Patient Journal.
May also include data from Interacoustics®' audiometers, impedance audiometers, and hearing aid analyzers.
Easy back-up function.

Included Parts VN415:

Combi Mask
One Camera module for Combi Mask (VN415m only)
Two Camera modules for Combi Mask and 4-channel software (VN415b only)
Installation CD
Disposable combi mask pads - includes 24 pieces
Infared remote control
FireWire PCExpress Card/34 w. power supply
Otoaccess™ database software
Quick Guide
Operation Manual

Recording:

Monocular/2 channel up to 174Hz and binocular/4 channel up to 105Hz.

Data Acquisition:

Method: Infra-red illuminated eye image captured by camera module.
Tracking: From cross hair movement.
Dynamic Range: +/- 30 degrees horizontal and +/- 25 degrees vertically.

Data Analysis:

Real time analysis with eye velocity determined from each data point, providing continuous appraisal of eye movement patterns. Discrete analysis offers appraisal of each nystagmus beat and may be preferable in cases of sporadic or weak nystagmus responses.

Visual Stimuli available with VO425:

- Colors and targets entirely user defined.
- Optokinetic - horizontal and vertical stimulation available. User designed jpeg stimuli can be imported. Also chessboard, stars and stripes available. User defined stimuli for Pediatric testing.
- Smooth pursuit - sinusoidal/linear, with or without acceleration.
- Saccade - horizontal/vertical.
- Gaze.

Reports:

One page displaying statistical data for four tests.
One page holding traces, display diagrams, statistical data for one test.
Easy to use templates with default settings for audiology and oto-neurology clinics.

Normative Data:

Implemented in software. Included in the systems software with Saccade, Smooth Pursuit, OPK and Bithermal Caloric.

Networks:

May be connected to a network. Then testing may be monitored from any reader station. Subsequent editing, including nystagmus analysis may be carried out from any networked PC.

Help:

On-line help through electronic operation manual.

Number of tests per session:

Unlimited.

Number of sessions per patient:

Unlimited.

Video Recording:

Synchronized replay and curve display including sound
Buffered recording
Unlimited recording period
Export function
Fast/normal/slow motion replay mode

Manual Nystagmus Edit Function:

Add or remove nystagmus
Redefine culmination phase

Included Parts VO425:

Combi Mask
One Camera module for Combi Mask (VO425m only)
Two Camera modules for Combi Mask and 2-channel software (VO425b only)
Installation CD
Disposable combi mask pads - includes 24 pieces
Infared remote control
FireWire PCExpress Card/34 w. power supply
Otoaccess™ database software
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Options VN415/VO425:

VLE415 Upgrade Kit VN415 to VO425
Upgrade Kit VN415m (monocular) to VN415b (binocular)
Upgrade Kit VO425m (monocular) to VO425b (binocular)
RCE15 Extension Rotary Chair Test



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