Dynamic Plantar Aesthesiometer

For Automated Mechanical Stimulation, Touch Sensitivity and Allodynia

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Dynamic Plantar Aesthesiometer

Automatically apply force and force rate and automatically detect paw withdrawal. Measures touch sensitivity and allodynia in rats and mice.

Allodynia refers to a painful sensation in response to a harmless stimulus (often, simply touching the affected area causes a sensation of pain).

The Dynamic Plantar Aesthesiometer is a unique system to assess mechanical sensitivity and pain thresholds, which fully automates the amount of force applied by an electromagnetic, silent motor, exerting from 0 to 100 grams at a rate adjustable from 0 to 50 seconds.

When the animal responds, by withdrawing its paw, the device automatically scores the time and the force at which the response occurred and the data can be stored or exported in CSV format in a USB key or via LAN.

Background

- Von Frey filaments are time consuming and subject to experimenter bias, while electronic von frey systems depend on the operator force application. For this reason Ugo Basile developed a fully automated instrument, independent from the operator.
- Moreover, the application of the force is always perpendicular, with a preset amount of grams and at a predefined rate
- The Dynamic Plantar Aesthesiometer has been used in a variety of applications in nerve injury, from partial sciatic nerve ligation (PNL, to chronic constriction injury (CCI) and spinal nerve ligation (SNL) to screen phenotypes and drugs to treat allodynia and hyperalgesia.

Typical device applications

The assessment of mechanical sensitivity and pain thresholds has been used in several applications:

- Neuropathic pain models
- Inflammatory pain models
- Chronic pain models
- Analgesic drug screening and dose-response studies
- Toxicology
- Behavioral phenotyping

The main advantages of the Dynamic Plantar Aesthesiometer over the Von Frey Hairs, Semmes-Weinstein set of monofilaments and the Electronic Von Frey systems (hand-held) are:

- Consistency in the vector of the force application (perpendicular)
- Consistency in the force application rate
- Possibility to apply low forces with high reproducibility
- Removal of experimenter bias in paw withdrawal scoring and addition of the time component, being the force rate adjustable.

Altogether, this brings about a high reproducibility, sensitivity and accuracy which no other mechanical stimulation application can provide. The reproducibility and sensitivity are by far the result of the fact that the force application does not rely on hand movement.

Moreover, the Dynamic Plantar Aesthesiometer, differently than Von Frey filaments, provide a linear and not logarithmic scale of stimulation, expressed in grams.

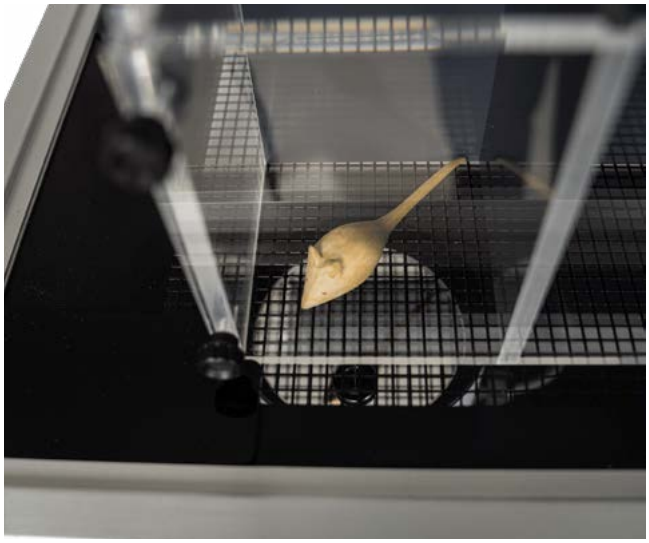
Product Description

The Ugo Basile Dynamic Plantar Aesthesiometer comes complete with:

- A movable touch stimulator with standardized (0.5 mm) stainless steel filament and angled mirror to facilitate paw targeting.
- A touch-screen based electronic unit, which controls all the setting parameters, collects data and saves into USB stick or LAN for seamless export into CSV, Excel-compatible format.
- A large testing grid surface with 5x5 mm square holes.
- A modular set of animal enclosures to hold up to 6 rats and 12 mice.

Additional features include:

- TTL outputs for start and stop.
- Automatic or manual detection of paw withdrawal.
- Analogue output is also available.
- Filament approaching curve can be adjusted to provide a smoother or lighter first contact with the animal paw, before the force application ramp starts.



Features	Benefits
Fully automated force and force rate application	Higher throughput and improved reproducibility
Automated scoring of paw withdrawal	Improved accuracy, thanks to decrease in experimenter bias
Large force range (0-100 grams)	Flexibility for performing many types of experiments from severe allodynia to hyperalgesia
Touch force and touch pause can be adjusted	The way the probe approaches the paw can be changed, depending on paw sensitivity
Touch screen and multiple data output (internal storage and CSV export)	Data can be quickly saved in the electronic unit, in the USB stick or to a PC via LAN for CSV export and further analysis
Optional manual scoring of paw withdrawal	Allows for scoring animals which present an unusual position of the paw and do require the experimenter to visually score
Painted metal grid and modular animal cages	Works with rats and mice in high throughput (6 rats and 12 mice at the time)

Main references

- Claudia Cristiano et al., 2022, The Beneficial Effects of Ultramicronized Palmitoylethanolamide in the Management of Neuropathic Pain and Associated Mood Disorders Induced by Paclit*xel in Mice, *Biomolecules*
- Hisakatsu Ito et al., 2022, Suvor*xant and mirtaz*pine improve chronic pain-related changes in parameters of sleep and voluntary physical performance in mice with sciatic nerve ligation, *Plos One*
- Katherine S. Adcock et al., 2022, Vagus nerve stimulation does not improve recovery of forelimb motor or somatosensory function in a model of neuropathic pain, *Nature, Scientific Reports*
- Laura Rullo et al., 2021, Nociceptive behavior and central neuropeptidergic dysregulations in male and female mice of a Fabry disease animal model, *Elsevier, Brain Research Bulletin*
- Huiying Du et al., 2019, Identification of the Genome-wide Expression Patterns of Long Non-coding RNAs and mRNAs in Mice with Streptozotocin-induced Diabetic Neuropathic Pain, *Elsevier, Neuroscience*
- Miodrag Mitrić et al., 2019, Layer- and subregion-specific electrophysiological and morphological changes of the medial prefrontal cortex in a mouse model of neuropathic pain, *Nature, Scientific Reports*
- Viljami Jokinen et al., 2018, Differential Spinal and Supraspinal Activation of Glia in a Rat Model of M*rphine Tolerance, *Elsevier, Neuroscience*

Specifications - Operation

Force Range	0.1 to 100 grams, in 0.1g steps
Force Increasing Rate (ramp)	Adjustable in the interval 0 to 50 seconds, in 1 s steps
Latency Time	Display in 0.1s steps
Measurement Mode	Automatic/Manual
Start Experiment	By Start button, push buttons or TTL input
Stop experiment	By Stop button, push buttons, cut-off or TTL input
Data input	Experiment protocol
Data export	.csv format into USB stick or PC via LAN
TTL/IO	Start/Stop, Detection Mode, Force level
Calibration	Calibration Weights (5g, 50g, 100g)

Specifications - General

Read out and commands	4,3 inches touch-screen (Resistive)
Power Requirements	Universal input 100-240 VAC, 50-60 Hz, 30W
Sound Level	Negligible
Operating Temperature	10°C to 40°C; 5% to 95% RH (non-condensing)

Physical

Dimensions (all parts)	135 (w) x 40 (d) x 50 (h) cm (required space on table; all parts)
Total Weight	10 Kg

Physical animal enclosure setup (internal dimensions)

Mouse	96mm x 96mm x 140mm (h) (max 12 animals)
Rat	96mm x 196 mm x 140mm (h) (max 6 animals)
Fat Rat	196mm x 196 mm x 140mm (h) (max 3 animals)

Ordering informations

37550	Dynamic Plantar Aesthesiometer complete with the following standard accessories: 37550-001 Electronic Unit; 37550-002 Touch Stimulator; 37550-321 Black kit case containing 2 umbrella probes, 1 Allen key for the umbrella probe, calibration weights (5g, 50g, 100g); 37000-003 Large Base Platform; 37400-327 Supporting Column 20.3cm h (4 pieces); 37450-005 large framed perforated metal sheet; 37000-007 Modular configuration Animal Enclosure (from 3 fat rats up to 12 mice).

Optional items

37450-278	Additional Stimulation Base, complete with perforated metal sheet and animal enclosure
37100	Set of 2 Durham Holders for Orofacial Stimulation
37102	Rat Holder, medium size, for use with Plantar Test and Dynamic Plantar Aesthesiometer
37103	Rat Holder, large size, for use with Plantar Test and Dynamic Plantar Aesthesiometer
37550-330	Dynamic Plantar filament assembly diameter 0.3 mm
37550-340	Dynamic Plantar filament assembly diameter 0.4 mm

Extra warranty (standard 12 months + 12 months with product registration) available

37550-UBC12	UB Care 12 additional hardware warranty extension 12 months (valid for SKU 37550)
37550-UBC24	UB Care 12 additional hardware warranty extension 24 months (valid for SKU 37550)

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