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## Exactly on time - Manger "Zerobox 107"

**The Manger bending wave transducer is certainly one of the most fascinating transducers. Until now it has only been used in high-quality studio monitors and outrageously expensive high-end products. With the "Zerobox 107" Manger is now presenting for the first time a complete finished loudspeaker, to allow a wider circle of music lovers to enjoy this exclusive transducer thanks to a helpful price policy.**

The starting point for the invention of Josef W. Manger was the recognition at the end of the 60's that loudspeakers with practically identical amplitude behaviour sound completely different, and in spite of high linearity until now tend towards aggressiveness and unwanted noisiness. In his search for the causes of this peculiar phenomenon he came across the transient of the loudspeakers, which he nowadays regards as the main factor for the tonal limitation of conventional designs. He was backed up in this by audiological studies at the University of Würzburg, which demonstrated that the human sense of hearing is capable of localising noise occurrences within the first 10 milliseconds in the brain-stem, whereas the noise character is not determined in the cerebrum until a latency period of 80 milliseconds. Apparently this capability was of extreme importance in human evolution, as man benefits from this ability to perceive the location of a potential danger source very quickly, even before he had to decide whether the "localised" noise represented an actual danger for him. In the case of loudspeakers the findings summarised here in the briefest form mean that due to the repetitions of short-term overshoots, the attention of the listener is unconsciously and permanently directed to the location of the loudspeaker, whereas the "hearing" of the sound body with a time delay suggests a different image. As time progresses this ambivalent information content is felt by human perception as time progresses as annoying and tiring. The Manger transducer reveals a perfect time behaviour embedded in a large acoustic baffle. However with only one single transducer in the loudspeaker housing a typical pressure drop to the half of the original value occurs as soon as the acoustic wavelength matches the housing width. With the two transducers fitted laterally on the Zerobox 107 this effect is compensated by generating a large sound baffle in an acoustic way. How this system works exactly is illustrated by the measured step response which matches almost perfectly the natural pressure compensation of the air.

The bending wave transducer finds its limits in the low bass range, which is why the Zerobox 107 is supplemented below the cutoff frequency of 150 Hertz by two dynamic 20 cm bass chassis manufactured by Vifa to Manger specifications. The measurement of the amplitude behaviour shows that in spite of the enclosed housing a relatively low limit frequency of 45 Hertz is achieved. Measured on the axis the Manger transducer reveals an exemplary linear progression. When the speaker is turned through 30° a narrow-band, but distinctive sound-pressure dip at 9 kHz occurs, so that the loudspeaker should be directed as far as possible towards the location of listening. The extremely fast decay of the transducer in the treble range is also impressive.

That a truly innovative technical development has been found also in the sound result was underscored by the Zerobox in the listening test. The most striking element is its capacity to represent sound structures and instruments in an absolutely unusual naturalness. The loudspeaker achieves the credible illusion of actually participating in the musical event. Whether this is actually attributable to the lack of transient phenomena can never really be determined subjectively, but the gentle and smooth mellifluousness and the exceptional purity with which the Manger loudspeaker is capable of reproducing human vocals makes this supposition seem credible. Unnatural hissing is suddenly absent and even in forte passages not a trace of noisiness could be determined. And the Manger loudspeaker does not achieve its warmth of sound and smoothness by a loss of brilliance. Strings are reproduced with the same love of detail and definition, and harmony-rich instruments are not restricted in their richness of sound timbre. In addition the Zerobox 107 never forces you to listen at high volume. Even at low volumes the complete sound content of a recording is present. The exact spatial representation makes it easy for the listener to recognise "the crimes" committed by some recording studios and the noise trails of poor reverb units, which also confirms the honesty and precision of these loudspeakers. The balance and homogeneity of the Zerobox 107 is a further criterion which listeners will not want to miss after listening for a longer period. The bass blends perfectly into the sound picture with its admittedly discrete and slim, but flawless and differentiated, playing.

### Summary

The Manger transducer is not only the result of decades-long research work with a great deal of expenditure and passion, but the application presented by the Zerobox 107 offers true progress in loudspeaker reproduction. And even if the technical explanation might appear to be somewhat difficult to comprehend, the sound result demonstrates that here for the first time a transducer system is available setting new benchmarks regarding homogeneity and naturalness of the reproduction with speaker dimensions to suit a domestic environment.

**Insert:**

**Manger Zerobox 107**

Thanks to a revolutionary transducer system real progress has been made in loudspeaker construction. Sets new benchmarks regarding homogeneity and naturalness of reproduction.

Sound	excellent
Handling	very good
Workmanship	very good
Price/Performance	very good - excellent

Evaluation grades: unsatisfactory, satisfactory, good, very good, excellent. Related to the relevant price class.

**Manger transducer**

The Manger transducer is the result of development work carried out over a period of more than 20 years by Josef W. Manger. The aim was to design a sound transducer, which would enable the exact-time radiation of all frequencies and to do this without the disturbing transient phenomena caused by dynamic transducers operating on the mass-and-spring principle. Due to the moving mass and the restoring forces of the spring tensioning conventional dynamic transducers produce more or less pronounced short-term overshoots, which are not present in the original input signal, and which are perceived in human hearing, as has been proved by recent audiological findings, as localisation information. These "transient noises" can demonstrably lead to threshold shifts and fatigue, as the hearing is being constantly fed - directly from the loudspeaker - with additional "localisation information", which it can correlate neither with the stereo representation nor with the experience of a natural sound impression.

To achieve his goal of an exact-time and vibration-free transducer Manger made use of the bending wave phenomenon, where the diaphragm, the stiffness of which gradually reduces from the centre to the tensioning edges, is excited centrally. The applied signal is deconstructed into its individual spectra, and all sections are radiated at exactly the same time, as illustrated by the sketch. The theoretical deliberations in 1978 of Dr. Manfred Heckl, Professor for Acoustics at the Technical University of Berlin, were the first to establish the absolute certainty that the "Manger Concept" operated without any transient phenomenon whatsoever. But a great number of manufacturing obstacles had to be overcome before the concept reached series production. Nowadays the technical - and also tonal - quality of the Manger transducer can be confirmed, and this development can certainly be regarded as revolutionary. The wide-band behaviour of this transducer from 85 Hz to over 30 kHz is also impressive with a maximum sound pressure of 110 dB. The rise time according to the manufacturer is 14 microseconds, which is clearly below the CD standard value of 22.7µs.

**Summary**

The absolutely perfect transducer acting as a single point sound source will not become available in the near future. In addition we will also have to live with the loudspeaker being the greatest source of error in the reproduction chain. But the presented options offer partial solutions, which have been elaborated with a great deal of imagination and, in the interim, have also been tried-and-tested, and the results of this do however differ greatly in their sound performance. The art of the clever loudspeaker designer remains what it has always been, namely to find the best sound compromise among all decisive criteria and the possibilities offered by the transducer.

**Insert:**

**Measured values**

**Elac 215 4π II**

Exemplary linear amplitude behaviour with slight bass boosting. The effect of the switch settings can be seen in the diagram. The Elac 215 4π II displays excellent omnidirectional behaviour. The two middle curves (measured on axis and at 30°) cover one another practically completely in the treble range. The decay spectrum reveals only minimum resonances.

**Odeon Theatre**

The amplitude behaviour reveals certain irregularities of the treble horn. A relatively marked sound pressure dip can be seen in the area of the cutoff frequency of 1.4 kHz. The horn has a rapid and practically resonance-free decay.

**Manger Zerobox 107**

The measurement of the Zerobox 107 turned through 30° from the axis reveals a narrow-band frequency cancellation. Otherwise only excellent measured results. Absolutely uncritical impedance, good efficiency factor at 90 dB, almost ideal step response as well as a remarkably rapid decay of the transducer above 2 kHz.

**Martin Logan CLS IIz**

The acoustic short circuit in the bass range below 150 Hz can be easily seen in the amplitude behaviour. Heavy, capacitive impedance with a minimum of 1.5 Ohms at 15 kHz. The decay spectrum in the middle range is also not resonance-free.