MANUAL

YJCS-5B ULTRASONIC POLISHER
I. GENERAL DESCRIPTION

The YJCS-5B is a bi-function polishing machine – ultrasonic vibration polishing function and EDM erosion function. 

During ultrasonic polishing, the vibration movement repeats at maximum 28,000 times per second. During EDM erosion, the machine discharges high frequency electric spark to remove excessive material at adjustable speed.

YJCS-5B works much faster than manual polishing; it can polish deep and narrow areas where manual polishing cannot reach. Its EDM erosion function offers an economical and fast approach to polish extra-hard alloy or carbide.

Previous models, customer dissatisfaction concerns:

(I) The hand piece is big and clumsy.
(II) High level of abrading sound.

To satisfy the customer need, we produce a new model – light and handy YJCS-5B. It also operates at a lower sound level.

By using sectional assembly, the machine size of YJCS-5B decreases noticeably and the machine quality improves significantly. YJCS-5B has also modified the hand piece overheating problem found in YJCS-5.
New Feature of YJCS-5B:
1. Ultrasonic vibration tracking system
2. Nine step numerical EDM power control
3. Nine step numerical vibrating power control.
4. Able to adjust the EDM gap automatically to obtain maximum output.
5. Fine EDM process, suitable for intricate mould.
6. Controlled power output and stored current consume little power.
7. The hand piece is light and handy, reduce fatigue and promote efficiency.
8. Machine occupies a small work place.

II. TECHNICAL SPECIFICATIONS
1. Application: ribs, slits, tapered holes of dies, different shaped holes and other areas that are hard to polish or finish by hand
2. Applicable Material: steel, carbide, glass, precious stones
3. EDM Fluid: kerosene or water
4. Input: single phase 220V±10% 50Hz
5. Output: 60W, 19-28 KHz, 9-stage output selection
6. Dimensions: 230×130×78mm3
7. Weight: Approx. 3Kg
III. EFFECT OF YJCS-5B POLISHING

1. **Appearance:** after polishing, the surface should be flatly lapped; all EDM, wire-cut or milling marks should be removed.

2. **Roughness:** After EDM Erosion Stage “1”, the surface roughness should be below Ra0.3. After complete ultrasonic finishing, the surface roughness should be around Ra0.012 (mirror finish).

3. **Ultrasonic Finishing Speed:**

<table>
<thead>
<tr>
<th>Tip Type</th>
<th>Roughness</th>
<th>Approx. Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic stone tip</td>
<td>Ra2.5-Ra0.5</td>
<td>1cm²/min</td>
</tr>
<tr>
<td>Brass rod tip</td>
<td>Ra0.1-Ra0.2</td>
<td>2cm²/min</td>
</tr>
<tr>
<td>Hard wood tip</td>
<td>Ra0.3-Ra0.05</td>
<td>1cm²/min</td>
</tr>
<tr>
<td>Soft wood tip</td>
<td>Ra0.05-Ra0.012</td>
<td>1cm²/min</td>
</tr>
</tbody>
</table>

The speed may differ due to operator familiarity and workpiece complexity.

4. **EDM Erosion Speed:** 2mm³/min.

5. **Polishing Accuracy:** The accuracy of polished moulds is directly related to the skill of the operator. The original roughness is another decisive factor. For moulds that require high accuracy and surface finish, the original surface of the mould must be reasonably fine.

6. **Note:** this machine is usually used for intricate, deep or narrow areas. If you want to use it to polish large flat surface, we recommend the following method: Hand lap the surface with polishing grit 800 or 1000 after the stage of hard wood tip polishing, and then proceed with soft wood tip. By doing this, the surface flatness will be substantially improved.
IV. POWER UNIT INTRODUCTION

The power unit is made of alloy steel. The back portion is slotted for heat dispersing. Under the heat dispersing part is the current supply plug. The front panel is illustrated in the following illustration.

**Illustration One – front panel**

1. VIBRATION POWER INDICATOR
2. EDM DISPLAY
3. EDM POWER ADJUSTOR
4. PAUSE/WORK INDICATOR
5. EDM INDICATOR
6. EDM FUNCTION SELECT
7. EDM OUTLET
8. ULTRASONIC OUTPUT
9. VIBRATION DISPLAY
10. VIBRATION POWER ADJUSTOR
11. VIBRATION INDICATOR
12. VIBRATION FUNCTION SELECT
13. PAUSE/WORK BUTTON
14. POWER SWITCH

1. VIBRATION POWER INDICATOR is used to indicate the actual vibration extent, the more shining lights, the higher the vibration power.
2. EDM DISPLAY is used to display the EDM grade that the operator has selected.
3. EDM POWER ADJUSTOR is used to adjust the EDM grades. YJCS-5B has nine grades of EDM output. 1 is the smallest and finest, and 9 is the largest and coarsest.

4. PAUSE/WORK INDICATOR is used to indicate the machine state. If the indicator is shining, the machine is in PAUSE state; if the indicator is off, the machine is in WORK state.

5. EDM INDICATOR is used to indicate the EDM function. If the indicator is shining, the machine is in EDM function.

6. EDM FUNCTION SELECT is used to select the EDM function. Press the SELECT once, the EDM INDICATOR will be shining and the EDM function will be activated.

7. EDM OUTLET is used to bind the EDM wire.

8. ULTRASONIC OUTPUT is used to plug the P-H cord (power unit – hand piece).

9. VIBRATION DISPLAY is used to display the VIBRATION grade that the operator has selected.

10. VIBRATION POWER ADJUSTOR is used to adjust the VIBRATION grades. YJCS-5B has nine grades of VIBRATION output. 1 is the smallest and 9 is the largest.

11. VIBRATION INDICATOR is used to indicate the VIBRATION function. If the indicator is shining, the machine is in VIBRATION function.

12. VIBRATION FUNCTION SELECT is used to select the VIBRATION function. Press the SELECT once, the VIBRATION INDICATOR will be shining and the VIBRATION function will be activated.

13. PAUSE/WORK BUTTON is used to select the working state of the machine. Press the BUTTON, the machine will switch between PAUSE and WORK.

14. POWER SWITCH is used to control the main power of the machine.
V. HANDPIECE AND COLLET

The handpiece is a crucial part of YJCS-5B. Inside the hand piece shell is the transducer, the function of which is to transform electrical signal into vibrating power. The working state of the transducer directly influences the efficiency of the polishing process.

1. P-H cord (power unit - handpiece)  
2. P-H cord socket  
3. Hand piece shell  
4. Transducer  
5. Collet  
6. Cap Screw  
7. Tip

The thinner part of the transducer is exposed outside the hand piece shell and is fastened to the collet which transmits vibration to the polishing tip.

Make sure the collet is properly tightened to the transducer and the polishing tip is properly fastened to the collet. Bad connection of the transducer, the collet and the polishing tip will obstruct the transmitting of ultrasonic
mechanical vibration, which significantly affects polishing efficiency.

**The collet** wears after a period of work due to high frequency vibration, but the worn spots are usually unobservable by eyes. The most convenient way to judge is by replacing. If you suspect that the old collet is worn, replace it with a new one. If the machine resumes good work after the replacing, the old collet should be worn.

The **P-H cord** may break because of high frequency vibration. Similar to worn collet, the broken spots are usually unobservable by eyes, because they are inside the insulation cover. You can test the P-H cord by using the test cord. If the machine resumes good work when using the test cord, it means the P-H cord must have broken somewhere.

There are two ways to deal with a broken cord:
1. Discard the broken cord and use a new one. It is convenient, but cost much more money.
2. Find the broken area and repair it. Once you are familiar with the method, the repair work is easy and prolongs the service life of a P-H cord by dozen times.

**How to repair:** You can judge the broken area by tearing the cover. The cover will torn without much effort, if the inner wires are already broken. Repair the broken area and the cord will be as good as new.
Most of the time, the broken area is shown in the left picture.

Sometimes, the cord may break inside the hand piece shell. In this case, you need to open the hand piece shell as illustrated. First rotate the back part of the shell clockwise 60° and then pull out the shell gently. You will find two wires connecting the
transducer and the P-H Cord Socket.

Wire 1 (white) should be connected to the metallic part of the transducer.

Wire 2 (black) should be connected to the crystal part of the transducer.

The wires should be insulated from the metallic part of the transducer.
VI. TIP TOOL

YJCS-5B has two types of tip tools: 1) VIBRATING tips; 2) EDM tips.

1. **VIBRATING TIP:**

There are two types of VIBRATING tips: a) with bounded abrasives; b) without bounded abrasives.

a) **VIBRATING tips with bounded abrasives:**

Diamond file tip and ceramic stone tip are two kinds of tips with bonded abrasives. No extra abrasives are needed when using these two vibrating tips. They provide a clearer working sight, and a more convenient working procedure.

Diamond file tip is suitable for polishing narrow slits and steep walls. It has great cutting power. You can use diamond files of varied shapes for different areas. Please use Φ3mm shank diamond files. The effective working area of diamond file tip is its flank with electroplated diamonds.

Ceramic stone tip is suitable for flat surface and corner edging. You can use ceramic stones of varied grit for different requirements. The effective working area of ceramic stone tip is its end.

b) **VIBRATING tips without bounded abrasives:**

Brass rod tip, soft wood tip and hard wood tip are three kinds of VIBRATING tips that need add-on diamond compound. This type of VIBRATING tips can be easily reshaped into desirable size and shape, so as to meet
varied requirements.

For rough polishing, we suggest coarse diamond compound with brass rod tip or hard wood tip. For fine polishing, we suggest fine diamond compound with soft wood tip.

i) BRASS ROD TIP: the suitable brass for VIBRATING tip is H62 or H65. The brass rod should be tough and shock resistant. The rod can be bent into many shapes to produce different vibrating direction. Basically the rod vibrates horizontally as per the left drawing below. If you bent it as per the right drawing below, it will vibrate vertically. The effective polishing area of a horizontally VIBRATING tip is its end, while the effective polishing area of a vertically VIBRATING tip is its flank.

![vibration direction of straight brass rod tip](image1)
![vibration direction of bent brass rod tip](image2)

ii) HARD WOOD TIP: Our company provides hard wood (bamboo) tips made of five-year-old bamboo sticks. If you customize this kind of tips, you can use other hard wood that has straight texture. When cutting the tip, try to make the profile smooth, otherwise, the tip may burn because of stress concentration.
iii) SOFT WOOD TIP: Our company provides soft wood (birch wood) tips that have no knots and straight lines. The latter half of the tip can be cut, filed to any shape. When cutting the tip, try to make the profile smooth, otherwise, the tip may burn because of stress concentration. Soft wood tip has the best smoothness and can process mirror quality surface.

2. EDM TIP:
The EDM tip is made of brass rod H62 or H65. The ultrasonic vibration system mobilizes the brass EDM tip to produce suitable EDM gap. Similar to brass VIBRATING tip, brass EDM tips can also be bent to change their vibrating direction, so as to influence the discharging area. Basically, the vibrating direction must be unparallel to the discharging area, i.e., the effective discharging area of a horizontally vibrating EDM tip is its flank, while the effective discharging area if a vertically vibrating EDM tip is its end.

![Important]

The machine must use a 3-point plug. It connects the earth wire, with earth current resistance $< 4 \Omega$.

When using EDM system, please note: the hand must not touch the metallic part of the transducer, the collet or the tip.
**VII. OPERATE PROCEDURE**

1. **PREPARATION:**
   a) Connect the power unit to the electrical source.
   b) Observe the workpiece and choose suitable collets and suitable tips.
   c) Fasten the collet and the tip. This is a crucial step. Please follow the illustrated way to fasten or loosen the collets.

| The collet, the spanner, the fixer and the hand piece (from left to right) | Put on the collet and put the hand piece onto the fixer. |
To fasten the collet, push the spanner clockwise. You must use your force until the collet is firmly fastened.

To loosen the collet, push the spanner counter-clockwise.

d) If you are using EDM function, connect the EDM wire: One end to the EDM outlet, another end magnetized to the workpiece. The magnetized area should be free of rust and oil.
e) Prepare suitable diamond compound, kerosene or water.
f) Prepare a good lamp to light the working area.
2. **ACTIVATE**

   a) Turning on the power switch, the power unit panel will be:
   Displaying “1” and “8” respectively on EDM DISPLAY and VIBRATION DISPLAY; VIBRATION INDICATOR and PAUSE/WORK INDICATOR are on.

   b) Press the PAUSE/WORK BUTTON once, the machine is now activated. With the VIBRATION DISPLAY on, the machine is in default VIBRATION function.

   The VIBRATION POWER INDICATORS will flash and then stabilize at a certain level. Normally, more shining indicators indicate larger vibration.

   The polishing tip feels slippery if you touch it or put it onto a surface. Do NOT pinch the vibrating tip with your fingers. If you pinch it hard, the vibrating power will be transmitted to your fingers and may probably burn the skin. If you want to change for another tip, please make the machine pause.

   Indicator level (i.e. vibration extent) is influenced by vibration grade selected, collets quality, tips quality and connection quality. If you find vibration extent too small, make the machine pause, and then check collet, tip, collet-transducer connection and collet-tip connection. Re-initial the machine and observe vibration.

3. **EDM SHAPING**

   a) Immerge the workpiece with water or kerosene. The liquid surface should be approx. 5mm above the
workpiece surface. If the workpiece is too big to be completely immersed, at least insure the working area is dipped by water or kerosene.

b) Press the EDM FUNCTION SELECT, the EDM FUNCTION INDICATOR will be shining, and the machine is in EDM function. The vibrating power (the VIBRATION DISPLAY) will be default 5. PLEASE check the EDM wire connection before work.

Use the EDM POWER ADJUSTOR to choose the suitable grade. For very coarse surface and large removal amount, grade 9 is recommended. For quite fine surface and high accuracy requirement, grade 1 is recommended.

For different EDM POWER grade, the machine will automatically choose a default vibrating grade. Normally, the default vibrating grade is the best for brass rod tip and common workpiece. If you use particular EDM tip or deal with particular workpiece, you can adjust vibrating grade manually.

c) Make sure every spot of the working area is evenly discharged before you proceed to a finer grade.

d) When using EDM, put the tip gently on the workpiece. If you press the tip too hard, there will be not enough space for vibration gap. You can judge the EDM effect by the black dirt discharged around the tip. The more dirt discharged, the more effective the EDM process.
e) We suggest that you move the tip approx. 100-300mm per second, and keep the spark in the middle of the tip end.

g) Some slits may be too deep for EDM, because deep water or kerosene can absorb lots of vibrating power. In this case, we suggest diamond file tip.

**h) Important Points to Observe:**
During EDM output, there is 100V DC current through the transducer, collet and the tip. As a result, your hand must not touch the metallic part of the transducer, the collet and the tip. Otherwise, you may get a shock. It is normally not lethal, but it is unpleasant and may cause danger to certain groups of people.

### 4. ULTRASONIC POLISHING

a) Press the VIBRATION FUNCTION SELECT, the VIBRATION FUNCTION INDICATOR will be shining, and the machine is in VIBRATION function.

If you emphasize removal speed, ceramic stone tip, diamond file tip and brass rod tip are good choices. These two tips are for rough polishing. The accuracy and smoothness may be compromised.

If you emphasize accuracy and smoothness, hard wood tip and soft wood tip are good choices.
Abrasive paper tip may give different performance depending on the abrasive paper you choose. Finer abrasive paper produce finer surface and coarser abrasive paper provide faster removal.

b) Routine polishing procedures:
1) For workpieces with roughness similar to EDM grade 1 or 2:
   Hard wood tip + W28 diamond compound → hard wood tip + W14 diamond compound → hard wood tip + W7 diamond compound → soft wood tip + W7 diamond compound → soft wood tip + W3.5 diamond compound.

2) For workpieces that has been polished by diamond file tip or ceramic stone tip:
   Brass rod tip + W40/W28/W14 diamond compound (diamond compound grit depends on the surface roughness) → hard wood tip + W28 diamond compound → hard wood tip + W7 diamond compound → soft wood tip + W7 diamond compound → soft wood tip + W3.5 diamond compound.

c) Important points to observe:
   1) Before changing to a finer diamond compound, you must ensure the surface is thoroughly polished to the matching roughness. If the surface has not been thoroughly polished to a matching roughness, you will waste lots of time when using a finer diamond compound.

   2) When changing diamond compound, make sure the workpiece is cleaned totally. The polishing tips must also be cleaned. You can file brass rod tips and hard wood tips to remove the contaminated coat, while you must use soft wood tips specially designated for a certain grit of diamond compound. If coarse diamond
compound remained on the workpiece or the polishing tip, it will contaminate the finer compound and ruin the surface finished.

3) If your workpiece doesn’t require mirror finish, you don’t have to use the soft wood tip polishing. Normally, hard wood tip can produce quite satisfactory result.

4) If you would like to choose diamond compound grits by yourself, please choose suitable interval. If you skip too much grits or use too close grits, you either waste lots of time or cannot ensure quality results. We suggest W40, W28, W14, W7, and W3.5.

5) If the compound is too thick, dilute it with some clean water.

⚠️ Important

The machine must use a 3-point plug. It connects the earth wire, with earth current resistance < 4 Ω. When using EDM system, please note: the hand must not touch the metallic part of the transducer, the collet or the tip.
### VIII. GENERAL FAULT AND MAINTENANCE

<table>
<thead>
<tr>
<th>Machine Fault Condition</th>
<th>Cause</th>
<th>Maintenance Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>No numerical display after switching on the machine.</td>
<td>The input cord is not properly connected. The fuse is blown.</td>
<td>Check the input cord. Replace the blown fuse.</td>
</tr>
<tr>
<td>Polishing tips have no vibration.</td>
<td>The machine is in “PAUSE” state.</td>
<td>If the “pause/work indicator” is on, the machine is in “Pause” state. Please press the “pause/work button” once, the machine will switch to “WORK” state.</td>
</tr>
<tr>
<td>The machine fails to find a matching frequency.</td>
<td></td>
<td>Reactivate the machine: Press the “pause/work button” to make the machine pause and then press the button again to restart it.</td>
</tr>
<tr>
<td>The vibration power indicators cannot stabilize at a certain level, keeping flashing.</td>
<td>Bad connection between the transducer, the collet and the polishing tip. The polishing tip is too long or too short. The soft/hard wood tip has knots or is not straight. The collet is cracked. The P-H cord is broken.</td>
<td>Fasten them. Please check the connection regularly after a period of work. Change for a longer one or cut it shorter. Replace it with a good tip. Replace it with a good collet. Check the P-H cord. Please See P9</td>
</tr>
<tr>
<td>No EDM output</td>
<td>The EDM wire is not in good connection</td>
<td>Make sure the EDM wire is in good contact with the workpiece. There should be no dust or rust between them.</td>
</tr>
<tr>
<td>The EDM output is too small</td>
<td>A small EDM grade is selected. The discharging area of the EDM tip doesn’t match the workpiece. The vibration system produces too small or too large gap. The EDM tip is broken, loose, too long or too short.</td>
<td>If you emphasize speed, choose a larger EDM grade. Choose suitable EDM tips for different working area. Please See P Adjust the vibration grade to test the EDM output. Usually, default vibration is OK, but for particular requirements, please adjusts the vibration grade manually. Replace, fasten or modify the tip.</td>
</tr>
<tr>
<td>The hand piece is noisy</td>
<td>The collet is not fastened.</td>
<td>Check the collet and fasten it properly.</td>
</tr>
<tr>
<td>The transducer screw is loose. The tip is cracked.</td>
<td></td>
<td>Fasten the screw. To open the hand piece, please see P10. Replace it with a good one.</td>
</tr>
</tbody>
</table>
IX. KIT LIST

⚠️ IMPORTANT

The machine must use a 3-point plug. It connects the earth wire, with earth current resistance < 4 Ω.

When using EDM system, please note: the hand must not touch the transducer, the collet or the tip.