PATHWAY

Pain & Sensory Evaluation System

System Overview

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8th Edition, Jul 2009

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1. Introduction

Medoc's PATHWAY Pain & Sensory Evaluation System introduces new technology and capabilities in the area of advanced thermal stimulation, and contact heat evoked potential products. The PATHWAY system has a configurable and modular design, which can be tailored to specific needs and protocols.

The PATHWAY system presents exciting new possibilities for pain and peripheral nerve disease research, as well as for implementation in pharmaceutical development and clinical applications.

Among other features, the PATHWAY system offers capabilities in the area of small fiber evoked potential (EP), deep cold pain (to -10C) investigation, and fMRI compatibility.

The PATHWAY system is offered in three main models:

- PATHWAY combined CHEPS and ATS
- PATHWAY model CHEPS
- PATHWAY model ATS

The following pages outline some of the PATHWAY system important features.

2. Overview

The PATHWAY Pain & Sensory Evaluation System is an advanced, computerized thermal stimulator, designed for advanced neurological and pain research. The PATHWAY System is available in several different configurations, tailored for customer needs, as it is a modular system with easy upgrade capabilities.

2.1. PATHWAY System

The PATHWAY system has two types of active probes, CHEPS Thermode, and ATS Thermode. These probes are attached to the skin of the tested subject to obtain contact thermal stimulation.

Thermal stimulation is induced using peltier element and heating foil, which are accurately controlled by PATHWAY hardware and software at a rate of 200Hz. Programs of temperature paradigms can be created and saved by the user.

The PATHWAY system offers designated software, for easy control and management of the system. PATHWAY software can be controlled by other research programs such as “LabView” and “MatLab”, for activating stimulation protocols, using analog and I/O channels.

The PATHWAY system allows synchronization with external research devices such as fMRI scanners and EEG systems providing the opportunity for multi-modality evaluation of brain response to thermal stimuli. Synchronization with fMRI and EEG is done via TTL inputs & outputs.

The PATHWAY system is offered in three main models:

- PATHWAY combined CHEPS and ATS
- PATHWAY model CHEPS
- PATHWAY model ATS

2.2. PATHWAY model CHEPS

PATHWAY model CHEPS offers fast heating rates of up to 70°C/Second and cooling rates of up to 40°C/Second within a temperature range of 30°C to 55°C, enabling the delivery of painful heat stimuli in less then 300 milliseconds. CHEPS is available with a large 27mm diameter Thermode (572 mm^2 contact area) enabling greater receptor fields resulting in a stronger cerebral response.

PATHWAY model CHEPS can serve as a tool for the assessment of objective pain perception, such as Contact Heat Evoked Potentials, and for evaluating the dynamic changes in pain sensation as a result of pain treatments, medications and experimental manipulations, such as Temporal Summation. CHEPS technology delivers fast heat stimuli of predetermined temperatures, resulting in a selective activation of different sensory fibers groups and brain evoked potentials.

2.3. PATHWAY model ATS

PATHWAY model ATS delivers precise and highly repeatable painful and non-painful thermal stimuli at a temperature range of 0°C to 55°C (expandable to -10°C to 55°C) with heating and cooling rates of up to 8°C/Second. ATS is available with 30x30mm Thermode (contact area of 900 mm^2), and 16x16mm Thermode (contact area of 256 mm^2).

PATHWAY model ATS opens new research opportunities in deep cold and heat pain studies as well as clinical applications in the diagnosis of neuropathies.

2.4. fMRI Safe configuration

PATHWAY system Thermodes are also available in an **fMRI** safe configuration. Both ATS and CHEPS Thermodes can be used to deliver thermal stimuli inside fMRI scanners. Using a special fMRI filter the PATHWAY system ensures accurate stimulation and reduced imaging artifacts.

PATHWAY stimulation in fMRI environment can be synchronized with fMRI compatible EEG recordings. This multi modality synchronization provides the opportunity for extended evaluation of sensory system functioning, and correlation between fMRI and EEG/EPs responses simultaneously.

3. PATHWAY Applications

3.1. Small Fiber Evoked Potentials

3.1.1. Selective Stimulation of Small Fiber Evoked Potentials

Small-fiber Evoked Potentials (EPs) to sensory (non-painful) and noxious thermal stimulation of skin can provide quantitative, objective information about the integrity of the nociceptive afferents as part of the peripheral nerve system.

A-delta mediated EPs are induced by PATHWAY model CHEPS using various temperatures applied to different body sites. EPs amplitude responses are strongly associated with subjective pain perception and intensity of applied stimuli (Truini et al, 2007, Greffrath et al, 2007, Granovsky et al, 2008, Roberts et *al*, 2008).

Based on results conducted at the University of Michigan in concert with Pfizer pharmaceuticals, PATHWAY Model CHEPS has proven to evoke a definitive wave pattern corresponding with selective stimulation of A-delta and C-fibers. Contact Heat Evoked Potential Stimulation (CHEPS), unlike laser stimulators, is able to elicit a C-fiber response, in certain experimental setup, overcoming the current difficulties in stimulating C-fibers (Granovsky et *al*, 2006, Tran et *al*, 2008).

CHEPS technology provides much greater versatility in algorithm design and control, is easier and quicker to set up, and is a very cost-effective new option with superior benefits. CHEPS can be applied with less safety precautions (e.g. no need for fulfilling laser safety guidelines and approved measuring rooms) as well as higher safety to patients and subjects (Wyndenkeller et al, 2008).

Objective response to thermal-evoked pain, as influenced by medications & treatments, opens a wide range of new research and pharmacological evaluation opportunities, using CHEPS as an indicator of drug efficacy and its specification, thus serving as a “surrogate endpoint”. Furthermore, since hyper activation of peripheral and central pain pathways at various chronic pain states (such as fibromyalgia, low back pain, and neuropathic pain syndromes) is reflected by changes in pain EPs characteristics, PATHWAY may have potential future clinical use.

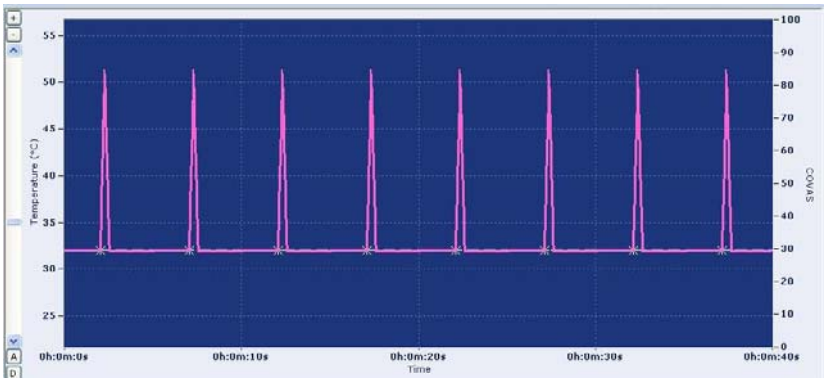

Figure 1: PATHWAY CHEPS stimuli

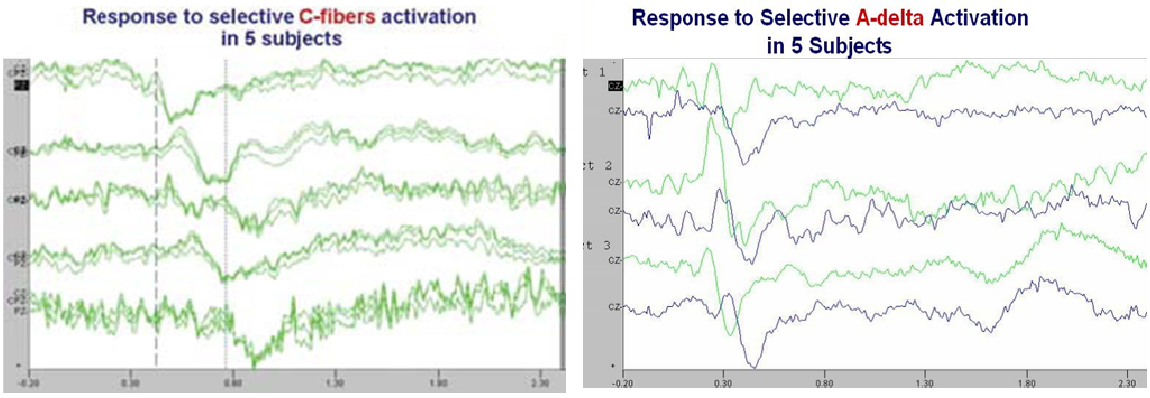

Figure 2: Selective A-delta and C-fiber recordings

3.1.2. Conduction velocity of central pain pathway

A recent study has shown that the conduction velocity of central pain pathways can be evaluated using CHEPS. These findings have important implications on the clinical applications of Nerve Conduction Velocity (Wyndenkeller et al, 2008).

Contact heat stimulation is a safe method for evaluating conduction velocity, providing better control of temperature, and risk of skin damage is negligible (Wydenkeller et al, 2008, Arendt-Nielsen and Chen, 2003).

3.1.3. PATHWAY as a tool for the diagnosis of small fiber neuropathy

Small Fiber neuropathy is very difficult to diagnose using conventional methods such as Nerve Conduction studies and QST, which require the co-operation of patients. Recent studies have demonstrated contact heat stimuli delivered by PATHWAY are at least as sensitive as skin biopsies. Abnormalities of A-delta potentials were recorded in patients who had border-zone low numbers of nerve fibers in intra-epidermal fibers biopsy counts (Atherton et al, 2007). Reduced amplitudes of A-delta evoked potentials were observed in neuropathic patients with skin denervation features and correlated significantly with intraepidermal nerve fiber density, amplitudes of sural sensory action potentials and peroneal compound muscle action potentials. Thus, PATHWAY model CHEPS holds the prospect of serving as an objective, non-invasive test for the evaluation of the severity of small fiber neuropathy. (Atherton et al, 2007, Chao et al, 2007)

3.1.4. Cold EP's

Brain-evoked potentials to fast innocuous skin cooling were recorded first in 1974 by Duclaux et al. (Duclaux et al, 1974). PATHWAY model CHEPS is capable of producing innocuous cooling stimuli to evoke cold EPs.

Cold EPs serve as a physiological parameter for the assessment of cold allodynia, similar to the use of heat EPs for the assessment of heat allodynia. The cold EPs would be of importance for clinical investigation and for drug development, particularly for treatment of the often troublesome cold allodynia. Cold EPs will allow testing drug effectiveness, such as TRPM8 blockers, on these neuropathies. The fact that there are distinct groups of patients suffering from heat / cold allodynia, reinforce the existence of two separate mechanisms for these two kinds of pathologies, which could be studied by using the PATHWAY- CHEPS.

3.2. Temporal Summation / Windup

The evaluation of **Temporal Summation** (“pain windup”) provides unique information regarding central pain processing mechanisms related to central sensitization. This information is of high value in elucidating alterations of neurosensory processing and in documenting treatment efficacy.

Temporal summation of pain may be produced independently of stimulus modality (mechanical, electrical, thermal), but due to certain similarities between heat evoked pain and natural features of clinical pain, the thermal modality is preferable and is widely used in psychophysical studies (Granot et al, 2006).

To Induce windup using PATHWAY model CHEPS, thermal stimuli can be applied repetitively at high frequencies (higher then 0.33 Hz) in two main methods or paradigms: delivering fast pulses with no duration at the peak temperature; and delivering stimuli with the plateau time of several hundreds milliseconds at peak temperature. The versatility of CHEPS Thermode and PATHWAY system advanced software enable the delivery of pre-designed pulse trains by adjusting baseline and destination temperatures at every pulse.

As was recently shown by Staud et al, robust temporal summation (which is C-fiber mediated) can be observed using PATHWAY CHEPS Thermodes. These findings correlate with conduction velocity estimates and qualitative descriptions of delayed pain (Staud et al, 2006).

Figure 3: PATHWAY model CHEPS, Windup screen using CoVAS

3.3. Diffuse Noxious Inhibitory Control Paradigm (DNIC)

Diffuse Noxious Inhibitory Control (DNIC) test paradigm is an advanced psychophysical test for the assessment of efficiency of the Endogenous Analgesia system (EA). The individual efficiency of EA system is of high clinical relevance in the characterization of one's capability to modulate pain, and consequently one's susceptibility to pain disorders.

PATHWAY model ATS can be used in the assessment of DNIC efficiency as the conditioned (test) stimulus. As was shown by Yarnitsky's group, low DNIC efficiency was associated with higher intensity post-operative pain, indicating that efficiency of DNIC can **predict the patient's susceptibility to suffer from chronic post-operative pain.** Assessment of the endogenous analgesia system before procedures that might generate pain may allow individually tailored pain prevention and management, which may substantially reduce suffering. (Yarnitsky et al, 2008).

3.4. QST

Quantitative Thermal Sensory Testing (QST) enables the assessment and quantification of small sensory fibers that can't be assessed using standard electrodiagnostic studies. QST is used to evaluate specific components of the nociceptive system, including pain-mediating unmyelinated C-fibers that can be extremely useful to the practicing pain physician.

Small-caliber fibers constitute 70% of the peripheral nerve system, with C and A-delta fibers responsible for pain transmission. Several disease processes afflict the peripheral nerves, some of which affect the entire spectrum of fibers, while others are selective.

PATHWAY model ATS is an essential Quantitative Thermal Sensory Testing tool, allowing the clinicians and researches to test small nerve fibers. Thresholds for warm and cold sensations, heat and cold-induced pain can be measured quantitatively serving as a tool for comprehensive study of disorders of the peripheral and central nervous system, with wide clinical applications.

PATHWAY model ATS can be used in diagnosing and studying disorders such as Radiculopathy, Chronic Regional Pain Syndrome (CRPS), Central Pain Syndromes (CPS), Post-Herpetic Neuralgia (PHN), Trigeminal & Facial Pain, Evaluation of Nerve Blocks, Painful Neuropathies, Fibromyalgia, and Headaches.

Quantitative Thermal Sensory Testing clinical applications include early detection of diabetic neuropathy of small fibers and early identification of functional neurological deficit in pain syndromes of different etiologies. In addition PATHWAY model ATS can be used to evaluate the effectiveness of pain-relief therapies.

PATHWAY model ATS expands the well known capabilities of TSA-II NeuroSensory Analyzer, and provides more opportunities in the field of Thermal stimulation.

Figure 4: ATS Thermode

3.5. fMRI Safe PATHWAY

The PATHWAY Pain & Sensory Evaluation System can be configured for use in the magnetic environment, thus researchers using fMRI (functional Magnetic Resonance Imaging) can use PATHWAY for administration of thermal painful and non-painful stimuli, therefore obtaining the brain response strongly synchronized with these stimuli through the MRI device. Both ATS and CHEPS PATHWAY models are available in an fMRI safe configuration. CHEPS stimulation in the fMRI environment can be synchronized with or without fMRI safe EEG recording, providing the opportunity for multi-modality evaluation of selectively activated A-delta & C-fiber function.

A recent study has demonstrated that brain activity, in response to noxious stimulation delivered by PATHWAY CHEPS, can be recorded simultaneously with EEG and fMRI. Evoked potentials monitored from within the MRI scanner were similar to those recorded under baseline conditions and highly reproducible. Developing simultaneous EEG and fMRI with CHEPS is highly valuable, as it provides an opportunity to exploit the high temporal resolution of EEG together with the high spatial resolution of fMRI to study the reaction of the human brain to thermal and nociceptive stimuli (Roberts et al, 2008, in Press).

Since 1997, Medoc's thermal stimulators have been utilized by researchers worldwide as a pain stimulator in fMRI studies, including use as a sensory and pain stimulator in PET (Positron Emission Tomography) laboratories. Current Medoc fMRI users include nearly 150 leading institutions worldwide, such as Massachusetts General Hospital, The National Institutes of Health (NIH), Wake Forest University School of Medicine, The University of Toronto, McGill University in Montreal, Pain Research Institute in Liverpool, The University of Munich, Imperial Collage Healthcare, Hammersmith Hospital, London, The University of Zurich, The University of Birmingham, The University of Oxford, King's Collage Pain clinical research Hub London, Hospital Clinic Barcelona, The University of Mainz, Tel-Aviv University, The University of Leuven Multidisciplinary Pain Center, Hamburg University of Technology, The Academic Hospital Maastricht, The University medical center Groningen, Teikyo University Tokyo, The University Medical Center Utrecht, The University of Dusseldorf, and The University of Greifswald.

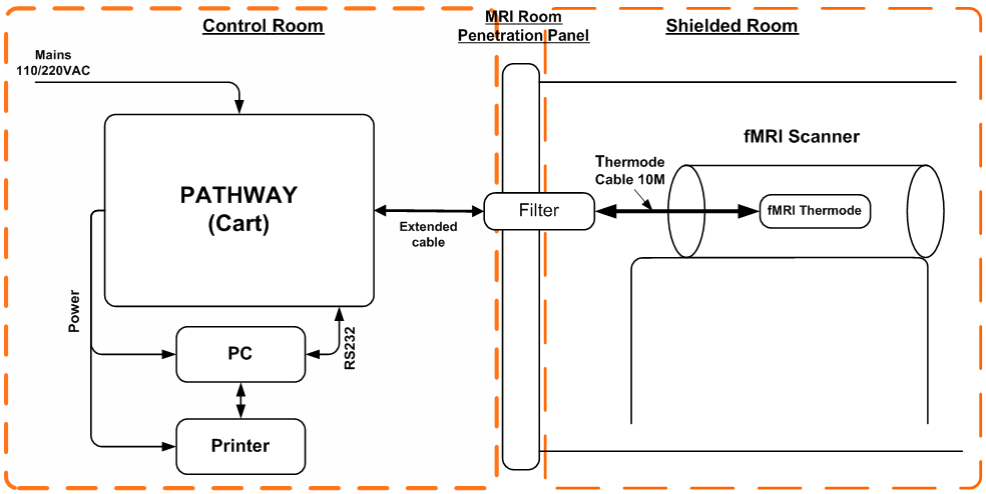

Figure 5: PATHWAY and fMRI Schematic diagram

3.6. MEG and PATHWAY

Magnetoencephalographic (MEG) assessment of evoked cortical activity following noxious stimulation of different modalities may provide additional information about afferent pathway characteristics and cortical processing of pain. Contact heat stimuli delivered by Pathway system fill the requirements for the MEG assessment. As was shown by Worthen and colleges (IASP, 2008), thermal noxious stimulation produced changes in neuronal brain activity in the regions relevant to the stimulation site which confirm the physiological feasibility of MEG implication in brain research. Great similarity was observed for timing of the pain-evoked MEG and EEG suggesting similar underlying brain circuitry for both responses (Boyle et al., IASP, 2008). MEG and EEG responses were found reproducible across study visits which point on future implication of contact heat evoked potentials in the longitudinal patients' assessments as well as for its effective use by pharmaceutical companies for drug trials (where the issue of test-retest repeatability is critical).

3.7. Pharmaceutical Field

For pharmaceutical companies, PATHWAY model CHEPS technology (objective small-fiber evoked potentials recording) holds the potential of a new "**surrogate marker**" which can significantly assist in the evaluation of the potential efficacy of new compounds. Contact Heat Evoked Potentials (CHEPS) can assist in rapidly identifying the most suitable compounds for early development. Provisional efficacy statements may be derived even from normal subjects in phase I studies. Resultant data obtained from PATHWAY CHEPS model can be used as supporting or providing pivotal data in later clinical trials.

Main advantages of using the PATHWAY CHEPS model in the pharmaceutical field include:

- Objective small-fiber data helps drive decision making between multiple compounds, especially in Phase IV of clinical trials
- Reduces statistical sample size
- Provides potential efficacy data stemming from Phase I
- Assists in defining dosage
- Potentially reduces time to market

4. PATHWAY Software

PATHWAY state-of-the-art Software provides an intuitive user interface enabling test management and online display. Test results can be recorded, saved and exported to Excel for further data analysis.

4.1. PATHWAY Software main features

PATHWAY Management – The PATHWAY software enables full control of PATHWAY system. The software allows conducting tests with the PATHWAY and configures all system settings.

- **Test Management and Database**
  - Patient Database – Patient information can be edited and saved. PATHWAY user can determine his specific patient information fields.
  - Program Database – Test programs can be easily created edited and saved. PATHWAY user can modify test parameters/protocols according to test protocol requirements and needs.
  - Results Database – Tests results are saved and contain all the test information including patient details, test program, tested body site and test statistics. The test results can be exported and used for further analysis.
- **Graphic Reports** – Outcome-based, color graphic reports with automated narrative discussion of test results including test information and statistics.
- **Dermatome Map** – Graphic Dermatome map for precise selection of tested body sites. PATHWAY user can add body sites according to his requirement.
- **License Protected Software** - PATHWAY system is configured according to user's licensing agreement. This agreement ensures the system will operate according to the User's system model.
- **Authorization levels** – Software meets hospital requirements for maximum data security.

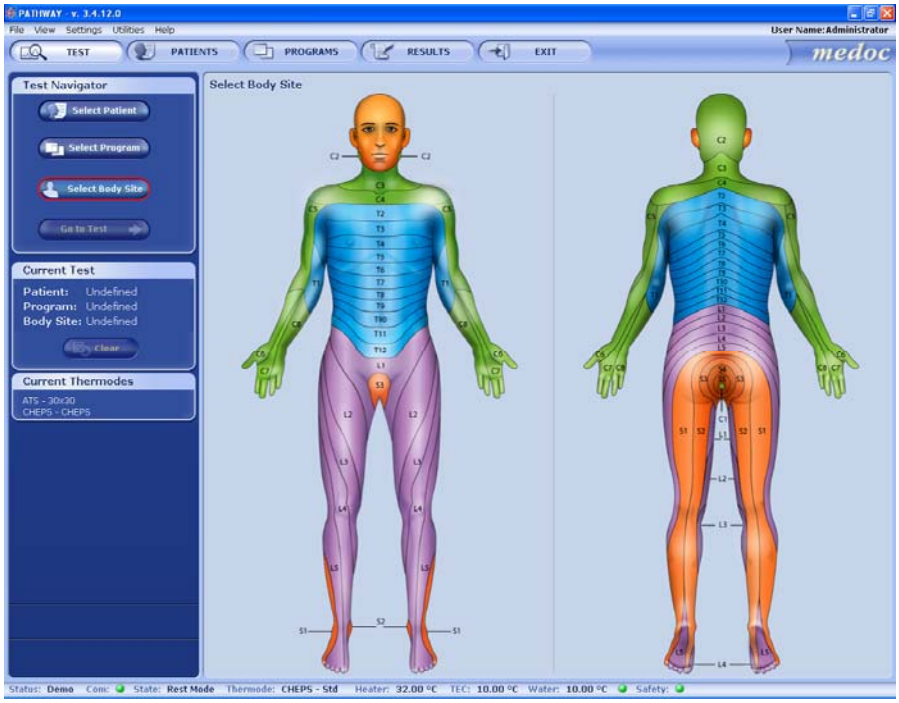

Figure 6: Pathway dermatome map screenshot

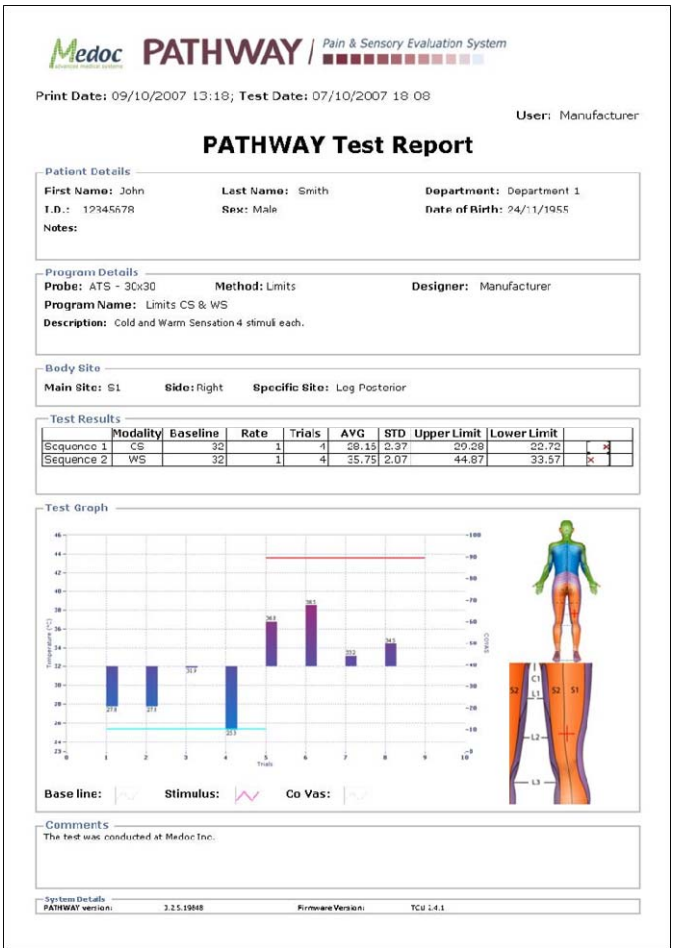

Figure 7: Test Example with normative data

4.2. PATHWAY Software Add-on Options

PATHWAY software offers powerful software add-ons that allow exciting new capabilities in advanced thermal stimulation.

- **External Control** – Control and management of test methods & protocols using external 8-bit interface commands. Tests can be automatically run, from a list of up to 250 predetermined programs that can be saved in the PATHWAY program data base. This feature in addition to data acquisition and decision making algorithm helps the researcher in determining which test from the PATHWAY data base would be best to use. External control is done via 8-bit TTL to the PATHWAY computer parallel port.
- **Cold EP's** – Creating and performing cold EP programs. This add-on extends the CHEPS Thermode thermal stimulation range to evoke brain potentials in response to cold stimulus. Cold EP's stimulation range is down to 20°C and cooling rate is up to 20°C/second and requires skilled operator to ensure optimal system performance.
- **Normative data** – A comprehensive database of normal thresholds collected by Medoc Ltd, from major studies. PATHWAY software can display the normative data and perform automatic comparison of test statistics to reference data. User collected normative data can also be added to PATHWAY database.

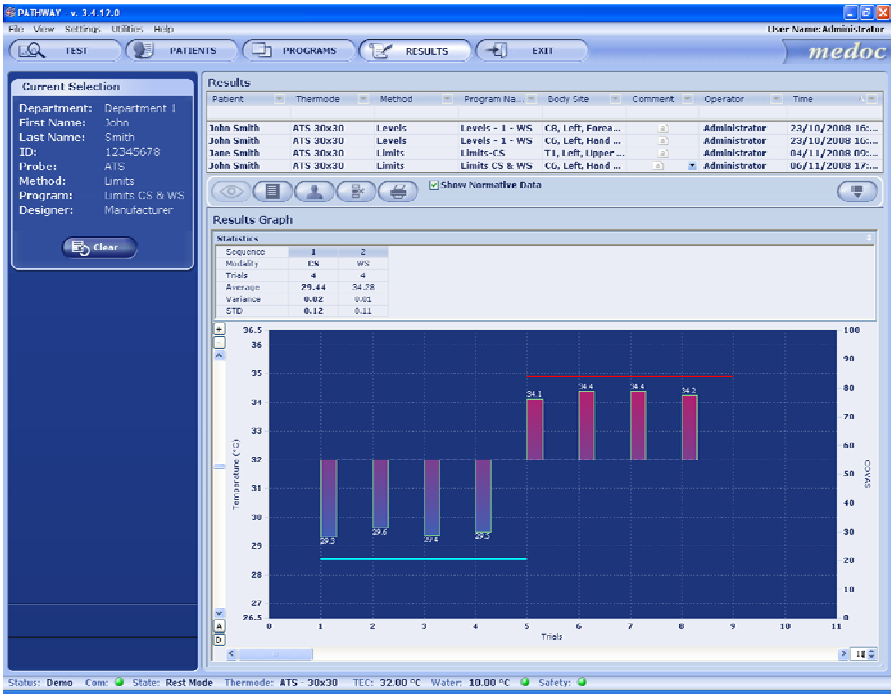

Figure 8: Test Example with Normative data

4.3. Supported Test Paradigms

PATHWAY software supports the following test methods, both in CHEPS and ATS models:

- **Threshold determination methods**
  - **Levels:** The tested subject is required to respond to each stimulus whether a predefined sensation was perceived. Each following stimulus is calculated according to subject's response to previous stimulus. The test continues until subject's threshold is reached.
  - **Limits:** The temperature of the stimulus continuously rises (or falls) at a pre-determined rate. The tested subject is required to stop the stimulus when a predefined sensation is perceived. Subject's Threshold is calculated at the end of the test.
  - **Thermal Sensory Limen (TSL):** The temperature of the stimulus raises to warm threshold until stopped by tested subject, then falls to cold threshold until stopped by tested subject and vice versa. Subject's warm and cold thresholds are calculated at the end of the test.
- **Pulses:** The temperature rises (or falls) at a very fast rate, and then returns to a predefined starting point for the next pulse. Pulses method can be used to evoke brain potentials.
- **Ramp & Hold:** The temperature of the stimulus rises (or falls) to a predetermined destination, at a predetermined rate, remains there for a predetermined duration, and continue to the next stimulus destination. Ramp and Hold method can be used for example in windup tests.
- **Search:** The temperature of the stimulus rises (or falls) according to the tested subject's response using CoVAS or Response Unit, and stops after a predefined period.
- **Chain:** several test programs can be chained repeatedly in any order.

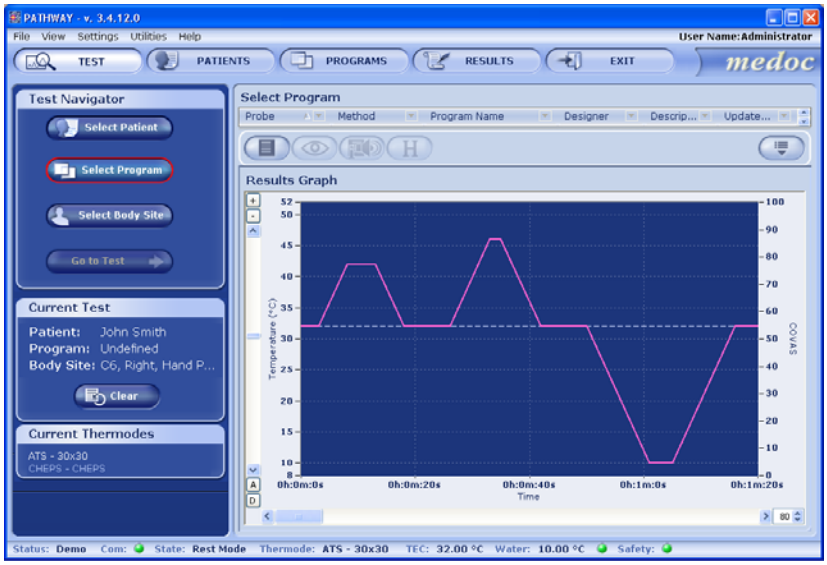

Figure 9: Ramp and Hold sequence example

5. PATHWAY Hardware

The PATHWAY heavy duty thermal stimulation system is mobile, extremely modular and available in several different configurations, such that one can easily upgrade to any of the possible configurations.

5.1. PATHWAY System

PATHWAY base assembly main features:

- Specially designed cart for safe and efficient usage
- Electronic box unit
- Heavy duty integrated cooling unit
- Analog output, and TTL input & output for synchronization with external applications including EEG and fMRI scanners.
- Digital Calibration Kit

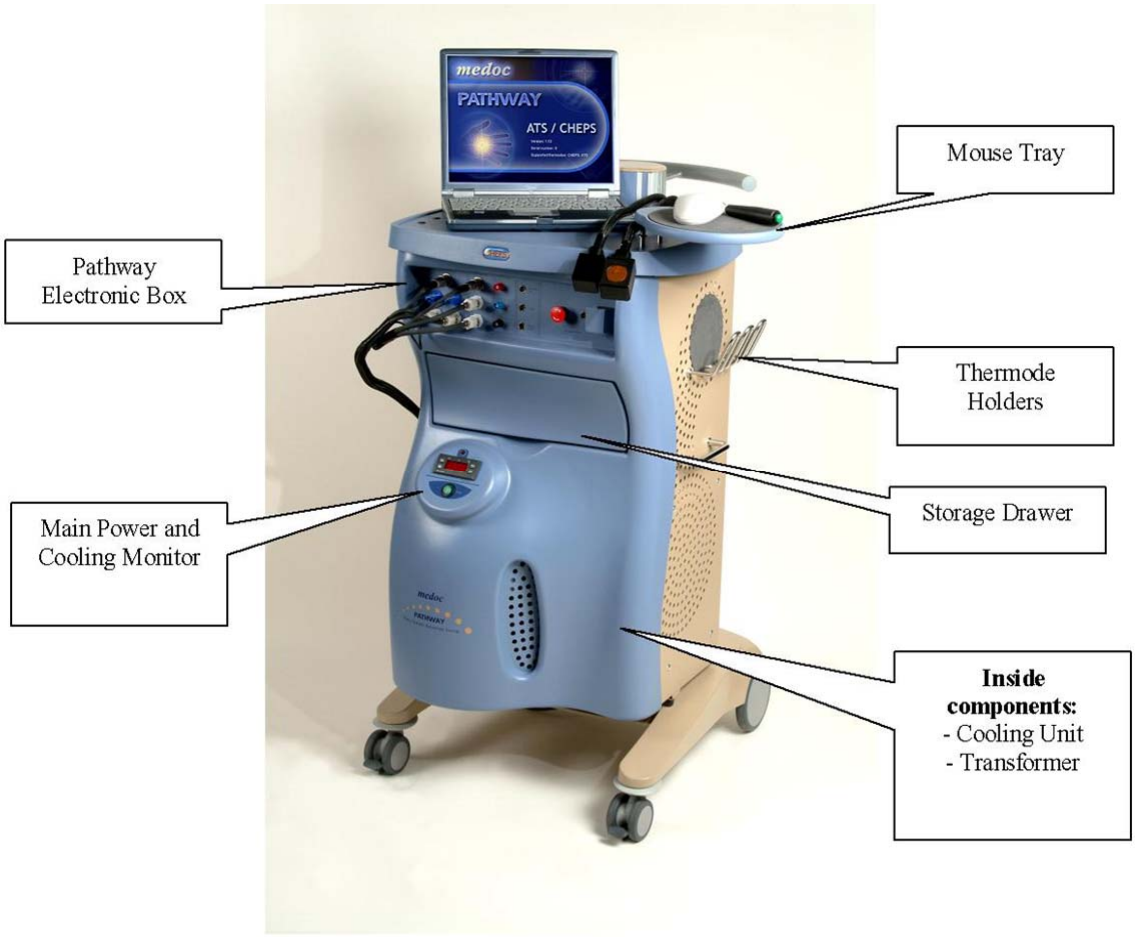

Figure 10: PATHWAY system

5.2. PATHWAY Thermodes

PATHWAY CHEPS Thermode main features:

- Temperature range: 30°C – 55°C
- Thermode size: 27mm diameter (572 mm^2)
- Heating Rates: 0.1°C/sec – 70°C/sec
- Cooling Rates: 0.1°C/sec – 40°C/sec

PATHWAY ATS Thermode main features:

- Temperature range: 0°C – 55°C (or -10°C- 55°C with appropriate licensing)
- Thermode size: 30x30mm (900 mm^2), 16x16mm (256 mm^2) and Intra-oral
- Heating Rates: 0.1°C/sec – 8°C/sec
- Cooling Rates: 0.1°C/sec – 8°C/sec (Maximum rate depends on destination temperature)

PATHWAY system can be configured to either ATS model, CHEPS model or combined. Both CHEPS and ATS models are available with fMRI safe thermodes.

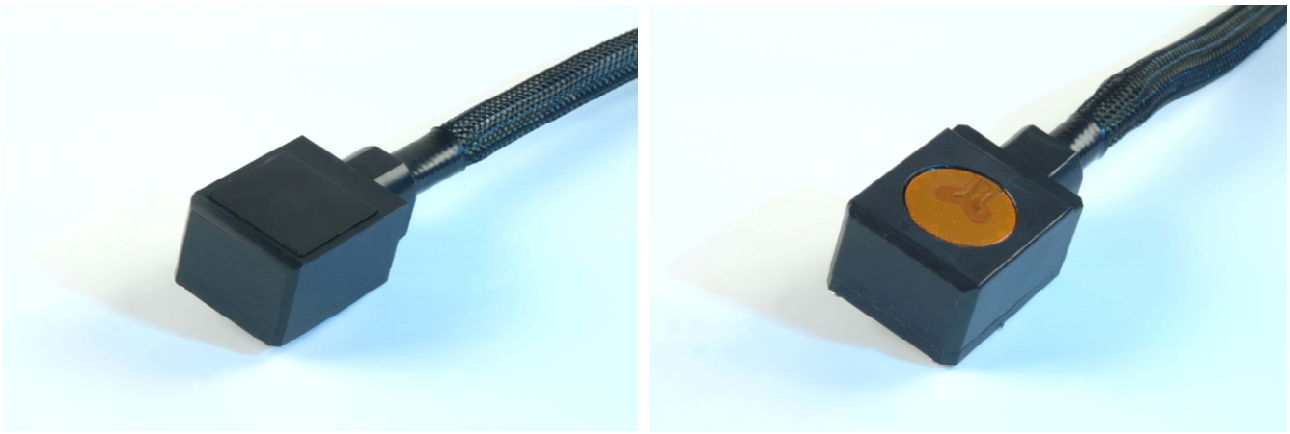

Figure 11: ATS and CHEPS Thermodes

5.3. PATHWAY Accessories

- Computerized Visual Analog Scale (CoVAS) – Enables the recording and simultaneous displaying of patient's subjective experience to thermal stimuli.
- Patient Response Unit – Enable the patient to respond whether or not a predefined sensation is perceived.
- Manual Trigger – Enables the test operator to start the thermal stimulation manually.
- fMRI Filter – Used to reduce the electrical noise and artifacts inside MRI scanners.

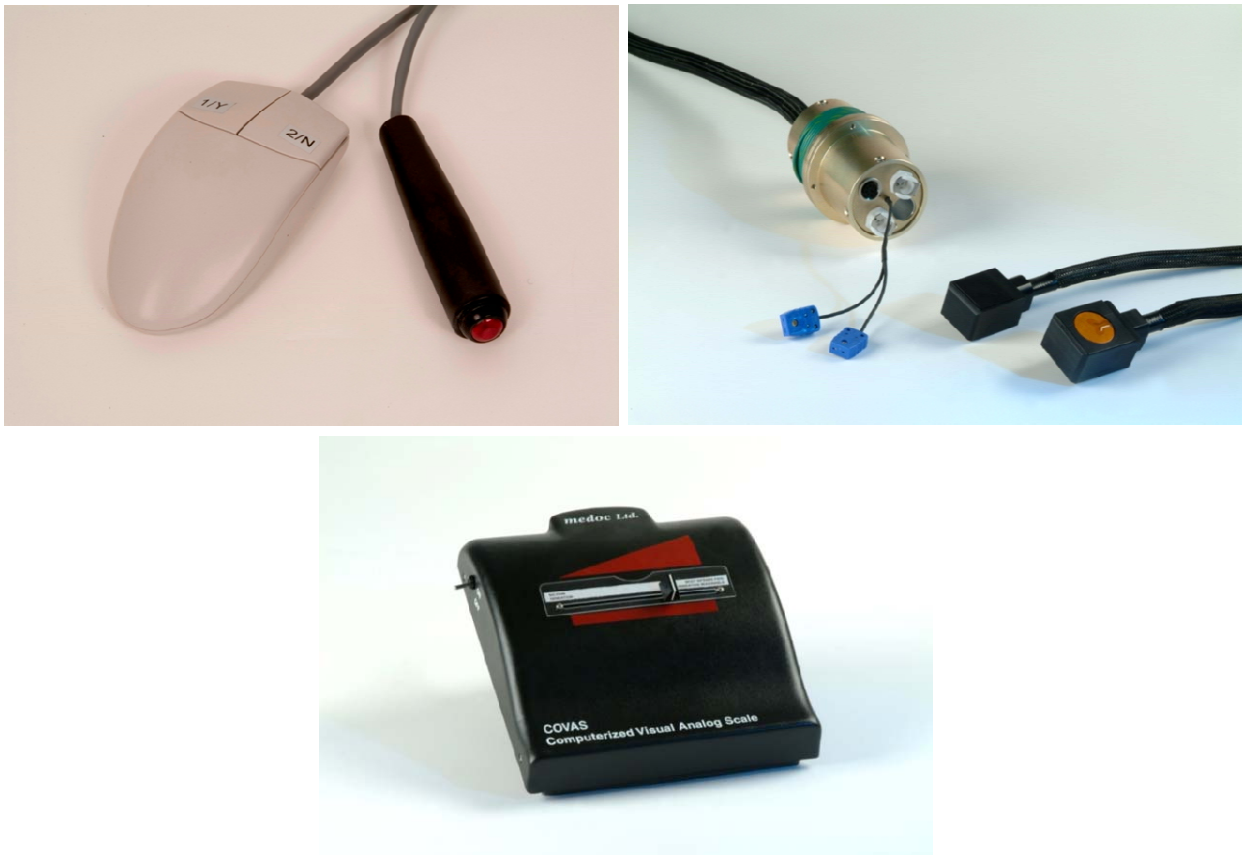

Figure 12: PATHWAY accessories (clockwise from top left): Patient Response Unit, fMRI Thermodes and filter, CoVAS

6. Reference Bibliography

The following is a bibliography of selected references related to certain topics addressed in the application chapter of this document. For a full comprehensive Reference Bibliography, please contact Medoc.

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7. System Technical Specifications

7.1. Specifications relevant for PATHWAY model ATS only

Parameter	Description
ATS Thermode (probe) active area	30x30 mm 16x16 mm
Temperature range	0°C to 55°C (Optional -10°C to 55°C)
Baseline temperature	10 to 45°C, programmable
Rate of temperature change- Linear mode	Heat from adaptation up - 0.1 to 8°C/Sec. Cool-down from peak to adaptation - 0.1 to 8°C/Sec. Cool-down from adaptation to 0°C - 0.1 to 8°C/Sec. Note: Rate may vary within 10%

7.2. Specifications relevant for PATHWAY model CHEPS only

Parameter	Description
CHEPS Thermode (probe) active area	27 mm diameter
Temperature range	20°C to 55°C
Baseline temperature	30 to 45°C, programmable
Heat EP mode – Rise rate	Heating rate from adaptation to peak is up to 70°C/Sec±10%
Heat EP mode – Return rate	Cool-down rate, from peak to adaptation, is up to 40°C/Sec
Ramp & Hold – Rate of temperature change (Linear mode)	Heat from adaptation up - 0.1 to 70°C/Sec. Cool-down from peak to adaptation - 0.1 to 40°C/Sec. Note: Rate may vary within 10%
Cold EPs mode	Cool down from adaptation (32°C-35°C) at approximately 15°C/Sec. Minimal low destination temperature is 25°C. Minimal ISI of 10 seconds.

7.3. Specifications common for both PATHWAY ATS and CHEPS models

Parameter	Description
Stimuli protocols	• Pulses • Ramp and Hold • Search • Limits • Levels • TSL • Chain
Stimulus duration in the peak	0 to 600 Sec (limited by safety cut-off. See below)
Inter-sequence time interval **(Time interval between sequences)**	0 to 600. Sec., in 0.1 Sec. resolution
Intra-sequence time interval **(Time interval between stimuli, in one sequence)**	0 to 600. Sec., counted onset-to-onset or end-to-onset, in 0.1 Sec. resolution. Optionally, this interval can be randomized within a predetermined range.
Randomize Option	**Option to randomize between sequences**
Number of stimuli in a program	Each sequence can include up to 100 trials (stimuli). The number of sequences in a program can be more than 100.
Stimuli trigger options	Automatic Manual, via a push-button, keyboard hot-keys External, via a TTL input
Synchronization options	(TTL input and output) TTL input, to allow external device to initiate the heat stimuli. TTL output upon trial start (activating “Run Test”) TTL output, upon each stimulus’ onset, reach destination and complete duration in destination. TTL specification: TTL input: TTL signal must be ±5[V], 10 - 15[mA], TTL output: TTL signal is ±5[V], 2[mA]. Duration of TTL output is programmable in the range of 50 to 1,000[msec]. Duration of TTL input must be greater then 5[msec], recommended 10[msec] (or more).
Auxiliary TTL output option	TTL output on a predetermined delay after onset. Delay is programmable. Duration of TTL output is programmable in the range of 50 to 600 milliseconds. Voltage of TTL output is +5V.
Sound option	Sound from the laptop upon: Stimulus’ start, Reach designation temperature and End of duration in destination temperature.

Optional CoVAS	Computerized VAS (Visual Analog Scale), as an accessory to the PATHWAY system. It allows real-time recording of the subject's pain level, according to the standard VAS procedure.
Optional operation in MRI environment	This option requires the use of MRI-safe Thermode and Filter. fMRI Thermode length: 10m fMRI filter body diameter: 70mm fMRI filetr cable length: 2m fMRI safe CoVAS is also available with cable length of 10m.
Parallel Mode Control (SDK)	Optional control mode, which can be integrated with research programs such as "LabView" and "MatLab", for controlling ATS & CHEPS protocols, using the PC parallel port.
Temperature set-point resolution	0.1°C
Temperature display resolution	0.1°C
Temperature repeatability	+/- 0.1°C
Absolute accuracy	0.3°C
Ambient temperature	18 to 24°C
Communication with computer	USB interface using RS232 protocol. (Optional – RS232 interface)
Communication with printer	Via the laptop
Computer Requirements	See in gray frame below
Software Operation System	Microsoft® Windows XP SP-2 or Windows 7 Professional Edition or higher
Database	SQL Server 2005 Express Edition©
Language options **(Built-in the program)**	English (default)
Available memory for program	Dependent on available laptop memory and restricted by SQL Server 2005 Express Edition capabilities.
Available memory for results	
Available memory for patient archive	
Safety	Complies with UL-2601-1:94 and EN-60601-1-1

Safety limitations on Temperature & Duration	• 56 °C during 0 sec. • 55 °C during 0.05 sec. • 52 °C during 0.4 sec. • 51 °C during 1 sec. • 50 °C during 5 sec. • 49 °C during 10 sec. • 47 °C during 60 sec. • 6 °C during 5 min. • 0 °C during 5 min.
System Configuration	Mobile cart configuration, including electronic box, heavy-duty water External Cooling Unit and 1 KW medical grade isolation transformer model ISB-100W. (Not including notebook laptop and printer)
Dimensions (Mobile cart config.)	103 X 52 X61 cm
Weight (Not including computer)	90-100 Kg (depending on thermode type)
Operation Voltage	100-120VAC, 60Hz, 4A. 220-240VAC, 50Hz, 2A. (Via a switchable isolation transformer)
System Overload Protection	2 X 250V, 5A Slo-Blo (for 230V Isolation Transformers). 2 X 120V, 10A Slo-Blo (for 110V Isolation Transformers).
Electronic Box Overload Protection	2 X 250V, 2A Slo-Blo (for 230V). 2 X 120V, 4A Slo-Blo (for 110V).
	Notebook PC and printer are not supplied by Medoc. Software Computer requirements: • PATHWAY may be installed on any laptop that runs on either Microsoft® Windows XP SP-2 or Windows 7[1] Professional Edition or higher • Microsoft Office XP and up is required for reading exported results in Excel format Hardware Computer requirements: • CPU – Pentium 4 and up (PATHWAY will not run on 64-bit CPU or Atom processors) • 1GB extended memory and up • Minimum 6 GB of free hard-disk space • CD drive • 1 USB Port (communication port) • RS232 or USB physical port (for automatic calibration external thermometer) • Physical Parallel Port (on main board) for Parallel Interface Add On • SAFETY: Complies with **IEC 950 - EN 60950 - UL 60950**

[1] Due to the custom configurations that often accompany the Windows 7 Operating System, it is possible that Medoc software may not install properly. Therefore, we advise using this operating system when customer has internal IT support that can manage such installation issues of Medoc software, should they occur.
For systems utilized with a PC employing the Windows 7 Operating System, Medoc will provide limited support only that does not cover issues related to the Operating System. Medoc will not be responsibility for any compatibility problems with this operating system.
On Windows 7 it may be required to use WIN XP compatibility mode.