

STEREO STEREO

MAGAZIN FÜR HIFI • HIGH END • MUSIK

TIME FOR A QUICK PLUG

SPECIAL REPORT: RCA PLUGGS

by Holger Barske

... about new developments at the back of our hifi systems. Following decades of standstill, two manufacturers have now made a breakthrough: WBT is also at the forefront of new trends with its "Next-gen" range. Welcome to the wonderful world of RCA plugs.

STEREO Print



Are you looking for a sure-fire business idea? Then you could do a lot worse than custom cable assembly; for audio interconnect cables to be precise. Because recent developments mean that things will never be the same in the world of connection technology. Hundreds - perhaps even thousands - of hifi enthusiasts will soon be wanting to fit their audio cables with new plugs. The reason behind this predicted euphoria?: WBT has developed a new RCA plug. Its name is "Nextgen 0110" and, as the name suggests, it is designed to signal a "changing of the guard" in the field of hifi connections.

It's not every day that an experienced physicist like Hans Strassner from Leverkusen-based cable specialist HMS calls us and says: "I'm sending you five audio cables - all identical but fitted with different plugs. You won't believe your

Close-up of the "central contact unit" of the 0110 showing the modular design and the punch-bent contacts



ance. The success story of the RCA plug continues up to this day - despite the blip that started in late fifties, when the standardisation-loving Germans decided to go their own way with the "DIN plug", the five-pin

version of which was a de facto standard in Europe for almost 20 years and which is still favoured today by some manufacturers (such as Naim or Phonosophie). Compared to its international counterpart, the advantage of the DIN plug was that it could point to clearly defined specifications, whereas RCA plugs were long characterised by extreme tolerances ranging from "doesn't even fit in the socket" to "keeps on falling out of the socket". These problems have meanwhile been ironed out, and plugs and sockets from all over the world now generally ensure a good fit - although it wasn't until 1999 that the "official" dimensions for plugs and sockets of this type were laid down internationally.

An RCA cinch is a coaxial connection: a thin inner conductor - the "hot" pin - is enclosed by a cylindrical outer conductor - the return conductor or the ground connection. The idea behind the concept is quite simple and consistent: the aim was to continue the generally coaxial structure of the connected cables all the way through to the plug and socket connection. The reasons for choosing this system are equally logical: the low-impedance ground on the outer conductor is designed to serve as an effective shield for the weak signal on the inner conductor.

So it was that this connection concept became generally accepted and relatively problem-free over a number of decades. It was

Up to the present, no standard RCA connection has been able to transmit digital signals in a technically correct manner - in other words, without reflections

ears". Suffice it to say that Strassner's prediction of our reaction was pretty accurate - in fact, we were totally amazed. But more about that later.

The RCA plug (also known as the cinch plug) is something like the "grand old lady" of the hifi world. It was invented by US company RCA in 1942 for a highly practical reason: the industry needed a low-cost plug connector to hook the

newly developed record player to a suitable amplifier - which in those days was more like a radio receiver. That's why the correct full name of the plug is still "RCA Phono Plug". There had previously been no need for a plug of this kind - there was nothing to hook up to, since the process of music playback all took place within one and the same ampli-

TEST-CHAIN

CD-Player: Einstein „The Last Record Player“, Audio-meca Obsession II

AMPLIFIER: Symphonic Line RG 14 Edition, Cayin TA35 S

PRE/POWER AMP: Vincent SA-93/SP-991 plus, Accu-phaseC-2400/P-7000

SPEAKERS: Lumen White „White Lights“, Odeon Fidelity

CABLE: HMS, Silvercom, Nordost

Characteristic impedance

It may be measured in ohms - but it's not the same as „everyday impedance“

Characteristic impedance is a communications-related parameter that is by no means easy to describe. So we're confining ourselves to a rough explanation of this phenomenon.

Things are fairly simple when it comes to the "normal" impedance of resistors: if a resistor is installed in a circuit, it limits the flow of current and converts the resulting power loss into heat.

Characteristic impedance is a far more complex matter: it can't be purchased in the form of a physical resistor. It is a design-based parameter of all signal-carrying components and does not really "burn off" electrical power. It only comes into play in the high-frequency range when the transmission phenomena extend beyond those phenomena that are influenced purely by Ohm's law. The characteristic impedance needs to be matched: ideally, all the parts involved in the signal-

carrying process (in our case: output stage, sockets, plugs, cable and input stage of the receiving unit) should have the same level. If this is not the case, the electrical signal is not transmitted with total clarity. Part of it is reflected at the

transition point, is fed back through the cable and makes life difficult for the "driving amp", which has to deal with these reflections. Moreover, this part of the energy is missing from the amplitude of the useful signal. If the various components involved in the transmission process are correctly matched, exactly half of the feed signal drops off along the overall route and there are no reflections.

Amateur radio hams know all about these interrelationships between radio unit and antenna and talk about "standing wave ratio": if this ratio is far enough from the optimum ratio (one to one), it can sometimes burn up the transmitter amp.

Signal transmission is only flawless if all components are correctly matched

not until the eighties that the high-end aficionados began to take an interest in phono plugs, and the RCA connector was soon transformed from a plain-looking practicality into a shiny chrome and gold prima-donna - a matching component for cables whose prices are meanwhile sometimes far higher than the components they connect. Ultra-stable, with optimised electrical properties and as functional as on the very first day after years in use - these are the qualities that are still expected from products in this segment.

This is not the first sign of new developments in the audiophile world in recent times. A few years ago, a modest-looking "plastic connector" - the "Bullet Plug" from Australian manufacturer Eichmann - began to make life difficult for the established solid metal connectors on the market. STE-

REO reported back in issue no. 10/02 on the amazing properties of the supposedly cut-price connectors.

The "empire" is now striking back - in the guise of WBT, but with a different goal in mind than Eichmann: the aim of the Essen-based specialists is to finally gain full acceptance for the RCA plug as a digital connector. Although a digital output with RCA socket can be found on just about any player, and although this connection mode is considered far superior to the mostly optio-

WBT's new unit is equipped with a low-eddy current aluminium sleeve via which the locking mechanism is also secured



nal fibre optic output when it comes to hooking up external digital/analogue converters and recording equipment - all existing digital transmissions via RCA cables are nevertheless technically flawed.

The reason is that when high-frequency digital signals in the Megahertz range are transmitted, the physical phenomena that come into play are of no relevance for audio signals in the range up to twenty or so Kilo-hertz - the keywords are "characteristic impedance matching" - the box on the left explains what this means. The fact of the matter is that no RCA plug of conventional design and no socket is able to satisfy these requirements - due not to a lack of forethought but simply as a consequence of the design and the dimensions.

KEYWORD

Coaxial design
Coaxial means "on a common axis". In this case: inner and outer conductor are arranged around a joint "centre".

And it is precisely here that WBT boss Thörner wanted to change things: he thought it must somehow be possible to build a true 75-ohm plug complete with matching socket without abandoning compatibility with the existing standard. It was possible, but it necessitated a radical break with a whole number of traditional design principles.

Deluxe admission ticket to audio nirvana: WBT offers the pack of four 0110 AGs for 164 euros. Not cheap - but worthwhile

INTERVIEW

„We want to make the 75-ohm RCA connection“



Wolfgang B. Thörner, WBT- Managing Director

STEREO: Mr. Thörner, what prompted you to make such a radical break with your previous product philosophy in the segment of RCA plugs?

Thörner: The differences are not as dramatic as they might seem. The main elements in the WBT philosophy are also part of the 0110: such as the generation of a high contact pressure on the ground side using a locking clamp mechanism - and this aspect is even more important in the new concept than in the older models with large-surface contact areas. In addition, the new range of plugs is also fitted with a sturdy strain relief device, and the ample space inside the plug enables even non-professional cable customisers to create a perfect electrical and mechanical cable connection. Ultimately, however, the primary motivation for the development of the 0110 was a purely technical one: the key objective was to finally make an RCA connection with a characteristic impedance of 75 ohms. When we began working on the new concept, we didn't expect it to possess other benefits that would also supply superb sound transmission properties - but we're naturally extremely pleased about these "side effects".

STEREO: The new range really does offer clear advantages compared to your previous models. What effects will this have on the WBT product range? Doesn't Nextgen signal the end of the road for your conventional RCA connectors?

Thörner: In our view, the Nextgen range supplements our existing delivery range - it doesn't make our other RCA plugs obsolete. The familiar solid metal plug versions have lots of fans all over the world, and we intend to continue providing them with products of proven quality.

STEREO: The first serial models of the 0210 socket to match the 0110 are already available. How will the insights you have gained in the interconnect segment influence the other product segments - loudspeakers, for example?

Thörner: The requirements for loudspeaker connections are not the same, as speakers have to handle totally different kinds of signals: the currents and voltages are higher by many orders of magnitude, while the impedance levels are correspondingly lower. However, you wouldn't be wrong in assuming that we are looking very closely at the options for adapting the Nextgen technology to suit requirements in this area. We've already made initial progress, and I don't think I'd be giving too much away if I say that we intend to extend our product range in this direction. Strictly speaking, we already have a loudspeaker connector in our product range - the sandwich spade; like the Nextgen, it uses pure copper as a contact material - in this particular case with a stainless steel strengthener.



The closed cylindrical ground conductor around the inner conductor had to go. The project would not have been feasible with this arrangement. The result is that the new WBT 0110 has a ground connection which appears to have been drastically downsized: a narrow lug contacts the socket at just one defined point. The conventional solid metal plug element would not have been able to achieve the necessary increase in "breadth": so it had to make way for a new solution with totally neutral characteristics in terms of electrical field effect: and this meant plastic. The main body of the 0110 consists of an ingenious arrangement of three moulded parts made of the high-tech materials "Ultramid" and "PEEK". Both materials boast high mechanical strength, and the latter also possesses excellent resistance to heat - after all, the plug still needs to be soldered to the cable without suddenly melting away.

Next question: if

ring about if we take a closer look at the overall transmission route rather than focusing exclusively on cables and plug. In other words, we need a socket that doesn't undo all our efforts - as is the case with all the conventional sockets, which naturally face the same geometric problems as the corresponding plugs. And this is why WBT developed "Nextgen" as an integrated system also comprising the "0210" - an RCA socket that finally allows the "75-ohm trick" to do its job. The innovative feature of the socket is the design of its ground contact: it consists of two foil elements attached to a plastic core, and

ing as a team.

It more or less goes without saying that the design of the 0110 and 0210 models offers several major advantages - such as the reflection-free transmission of digital signals - and the drastically reduced metal content promises clear-cut sound-based benefits, also with low-frequency applications: these benefits range from a noticeable reduction of undesired capacitance between the metal parts of the two "poles" to a reduction in the volume of eddy current losses (which are

explained in the box below). Due to

the lack of appliances with matching sockets, we have not yet been able to actually hear the advantages

of the correctly impedance-matched digital connection, but we have sampled the benefits of the plugs on their own in pure interconnect mode. We would like to thank HMS once again for lending us five sets of "Gran Finale" audio cable. You can read about which plugs - alongside the "0110 Cu" and "0110 Ag" - were mounted on these cables at the end of the article.

Sound variations between plugs? Not exactly news to us, but to be on the safe side, the two plugs we selected for our audio test input were models we hoped would certainly produce noticeable differences: WBT "old" versus WBT "new" - both in the copper version. And we didn't need to cross our fingers, as the difference we heard after changing the plug on the 0110-equipped

the extremely ingenious geometry of the socket ensures that the 0110 only ever contacts one of these foils - regardless of the position in which the plug is inserted.

What's more, WBT has even found a way to ensure that both the new plug and the socket are compatible with all standard RCA connectors, although they naturally only play to their full potential when work-

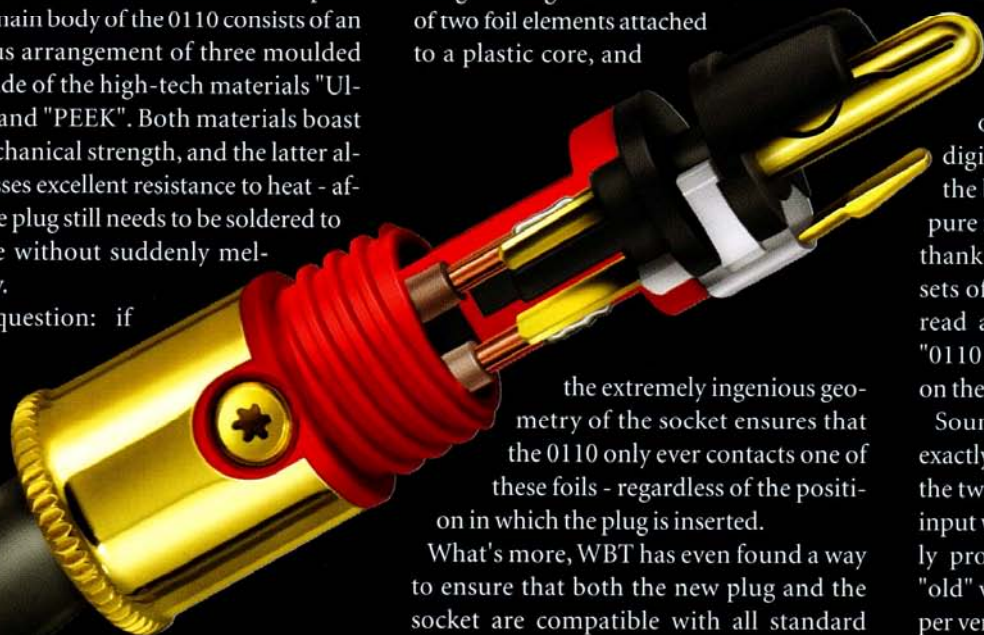
All about „Eddy“?

Little attention paid to eddy currents in audio connections to date

Looked at in detail, the transmission of electrical signals is not quite as simple as it might appear. Although the statement that "current flows along a wire" is correct in principle, there are many more pieces of wisdom that are of relevance in this connection. And we owe most of them to the Scottish physicist James Clerk Maxwell, whose 1876 publications on the relationships between electrical and magnetic fields are as valid today as they ever were. Every electrical field generates a magnetic field - and vice-versa. This is, roughly speaking, one of Maxwell's core statements, and it also applies to the current flowing through the signal conductor of an RCA plug. This field spreads cylindrically to enclose the conductor and has, in turn, an influence on the metallic sleeve of the plug, which once again - you guessed it - generates

an electrical field. What is more decisive from our point of view, however, is the fact that the magnetic field of the inner conductor "induces" an electrical current in the sleeve. In principle, this is a kind of transformer which "decouples" part of the power of the useful signal - which is then lost for the process and signal transport and even has memory effects which interfere with this process - as a transformer does not work at infinite speed. The task is either to "break up" the currents flowing on the sleeve jacket - and trials were conducted at HMS for this purpose using slotted connector sleeves, for example - or to prevent them from occurring in the first place. This is the route taken by Thörner with his extremely thin-walled aluminium sleeve in the 0110. Due to the low inductance,

this arrangement draws off only a very small amount of energy from the magnetic field of the inner conductor. A true non-conductor would be even more effective, but this would also "nix" the shielding effect.



0110 right

down to the sleeve:

it's easy to recognise the two wide-apart contacts - and this facilitates cable customising

plastic is to play the leading part, is it still necessary to use mechanically stable but electrically rather "imperfect" conductor materials like gold-plated brass?

The answer was no, even if WBT had to do a few contortionist-like tricks to bring pure copper and solid silver into a shape that is up to the job for the duration.

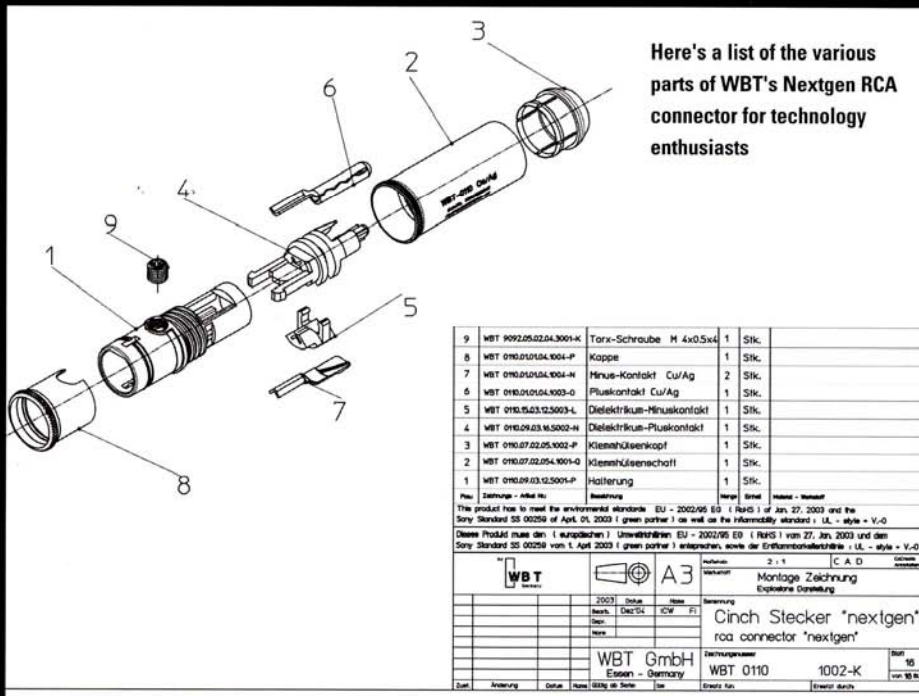
KEYWORD

Punch bending technology
The input material is a thin metal sheet from which the required contour is punched out. The press then forces the part into the desired shape.

The new contact elements are made via a "punch bending process" and leave the task of taking up the mechanical strain to the moulded plastic components of the "0110". As indicated above, they are available in two versions: a Cu version with gold-plated copper

for just over 25 euros apiece and with solid silver contacts (version Ag) for 42 euros per plug.

At the same time, however, the whole impedance business is only worthwhile bothe-



Here's a list of the various parts of WBT's Nextgen RCA connector for technology enthusiasts

Pos.	Bestell-Nr.	Bezeichnung	Material	Menge	Einheit
9	WBT 9092.05.02.04.3001-K	Torx-Schraube M 4x0,5x4	Stk.	1	Stk.
8	WBT 010.01.01.04.1001-P	Kappe	Stk.	1	Stk.
7	WBT 010.01.01.04.1001-N	Minus-Kontakt Cu/Ag	Stk.	2	Stk.
6	WBT 010.01.01.04.1003-O	Pluskontakt Cu/Ag	Stk.	1	Stk.
5	WBT 010.5.03.02.5003-L	Dielektrikum-Minuskontakt	Stk.	1	Stk.
4	WBT 010.08.03.04.5002-N	Dielektrikum-Pluskontakt	Stk.	1	Stk.
3	WBT 010.07.02.05.1002-F	Klemmhülseknopf	Stk.	1	Stk.
2	WBT 010.07.02.05.1001-O	Klemmhülseknopf	Stk.	1	Stk.
1	WBT 010.09.03.02.5001-P	Halterung	Stk.	1	Stk.

This product has to meet the environmental standards EU - 2002/96 EG (RoHS) of Jan. 27, 2003 and the Sony Standard SS 00258 of April 01, 2003 (green partner) as well as the information standard UL - style - V-0.

Dieses Produkt muss den (europäischen) Umweltschichten EU - 2002/96 EG (RoHS) vom 27. Jan. 2003 und dem Sony Standard SS 00258 vom 1. April 2003 (green partner) entsprechen, sowie der Informationsvorschrift UL - style - V-0.

WBT	A3	Montage Zeichnung	2 x 1	C A D
Cinch Stecker "nextgen"				
rca connector "nextgen"				
WBT GmbH	WBT 010	1002-K	10	10
Essen - Germany				

HMS cable required little or no concentration: the new plug improved the sound quality considerably. The overall musical performance suddenly took place in front of a far more tranquil background. It was almost as if someone had increased the signal-to-

model", the Clearaudio model, removed any doubts: the era of the solid connector seems to be drawing to a close. There were also measurable differences in sound quality between the 0101 and the Mid-MPC: the WBT gave a more dynamic and sharper

The audio test showed that lots of metal is not good for sound quality. The "downsized" plugs produced audibly better results

noise ratio in the chain by at least 20 decibels. The spatial quality of the sound was noticeably deeper than before, and the bass seemed to have an extended downward reach of half an octave. How could this be? Was our cable with the 0101 defective? The comparison test using another "heavy metal

performance, while the Clearaudio had a more relaxed feel. In this respect, it was similar to the "plastic WBT". The gold-plated model from the Erlangen-based company also generated a noticeably different spatial effect: slightly more depth than the "old WBT" but not as much breadth. But another listen to the setup with the new WBT plugs provided the benchmark that put all this back into perspective: even the Clearaudio didn't stand a chance against WBT's combination of smoothness, power and definition.

In the next round, we looked at whether the not insubstantial added investment in



The transparent "demo version" of the interior of the Nextgen socket clearly shows the wire routing

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- Australia** Audio Dynamics Pty. Ltd. info@audiodynamics.com.au
- Belgium** Greenwich Electronics SPRL greenwich@wanadoo.be
- Canada** Just May Audio Inc. justmayaudio@hotmail.com or sales@justiceaudio.com
- Croatia** ileana d.o.o. audio art info@audio-art.net
- Czech Republic** Servis Elektro - Jan Cerný office@serviselektro.cz
- Denmark** L C Audio Technology ApS mail@lcaudio.dk
- France** BC Acoustique S.A.R.L. bruno.roux@bc-acoustique.com
- Greece** Exclusive-Audio Y. Poutous & Co. poutous@spark.net.gr
- Hong Kong** Elephant Holdings Limited inquiry@elephant.com.hk
- Japan** TEAC Corporation Consumer Products hi-end@ho.teac.co.jp
- Korea (ROK)** K-One AV Corporation sam.park@bestav.com
- Malaysia** Wisma Audio Centre wismaaudio@hotmail.com
- New Zealand** Denco Audio Ltd frank@dencoaudio.co.nz
- Norway** Norwegian Custom Media Solution as info@ncms.no
- Portugal** AJASOM, comércio e indústria de som, lda. ajasom@ajasom.net
- People's Rep. of China (PROC)** Laco HiFi Co., China laco@lacohiend.com
- Republic of China (ROC)** Sound Ray Electronics Ltd. soundray@ms19.hinet.net
- Russia** AudioSphere Company (Qvinta) info@qvinta.ru
- Serbia and Montenegro** BM office@bm.rs
- South Africa** Lowveld Audio goodhifi@soft.co.za
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the pure silver version of the 0110 is a worthwhile one: let's not forget that we're talking about a healthy difference of 66 euros per set of four plugs. Depending on requirements and point of view, it may or may not be worth spending the extra money: the silver model should be able to tweak out the occasional breathing sound or a few other details - and it creates a slightly different spatial effect than the gold-plated copper contact: the pure silver version has a slightly deeper feel and builds up a wonderfully semicircular stage. The "normal" 0110, on the other hand, has a greater lateral reach beyond the sides of the speakers and supplies a slightly more sonorous and pleasing tone. You need to hear them both to decide which model is preferable for your surroundings.

KEYWORD

Cu / Ag
 "Cu" is the standard international abbreviation for copper and comes from the Latin "Cuprum". "Ag" stands for "Argentum", the Latin word for silver.

In terms of pure tonality, we tended to prefer the copper.

Then we moved on to the "big rival" of the WBT 0110, the Bullet Plug. HMS had fitted the silver version to

our test cables, and we expected the design parallels with the Nextgen to produce certain tonal similarities - and these similarities are indeed present. Like the 0110, the Eichmann connection generates an extremely "black" background. It avoids any kind of nervousness and gives a dynamic performance which can be said to be on a par with that of the new WBTs. In terms of tonality, it



The first series is currently being produced: the Nextgen 0210 socket is the logical partner for the 0110 plug. Central feature - the ingeniously designed ground contact

that of the WBT; the only property it could not quite match was the remarkable ability of the copper WBT to create a truly correct portrayal at the higher levels. It is without doubt, however, one of the winners of this comparative test, underlining the fact that the tonal superiority of the new connector concepts is due to their design principles.

In addition, it must be taken into consideration that the differences in sound quality were recorded using "normal" RCA outputs which partly counteracted the eddy current-reducing effect of the WBT 0110 and

The traditional RCA connection is handing over the baton to the next generation: WBT and Eichmann are setting the new standards

is - interestingly - quite close to the copper 0110, and it also possesses the same earthy, tangible character. At rare intervals, the silver was apparent only in the very slight increase in the carrying power of voices and percussive elements. For practical purposes, the precision of its breadth is equivalent to

Eichmann plugs. We can only forecast what the result would be if the driving and receiving units were also fitted with the Nextgen socket: there would certainly be an added gain in tonality - and, of course, more work for the custom cable professionals.

EICHMANN BULLET PLUG

Approx. € 55/€ 129 (Cu/Ag) / set of four

Cable manufacturers have a love-hate relationship with this plug: although the Bullet Plug was considered the state of the audio art until the WBT 0110 came onto the scene, the makeshift-looking plastic plug is a nightmare when it comes to cable customising. Some manufacturers even freeze the Bullet Plug to make sure it survives the soldering process. Like the WBT plug, it is available in a gold-plated copper version or with solid pure silver contacts. A really good plug, but only recommended for users well versed in soldering.



CLEARAUDIO MID-MPC

Approx. €78 / set of four

The Clearaudio Mid-MPC is the second model in the plug family of the Erlangen-based company. Its brother, the "big" MPC, is fitted with a spring-based inner contact made up of a multitude of "wires" designed to ensure optimum contact of the inner conductor. This far more reasonably priced version was developed to do the same job: its central contact is a sleeve with multiple slits forming several "contact springs" designed to perform a function comparable to that of its "big brother". In mechanical terms, the Clearaudio is certainly a product of the very highest quality.



WBT 0101

Approx. €92 / set of four

It was this classic plug in the WBT product range that laid the foundation for the comet-like rise of the company. It was equipped with a locking feature to clamp the ground contact in place - a first in the industry, which had never seen an RCA plug of such precision design and sturdy construction. It is these properties that underpin the still widespread use of the 0101 today - even if its successors are beginning to make life difficult when it comes to the quality of sound reproduction.

