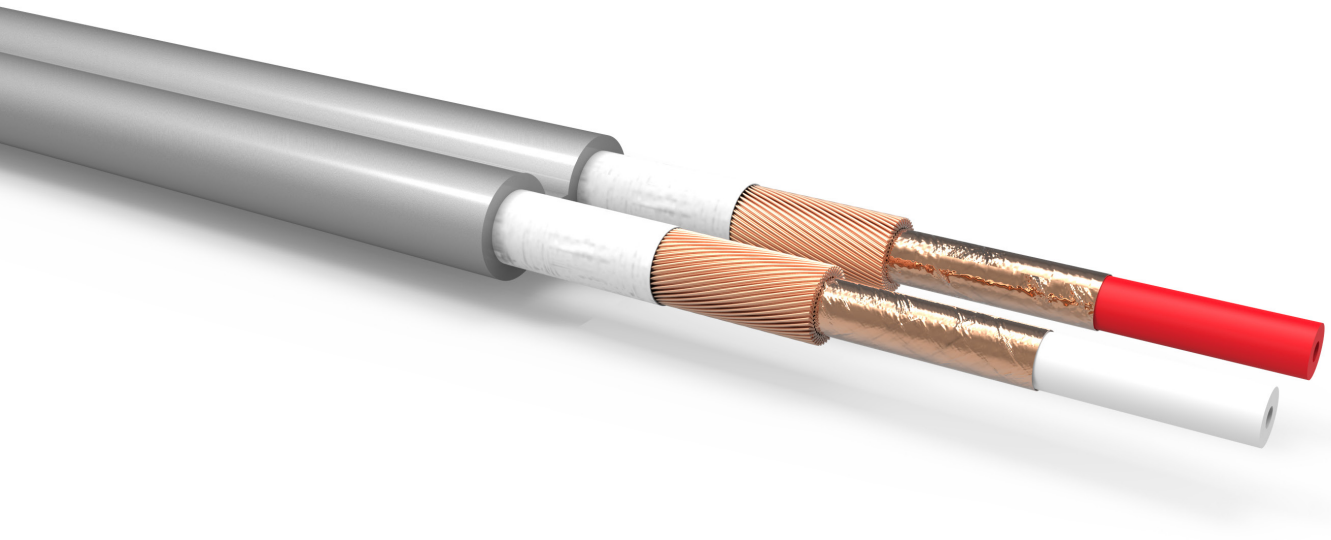
QED

XT40i SPEAKER CABLE

With X-TUBE™ TECHNOLOGY



The Sound of Science

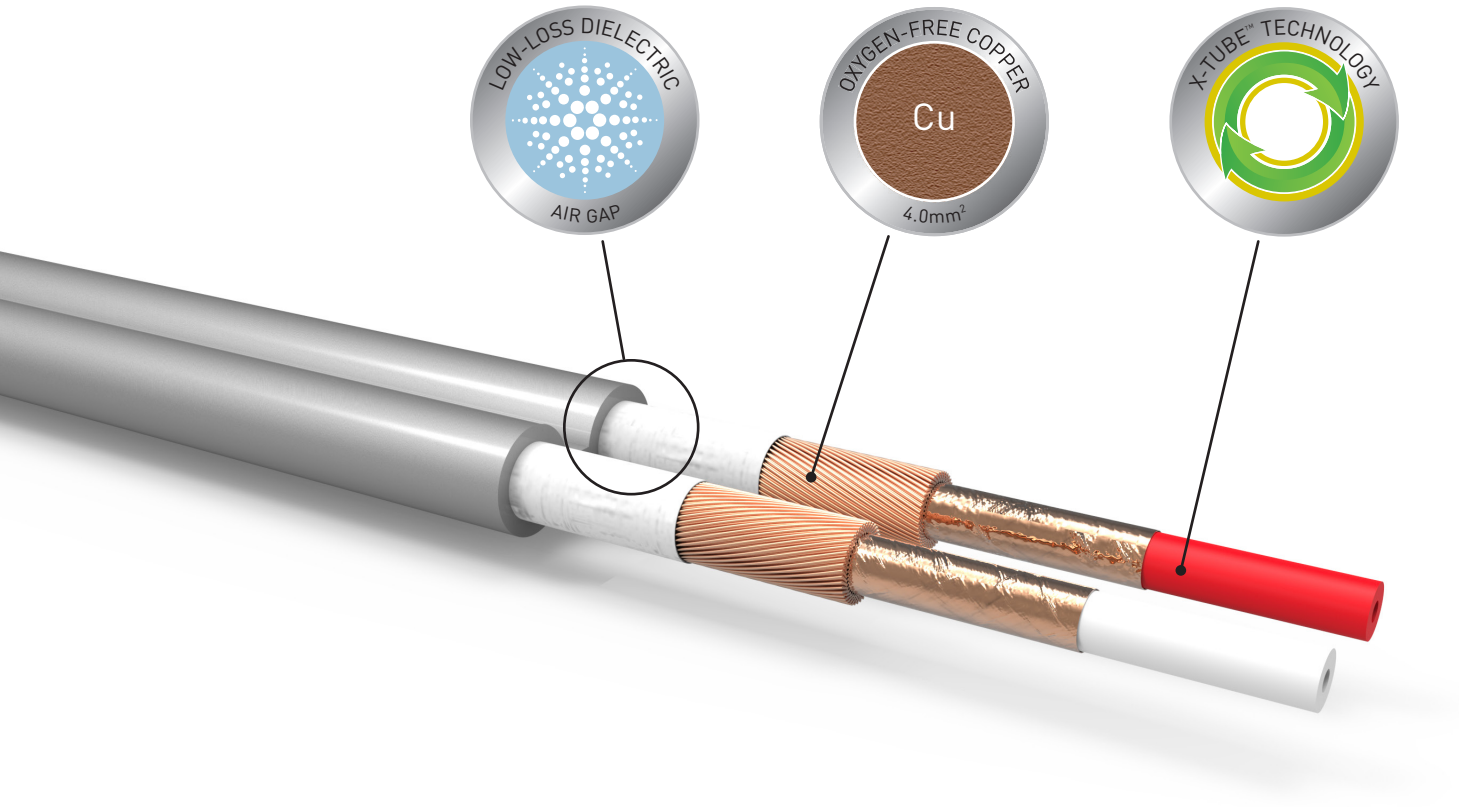
Why QED XT40i?

QED XT40 was first introduced in 2014 and was voted the best speaker cable by What Hi-fi? in the same year. Instead of resting on our laurels we have decided to improve upon this winning formula and introduce a cable improvement in the form of XT40i.

QED's top-down design philosophy

In common with all our cables, the design of XT40i is informed by the results of our exhaustive research into loudspeaker cable design, which was begun in 1995 and detailed in the recently updated Genesis Report. This report sets out the design principles to which we have adhered ever since and which resulted in the development of QED Supremus speaker cable – the ultimate expression of sound through science without compromise. Each QED cable in the range is based on this unique design and although they may be variously influenced by price, size or ease-of-use, each retains the basic original features of the flag-ship model. This gives even the base model cables a sonic advantage over their similarly priced competitors. XT40i for instance has been so designed that in some aspects it matches or outperforms its more expensive sibling. At the same time it retains the ergonomics and ease of use of a normal figure-8 cable with its easy-strip jacket and relatively small 6 mm profile.

So what are the features which make this cable so special?



Very Low DC Resistance

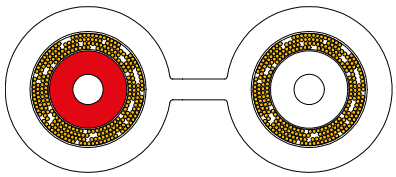
At QED we recognise that low DC resistance of the loudspeaker cable is of prime importance for high fidelity signal transfer. This is because the speaker presents a frequency dependent load to the amplifier of which the cable forms a variable proportion. If resistance is allowed to be too large then audible changes to the frequency response characteristics of the loudspeaker will be introduced which cannot be corrected by the amplifier's negative feedback loop. To that end the cross-sectional area of XT40i has been maintained at a large 4 mm^2 which instantly gives the new cable a vanishingly low loop resistance of just 8 mΩ/m and therefore a higher fidelity musical delivery. Additionally the use of long-grain 99.999% oxygen-free copper ensures that XT40i works at 102% of the conductivity of standard copper conductors.

X-Tube™ Technology

As the frequency of an AC signal increases, electrons are forced to flow more and more towards the periphery of a conductor so that if the frequency is high enough only a very thin layer (or skin) on the outside of the conductor can be used. This 'skin depth' can be calculated for different materials at a fixed frequency. In copper it means that if a conductor has larger than 0.66 mm^2 cross-sectional area not all of that area is available for an analogue music signal to use. In XT40i the 'skin effect' problem is effectively eliminated by the use of X-Tube™ Technology which works by placing all of the conducting material around a central hollow insulating rod. By forming the conductors into a tube-like shape with a hollow centre, current densities at different frequencies are equalised. This is because the electric field (which contributes towards the eddy currents which cause the skin effect) acts towards the centre of the conductor from where the conductive material has been removed. For large conductors like XT40i this arrangement ensures that the resistance part of the impedance remains much the same at all frequencies within the audio band. By contrast, ordinary cables - such as the much vaunted 'cooker flex' - can increase in resistance by as much as 200% within the audio band.

A very interesting side-effect of X-Tube™ technology is that the resulting self-inductance of the cable measures virtually half that which would normally be expected. Low inductance gives the cable improved transient response, and lower distortion and phase shift across the audio band. Also it was possible to increase the conductor spacing of XT40i to trade some of the reduced inductance for reduced capacitance. As a result, the cable benefits from the improved timing and imaging usually found in much more expensive, esoteric, high-end cables.

What is X-Tube™ Technology?



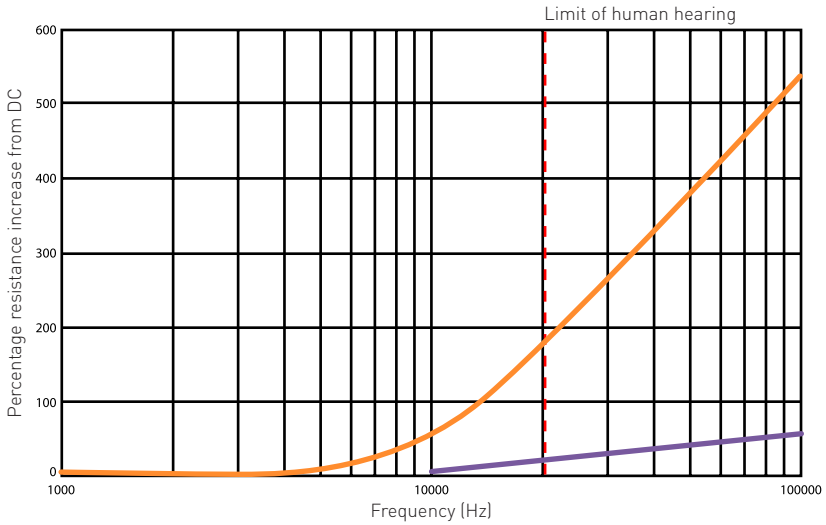
Calculation can accurately predict the maximum skin-depth at a given frequency for a particular conducting material. This makes it possible to keep the diameter of the cables below the critical size determined by the maximum frequency expected. QED cables above 1.5 mm^2 cross-sectional area utilize X-Tube™ technology to obviate the skin effect by bundling the conductors together to make up a larger CSA. If these conductors are arranged around a hollow central core of polyethylene, the self inductance exhibited by the cable can be reduced to around half that predicted by calculation. Thus a useful linear lowering of impedance across the whole audio spectrum can be achieved using this geometry when compared to a traditional large CSA twin core cable.

Low-Loss Air Gap Dielectric

It is not generally appreciated that electrical signals moving at or near the speed of light in a wire, do so via the medium of electromagnetic (EM) waveforms, which must travel within the dielectric which surrounds the conductors as well as within the conductors themselves. It is clear that the movement of electrons along the conductor merely *facilitates* generation of the EM waveform, as their 'drift velocity' is much too slow - being only a few centimetres per second. It is therefore important to ensure that the dielectric material used to insulate and protect the central conductors of the speaker cable is of a type which 'permits' the establishment of EM waveforms without appreciable loss. Dielectric losses are directly proportional to the 'permittivity' of the material used and as this is a measure of each material relative to that in a vacuum it should be as close to unity as possible. To make XT40i a user-friendly, easy-to-terminate cable, a soft PVC outer jacket has been used in combination with hollow PE rods which would ordinarily only give average results as far as dielectric performance goes. However, due to the advantages conferred upon it by its X-Tube™ geometry, the increased separation of the conductors results in much more of the space between them being made of air, which has the effect of reducing the dielectric constant of the insulation without even changing the materials. In this way, using an Air Gap Dielectric both capacitance and dissipation factor have been halved when compared to the old award winning cable, bringing audible improvements in musical timing, lower distortion and better transient performance.

Is there a measurable audible result of all these improvements?

The graph below shows how the resistance part of the impedance of XT40i remains effectively unchanged across the entire audible frequency band when compared to an ordinary cable of the same cross-sectional area. Combined with the sonic advantages of a lower-loss dielectric, these improvements place the new cable in a unique position to rival its illustrious predecessor.



Cooker Flex cable (—), XT40i cable (—)

During development, we typically design and test at least four variants of each design to see where the extremes of each of the parameters lie. The cable that eventually becomes a product has been measured and listened to exhaustively and represents the best state-of-the-art at any given time. QED XT40i is no exception in this regard. Here are some comments from our panel of testers drawn from experts in the industry and amateur enthusiasts alike:

"...I wanted to keep listening and turn it up..."

"...very engaging, could follow individual instruments with ease..."

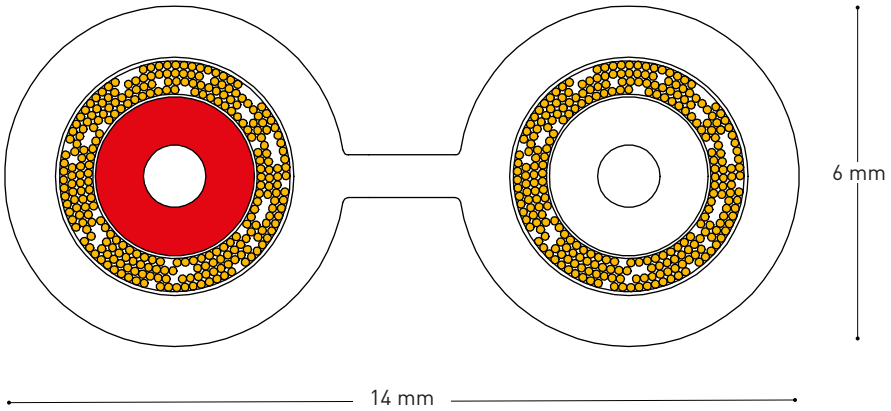
"Bass under control"

"Reveals a new level of detail"

"Good timing, clean highs"

"Separation of instruments is better with wider dynamics"

Specification



Outside diameter	6 x 14 mm
Conductor area	4.0 mm^2
Conductor chemistry	99.999% oxygen-free copper
Dielectric properties	Air Gap (ε_r = 2.4)
Loop resistance	8.0 mΩ/m
Parallel capacitance	35 pF/m
Dissipation factor @ 10 kHz	0.0295
Self-inductance	0.57 µH/m

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