

Sound & Recording
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TESTREPORTS

NEUMANN KH420
Midfield-Monitor



In time for the IBC and AES fall trade fairs and the Tonmeistertagung (Sound engineers congress), the Neumann, Berlin company is presenting its new flagship studio monitor. Following the KH 310 and KH 120, the KH 420 is the third new monitor introduced under the Neumann regime, and replaces the O 410, the last remaining model developed by the former Klein+Hummel.

Striking Midfielder

Neumann KH 420 Large Midfield Monitor

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Its size and configuration classify the KH 420 as a midfield or main monitor for greater listening distances or mastering applications. Like the KH 310, the KH 420 has a three-way design, with a large 3" midrange dome and a crossover at 2 kHz to a 1" treble dome for higher frequencies. Both domes were developed in-house by Neumann and are manufactured exclusively for the company.

In its external appearance, the KH 420 is a massive, heavy loudspeaker. The outstanding workmanship and attention to detail can be clearly seen and felt. As appropriate for a professional piece of equipment, a wide range of accessories is available for the KH 420, including hardware for wall, ceiling and stand mounting, a transport case, and a protective grille to permit operation in uncertain conditions.

There is also a mounting set that enables the electronics to be located remotely from the loudspeaker, e.g. if the monitor is installed in a wall, making the rear panel inaccessible. If required, e.g. for surround sound with a separate subwoofer channel, or for large spaces, as an addition Neumann also offers the 2 × 10" KH 870 subwoofer with an integrated 7.1 bass manager.

LOUDSPEAKER CONSTRUCTION

The diaphragm of the midrange dome is made of especially light, low-resonance fabric. The treble driver operates with a metal fabric diaphragm. Each of these domes is equipped with its own generously propor-

tioned waveguide. A certain waveguide size is needed for the midrange driver, which requires controlled directivity beginning at 500 Hz. As a result, the midrange/treble unit has an impressive appearance, occupying half of the front area. The waveguides were developed by Neumann via the Mathematically Modeled Dispersion (MMD) process. The waveguides were first optimized in a computer simulation, then manufactured and measured as a prototype, and subsequently subjected to a listening test. The advantage of this approach is the accelerated development, since the laborious construction of numerous prototypes in the optimization phase is eliminated, and the results can be examined in advance, in the simulation.

Four screws can be loosened, allowing the entire unit containing both the midrange and treble drivers to be rotated 90°, if the monitor is to be positioned horizontally. This ensures that at least the treble and midrange drivers can be operated in the more favorable configuration, one above the other. For the transition from the bass to the midrange driver, this factor is less critical due to the longer wavelength of the crossover frequency.

The bass driver – a 10" cone chassis from France – also involves an exclusive new Neumann development. Thanks to ELFF (extremely linear force factor) technology with a special voice coil design, the bass driver achieves a very large linear excursion. To prevent this from causing unwanted noise else-

where, the die cast basket of the chassis has a flow-optimized design, as do the bass reflex tunnels. The latter are also equipped with a damping system to reduce tunnel resonances.

Since Neumann leaves nothing to chance, the entire housing is also optimized via modal analysis. In addition, the front panel is as smooth as possible, with no edges or discontinuities, and all of the housing edges are carefully rounded.

ELECTRONICS

The care lavished on the drivers and housing naturally extends to the electronics. In the interior there are three amplifiers with classic class AB circuitry. The treble and midrange drivers are each powered by a pair of bridged amplifiers with 140 W, and the bass driver is powered by a special bridge parallel circuit with four amplifiers, which can provide 330 W. Two modern HF switched-mode power supplies, one for the bass and one for the midrange/treble amplifiers, ensure an optimal supply with no feedback.

On the rear we find the analog input, balanced on XLR with ground lift, and an optional digital input module (DIM 1) in AES3 format with XLR and BNC inputs and a link connector. A rotary switch can select which one of the channels in the digital data stream the monitor will use, or the sum of both. All signals are accepted up to 192 kHz. The module also offers the possibility of delaying both the digital and analog input signal by up to



400 ms, to ensure synchronicity with digital video display devices, or to compensate for listening distance (time-of-flight) differences resulting from the setup.

Despite current trends and the possibilities of modern digital technology, in the KH 420 the internal signal processing is entirely analog. Three switchable filters (Acoustical Controls), for bass, midrange and treble, are available, as well as a parametric equalizer to suppress possible room mode interference. The setting ranges and operation of the filters are illustrated in Figure 1. The comprehensive operating manual provides detailed instructions on how to use the filters, depending on the setup of the monitor. A switch makes it possible to set the precise output level for a 0 dBu input signal. Values from 94 dB to 114 dB can be selected, for a distance of 1 m.

It should also be mentioned that the filters and level controls actually function exactly as indicated. In contrast, for many monitors the values tend to be rather approximate. Schalter ermöglicht eine präzise Einstellung des Ausgangspegels für 0 dBu Eingangssignal. Zur Auswahl stehen Werte von 94 bis 114 dB, bezogen auf 1 m Entfernung.

Nicht unerwähnt bleiben sollte, dass die Filter und Pegelsteller auch tatsächlich genau das machen, was ihnen zugeschrieben wird. Bei vielen anderen Monitoren handelt es sich dagegen eher um Tendenzwerte.

LISTENING TEST

In keeping with the typical areas of application, the KH 420 listening test was performed with a relatively large listening distance of approximately 3 m from the monitor. Meas-

urements at the listening position yielded the curves shown in Figure 8, from which an external equalization curve was derived to correct for influences from the room. The room modes can be readily detected below 150 Hz, and a slight boost in level between 150 Hz and 1 kHz is attributable to the acoustic conditions in the room. Under these less than optimal conditions, the KH 420 nevertheless delivers extremely smooth results at the listening position.

If we turn our attention from measurement technology to the listening impression, in a word, this can be described as perfect, with almost no limits in any direction. Due to the very extensive low range of the bass, even with electronic music the feeling never arises that something is missing. In addition, the midrange and treble play with the utmost perfection, with never a hint of coloration or



KH420 Manufacturer/Distributor Neumann Berlin / Sennheiser Vertrieb und Service GmbH & Co. KG
Price List/Street 9.132,- Euro / ca. 8.000,- Euro www.neumann-kh-line.com

+++

Measurements

+++

Sound quality

+++

Fields of application

+++

Workmanship and value

+++

Price/performance ratio

NEUMANN KH 420 PROFILE

Frequency range: 25 Hz - 22 kHz (-6 dB)

Ripple: 2.7 dB (100 Hz - 10 kHz)

Horizontal dispersion angle:

110° (-6 dB isobar 1 kHz - 10 kHz)

Horizontal standard deviation:

9° (-6 dB isobar 1 kHz - 10 kHz)

Vertical dispersion angle:

77° (-6 dB isobar 1 kHz - 10 kHz)

Vertical standard deviation:

23° (-6 dB isobar 1 kHz - 10 kHz)

Maximum SPL:

115.7 dB (3% THD 100 Hz - 10 kHz)

Bass capability:

108 dB (10% THD 50 - 100 Hz)

Maximum SPL at 1 m (free-field) with EIA-426B

signal at full output:

109 dBA Leq and 124 dB peak

Pair deviation:

0.24 dB (max. value 100 Hz - 10 kHz)

Noise level (A-weighted): 18.3 dBA (distance 10 cm)

for the setting 100 dB/1 m at 0 dBu input

Dimensions: 330 × 645 × 444 mm (W×H×D)

Weight: 35 kg

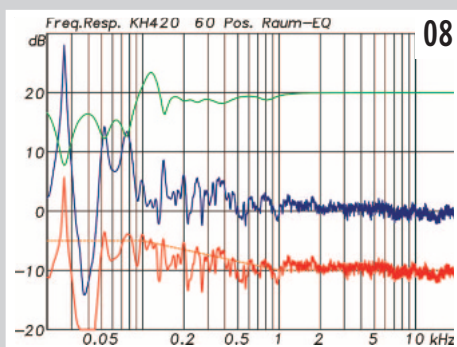
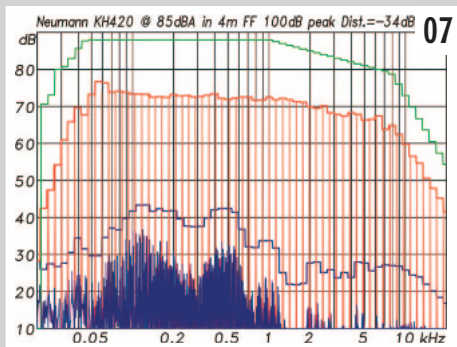
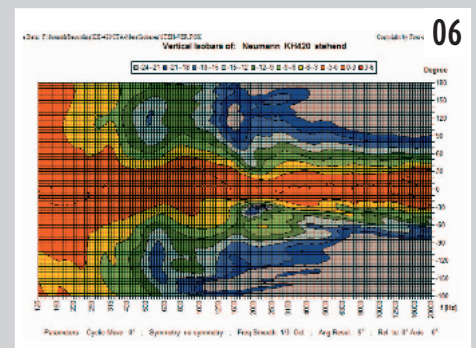
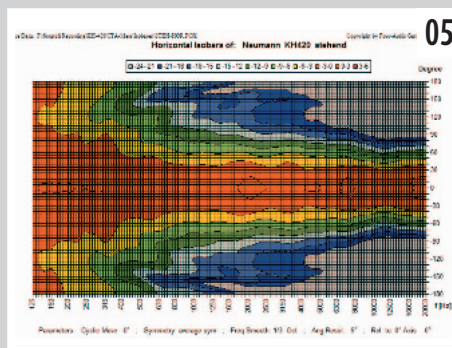
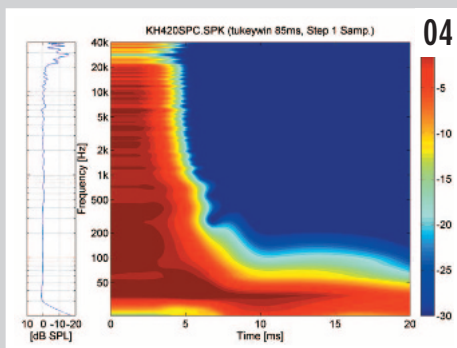
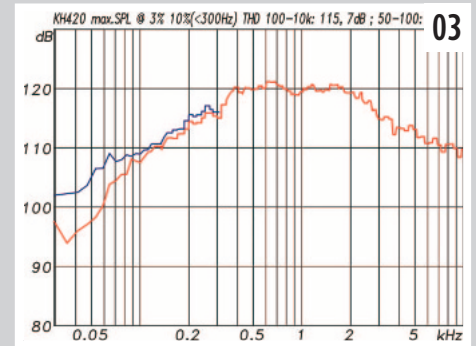
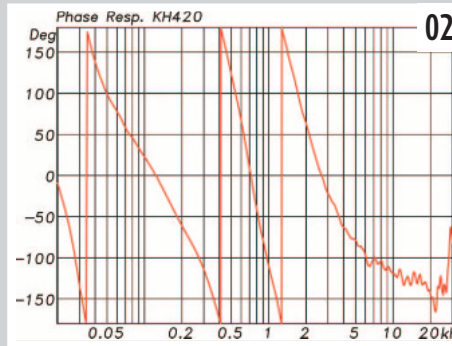
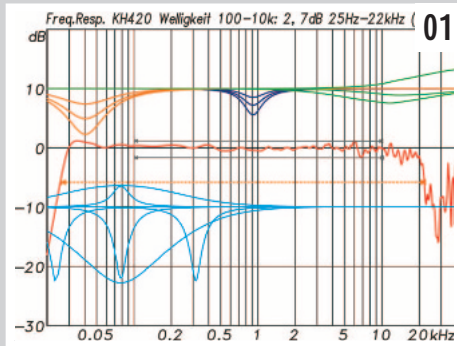
distortion. In fact, as found in the high-end scene, for some recordings this is a revelation, and one discovers previously hidden qualities in the music. This applies to the detailed definition as well as to the spatial quality of the recordings. Although it is perhaps not exactly the intended area of application, the KH 420 is a genuine, serious high-end loudspeaker.

CONCLUSION

In the microphone branch, the Neumann name stands for the highest perfection and outstanding audiophile quality. This third studio monitor in the Neumann KH line substantiates, in a way that can no longer be overlooked, that these standards are also met in the realm of sound transduction at the other end of the transmission chain, in loudspeakers. The KH 420 provides everything that one expects from a large studio monitor, with no exceptions. Here everything is right, from the outstanding drivers and perfect workmanship of the housing and electronics, to the measured values for all positions, to the listening impression. With an expected street price of around 8,000 euros per pair, the KH 420 is certainly a significant investment. However, this is put into perspective when one considers that this is not merely a small, near-field monitor, but rather a big loudspeaker for large spaces.

Despite the price, the KH 420 gives one the satisfied feeling of having invested every cent to the best advantage, while incidentally providing for many years of enjoyment of work in the studio. Those who like to satisfy their demanding tastes in private life should also consider the KH 420. A listening comparison with some loudspeakers many times more expensive could open one's eyes and ears. However, caution is advised, since this could also unexpectedly dispel some myths and illusions. Here the author is speaking from experience. ■

The following measurements of frequency response, directivity and distortion values were obtained in a measurement laboratory with anechoic conditions. The class 1 measurement chamber permits measurement distances of up to 8 m, and provides free-field conditions for 100 Hz and above. All measurements are made with the Monkey Forest audio measuring system, using a B&K 1/4" 4939 measurement microphone with a 96 kHz sampling rate and 24-bit resolution. Measurements below 100 Hz are performed as combined near-field/far-field measurements.



01 On-axis frequency response measured at a distance of 4 m. At the top are curves for the bass, midrange and treble filters (orange, blue and green, respectively). The two gray lines indicate the frequency range from 100 Hz to 10 kHz for the evaluation of ripples (2.7 dB from minimum to maximum). The orange line shows the transmission range (at -6 dB) from 25 Hz to 22 kHz. An additional completely parametric bell filter (light blue) can be used to suppress the strongest room mode.

02 On-axis phase response measured at a distance of 4 m. There are phase shifts of 360° at the crossover frequencies 570 Hz and 2 kHz, and another shift of 270° at the lower end of the transmission range, plus 360° due to the electronic (3rd order) and acoustic (4th order) high-pass filter.

03 Maximum SPL at a distance of 1 m, with a maximum distortion of 3% (red curve) and 10% (blue curve), for the bass range to 300 Hz.

04 The KH 420 spectrogram shows that each driver is operating precisely in its optimal frequency range. Even a very critical examination cannot detect any resonances here.

05 Isobar diagram showing horizontal directivity. The boundary between yellow and light green marks where the level has fallen by 6 dB relative to the center axis. The isobar curves are extremely uniform, with an average dispersion angle of 110° (at -6 dB).

06 Vertical directivity plot with a considerably smaller dispersion angle, averaging 77°. Slight constrictions can be seen at the crossover frequencies.

07 Measurement of intermodulation distortion for a multi-sine signal with an EIA-426B spectrum (green curve), and a 12 dB crest factor at 85 dB Leq at a distance of 4 m (red curve). The peak level Lpk was 101 dB, likewise at a distance of 4 m. The distortion adds up to only 2%.

08 Average frequency response measurements for 30 positions of the left and right loudspeakers in the listening area (blue). Below 150 Hz, the room modes are clearly evident. An equalization curve (green) for room correction was derived from the measurements. Shown at the bottom are the averaged curve with equalization (red) and the target function (orange).