Thermal Gradient Ring

Thermal preference phenotyping for
tethered and non-tethered mice

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DISCOVERY SINCE 1963

Thermal Gradient Ring (TGR) version 2

Best Choice for thermal preference phenotyping and drug screening in mice.
Fully automated temperature preference and temperature avoidance.
Increased thermal test sensitivity and accurancy.
Out-of-the box apparatus ready to use in ANY-Maze software.

1 Adjustable swivel holder

We support most of the available swiwel on the market, just let us know the one You plan to use.

2 Guidance for animal cable

Disk guide for the cable of tethered mice on the top of the central camera holder. Easy set-up change for tethered and non-tethered mice.

3 New design of maze walls

2 wall height available
Easy and fast de-mounting for cleaning (needed when chaging animal)

4 Automatic start timer

To let apparatus be ready when You come to the Lab

Background

- The TGR invention paper showed how circular design allowed to dissect exploratory behaviour from thermal selection (2016, F. Touska et al.)
- The novel circular thermal gradient assay opens new opportunities for thermal preference and avoidance and addresses limitations imposed by classic linear equipment.
- The TGR can clearly discriminate temperature-dependent phenotypes or drug effects and its advantages over other techniques (i.e. linear corridors, two-choice temperature preference) are well described in the 2024 paper "*Thermal gradient ring for analysis of temperature-dependent behaviors involving TRP channels in mice*" (Ujisawa et al. (Prof. Tominaga Lab).

Typical device applications

The TGR has been used to study sensory neuropathies (2020, Valek et al.), diabetic peripheral neuropathy with symptoms of the thermosensoryimpairment (2022, Sasajima), TRP channels (2022, Ujisawa) and CCI-induced thermal hyperalgesia.

The TGR records and analyses thermal preference phenotyping in mice. For neuropathic pain studies, peripheral neuropathy, temperature sensitivity and insensitivity assessment in basic research, phenotyping and drug screening.

The new version is designed to use also cabled animals for optogenics, electrophysiology and other techniques which require the use of wires.

Product Description

In the TGR, mice can freely move around the ring, thereby avoiding the stereotypical habit that mice have of staying in a corner, as occurs in rectangular systems.

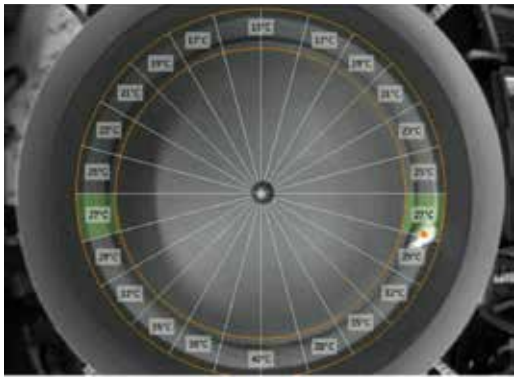
An infrared camera is located on the upper side of the apparatus, together with a visible and infrared illuminator and an infrared transmissive inner wall.

The animal is freely moving and its position is tracked by the camera, and no user intervention is required to gather time spent in each temperature zone (12 zones in duplicate) and many other parameters.

The behavioral data is obtained by video-tracking with ANY-Maze software and generate measurement parameters, such as:

- **Thermal zone occupancy**: percentage of time spent in a zone.
- **Zone entries:** number of entries in each zone.
- **Preference temperature:** calculated as the weighted preferred temperature.
- **Cumulative distance:** calculation of the cumulative distance per zone or per the whole apparatus.
- **Coordinates of location within the Ring**: can be used to visualize mouse behaviour in the ring with Heat Maps.

Temperature controlled cabinet (-10/+100 °C range temperature) to hold up to two Thermal Gradient Rings under constant temperature and sound isolation, to be not depending on of the lab room temperature (optional item).



ANY-Maze Video-tracking software automatically analyses thermal preference and avoidance parameters.
A dedicated (TGR limited) ANY-Maze software version is available at a lower price than the ANY-Maze full version and also includes TGR protocol ready to use.

Features	**B**enefits
Circular maze design	Duplicate values, no border effects, no spatial cues
New design which includes swivel support and has no obstruction for animal mounted wires	Allows for use of techniques that required cabled animals, such as optogenetics, electrophysiology and others
12 zones per side (specular), 40cm^2 each	Temperature Δ proportionally divided into 12 (in the method paper 15°C/-40°C = 2.27°C per zone)
CCD-IR-camera (included in the standard package, with its dedicated support) and ANY-Maze video-tracking software (to be order separatly)	Behavior recorded automatically during test time
Heater and cooler units on opposite sides, to establish a symmetric thermal gradient	Gradient setup superior to two-plate choice design
Thermal ring-shaped aluminum runway, whith special color and special grip floor.	More sensitive than previous methods: bias-free, reproducible data
Designed for tethered and non-tethered mice. (no swivel provided)	For optogenetic, electrophysiology and other tethered animal studies
Thermal sensors embedded in the thermal gradient ring sensing the temperature	The exact temperature gradient measured in real time
Control ambient temperature	Improve temperature accuracy avoiding laboratory temperature oscillations

Main References

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Specifications - Operation

Ring temperature range	Heating Plate: from 20°C to 65°C - Heating/cooling Plate: from 4°C to 65°C
Temperature feedback	By 4 thermocouples monitored in real time by ANY-maze software
Animal detection	Via ANY-maze specific protocol for TGR through integrated USB camera
Illumination	Set of 4 dual visible /IR light
Power	Universal input 85-264 VAC, 50-60Hz, 400W max

Physical

Aluminium runway	Internal diameter 45 cm; External diameter 57,5 cm; Corridor width 6,5 cm
Maze wall height	15 cm (standard); 25 cm (optional)
Dimensions	81x60x86(h)cm
Weight	49.5 Kg

Ordering informations

35530	Set-up for Thermal Gradient Ring (Zimmermann's method) TGR2.0 - for thetered and non-tethered animal, circular corridor with enclosing opaque walls, USB camera with dual (visible/I.R. lights). Software ANY-maze to be ordered separately (TGR limited version available).

Software (REQUIRED; choose one)

60000-TG	ANY-maze software, Thermal Gradient Ring specific version (THERMAL GRADIENT RING TEST ONLY)
60000	ANY-maze, flexible video tracking system designed to automate testing in behavioural experiments. Full License, including lifelong support and updates. (TGR device already included in the available devices list)

Optional items

35580-US	Thermal conditioned cabinet ready to hold 2 TGR devices (for USA 220/240 Volt US plug). Temperature range from -10 up to 100 °C
35580-EU	Thermal conditioned cabinet ready to hold 2 TGR devices (for Europe 220/240 Volt EU plug). Temperature range from -10 up to 100 °C
35530-003	Thermal Gradient ring high maze walls (25cm)

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

35530-UBC12	UB Care 12 Additional hardware warranty extension 12 months for TGR (valid for SKU 35530)
35530-UBC24	UB Care 24 Additional hardware warranty extension 24 months for TGR (valid for SKU 35530)

Related Products

Hot/Cold Plate
SKU 35300

Thermal Place Preference
SKU 35350

Plantar Test for Thermal Stimulation
SKU 35750

Orofacial Stimulation Test
SKU 31300

Tail Flick
SKU 37560

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Rev2.0 March 2025

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