DivisionMaster Pre-wired Stepper Motors and Motor Mounts

INTRODUCTION

DivisionMaster can supply two stepper motor mounts and associated shaft couplings for use with proprietary rotary tables and dividing heads:

- A NEMA 23 motor mount that can be used with the Vertex HV4 (4”), Homge HHV150, Myford, and Vertex HV6 (6”) rotary tables, and can also be used, with some modification, with the Homge, Myford, and Vertex BS0 dividing heads; and
- A NEMA 34 motor mount that can be used with the Vertex HV8 (8”) rotary tables.

These mounts allow standard NEMA 23 or NEMA 34 stepper motor to be mounted in place of the operating handwheel or indexing arm.

Stepper motors, in NEMA 23 and NEMA 34 sizes, pre-wired to suit the controller, can also be supplied.

PREPARING VERTEX HV4, HV6, AND HV8 ROTARY TABLES

The Vertex HV4, HV6, and HV8 rotary tables often need some initial preparation in order to make them suitable for use with a stepper motor drive. The objective of this preparation is to minimize the frictional and viscous load that is “seen” by the motor, thereby maximizing the usable torque available for rotating the table.

The bearings in recent samples of these rotary tables are “plain” bearings, and the worm-and-wheel are lubricated using a fairly heavy grade of grease. It is important to make sure that the bearings, in particular the worm shaft bearings, are as free running as possible; in order to achieve this it may be necessary to remove the heavy grease from the worm drive and replace it with a light machine oil, although simply lubricating with light oil may “thin” the grease sufficiently to improve the free running. If it is necessary to clean out grease from the worm drive, the procedure for this is as follows:

1. Remove the bearing thrust plate from the base of the rotary table. This plate is used to adjust the end-float on the table’s main bearing; it is secured by four cap-head screws, along with four set-screws that are used to “lock” it after adjusting end float. Before removing the plate, it is worth marking the position of the plate relative to the table spindle with a couple of “centre pops”; if this is done, and the set screws are not adjusted during removal of the plate, adjusting the end float on re-assembly is somewhat simpler.

2. Disengage the worm from the wheel, allowing the table to rotate freely. The table, complete with worm wheel, can now be removed from the body of the device.

3. Carefully wash all traces of the grease from the worm wheel, using a small brush (a toothbrush works well for this) and some paraffin (kerosene). Similarly, clean all traces of grease from the worm. At this point, the worm shaft bearing (which is also a plain bearing) can be lubricated with light oil.

4. Remove the handwheel and its key from the worm shaft, by releasing the central cap head screw and carefully driving the handle off the shaft with a soft faced mallet or a hub puller.

5. Adjust the end float of the worm shaft for minimum end float consistent with there being no "tight" spots. This can be aided considerably by “running

in" the shaft bearings by driving the shaft with a small variable speed hand drill for a few minutes to help the bearing surfaces to bed in.

6. Re-lubricate all of the bearing surfaces of the table, including the worm and wheel, using a light machine oil.

7. Re-assemble the table, adjusting the thrust plate so that the table is free to rotate, but doesn't have any detectable end float. This is achieved by adjusting the four cap screws until the table just starts to "drag", and then tightening the four set screws to lock the adjustment. Tightening the set screws will tend to reduce the "drag".

8. Adjust the worm engagement for minimum backlash in the worm consistent with free rotation of the worm. A small set screw to the right of the table base (when viewed from the end of the worm shaft) limits the travel of the worm eccentric adjustment. Again, some "running in" by rotating the table under power can help to bed in the worm and wheel bearing surfaces.

The table should now be in a condition where it can successfully be driven using a stepper motor of a suitable torque rating.

Similar preparation procedures may be appropriate in order to prepare BSO dividing heads prior to use.

Preparing Homge HHV150 rotary tables

These tables are manufactured to a higher specification than the Vertex HV6 tables; a ball thrust race is used on the worm shaft, and a ball race is used at the base of the table spindle, so the free running properties of these tables tend to be superior to the Vertex tables. Hence, it may be unnecessary to perform any preparatory work on the table beyond removing the handwheel as described for the Vertex table in step 4 above.

Mounting Instructions

The motor mounting kit consists of the following components:

- A motor mount "tube" with a flange or a circlip to retain a square motor mounting plate;
- A coupler component bored 12mm diameter, to fit onto the worm shaft of the table or dividing head;
- A coupler component bored 3/8" or 8mm or 1/4" to fit onto the stepper motor shaft;
- A plastic "torque disc" that fits between the two coupler components;
- Four M4 (NEMA 23 mount) or M5 (NEMA 34 mount) cap-head screws to screw the motor onto the mounting plate;
- Three M5 cap-head screws to screw the motor mount tube onto the mounting flange of the table or dividing head.

Fitting the NEMA 23 motor mount to HV4/HV6/HHV150

1. Remove the hand wheel or indexing arm from the rotary table or dividing head. It is held by a central bolt and a keyway; remove the key also. These can be retained in the very unlikely event that you decide to return the table to manual use.

2. Fit the motor mounting plate over the motor mount tube so that the flange or circlip on the end of the tube seats in the plate's recess.

3. Mount the tube to the mounting boss on the table/dividing head by means of the three M5 bolts supplied.

4. Fit the 12mm bored coupler component to the end of the worm shaft, making sure that it seats properly on the shaft, and tighten the set screws, using the oval hole in the side of the motor mount tube to access the set screws.

5. Fit the 8mm bored coupler component to the motor shaft and fit the plastic torque disc to the coupler.

6. "Trial fit" the motor to the mounting plate, and adjust the position of the coupler components so that there is no end thrust on the motor shaft when the motor is in place. In some cases, this may require the motor shaft to be shortened slightly.

7. Tighten up the set screws on the two halves of the motor coupling.

8. Fit the motor to the mounting plate with the four M4 bolts provided. The mounting plate can be rotated to a suitable orientation before finally nipping up the mounting bolts.

Item 6 above is very important - if the motor is under axial load as a result of the coupling being positioned incorrectly, the motor will bind completely or lose steps unpredictably. Similarly, ensuring consistently free movement of the table's worm drive is important for reliable operation (see “Preparing the Vertex rotary tables” above).

Fitting the NEMA 23 motor mount to a BSO dividing head

The procedure is very similar to the description above for fitting the mount to the rotary tables; however, there is one significant difference caused by the design of the worm shaft. The shaft ends in a short length of stud threaded 5/16th Whitoworth; it is necessary to make up a short sleeve, OD 12mm and internally threaded 5/16th Whitworth, to take the 12mm ID coupler component. This must be screwed onto the stud with a suitable thread locking adhesive, so that, if it is ever desired to return the dividing head to manual operation, the sleeve can be freed, with the application of a little heat if necessary to release the threadlocking compund. Superglue works just fine for this. The assembly sequence is otherwise as described above.

The BD0 dividing heads can sometimes be fairly stiff in operation, especially when new; it may be necessary to “prepare” them by a period of running in, perhaps using a motor to drive the worm shaft, and to take similar lubrication steps to those described for the Vertex rotary tables.

Fitting the NEMA 34 motor mount to a Vertex 8” rotary table

The mounting sequence is very similar to that described above for the smaller rotary tables, with the exception that the worm shaft half of the Oldham coupling must be fitted to the shaft before the motor mounting tube is screwed in place. As there is no hole in the side of the motor mount tube, it can be a little tricky to get the motor half of the coupling located properly so that the coupling connects correctly with no end load on the motor; the simplest approach here is to tighten the motor half of the coupling only sufficiently to allow it to stay in position and allow it to slide up the shaft if force is applied; the coupling will then adjust to length as the motor is seated on the end of the tube, and the setscrew can be fully tightened after the position of the coupling on the motor shaft has been properly adjusted.

MOTOR CABLE AND CONNECTORS

Pre-wired stepper motors are supplied with cables and plugs fitted to suit the DivisionMaster controllers. Two styles of plug are used:

- 6-pin DIN plugs, wired to suit the socket on the older "plastic case" style of DivisionMaster controller;
- 4-pin "XLR" plugs, wired to suit the socket on the newer "metal case" style of DivisionMaster controller.

Please refer to the DiviosionMaster operating manual for connection diagrams.

MOTOR SPECIFICATION

The motor supplied with this unit has the following specification:

Motor size:	
Holding torque (Nm)	
Holding torque (oz-in)	
Number of wires	
Coil connection type	
Max current setting	
Min current setting	

PLEASE NOTE that the current specification indicated above may differ from the manufacturer's specification on the motor's label; **USE THE CURRENT RATINGS INDICATED ABOVE** to avoid damage to the motor due to overheating.

MOTOR EARTHING

The motor has an earth terminal wire fitted to the motor end of the motor cable. If the motor will not be connected to earth via the rotary device that it is mounted on, this earth terminal should be connected to the body of the motor, for example by clamping it under one of the motor mounting bolts. **However, if the rotary device that the motor will drive is itself already earthed, either directly or by virtue of it being bolted to the bed of a machine tool that is earthed, then the earth terminal wire MUST be left disconnected, insulated, and steps taken to ensure that there is good electrical connection between the motor mount and earth via the rotary device and/or the machine to which it is attached.** This is required in order to avoid the creation of earth loops that might otherwise affect the operation of the controller.

THE MOTOR AND THE CONTROLLER MUST BE PROPERLY EARTHED AT ALL TIMES.

DIVISIONMASTER SUPPORT

The DivisionMaster automatic indexer and accessories are supplied by:

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