

T+A

CRITERION TCD Loudspeakers



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Actually we're scientists ...
because T+A stands for Theory and Application in the field of audio technology. That means that we conceive, refine and manufacture Hi-Fi components of the very highest quality, with the aim of developing consummate High-End products for our customers all over the world. Since 1978 our enterprise has been based at Herford in Eastern Westphalia, and this is the focal point of all our thoughts and actions. When considering our products we set ourselves no limits, and spare neither cost nor effort in order to achieve perfection in sound. The results speak for themselves in our products: extremely long product cycles, extended lifespans and a wide range of retro-fit options make a T+A system a sound investment for the future.

CRITERION

The audiophile standard

T+A found success with its speakers from the very start. In 1982 the decision was made to develop a unique and truly ground-breaking series of loudspeakers; distinctive speakers which were intended to stand out from all other conventional units in terms of sound quality, appearance and technology. We named this series CRITERION - benchmark - and this marked the birth of one of the most successful loudspeaker ranges in our industry. Since their introduction the name of CRITERION has become a byword for unusually high-performance loudspeakers equipped with unique and superior technologies, which also offered extraordinarily good sound. TMR 160, T 160, TB 140, TAL X1.1 and TS 300 are just a few examples of speakers which caused tremendous excitement, and set new standards over a period of many years. From the outset we have always placed tremendous importance on top-quality sound and the latest technologies, and that is why all our speaker ranges have enjoyed unusually long production cycles; they remain more than competitive even after production has stopped. The TCD series presented here now supersedes the TL range after more than five years of production. We have no interest in the usual annual round of "new products"; instead we don't introduce a new range until we are confident that our advances have resulted in tangible improvements!

You can therefore be sure that our TCD series incorporates important improvements and further developments in all aspects. Naturally we have remained true to the unique and superior transmission-line principle for our floor-standing speakers, but have once again succeeded in enhancing the effectiveness of the line through our cabinet design, which in turn has further lowered the lower cutoff frequency and increased deep bass output.

The cabinets are based on an enclosed internal case to which the substantial side panels - up to 30 mm thick - are permanently bonded. This makes the cabinets very heavy as well as extremely rigid, and totally eliminates resonance effects. The side panels are finished in selected veneers of the very highest quality, with an option of semi-matt or high-gloss lacquer, both harmonising perfectly with the high-gloss top covers of black safety glass. The mid-range drivers are housed in separate, airtight chambers which, together with the transmission line guides, provide additional stiffening inside the cabinets.

The Criterion loudspeaker drive units are based on those used in our High-End SOLITAIRE® series. The free air resonance of the bass units is very low, making them very well suited to the bass-tuned transmission lines. The net result is that even very low bass signals at high levels are reproduced in an extremely clean, precise manner. The speakers feature paired mid-range units of superb quality in the D'Appolito arrangement, combined with Waveguide dome tweeters - a completely new development - which exhibit precisely defined radiation characteristics. This behaviour is constant over the full frequency range, and largely eliminates the influences of the listening room. The Waveguide (sound guide) of our high-frequency dome unit is accurately calculated, and ensures that the lateral radiation characteristics match those of the mid-range units in the transitional frequency range. This provides an enormous improvement in the speakers' imaging qualities and positional accuracy, enabling them to reproduce the finest details with incredible definition and transparency. These qualities explain the designation of our series: T means Transmission-line and CD means Constant Directivity!

CRITERION TCD 110 S

Floor-standing speaker



The TCD 110 S is the flagship of the CRITERION series, and reflects in an exemplary manner the basic principles behind the three floor-standing loudspeakers of the TCD series. Each model features two special bass drivers, two mid-range units in the D'Appolito arrangement, and a completely new kind of super-quality dome tweeter with waveguide. The drivers employed are based on those fitted to our SOLITAIRE® high-end speakers. The only differences between the three floor-standers are their physical cabinet dimensions and the size of the drive units employed.

The TCD 110 S is a large, fully developed, floor-standing transmission-line speaker with a very long line. The two 26 cm bass units are perfectly matched to the cabinet and the resonance frequency of the transmission line, and generate an incredibly deep, precise, high-pressure bass thanks to their extremely low natural resonance. The loudspeaker's transient response is superb even at extreme levels; it also has a wide dynamic range and is devoid of distortion. This is due to the refined design of the system as a whole: hard, embossed cones, aluminium baskets with narrow struts and very high excursion capability, ultra-powerful magnets and large, high-performance coils. These drive units are also fitted to our high-end SOLITAIRE® CWT 2000 loudspeaker!

Two 17 cm mid-range units and the waveguide high-frequency dome form an acoustic unit which we have designated CD = Constant Directivity. The mid-range units are ingenious designs which effortlessly cover the full vocal range from 200 to 2200 Hz, while their dynamic, lively nature creates an amazingly natural sound. The same units are also fitted to the SOLITAIRE® CWT 2000. The use of two mid-range drivers helps to optimise the speaker's radiation characteristics, as well as dramatically increasing their ability to handle high levels, because the excursions required for each individual driver are halved. The woven dome handles even the most severe dynamic peaks in a swift, airy manner without any trace of hardness or sharpness. On the one hand the large waveguide perfectly links the unit's radiation characteristics to those of the mid-range drivers, and at the same time causes a timing delay in the tweeter response, providing a further improvement in transitional behaviour. The sophisticated double-sided three-way crossover unit (FSR) is a no-compromise design, assembled using the finest close-tolerance components for minimal losses. The circuits are optimised for best possible transient and frequency response, and effortlessly process even the highest signal levels, ensuring that the three frequency ranges are matched perfectly to the drive units. This component plays a crucial role in the superb imaging and radiation qualities of the system as a whole.

CRITERION TCD 210 S

Floor-standing speaker



In principle the three floor-standing speakers of the TCD range share the same construction: each model features two special low-frequency drivers, two mid-range units in the D'Appolito configuration, and a completely new type of high-end dome treble unit with Waveguide. The sole differences are their size and their internal components. The TCD 210 S is the second largest speaker in the TCD series, and is of very similar construction to the top model, the TCD 110 S; their internal mid-range / treble components are actually identical. The TCD 210 S is a no-compromise floor-standing transmission-line speaker fitted with a very long transmission line. Two massive 22 cm bass units with low natural resonance are accurately tuned to this line, and their extremely hard, embossed cones generate unbelievably low, accurate bass at very high sound pressure. The same drive units are also employed in our High-End SOLITAIRE® loudspeaker speaker line!

The pair of 17 cm mid-range units and the Waveguidedome tweeter form an acoustic unit which we have designated CD = Constant Directivity. The mid-range units are ingenious designs which effortlessly cover the full vocal range from 220 to 2200 Hz, and their dynamic, lively nature creates an amazingly natural sound. The use of two mid-range drivers helps to optimise the speakers' radiation characteristics as well as dramatically increasing their ability to handle high levels, because the excursions and power handling required of each individual driver are halved. The woven dome handles even the most severe dynamic peaks in a fast, airy manner, without any trace of hardness or sharpness. On the one hand the large Waveguide perfectly matches the unit's radiation characteristics to those of the mid-range drivers; at the same time the rear-mounted coil causes a timing delay in the tweeter response, matching the midrange units for a further improvement in phase response of the speaker.

The sophisticated double-sided three-way crossover unit (FSR) is assembled using the best available components. Accurately calculated, optimised for best transient and frequency response, the circuit effortlessly processes even the highest signal levels, and ensures that the three frequency ranges are matched perfectly to the drive units. This crossover plays a crucial role in the superb imaging and radiation qualities of the entire system.

CRITERION TCD 310 S

Floor-standing speaker



The TCD 310 S is the medium sized floor-stander in the TCD series, although it extends to a good metre high, so it is not really small. It is of very similar construction to the TCD 210 S; just the mid-range and bass units are slightly smaller.

The TCD 310 S is another fully developed transmission-line floor-standing speaker with a very long line. Two 17 cm bass units with low free air resonance are accurately tuned to the transmission line, and their extremely hard, embossed carbon cones generate very deep, accurate bass at high pressure.

Two 15 cm mid-range units and the Waveguide high-frequency dome form an acoustic unit which we have designated CD - Constant Directivity. The mid-range units are ingenious designs which effortlessly cover the full vocal range from 250 to 2200 Hz, and their dynamic, lively nature creates an amazingly natural sound. The use of two mid-range drivers helps to optimise the speakers' radiation characteristics as well as dramatically increasing their ability to handle high levels, because the excursion and power handling required of each individual driver are halved. The same superb drive units are also employed in our SOLITAIRE® CWT 2000 speaker.

The woven dome handles even the most severe dynamic peaks in a fast, airy manner, without any trace of hardness or sharpness. On the one hand the large Waveguide perfectly links the unit's radiation characteristics to those of the mid-range drivers, and at the same time causes a timing delay in the tweeter response, providing a further improvement in transitional behaviour.

The TCD 310 S is fitted with a sophisticated double-sided three-way cross-over unit (FSR). The circuit effortlessly processes even the highest signal levels, and ensures that the three frequency ranges are matched perfectly to the drive units. The impressive imaging and radiation qualities over the full frequency range are directly due to the design of this cross-over unit.

The curved cabinets offer more than just an elegant appearance - their construction provides enormous rigidity and strength: the side panels are bonded permanently to the inner case and the internal sound guides of the long transmission line. These measures helped to achieve even greater dynamic range and higher pressure in the extreme bass.

CRITERION TCD 315 S

Floor-standing speaker



High gloss Carbon 93

With a height of just 85 cm, the TCD 315 S is the smallest and slimmest floor-standing speaker in the TCD series. Its construction is very similar to that of the other floor-standers; the speaker is fitted with the same mid-range and treble drivers as the TCD 310, while the bass units are simply a little smaller. In spite of its small stature, the TCD 315 S constitutes another fully mature speaker with a very long transmission line, which is folded several times within the cabinet. The two 15 cm bass units with low natural resonance are matched accurately to the transmission line, and their extremely hard, embossed carbon cones generate very low, accurate bass at high pressure.

The 15 cm mid-range unit and waveguide dome tweeter form an acoustic unit which provides constant radiation characteristics in the transitional area between mid-range and treble (CD = Constant Directivity). The waveguide dome is positioned below the mid-range driver, and this, combined with the carefully calculated design of the crossover unit, creates an acoustic axis in the mid / treble range which rises with increasing distance from the speaker, thereby compensating for the speaker's low height. The result is brilliant reproduction of the mid / treble range in the area well above the cabinet itself.

As in the TCD 310, the mid-range driver provides perfect coverage of the full vocal range from 320 to 2200 Hz, while its sparkling, dynamic nature creates an amazingly natural, lively impression. This superb drive unit is also employed in the SOLITAIRE® CWT 2000.

The woven dome of the waveguide tweeter provides a swift and airy response, and reproduces huge dynamic peaks without any trace of hardness or sharp edge. The large waveguide has a dual purpose: it perfectly matches the radiation characteristics of the treble unit to the mid-range drivers, and at the same time produces a time delay in the treble unit, thereby further improving the speaker's transitional behaviour.

The sophisticated, double-sided three-way crossover unit (FSR) is effortlessly capable of handling extremely high levels, and ensures that the three frequency ranges are distributed precisely, as well as accurately generating an acoustic axis with a slight upward inclination. The impressive imaging and dispersion characteristics over the entire frequency range are directly due to the design of the crossover unit.

The curved cabinets are built on exactly the same principle as the other floor-standing loudspeakers, and - like them - are very heavy, and tremendously rigid and strong.

CRITERION TCD 410 R

Bookshelf speaker



The TCD 410 R is a compact, medium-sized bookshelf speaker which can also be stand-mounted. It is a classic two-way design, and manages the feat of combining the delightful tonal and spatial characteristics of the compact two-way speaker with the bass response and deep bass dynamics of larger floor-standers. As with all TCD models, the cabinet is extremely solid and resonance-free, because it consists of a rigid internal case permanently bonded to the side panels.

For the two-way system of the TCD 410 R we have developed a 17 cm bass / mid-range driver which offers superb dynamic qualities in the bass range as well as operating effectively in the mid-range, with a completely unfettered, uncoloured and open character. This unit also features our GREYCONE® cone. This consists of air-dried wood fibres and graphite particles, producing an extremely stable, highly damped, amorphous material which eliminates any systematic propagation of structure borne sound in the cone.

To prevent any form of resonance and break-up in the extremely critical mid-range area, the cone incorporates carefully defined slots which are sealed with a special adhesive; this not only stiffens the cone, but also prevents all partial vibration. An optimised phase plug made of machined aluminium ensures homogeneous radiation characteristics up to 4000 Hz and above. The low-profile surround provides good damping, guarantees accurate excursion characteristics and also perfect roll-off and transition qualities in the mid-range / treble-range. The huge magnet forms a perfect unit with the rigid die-cast basket. This unique driver endows the entire vocal range with an incredibly musical and pleasant character.

Naturally the Waveguide dome tweeter is employed for the high frequency range. These two drivers harmonise together perfectly, creating tremendous detail fidelity and imaging accuracy. Massive bi-amping terminals, an extremely low-loss cross-over unit with a new form of low-saturation, low-distortion coils, and an accurately tuned bass reflex system are important constituents of this surprisingly powerful small loudspeaker.

CRITERION TCD 510 C

Center speaker



Centre speakers are of crucial significance to the sound quality of surround systems, and their importance is very often underestimated. That is why we decided to develop a completely new centre unit. The main problem inherent in conventional centre speakers is their radiation pattern, and we have produced an elegant solution with the intelligent use of special drive units. All centre speakers fitted with two bass / mid-range units and a dome tweeter share the problem of severe interference effects in the mid / treble range, and this affects their spatial imaging characteristics in particular, causing the sound image to become less natural. To cope with this problem our developers came up with an ingenious answer: the mid / high-frequency range is reproduced by a special co-axial system which consists of a 15 cm mid-range driver with a highly damp-ing cone, fitted with a centrally located 25 cm woven dome tweeter. This unit has a constant dispersion angle and eliminates any hint of localised interference effects. At the same time the cone acts as a waveguide on the dome tweeter, generating the same sound characteristics as our other TCD loudspeakers. This means that the speaker blends perfectly with any speaker configuration in a surround set-up.

We deliberately developed the TCD 510 C with the emphasis on excellent dynamic characteristics and good stability under load, because these aspects play a vital role in rendering speech as comprehensible as possible - an absolute must in any high-quality surround system. At the same time we insisted that the speaker should combine modest physical dimensions with an ability to satisfy requirements for high performance. Many centre speakers are so large that they are very difficult to accommodate in the listening room. Our aim was therefore to develop a centre speaker capable of exploiting to the full the quality potential of high-resolution digital surround systems, and yet of relatively discreet dimensions. The TCD 510 C is equipped with two 150 mm bass units with extremely hard cones, very low resonance frequency, high-performance magnets and very high excursion capacity. These features ensure that the TCD 510 C not only generates tremendously impressive deep bass, but also offers outstanding transient handling, remaining totally clean, comprehensible and distortion-free even at very high levels. These characteristics are precisely what is required for a centre speaker. The TCD 510 C ranks as a genuine full-range 3-way loudspeaker which effortlessly fulfils the elevated requirements made on centre speakers.

CRITERION TCD 610 W SE

Active subwoofer



This active subwoofer is yet another completely new development. Its amplifier is based on the overall design of our switch-mode output stages of discrete construction (they do not employ standard off-the-peg chips), which have already proved to perform superbly in our TCI active loudspeakers. The amplifier offers unsurpassed dynamic abilities and speed, and its power reserves and sound qualities are equally impressive. An output of more than 1000 Watts is available, and the amplifier is directly coupled to a pair of special 26 cm drivers of very low resonance frequency, capable of enormous excursions. The net result is an exceptional standard of deep bass reproduction and tremendous stability under load - a combination which has never been achieved before. We have equipped the active unit with a modern signal processor which controls the whole system; automatic calibration to match the listening room is possible using the microphone supplied in the set. The calibration software, which is an in-house development, also offers the option of using a PC to calibrate the sub-woofer's output and frequency response to suit the listening room to match individual preferences. The remote control handset included with the speaker has many useful set-up facilities, such as user-variable limit frequencies and continuous level and phase control from the listening location. As you would expect, the TCD 610 W also features a sophisticated protective circuit and automatic power-on facility.

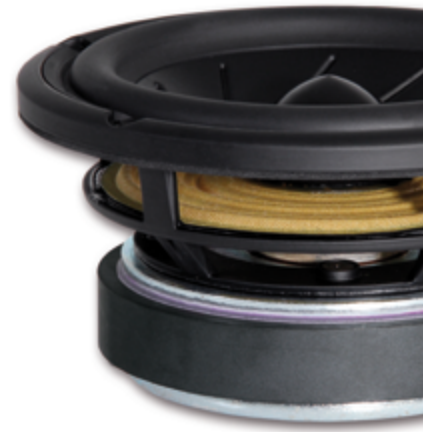
The remote control handset also supplied provides facilities for many useful adjustments from the listening position, such as variable limit frequencies and continuous level and phase control. Naturally the TCD 610 W SE also features comprehensive protective circuitry and an automatic power-on function.



Technology

The mid-range drivers are real power-packs with dynamic characteristics which are usually the preserve of PA (public address) equipment. We have equipped them with our unique GREYCONE® cones, which consist of air-dried wood fibres and graphite particles, producing an extremely stable, highly damped, amorphous material which eliminates any systematic propagation of structure borne sound in the cone. To prevent any form of resonance and break-up in the extremely critical mid-range area, the cone incorporates carefully defined slots which are sealed with a special adhesive; this not only stiffens the cone, but also prevents all partial vibration. The low-profile surround provides good damping, guarantees accurate excursion characteristics and prevents reflections. A carefully optimised phase plug made of machined aluminium ensures excellent radiation characteristics in the upper frequency range. These unique drive units endow the entire vocal range with an incredibly musical and pleasant character.

The dynamic requirements on the mid-range drive units are very high, since the high-frequency drivers and bass units display superb characteristics. For this reason the mid-range drivers of the TCD speakers are amongst the most sophisticated available today. The outstanding features of these superb units are an enormous magnet of sophisticated design, a large coil, a cone with embossed stiffening patterns for effective damping, a flat spider with linear excursion and a rigid, torsion free die-cast aluminium basket. They boast perfect radiation characteristics and handle the full vocal range without any hint of coloration.



Midrange driver TCD 310 S



Coaxial midrange / tweeter TCD 510 C



When the parameters of a transmission line are correctly chosen, the result is a combination of effective damping of the free air resonance of the drive units and a considerable gain in sound pressure at low frequencies. The resonance frequency of the line and that of the bass driver must coincide exactly in order to achieve optimum cone excursion and transient characteristics. This requirement calls for a major investment in the design of the drivers and cabinets, especially with the very low tuning which we achieve. The cones feature an impressed stiffening texture which prevents distortion even at very high acceleration and level. The big, well damped surround provides accurate cone displacement and permits greatly extended excursion. The result is that the speaker is capable of generating tremendously deep, dynamic and clean bass which is unique for this size of cabinet.

The Waveguide tweeter of the TCD series is totally unique and unrivalled: it features an extremely sophisticated magnet system driving a 25 mm coil with a woven dome. We have a marked preference for woven domes over any form of metal equivalent, because fabric provides much better damping, and displays no resonance effects. High-frequency sound in the rear chamber is reduced to zero by a specially designed asymmetrical reflector, while the supplementary Waveguide provides optimum matching to the mid-range driver in terms of sound pressure and radiation characteristics, with the result that a constant radiation pattern is achieved. At the same time the rear-mounted coil causes a timing delay in the tweeter response, providing a further improvement in transitional behaviour in the mid-range / high-frequency area.

Waveguide-dometweeter



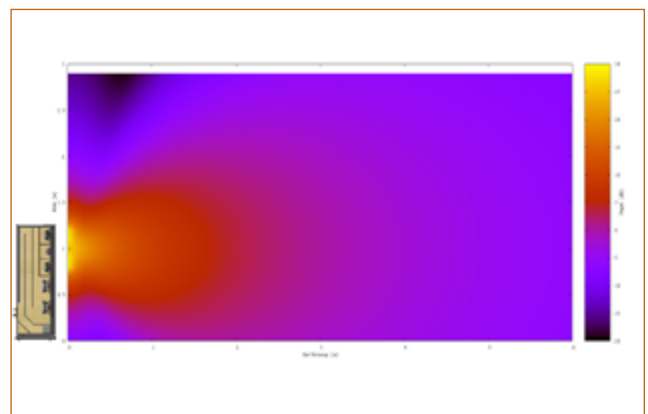
Midrange driver TCD 110 S and TCD 210 S

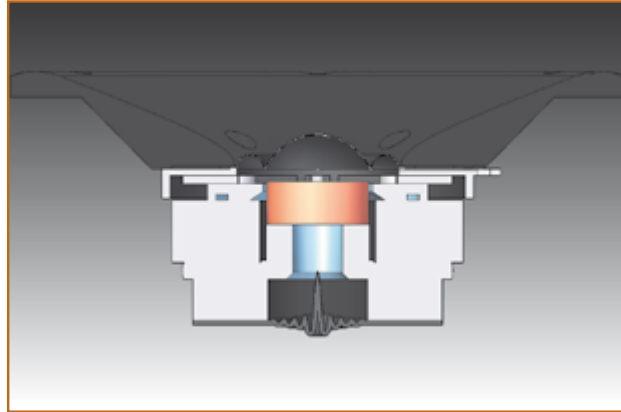


More on the technology

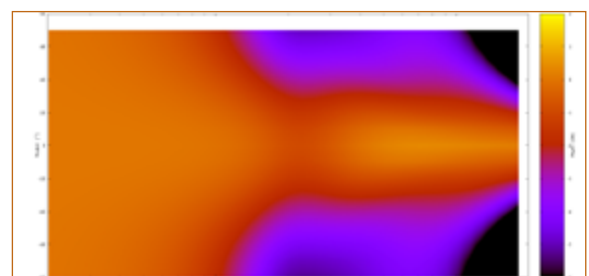
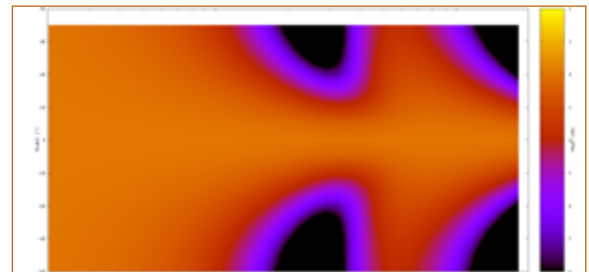


The two mid-range drivers and the Waveguide tweeter are installed in the D'Appolito arrangement, and the illustration printed alongside show how this works: interference effects cause the energy to be concentrated vertically, preventing the reflection of radiated sound components from the ceiling and floor; this in turn avoids indirect sound adversely affecting the signal. The radiation pattern of the Waveguide high-frequency driver is the same as that of the two mid-range units, producing a homogeneous listening zone, devoid of indirect sound, positioned in front of the loudspeaker.





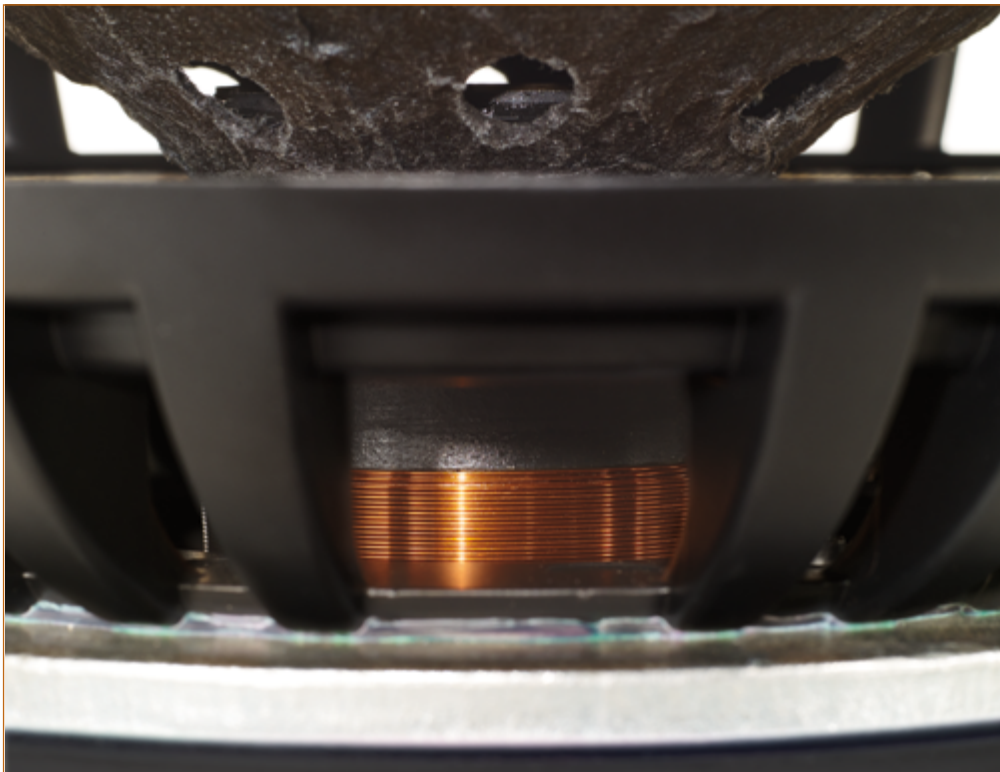
The radiation pattern of conventional mid-range / high-frequency combinations varies greatly with frequency: mid-range drivers are characterised by a very wide dispersion angle in the low mid-range, with an increasingly concentrated pattern at higher frequencies; high-frequency drivers have similar characteristics. The result is a drastic difference in dispersion patterns at the transitional frequency between mid-range and high-frequency, where the mid-range unit radiates a concentrated sound, but the treble unit has a wider pattern (top picture). That is why the sound guide of our Waveguide tweeter is designed specifically to produce a homogeneous dispersion pattern precisely at the transitional frequency, with the result that the imaging and sound stage remain stable, with no tendency for sudden changes at a particular frequency (bottom picture).



More on the technology

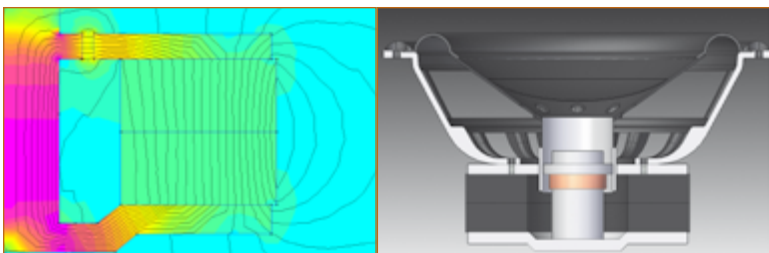


The TCD 610 W SE features huge power reserves in the deep bass range. The mechanical stress acting upon the bass drivers of a sub-woofer are gigantic, and rise rapidly as the frequency diminishes. At high volume levels the drive units can easily approach their mechanical performance limits - especially if driven by high-power output stages. Although many sub-woofers are capable of producing high volume, they also generate very high levels of harmonic distortion and thereby lose their clarity. It is true that the human ear is relatively insensitive in this frequency range, but a trained and demanding listener very quickly detects poor bass quality. For this reason we have developed a completely new and very special "State of the Art" drive unit for the SE version. This unit has outstandingly good mechanical characteristics, and does not reach its limits even at extreme levels and cone excursions! The cast aluminium basket is completely immune to torsional stress. It is constructed with many narrow struts in order to avoid air turbulence, and is designed to allow the use of special long-throw cone surrounds and centring spider. The large, flat centring spider is made of specially impregnated woven material, and accurately centres the voice coil in the air gap, while the long-throw synthetic rubber suspension guides the cone completely straight, without wavering, even at very high travels. The four-layer voice coil is made of high-purity copper, wound on a black-anodised aluminium carrier, and finished with a baked, heat-resistant, high-temperature lacquer. The cone is produced from a mixture of air-dried cellulose and carbon, and is extremely hard and torsionally rigid.



To obtain reproduction with minimum possible distortion, it is essential that the driving magnetic field should be constant. However, the current through the voice coil generates a dynamic magnetic field which modulates the static element of the permanent magnet, and this results in distortion. The special new sub-woofer employed in the SE version solves this problem by utilising a pole core which is highly saturated magnetically (shown in violet img. 1). This means that the core is no longer able to absorb any more magnetic flux, and the static field therefore does not suffer modulation. We deliberately decided against a hollow pole core; on the one hand to maintain high flux density in the air gap, on the other to ensure that the air displaced by the cone is forced through the air gap; this ensures that the voice coil is effectively cooled, helped by the solid, black anodised aluminium carrier. The pole core is extended upwards, promoting an extremely linear and symmetrical drive curve. To exploit this linearity the entire mechanical suspension has

been re-developed: it now permits 28 mm of travel in every direction, with-out any danger of the drive units striking their stops!



Img. 1



Two mid-range drive units and the Waveguide dome form an acoustic unit which we have designated CD = Constant Directivity. This concept is unique, and was perfected by our engineers in a complex series of simulations and measurements. The radiation pattern of loudspeakers varies with rising frequency, leading to an increased sound focusing effect with conventional drive units, with the result that the mid-range unit tends to be more directional with increasing frequency, and the tweeter unit more omni-directional in the crossover area between mid-range and treble. This results in inconsistent imaging, and a loss of positional accuracy. From experience with our SOLITAIRE® loudspeakers we are aware of the enormous sonic advantages offered by constant radiation characteristics in the mid / high-frequency area in terms of accurate positioning and good imaging. We have succeeded in this with our SOLITAIRE® speakers by investing enormous effort in the mid-range arrays and extended electrostatic units, which are designed to generate cylindrical waveforms. Naturally such sophistication does not come cheap, and can only be exploited in expensive loudspeakers. However, our development team has succeeded in achieving similarly good results with cone-based loudspeakers by taking an ingenious approach: the use of two mid-range drivers in the so-called D'Appolito arrangement results in energy compression in the listening area, and a reduction in sound radiation upwards and downwards, thereby reducing reflections from ceiling and floor. The 25 mm woven dome is fitted with a carefully calculated Waveguide (sound guide) whose depth and shape mould the radiation pattern in the transitional area to match that of the mid-range drivers. The net result is that the radiation characteristics of the tweeter and the mid-range units are very similar and homogeneous over the frequency range. This ingenious concept produces incredibly precise, dynamic reproduction with tremendously fine definition and excellent detail reproduction. The arrangement avoids the usual "step" in the sound image, producing a listening zone in which the sound and imaging characteristics are totally homogeneous. The system also offers another major advantage: it reduces overall distortion to an extreme extent, because even at very high levels the excursion of the paired mid-range units is not great, and at the same time the dome's Waveguide causes a considerable gain in sound pressure, which in turn reduces distortion to a vanishingly small level.



The cabinets - Hand made

The transmission-line principle offers major advantages over the bass reflex system, but does call for extremely sophisticated design if the speaker is to exhibit a very low bass cut-off frequency. In specific terms, this means that the sound guide behind the bass drivers (the transmission-line) must be very long - similar to an organ pipe - otherwise very low frequencies cannot be generated. The natural resonances of the line and the bass units must also be tuned accurately to each other. These requirements can only be fulfilled if the cabinet features a long sound guide (line), the bass drivers have very low natural resonance, are capable of large excursions, feature an extremely powerful magnet, and have high power handling capacity. Our low-frequency drivers are specially developed and designed for this extreme application, and therefore feature rigid die-cast aluminium baskets, hard cones, long-exursion suspensions with accurate centration, and extremely powerful magnets.

All three transmission-line models are of extremely complex construction, and share the same basic design principles: an inner case which consists of a large number of accurately machined individual components, slotted and channeled into each other, and bonded under pressure to ensure air-tight joints. All the openings and slots for the drive units are machined in the baffle itself, with the air-tight chambers for the mid-range units and the Waveguide tweeter located behind the openings. Directly behind the two bass drivers is the pressure chamber, coupled with the long, folded sound guide which constitutes the transmission line. The line is designed in such a way that its effective cross-section increases towards the outlet port, providing an optimum damping effect for the bass drivers. The inner case components are manufactured from different thicknesses of MDF and particle board, which effect excellent suppression and damping of structure-borne sound and resonances.

The large number of chambers and lines helps to make the cabinet extremely rigid and stable once the sides are bonded in place. The external side panels are up to 30 mm thick, and are bonded to the inner case over their full area (i.e. laminated) in a separate process. This construction makes the cabinets very heavy, as well as completely eliminating structural sound and cabinet resonance effects.



The cabinets - Hand made

The complex construction of CRITERION speaker cabinets requires many years of expertise and craftsmanship in addition to the very latest production methods and machinery. For this reason we collaborate with one of Germany's finest and most experienced cabinet manufacturers. Production tolerances are very tight - reminiscent of metal processing techniques - and can only be attained if first-class production machinery and processes are employed. The CNC-controlled routing machines operate at speeds over 25,000 rpm, and produce totally clean and accurate machined openings which are a perfect match to the shape of the speaker drive units. The drivers are mounted extremely securely by means of screws which engage in metal threaded sockets let into the baffles.

The external side panels are cut in a single process from solid MDF sheets of high specific density using a special planing machine.

The extra-thick hardwood veneer is then laminated onto the panels using a membrane press before being fine-sanded. The visual quality of the cabinet is crucially dependent on the quality of the veneers employed. We use first-class veneers exclusively, sourced from a company specialising in high-quality timbers. The veneer sheets are pre-selected, book-matched, and assembled individually in pairs for each pair of speakers.

The final surface treatment is extremely sophisticated: multiple primer coats are applied, sanded between coats, and prepared for the final lacquer which is then hand-polished. The polishing stage for the high-gloss versions takes more than an hour, and involves painstaking manual work.

This enormous effort is worthwhile since the result is a uniquely beautiful surface which is also tough and durable.



The assembly - Hand made

CRITERION loudspeakers are not mass-produced goods! Just as the cabinets are made individually by experts, and incorporate a great deal of manual work, the technical components are installed individually, rather than on a production line. At the cabinet production stage the versions finished in real timber are made in pairs with veneer patterns which match as accurately as possible, and they remain as matched pairs when their internal components are installed. Fitting the internal components in transmission-line loudspeakers is a very demanding task in itself, and the sophisticated design of the TCD models makes the job even more challenging. It is essential that the mid-range chambers are totally airtight, and the same applies to all the drive units and screw fixings. The crossovers are very heavy owing to their large copper coils, and these assemblies have to be positioned and secured accurately, together with their high-quality connecting cables, to avoid adverse effects on the sound ducts. The damping consists of several different, carefully specified damping materials with different absorption characteristics located at precisely defined points on the line. As the heavy side panels further stiffen the internal case, so the solid, heavy base plate increases the stability of the cabinet - which is already very heavy - as well as decoupling it from the floor by virtue of its mass. The cabinet cover is made of safety glass and looks superb, but it is more than that: since it is bonded to the cabinet, it has the effect of preventing structural sound at the top of the speaker. After final assembly every single loudspeaker is subjected to a comprehensive test programme. The first step involves a frequency generator which checks for freedom from resonance; this stage is followed by a fully automatic process carried out in a low-reflection room, where measurements are made to establish correct phase, frequency response and distortion characteristics. In this way we ensure that each speaker fulfils our high quality requirements, and is as good as we can possibly make it.

	TCD 110 S	TCD210 S	TCD310 S	TCD 315 S
	Floor-standing speaker	Floor-standing speaker	Floor-standing speaker	Floor-standing speaker
Nominal power rating Watts	250	200	160	140
Music power rating Watts	330	270	220	200
Impedance Ohms	4	4	4	4
Frequency range Hz	22 - 35000	25 - 35000	28 - 35000	30 - 35000
Sensitivity	88 dB	88 dB	87 dB	86 dB
Drive units bass mm	2 x 260	2 x 220	2 x 170	2 x 150
Drive units midrange mm	2 x 170	2 x 170	2 x 150	1 x 150
Drive units high frequency mm	1 x 25	1 x 25	1 x 25	1 x 25
Crossover frequencies Hz	200 / 2200	220 / 2200	250 / 2200	320 / 2200
Dimensions H x W x D cm	131 x 36 x 49	122 x 30 x 44	105 x 26 x 36	84 x 21 x 31
Dimensions H x W x D inch	51.6x14.2x19.3	48x11.8x17.3	41.3x10.2x14.2	33x8.3x12.2
Weight kg	59 kg / 130 lb	47 kg / 103.6 lb	33 kg / 72.8 lb	23 kg / 50.7 lb

	TCD 410 R	TCD 510 C	TCD 610 W SE
	Bookshelf speaker	Center speaker	Active Subwoofer
Nominal power rating Watts	100	150	
Music power rating Watts	150	200	
Output power Watts			1000
Peak power rating Watts			1500
Impedance Ohms	4	4	
Frequency range Hz	35 - 35000	35 - 35000	15 - 150
Sensitivity	85 dB	86 dB	
Drive units bass mm	1 x 170	2 x 150	2 x 260
Drive units midrange mm		1 x 150	
Drive units high frequency mm	1 x 25	1 x 25	
Crossover frequencies Hz	2200	300 / 2200	variabel
Dimensions H x W x D cm	41 x 25 x 30	20 x 55 x 30	70 x 36 x 49
Dimensions H X W x D inch	16.1 x 9.8 x 11.8	7.9 x 21.7 x 11.8	27.6 x 14.2 x 19.3
Weight	12 kg / 26.5 lb	18 kg / 39.7 lb	42 kg / 92.6 lb

LS-TCD

	Loudspeaker stand for TCD 410 R and TCD 510 C
Dimensions overall height cm	57 (without Spikes)
Base plate H x W x D cm / inch	2 x 26 x 31 / 0.8 x 10.2 x 12.2
Mounting plate H x W x D cm / inch	0.4 x 19 x 26 cm / 0.15 x 7.5 x 10.2

TCD 110 S

STEREO

Stereo 1/2013

Outstanding audiophile recommendation! T+A's TCD 110 S is a phenomenal unit which produces exactly the sound required from this size of speaker.

Fiercely dynamic, very fine resolution and with OUTSTANDING timing.

Sound quality: 90%

Price / performance: excellent

TCD 110 S

stereoplay

stereoplay Highlight

Stereoplay 10/2012

Immense power for big rooms and large listening distances. Superbly refined audiophile sound with sensational transparency.

Sound: absolute top class

Overall verdict: very good

Price / performance: superb

TCD 210 S

AUDIO

AUDIO EMPFEHLUNG GROSSE SAHNE

Audio 8/2012

Beautifully balanced, silky-smooth speaker offering huge, high-pressure sound to fill even large rooms. The new T+A product has several surprises in store: this powerhouse gives almost childish pleasure when it lets rip, its dynamic delivery and solid bass sounding like a large PA system at a rock concert. Yet at normal volume it still provides a convincing sound, surprisingly full and smooth.

Verdict: 97 points

Price / performance: superb

TCD 310 S

STEREO

Stereo 9/2012

Little sister with a long line

In our tests the smallest floor-stander in the new Criterion TCD series turned out to be an inspired homage to its big T+A siblings at an affordable price; it produces music of very high quality, radiates an equally superior sound image and is an excellent choice for medium-sized rooms.

Sound level: 81%

Price / performance: excellent

TCD 310 S

AUDIO

AUDIO EMPFEHLUNG NATÜRLICHER KLANG

Audio 12/2012

The sound line!

One thing is certain from the very first notes: T+A developer Jochen Fabricius is a master of his trade!

Natural sound, beautiful workmanship, powerful, high-quality bass.

Highly detailed imaging.

The mid-range is both spirited and unobtrusive - the highest compliment we can pay to any loudspeaker.

Sound verdict: 96 points

Price / performance: very good

TCD 610 W SE

audiovision

Audiovision 4/2014

T+A in a really large home cinema setting? Bring it on! So wonderfully clean-sounding, but still mightily powerful, with great peak-handling capacity, and sub-woofers which delight in coping with the most profound bass - we just wish there was more equipment like it! The system is an obvious choice for the Reference class in the audio-visual field, and is truly tremendous.

Materials and workmanship: very good Features: good

AV verdict: very good, reference standard

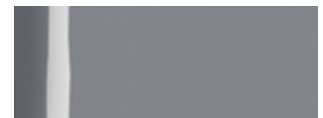
Surfaces



Rubbed lacquer black 12



Rubbed lacquer white 11



Arctic silver 94



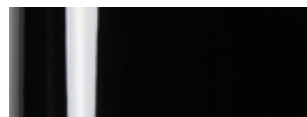
Walnut dark 81



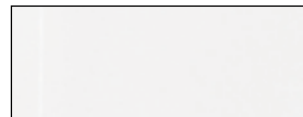
Cherry stain 82



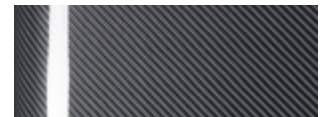
Macassar ebony 90



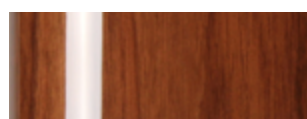
High gloss black 23



High gloss white 24



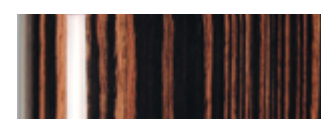
High gloss Carbon 93



High gloss walnut dark 89



High gloss cherry stain 88



High gloss macassar ebony 87

