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# the **AQUILAR**<sup>©</sup> 10" and 12" reference tonearm

owner's manual

## A brief word from the designer

My thanks and congratulations to you for choosing the AQUILAR.

The AQUILAR is the result of my more than 35 years of intimate research and preoccupation with analog playback - with the specific focus on the interaction of the record groove with the cartridge and tonearm.

The AQUILAR in both versions - the 10" and 12" effective length - is the direct derivate and distillate from our 12" AXIOM tonearm introduced in 2012.

A truely universal tonearm, which offers all and every option of alignment – while ensuring the best possible mechanical guidance for any cartridge.

Taking into account the paramount importance of energy transfer in relation to effective moving mass.

Resulting in a level of performance only obtainable, when each and every aspect of the analog audio tracking process is attended to with utmost attention to every minute detail.

A level of performance, which transcends prior frontiers and opens new levels of musical realism in the playback of recorded music.

We do share the real passion for music and I am confident that the AQUILAR will allow you to hear and enjoy your favorite records like never before.

Please get yourself accustomed with this manual.

Make sure you familiarise yourself with each and every aspect of the AQUILAR's options.

Your time will be rewarded with outstanding performance, to the benefit of your whole analog set-up and ultimately your enjoyment of recorded music.

The AQUILAR is entirely designed, manufactured and assembled with care and dedication in Bavaria, Germany.

Kind regards

D. D. Brakemeier



THE DECCA RECORD picture by Moritz Teichmann

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**General note:** Technical data, minor design and specifications are subject to change without prior notice.

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Manufactured and assembled in Germany

For further infomations: www.acoustical-systems.com, info@acoustical-systems.com



## Technical features & general design

The **AQUILAR** is a pivot tonearm featuring a double nano-gimbal bearing architecture.

The **AQUILAR** is a static, full lateral balanced design.

The **AQUILAR** features an unique compound arm wand - a combination of surface hardened Titanium and Carbon Fiber pipes blocked together and internally damped by an all new design concept, a concept never before applied in tonearm design and first featured in the **AXIOM** resulting in unmatched fast energy transfer and total absence of any parasitic resonances in the tonearm.

The **AQUILAR** was designed to explore the possibilities of analog playback to the utmost degree. To accomplish the best possible analog playback performance, the **AQUILAR** offers an unique complete set of alignment features.

## Alignments

### Leveling the bearing axis

The **AQUILAR** can be precisely leveled by the user, independent from the turntable or mounting surface. This is essential to avoid parasitic side-forces prior to alignment and antiskating setting.

# SRA/VTA adjusted at the cartridge

In the **AQUILAR** the important alignment(s) of VTA / SRA can be made at the cartridge – without altering the static parameters of the tonearm, while preserving the other set alignments and leaving the arm wand always horizontal. This again is of paramount importance in a static balanced design to avoid unwanted changes in static settings (namely tracking force) when changing tonearm height to accommodate VTA or SRA.

# Offset and Overhang adjustment

Offset is adjusted in the prolonged and slightly widened slots for the cartridge mounting screws.

Overhang can be adjusted at 2 spots, both located at the head. First of course in the prolonged 1/2" slots for the cartridge mounting screws. Here the slots allow for up to 5 mm adjustment in overhang and thus effective length. The 2nd spot is at the collar of the headshell where it is clamped to the arm wand. This is an additional spot for further overhang adjustment only IF NEEDED. The whole headshell can be moved back and forth by up to another 5 mm in this way. This should hardly ever be necessary.

### Azimuth

The headshell's collar is also the point for azimuth adjustment. By loosening the clamp screw the user may rotate the whole headshell in either direction.

Small indication marks at the rear of the headshell's collar and on top of the arm wand allow for reference and easy return to former settings.

### **Dynamic anti-skating**

Skating compensation – or anti-skating – adjustment in the AQUILAR is dynamic and follows the tangential geometry of the AQUILAR. If carefully operated, it can be adjusted during play. However we recommend that you do ALL adjustment or alignment at the AQUILAR ONLY with the cartridge / stylus lifted off the record.

### Tonearm height – VTA

Tonearm height can be adjusted on the main VTA-tower of the **AQUILAR**.

One full turn of the large top knob adjusts height by precisely 1 mm.

### **Tangential alignment**

It is possible to align the **AQUILAR** to the standard tangential curves of Baerwald, Stevenson or Loefgren in any version and standard.

The absolute best possible performance however is obtained only by aligning the **AQUILAR** to the new **UNI-DIN** tangential curve.

It's geometric design is uniquely based on the **UNI-DIN**, a tangential curve formulated in 2011.

## Step-by-step procedures

In the next pages I would like to take you through the mounting and alignment options of the **AQUILAR**.

All procedures are illustrated step-by-step.

The pictures will give you most all of the information you need to perfectly mount and set-up the **AQUILAR**.

However, I will guide you through this with my comments too and try to give further information whenever the mere picture may not tell the whole story.

We all like to get a new tool working as fast as possible.

May I please encourage you to follow me

through this mounting and set-up procedure as precisely as possible and to the very end - it will be to your advantage.

This will ensure that you get the best possible performance from your **AQUILAR** and take advantage of all its features and capabilities.

### Single-point mounting vs. SME slide base

In this manual we will cover the **AQUILAR** mounting with the standard 1-point mounting.

In addition there is the option to mount the **AQUILAR** easily onto any existing 9" or 10" SME armboard.

We do offer - as a special order item - a dedicated SME-slide base for the **AQUILAR**. If interested, please ask your dealer for the SME-slide base for the **AQUILAR**.

There is no difference in performance between the 2 mounting options.

We further offer other adaptor mounting plates for existing armboards upon your request.

If you are in need of a mounting plate for other existing armboards - to take advantage of existing pre-drilled armboards - please kindly check back with your dealer who will contact us.

### **GENERAL NOTE**

Please make sure prior to setting up the AQUILAR that your turntable's platter and armboard are dead level.







# Unpacking the AQUILAR

Please make sure that all parts are present by unpacking the **AQUILAR** and all its tools and accessories:

The **AQUILAR suitcase** containing the following:

- the AQUILAR tonearm
- the main HD18 counter weight
- (2) Lateral balance weights (1) stainless steel, (1) aluminum
- the AQUILAR's accessory box

#### The AQUILAR's accessory box

containing the following:

- AQUILAR alignment template - detailed description on page 24 -
- (2) black knob fingerscrews
- (2) stainless steel countersunk screws
- (1) white knob fingerscrew with sharp tip in 8 mm sleeve
- (1) white 20 mm POM adapter
- (2) small white 7 mm spindle hood
- (1) additional 40 mm length stainless steel lateral rod for heavy cartridge counterbalancing
- (1) 100 mm long, 3 mm stainless steel pin
- plastic bag with (2) distance stands
- (4) 90° Allen wrenches metric sizes 0.89, 1.5, 2.0 and 4.0
- (1) small diameter spirit level for use on tonearm bearing pivot

- (1) 20 mm round dial scale for SRA / VTA adjustment at headshell
- (3) special M5 mounting screws with
  - (1) 20 mm length
  - (1) 25 mm length
  - (1) 30 mm length
- (1) set of M5 washer and spring ring

# Mounting the AQUILAR

The **AQUILAR** is mounted with 1 M5 screw and 1 set of stainless steel washer and spring ring only.

All you need is a single 5 mm hole in your armboard to mount the **AQUILAR** on your turntable.

Please take the **AQUILAR** from its packing and place it like pictured above.

Now remove the screw in the bottom of the mounting plate.

Select 1 of the M5 screws in the accessory box suitable for your armboard. The M5 screw should be at least 8 mm (1/3") greater in length than your armboard's thickness.

Now take the stainless steel lower mounting plate and look at it.

The 3 indents have to point upward.

Please take this 50 mm lower mounting plate and place it onto your armboard with the 3 indents pointing upwards.

The 5 mm center hole should be placed directly over the 5 mm mounting hole.

**Please note:** There is a selection of mounting plates available to accommodate existing arm boards - please ask your dealer for details.







upper row: SME - slide base lower row: mounting plates for Kronos, Jelco, Tri-Planar and Brinkmann











### If you use the **AQUILAR's alignment** template - detailed description on page 24

to determine the mounting distance, please insert the 100 mm stainless steel pin careful into the dedicated hole next to the thread for the positioning screw. Sharp tip downwards - open M3 thread pointing upwards (**1**).

### The pin has a sharp tip - be careful! -

this can be used to mark the desiered spot on the armboard. A controlled gentle hit with a small hammer on the end of the pin will do (**2**).

Take the selected 20 - 30 mm length M5 screw with spring ring and washer attached. Put it up through the suitable center hole on the turntable mounting board and through the center hole in the stainless steel lower mounting plate (**3**).

Place the whole **AQUILAR** assembly directly on top of the M5 screw and secure it in place by screwing the M5 screw upwards through the hole in armboard, through the lower mounting plate into the center pillar of the **AQUILAR**.

Make sure to position the lower mounting plate with the indents as pictured (**4**).

That way you can easily align the 3 levelling spikes in the upper mounting plate in the correct position towards the matching indents in the lower mounting plate.

### PLEASE NOTE

The 3 spikes MUST sit in the matching indentions in the lower mounting plate.

Now tighten the mounting screw **JUST A BIT** - not anywhere near maximum strength.

Do not use maximum force, just make sure it is loosely tightened so that the mounting plate can still be rotated in the horizontal plane.

The mounting screw will be fixed during levelling the pivot plane.

The **AQUILAR** is now sitting in place.

# Now use the AQUILAR's dedicated alignment template (description on page 24).

Please see picture for reference - you will find all needed mounting gear and tools in the accessory box.

On top of the **AQUILAR's** bearing house is a 12 mm diameter stainless steel plate with a small center hole. This center hole clearly marks the pivot center of the **AQUILAR (1)**.

First place the **AQUILAR's** alignment template - with 20 mm white POM spindle ring in place in the hole in the mirrored tangential template - onto the spindle of your turntable (2 + 3).

In its resting position, the inside of the **AQUILAR's** headshell should be approximately 2" or 5 cm away from the outer rim of the turntable's platter.

Now take one of the 2 small 7 mm spindle adapter hood and **SLOWLY** and **CAREFULLY** place it on top of the spindle and ever so slightly press down (**4**). Check which one fits better.

### IMPORTANT - be careful!!

**DO NOT** press down the spindle adapter any more than 1-2 mm. If you press too hard, you will have a very hard time getting the white 20 mm POM ring off your spindle again (**5**).

The 7 mm spindle adapter allows the precise centering of the alignment tool on a wide range of spindle diameters.

#### Remember

Please be careful and do not use any excessive force. Pushing down realy hard creates a VERY tight lock which you will have big problems loosening up again.











5

Δ

2

3

9



Now slide the alignment template into place with the 8 mm hole thread at the end of its outward positioning beam over the pivot locating plate on the **AQUILAR**.

Now take the white knob fingerscrew and put it into the 8 mm hole with the tip downwards. The tip must meet the indention in the center of the 12 mm pivot plate.



The **AQUILAR** should be positioned, so that the underside of the armwand is approximately 2.5 cm / 1" above the turntable's platter surface.

First you have to unlock the knob screw at the inward side of the VTA tower by turning it **ONLY** 1/4 revolutions anti-clockwise (**A**).

If you need to adjust for the above desired height by lifting the **AQUILAR** in height above the arm board, adjust the height using the top VTA knob (**B**).

# Important: <u>Always</u> loose locking screw A <u>first</u> (1/4 turn only) before doing any height adjustment at top knob B !

Before you proceed to mount the cartridge of your choice, you first have to attach the main counterweight and the lateral weight assembly to the **AQUILAR**.

Please remove the lateral weight assembly as well as the airplane-nose shaped HD18 counterweight from the **AQUILAR's** box.

Next take the metric 1,5 Allen key and slightly turn the screw in the counterbar's end anti-clockwise - only about 1-2 revolutions (**1**).

Now please take the HD18 counterweight and slide it - narrow head to the front - onto the stainless steel counterbar (**2**).









Consider a preliminary position like pictured (**1**).

You may - even so slightly!! - fix the PTFEsleeve on the counterbar attending 1 of the 2 M2 grub screws with the 0.89/90 Allen key (2).







In the next step please loosen booth lateral weights from the 4 mm diameter stainless steel rod (**3**).

Select 1 of the 2 lateral weights:

For a cartridge weight of approx.**14 grams** or less, please use the aluminium cylinder (matt silver in color and light weight).

For a cartridge body weight of **15 to 25 grams** please select the stainless steel lateral weight (higher weight).

For a cartridge weight of **26 to 31 grams**, please select the extra long rod from the accessory box and use both lateral weights. Such a weight is unlikely, nevertheless it can be accomodated as described in detail later in this manual.

Fix the aluminum (or stainless steel) cylinder again at the end of the rod.

Now slide the rod into the inward pointing side of the through hole in the end of the counterbar.

This position ensures perfect lateral balance with the geometry of the **AQUILAR**.

2

Please fix the rod - with the end just meeting the opening of the through hole - by attending again to the M3 grub screw at the end (1).



Settings in pictures (2 + 3) and (4 + 5) are both possible and correct.







In case you are working with an unusually heavy cartridge weighing in at more than 25 grams, you may need to use both lateral weights to counterbalance that cartridge.

It is unlikely, that such a cartridge is used however we never know what the future brings and your **AQUILAR** is able to counterbalance a wider range of cartridge weights than most other tonearms.

Now position the aluminum lateral weight left (outward - **A**) of the counterbar and the stainless steel lateral weight right (inward - **B**) onto the 4 mm rod.

The aluminum lateral weight has to be positioned as pictured, otherwise there is no perfect lateral balance possible.





# How to mount your cartridge of choice for best performance

Here are just some standard recommendations:

For mounting your cartridge, please use **NON- magnetic** M2.5 screws and plastic washers under the screws head. We recommend using Titanium screws.

If you can't use Titanium screws, please use brass/gun metal M2.5 screws. They are non-magnetic and provide good energy transfer.

Aluminum is too soft and does not give enough coupling for perfect energy transfer.

Stainless steel screws always have a minimum

Recommended torque values for cartridge mounting screws for optimum energy transfer

#### M2.5 torque

Titanium	0.75 Nm =	• 75 cNm
Stainless steel	0.58 Nm =	58 cNm
Brass	0.45 Nm =	• 45 cNm
Aluminium	0.35 Nm =	: 35 cNm



Best sonic results can be obtained with the special **SMARTscrews** made out of Titanium Timet 1100 (if you are interested please ask your dealer).

of magnetism - do not use them. You will loose sound quality.

Do use, if possible, a torque driver with precisely adjustable settings.

For M2.5 cartridge screws please use torque settings according to 80-90% of maximum as recommended by German engineering norm for DIN 912.

This ensures perfect energy transfer - and thus gives you the most dynamic and detailed, uncolored sound from your cartridge.

Detailed recommendations regarding mounting screws, settings and special tools are available from acoustical-systems upon your request.



Recommended top quality torque drivers left: fixed torque middle and right: adjustable torque







The **AQUILAR's mirrored alignment template** ensures a super precise 1-point alignment to the **UNI-DIN tangential curve**.

The **AQUILAR's** geometry is tailored to the UNI-DIN geometry designed and introduced by acoustical systems in 2011.

If you are interested in the background of this all-new tangential alignment - please check back on acoustical-systems.com website for an essay I have written about **UNI-DIN** and its unique features.

Make sure that the stylus meets the single point sweet spot in the mirrored template while your cartridge's cantilever is in line with the center line behind the sweet spot.

The template features the same precision and construction as our **SMARTractor** universal alignment tool.

Should you need to adjust azimuth, please look at the rear collar of the **AQUILAR's headshell**.

The markings will allow easy return to former settings and give you a good indication of direction and position.

You need to completely loosen the inward pointing lockscrew on the left hand lower side of the headshell's collar, using the long silver Allen key.

The question will come - thus I will answer it right here: Why is the headshell lock screw located left side for left hand operation and not right (outward) side?

Well, why not? - Actually half the world's population is left handed .... as is the majority of our staff!

Do lock the screw again after finding the right azimuth.

The **AQUILAR** is one of only two tonearms on the market - the other being it's "brother" the **AXIOM** - allowing you to set SRA and VTA at the cartridge without altering static settings.

If you need to adjust SRA / VTA, first loosen the hidden screw on the left front side in the **AQUILAR's headshell**.

This screw actually tightens a clamp fixing the mounting plate in place.

Untighten this clamp by turning the screw anti-clockwise for half a revolution - 180° turn of the 1.5 Allen wrench.

Now take the 2.0 Allen key in the accessory box for adjusting the grub screw at the rear top end of the headshell.

Clockwise rotation will turn down the tail of the cartridge and thus will decrease the SRA°.

The total mounting plate angle allows for freely changing SRA for most all cartridges from 97° down to 84°.

To accomplish this for other 10" tonearms you would need to move them up and down their towers by more than 2.5" up and 2.5" down - practically impossible.

Likewise this change in SRA will of course also influence the VTA angle of your cantilever.

To raise the SRA° make some "room" first by turning the set screw up to the desired position. Now with 1 finger carefully press the rear bottom of your cartridge upwards.

When done, please tighten the headshell clamp again by turning the screw clockwise.

You can use the 20 mm round scale to return to former settings and keep track of SRA adjustment.

















# Levelling the AQUILAR's pivot

Another very important feature in the **AQUILAR** which is rarely found in tonearm designs: The **AQUILAR** allows the precise levelling of the horizontal pivot plane - independent from the armboard or turntable plinth.

This is where the 3 spikes in the upper mounting plate come into action.

Please take the long sliver ball-head 2.0 mm Allen key and position the small blue precision spirit level on top of the 12 mm pivot plate.

Adjust the position of the spikes so that the spirit level bubble is centered. The 3 spikes in 120° on a circle to each other allow for precise levelling. Adjusting the top of the spike clockwise makes it go down, thus lifting up that part of the upper mounting plate and results in the bubble moving towards that spike.

After a few moments you will get used to this procedure and will have no problems getting perfect level of your pivot in just 1-2 minutes.

Peek at the spirit level from directly above the pivot by using only your dominant eye while closing the other.

This is to make sure you have no parallax error in your sight during this setting.

# Raising or lowering the AQUILAR's pivot plane

Unscrew the lock screw on the inward side of the VTA tower by turning it 90° anti-clockwise.

Just a quarter of a revolution of the lock screw -  $90^{\circ}$  - is enough.

### Important:

<u>Always</u> loose locking screw A <u>first</u> (1/4 turn only) before doing any height adjustment at top knob B !

Now you can lower or lift the **AQUILAR** by turning the top screw.

After you have reached the desired height, please - **gently!!** - fasten the side lock screw again.

Excessive force is never needed anywhere on the **AQUILAR**. And it has absolutely no benefit whatsoever.





#### **IMPORTANT - PLEASE NOTE**

We always recommend doing all adjustments requiring hand action only while the stylus is lifted off the groove.



The **AQUILAR** features (2) laser engraved height scales in its inner stainless steel pillar.

One height scale is visible from the front and the other is visible from the inward side.



If you muse to mount the **AQUILAR** as a "secondary" tonearm on a turntable featuring 2 or more armbases, know that we have specially catered for this by providing this additional feature of the 2nd scale on the inward pointing side.

### **Removing the fingerlift**

The **AQUILAR** allows for the easy removal of the fingerlift.

Please select the 0.89/90 Allen key from the accessory box.

Undo the rear M2 grub screw at the upper left of the headshell's rear.

It fixes the fingerlift in place.

Undo the screw and remove the fingerlift.

You can easily restore the fitting by reversing this routine.

This feature was incorporated for 2 reasons first to offer the purist the option to eliminate another "not necessary" feature.

But also to allow for perfect close use of the **SMARTstylus** - thus paving the way for easy and fast fine-tuning of SRA and VTA - to a level hardly possible otherwise.

Don't underestimate the fundamental positive effect of this additional alignment option of the **SMARTstylus** - especially when made possible in this close perspective! - It can enable you to achieve the ultimate level of performance from your analog set-up.









The exchangable and adjustable mounting is available in 2 versions:

- "standard" with 5 mm thickness (1 pc included)
- "extra" with 8 mm thickness suitable for small body cartridges

# Exchanging the cartridge mounting plate

Should you ever need or want to exchange the mounting plate, you can easily do so by turning the 2 small black ball plunger grub screws on each side of the headshell.

Undo them by 1-2 revolutions anti-clockwise.

Now undo the front clamp lock screw just 1 revolution anti-clockwise - and you can remove the mounting plate (press down to remove) and insert another mounting plate. If interested in additional mounting plate(s), please ask your dealer for details.

Turn back the M2 ball plunger grub screws on each side and tightern the lock screw to close the headshell's clamp again.



### **Setting antiskating**

#### It is best to set antiskating last after lateral balance, cartridge alignment and precise levelling of the pivot plane have been achieved.

Otherwise the antiskating would further have to battle with uncertain and parasitic side forces due to the pivot plane not being dead level and/or the inevitable breakdown torque force in all pivot tonearms not being compensated by lateral balance and thus applying additional force on the inward groove wall, directly resulting in extra skating force.

The antiskating is applied by turning the knob screw on the side of the top right of the bearing houseing inward i.e. clockwise rotation.

On its tip is a magnet which interacts with 3 magnets on the inner vertical bearing house.

Thus compensating skating force is achieved without friction and in dynamic mode in correspondence to the tangential curve.

After lateral compensation and pivot balance having been achieved, the skating force depends to a considerable degree on applied tracking force and stylus shape. This is also the reason why you do not find an "antiskating" scale here. It would - in most all cases - be misleading.

For best results, I strongly recommend not just trusting a "skating force track test record", but use a good, pure - and demanding in its dynamic scale - acoustical recording of a single voice with guitar to perfect the fine tuning of the antiskating setting.

**Opus3** and similar audiophile purist labels do offer many such well suited recordings.

Now you are done with mounting and initial set-up.

Thank you for your care and patience while following me through this manual.

For the dedication and precision you have applied to mounting and aligning your **AQUILAR**, you will be rewarded with endless hours of the most detailed, colorful, dynamic and distortion-free sound from your favourite records.

We did our best to provide as complete a manual as possible. Should you have any comment or constructive criticism to share, we would very much appreciate to hear from you and your experiences. Feedback for us is very important and helps us to further improve our designs - by tuning them to your needs and demands.

Please do contact us - we highly value direct feedback from the experienced users of our components.

After all - the AQUILAR was designed for you.

## Now enjoy your records!

### **Specifications**

- Geometry: UNI-DIN
- Effective length w/Loefgren A: 10" = 250 mm 12" = 300 mm
- **Pivot to Spindle:** 10" = 238 mm 12" = 288 mm
- Offset angle: variable approx. 16° 23°
- **Overhang:** variable approx. 5 to 16 mm
- Effective moving mass net: 10" = 11.4 grams 12" = 18,8 grams
- Inner wiring: soft aged pure silver litz wire
- **Resistance inner wiring:** 0.9 Ohms/m
- Capacitance inner wiring: 25 pF/m
- Cartridge weight balanced: 5.2 to 30 grams

Adjustment ranges:

- **Pivot plane adjustment:** +/- 6° horizontal
- Arm wand height adjustment: 15 mm
- Offset angle adjustment: +/- 4°
- Overhang adjustment: max. 11 mm
- Azimuth adjustment: +/- 8°
- **SRA angle adjusment:** 97° to 84°
- VTA angle adjustment 28° to 14°

#### **IMPORTANT - PLEASE NOTE**



This product can be recycled. Products bearing this symbol must NOT be thrown away with normal houshold waste. At the end of the product's life, take it to a collection point designated for recycling of electrical and electronic devices. Find out more about return and collection points through your local authority.

### This is the special AQUILAR template as it looks when fully assembled (example mounted for 10" Version)



### This is the special AQUILAR template as it looks when fully assembled (example mounted for 12" Version)

