Ultra small implantable loggers

TEMPERATURE
HEART RATE
ACTIVITY

ADVANTAGES AT A GLANCE

- Leadless, minimally invasive
- No housing restrictions
- Stress-free measurements
- Long battery life
- Reusable

STAR ODDI

Logging Life Science

www.star-oddi.com

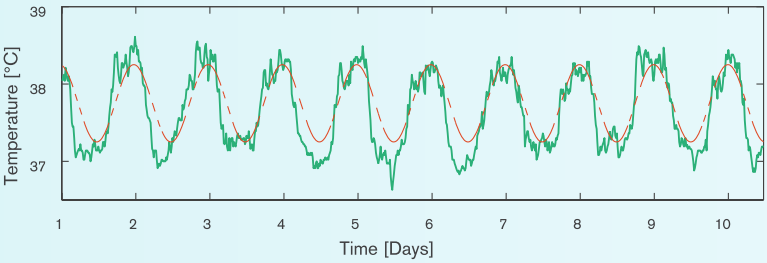
Temperature Measurements

UNDISTURBED CORE BODY TEMPERATURE

The DST temperature loggers are well suited for recording core body temperature throughout your research with no disturbance to the animal subject. This makes them ideal for a variety of studies including baseline measurements, immune response to infection, vaccine efficacy and safety pharmacology.

FOR ALL TYPES OF LABORATORY STUDIES

Star-Oddi's DST loggers come in a wide range of sizes, the smallest weighing only one gram, making it possible to record temperature in a wide range of animal sizes. Animal housing, cage type and other equipment inside the laboratory have no effect on the logger's measurements, allowing the user to measure even in high biosafety levels.



Circadian rhythm recorded as core body temperature (green)

	DST nano-T	DST micro-T	DST milli-T	DST centi-T
Size (diameter x length)	6 mm x 17 mm	8.3 mm x 25.4mm	13 mm x 39.4 mm	15mm x 46mm
Weight	1 g	3.3g	9.2g	19g
Battery life	14 months*	28 months*	5 years**	9 years*
Memory capacity per sensor	43,477 measurements	43,477 measurements	87,000 measurements	174,000 measurements
Minimum measuring interval	1 sec	1 sec	1 sec	1 sec
Temperature range	5 to 45°C (32°F to 113°F)**	5 to +45°C (32°F to 113°F)**	5 to +45°C (32°F to 113°F)	5 to +45°C (32°F to 113°F)
Temperature resolution	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)
Temperature accuracy	+/- 0.2 °C (+/- 0.36°F)	+/- 0.2 °C (+/- 0.36°F)	+/-0.1°C (0.18°F)	+/-0.1°C (0.18°F)

*For sampling interval of 10 min

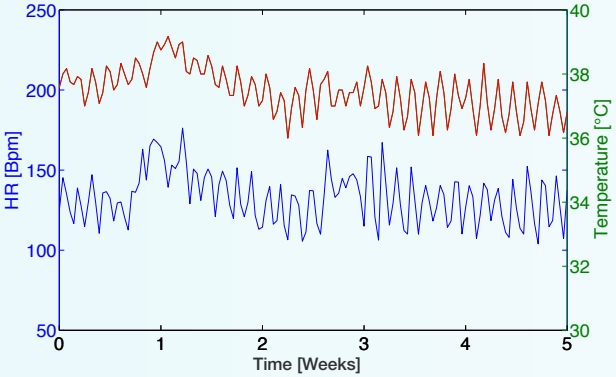
Heart Rate Measurements

LONG TERM HEART RATE AND BODY TEMPERATURE

The DST HRT loggers simultaneously measure long term heart rate and core body temperature. This makes it possible to identify correlation between heart rate and body temperature as well as a variety of physiological changes, including cardiac and thermoregulatory effects, stress response and metabolic changes.

LEADLESS SINGLE CHANNEL ECG

The heart rate is derived from a leadless single channel ECG in which the electrodes are part of the housing material, making the logger especially easy to implant. To calculate the heart rate the logger takes a burst measurement on any set time interval and calculates the mean heart rate for each recording. For validation purposes, each individual burst is graded with a quality index (QI).



Averaged heart-rate (blue) and SC temperature (red) over a five weeks' period

	DST micro-HRT	DST milli-HRT	DST centi-HRT ACT
Size (diameter x length)	8.3mm x 25.4mm	13mm x 39.5mm	46mm x 15mm
Weight	3.3 g	11.8 g	19g
Battery life	3.5 months*	8.5 months*	19 months*
Memory capacity per sensor	43690 measurements	699,051 measurements	699,051 measurements
Minimum measuring interval	15 sec	15 sec	15 sec
Temperature range	5°C to 45°C (41°F to 113°F)	5°C to 45°C (41°F to 113°F)	5°C to 45°C (41°F to 113°F)
Temperature resolution	0.032°c (0.058°F)	0.032°c (0.058°F)	0.032°c (0.058°F)
Temperature accuracy	+/- 0.2°C (0.36°F)	+/- 0.2°C (0.36°F)	+/- 0.2°C (0.36°F)
HR sampling freq	100-800Hz	100-800Hz	100-800Hz

*For sampling interval of 10 min

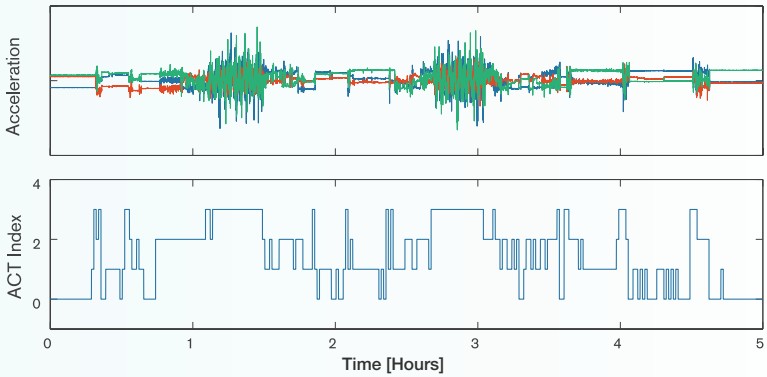
Activity Measurements

OVERVIEW OF CHANGES IN ACTIVITY OVER TIME

Measuring acceleration derived activity gives researchers the chance to get an overall view of changes in the study animals' activity over time. The DST activity loggers measure acceleration in three dimensions, in relation to earth's gravity field.

IDENTIFY CORRELATION BETWEEN HEART RATE AND ACTIVITY

The logger comes with the option of either two or three parameters: activity and temperature or activity, heart rate and temperature. Looking at activity, heart rate and temperature together gives researchers an opportunity to identify signs of disease and other physiological changes, by looking at correlation between the measured parameters.



(Top) Activity recorded through 3-axes accelerometer (Bottom) ACT index derived from the accelerometer data from 0 (low) to 3 (high)

	DST centi-ACT	DST centi-ACT HRT
Size (diameter x length)	46mm x 15mm	46mm x 15mm
Weight	19g	19g
Battery life	3 years*	19 months**
Memory capacity per sensor	279620	233017
Minimum measuring interval	1 sec	15 sec
Temperature range	5°C to 45°C (41°F to 113°F)	5°C to 45°C (41°F to 113°F)
Temperature resolution	0.032°c (0.058°F)	0.032°c (0.058°F)
Temperature accuracy	+/- 0.2°C (0.36°F)	+/- 0.2°C (0.36°F)
HR sampling freq		100-800Hz

*For sampling interval of 1 min
**For sampling interval of 10 min

LEADLESS AND MINIMALLY INVASIVE

With the completely leadless design of the biocompatible loggers the implantation surgery becomes minimally invasive which facilitates quick recovery.

STRESS-FREE ACCURATE MEASUREMENTS

The Star-Oddi loggers are small implantable recorders that measure heart rate, temperature and activity with high accuracy and store real-time data in their internal memory. All loggers are delivered with calibration certificates, traceable to Fluke's CalNet standard, to ensure compliance with good laboratory practices (GLP).

LONG BATTERY LIFE AND REUSABLE

The same logger can be reused for as long as the battery lasts. When data has been retrieved the logger can easily be sterilized and reset for new recordings. The Star-Oddi loggers are simple in use, from setup and surgery to data retrieval. The measurement data can be analyzed in graphic and tabular form and exported to other statistical analysis programs.

Scientific publications using Star-Oddi's loggers are available at:
www.star-oddi.com/biomedical/publications

SMALL SIZED LOGGERS
The DST product family features four different sizes: centi, milli, micro and nano. The DST loggers vary in size, memory & battery life.

HEART RATE, TEMPERATURE & ACTIVITY LOGGER
No wires - electrodes are part of the housing.

HIGH PERFORMANCE – SMALL SIZE

Star-Oddi has over 20 years of experience making small, high performing loggers for all types of laboratory animals, wild animals and pharmaceutical production.

COMMITTED TO PROVIDING SMALL RELIABLE LOGGERS

We are always focused on making long lasting loggers in the smallest possible sizes, never compromising on reliability.

COMMITMENT TO THE 3Rs

The 3Rs ethical framework is implemented by Star-Oddi in its implantable DST logger series. Being able to measure core body temperature, heart rate and activity without human interference reduces the stress placed on the animal, avoiding consequential measurement fluctuations. This can reduce the number of laboratory animals used, with fewer animals needed to get reliable data.
In addition the leadless design of Star-Oddi's heart rate loggers minimizes wound pain and trauma of implantation on the animal.

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