**Pickup Technology**

by some popular stereo

**Pickups & Cartridges**

1958 - today

Some well-known stereo Pick-up from 1958 to today

"**URLs** of popular cartridge & pickup fire"

"The influence of a so-called 'Compensation Capacitor' on frequency response of mm of cartridges.

"the influence of a compensation condenser on the frequency response of a mm pick-up.

---

1958

This is typical frequency response of 1st generation Ceramics stereo Pickup

Typical frequency response of one of the first ceramic(s) stereophonic sound customers:

Reference Disk: DGG99005
Output Load: 1 MOhms

![Graph](Fig. 2.1)
Fig. 2.2 refers to the fundamental structure of a piezoelectric pickup, as it was usually planned with crystal elements from Seignettesalz (Kaliumnatriumtartrat) for inexpensive record players. To the unfavorable influence of temperature and air humidity on such a crystal connection ceramic(s) offers against it by far more favorable characteristics. Fig. 2.1 shows the frequency response of a piezokeramischen pick-up made of barium titanate (asking IO 3).

The piezoelectric pick-up family does not need usually the Entzerrung necessary for magnetic systems! Crystal or ceramic(s) pick-ups usually supplies in addition more output voltage than magnetic (+30 railways... 40 railways in relation to mm of version), which delivers only few millivolts with 1 kHz; MC types (Moving Coil) are appropriate with this frequency usually still below millivolt.

Fig. 2.2.1 shows a ceramic(s) stereophonic sound customer of RFT (Leipzig). Both the bearing house and the coupling bar consist of hard rubber. The camp block of the clay/tone needle carrier is in the pick-up housing, which was however removed here.

Fig. 2.2.1 shows a ceramic stereo pickup, as manufactured by RFT, Leipzig, Germany. The support block (blue) is larva OF hard more rubber, as wave as the coupling more lever (white). The support block OF more cantilever (stylus rod) has its position into the cartridge box which has been removed!

Fig. 2.2 refers tons of A basic construction OF piezoelectric pickup that which usually supplied with low turntables cost. Most OF thesis pickups have seignette salt crystals based on potassium sodium tartrate. Regarding the disadvantageous influence OF temperature and humidity, more however, ceramics instead OF that crystal compound does more offer much more better properties. Fig. 2.1 shows the frequencies response OF A piezo ceramic pickup larva OF barium of titanates (asking IO 3).

Piezo electric pickup family usually does emergency need equalization as necessary for magnetic type! Generally, crystal or ceramics cartridges more deliver more outputs volume-meets than magnetic ones. The difference is +30 tons of 40 railways vs. mm of type that usually give out A few milli volt only RK 1 kHz. Moving coil type typically DO less than 1 millivolt RK that frequencies.

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How does one attach a crystal or a ceramic(s) pickup?

Unfortunately, decay audio amplifiers have NO special inputs jack for A piezo electric pickup! This is A very disadvantageous item since the AUX input usually does emergency guarantee best audio performance into this case. However, reliable adapters circuits have been introduced for using now the amplifier's magnetic pickup inputs!

Fig. 2.2.2 reveals A 36 railways t Attenuator as well as A simple L-type version (27 railways). Note wave that search adapter must have A shielded case!

In 1958, Experts recommend ton replace sapphire stylus OF piezo electric pickups after about 50 hours OF usage, while magnetic or dynamic pickups acres usually supplied with longlife dia. moon stylus.

1959

C. R. Bastiaans of makes A documentary report on different child OF technical pickups for radio bulletin of magazines [ 2.9 ]. The radio funkschau of publishes A reprint from his detailed contribution in German LANGUAGE [ 2.10 ].

On the left of quoted author a documentation provides magazine [ 2.9 ] over different kinds of pick-ups for the radio bulletin. The radio funkschau publishes a reproduction of its detailed contribution [ 2.10 ].
Stereo Pickups & Phono cartridges: 1958 - today - stereophonic sound customer

This illustration, Fig. 2,3,1, represents a piezo electric system as manufactured by the company Garrard. From the internal groove flank - this is reserved for the left channel - removed a signal causes the movement shown by the not interrupted arrow. Thus L crystal with a lateral bending stress is subjected; and only this can cause an electrical tension at the crystal.

Fig. 2.3.1

Fig. 2.3.2 shows improved popular construction with a rhombus of material compliant on for coupling devices, as applied by British BSR, German DUAL, and Dutch RONETTE of companies.

Fig. 2.3.2

This illustration, Fig. 2,3,3, is exploded view of a so-called Duplo Pickup' for expired normal format (mono) as wave as Micro in such a way on for stereo! Note that A wants clamped for stereo mode, while there wants motion on pivot POINTS # 1, # 3, and # 2. However, A wants laterally moved when playing N 78 disks after A helped revolution of this system. This refined pickup has been thus applied by aforesaid companies.

Fig. 2.3.3

The design given with Fig. 2,3,3 is an explosion representation of a so-called Duplo of system for the replaced normal mono and the Micro Stereoformat. Point A has firm wedging with Stereobetrieb, during 1, 3 and 2 fulcrums is. With N 78 monodisk rendition (system turned around 180°) is however laterally moved A. This refined system was used likewise at the aforementioned companies.
Philips's company prefers the so-called w-system, Fig. 2.3.4. The enclosed ends of both crystal slices of acres linked with a flexible stripe. The broken arrow represents force direction by right channel groove flank which accordingly bends the corresponding crystal slice on the right. Position #1 indicates pivot ton this instance.

The company Philips prefers sucked. W-system, Fig. 2.3.4. The eingefass ten ends of both kristallplättchen is connected by a flexible strip. The interrupted arrow shows the force direction of the right channel signal, which effect affect the assigned crystal (right). Number 1: Fulcrum.

The American Columbia company favours this "winged construction", Fig. 2.3.5. The black arrow shows motion direction of left channel signal which May only cause force RK # 2. POINT #3 wants virtual bending pivot ton the axis defined by #1 and # 3.

Westrex, the USA, has developed an a dynamic pickup as principally shown by Fig. 2.3.6. The moving coils acres fixed RK the struts of both a compliant plastics bow, # 1, # 2, and the stylos more cantilever, #3 # 4. Thus, this construction is to example for MC pickup.

Westrex, the USA, developed a dynamic pick-up, whose principle representation is shown in Fig. 2.3.6. The moved coils are both at the props of of a flexible plastic handle (1, 2) and at those the needle rod (see 3, 4) fastens. Thus this construction is an example of Mc a pick-up.
Another refined dynamic pickup system presents the Danish Ortofon company. Fig. 2.3.7 reveals that the more cantilever has been fixed RK A cube for special Cardanic transmission. POINTS #1 and #2 Mark the position of the suspension pin. Note that all magnetic system components have been omitted for demonstrating only this so-called 'CROSS more coupler' which converts stylus deflection into channel separated rotary motion.

American Electrovoice company of creates an impressive piezo ceramic pickup as illustrated by Fig. 2.3.8. Its valve is based on lead zirconate of titanates compound (LCT). Numbers 1 to 4 Mark the more outer electrodes, whereas the concentric internal has been connected to ground. This polarized valve has been simply coupled with rotary cantilever systems that harbours both mono and stereo stylus.

The American company Electrovoice creates an impressive piezokeramischen pick-up, Fig. 2.3.8. Its ceramic tube is made of lead zirconate titanate. The outside electrodes consist of silver strips, while the internal common mass leads. This polarized tube was connected simply with the turnable needle carrier. This carries both a mono and the Stereonadel.

Fig. less expensive electromagnetic pickup larva by General Electric company, the USA. The diagonally aligned pieces, standing in orthogonal position ton polarizes 2.3.9 represents A each OTHER, DO guarantee channel separation.
Pickering company refers to a solution which is quite related to construction of General Electric Company. However, this variant by Pickering, Fig. 2.3.10, has two pairs of pole pieces. (Note that only one of four coils appears in this illustration.) The armature, to which also belongs the cantilever, has been suspended at the magnet for pivot position. Thus, this pickup system is based on more efficient push-pull mode.

Fig. 2.3.10

Fig. 2.3.11: This less expensive realization of dynamic MM pickup (Moving Magnet) was favoured by American SHURE company as well as German ELAC, see also Fig. 2.3.14.

Fig. 2.3.11

The MC pickup by Fairchild, USA, shows Fig. 2.3.12. Both coils, diagonally aligned and standing in orthogonal position to each other, are immovably fixed at the cantilever.

Fig. 2.3.12

Pickering bezieht sich auf eine Lösung, die der von General Electric sehr ähnelt! Die Pickering- Variante, Fig. 2.3.10, hat jedoch zwei Paar Polschuhe - nur eine von vier Spulen wird hier gezeigt. Der Anker ist gleichzeitig Nadelträger und am Magneten drehgelagert. Dieses magnetische Aufnehmersystem basiert somit auf dem effizienteren Gegentaktprinzip.

Fig. 2.3.10

Fig. 2.3.11: Diese weniger aufwendige Ausführung eines dynamischen MM- Systems (Moving Magnet) wurde sowohl von den Firmen SHURE, USA, als auch von der deutschen ELAC bevorzugt, siehe auch Fig. 2.3.14.

Fig. 2.3.11

Das MC Tonabnehmersystem von Fairchild (USA) zeigt Fig. 2.3.12. Beide Spulen, diagonal ausgerichtet und senkrecht zueinander stehend, sind mit dem Nadelträger fest verbunden.

Fig. 2.3.12
Neumann company, Germany, offers this construction of dynamic moving coil pickup.

Die Firma Neumann (Deutschland) bietet diese Konstruktion eines dynamischen MC-Tonabnehmers an.

---

**Fig. 2.3.13**

Frequenzgang (Kurve a):
20Hz-16000kHz +/- 2.5 dB
Ausgangslast: 33 k Ohm
Gestrichelt: linker Kanal.
Übersprechen: Kurve b
Nadelauflagekraft: 3-5 pond
Compliance: 4x10^-6 cm/dyn
Nadelrundung: 15 ... 18 µm
Dyn./Effektive Masse: 2.15 milligrams
Impedanz: (1480 + j0.65) Ohms
Ausgangsspannung p. Kanal: 20 mV bei 10 cm/s Schnelle
Gewicht: 12 g

---

**Fig. 2.3.14** ELAC Series STS 300 [2.11]

Technical diagram of a pickup as based on Fig. 2.3.11.

Curve pair a shows frequency response at an output load of 33 kOhms and stylus force of 4 pond. Broken line: Left channel.

Curve pair b shows crosstalk.

Compliance: 4x10^-6 cm/dyn. Rounding of spherical stylus: 15-18 µm. Dynamic Mass: 2.15 milligrams. Weight: 12 grams

Electrical impedance per coil: (1480 + j 0.65) Ohms. Output Voltage per channel: 20 mV at rapidity of 10 cm/sec.

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1961
In 1961, Shure Company presents a pickup unit, a tone arm supplied with a magnetic cartridge, whose technical data might impress even today's users. See Fig. 2.4 for frequency response diagram. This product, the M212, was basing on the company's long experience of making phonographic appliance.

**Technical Data:**

- **Frequency Response:** 20-20,000 Hz ±2.5 dB
- **Crosstalk:** < - 20 dB
- **Compliance:** $9 \times 10^{-6}$ cm/dyn
- **Stylus Force:** 1.5-2.5 pond
- **Dyn. Mass:** 1.3 milligrams
- **Diamond Stylus:** spherical 17µm
- **Output Voltage:** 4.5 mV at 1kHz

**Fig. 2.4**

Frequency Response of Shure M212.

**Fig. 2.5**

Shure M212.
All data and both illustrations by [2.1].
A New Semiconductor Phono Transducer is introduced by John F. Wood in "Electronic Worlds" on Feb. 1965, P.50. The manufacturer is Euphonics Corp., USA, that offers this pickup system for nearly 80 US-$. The U-15 type has one silicon chip (63 x 63 x 5 mil) per channel that converts change of pressure to change of resistance. This is its excellent technical data of that time:

Frequency Response:
0-30,000 Hz ±2 db
Crosstalk: < - 25 db
Compliance: 20 x10^-6 cm/dyn (s.Tab. 2.1)
Stylus Force: 0.75-3 pond
Weight: 2 grams
Diamond Stylus:
  biradial/elliptical 5x23 µm
Output Voltage: max. 80 mV at 20 V
Supply (Feeding current: 10 mA).

In the same year, F.A. Loescher, audio expert, thoroughly tests some pickup cartridges of remarkable reputation [2.3].

Classification:
1 Shure V15
2 Ortofon SPU-TE and ADC-4E
3 Pickering V15AME1 a. Shure M44-7

<table>
<thead>
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<td>V15</td>
<td>11</td>
<td>25 25</td>
<td>-</td>
<td>15°</td>
<td>biradial</td>
<td>5 / 22.5</td>
<td>0.8 - 1.5</td>
<td>6mV at 50kohms</td>
<td>&gt; - 25</td>
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<td>SPU-TE</td>
<td>17</td>
<td>10 10</td>
<td>1</td>
<td>20°</td>
<td>biradial</td>
<td>5 / 30</td>
<td>2</td>
<td>10mV at 50kohms</td>
<td>&gt; - 25</td>
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<td>6</td>
<td>30 30</td>
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<td>8mV at 50kohms</td>
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<td>13 10</td>
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<td>5 / 30</td>
<td>0.8 - 3</td>
<td>6mV at 50kohms</td>
<td>&gt; - 22</td>
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<td>Shure</td>
<td>M44-7</td>
<td>7</td>
<td>20 20</td>
<td>-</td>
<td>15°</td>
<td>spherical</td>
<td>15 - 18</td>
<td>1.5 - 3</td>
<td>5mV at 50kohms</td>
<td>&gt; - 24</td>
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<td>Sonotone</td>
<td>9 TAHC</td>
<td>2.8</td>
<td>13 -</td>
<td>2.5</td>
<td>-</td>
<td>spherical</td>
<td>15 - 18</td>
<td>1 - 3</td>
<td>0.2V at 2M0hms</td>
<td>&gt; - 20</td>
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</table>

Der Audioexperte F.A. Loescher führt im gleichen Jahr gründliche Tests an einigen Tonabnehmern von bemerkenswertem Ruf durch [2.3].

Rangfolge:
1 Shure V15
2 Ortofon SPU-TE und ADC-4E
3 Pickering V15AME1 u. Shure M44-7
Stereo Pickups & Phono cartridges: 1958 - today - stereophonic sound customer

<table>
<thead>
<tr>
<th>Connoisseur</th>
<th>SCU-1</th>
<th>7.5</th>
<th>10 -</th>
<th>1</th>
<th>-</th>
<th>spherical</th>
<th>15 - 18</th>
<th>1.5 - 3</th>
<th>0.3V at 2MΩ</th>
<th>&gt; - 20</th>
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<tr>
<td>Schumann</td>
<td>STC 481</td>
<td>4</td>
<td>8 - 5</td>
<td>2.4</td>
<td>12°</td>
<td>spherical</td>
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<td>2 - 4</td>
<td>0.15V at 2MΩ</td>
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**Tab. 2.1**

<table>
<thead>
<tr>
<th>Dynamic / Magnetic Type</th>
<th>Ceramic Type</th>
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<tbody>
<tr>
<td>1N = 10^5 dyn</td>
<td>1cm = 0.01m</td>
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</tbody>
</table>

**Notes:**
- biradial = elliptical
- Stylus Rounding originally quoted 5 / 30 for Shure V15 has been corrected.

**Anmerkungen:**
- Vertical Pitch = vertikaler Nadel-Anstellwinkel
- Angegebene Ausgangsspannungen bei s = 5 cm/s.
- Für Shure V15 zitierte Nadelgeometrie (Rundung 5 / 30) wurde korrigiert.
Fig. 2.6
Frequency Response Diagrams (Links = Left Channel; Rechts = Right Channel) Frequenzdiagramme.

<table>
<thead>
<tr>
<th></th>
<th>Shure V15</th>
<th>Ortofon SPU-TE</th>
<th>Audio Dynamics ADC-4E</th>
<th>Pickering V15 AME1</th>
<th>Shure M44 -7</th>
<th>Sonotone 9 TAHC</th>
<th>Sonotone 9 TAHC, output load 1 MOhms</th>
<th>Connoisseur SCU -1</th>
<th>Connoisseur SCU -1 plus pre-amplifier for MM system (input load: 50 kOhms)</th>
<th>Schumann STC 481</th>
<th>Schumann STC 481 plus RC correction filter plus pre-amplifier for MM system (input load: 50 kOhms)</th>
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<tr>
<td>a</td>
<td>Shure V15</td>
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<td>g</td>
<td>Sonotone 9 TAHC, output load 1 MOhms</td>
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Technical Data of Shure Products, 1965 [2.4]

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<td>Hz</td>
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<td>20 - 20 000</td>
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<td>Output Voltage (1 kHz) (Ausgangsspannung)</td>
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<td>9</td>
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<td>Channel Separation (Kanaltrennung)</td>
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<td>&gt; 25</td>
<td>&gt; 25</td>
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<td>Cartridge Load (Abschlusswiderstand)</td>
<td>k0hms</td>
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<td>47</td>
<td>47</td>
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<tr>
<td>Compliance (cm/dyn)</td>
<td>25x10^-6</td>
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<td>Stylus Force (Nadelaufagekraft)</td>
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<td>DC Resistance p. Channel (Wicklungswiderstd.p.K.)</td>
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<td>Stylus Rounding (Nadelverrundung)</td>
<td>µm</td>
<td>13</td>
<td>18</td>
<td>22.5x5</td>
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Tab. 2.2
Stereo Pickups & Phono cartridges: 1958 - today - stereophonic sound customer

Philips, Netherlands, introduces a High Fidelity ceramic pickup cartridge with renewed transducer material: The compound for GP 233 product is lead-titanate-circonate: PbTiZrO₃.

This development largely excels barium titanate based ceramic pickups. However, this pickup system will need a pre-amplifier.

Technical Data GP 233:
Ceramic Resonant Frequency:
100 kHz...1 MHz (!)
Frequency Response:
30-17,000 Hz ±2 db
Crosstalk: < - 24 db
Compliance: 8x10⁻⁶ cm/dyn
vertical: 6.5x10⁻⁶ cm/dyn
Stylus Force 1.5 -2 pond
Dyn. Mass: 2 grams

At German HiFi fair '68, Dusseldorf, Japanese Thoshiba company presents a much impressing optical pickup cartridge, the C-100P type as represented by Fig. 2.8.

This innovation is not typically based on generator principle, as Fig. 2.9 does demonstrate accordingly. The cantilever is fixed at the rubber plate that maintains viscous resistance for compliance and absorbing. The fixed screen as well as the moving shutter are slit. The photo transistors have extremely focussed lens.

The designers could reduce harmonic distortion to less

1968

1968

Der Philips Konzern stellt sein erneuertes High Fidelity Tonabnehmersystem mit der Bezeichnung GP 233 aus Blei-Titan-Zirkonat Keramik vor (PbTiZrO₃).

In seinen übertragungstechnischen Eigenschaften übertrifft diese Entwicklung deutlich die auf Bariumtitanat basierenden Tonabnehmer. Es wird jedoch ein Phono- Vorverstärker benötigt.

Technische Daten GP 233:
Resonanzfrequenz der Keramik:
100 kHz...1 MHz (!)
Frequenzbereich:
30-17.000 Hz ±2 dB
Übersprechen: < - 24 dB
Compliance: 8x10⁻⁶ cm/dyn
vertikal: 6,5x10⁻⁶ cm/dyn
Nadelauflagekraft 1,5 -2 pond
Dynamische Masse: 2 Gramm

Auf der Düsseldorfer HiFi Messe stellt die japanische Firma Toshiba einen recht beeindruckenden optischen Tonabnehmer vor, den C-100P, wie im Foto Fig. 2.8 dargestellt.

Diese Innovation beruht nicht auf dem typischen Generatorprinzip, wie Fig. 2.9 entsprechend ausweist. Der Nadeltäger ist an einem Gummifederplättchen befestigt, welches den viskosen Widerstand für die Compliance (Nadelnachgiebigkeit und Dämpfung) herstellt. Sowohl der unbewegliche Schirm als auch der sogenannte Schatter (bewegte Schlitzblende) sind geschlitzt. Die Fototransistoren verfügen über eine stark bündelnde Optik.
Stereo Pickups & Phono cartridges: 1958 - today - stereophonic sound customer

than 0.65% at 1 kHz, cf. Fig. 2.10. The rating of the 2 Volts filament lamp will be circa 10,000 hours. The large size of the cartridge, as shown by the photo, is a result of sink function for the lamp's heat!

This optical pickup has an enormous transmission parameter of 14.5 mVs/cm, respectively 40 mVs/cm per channel at the output of its pre-amplifier.

Technical Data by manufacturer:

Frequency Response:
20-40,000 Hz
Crosstalk: < - 32 db
Compliance: 30 x10^{-6} cm/dyn
Stylus Force: 0.5-1.7 pond
Dyn. Mass: 0.3 milligram.
Weight: 11.5 grams
Diamond Stylus:
birad./elliptical 7.6x20.3 µm

Reference: [2.5].

Shure company improves trackability of M75 pickup cartridges [2.6]. The company's best pickup, V15 II, can handle now rapidity of 35 cm/sec.

1970

Die Firma Shure verbessert das Abtastverhalten der M75 Tonabnehmer [2.6]. Ihr bestes System V15 II beherrscht jetzt eine Schnelle von 35 cm/s.

<table>
<thead>
<tr>
<th>Type</th>
<th>Dynamic Mass Effektive Masse [x 0.001 kg]</th>
<th>Stylus Form Nadelausführung</th>
<th>Stylus Force Nadelaufagekraft [pond]</th>
<th>Max. Rapidity Max. Schnelle [cm/sec] (1 kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M75 -6</td>
<td>0.6</td>
<td>spherical</td>
<td>1.5 - 3</td>
<td>28</td>
</tr>
<tr>
<td>M75 -G Type2</td>
<td>0.6</td>
<td>spherical</td>
<td>0.75 - 1.5</td>
<td>28</td>
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<tr>
<td>M75 -E Type2</td>
<td>0.6</td>
<td>biradial</td>
<td>0.75 - 1.5</td>
<td>28</td>
</tr>
<tr>
<td>M75 -EJ Type2</td>
<td>0.6</td>
<td>biradial</td>
<td>1.5 - 3</td>
<td>35</td>
</tr>
</tbody>
</table>

Tab. 2.3

Die Entwickler konnten den Klirrfaktor unter 0,65% bei 1 kHz halten, vgl. Fig. 2.10. Die Lebensdauer der 2 V Glühfaden-Lampe soll ca. 10.000 Stunden betragen. Das große Gehäuse des Tonabnehmers (Foto) wurde für die Ableitung der Lampenwärme bemessen!

Dieser optische Tonabnehmer hat einen enorm hohen Übertragungsfaktor von 14,5 mVs/cm, beziehungsweise 40 mVs/cm pro Kanal an seinem Vorverstärkerausgang.

Technische Daten vom Hersteller:

Frequenzbereich:
20-40.000 Hz
Übersprechen: < - 32 dB
Compliance: 30 x10^{-6} cm/dyn
Nadelaufagekraft: 0,5-1,7 pond
Dyn. Masse: 0,3 mg
Gewicht: 11,5 g
Diamond Stylus:
biradial/elliptisch 7,6x20,3 µm

Quelle: [2.5].
Matsushita, Japan, has made use of strain gauge for a new pickup system. Sescosem, a French company, takes pattern from this development and presents a sophisticated application basing on a silicon gauge coupled with a MOS transistor device. This pickup will deliver 200 mV output voltage per channel within a frequency range of 0-30,000 Hz. The dynamic mass was quoted 0.7 milligram at a compliance of 10x10^{-6} cm/dyn for a stylus force of 0.75 pond. However, it has been proposed to improve this development for the S/N ratio of only 40 db; [2.7].

**2004**

**audio-technica**

**CN5625AL**

This low-cost MM cartridge made by audio-technica is a much popular "aftermarket product" which is offered for circa 30 US-$ by an American retailer (April 2004). The CN5625AL can easily replace many other cartridges by its 1/2" two hole standard mount system.

Technical Data (Quotation):
- Frequency Response:
  20-20,000 Hz
- Linearity: No data by manufacturer publication.
- Channel Separation: 20db (1kHz)
- Channel Balance: 1.5db
- Stylus force: 1.5-2.0grams
- Stylus form: conical (0.7mil)
- Output voltage: ca. 4mV at 1kHz and a rapidity of 5cm/sec

**MM Tonabnehmer-Angebot eines deutschen Anbieters**


Technical Daten (Zitat):
- Frequenzbereich:
  20-20.000 Hz
- Linearität: keine Herstellerangabe
- Kanaltrennung: 20dB (1kHz)
- Kanalabweichung: 1.5dB
- Nadeldruck: 1.5-2.0 p
- Nadelform: konisch (0.7mil)
- Ausgangsspannung: ca. 4mV bei 1kHz und 5cm/sec Nadelschnelle
Fig. 2.12 & 2.13 are photos of an opened magnetic pickup made by Audio Dynamics (ADC), USA. Each channel has two coils which are linked crosswise. Their pole pieces are diagonally falling into the inlet for the cantilever. (US Patent 3 294.405)

Fig. 2.11 sind Fotos von einem geöffneten Magnetsystem von Audio Dynamics (ADC), USA. Jeder Kanal hat zwei kreuzweise verbundene Spulen, deren Polbleche diagonal im Nadelträger-Kanal münden. (US Patent 3 294.405).

### Specifications: URLs of popular cartridge & pickup brands

In alphabetical order.
April 2004.

<table>
<thead>
<tr>
<th>Name</th>
<th>Internet URL</th>
<th>Cartridge products</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADC</td>
<td><a href="http://www.adelcom.net/ADCCart1.htm">http://www.adelcom.net/ADCCart1.htm</a></td>
<td>all</td>
</tr>
<tr>
<td>audio-technica</td>
<td><a href="http://www.audio-technica.com/guide/other/styli/cart.html">http://www.audio-technica.com/guide/other/styli/cart.html</a></td>
<td>all</td>
</tr>
<tr>
<td>Dynavector</td>
<td><a href="http://www.dynavector.com/dvcarts.htm">http://www.dynavector.com/dvcarts.htm</a></td>
<td>all</td>
</tr>
<tr>
<td>Goldring</td>
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<td>moving coil cartridges</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.ortofon.com/html/body_magnetic_technical_data.html">http://www.ortofon.com/html/body_magnetic_technical_data.html</a></td>
<td>all</td>
</tr>
<tr>
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<td><a href="http://www.pickeringuk.com/spex.html">http://www.pickeringuk.com/spex.html</a></td>
<td>all</td>
</tr>
<tr>
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</tr>
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<tr>
<td></td>
<td><a href="http://www.shure.com/m92e.html">http://www.shure.com/m92e.html</a></td>
<td>M92E</td>
</tr>
<tr>
<td>Other (retailer):</td>
<td><a href="http://www.moving-coil-cartridges.com/">http://www.moving-coil-cartridges.com/</a></td>
<td></td>
</tr>
</tbody>
</table>

Errors and omissions excepted!
Irrtum und Auslassungen vorbehalten!

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References - Quellen

[2.8] Funkschau 1958, Nr.11, S.273