

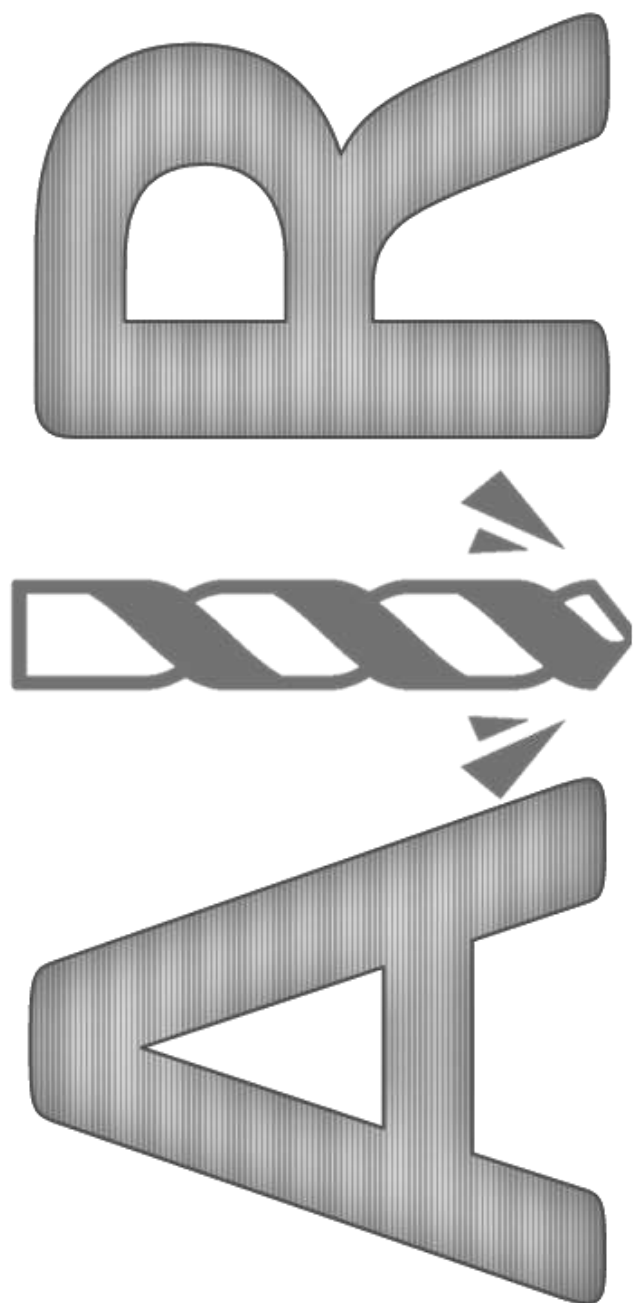
# USER MANUAL

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# CNC ROUTER

***KE - 70***





CNC SOLUTIONS

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## **I. SAFETY RULES**

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As with all machinery, there are certain hazards involved with the operation and use of your machine. Using it with caution will considerably lessen the possibility of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator may result. If you have any questions relating to the installation and operation, do not use the equipment until you have contacted your supplying distributor.

- **Read the following carefully and fully before operating the machine.**
  - Keep the working area clean and ensure adequate lighting is available.
  - Do not wear loose clothing, gloves, bracelets, necklaces or ornaments.
  - Do wear face, eye, respiratory and body protection devices as indicated for the operation or environment.
  - Ensure that the power is disconnected from the machine before tools are serviced or any attachment is to be fitted or removed.
  - Never leave the machine with the power on.
  - Do not use dull, gummy or cracked cutting tools.
  - Ensure that the keys and adjusting wrenches have been removed and all the nuts and bolts are secured.

## **2. NOISE EMISSION**

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Given that there exists a relationship between noise level and exposure times, it is not precise enough to determine the need for supplementary precautions. The factors affecting the true level of exposure to operators are clearly the amount of time exposed, the characteristics of working environment, other sources of dust and noise, etc. For example, adjacent machines may impact the level of ambient noise.

### 3. SPECIFICATION SHEET

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<b>Spindle</b>	400W 48V CNC Brushed Air Cooled Spindle
<b>Spindle RPM</b>	3000-12000r/min, (12V-3000r/min, 24V-6000r/min, 36V-9000r/min, 48V-12000r/min)
<b>Controller</b>	Arduino GBRL CNC
<b>Voltage</b>	220 V inlet, Power supply 24V DC 20 AMP
<b>Gantry Clearance</b>	100 mm
<b>Machine Work Table</b>	(850 x 850 x 50 mm) OR (2800 x 1300 x 50 mm)
<b>Machine Foot Print</b>	(1000 x 1000 x 60 mm) OR (3000 x 1500 x 90 mm)
<b>Weight</b>	20 kg

### 4. RECEIVING YOUR MACHINE

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Note: It is probable that your machine will be delivered by a third party. Before you unpack your machine, you will first need to inspect the packing, invoice, and shipping documents supplied by the driver.

Ensure that there is no visible damage to the packing or the machine. You must do this prior to the driver leaving. All damage must be noted on the delivery documents and signed by you and the delivery driver.

## 5. GLOSSARY OF TERMS

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- **DXF file** - Drawing exchange format file that was created as a standard to freely exchange 2- and 3-dimensional drawings between different CAD programs. It basically represents a shape as a wire frame mesh of x, y, and z coordinates (vectors).
- **G-Code** - The standard machine tool language around the world. It generally consists of specifying the x, y, or z (and a, b or c) coordinates that the machine is to move to. Such movement can be linear, circular or even special drilling operations. It is the universal language of all modern machine tools (mills, lathes, EDM machines, etc.).
- **Stepper Motor** - A motor that derives its motion by receiving input signals (pulses) in a very specific sequence. The most common type is one that rotates 1.8 degrees for each input pulse. This provides a very simple way of controlling motion very precisely with the use of common digital logic circuitry.
- **Tool Path** - A series of vector coordinate positions that define a cutting path. This cutting path can be a simple 2D or sophisticated 3D (even 4D or more) path used to machine out the shape of a desired part.
- **DRO** – Digital read-outs, shows the axis positions in the interface.
- **MDI** – Manual data entry, used for entering commands manually, line by line.
- **CAD** – Computer-aided design, the using of computers to assist and develop design.
- **CAM** – Computer-aided manufacturing, the use of computers to assist in manufacturing.
- **CNC** – Computer numerical control.
- **Command** – A signal or series of signals that initiates one step or series of steps in the execution of a program.
- **Feed Rate** – A multi character code containing the letter F followed by digits that determine the machines rate of movement.
- **H.M.I** - Human machine interface.
- **H.P.** -- Home point.
- **O.P.** -- Origin point also known as zero-point offset. This is the point where the program starts at on the spoil board.

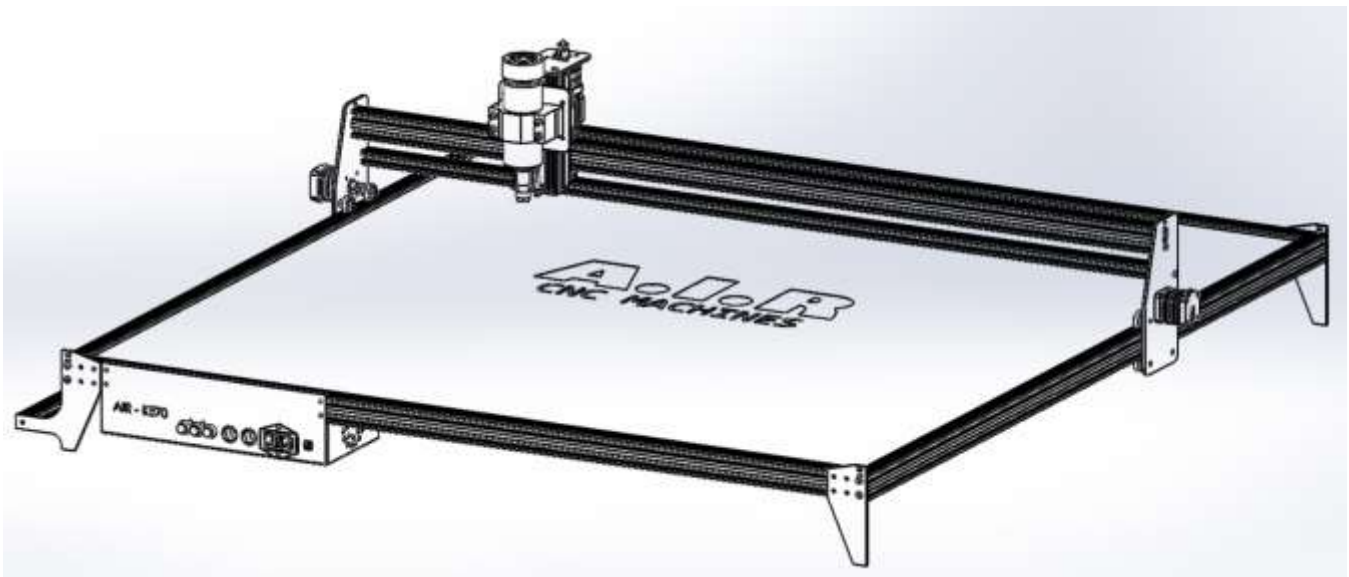
## 6. INTRODUCTION TO AIR MACHINES

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The AIR CNC is designed to give you years of safe service. Read this owner's manual in its entirety before assembly or use. The advantage of the AIR CNC machine is that it can, in most cases, fully machine the complete job without it being removed from the table so that you have finished parts of high accuracy that are totally repeatable. It can, with the purchase of the relevant software, also produce intricate carvings. Nesting is also a valuable feature of AIR machining that saves on waste and cost. It is possible to reduce the number of different machines in the shop, as the AIR will perform multiple functions and is a must for serious woodworkers.

## 7. PARTS OF THE AIR-KE70 ROUTER

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- **Frame** The frame consists of 2020 & 2040 aluminum profiles that supports all the other parts of the machine.
- **Bed:** - The bed of the machine consists of a sheet of plywood that is supported by the heavy-duty lightweight aluminum frame.
- **Aluminum profiles:** - these rails guide the gantry as it travels along the frame of the machine.

- **Gantry** The gantry straddles the bed and carries the router spindle motion system. It is moved along the length of the bed by the GT2 belt and is guided by the V-groove bearing and 2040 rails. The gantry is controlled by the machine controller.
- **GT2 belt** there are three belts, one for each axis. Each belt is driven by a stepper motor and moves the router spindle in the X and Y directions.
- **Router Spindle** The router spindle is very high precision and air-cooled. The router spindle is moved in the three axes by precision gt2 belts and Lead screw system that are controlled by the machine controller.
- **Gantry caterpillar track** the caterpillar track runs along the side of the machine in a trough and carries all the electrical cables. There is a second caterpillar track under the bed of the machine that carries the electrical cables for the longitudinal movement.
- **Electrical control box** the electrical control box is fixed to the machine under the bed. The electrical control box houses all of the electrical components. There is an emergency stop switch, on/off switch, Abort switch , Hold switch main electrical isolation switch and spindle controller. The mains power cable is located at the front of the box

## 8. ADDITIONAL INSTRUCTIONS FOR THE USE OF THE AIR-KE70

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Like all machines, there is danger associated with the machine. Injury is frequently caused by lack of knowledge or familiarity. Use this machine with respect. If normal safety precautions are overlooked or ignored, serious personal injury may occur. As the AIR-KE70 is under the control of the onboard machine controller, it is important that you are clear of the cutter and moving parts when operating the machine.

## 9. WHERE TO LOCATE YOUR MACHINE

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The AIR-KE70 is table mounted (TABLE NOT SUPPLIED). The table must be of a robust construction, as the AIR-KE70 needs to be adequately supported. Before you unpack your machine, select the area where you will use your machine. There are no hard-and fast rules for its location, but here are a few guidelines:

- There should be an area around the machine suitable for the length of wood that you will be machining.
- Adequate lighting: the better the lighting, the more accurately and safely you will be able to work.
- Solid floor: you should select a solid flat floor, preferably concrete or something similar.
- Situate the machine close to the power source and dust collection.

## 10. UNPACKING THE MACHINE

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To unpack your machine, you will need a knife and a wrench.

- Remove the box from the AIR-KE70 machine (if fitted) and any other packaging material. The parts ordered with the machine will be packed on or inside the machine.
  - Note: The machine is heavy, and if you have any doubt about the described procedure, seek professional assistance. Do not attempt any procedure that you feel is unsafe or that you do not have the physical capability of achieving.
- Remove the securing bolts that attach the machine to the pallet (if fitted).
- Move the machine to the required position and lower it gently onto the support table (not supplied).
- Level the machine so that the machine is level in both directions. The weight of the machine must be taken on each corner and no rocking is taking place.

## 11. ASSEMBLING YOUR MACHINE

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The AIR-KE70 comes almost fully assembled except for the handheld controller (optional), dust hood (optional), touch-off puck and connecting the electrical supply.

## 12. LEVELLING THE AIR-KE70

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It is suggested that the machine is mounted on a strong table. You might find that it is an advantage to mount the AIR-KE70 on rubber pads (not supplied) to act as antivibration mounts.



This will be dependent on your setup. It is suggested the table has a shelf to accommodate the tool box.

The main power cable may not have a plug fitted, as it will be dependent on your installation. Ensure that when installing the electrical supply to the machine.

- **Note:** When wiring the machine to your electrical system, keep your cable as short as possible. The cable should not be allowed to run along the floor, as this will cause a trip hazard.

## 13. FITTING THE ROUTER BIT INTO THE ROUTER HEAD

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- Select a router bit and its relevant collet.
- Fit the collet into the spindle nut. Press the collet into the spindle nut until it snaps into place.
  - Note: The router bit must not be fitted into the collet until the collet has been fitted into the spindle nut. With the router bit fitted into the collet, the collet cannot compress and snap into the spindle nut. The face of the collet and the face of the spindle nut will be close to flush.
  - Note: To remove the collet, hold the spindle nut and press the collet on the side. The collet will compress Spindle nut Collet and pop out. Do not try to remove the collet while a cutter is fitted, as the collet will not compress and pop out.
- Fit the spindle nut and collet assembly onto the spindle thread by hand.
- Press the bit into the collet, but note that the flute of the router bit must not be inside the collet and should be a minimum of 2 mm outside the collet.
- Hold the router spindle with the supplied wrench and tighten the collet with a second wrench. **Do not over-tighten.**
  - **Note:** Use this process for all other router bits that you need to fit, but note that you will have to change the collet if the shank of the router bit is a different size
- **Note:** Before changing or fitting the router bit, always disconnect the power to the machine.

- **Note:** Collets and spindle collet holes must be cleaned regularly. Ensure that the slots in the collet are free of sawdust, as sawdust builds up and will stop the collet from compressing. If the collets or spindle holes are not clean, the router bit may not run true, and this will affect the performance of your machine.

## 14. TYPES OF ROUTER BITS

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There are five basic types of router bits: straight, up shear, down shear, combination (also called compression), and form tools (round over, ogee, etc.).

- **Straight Router Bits** These are the standard router bits that are commonly used with handheld routers and are readily available.
- **Up CUT Router Bits** These bits have flutes that are spiraled upward (a standard twist drill is an example of this type of bit). This bit design removes the chips from the kerf but tends to chip the top surface, especially veneers or melamine surfaces. Ball Nose Router Bits are a variation of the up-shear bit design but have a radiused end. These bits are typically used for 3D surfacing applications.
- **Down CUT Router Bits** These bits are like the up shear but with an opposite spiral that tends to pack the chips into the kerf. These bits prevent chipping the material surface, especially with veneers or melamine surfaces.
- **Combination (Compression) Router Bits** These bits combine the advantages of both up shear and down shear designs. The top section of the tool is down shear to prevent chipping the top surface of the material, and the lower part of the bit is up shear to prevent chipping the bottom surface of the material. Combination Router Bits are the preferred configuration for machining veneered plywood as well as melamine-surfaced products. A variation of the bit is called the “Mortising Compression” router bit. With this bit, the up-shear portion of the bit is less than 1/4" in length so that the bit can be used on 1/4" veneered plywood and for dados.
- **Form Router Bits** Form Router Bits typically are available in standard profiles such as round over, ogee, etc. Router bits that have a shape associated with them would be classified with this group.

## **15. GETTING STARTED**

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- Note: Before you turn on the machine, remove all tools and other objects from the machine table.
  1. Have 220volts power wired to the machine.
  2. Make sure the E-STOP button is released before turning the power on.
  3. Power machine.
  4. After the machine has fully booted, the green light will turn on
    - It is required that the machine be homed before any other function is allowed.
    - Homing gives the machine a starting point reference

## **16. FITTING A JOB TO THE BED**

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The machine is supplied with plywood bed. That is designed so that it will not damage the cutter even if it come in contact.

- Note: When cleaning the table and the spoil board, do not brush, but only use a vacuum or a blower.

## 17. REMOVING THE JOB FROM THE BED

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If you use double-sided tape to attach the job to the bed board, lever the job off the bed board with a wide blade

## 18. MAINTENANCE

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As with any machine, to ensure optimal performance, you must conduct regular maintenance.

- **Daily checks**

- Clean the machine. Wipe off any excess dust and buff with a dry polishing cloth. This will reduce the likelihood of rust forming.
- Check cutter teeth for chips and dullness.
- Generally inspect the machine for damage and loose or worn parts.
- Collets and spindle collet holes must be cleaned regularly.
- Ensure that the slots in the collets are free of sawdust, as sawdust builds up and will stop the collet compressing.
  - If the collet or spindle holes are not clean, the router bit may not run true, and this will affect the performance of your machine.

- **Weekly checks**

- Clean the cutters.
- Check cutter teeth for chips and dullness.
- Collet fitted to spindle nut
- Generally inspect the machine for damage and loose or worn parts.
- Check the dust extraction for blockages, as any large bits could cause blockages.
- Check that all the electrical connectors of the motors are fitted correctly and are not loose.

- Check that all the motor couplers are connected and that the screws are tight.

## **I9. TROUBLESHOOTING**

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- **Machine will not start**

- Check that the start switch is being pressed full in.
- Check that the red emergency stop switch is fully out.
- Check that the electrical power cord is plugged into the power outlet.
- Check that the electrical supply is on (reset the breaker).
- With the power disconnected from the machine, check that the wiring to the plug is correct. Check that the rubber insulation is stripped enough and is not causing a bad connection. Check that all the screws are tight.

- **Motor tries to start but will not turn**

- With the power disconnected from the machine, try to turn the spindle by hand. If the spindle will not turn, check the reason for the jamming.
- Motor faulty. Replace the spindle.
- Check that the voltage supplied to the DC Booster is 48v.

- **Motor overheats**

- Typical reasons are dull cutting tools, blockage in the coolant fan due to contaminant of dust and excessive ambient temperature.

- **Squeaking noise**

- Check the bearings.

- **Spindle slows down during a cut**

- Dull cutting tools. Replace the tool or have it re-sharpened.
- Feeding the wood too fast. Slow down the feed rate.

- Cutter feeds and spindle speed are not correct. Adjust the feeds and speeds.
- **Machine vibrates**
  - Machine not level on the bench. Re-level the machine, ensuring that it has no movement.
- **Jobs are machined inconsistently**
  - Check that the motor drive belt is tight and not damaged. If damaged, replace.
  - Check if the drive couplings are tight or damaged. If loose, tighten; if damaged, replace.
  - Check if the v-wheel bearings are fixed tight or damaged. If loose, tighten; if damaged, replace.
- **Inaccurate position of router head**
  - Check that the drive screws and the bearing rails are clean.
  - If the gantry/router head movement is too fast:
    - Check that the parameters are set correctly in the controller.
    - Check for static or external electrical interference and the machine is correctly earthed.
    - Check that all the bearing, motor-fixing bolts are tight.
    - Check the input voltage is correct; it must be 220V.
- **The cutting depth is inconsistent**
  - Check that the spoil boards are flat and clean prior to fitting the job.
  - Check if there is excessive play in the Z axis lead screw drive mechanism.
  - Check that the bit is tight in the spindle collet.