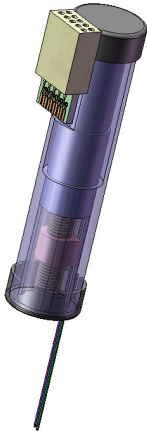


Single Microdrive Neural Headstage	ND1HS
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Lightweight Motorized Neural Probe Assembly for Awake Animal Neural Recording

- Single motor microdrive
- 4 microelectrode circuits
- 1 reference circuit
- 1 stimulus circuit
- Independent 3-wire motor control circuits
- Omnetics Nanominiature connector
- 1 gram total microdrive mass



Ordering Information _____

Motor Configuration	Part Number
MicroMo 0308A003B+03A 125:1S3	ND1HS-1

Accessories _____

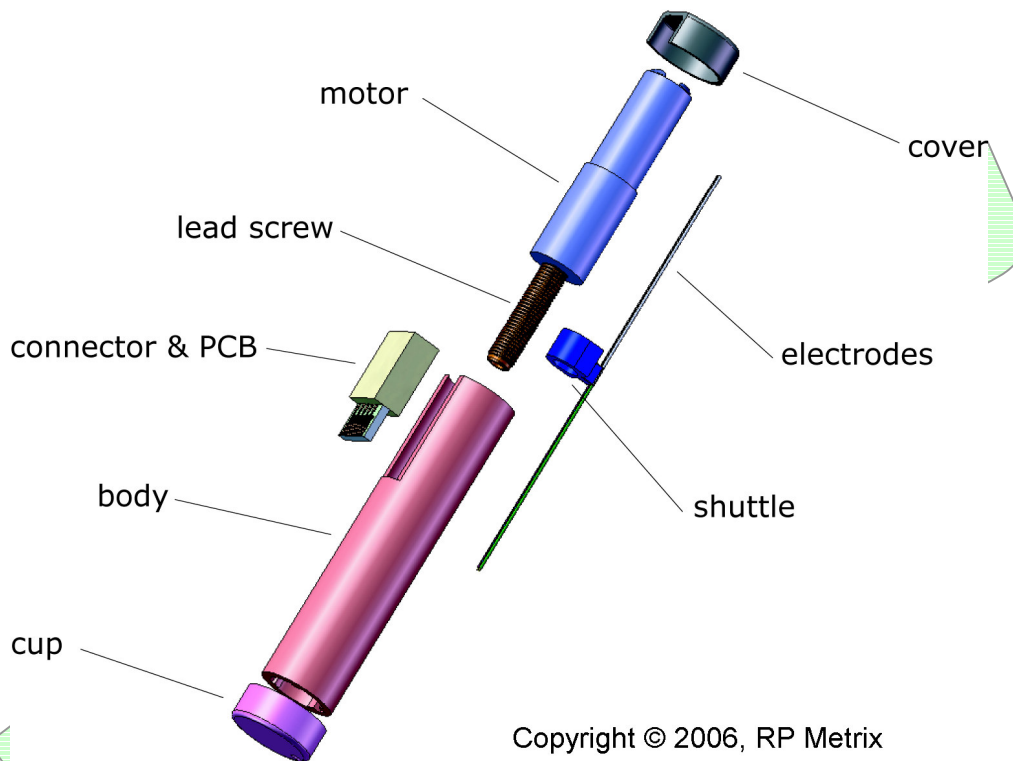
Description	Part Number
JFet Buffer Assembly	ND1BAJ-1
Tether Cable	ND1TC-1
Shuttle Assembly Fixture	ND1SAF-1
Microelectrode Capillary	ND1MEC-1

Absolute Maximum Ratings _____

Characteristic	Symbol	Min	Typ	Max	Unit
Microelectrode Circuit Current	I_E			10	mA
Reference Circuit Current	I_R			10	mA
Stimulus Circuit Current	I_S		0.020	100	mA
Motor Current per Winding	I_W		110	150	mA
Motor Winding Voltage	V_W		3.8	5.25	V

Specifications

Characteristic	Symbol	Min	Typ	Max	Unit
Gearhead Reduction Ratio	GR		125:1		rotor/shaft
Output Shaft Diameter	D_S		1.6		mm
Output Shaft Thread Pitch	TP		0.2		mm/rev
Shuttle Step	L_{SS}		0.27		μm
Shuttle Travel	L_{ST}			4300	μm
Shuttle Speed	V_S		1	400	$\mu\text{m}/\text{sec}$
Direction Reversal Hysterisis	H_{DR}		100		μm
Microdrive Diameter	D		5.0		mm
Microdrive Length	L		20.0		mm
Microdrive Mass	M			1.0	gm
Electrode Diameter, Tungsten	D_E		75	100	μm



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Figure 1 - Headstage Exploded View

Description

The ND1HS headstage incorporates a miniature motor with a gearhead mounted within a cylindrical body made of sturdy, lightweight, and chemically resistant anodized aluminum (See Fig. 1). The gearhead reduces 125 motor rotations to one output shaft rotation. The output shaft is a threaded rod, turning in a screw thread within a sliding shuttle. The shuttle can carry from one to four tungsten electrodes. The rotational movement of the threaded rod transforms to linear

movement of the shuttle at 0.2 mm per shaft revolution. The minimal motor step is 60 degrees, corresponding to 0.27 μm of longitudinal movement of the electrode(s).

To achieve reproducible electrode placement, always move them in one direction. For example, if the main direction is forward, then to move electrodes back, first retract them farther than the desired position by at least the amplitude of the hysteresis ($H_{DR} = 100 \mu\text{m}$) and then move them forward to the desired position.

Electrodes are glued to the shuttle with epoxy. Electrical connection between electrodes and contact pads on the head stage is made using thin copper wire (40 AWG). It is recommended to embed the electrode wire connection and part of the wire close to the shuttle in epoxy.

During implantation the cup and body are fixed to the skull of the animal with dental cement. The cup and tube prevent contact by the motor and other electronics with dental cement and live tissue. To remove the headstage from the animal, gently pull the tube from the cup and remove it. The cup remains on the animal until euthanasia. Remove the dental cement from the cup by dissolving it in solvent.

The circuits for motor control, microelectrode signals, the neural reference signal, stimulus signal, and ground reference are accessed through the printed circuit board solder pads. A dual row 10-pin fine pitch connector provides an attachment point for an external tether cable.

I/O Information

ND1HS-NPD-10 (Omnetics Nanominiature Male) 10-Pin Interface Connector

Pin #	Signal	Pad	Input/Output	Pin #	Signal	Pad	Input/Output
1	Probe1	1	Output	2	Reference1	R	Output
3	Probe2	2	Output	4	MotA	mA	Input
5	Ground	G	-----	6	MotB	mB	Input
7	Probe3	3	Output	8	MotC	mC	Input
9	Probe4	4	Output	10	Stimulus1	S	Input

Electrode Pad Information

Fig. 2 shows the top layer of the headstage flex printed circuit. All electrode, reference and stimulus connections are accessible on this layer. In the **I/O Information** table above, the **Pad** column refers to the pad labels shown in this figure. The pads for the 10-pin interface connector are also labeled in this figure. The top-side row of connector pads appears in the center with labels '1', '2', '3', 'G', etc. The bottom-side row of connector pads is obscured by the top-side row but the labels for these pads appear below the first set of labels as 'R', 'mA', 'mB', 'mC', etc. There is one pad for the reference circuit ('R'), one pad for the stimulus circuit ('S') and there are two pads for the ground circuit ('G').

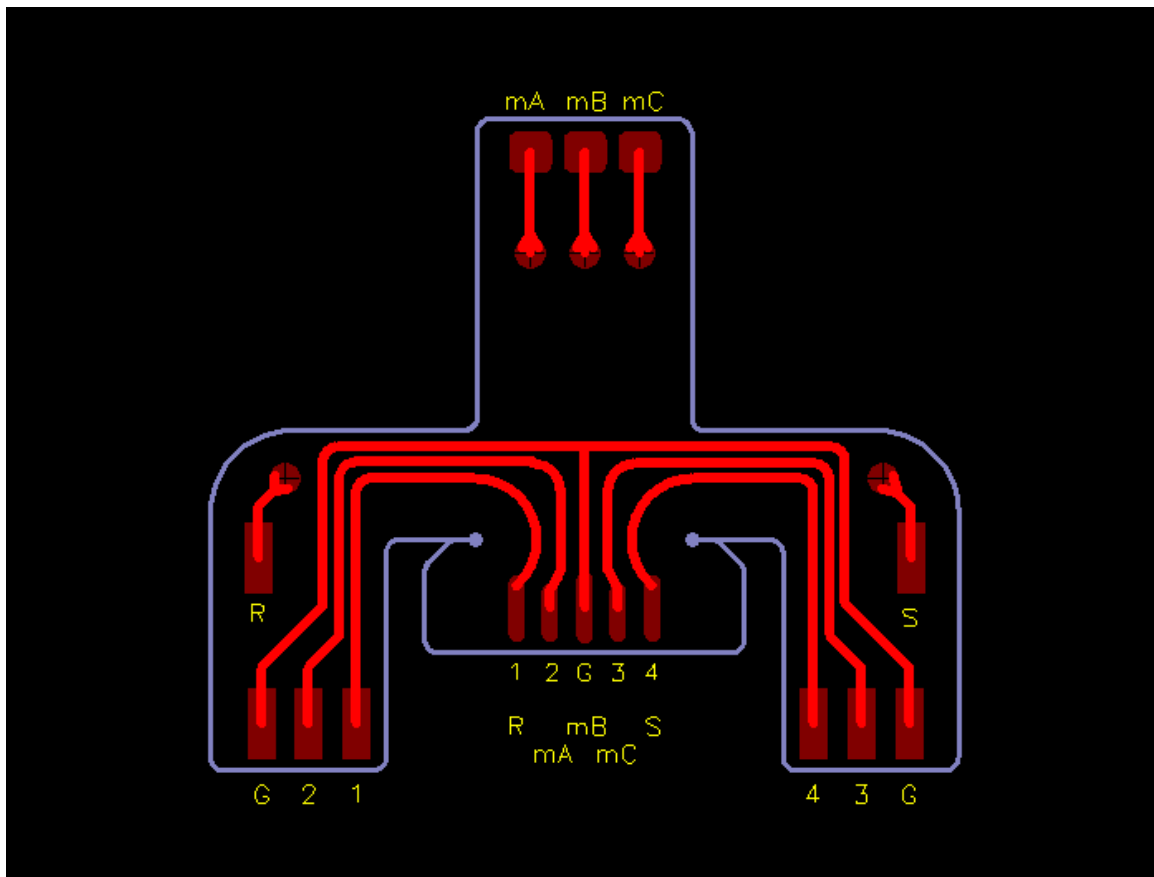


Figure 2 - Electrode pad locations on headstage.