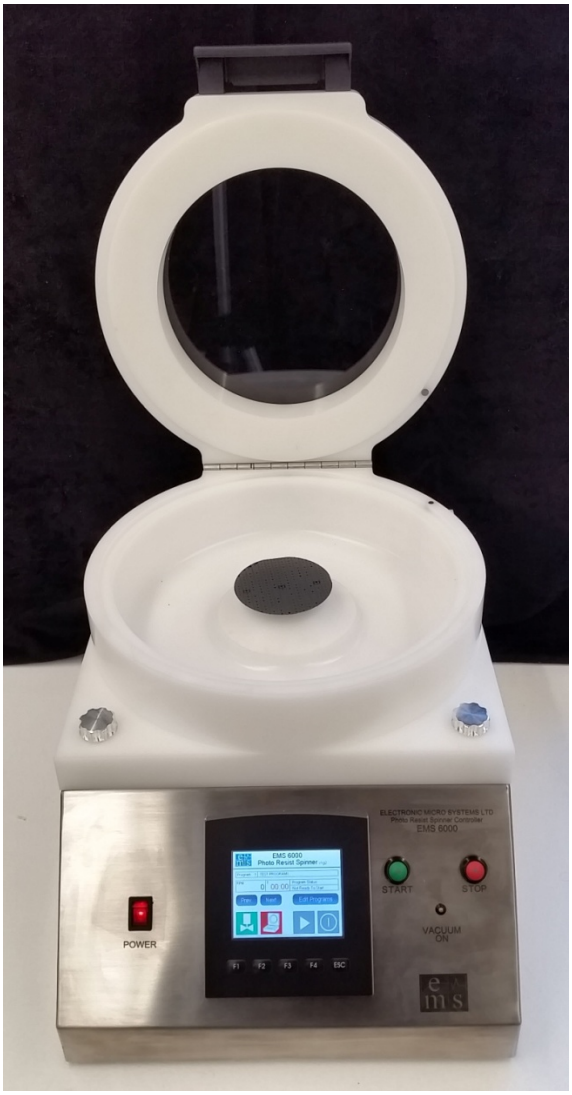
Electronic Micro Systems

Photo Resist Spinner
EMS 6000



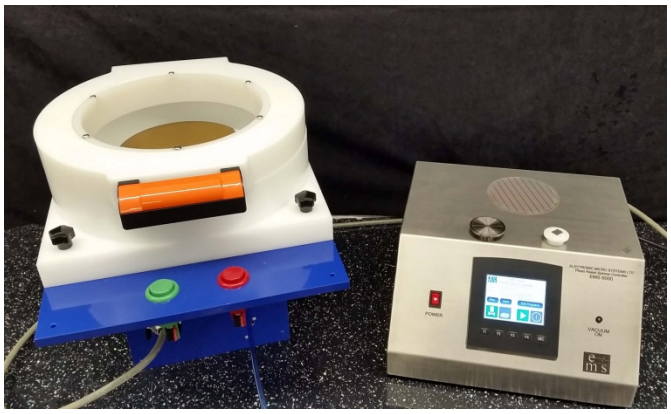
Features include:

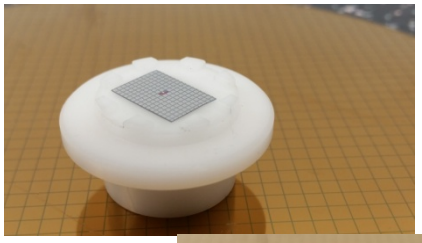
1. Spin Speeds from 200 to 10,000 RPM
2. Substrate Size up to 150mm
3. Full control and programming on Colour Touch Screen
4. Simple quick recipe creation

Operation & Maintenance Manual

Table Top
Stand Alone
EMS 6000

Bench Mountable EMS 6000





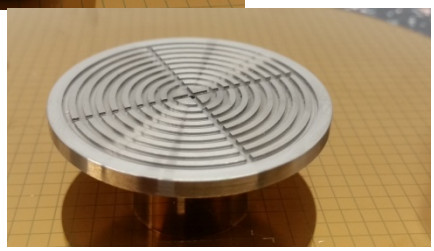


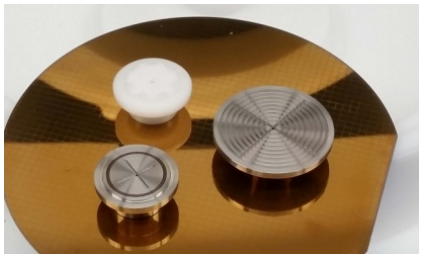
Table of Contents

Electronic Micro Systems

Introduction

The EMS 6000 Photo Resist Spinner is a manually operated system that provides a simple and economical means of creating highly accurate Photoresist coatings on a wide variety of substrates such as silicon and ceramic.

By placing your substrate on to the most suitable interchangeable vacuum chuck, depending on your sample size, shape, weight etc.



Create a recipe on the Unitronics Vision 350 Colour Touch Screen, the parameters available are Speed, acceleration and time, up to 10 steps available. By experimenting with these parameters you can produce the desired Photoresist film thickness and uniformity. Optical encoder feedback technology enables precise repeatability suitable for batch wafer production. There is storage for up to 20 Programs.

Program Name	Default Program 1					
Program No. 1	Step	Speed	Accel	Time	OP1	OP2	OP3
Prev.	1	1000	100	10	☐	☐	☐
Next	2	2000	200	20	☐	☐	☐
Save	3	3000	300	30	☐	☐	☐
Exit	4	4000	400	40	☐	☐	☐
	5	5000	500	50	☐	☐	☐
	6	6000	600	60	☐	☐	☐
	7						
	8						
	9						
	10						
	End	0	100	10	☐	☐	☐

There is also an option to select one of three output (+12VDC) for each step in the spin cycle, to enable control / synchronisation of external devices.

EMS 6000 Start Up

Services required

System may be set up for 110 or 240V AC input, please check labelling on the system.

Vacuum >> 15” Hg via 6mm OD Tube

Assembly

The Wafer Chucks and spinner cap will have been packaged separately, so they need to be fitted inside the bowl, as per picture.

The polypropylene bowl is held down by 4 of hand tightened screws, this is to allow easily removal for cleaning, so please ensure these are tight before running. If you wish to remove the bowl please note there is a reed switch for detecting the lid position that has two wires coming from the base of the bowl, so they need to be disconnected inside the motor enclosure, via a two pin connector.

Power Up

On power up the power switch will glow and the touch screen should appear, as shown on the right. This is the home screen for selecting a desired program and running.

Interlocks

We now have a chance to test the two important interlocks on the system.

1. **Lid Interlock**, controlled by a magnet in the lid and a reed switch in the bowl base.

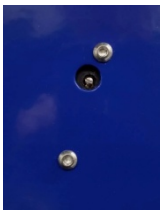
Lid Open  Lid Closed and safe to run 

2. **Vacuum Interlock**, there is an adjustable vacuum switch monitoring the vacuum at the chuck, this can be set for go or no go.
   This ensures the wafer sample is sucked on to the chuck, before and during spinning. The amount of suction achievable will depend on many factor such as house vacuum, the chuck wafer interface, chuck spindle interface and the quality of the PTFE seals on the spindle.
   This can be tested by touching and holding the screen vacuum icon for 3 seconds, this will open a solenoid valve and allow vacuum at the chuck. (touching and holding the vacuum icon while on for 3 seconds will switch the vacuum off)
   Without a wafer on the chuck or no vacuum supply available the icon should soon turn RED, indicating insufficient vacuum created.
   With a wafer on the chuck the icon should go green and the Vacuum LED on the front panel will also light up.

   No Vacuum  Good vacuum at the Chuck 

   If there is not enough vacuum, perhaps it is OK to adjust the trigger point, this is achieved by using a small flat head screw driver on the Vacuum switch.

Lower the Trigger point, turn the screw CW.
Higher the Trigger point, turn the screw ACW



   Caution please note lowering the Trigger point may cause problems for securing large wafers at high speeds, centering the samples on the chuck is also key for reliable spinning.

Creating a Spin Recipe

The following parameters can be set using the front panel display:

- Number of spin steps: 1 – 10
- Spin speed: 200 – 10,000 rpm
- Spin periods: 1 – 999 seconds
- Acceleration control: 1 – 9,999 rpm per second

There are 3 outputs that can be programmed on/off throughout the spin cycle, these are typically not utilized unless ancillary options have been added to the system.
The 3 outputs may be accessed from the Unitronics Vision 350 PLC controller.
These outputs are located internally on the lower connector to the Unitronics 350 PLC
OP1; is Pin 12, OP2; is Pin 13, OP3; is Pin 14.
The output is high (+12VDC) when selected

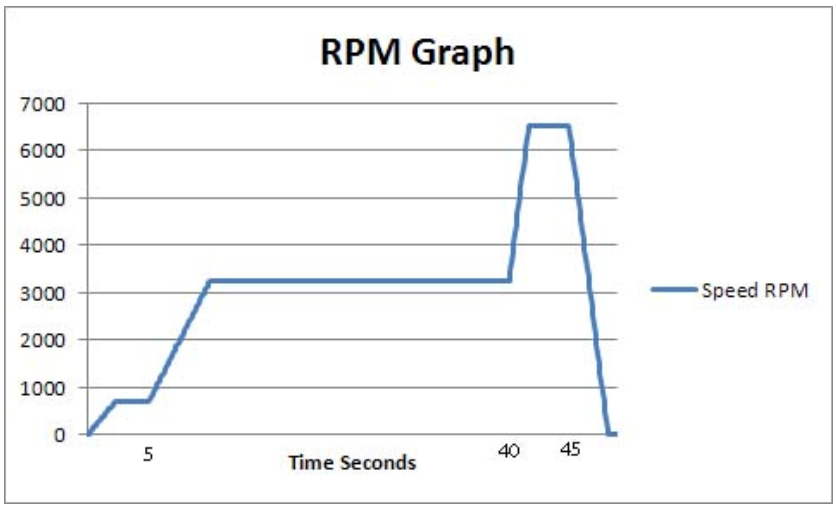
The spinner is able to spin faster than 8000 RPM however I would recommend, treading very cautiously above these speeds as a large sample slightly eccentric with a weak vacuum will inevitably come off the chuck. The outside edge a 6" wafer is moving at 140 mph at 8000RPM.

The Touch screen is very sensitive and we would recommend using a soft capacitive stylus type pen for precision selection and minimizing any damage to the screen.

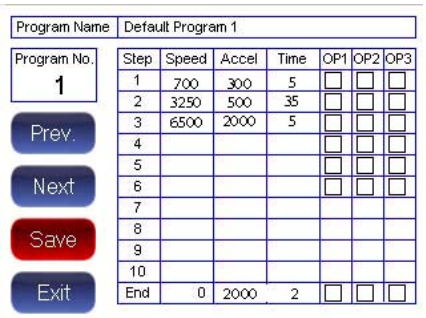
To Customise a Recipe

From the start screen Select "Edit Programs"
There are 20 default programs, you can move between them by selecting "Prev" or "Next".
Once you have found the one you wish to edit, you can change the name by touching it, a QWERTY pad will appear and you can create your own name.
Each item in the program can be edited by selecting it, once selected a numeric pad will appear.
If you wish to clear all the steps select step 2, all steps below will clear and you can start fresh.
When you select the step number default values are entered you then need to edit these for your application.

Spin Speed Recipe Example



This translates to the following Recipe



Recommended Speed values between 500 and 8000. Please note the Accel values are RPM per sec, the range of workable values is between 200 and 2000, higher values may create an overshoot.

Once you have modified the recipe the Save button appears, before you can leave this screen you need to select and hold the Save for 3 seconds, a beep will be herd and the new recipe is now saved. You may now exit the screen.

Ready To Run

In the home screen you can select the Program / Recipe you would like to run, with “Prev” or “Next” buttons. Please note it is worth checking in “Edit Programs” it is the correct recipe for your sample, running large samples at very high speeds (ie wrong recipe) can cause problems.

Once the Lid is closed  and the vacuum is available  , then start goes green  and therefore ready to start.

Select Start and the system opens a solenoid valve to allow Vacuum to the chuck, a vacuum switch is now checking there is sufficient vacuum available before starting. Once this is accepted then the motor will turn and the speed will appear in the RPM box, and the time remaining per step is presented in the “T” box.

To stop the system, you may hit the red stop buttons as well as the touch screen  . The motor will ramp down to zero rather than a sudden stop to minimize any sudden deceleration to the sample and potential slide off.

At the end of the program, there is a programmed deceleration and pause before the vacuum is switches off, a beep is herd and it is now safe to remove the sample.

If no Vacuum was detected, Program Status will be “Waiting for Vacuum”

You can abort by selecting  , this forces the program to the end step.

Running with out Vacuum

With growing interest in spinning on sticky pads as well as the fear of vacuum causing some flexing on the samples, we have provided a Vacuum Bypass switch.

The program is looking to the Vacuum switch to confirm a suitable vacuum is available, so a simple latch switch is available to bypass this signal and allow the program to run.

Please note the solenoid valve will still open and if you have vacuum permanently available to the system, then vacuum will still appear at the spindle, this should not cause any problems, however something to be aware of.

Summary of Touch Screen icons

Start.
Hold to start.

Not ready to start

Stop.
Hold to stop during operation.

Vacuum
Ready to start

No vacuum

Vacuum running.
Hold to switch Vacuum off, if safe to do so.

Lid
Open

Closed

Maintenance

1. Electrical Drawings are enclosed to enable any trouble shooting of any failing components.

2. The mechanical components have been designed to be tough and durable and will provide many years trouble free use.

3. The components that will wear with time and use are the Spindle bearings and PTFE seals which enable the vacuum at the chuck.

4. Bearing problems may show up as an increased noise level when spinning, with power off try twisting the spindle with fingers and feel for any irregular forces i.e. not feeling smooth on a full revolution.
   If it feels sticky/ jerky in patches then it is probably time to replace the bearings.

5. PTFE washer seal problems, there are two washers next to each bearings this is creating a tight fit onto the spindle, eventually with use, the PTFE will wear to a point that the seal is not so good and the achievable vacuum is compromised and probably time to replace.

Replacing Bearings and PTFE washers

Please review the enclosed drawing EMS-6000-101-A. Spindle and Motor assembly.
Item “2” Washers and items “3” Bearings need replacing together, both will be damaged when disassembling as they are all press fitted together.

1. Need to remove the Motor and Spindle as one.
   Access the motor area and disconnect the electrical connection, 6 pin Molex connector, and the “T” junction pneumatic fitting.
   Remove Chuck and spinner cap to reveal spindle and 4 of M4 Cap Head Allen Screws, loosen and remove these 4 screws while holding the Motor assembly, carefully remove the motor without snagging any cables.

2. Remove Vacuum Nipple and M5 extension fitting, now the bearing housing can be removed.
   Remove motor coupling from spindle.

3. The spindle needs to be pressed out of the bearing housing care needs to be taken not to damage the spindle or bearing housing as large forces may be required.
   The bearings may fall apart, which is OK as they need to be replaced with the following Part. Two of DDRIF1438ZZRA5P24LY121, SFR6ZZ NMB Stainless Steel Flanged Bearing 3/8 x 7/8 x 9/32".
   Hopefully one of the bearings should come out when the spindle is pressed out, this then makes life easier to press out the second bearing. If both bearing are still in place once the spindle is out this then requires some ingenuity depending on what tools you have available.

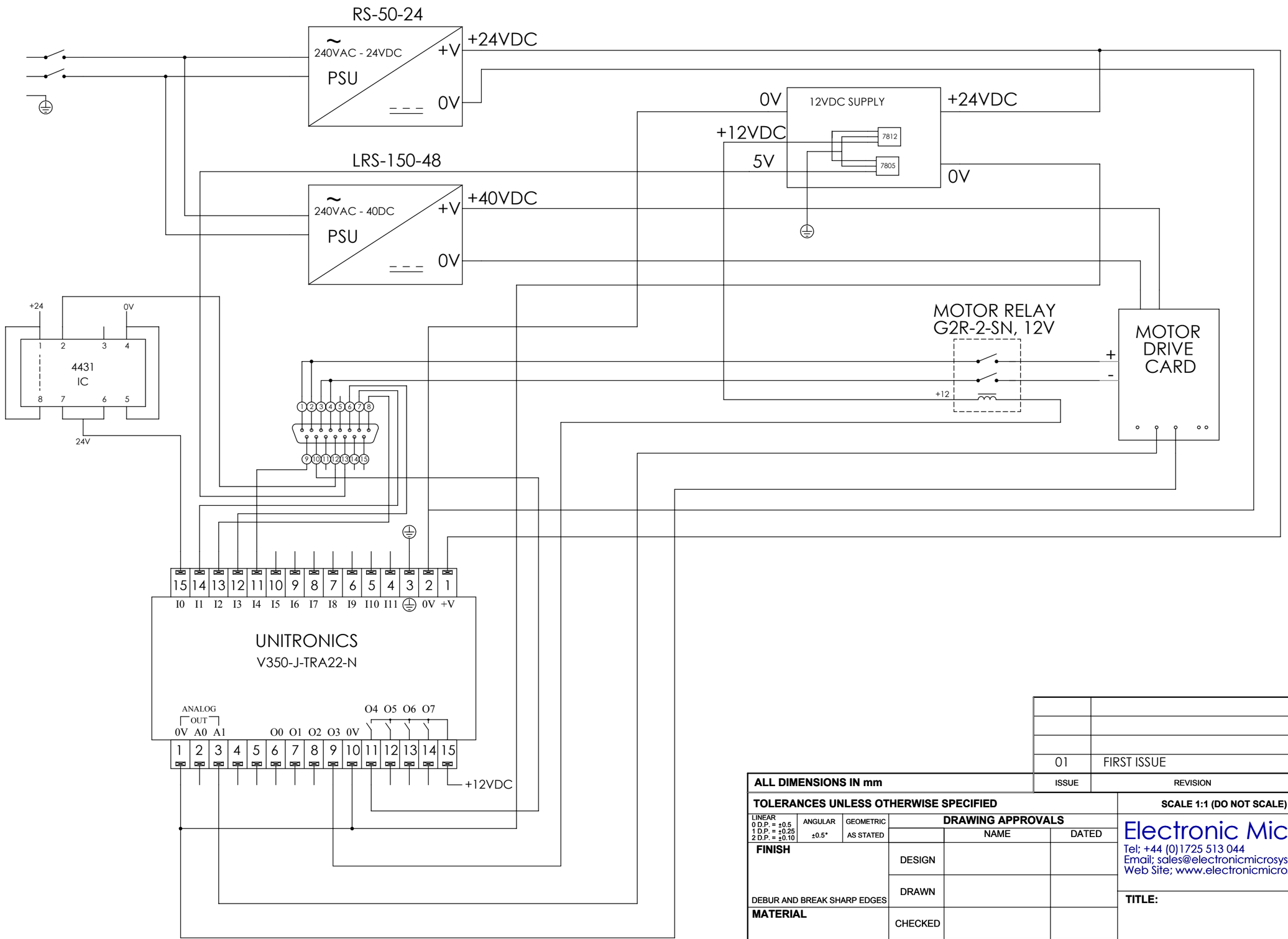
4. Once you have recovered the spindle and bearing housing they will need cleaning. Now you are ready to re-assemble with new PTFE washers, they should be 22mm diameter 9.35mm hole and 1mm thick. EMS can supply these.
   All of the parts need to be pressed together, with some Loctite around the bearings and washer to ensure everything stays firm. The spindle coupling end should be just protruding enough to fit the motor drive coupling. This should leave 22mm of spindle at the chuck end.
   The PTFE washer should be a tight fit on the spindle and will be difficult to rotate, as the washers need to be bedded into the diameter of the spindle, which take some rotation time, perhaps you can use a hand drill to do an initial burn in so as not to strain the spinner drive motor.

If you prefer EMS can provide a quote to replace these parts just email sales@electronicmicrosystems.co.uk
The Motor and Spindle assembly will need to be returned to EMS Birmingham England.

Electronic Micro Systems
Tom Murray

Tel +44 7939 285783
Birmingham, England, UK

Email sales@electronicmicrosystems.co.uk
www.electronicmicrosystems.co.uk



ISSUE	REVISION	BY	AUTH	CHKD	DATE
01	FIRST ISSUE	RJL	XX	XX	20/02/19

ALL DIMENSIONS IN mm

TOLERANCES UNLESS OTHERWISE SPECIFIED

LINEAR
0 D.P. = ±0.5
1 D.P. = ±0.25
2 D.P. = ±0.10

ANGULAR ±0.5°

GEOMETRIC AS STATED

FINISH

DEBUR AND BREAK SHARP EDGES

MATERIAL

USED ON

DRAWING APPROVALS

	NAME	DATED
DESIGN		
DRAWN		
CHECKED		
APPROVED		

CAD
CHANGE ON CAD ONLY

THIRD ANGLE PROJECTION

SCALE 1:1 (DO NOT SCALE) A3

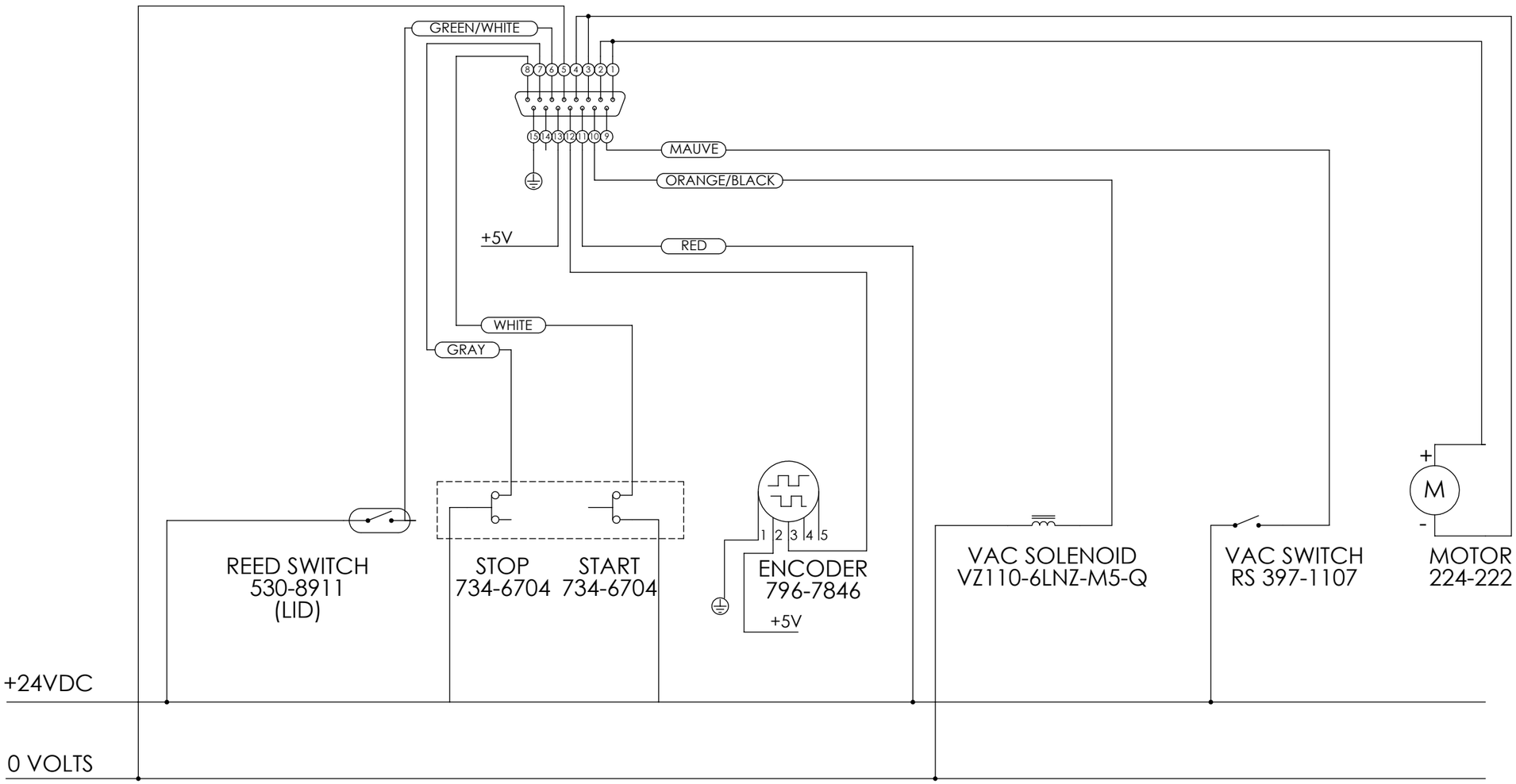
Electronic Micro Systems Ltd
Tel; +44 (0)1725 513 044
Email; sales@electronicmicrosystems.co.uk
Web Site; www.electronicmicrosystems.co.uk

TITLE:

Drawing No.

SHEET 1 of 2

ISSUE



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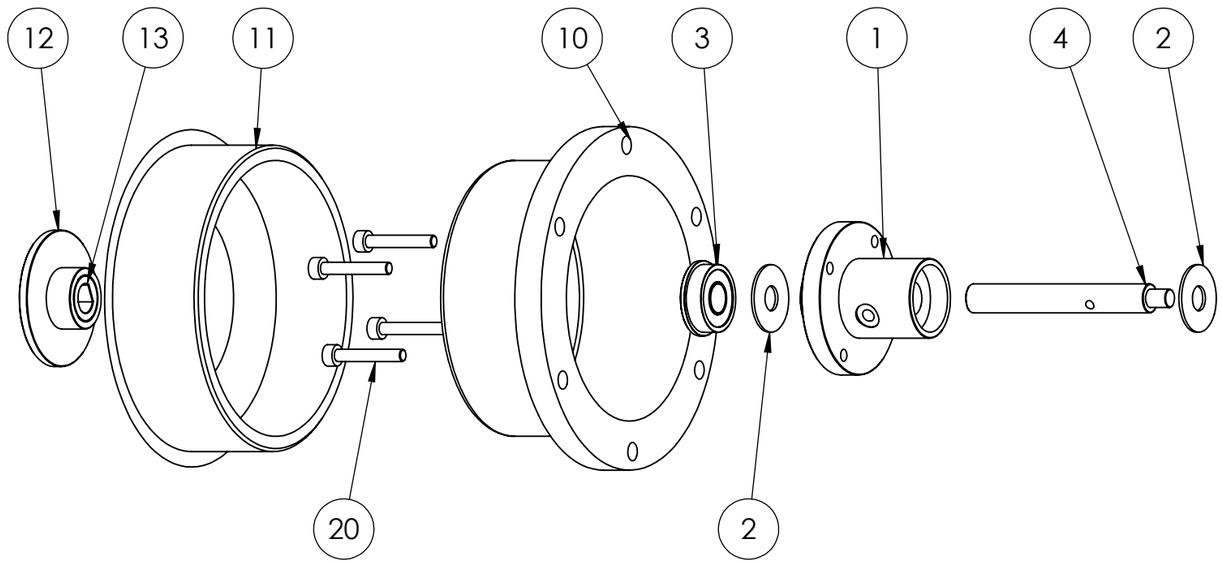
TITLE:

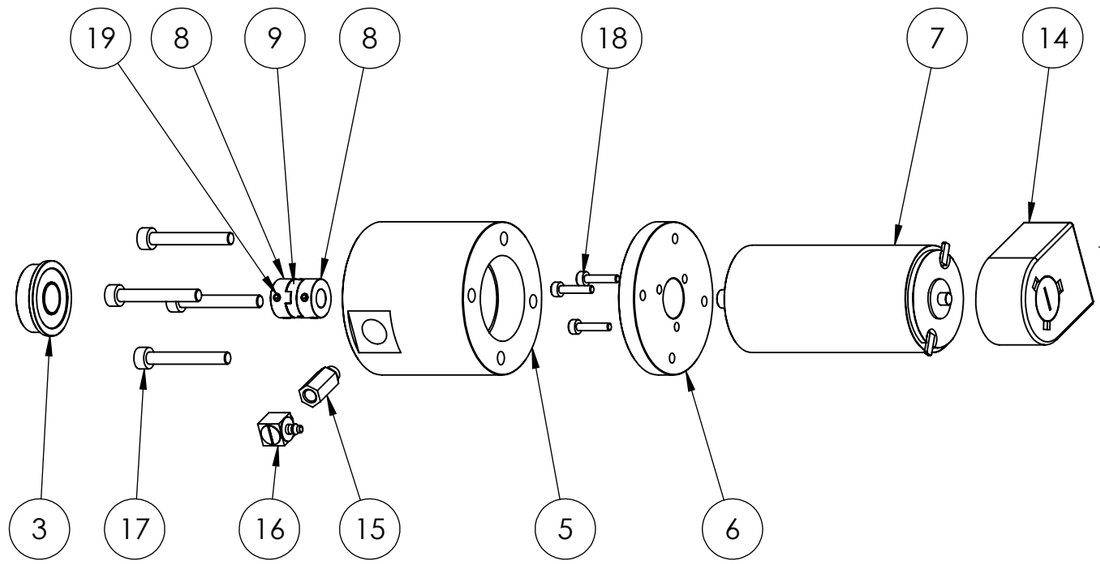
Drawing No.

SHEET 2 of 2

ISSUE

ITEM NO	Description	PartNo	QTY
1	BEARING HOUSING	EMS-6000-09	1
2	PTFE WASHER	EMS-6000-07	2
3	BEARING	747-715	2
4	SPINDLE	EMS-6000-11	1
5	MOTOR MOUNT HOUSING	EMS-6000-08	1
6	MOTOR MOUNT	EMS-6000-10	1
7	MAXON DC MOTOR	224-222 + 5540-A11	1
8	HUCO OLDHAM COUPLING 450H13.22	692-8046	2
9	HUCO ACETAL COUPLING TORQUE DISK, 236.13	692-8186	1
10	PHOTO RESIST SPINNER CAP HOUSING	EMS-6000-02	1
11	PHOTO RESIST SPINNER CAP	EMS-6000-01	1
12	SPINNER	EMS-6000-20	1
13	SHAFT INSERT	EMS-6000-21	1
14	BROADCOM INCREMENTAL ENCODER	796-7846	1
15	M5 STAND OFF	M-5J	1
16	M5 TO 4mm SWIVEL ELBOW	M-5HL-6	1
17	M4 x 30 CAP HEAD ALLEN SCREW		4
18	M2.5 x 12 CAP HEAD ALLEN SCREW		3
19	M3 x 3 GRUB SCREW		4
20	M4 x 25 CAP HEAD ALLEN SCREW		4





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DRAWN		22/01/2019
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APPROVED		

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Electronic Micro Systems Ltd
Tel; +44 (0)1725 513 044
Email; sales@electronicmicrosystems.co.uk
Web Site; www.electronicmicrosystems.co.uk

TITLE:

SPINNER ASSEMBLY

Drawing No. EMS-6000-101-A

SHEET 2 of 2

ISSUE 01

CE – Certification

This is to certify that the following product:

EMS Photo Resist Spinner Model 6000

Manufactured by

Electronic Micro Systems
110 Grange Lane
Sutton Coldfield
B75 5LJ
England, UK

Designed and tested to comply with requirements of the following EU Directives:

73/23/EEC	Low Voltage Equipment (LDV)
89/336/EEC	Electromagnetic Compatibility (EMC)
92/31/EEC	Electromagnetic Compatibility (EMC)

This has been accomplished by means of self- certification.

Mr T Murray
Managing Director
Electronic Micro Systems