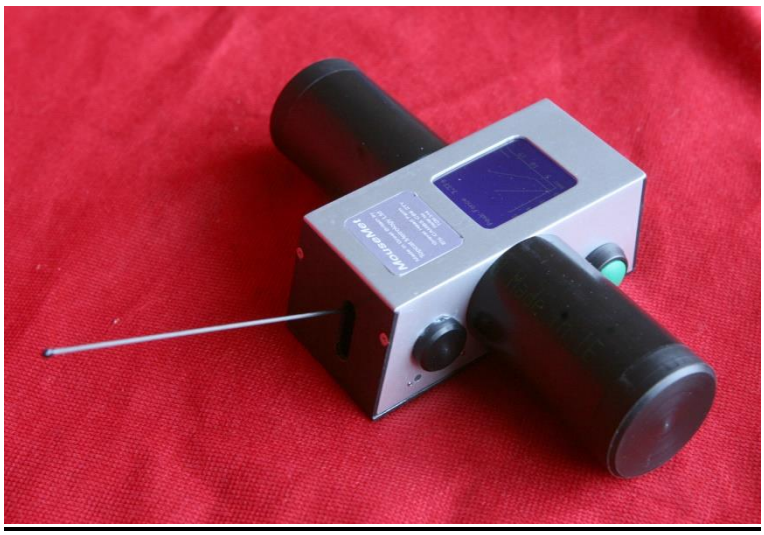
Jan 2025

The MouseMet EvF System

Introduction

MouseMet EvF is a novel, fully integrated electronic testing system for the efficient measurement of mechanical thresholds on the plantar surface of a mouse's paw. The transducer has been specifically designed to be insensitive to the hand tremor of the operator at the very low forces required for this species (0.05-7g). The force is applied simply by rotating the handles of the transducer with the probe in contact with the plantar surface. At threshold the probe is withdrawn and the "mark test" button pressed. A graph of force against time is then displayed on the screen, along with the peak force. The system is very similar in use to MouseMet HOT; once an operator is familiar with one system, the other is trivial to learn.



Assembly

Measurement arm

Two measurement arms are supplied. The longer arm is for the lower force range: 0.05g – 3gf and the shorter for the higher force range 0.1 – 7gf. The system detects automatically which arm is in use.

The hole for the measurement arm is visible through the slot in the end of the casing. The surround for the hole is painted white. Insert the measurement arm with the filament pointing straight up until it clicks into place against the magnetic stop. To remove the arm, pull it out gently.

Installation

In order to make very sensitive measurements, the Mousemet transducer incorporates novel technology. In common with many other transducers, there is a possibility that “noise” from other electrical equipment in close proximity will distort the measurement. Topcat Metrology are not aware of any such instance but recommend that Mousemet EvF should always be installed as far away from other electrical equipment as possible and that other nearby equipment should be turned off if this is feasible. Information on how to recognise and deal with noise is given in the calibration section of this manual.

Batteries

Two 9V PP3 batteries are required (not supplied with the system). Topcat recommends the use of LiPo rechargeable batteries but disposable batteries can also be used. To install the batteries, first make sure the power switch is in the OFF position (pointing towards the back of the transducer). Pull the caps off the handles, insert the batteries, plug them in and push the caps back on.

With LiPo batteries of 800 mAh capacity, battery life is approx 10 hours before the battery low legend appears. Disposable batteries may also be used (but do not attempt to re-charge them). When the batteries are low, the words "Battery Low" will appear on the screen. At this point the system contains sufficient charge for 1-2 more tests.

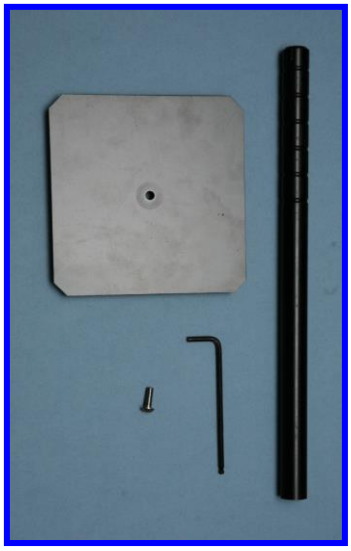
Switch the transducer on and wait for the screen. When the graph shows, press the green button on the right hand side. The display will now show the last 10 seconds of data collected, together with the peak force. If the transducer has not been used during this time, this graph should be a straight line at zero grams. Now push the measurement arm gently to simulate a test and then press the green button immediately afterwards. The test should then be displayed.

MouseMet Runs (if supplied)

Assembly

MouseMet EvF may be supplied with multiples of two mouse runs and a stand which requires assembly before use;

1. Bolt the long vertical support, with notches at the upper end, to the baseplate using the screw and hexagon key provided.
2. Thread the crosspiece onto the vertical rod and set to the correct height. The ballscrew in the crosspiece will click into the grooves (it can be tightened or loosened if necessary).
3. Thread the support bars through the holes in the top of the runs and push an O ring on either side to secure them.
4. Place the runs onto the horizontal bars.
5. Test for height and adjust if needed. It is important to be comfortable with your elbows on the bench so that you can rotate the handles of the transducer easily.



Cleaning

The runs are suitable for cleaning and sterilisation by standard washing and normal laboratory disinfectants (eg Trigene).

Testing

To carry out a test, raise the transducer until the tip is just below the mouse's foot. Make sure that your elbows are comfortably supported and that the run is at the correct height for you.

Now bring the probe tip into contact with the plantar surface and hold it there for about one second. At this point the force applied should be less than 0.1 gf.
If the mouse responds to this stimulus, then it may be an inadvertent "touch-on" response or a genuine low threshold. You will need to repeat the test to find out which.

Touch-on responses

Animals sometimes react to the first touch of a mechanical probe, rather than waiting for the true painful sensation. Our experience is that this is more likely if the probe is "stiff" and cannot bend slightly to compensate for the inevitable slight hand tremor of the operator. Under these conditions the probe may slide or scratch slightly across the tissue surface before a significant force is applied. For this reason, all our probes are flexible (rather like a von Frey filament, but operated below its buckling force).
If the mouse does not respond to the initial "touch-on" then, after the dwell time, rotate the handles slowly to increase the stimulus. A true response is generally a rapid lifting of the leg, often with a shake of the foot but, as with all species, individual behaviours may vary.

At threshold, just withdraw MouseMet EvF and, if you think the response was a valid one, hold the transducer stationary and press the green button within 5 seconds to display the test on the screen, along with a guide line showing a nominal ramp rate of 1gf/sec. This rate is not prescriptive, but is there as a guide to help the operator achieve consistency. We chose this rate as allowing sufficient time for the mouse to feel the stimulus and to react whilst still being realistic about how long the average mouse is going to sit still for a test.

Calibration

MouseMet is calibrated in our laboratory before shipment over the range of 0.05 - 7gf. A calibration arm with a 5g weight is provided for routine checking of the calibration. To perform the calibration, follow these steps;

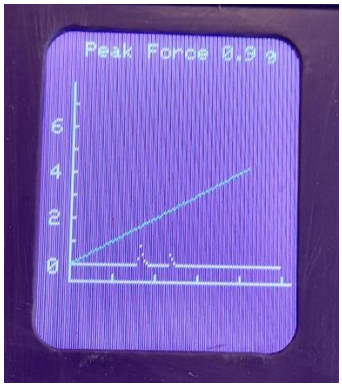
1. Remove the measurement arm and attach the calibration arm to the transducer.
2. Apply the calibration weight and then adjust the position of the transducer so the arm is horizontal. Remove the weight.
3. Switch the transducer on.
4. Press the green button to check the zero reading. Then add the calibration weight gently, so that the arm does not bounce below the maximum reading. Remove the weight, equally gently without allowing the arm to bounce as it returns to zero. Then press the green button again and record the force reading.
5. If the indicated force is more than 0.1g different from the nominal, call Topcat to discuss. If the line is within these limits, we suggest that you record the value but do not consider recalibration. Please resist the very natural temptation to spend a lot of time chasing the perfect calibration. Remember that the mouse is generally the largest contributor to data variability!
6. Note that an extended set of calibration weights, together with a stand to achieve easy positioning of the arm in the horizontal position is available as an accessory.

Environment and Electromagnetic Interference

As noted above, the intrinsic design of the MouseMet transducer means that it is theoretically possible for it to be affected by local electromagnetic interference ("noise"). Topcat Metrology are not aware of any such instance, and have incorporated all possible refinements into the system to mitigate against this possibility but the user should still be alert.

There are two possible types of interference:

1. A continuous level (from, for example, an unsuppressed electric motor running nearby) might produce a change in the calibration which is constant while the noise source is present.
2. Transients (from, for example, a mobile phone ringing or from heavy electrical plant switching on or off) might produce one or more spikes in the force ramp. The trace below shows an example while no force is applied but if this were to occur during a force ramp then an incorrect peak reading might be made.



To guard against this, the user is strongly advised to follow these procedures:

1. To check for continuous interference, perform at least a nominal calibration at the beginning and end of each test session.
2. Inspect the force ramp for each test and check that it shows a smooth increase and decrease in force with no distortion from "glitches".
3. Periodically during testing, press the mark button without performing a test to check that the force trace is smooth at 0 grams without any "glitches".
4. Do not use a mobile phone or other wireless transmitting device within 1m radius of the equipment.
5. If the equipment is always used in the same location, confidence will increase with time and the checks need not be performed so frequently. Conversely, if the equipment is moved to a new test site, more regular checks should be made at first.

Packing List

1. MouseMet transducer
2. Hi and lo range tips
3. Calibration arm.