Mono & Stereo

# AFI flat.2 Record Flattener/Relaxer Review


Flattening the records? Adjusting to temperature and de-stressing? I am sure every proud owner of a record collection immediately gets nervous at these two terms.

The fact is that many of the old records were not completely flat in the first place because they bent over time for a variety of reasons, such as not being stacked vertically correctly, or being bent during transport because they were left in the car, etc. Many of the reasons are found especially with used records, but I have also received some of the freshly released, not-so-cheap pressings that were badly bent. In addition, uneven cooling after removal from the stamper affects the molecular structure of the vinyl. This is called negative stress and malformation of the atoms.

**The story**

The developer and manufacturer Dr. Ullrich Kathe is a longtime customer of Oliver Wittman from HiFi-Studio Wittmann in Stuttgart, the AFI world distributor. He is quite a vinyl enthusiast and aficionado and a Dr. of Chemistry. The annoyance about corrugated records made him get more familiar with the vinyl chemical structure. At some point, he came to Wittman's studio with his idea of a perfect record flattener.


Wittman was immediately enthusiastic and promised his support with his listening experience and the possibility to hear the result on different turntables. Initially, the listening tests were only carried out to prevent the records from being wrapped and without waves after the ironing process, not to destroy their sound. At a certain point in the development, however, Wittman noticed that the records sounded even better after the ironing process than before. Many more tests with different temperatures and temperature curves were carried out, always to further optimize the sound of the flattened record. The result is now the AFI flat.2, the second generation.

**AFI flat.2**

The Audio Fidelity Improvement Flat.2 is a state-of-the-art, multifunctional record flattener and relaxer. It flattens vinyl LPs, 12" maxis, and 7" singles weighing 100 grams or more. By using special flat mats and high-quality control electronics, the flat.2 achieves even heat distribution and thus previously unattainable results. Preset programs ensure very easy handling. The Standard program reliably eliminates most warping. In addition, there is an Expert program with flexible settings.The flat.2 works very precisely and has several protective mechanisms that ensure very high product and process reliability. The temperature distribution on the surface as well as on the top and bottom is homogeneous. The deviation from the set value is less than 0.25 °C. Another special feature of flat.2 is the relaxation program. The record is heated (and then cooled) very slowly, evenly, and in a controlled manner to temper the record. This thermal process of tempering is a traditional physical method and in most cases results in a significant sound improvement.

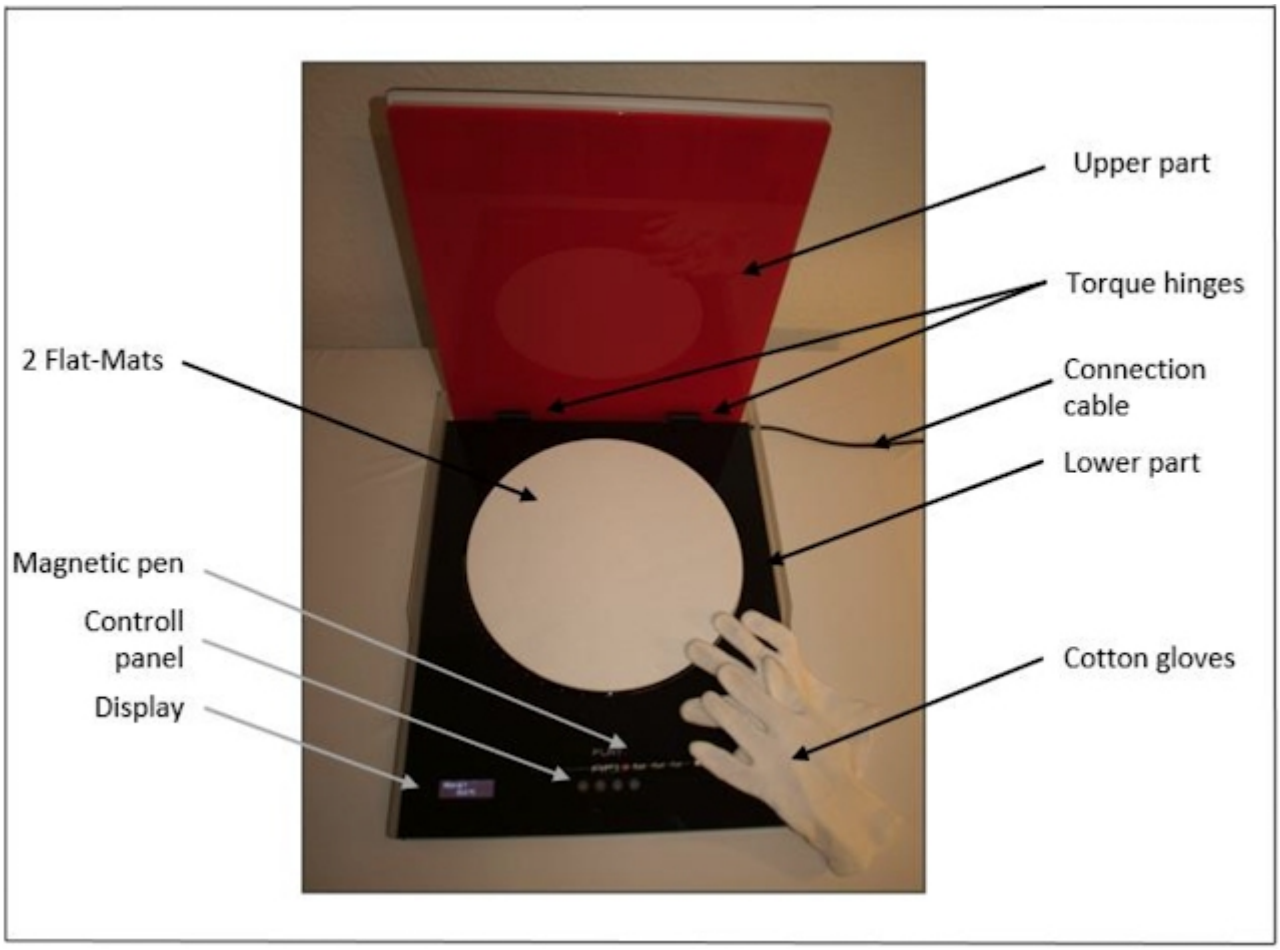

**Highlights**

- Special flat mats for an even distribution of the temperature at any point of the record
- Homogeneous heating surfaces inside the unit
- Intelligent and separate control of the top and bottom sides
- High-quality magnetic switches for safe contact and durability
- Easy handling of standard programs
- A special program of thermal relaxation/tempering for sound improvement
- High process reliability due to error detection and temperature limiting mechanisms
- Easy to clean, high quality tempered glass surfaces

**Tempering!? What is tempering?**
Tempering is not API invention, but has been a common procedure for material relaxation in many industrial production processes for decades. This process is used for metals, glass and many plastics.

**Why tempering?**
Records are pressed at approximately 150 degrees centigrade and the pressing process takes around 30 seconds. After a short cooling phase, in which the matrices are cooled with water, the press is opened and the record is removed. For further cooling, the records are stacked on a spindle and weighted down with metal plates. This production process is very likely to lead to material tension. Due to the uneven, rapid cooling and the toughness of the material, the long molecular chains of PVC and polyvinyl acetate (vinyl) have little chance of aligning themselves in a relaxed state. The tensions are virtually frozen in the material. And you can hear that in the music.

**What happens during tempering?**
Tempering leads to a relaxation of the material. The record is heated slowly and evenly to the so-called plateau temperature, left at this temperature for a while and finally cooled down slowly and in a controlled manner. This process takes up to four hours. This gives the molecules enough time to align themselves naturally and relaxed without stress.



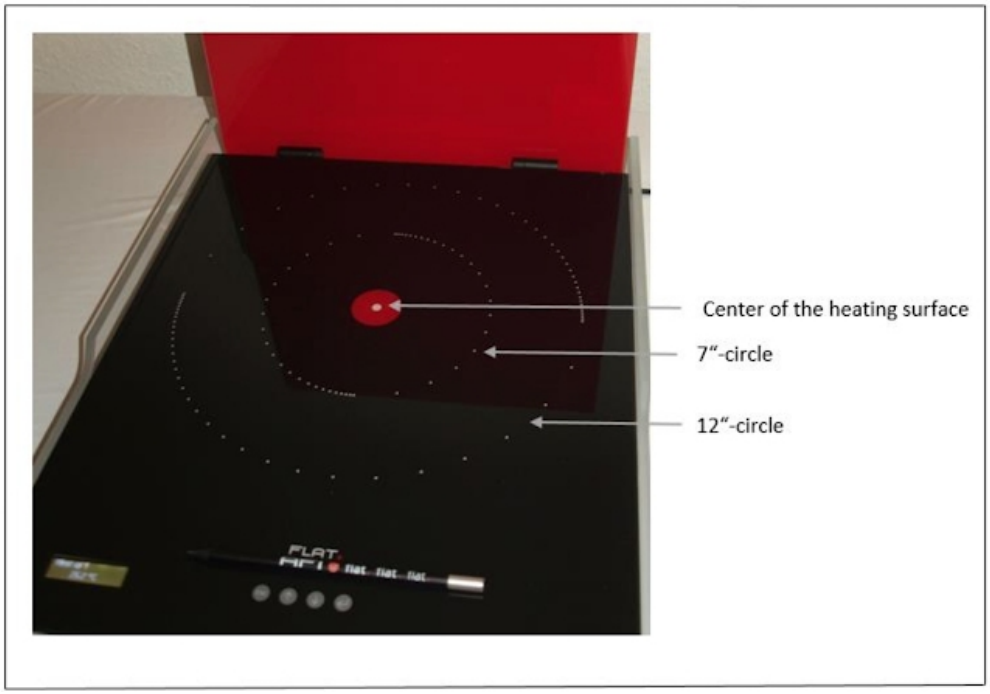
**How does the AFI flat.2 temper?**
The flat.2 is designed in its choice of materials, its construction and, above all, its process sequence in such a way that every part of the record (inside, outside, top or bottom) has a uniform temperature at every point in the process. The flat.2 pays special attention not only to uniform heating but also to the cooling process. Simply switching off and letting it cool down is not a good idea. Since the material becomes increasingly tough as it cools, the mobility of the molecules decreases more and more as the temperature decreases. Therefore, the duration and the height of the plateau temperature as well as the time and constant falling of the curve are crucial for an excellent result. Only if the cooling process is very slow, very homogeneous, controlled and regulated, the material can be relaxed optimally.

**The surface of the record becomes harder**
The tempering process leads to an increase in the crystalline content of the vinyl. This makes the surface harder and reduces scanning noise. The result of the tempering process is permanent, provided the record is stored properly.

**Operational**

The Record Flattener flat-2 was developed exclusively for the tempering of vinyl records, especially 12" records (LPs). These records dominated the market since the early 1960s and are currently experiencing a renaissance. Water dissolves into the vinyl material in trace amounts, depending on ambient humidity and exposure time. If a vinyl that is too moist is heated too quickly, the resulting water vapor cannot be released into the atmosphere fast enough. Small craters may form, which would impair the acoustic quality.


Records that have been stored in damp places for a long period or even exposed to water must be air-dried for several days. After that, the expert menu can be used with a gradually increasing treatment temperature. In the first step, the vinyl is dryied, and in the second step, you its flattened. The Record Flattener flat-2 is operated with a magnetic pen and is used to touch the four keys "Escape", "Forward", "Backward" and "Enter". The display helps you navigate through the menu. All settings are automatically saved in place. The upper and lower contact surfaces are heated with two identical heating foils. They are glued to the inside of the glass panes. With the help of two precision temperature sensors, both contact surfaces can be controlled separately. This ensures that the upper and lower contact surfaces are always equally warm.



The heaters are temperature homogenized. As a result, the plate is exposed to a uniform temperature during annealing. This applies to every point of the process and to every point of the record, both in the center and at the edge, on both the A and B sides. Only in this way can the vinyl be effectively stress relieved.

The heating elements are thermally well insulated. Therefore, the heat reaches the record and does not heat up the unit unnecessarily.

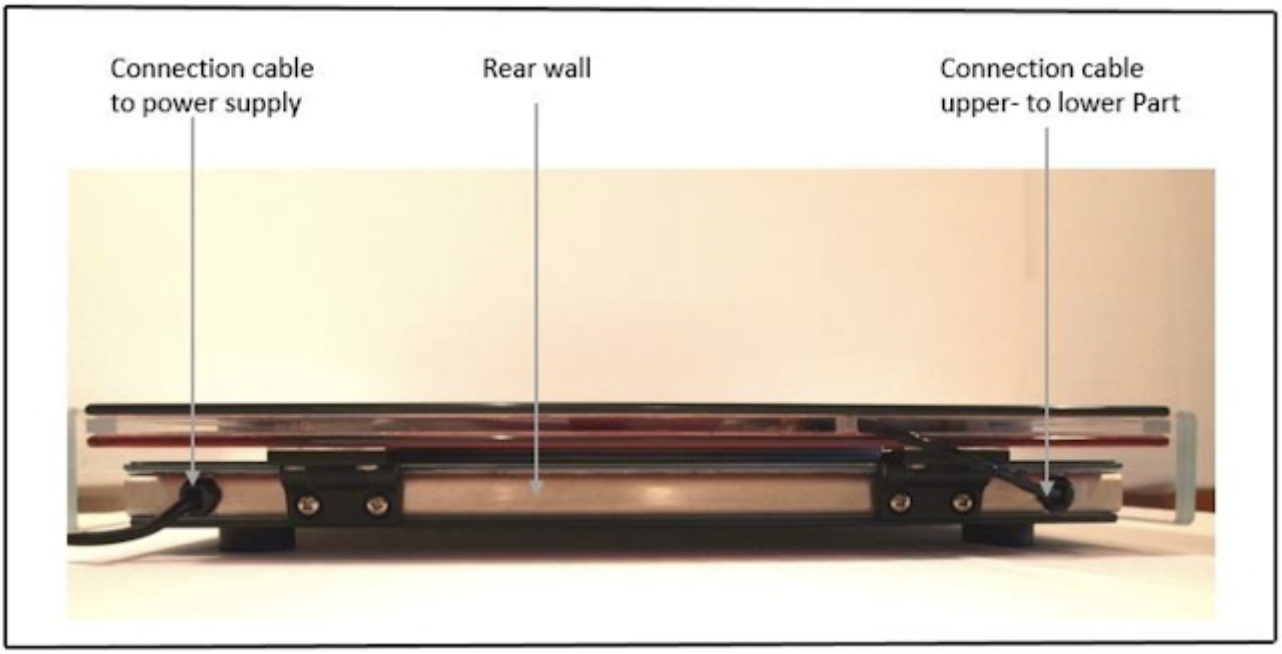
The maximum temperature of the heaters is limited to 60° C for safety reasons. It can be set in the expert menu. The error detection integrated in the software provides additional safety. In addition, each heater is equipped with a thermal fuse that permanently interrupts the circuit when the corresponding error occurs.


The two flat Mats play an important role in the uniform transfer of thermal energy to the record surface. They serve as a heat transport medium and contribute to a homogeneous temperature of the vinyl.On the one hand, the Flat-Mat material is flexible enough to conform to the surface of the record, even if it is slightly warped. On the other hand, the material is able to build up the necessary counterpressure to smooth/flatten the record. In addition, it is possible to compensate for differences in the thickness of the records with the help of Flat-Mats. The contact surface of the lower part of the heated zone is marked as a circle. On this surface, the record can be treated with uniform temperature.

- The plateau time "standard" is approximately 4 hours 59°C 1.00 hour.
- Plateau time "Relaxation" is approximately 3 hours 56°C 0.25 hours
- "Expert" plateau time variable Variable 0.25 - 6.00 hours 40-60°C

During "Heating phase 1", the plate is heated to a temperature of approximately 40°C. This step is performed relatively quickly and with a uniform temperature gradient. "Heating phase 2" begins at temperatures above 40°C. At about this temperature, the vapor pressure of the volatile substances dissolved in the vinyl has an increasingly disturbing effect. This means that these substances expand in the vinyl material and become increasingly mobile as molecules with increasing temperature. Therefore, they must be given the necessary time to squeeze through - figuratively speaking - between the molecular chains of the vinyl onto the vinyl surface. To prevent the formation of surge like vapor, which could lead to cracks in the vinyl surface, heating above 40 °C must not take place too quickly.

In "Expert" mode, the Record Flattener flat-2 offers the option of setting the two important parameters "Plateau temperature" and "Heating time". For safety reasons, the setting is limited to 60° C by software. This is a temperature that most vinyl mixes can withstand for some time without damage. After the plateau phase, the record must go through the cooling phase to a temperature of 40°C. This phase is particularly important for the record, as the thermal tensions between the molecular chains in the vinyl are relieved. Cooling is also slow, as the top and bottom sections are also moderately heated during the cooling process. The record is subjected to the same decreasing temperature from above and below.




In the final phase, the record continues to cool without heating up. When the device temperature approaches the ambient temperature or falls below 30° C, the program is terminated. Then the end signal sounds.

Subsequently, a new flattening process could be initiated. The maximum ambient temperature during the flattening process must not be higher than 35° C. A slim construction and first-class workmanship of specially tempered glass emphasize the elegant and timeless design. The rest of the housing is also

predominantly made of glass, with the glass panes bonded together with high-strength, transparent UV-curing adhesives. Float glass, partly as safety glass, stainless steel.

**The Music!?**

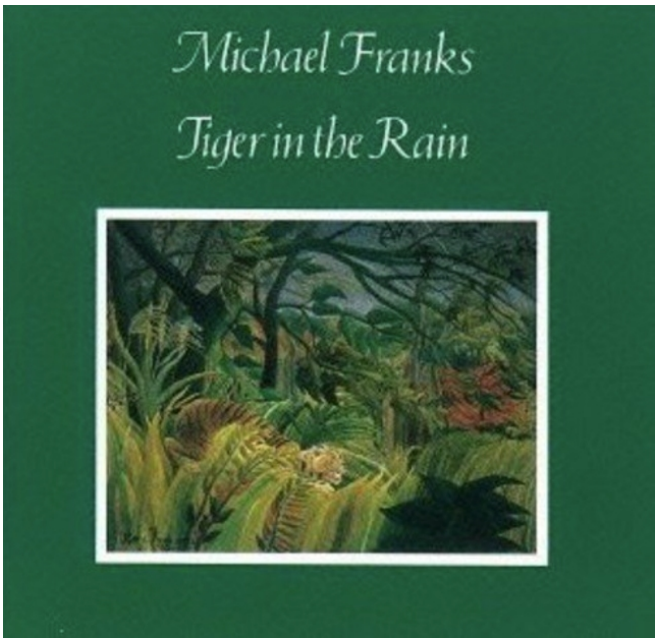
I treated a couple of seriously warped records with AFI flat.2, including the debut album by Tracy Chapman and Norah Jones and the recently released Pink Floyd album at half mastering speed. All were seriously warped and unplayable and actually dangerous to seriously damage the needle.


Chapman's used record was delivered as such, and Norah Jones' was accidentally left in the car too long the summer after purchase. Pink Floyd was wrapped, coming directly from the store shelf.

Chapman needed one round of flattering, and both Jones' and Pink Floyd's albums needed two processes. The end result was quite impressive, as both records became playable without the dangerous spikes that could easily destroy the pickup.

So straightening records was one test, and the second was even also fascinating. By relaxing the vinyl record, something ensues to the sound. Repeatedly!

As the name Relax! suggests, the sound presentation becomes a bit more relaxed and, dare I say it, more natural, which can be instantly recognized and is especially noticeable with the acoustically recorded music.




For the "ultimate" test, I put two identical copies of Michael Frank's Tiger In The Rain to the test. Same release, same label, same print.

I ran one copy through the flattener first. And compared it to the untreated copy. Dynamics! Details! I suspect this has to do with the smoother, more even vinyl allowing better cartridge tracking.

Further processing with the Relax produced an even more pronounced effect.

The music sounded less congested, more even across the complete frequency spectrum, and the already beautiful three-dimensional recurrence was noticeably expanded horizontally and vertically.

While flattening brought in more sharp and focused detail, better decays, and acoustic focal points, Relax mode permitted and decoded more density, meaning better leading edges of notes and a better holographic representation of instruments and performers. They were simply presented as more "airy", more captivating, and with better harmonic structure.

**Conclusion**

So, who is the AFI flat.2 for? I think any serious record collector could get comfortable with this unit. I am sure some analog enthusiasts are immediately skeptical about subjecting their beloved vinyl records to any kind of treatment, and AFI is straightforward in that both flattening and relaxing are done at the user's own risk, yet over the past few months, during my evaluation, the AFI apartment.2 has proven to be consistent, trouble free in the its chore .

The fact is that perfectionists would want their records perfectly flat and there is no other way to address all the shortcomings already mentioned than with a device like the AFI flat.2.

There is no doubt that in the analog front end, regardless of the price level, every little minuscule change is of the utmost importance.

Over the years, the quality of vinyl has changed, and analog connoisseurs are connecting the resulting sound.

The vinyl mixes used for records differ in composition, and thus in their thermal and plastic properties. For this reason, there can be no universal and uniform program for smoothing records that reliably leads to success.

The "standard" method does cope with the vast majority of vinyl compounds. Nevertheless, there are records made of material that softens at temperatures lower than 59°C.

If there is considerable doubt about the material composition of the record or particularly valuable disk to be smoothed, the Expert program offers the option of first treating the record briefly at a low temperature. If the result is not satisfactory, the process can be repeated under more stringent conditions.

The flattened, nanoscopically treated record puts less stress on the pickup, since the envelope causes a sub-sonic pulsation, but also causes unevenness, which is easily heard on many records.

The well-known adage is that in Formula 1 a few percent of the upgrade costs millions and what may be hidden to the normal eye means the world to the driver.

Similarly, a well-balanced high-end audio system in which the user has invested a lot of time and money to achieve top-notch performance will benefit from every little sonic improvement. What may not matter to the rest is a key factor for such an aficionado.


For example, considering how much effort was put into my Dohmann Helix 2 turntable, Lyra Atlas Lambda cartridge, and SAT CF1-09 tonearm, the extra step of smoothing and relaxing the records does not seem so unreasonable to me.

The key question is whether all these steps are necessary and what they accomplish. For me, analog playback in the 21st century has never been at such a high level. I avoid using the overused phrase "close to the master tape." Nevertheless, having a few direct official copies of well-known pieces of music and comparing them with the vinyl releases, an interesting conclusion occured.

To answer the $1 million question. Can AFI flat.2 bring vinyl playback closer to the master tape? Yes, it can. It certainly will not turn a poorly pressed and poor sounding record into a first-class sounding material. For great records, AFI flat.2 brings playback another step closer to what was recorded on the tapes by introducing both flattening (to ease the pickup) and relaxation processes (for more nautral sounding replay).

I have had the AFI flat.2 long enough to subject it to the long operating cycles that have proven to produce consistent results. Both in smoothing and relaxation treatments. It's a silent device that, once you understand it, does not require much effort to operate.

Listening to records is a simple matter, right? Well, yes, and no. If the ritual is just taking the vinyl out of the sleeve and dropping the needle on the turntable, then yes.

In my current system, the ritual has been heavily updated and upgraded in recent months. It became a three-step process that includes ultrasonic cleaning, smoothing, record relaxation, and dust and static charge removal with the Furutech Destat III Static Charge Eliminator.

The AFI flat.2 is not a cheap device, but considering the prices of cartridges, cables, tonearm, turntable, etc., it is certainly not the most expensive.

If the AFI flat.2 were just a flattening device, the price would certainly be harder to justify. But with the Relax option, can not only do a few wrapped disc get their flattening treatment, but a whole new exploration of sonic progress is possible.

API flat.2 is certainly a more than interesting device worth exploring. Given the cost of high-end analog components, where the cartridge alone can easily cost 15,000 euros or more, and that some people are willing to pay 1000 euroes+ for the first pressings the price of the flat.2 seems far less excessive.

**Technical**
- Maximum temperature: 59° C (standard program),
- 54-60° C (expert program)
- Deviation of target temperature: less than 0,25 °C
- Power: max. 90 W
- Weight 8,7 kg
- Dimensions 40x50x5.5 cm