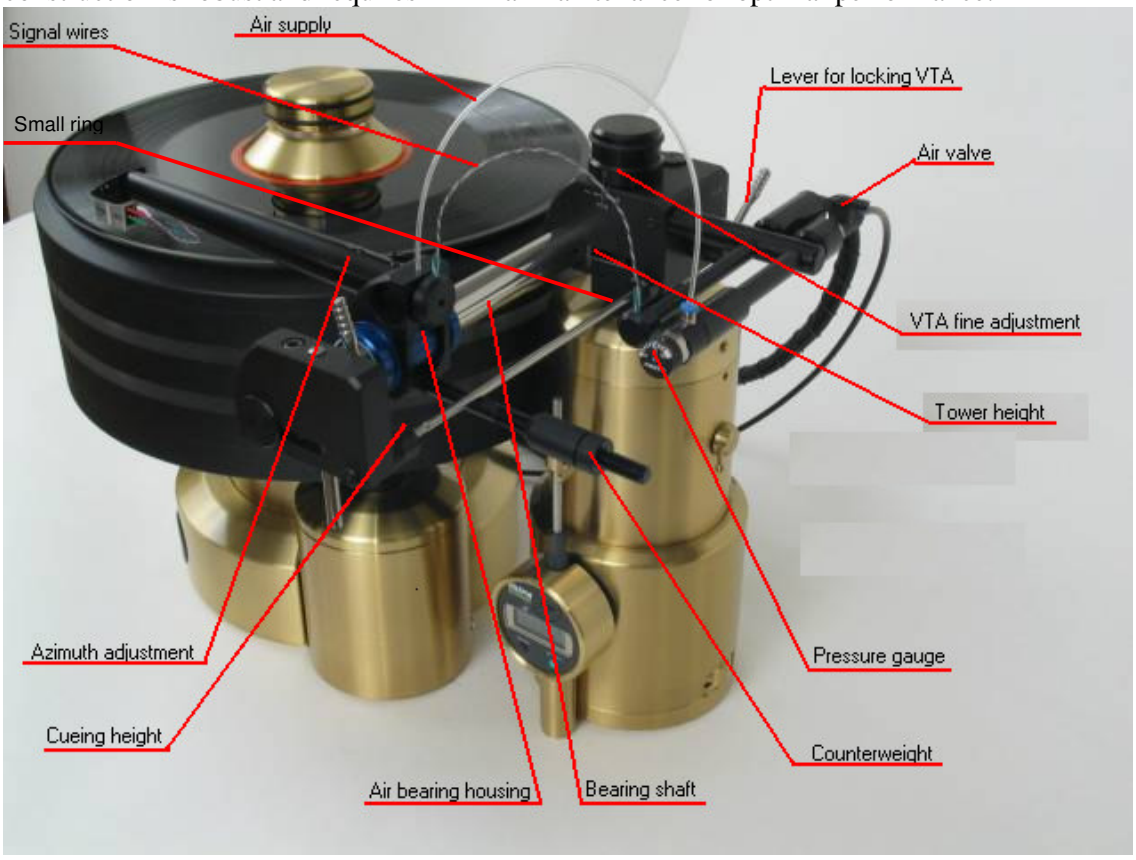
KUZMA AIR LINE AIR BEARING TONEARM

Instruction manual Serial Number: …..

2007-6

KUZMA LTD
INSTRUCTION MANUAL FOR AIR LINE tonearm

The **Air line** tonearm is a very precisely engineered piece of equipment. However the construction is robust and requires minimal maintenance for optimal performance.



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General description: Main outer box contains two inner boxes. One box contains the compressor with oil and PVC drain bottle and the second box contains the tonearm with all spare parts: Allen keys, armbase, geometry protractor and PVC tubing.

Oil lubricated electric compressors, which are the quietest on the market supply the air. The compressor has a cylinder (head) where air is compressed and then is stored in a reservoir. On the outlet of the reservoir is an automatic sensor system which measures the pressure inside the reservoir. When the air pressure drops below a certain level, the system automatically starts the compressor head and fills the reservoir to a higher pressure, at which point the system automatically switches off. On the outlet of the reservoir there is an air filter and pressure regulator, which keep the air pressure on the chosen level of 4.5 bar (60 psi). Due to compression, moisture in the air is collected in the system. This is automatically drained by an electronic device and mechanically with an automatic drain system. Water (with a little oil) is collected into a plastic bottle from the reservoir, filter and from the automatic sensor system (three black tubes). Red filters stand separately and they dry the air further and remove any oil mist from the compressed air. This is automatically drained into holder stands. The compressor is equipped with a safety valve and switches off in case of overheating. The whole system is easily maintained and simple to use.

KUZMA AIR LINE-Linear tracking air bearing tonearm:

Effective length	184 mm
Fixing distance	212 mm-Kuzma cutout
Effective mass	13 gr vertical
Recommended cartridge compliance	Below 25 cu
Minimum clearance below platter	30 mm
Height adjustment	Yes
VTA fine adjustment	10 mm
Azimuth fine adjustment	Yes
Air bearing	Diameter 20mm x 50 mm
Load axial or radial	30 N (aprox 3 kg)
Air pressure	4 bar (60 psi)
Air consumption	4 L/min
Mass	2 Kg

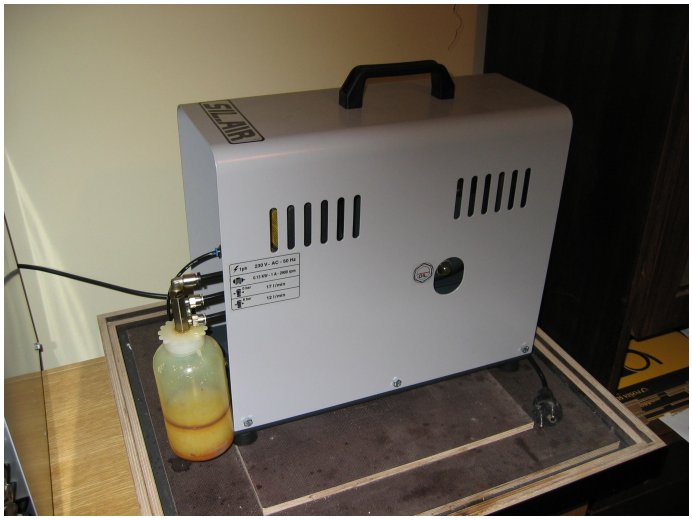
Saftey Precautions:

Electrical connection to the mains comes from the compressor via the cable. Please keep the compressor away from moisture and be careful not to damage the mains cable.

Important Note:

Turntable or turntable support must be capable of very fine horizontal levelling to allow Air Line desired horizontal level.

1. Unpacking:



Compressor with drain bottle

Compressor box:
Open the box and lift up the compressor by the handle. It is a heavy item. Remove the plastic bag. Inside the box is the instruction manual for the compressor, bottle with oil, and plastic drainage bottle. In a small bag inside the compressor housing are the air filter and black PVC nozzle for filling oil into the compressor. Remove the two pieces of cardboard wedged between compressor head and housing during transport. The compressor should not be transported with oil inside unless you can guarantee that it will be in a vertical position at all times. Position the compressor on a hard surface with plenty of air for ventilation. Do not position it in the sun or in temperatures below freezing. The compressor will be connected to the mains voltage.

Tonearm box:
On top of the box you will find this instruction manual. After lifting the top cover and second layer of foam, remove the black armbase, two red filter items with supporting stands, set of Allen keys and PVC tubing. Lift filters out carefully because the filter stands are not fixed onto the filters and they can slide down. Do not remove tonearm until you have fixed the armbase onto the turntable.

Basic setup:

Mount the armbase onto armboard. The dimension and position is the same as for Stogi tonearms but the main cutout hole is bigger. Diameter is 40 mm. The Air line tonearm also fits existing armbases for the Stogi tonearm. Three screws will fix the armbase from the top through the armboard into the black metal ring.
With the Allen key, firmly secure armbase. Position it in such way, that the hole for fixing tonearm height is easily accessible during mounting .The usual direction is away from the platter.

Do not slide the tonearm bearing unnecessarily without compressed air!
Do not tilt the compressor while it contains oil! For transport check page 15!
Do not rotate VTA knob when the lever is in the lock position!

Lift the tonearm from box, taking care of wires and tube loop, as well as tonearm cable. Then fix the tonearm gently into the armbase with Allen key 2mm. The tonearm should be rotated in such a position that the headshell is outside of the platter, i.e. as in the rest position off the record. The height of the tonearm in the armbase should be such, that the centre of the main stainless steel shaft is at the approximate height of an LP. Check that scale for VTA, in front of the main base, is in the middle position with the edge in line with the thicker mark. This means that theactual VTA can be precisely adjusted plus/minus 5 mm. If this is not the case, move the locking rod lever away from the lock position, in a similar way to lowering a cueing device. Now by rotating the VTA knob bring the position of the base to the middle part of the scale. Lock back gentle.

Unscrew the **small black ring** under the tonearm. It will slide down to the armbase. Fix it gently. If you now unlock the tonearm in the armbase, this ring will hold the tonearm at the same height but it can still be rotated horizontally. This is important when adjusting tonearm geometry.

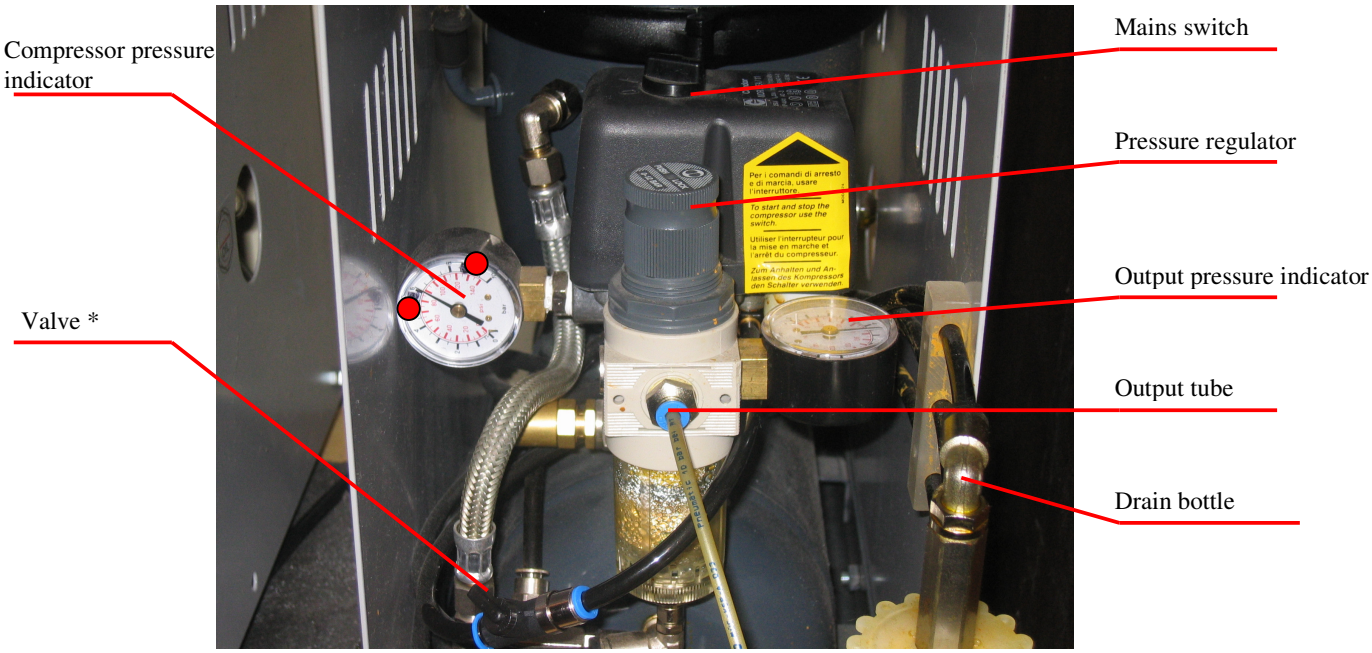
Choose the shorter piece of PVC tube that runs from tonearm to red filters. Position red filters on the floor or other suitable place near the tonearm. Check the arrows for air flow, which should be from compressor to red filters and then to tonearm. Connect PVC tube. All connections are 'quick fit'. Simply push in the tube at filter and at the tonearm. It seals automatically. When removing the tube, you must first push in the blue (or black) plastic collar and at the same time pull out the tube. This is much easier done when there is no compressed air inside the tube. Using the bigger piece of tubing and fix it into filters at input. It is a hard flexible tube and it can be hidden behind your skirting board. Permanent walking or placement of furniture on top of it, however, will break it. Plug it into the 'quick fit' fitting on the compressor, at the filter output. If necessary the PVC tube can be cut to length with a sharp knife. Position the tube on a hard surface and cut at 90 degrees down. The compressor is factory set for working pressure.

Compressor: for details see instructions with the compressor. The compressor has a safety valve and overheating protection!

Everything is set and checked by Kuzma Ltd. The only item missing is oil inside the compressor and air intake filter, which must be fitted after transport. If the compressor is in an upright position, however, it can be moved safely.

Note: The compressor is factory adjusted to a higher pressure (8 bar-120 psi) than quoted in the Compressor Instruction Manual. (See label at the side of the cover!)
Note: Do not switch on the compressor before filling with oil and connecting the air intake filter.
Note: Oil should last for at least 5 years of normal use and should be replaced when it is very dark - almost black in colour.
Note: Check water condensation occasionally, 1-3 months approx.

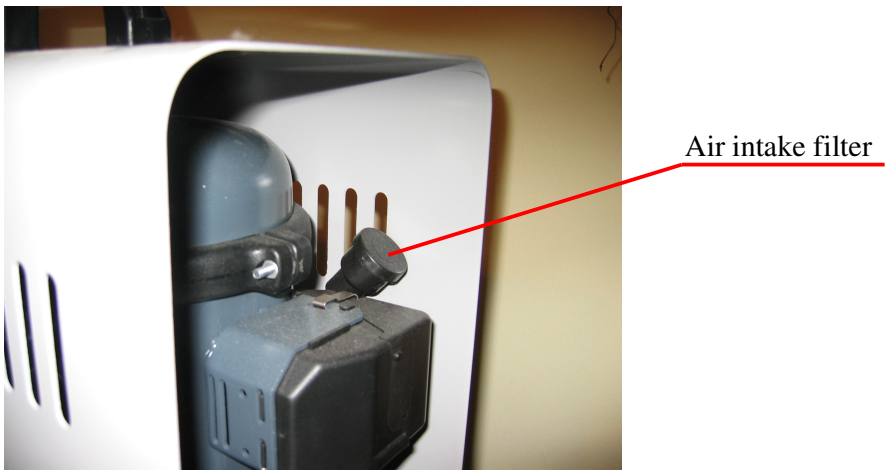
If you have any questions just drop us an E mail: kuzma@s5.net



Compressor - front view

At one end of the compressor are filters and pressure gauge and at the other end are main cable and input air filter. In the plastic bag inside the housing is an air intake filter and nozzle for filling the oil. Remove the small plastic cap from the metal input tube at the head of compressor, which is on the same side as the mains cable. Fix the nozzle onto the oil bottle, after cutting the metal cover on the oil bottle and a 5-8 mm of hose. Putting the nozzle into the metal tube, gently squeeze oil into the compressor. At the side of the compressor is a glass bubble which will show the level of oil when the compressor is not working. The whole bottle should go in. Wipe any spillage of oil and fix on the air intake filter.
Connect the PVC tubes. It is a blue 'quick fit' fitting. Keep the valve closed at the tone arm.
There are two pieces of PVC air supply tubing. The shorter connects the air supply from the red filters to the tonearm and the longer connects the compressor to the red

filters. On one end of this longer part is a valve. This end should be connected to the red filters. The valve lever should be in »close position« (i.e. with lever at 90 degrees to the tube). When full air pressure is reached in the compressor (and compressor stops) open this valve and the air flowing into the red filters will automatically seal the drain systems in these filters. There is, therefore, no need to do this manually as before.



Compressor - rear view - air intake filter

Locate PVC bottle which has three black 'quick fit' fittings at the top end of bottle. There are three black tubes (6mm in diameter), which drain moisture from various parts of the compressor (reservoir, filter, cylinder). Push them into the top of the fitting on the bottle.

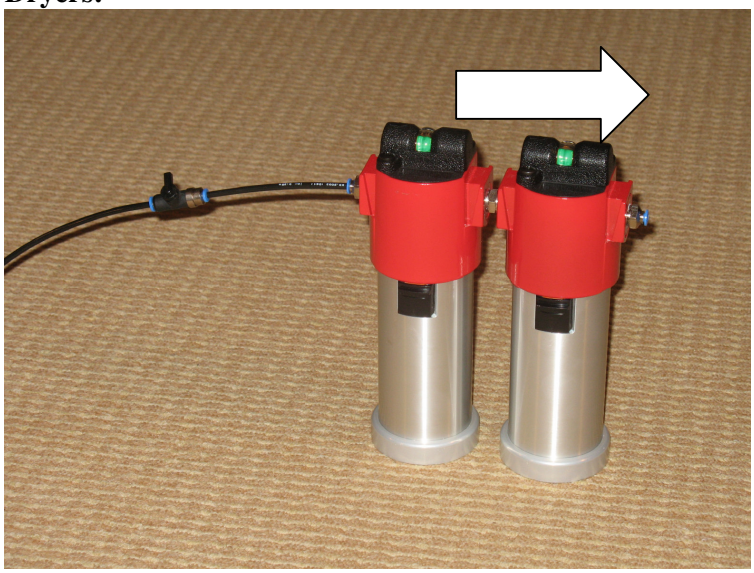
Compressor - oil level

Plug the compressor into the mains. The switch is under the cover on the top. It has two positions. Be careful inside not to hurt your fingers, although there is no danger of electrical shock. Switch on the compressor and you will see the pressure building up on the pressure gauge on the left side of the compressor. This shows the air pressure in the reservoir. The right hand pressure gauge shows working pressure. It should reach 4.5 bars (65 psi). The knob on top of the filter is for readjusting the working pressure. To operate, it must first be pulled up.

Note: red filter (dryers):
Sealing red filters (dryers): When switching on compressor, air pressure must build up in red filters. See section Dryer on the next page. See arrow for airflow!

***Valve on drain tube: Optional by order.**
For normal operation this should be open (level along axis of tube). If used in the same room as tone arm it should be closed. This prevents noise when switching off compressor. **Every week or so this should be open for a few hours when the compressor is running!**

Dryers:



Dryer with stands

The pressure should now build up to about 8 bars (120 psi) when the system will switch off automatically. It will be switched on automatically when the pressure drops to around 6 bars (90 psi). **Note: Keep the red filters in upright position.**

The red filters which are positioned near the tonearm have an automatic drainage system. There will be some leakage when the air pressure builds up in the system for the first time after you open valve on incoming tube. If they are still leaking do this:
when the pressure in the reservoir shows at least 1-2 bars (20-30 psi), lift the red filters out of the stands(keeping them in vertical position) and you will hear a slight noise due to the leakage of air. At the bottom of the filters are two black plastic outlets for drainage. Just close them with fingers for about 20 – 30 seconds and then quickly remove fingers. This will seal the drainage system and there should be no further leaking noises. Put them back into stands .

On the tonearm remove the security wire which has restricted movement of the arm bearing during transport. The tonearm is not balanced, as there is no extra weight on the headshell. When the air bearing is functioning, the counterweight will rotate the tube so that the headshell will go up. To avoid this, mount the cartridge in the headshell with stylus guard on. Open the valve. Pressure on the small pressure guage on the tonearm, should show about 4 bars.
By holding the headshell and lifting it, so that the counterweight support is not touching the cueing device rod, gently move the tonearm towards the centre of the platter a few times and also rotate it up and down. If you feel any resistance do not push but check the air supply or pressure. Check wire and air supply loops to ensure that they are not crossing each other.

1. Setting up the tonearm:

Again check the height of the tonearm. The basic height should be such, that the centre of the shaft (centre of vertical movement), is at the height of an LP on the platter. If there is big difference, readjust the height of the armbase. If small (1 – 2mm), readjust by rotating the VTA knob, after first unlocking the VTA lever.

Put the alignment protractor on the platter without a record. Be careful not to touch the cantilever. Rotate the tonearm so that the base is parallel to and touching the narrow part of the protractor. This will precisely position the tonearm. Fix the tonearm with the Allen key 2.5mm. Due to its special construction, it is not necessary to overtighten.

Cartridge pins are: colours or other symbols:

Right	(+)	red
Left	(+)	white
Right ground	(-)	green
Left ground	(-)	blue

If necessary, due to the added weight of the tonearm, re-balance the turntable. Use a spirit level to adjust horizontality of the turntable platter. If this is not possible readjust the turntable support. Do note that spirit levels are not completely accurate. The turntable should be horizontal, otherwise the tonearm will slide in one direction more than in another.

2. Mounting the cartridge

With Allen screws 2.5mm, fix the cartridge onto the headshell. The position of the needle should be in line with the end of the headshell when viewed from the side. Then fix cartridge pins.

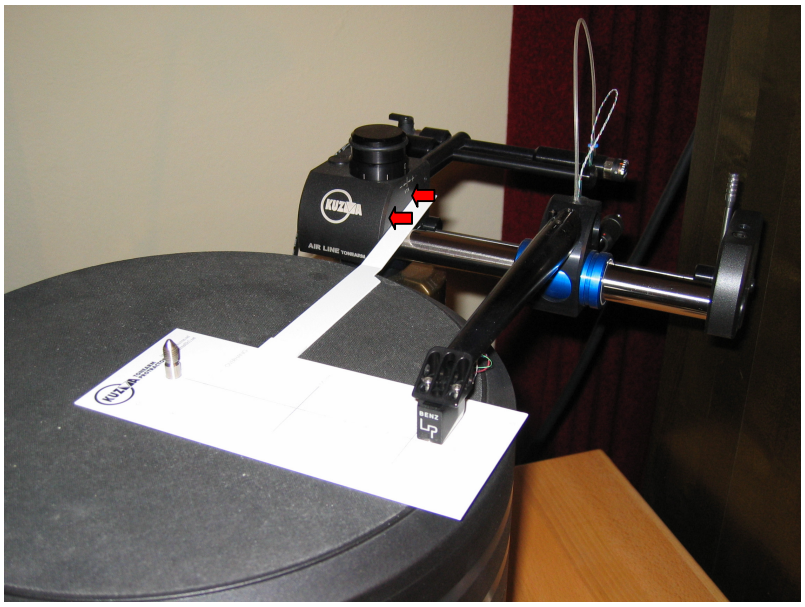
3. Adjustment of tracking force

The counterweight is made from two parts. Rotating the counterweight position from one red point to another, **changes the tracking force for 0.1 grams**. Locking is achieved by holding the part which is nearest to the bearing and rotating the smaller part (view from headshell) anticlockwise for about quarter of a turn. In the unlocked position rotation of the counterweight is easy. To begin with, the tonearm should be balanced to zero tracking force. This is not easy to achieve due to the very low friction in the bearing.

Heavy cartridges (above 15g)**:** use a small counterweight which should be firmly screwed by hand at the end of the threaded rod for counterweight.

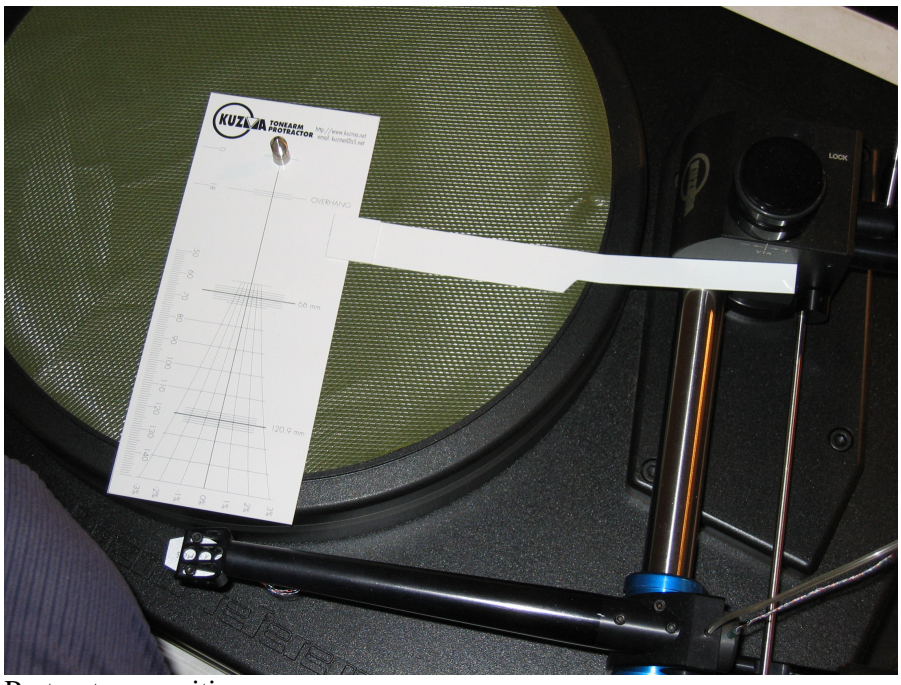
Add tracking force by rotating the counterweight anticlockwise, then locking the counterweight. Move the tonearm gently with the fingers in one direction, while the cueing device is in the up (not play) position. The counterweight support will slide along the cueing device rod with a certain friction. The tonearm will move to a certain distance. Now repeat the same in the other direction. A big difference in the distance travelled means that the tonearm is not horizontal. Try to adjust the level of the turntable again, especially in the direction along the bearing shaft.

4. Adjustment of tangential geometry



Protractor

Put a record on the platter and, using the cueing device lever, lower the cartridge on to the record. Observe the VTA. If you know what the best VTA for this cartridge is, then adjust VTA by unlocking lever from 'Lock' position and rotating the knob to achieve the desired VTA lock the lever back gently. Remove the record and put on the geometry protractor which should touch the side base of the tonearm. If you can, fix the platter and protractor against rotation.



Protractor - position

Move the cartridge along the headshell to such a distance, that the tip of the diamond (needle) is on the line on the protractor, which goes from centre of record towards edge of record. This is the line where the tip of the diamond will be 'tangential' to all grooves on an LP.

Using the cueing device, just lift the needle above the protractor for a mm or so. Move the tube along to see if the needle is travelling along this line. If it is travelling parallel to the line but in front or at the back, then reposition the cartridge. But if it travels at an angle to this line, (eg if tip is at line 66mm but not at 121 mm) then rotation of the tonearm must be repeated. The protractor was not precisely aligned against the base, or the cutout for position of the armbase was not precise. Experimenting with small rotations of the tonearm will solve the problem. The tip of the diamond must travel parallel to the centre line, even if it is in front or behind. Now simply position the cartridge backwards or forwards. When you are sure check by, actually lowering the tip onto the protractor. The cantilever will deflect due to the tracking force.

When this is complete the needle should travel along the line. We must achieve a tangential position on the grooves. Rotate the whole cartridge without moving it along the headshell, so that cantilever is tangential to the parallel lines. Just chose one and then align the cantilever to be parallel, by twisting the cartridge body in the headshell. When this has been done, check again if the needle travels along the line from the centre of the spindle. Check again, if cantilever is in a tangential line. Fix the cartridge screws one at a time, gradually, being sure not to move the cartridge.
After the cartridge is firmly secured check geometry again.

Note: Do not use the damping facility while levelling the tone arm!

Now you can start playing LP. On spinning record gently lower the needle into the first groove. When the needle touches the record it will move in and out a little before settling into the first groove. If it moves inside, skipping a few grooves or drops from the record, that means that the horizontality of the tonearm is not correct.

If it jumps out towards the edge of the record, then the tonearm is tilted too much downwards towards the edge of the LP. You must raise that part of the turntable. If it moves inwards, towards the centre of the record, then it is tilted too much upwards and you must lower that part of the turntable.

5. Horizontal fine levelling of the tone arm:

Bring the cartridge above the LP in the middle of the modulated grooves having cueing device in the upper position. Then lift up the headshell and let it drop back towards LP. The cueing device being in the “up” position will prevent the cartridge dropping on the LP. The headshell will bounce up and down because rod of cueing device will restrict movement of the threaded rod of counterweight at the back. At the same time the whole assembly while drift sideways in one direction, or only move very little.
Try the same experiment above outer perimeter of LP and also at the inner grooves

The tone arm is correctly levelled when:
Above the outer grooves whole assembly should move slowly away from the record.
Above the middle of the grooves should stay more or less stable or have very small drift.
Above the inner grooves the whole assembly should move slowly towards the record centre.

If the tone arm is stable at the outer groove and moves towards the centre at the middle and at the inner grooves, then tone arm should be levelled in such way, that the whole assembly will slide down towards outer perimeter of the LP.

If it is stable at inner groove and move slowly outwards at the middle and also at the outer perimeter of LP runs outwards (away from LP centre) then the air bearing should be levelled so that the whole assembly will drift towards the LP centre.

6. Adjustment of VTA

Note: Do not operate theVTA knob while the lever is in the lock position!

VTA is adjusted by rotating the knob on the top of the base. Rotation in the direction of the arrow (+), means that the tonearm will be raised at the support. A rough scale can be seen on the front of the main base. This is on a scale of 10mm. In the middle of the scale is a stronger line indicating the zero starting point. The space between each line represents 1mm difference. Full rotation of the knob is 8 markings, representing 0.1mm between two lines.

To make VTA adjustment easier, you can rotate the ring while holding the main knob to adjust the zero starting point on the knob. This knob can rotate a little even when the lever is in the lock position (the lever locks the support mechanism and not the knob itself). The lever, gently pushed in to the lock position, gives rigidity to the VTA system due to its special construction. Fine adjustments of only a few 0.1 mm will make a big difference in sound on the same LP. Bear in mind that the tonearm cables need at least 40 hours of 'burning in' for optimal performance.

7. Adjustment of Azimuth

To make azimuth adjustments, release the two screws locking the mechanism at the centre top of the tube, with Allen key 2mm. The small tube with hexagonal screw on the left side, is for fine rotation of the tube. To change azimuth, insert Allen key 2mm and finely rotate it. The Allen key might feel loose in the screw but when you rotate it, by small increments, it will change the azimuth. Returning it back will bring azimuth to its previous position. Changes can be seen by misalignment of the white lines on the top of the centre of the tube. Even 15 degrees rotation of the Allen key will make a significant difference.

Of course the use of a test record and osciloscope is mandatory for optimal azimuth. VTA changes and even changes in the height of the armbase, will not change azimuth, due to precision in construction.

8. Adjustment of the cueing device

The cueing device has no damping for motion as is usual. Due to the construction it is not needed. It can stay in any position and can be precisely cued on the record. Using the allen key 1.5mm to release the small knob, which holds the lever and rotating it, we can adjust the height of the cartridge above the record.

Cueing device level resistance:
Theblocking plate, at the end of air bearing shaft, controls ease of movement of cueing device lever. If released with Allen key 4mm, it can be pushed away from the main tone arm tower and this eases movement. When fixing blocking plate back, be sure that it is parallel to the main tower, otherwise this can cause the distance from diamond tip to record surface to be different at outer grooves compared to the inner grooves. Slight rotation of the blocking plate can correct this.

9. Operation of the tonearm

The compressor should be permanently switched on. When not in use the valve on the tonearm should be in the lock position. In use, open the valve and move the tonearm once or twice along the main bearing shaft (if tonearm has not been used for more then 24 hours). This will clean the shaft of dust particles.

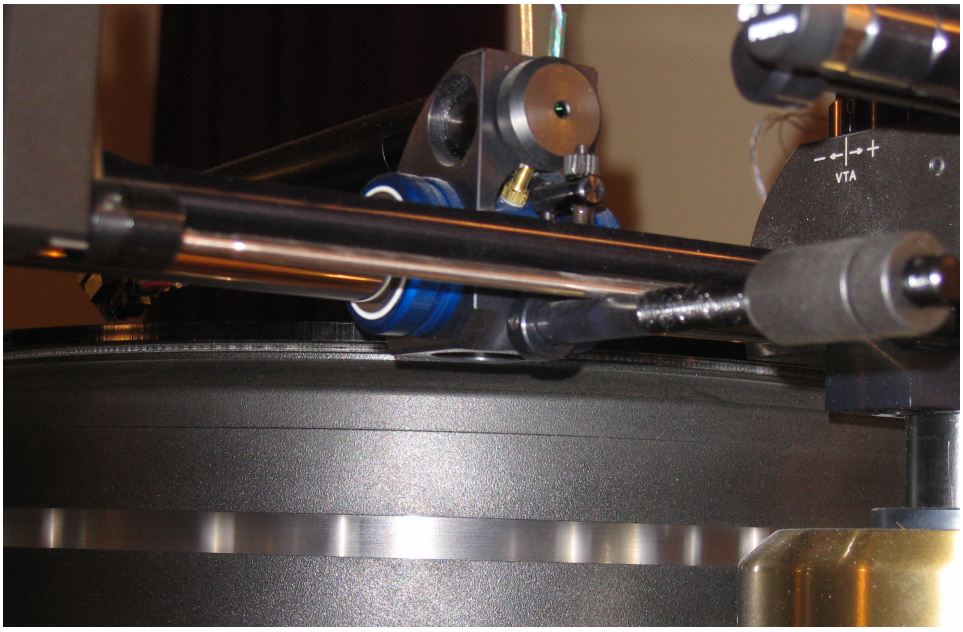
After use merely close the valve on the tonearm. The compressor will go on stand by. Every few hours or so air release noises can be heard and the compressor will switch on few times per day when resting in the stand by position.

10. Damping (optional)

A damping system, consisting of a paddle, damping trough and silicone oil, can be retrofitted on all Air Line tonearms.
The paddle is fixed on to the threaded rod and the trough is fixed on to the blocking plate. With oil levels, paddle height, damping can be changed from zero to max. This is suitable for cartridges with high compliance.

Note: Do not use the damping facility while levelling the tone arm!

Inserting silicone oil
Cut off the tip of the nozzle from PVC bottle. Squeeze silicone
oil into the trough- it will go slowly before it spreads evenly. Fill it up to the line or about half way up.



Damping system

Damping change

Release black plastic nut by hand and rotate the paddle-screw into the trough with allen key 1.5 mm. Bend signal wires away to make space for doing this. To secure paddle at desired height, fix it with rotating CCW plastic nut, while preventing paddle-screw rotation with inserted allen key.

Optimisation:
The only way to reach optimum damping is by experimentation. Start with the height of paddle when the needle is in the groove so, that the tip of the paddle is just touching the surface of the silicone oil. Listen to the sound and increase the depth. Also observe what happened when the needle touches the grooves, how the whole assembly moves in a horizontal level a few times, before stabilising in the groove. If you have a test record observe how the damping decreases movement of the assembly when resonance occurs.

For a lot of cartridge combinations the best sound will be without the use of damping. But cartridges with higher compliance might benefit.

11. Zero Switching kit(optional)

Zero switching kit: To eliminate switching noise problem there is a kit available from us called Zero switching kit consisting of switching box, which can be fitted in the compressor by qualified electrician.

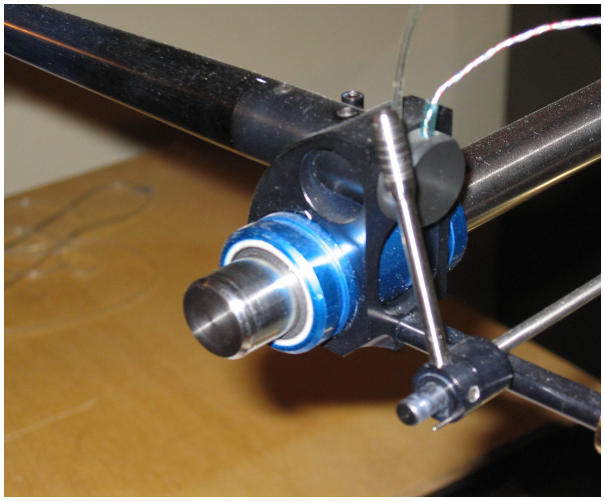
Mainentance

When air is consumed, the compressor works automatically, aproximately every minute and then rests for about a minute. When it stops you will hear the noise of air being released. The automatic drainage system works every few hours and you will hear a similar noise when air is released from the reservoir in the compressor. This is normal. The amount of water released depends on the working hours of the compressor and the humidity of the air. In winter months there is less. (In northen hemisphere) Water will be collected in the PVC bottle. When it is half full, unscrew it and empty it. From the red filters, small amounts of water will drain into the supporting stands. Lift up the filters and empty the liquid. Occasionally some noises will be heard due to the automatic drainage system releasing water.

With normal use check this every few months. If the tonearm is used every day and humidity is high, (over 70%) then monthly checking is recommended. In the compressor manual, working conditions are described for compressors used all day, every day, all the time in industry, where conditions are much more demanding.

Dis-assembley of the tonearm

Removing the bearing assembly from the shaft



Air bearing assembly and bearing shaft with cueing device

Note: Clean only occasionally- i.e. every year or two

Protect the cartridge. Do not slide the bearing without compresed air. Allen key 4 mm will release the top screw of the blocking plate, which is at the end of the shaft. Slide it off. Then gently pull off the whole assembly (tube with blue bearing). Be careful as the wires are short, and put the assembly down on the platter. The wires can be pulled out from the rear of the tube a little with gentle force and can be pushed back if the wire loop is too big.

Using appropriate cloth supplied, which does not leave small particles. Soak with 75-95% isopropyl alcohol (not acetone or any other dillutants) and wipe the shaft clean.

Spread cloth over the platter under the blue bearing and from bottle, squeeze alcohol on to the inside of the bearing, which will then drain on to the cloth. You will hear bubbling noises of the air coming through it. After a few minutes, shaft and bearing will be dry and you can gently slide back the bearing. Move it a few times back and forth. Fix back plate.

Be careful to also insert the cueing mechanism bearing in the 'up' position. Press gently and fix it. Then align the plate vertically with the main tonearm base. If the cueing mechanisem is too hard to move, unlock the plate so there is less pressure against it.

Check loops and, if necessary, push back a little bit of wire. The wire loop should be long enough, but if it is too long the loop will wobble.

Compressor- transportation:
If you can **ensure** the compressor will be in an upright position at all times it is not necessary to remove the oil. If, however, there there is a possibility that it may be tilted or turned upside down then the **oil must be removed**. To do this it is necesarry to refer to the compressor instruction manual.
Note: First ensure that there is no pressure in the compressor and that it is disconnected from the mains. Loosen the screw holding the rubber seal on top of the compressor head and lift off the cover. Pour away oil and return the head cover and fix the screw. Ensure that sealing ring is correctly positioned.

Problems

Cartridge skips the groove:
Tonearm is not horizontal: check horizontality
Excessive dirt on record: check and clean for small particles stuck in the groove
Inaccurate geometry: check that the cartridge tip follows line
Low tracking force
Moisture or dirt in the bearing: clean and check PVC bottle and Red filters stands
clean shaft and bearing with alcohol- see # 11

Cartridge does not cue first groove but runs in:
Tonearm is tilted down toward the centre of the record : adjust horizontal level down.
See above

Cartridge runs from record outwards:
Tonearm is tilted up towards the edge of the record: adjust horizontal level upwards.

Compressor can not generate enough pressure or runs longer than normal:
Check that the red filters drainage system is sealed
Leaking in the system: check tubes, filters, drain bottle at the compressor.

Compressor does not start:
Caused by overheating from being in closed space. Switch off and wait to cool down for 1-2 hours
Check the mains electricity.

Compressor switching noise through the speakers:
The compressor has the same effect as household refrigerators which generate noise wehen switching on or off. Some systems are more sensitive than others. If possible the compressor should be connected to a secondary electrical circuit then the audio system. If this is not possible then the compressor should be as far away as possible from the audio system connected to the mains. A noise filter on the compressor together with a long mains cable might help. See also **Zero Switching kit**.

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