RotoRocket

Basic Operational Instructions

(Version 3.0)

ROTO Rocket

Observational
Uni-axial
Benchtop
Rotomachine

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493K

1. Declaration of Conformity.

DECLARATION OF CONFORMITY

We the manufacturer **493K Limited**
23 Watch Hill Road
Ballyclare
Co. Antrim
BT39 9QW
United Kingdom

CE

declare under our sole responsibility that the product :-

RotoRocket, Model No. RR2.0

to which this declaration relates is in conformity with the following standard(s) or other normative document(s) :-

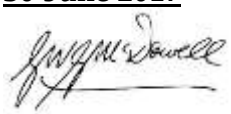
EN55022 : 1988 Class B
EN50082-1
IEC 801-2 : 1991
IEC 801-3 : 1984
IEC 801-4 : 1988

following the provisions of :-

EC EMC 2004/108/EC.

Place of issue **493K Limited**
23 Watch Hill Road
Straid
Ballyclare
N. Ireland
BT39 9QW

Date of issue **30 June 2017**



Signature
Name **Dr Gareth W. G. McDowell**
Position **Managing Director**

2. The Equipment

a. *ROTOROCKET features:*

- forward & reverse rotation;
- speed control (c.2 - 45 RPM);
- two separately switched heater banks (1 x 1kW & 1 x 0.5kW = 1.5kW total);
- heater position adjustment bolt.

b. *Items included:*

- 1 x glass cylindrical mould;
- 1 x release agent;
- 1 x ends of mould shrink wrap;
- 1 x manual (downloaded);
- Temperature logger;
- 1 x PT100 probe;
- K-KORD graphing software (downloaded);
- 1 x USB microscope & drivers;
- 1 x power cable (country dependent);
- Selection of basic powder samples (subject to location sold).

c. *Further recommended equipment & materials not included:*

- Electronic scales to measure powder shot weights;
- Windows PC to run K-KORD data recording software;
- Box cutter or sharp blade to cut excess mould shrink wrap from the ends;
- Cloth to apply release agent;
- Plastic scraper to clean mould.
- A desktop fan to enable faster cooling.

d. *Power Supply*

The Rotorocket requires a 8A, 220-240v supply. ***NB for countries with a 110v supply a 240v power supply must be used; if a voltage inverter is used ensure that the power supply to the inverter is rated for 15Amps.***

e. The Main RotoRocket Body:

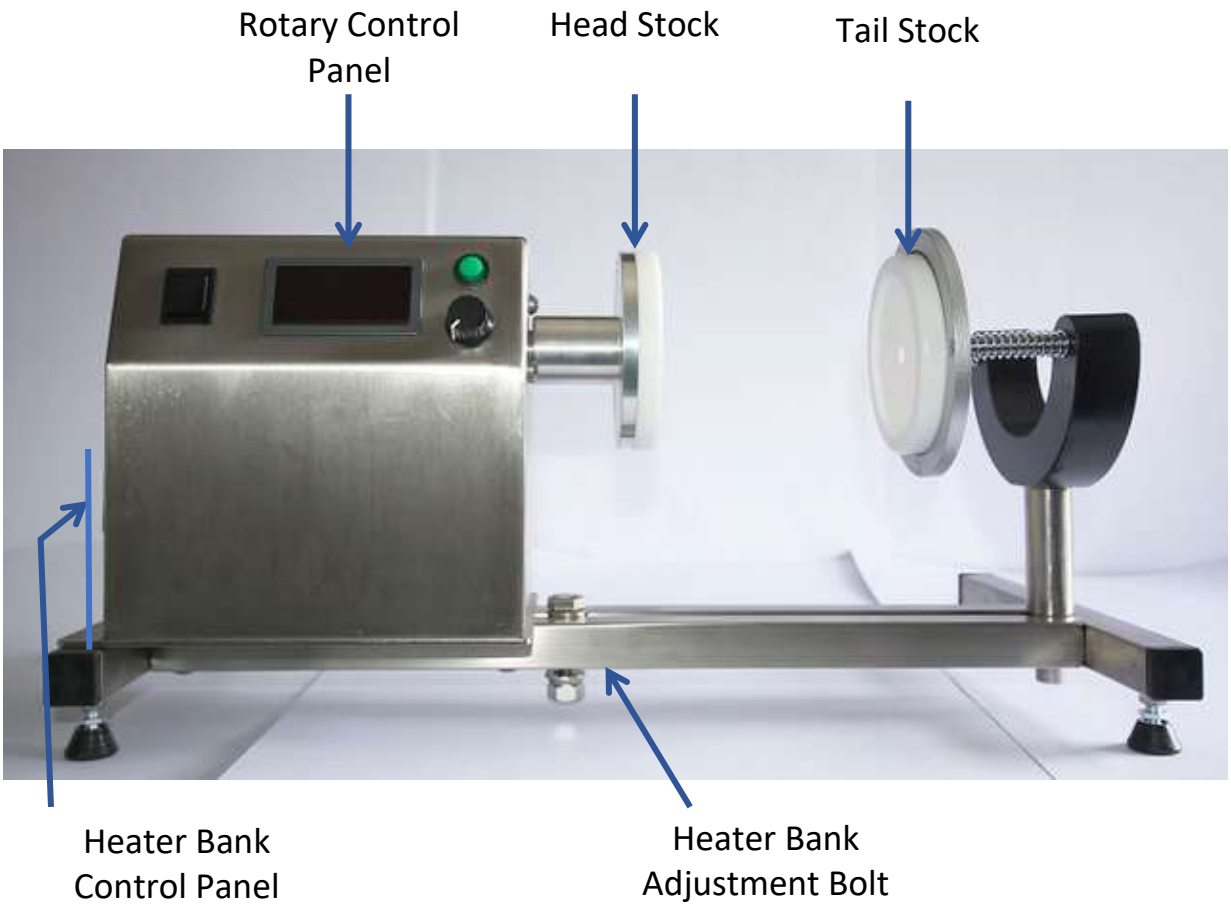


Figure 2-1 The Main RotoRocket Body.

f. The Heater Bank

There are two banks of heaters, each independently switched via the Heater Control Panel at the sided of the main body. Heater Bank #1 comprises the bottom two (individual heaters). Heater Bank #2 is the top single heater.

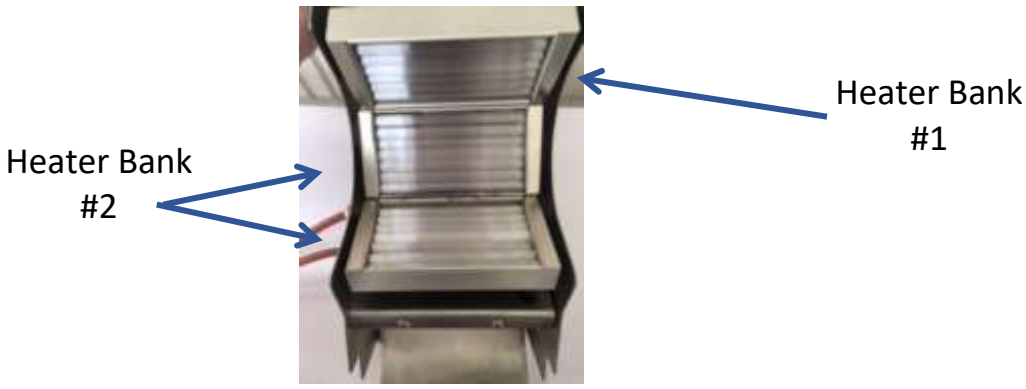


Figure 2-2 The Heater Banks.

g. The Mould

It is essential that release agent is applied to the internal surface of the glass mould. Although first coat is applied in the factory prior to dispatch it is recommended that a further application is made before the first moulding. The release agent should be baked on in an oven of 150°C for 10mins. The grade of release agent is a standard rotomoulding water based grade. It is recommended that release agent is re-applied every 3x mouldings, though it is not necessary to bake it on. If there is not adequate amounts of release agent on the glass mould it will likely result in the PE sticking to the glass, causing it to crack during cooling.

Figure 2-3 The Glass Mould.

h. The Temperature Logger.

Download the K-KORD monitoring software from the www.493k.com website and install. Ensure that Windows is connected to the internet and then connect the USB cable of the monitoring unit to the PC. The drivers for the electronics should automatically install. If not, then the drivers can be downloaded from www.ftdichip.com found under Virtual COM Port Drivers. There are two channels on the electronics units, Channel #1 and Channel #2. It is recommended that the probe is inserted into the mould, through the end of the tailstock to enable the internal mould air temperature to be monitored.

Figure 2-4 The Temperature Logger

i. The temperature Probe.

The probe is inserted through the vent pipe and should extend into the mould by enough distance to prevent outside ambient or other materials from affecting the measurement. A distance of 15-25mm is recommended. If a Supavent is used in the mould, then using a sharp edge cut a small hole at the end of the vent. Do not use the probe itself to pierce the hole as it may cause tearing. If the probe cable requires more support, then it can be threaded through a small pipe (see Figure below).

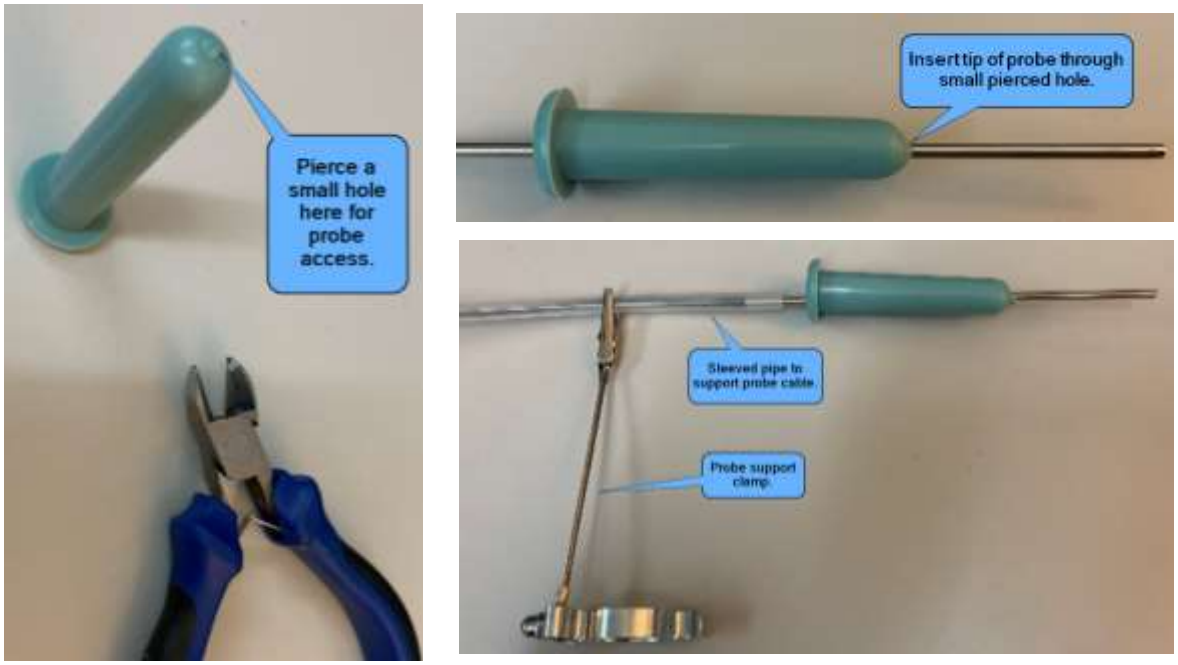


Figure 2-5 Mounting the Probe

j. The USB Microscope.

Use the software and drivers that come with the USB microscope. The microscope can be used to:

- Pause the rotation and zoom in through the glass mould and record the bubbles forming.
- Pause the rotation and zoom in through the glass mould and record the part releasing from the mould.
- After the part has been de-moulded it can be interesting to look at the surface porosity of the finished part.

- Observe the condition and adherence qualities of moulded in graphics or inks.
- Observe the size and shape of powder particles.

Care should be taken to ensure that the microscope does not touch the hot mould surface or remain close to it for longer than 30 seconds.

Figure 2-6 The USB Microscope

3. Operation of the RotoRocket

a. Turning the unit ON/OFF.

The RotoRocket requires a 8A, 220-240v power supply. It does not operate on a 110v supply. An appropriate voltage inverter should be utilised in the case where only a 110v supply is available and the outlet should be rated to 15Amps.

On some early models a master power switch is located on the side of the RotoRocket. Later models do not have a master power switch but instead have only individual switching of the various modules (i.e. heaters & rotary motion).

b. Electrical Fuses.

The RotoRocket is protected with a number of fuses:

- A resettable motor fuse (this would trip for example if the motor was stalled)
- A 10A slow burn fuse (T10A) on the live main supply feed
- A 10A slow burn fuse (T10A) on the neutral main supply feed (not on earlier models)
- A 6.3A slow burn fuse (T6.3A) on the live feed to Heater Bank #1
- A 6.3A slow burn fuse (T6.3A) on the live feed to Heater Bank #2

c. Heaters.

For normal PE rotomoulding Heater Bank #1 is adequate. Heater Bank #2 is sometimes needed for specialist materials that require fast heat up. The heaters are switched on using the RED switches on the side of the control panel.

d. Controlling the Rotary Motion of the mould.

The Rotary Control panel is turned ON/OFF using the round green button on the front of the RotoRocket. It is important that the Motion Switch is in the OFF position before turning the Rotary Control panel on to avoid immediate rotation of the unit.

The variable speed knob adjusts the rotational speed between 0% and 100% - NB this is not an RPM display. The Motion Switch controls the rotation and its direction, clockwise or counter-clockwise.

GENERAL ROTATION SPEEDS		
	Rotational direction as viewed from the top of the control panel	
Digital Read Out (0-100%)	Clockwise R.P.M.	Counter-clockwise R.P.M.
<10	***Do not use.***	***Do not use***
10	< 2.0	< 2.0
20	6-7	5-7
30	10	10
40	15	14
50	20	17
60	25	22
70	30	27
80	35	30
90	40	33
100	45	37.5
NB These RPM values are approximate and individual motors should be calibrated on-site.		

For optimum emulation of a production scenario the tangential velocity of the powder over the mould surface should be considered as more important, rather than the normal Revolutions per minute (RPM), i.e. a smaller mould will have a slower powder velocity over the mould surface when compared with a the same powder velocity in larger mould turning at the same RPM.

Figure 3-1 Heater Bank Controls, Main Switches & Fuses.

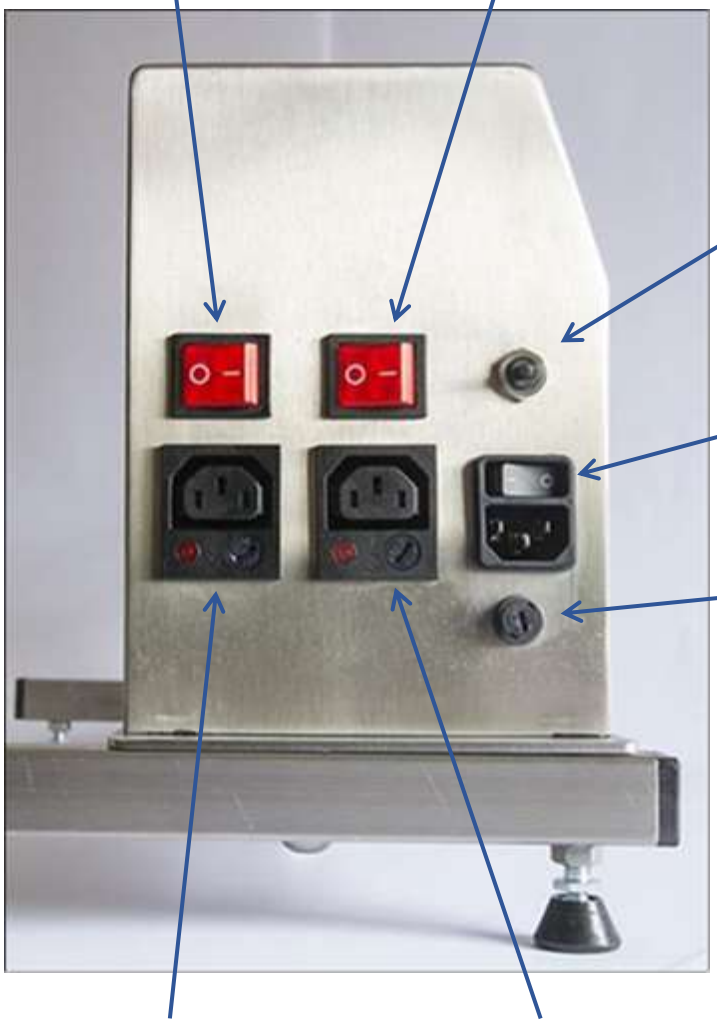
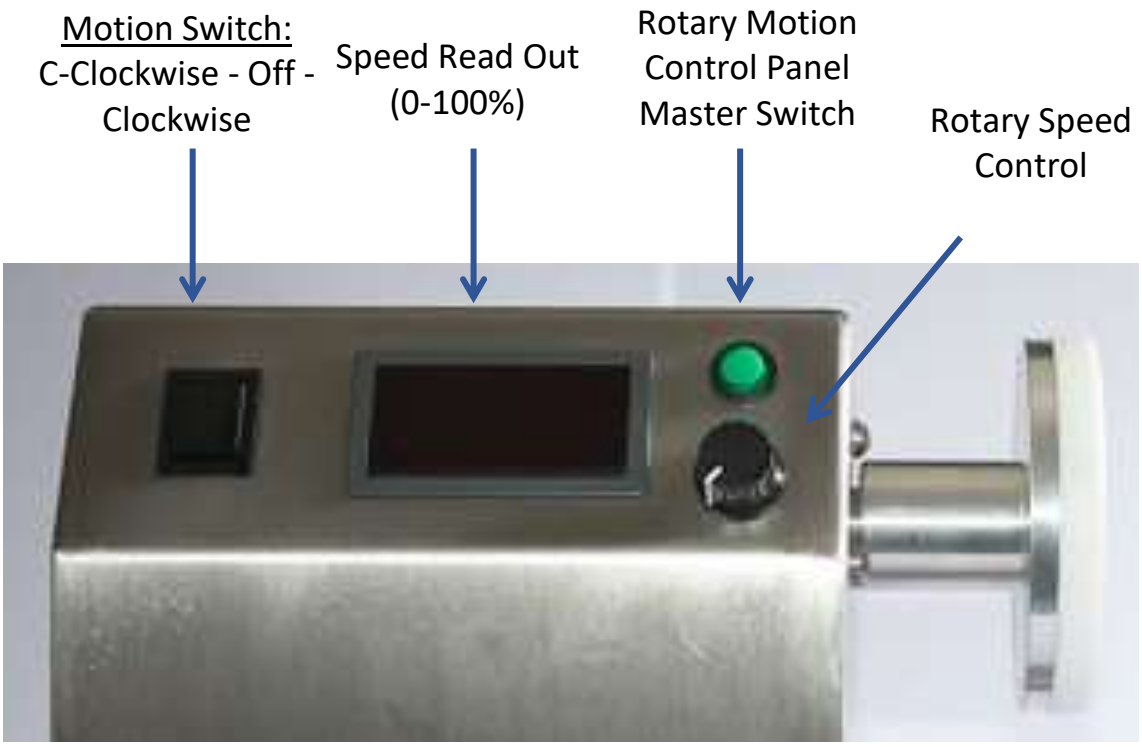


Figure 3-2 Rotary Motion Control Panel



4. Preparation of a Mould

a. *Applying Release agent to the mould*

It is essential that the glass mould has release agent applied for the first moulding. Subsequent applications of release agent should be made every 3-5 mouldings, or earlier should parts be difficult to release. Please note that inadequately applied release agent will result in cracked moulds.

b. *Loading the mould with powder*

- Stretch the shrink wrap over one end of the mould. *(Excess Shrink wrap can be trimmed when the mould is mounted for moulding by holding the knife supplied against the rotating mould)*
- Load the mould with the required amount of poweder, e.g.150g
- Stretch the shrink wrap over the open end of the mould and seal.

c. *Mounting the mould in the RotoRocket*

Carefully engage the mould on the tail stock end of machine. Whilst holding the mould to the tailstock with one hand and securing the body of the RotoRocket with the other, compress the tailstock spring with the mould. The mould, tailstock and compressed spring can then be pivoted about to come in line with the headstock of the RotoRocket.

Ensure both ends of the mould are engaged in their respective end caps before rotating mould. Ensure no powder leaks from the mould end caps.

Holding a sharp blade against the glass mould 5mm from the end of the end caps and while rotating the mould slowly, cut off any excess shrink wrap.

Using a sharp blade pierce the shrink wrap that is covering the vent hole to allow a vent and probe to be inserted.

The moulding is now ready to rotate.

5. Processing a Cycle

A typical moulding set-up for the first experiment could begin as follows.

i. Load the mould with a material shot weight of 120g;
ii. Mount the mould in the machine, ensuring the temperature probe is inserted through the vent pipe;
iii. Set the speed at '30' on the speed controller (approximately 11RPM) and initiate rotation *clockwise* (as viewed from the position of the control panel); this will ensure that the powder is pulled up close to the front of the heaters rather than the anti-clockwise rotation being used to take the powder further away from the heaters.
iv. Switch on Heater Bank #1;
v. Raise the Heater Banks ;
vi. Observe the moulding process through the glass mould and relate the phases of the moulding cycle to the temperature monitored.
    - Powder flow ("Avalanches")
    - Powder layup ("Fines "first)
    - Sintering
    - Cooling
    - Solidification
    - Release (from ends)
    - Demoulding
vii. While the mould rotates and the temperature continues to rise the polymer will go through various stages. These can be kept track of the inside air temperature of the mould. Typically the polymer melts at approximately 120°C. Melting will not be complete at an internal air temperature of 120°C and it will take a rise to about 140°C to ensure all the material has melted.
viii. The heating can be stopped around an internal air temperature of 160°C. The heaters should be folded down away from the mould to let cool air circulate and cool the mould.
ix. A desktop fan can be used to force cool the moulding.
x. When the mould air has cooled to 80°C-100°C and the part is completely released from the glass mould the cooling cycle can end and rotation can stop.

xi. Whilst gripping the mould and pulling it backward towards the tail stock swivelling the mould away from the head stock and release the mould from the machine.
xii. The moulded part should easily slide from the glass mould; if not it is advisable to wait longer rather than forcing the part from the mould.

Congratulations on your first moulding!