Mini Batch Reactor (Mini kickass-9000)

1. List of required parts

S.N.	Part	Vendor	Product Number
1	6061 Aluminum Block	McMaster	8974K82-1610T41
2	1/16” compression x 1/16” NPT fitting	McMaster	5182K834
3	304 Stainless Steel End Cap, Trade Size 5, female	McMaster	1767K63
4	Steel End Cap, Trade Size 5, male	McMaster	17135K82
5	Ceramic Fiber Insulation	McMaster	93315K51
6	3” Band Heater	McMaster	3671K151
7	Rubber Grommet	McMaster	9600K75
8	Two Prong Electrical Plug	McMaster	6755K71
9	1/16” Thermocouple (Type K)	Omega	KMQXL-062U-6
10	Micro reaction Vessel (5ml)	Sigma Aldrich	27039
11	Triangular Stir Bar	Sigma Aldrich	23227

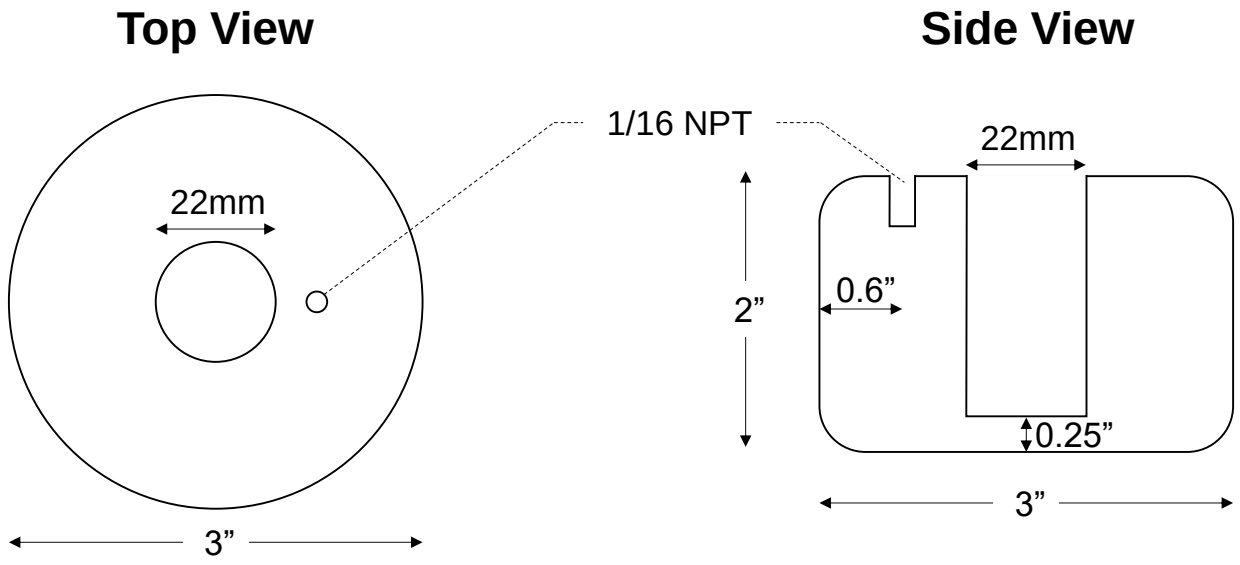

Figure 1 - 6061 Aluminum Block Cut and Machined to Size

This simple design affords a cost-effective heated and magnetically stirred batch reactor. The 3" OD x 2" thick aluminum cylinder acts as the heated thermal mass, machined as depicted in Figure 1. A 22 mm hole, slightly oversized to fit the miniature glass vial reactors (20 mm OD), is drilled into the center of the aluminum block, with a depth of 1.75". A thermocouple well is drilled off center from the reactor hole, threaded to accommodate a 1/16 NPT x 1/16 compression fitting. A 1/16" type K thermocouple is passed through the compression side of the fitting until it touched the aluminum block, then the compression ferrules are tightened to secure the thermocouple in place.

Clamped around the entire machined aluminum block is a 3" band heater, which provides heat inwards radially towards the reactor at the center. Attached to two electrical connections found at either side of the band heater, are ring terminals, onto which an electrical wire is crimped. Each wire passes through appropriately sized holes in the top steel end cap; rubber grommets are placed within each hole to protect the insulation sheath of the electrical wire. The two electrical wires are connected to an appropriate electrical plug, connected to a suitable temperature controller. The entire band heater/aluminum block assembly is wrapped with multiple layers of ceramic fiber insulation (around, below and above). Appropriate holes are placed in the top insulation layers to allow for the reactor and thermocouple fitting to pass through. The entire insulated assembly is encased within a pair of end caps (male/female), which firmly hold the assembly in place. The now assembled reactor furnace can be placed on top of a stir plate, used to drive the triangular magnetic stir bar placed in the miniature glass reactor. The stainless-steel end cap must be placed at the bottom to avoid interference with a magnetic stir place.

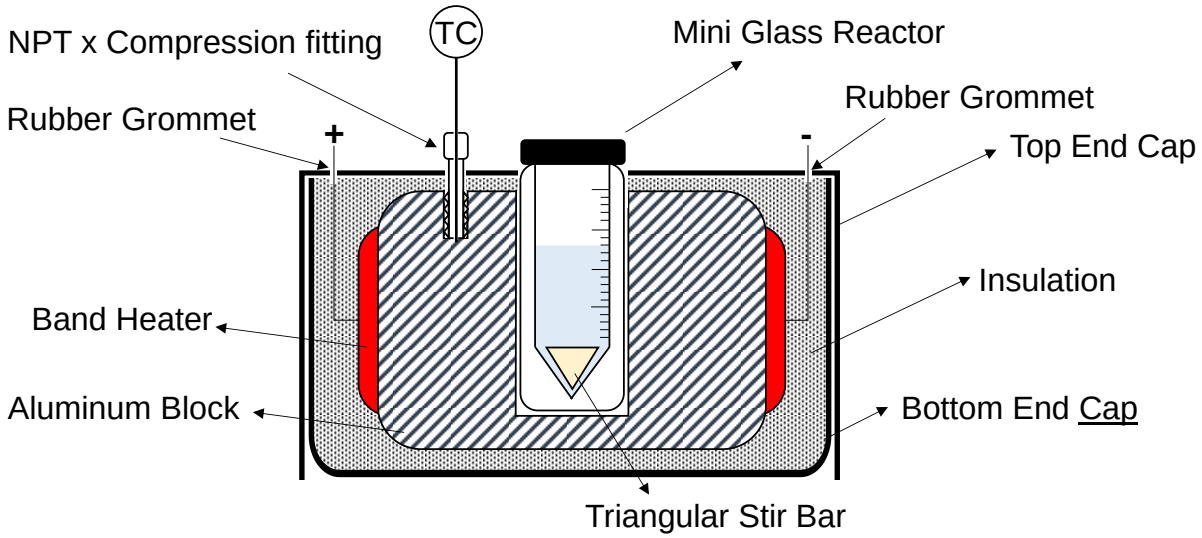

Figure 2 – Cutout view of reactor enclosure. TC – thermocouple. Not shown, thermocouple and power connections sent to appropriate temperature control device.