



FLAT.





**How many records are there that either won't play well, or even at all, due to warping? And how many are there with the slightest of ripples preventing the cartridge from fulfilling its full sonic potential? And might not all of them possibly benefit from a controlled heat treatment that could relieve plastic strain, leading to better sound quality?**

## Duty and pleasure

It was basically a silly idea: a good friend of mine had left a not-exactly-cheap LP lying on the radiator, which left it looking like one of Dali's melting clocks – and I suggested to him that he tried his luck with the Japanese record flattener at Schallplattenladen, Munich's well-known record shop. The Brown Bunny (Brown Records 01, unofficial), soundtrack to Vincent Gallo's film of the same name, was never officially released on vinyl, but changes hands for serious money due to the film music by Red Hot Chili Peppers guitarist John Fruscianti contained thereon. The idea of using the record flattening machine on it was a silly idea, because the LP had warps of several centimetres, and the grooves of the thick, hard orange vinyl were distorted due to the kinks, and therefore definitely damaged beyond repair. As expected, I received it back from the dealers unchanged after the attempted flattening, still looking like an attempt at vinyl sculpture. I'd pretty much forgotten all about it, when I received a newly-developed record flattener for testing: the flat.2 (pronounced "flat dot"). The first attempt, with a cheap LP to be on the safe side, My Name Is Barbra by Barbra Streisand (Columbia, PC 9136), was extremely gratifying: the sharp, heavy warp over just a few centimetres, a real cartridge-killer – practically a ski jump – was completely gone after just one treatment on the "Standard" programme!

So, another seemingly pointless attempt with the poor old misshapen Brown Bunny. But woah! After the good four-hour-long treatment, the record lay pretty much flat on the platter, and after a further two runs was actually playable again from track 3 onwards; there was obviously never going to be any chance of a better result on account of the outer grooves having melted together on the radiator. But how could this machine work so well, when attempts on other machines had been fruitless? Maybe the flat.2 used dangerously high temperatures? No, quite the reverse, it has a high precision temperature management system, which gently heats the LP, initially with a quick, linear rise to 40°C in the "warm-up phase 1". Then – and here's where it gets interesting – with a much flatter heating curve up to 59°C. But why? The flat.'s developer and manufacturer, Dr. Ulrich Kathe, explains: "Above about 40°C, the so-called vapour pressure of the volatile compounds dissolved in the



vinyl increases. These then expand, become more mobile, and concentrate on the surface. If this happens too quickly, it can give rise to a surge of vapours which can erupt as tiny blisters on the surface of the vinyl” – “which then leads to crackles and pops”, I add.

Any guesses what Dr Kathe’s a doctor of? Exactly! He received his doctorate in analytical chemistry, and his day job is as a development engineer in process engineering. He knows what he’s talking about. When not dedicating himself to his old passion, vinyl, he works

at Endress + Hauser, a global player in automated long-term analysis equipment for drinking and waste water. Before his many years of experience in development and production there, he got to grips with silicate chemistry in his degree thesis, and subsequently worked in Ilmenau, an important centre of the glass industry in the old East Germany, between 1980–2000. These experiences are clearly reflected (pun intended) in the aesthetic appearance of the AFI flat.2: its housing consists of chemically-hardened float glass and captivates with its flat, simple elegance. It was designed by Kerntopf Design, and modern glass bonding technology was prerequisite for the clean, uninterrupted forms, which dispense with the need for screws.

As a matter of fact, the glass makes a whole range of other advantages possible alongside the flat.2’s decidedly beautiful external ap-



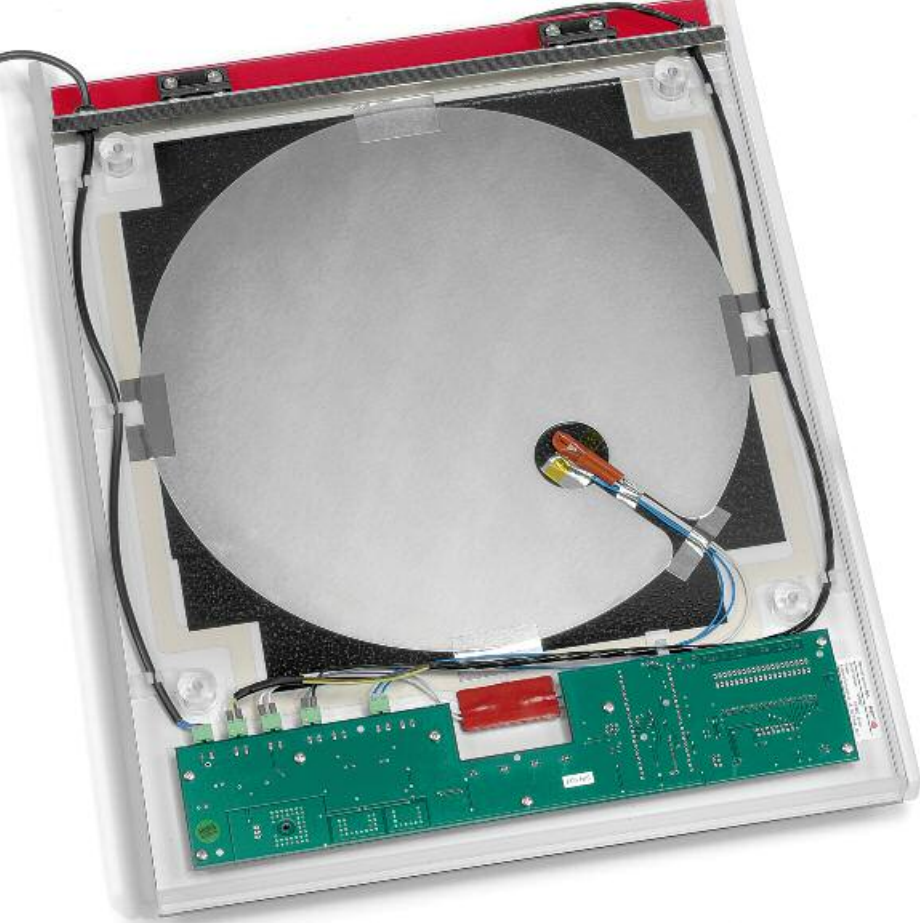
Gorgeous and easy to use: lay the first felt disc on the glass surface, then the record, then lay the second felt disc on top, lower the lid and off we go! The AFI flat.2 can also treat 7" and 10" discs, with or without Gruve/Gard (raised anti-scratch safety rim). However, the records should be thoroughly cleaned, preferably using a record cleaning machine

pearance. The radiant heat from a heating surface under glass can be precisely targeted upwards. This is necessary for maintaining an absolutely precise temperature over the entire heating surface. And there's more. Glass is an outstanding electrical insulator and delivers the desired degree of safety. A further safety benefit is that glass is a poor conductor of heat, unlike metal. This means unintentional contact will not result in burnt fingers (for example by misuse, opening too early, or touching the heating zones). And last but by no means least, glass is really easy to keep clean, which is a significant aspect in the temperature treatment of vinyl, because no-one would want to bake dirt and dust into the vinyl. Let me return briefly to the evenness of temperature across the whole surface of the LP: this was a primary development goal for Dr Kathe, as only thus is an even, strain-free flattening guaranteed. For this purpose he deployed professional-grade polyester glass heating elements of German origin. These assure a temperature gradient of just a quarter of a degree Kelvin across the entire surface, whereas those of the Japanese disc flattener are 2.5°K, that is to say 10 × less accurate.

And his flat.2 has one big, critical advantage: it is also possible to programme lower temperatures and various programme durations. That seems to me to be not just handy, but pretty much of the highest priority, considering how different the requirements of all the various records are likely to be. After my outstanding first experiences with the new wonder machine – including the flattening of a hitherto utterly unplayable copy of Rubber Soul by the Beatles (EMI PMC 1267 mono), which has had an unusually hard, almost tectonic ripple, probably since it was pressed in 1967 – I tried a delicate attempt at a custom setting outside of the Standard programme: for the dished disc with a 1 cm high lateral runout, I used the so-called Expert mode to select a somewhat lower maximum

temperature of 57°C and a correspondingly longer plateau time of 1h 30m; the Standard programme plateaus for 1 hour. Sure enough, disc 1 of Kenny Burrell's sampler Cool Cookin' (Bellaphon BLST 6538, 2-LP, D '72) was completely flat after a single run. Ha! This is fun! And did it not also sound better, not just cleaner and spatially better defined? You would expect that from a now-corrected azimuth – yes, dished discs cause the needle to enter the groove at an angle, and moreover, ripples cause heavy fluctuations in tracking weight and a fluctuation in vertical tracking angle (the plunge angle of the needle including the cantilever). Furthermore, I had the strong impression that it sounded fresher, crisper, more appealing. Finally I wanted to check this against the second disc of the double album. This disc was not warped, so any effect on sound would largely be down to tempering, the material relaxation due to the thermal treatment. I say largely, because even records that appear flat can still exhibit small warps or ripples, which may be barely visible, but at the microscopic level of groove tracking may still present substantial height differences.





Control electronics and lower heating foil: temperature and heating time are individually controlled to allow anything from gentle tempering to firm flattening of completely warped vinyl discs

Firstly, a couple of tips for using the flat.: I found the operation immediately intuitive, you can recognise the hand of an industry practitioner. Dr Kathe is keen to emphasise that his distributor Oliver Wittmann gave him many valuable suggestions for the build. Firstly, you open the cover, lay the (previously cleaned) LP on the first natural white felt disc, lay the second felt disc on top, and close the cover. Then you pick up the magnetic pencil and use it to tap the Enter key. A second touch leads to either starting the last-selected programme, e.g. Standard, or, with a touch of the key to the left, you can select Expert mode with its individually customisable temperature and treatment time, or the Relax programme to temper your vinyl. Operation via the magnetic pencil is practical on the one hand, because it precludes inadvertent actuation of a key. And as long as you don't leave the pencil in its magnetic storage bay hidden elegantly under the glass, but remove it from the machine, it is also child-proof. Without a magnetic pen it cannot be switched on.

The two felt discs that sandwich the vinyl serve several purposes, and the search for the best material resulted in a never-ending number of experiments, according to Dr Kathe. For one thing, it needs to have good liquid absorption. This is important for discs that have been stored in excessively damp environments and therefore give off moisture during heating – not good if the abutting surfaces cannot absorb it. Vinyl that has been exposed long-term to extreme humidity (say, 90%) should be allowed to dry out somewhat, and subsequently further pre-dried using Expert mode, before treatment. Other important factors were the right hardness (or softness) of the felt, its thermal conductivity, durability and the optimal thickness: if the fabric is too thick it will act as an insulator, but if it is too thin it will not be able to conform to the warps on the vinyl. I think the ability of the felt to adapt snugly to the vinyl's ripples, combined with the precise, carefully conceived heating process contribute to the fact that the flat.2 succeeds in flattening records where other machines totally fail.

And now the promised experiment with disc 2 of the Kenny Burrell double album. As with all the testing on the flat., during the testing phase I was extremely careful to ensure repeatability of the same test conditions in order to be in a position to fairly judge the acoustic results. LPs should already be well-played to ensure that any improvement after the flat.2 treatment isn't simply down to the light cleaning effect of playing a new record through a few times (even after washing with the VPI and L'art du Son). The whole

hifi system, including the cartridge, should be warmed up to the same degree before and after the several-hour-long treatment process. Obviously the volume was kept exactly the same. I also took care to ensure that my hearing was in a similarly relaxed state before and after the tests. Even with much experience of critical listening, the effect of an interval of between three hours (tempering) and potentially six hours (individual Expert mode settings) on one's ability to judge should not be underestimated. Clearly, a good knowledge of the music being listened to is also pretty handy for the expert.

So, here we go with Kenny Burrell and "Go Where I Send Thee". After tempering with the flat.2 it is noticeably fresher, livelier, the percussive beats on the left sound freer in space, the quieter percussion on the right is more clearly defined, and most of all, Burrell's guitar in the centre appears more fluid, in some way more playful, more involved, and the wind section mid-left seems fuller. "Isabella" follows: the guitar now sounds more full-bodied, the cymbals in Elvin Jones' drum kit behind are now noticeably better spatially separated from one another. Also Hank Jones at the piano and Milt Hinton plucking his bass strings appear clearly more accentuated. Now the keyboard solo, the piano sounds more powerful, more flowing, as if Hank Jones were suddenly gripped by a greater love of playing. The next track, "Growing", is even

more exciting and revelatory – right from the start, the sound stage is more clearly defined, it's as if you are looking in on it, rather than just having a vague idea of the size of the hall like before. Also the wind section seems more powerful and yet simultaneously more relaxed. Not that it was unpleasant before, or even distracting, but it now seems to come in audibly richer. A complementary effect on "Recapitulation": if the presentation of the wind section on the right sounded a little bit too small, now its spatial depth is noticeably more apparent and you perceive it as being big enough thanks to the improved portrayal of distance. Burrell's more inspired-sounding fast guitar riffs on the final track, "Trio", appear simultaneously fuller, more clearly defined; similarly, Elvin Jones now sits at a more sharply-depicted drum kit, while he himself appears to play more strikingly and with greater physicality. Of course, that is indeed how he played – but you only get to hear it after the treatment. To his left you can still hear the audience in the background even when the band play louder, which was not previously the case. Ultimately with every track, as well as every album that followed, the improvements in sound quality through the thermal relaxation with the flat.2 were different for each piece, but every record benefited in its own way.

Of course the results are going to depend on the resolution capacity of the system, but here it was so con-



FLAT.

Programm  
Relax



Elegant and safe: the intuitive-to-use flat.2 can only be controlled with a magnetic pen.  
This protects against inadvertent keystrokes

sistently good, that there was actually no need for all the careful preparation to ensure perfect test conditions for the comparison – this overall strengthening of power, substance and precision due to the treatment did not require any special attention, it was simply apparent. But what is the reason for it, where should you look for the cause if you find the explanation of “relaxing” the vinyl a bit woolly or vague? Dr Kathe gives us a couple of insights, even if as a scientist he chooses his words more carefully than if he were speaking as an audiophile: if you were to look at colourless vinyl in polarised light, you would observe structures which are affected and reduced by the tempering – tensions in the material have been dissipated. The reasons for that are to do with the molecular structure of the vinyl. Essentially it is composed of the constituents PVC (polyvinyl chloride) which has a predominantly amorphous (unorganised, non-crystalline)

structure, but also 5–10% crystalline structure; and the softer, completely amorphous PVAc (polyvinyl acetate). The tempering process is said to increase the crystalline proportion, with the result that the amorphous component is reduced, resulting in a harder, stiffer moulding. The tensions in the vinyl’s amorphous component are thereby reduced.

Dr Kathe is convinced that for this process to happen, not only a linear heating but also cooling is necessary. Therefore there was another prerequisite for the acoustic improvement: because the cover lid of the flat.2 is lighter, and therefore has a different specific heat capacity which results in it cooling faster than the baseplate, its temperature needs to be precisely matched to the temperature of its opposite number. According to Dr Kathe, a maximum temperature differential of 0.25°K must be maintained. In practice, this means that during the slow natural re-

duction in temperature of the baseplate, the cover continues to receive carefully controlled heating in order to ensure the record is exposed to the desired identical temperature from above and below.

Allow me to describe a couple more surprising experiences with the flat.2 Since my youth I've been familiar with A Salty Dog by Procol Harum (Polydor 184221, D, '69). After tempering, the screeching of seagulls at the start met my ear with a previously unknown liveliness – that's not just a couple of well-recorded examples, the screeching and the movement of the birds is quite obvious. Barrie Wilson's drum kit also comes across as more defined, yet at the same time more expansive, more voluminous, more incisive, particularly at the higher end of the frequency spectrum. Gary Brooker's voice also clearly benefits, sounding clearer, in particular the plosives are more integrated, where before they seemed a little hissy and whispered. The calm "Too Much Between Us" confirmed my earlier subtle observation: groove noise is noticeably decreased, or at least, its fitful rustling component is reduced. Wow! "The Devil Came From Kansas" with its powerful drums blasting into the room from the back seems more powerful than ever, allowing greater perception of spatial atmosphere. More importantly there's a qualitatively greater difference: in the louder passages it always sounded a little stressed, like so many analogue recordings from the 1970s, as an ever greater number of tracks and higher levels were mixed. This is now markedly less so – I'd happily increase the volume rather than turn it down.

There was one thought I needed to follow up on: if, as Dr Kathe maintains, volatile compounds from within the vinyl are driven to the surface, would it not be possible that a further improvement in sound quality could be achieved by a further washing? My experiments proved otherwise, even with a wide variety of records. Quite to the contrary in fact: it always sounded a little less incisive, a bit fuzzier, as if the treatment with the flat.2 had not been quite so effective. Finally, I'd like to describe an experience that shows that the tempering leads to not just more acoustic and musical

pleasure, but to experiencing the music completely differently: I actually wanted to discover what effect tempering alone would have, without any flattening effect, by listening to all the Beethoven symphonies conducted by Sir Simon Rattle on the thick, flat as a board pressings contained in the great, opulent Berlin Philharmonic box set. To this end, I picked No. 6, the Pastoral Symphony, (Berliner Philharmoniker Recordings BPHR-6, #26/2000, 1st Edition, D '17), admittedly because the interpretation didn't really agree with me; it seemed a bit too tense, so that the lyrical content of Beethoven's painterly observations of nature fell short. Yet after tempering, it was as if Rattle's Berlin Philharmonic had suddenly been overcome by a soulful litheness. The sounds unfurled more richly into the hall, and alongside the emotional exaltation, some elements could be completely objectified: perhaps most noticeably that the orchestral sound was now more balanced, with a greater emphasis on the violins, probably because these sounded finer and more beautiful in the upper registers. From the concentrated, somewhat dissective critical listening, I now bathed in Rattle and the Berlin Philharmonic's taut, yet sumptuous interpretation of the Pastoral Symphony. How else could one rate the AFI flat.2 other than to award it 10/10 for its voluntary exercise of record conditioning – it already gets a 10/10 for flattening anyway. □

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## AFI flat.2 record flattener

**Principle:** Temperature controlled flattening and tempering for vinyl records of all sizes, with or without Gruve/Gard safety lip

**Special features:** flattening and relaxing with pre-programmed Standard and Relax programmes or individually selectable temperature and time in Expert mode **Dimensions (W/H/D):** 40/5.5/50 cm **Weight:** 8.7 kg (excluding external 24V mains adaptor) **Guarantee:** 2 years **Price:** 3500 Euro

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